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TECHNICAL NOTE

Classification of Geosynchronous objects.

Prepared by ESA Space Debris Office
Reference GEN-DB-LOG-00270-OPS-SD
Issue/Revision 21.0
Date of Issue 19 July 2019
Status Issued

Abstract

This is a status report on (near) geosynchronous objects as of 1 January 2019.

Based on orbital data in ESA's DISCOS database and on orbital data provided by KIAM the situation near the geostationary ring is analysed. From 1578 objects for which orbital data are available (of which 14 are outdated, i.e. the last available state dates back to 180 or more days before the reference date), 529 are actively controlled, 831 are drifting above, below or through GEO, 195 are in a libration orbit and 21 are in a highly inclined orbit. For 2 object the status could not be determined.

Furthermore, there are 60 uncontrolled objects without orbital data (of which 55 have not been catalogued). Thus the total number of known objects in the geostationary region is 1638.

Finally, there are 130 rocket bodies crossing GEO.

If you detect any error or if you have any comment or question please contact:

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1 INTRODUCTION

All objects that are catalogued in ESA's DISCOS Database (Database and Information System Characterising Objects in Space) and residing at the reference date within one of the orbital classes GEO, IGO and EGO (see table 1 for the class definitions) are listed in this document. The main purpose is to classify all the objects residing in the first two orbital classes according to different categories (top level: controlled, drifting and librating). In addition, all objects that are catalogued in DISCOS as rocket bodies and were crossing the GEO protected region during the calendar year prior to the reference date are listed as well. The reference date for this report is 1 January 2019.

Table 1: Orbital classes defined by a combination of inclination i [deg], semi-major axis a [km], eccentricity e, perigee height h_p [km] and apogee height h_a [km]. As they are non-exclusive, orbits are assigned according to the order given here. Additionally, the Inter-Agency Space Debris Coordination Committee (IADC) GEO protected region [1] defined by latitude ϕ [deg] and altitude h [km] is given.

Orbit	**Description**	**Definition**		
GEO	Geostationary Orbit	$i \in [0, 25]$	$h_p \in [35586, 35986]$	$h_a \in [35586, 35986]$
IGO	Inclined Geosynchronous Orbit	$i \in [25, 180]$	$a \in [37948, 46380]$	$e \in [0, 0.25]$
EGO	Extended Geostationary Orbit	$i \in [0, 25]$	$a \in [37948, 46380]$	$e \in [0, 0.25]$
GEO_{IADC}	IADC GEO Protected Region	$\phi \in [-15, 15]$	$h \in [35586, 35986]$	

The document is structured as follows: Section 2 describes the sources being used to compile this report and section 3 gives an overview of all the catalogued objects. Detailed information about the objects is given in section 4 and 5 for objects where orbital data is available and where no orbital data is available respectively. Figures are presented in section 6 to visualize the data and section 7 summarises the findings.

2 SOURCES

Subsequently, each source contributing to this report is presented in a separate section. They are ordered by priority in case an object appears in multiple sources. From these sources, the report exhibits the categorisation of objects based on observed orbital patterns. Nine different classifications are distinguished:

- **C1** objects under longitude and inclination control (E-W as well as N-S control) – the longitude is nearly constant and the inclination is generally less than 0.3 degrees (however control at larger angles within one year is accepted as well),
- **C2** objects under longitude control (only E-W control) – the longitude is nearly constant but the inclination is generally greater than 0.3 degrees,
- **C4** objects maintaining a drift orbit near or inside GEO_{IADC},
- **D** objects in a drift orbit,
- **L1** objects in a libration orbit around the Eastern stable point (longitude 75 degrees East),
- **L2** objects in a libration orbit around the Western stable point (longitude 105 degrees West),
- **L3** objects in a libration orbit around both stable points,
- **I** objects in highly inclined orbits with inclination greater than 25.0 degrees,
- **X** objects crossing the GEO protected region,
- **Ind** objects of indeterminate status.

2.1 USSTRATCOM Two-Line Elements (TLEs)

The basic source of information are the USSTRATCOM Two-Line Elements (TLEs). The DISCOS Database [2] is updated at regular intervals by ESOC's Space Debris Office with this source. The accuracy of TLE is limited. At the geostationary altitude, TLE are provided on a regular basis, and are mainly for objects larger than about 1 meter in size. TLE for smaller objects are provided rather sporadically. It should be noted that also some of the derived parameters like libration period and libration amplitude may in some cases be subject to a limited accuracy. For further information about the method of classification please refer to Classification of Geostationary Objects [3].

The frame in which the mean orbital elements are expressed for objects from this source is the true equator, mean equinox (TEME) frame. The catalogue number is given as the source id (S-ID).

2.2 JSC Vimpel Space Data

This source of data is a bulletin prepared jointly by the data-analysis centre of near-Earth space monitoring (DAC NESM) of JSC Vimpel Interstate Corporation and KIAM. Orbital data are obtained from optical information of JSC Vimpel, KIAM, JSC Astronomical Scientific Center, and the International Space Observation Network (ISON) and their partners. The DISCOS Database [2] is updated at regular intervals by ESOC's Space Debris Office with this source. The content of the data is specialised to objects in near-Earth orbit with long, i.e. above 200 minutes, periods not covered in the TLE data source.

When using orbital elements, they are expressed for objects from this source in the Earth Mean Equator and Equinox at 12:00 Terrestrial Time on 1 January 2000 frame (J2000). The catalogue number is given as the source id (S-ID).

2.3 Keldysh Institute for Applied Mathematics (KIAM)

This source provides orbital data derived from ground-based optical observations. Data are provided only for objects for which no USSTRATCOM TLEs are published. Orbits given in this report are produced from measure-

ments obtained in 2017 and prepared by Vladimir Agapov, Keldysh Institute for Applied Mathematics, Moscow (KIAM), but not updated in 2018. The orbits are a joint product of the wide cooperation of organizations including:

- Center on collection, processing and analysis of information on space debris at the Keldysh Institute of Applied Mathematics of the Russian Academy of Sciences (KIAM RAS, Moscow, Russia),
- International scientific observation facilities network (ISON) coordinated by KIAM RAS and other observatories operated by Russian scientific and industry organizations:
  - Ussuriysk Astrophysical Observatory of the Far East branch of the RAS (Gornotayozhnoye, Primorsky Krai, Russia),
  - Zvenigorod observatory of the Astronomy Institute of the RAS (INASAN) (Moscow oblast, Russia),
  - Crimean Astrophysical Observatory (Nauchny),
  - Ulugbek Astronomical Observatory (Kitab facilitiy, Qashqadaryo Province, Uzbekistan),
  - Observation facilities operated by the ”Astronomical Scientific Center”, JSC:
    * Artem (Primorsky Krai, Russia),
    * Blagoveshchensk (Amur region, Russia),
    * Kislovodsk observatory (Karachaevo-Cherkesskaya Republic, Russia),
    * Lesosibirsk (Krasnoyarsky Krai, Russia),
    * Elizovo (Kamchatka Krai, Russia),
    * La Serena (Chile),
  - Byurakan Astrophysical Observatory of the Armenian Academy of Sciences (Byurakan, Armenia),
  - Andrushivka Observatory (Zhytomyrs’ka oblast, Ukraine),
  - National observatory of Bolivia (Tarija, Bolivia),
  - Sayan Solar Observatory of the Institute of Solar-Terrestrial Physics of the Siberian branch of the RAS (Mondy, Republic of Buryatia, Russia),
  - Observation facility of the PGU (Tiraspol),
  - Odessa State University Astronomical Observatory (Mayaki, Odes’ka oblast, Ukraine),
  - Derenovka observation facility of Laboratory of space researches, Uzhhorod National University (Zakarpats’ka oblast, Ukraine),
  - Chuguyev observation facility of the Astronomy scientific and research institute of Kharkov national university (Kharkiv’ska oblast, Ukraine),
  - Cosalá observation facility of the The Autonomous University of Sinaloa (Universidad Autónoma de Sinaloa, UAS, Mexico),
  - Khureltogoot observatory of the The Research Centre of Astronomy and Geophysics of the Mongolian Academy of Sciences
  - Observatory ”Peak Terskol” of the International Center for Astronomical, Medical and Ecological Research (Kabardino-Balkaria Republic, Russia),
  - E.Kharadze Abastumani Astrophysical Observatory of Ilia State University (Abastumani, Adigeni District, Georgia),
  - Mul’ta observation facility (Altai Republic, Russia),
  - Observatory of Altai State Pedagogical University (Barnaul, Altaisky Krai, Russia),
  - Observation facility of El Centro de Investigaciones de Ciencias Físico Matemáticas de la Universidad Autónoma de Nuevo León (UANL, Mexico).
- Astronomical Institute of the University of Bern, partner of ISON, operating the Zimmerwald observatory (Switzerland) and, for space debris observation, the ESA 1m telescope at the optical ground station (OGS), Izaña, Tenerife, Spain,
- Telescope Fabra ROA Montsec (TFRM) operated by the Reial Acadèmia de Ciències i Arts de Barcelona - Observatori Fabra, the Real Instituto y Observatorio de la Armada (ROA) and the Departament d’Astronomia i Meteorologia, Universitat de Barcelona, Spain.

The objects for which an ephemeris was provided by KIAM were observed repeatedly by ground based telescopes. They were listed in issues 7 to 13 as 'Unidentified objects'. During the years 2011-2015, most of them were correlated to a launch thanks to the excellent work of satellite analysts and amateur observers. A source id (S-ID), consisting of a label and number, is given for each such object in order to correlate it with itself from an earlier report. The labels are:

UI (formerly) unidentified objects in proximity of GEO_{IADC},

U uncontrolled catalogued by the USSTRATCOM objects known to be in or in proximity of GEO_{IADC}, but with no orbital data provided by any source (for this category, the numbers do not correlate with earlier reports), see section 5.1,

UU uncontrolled, uncatalogued by the USSTRATCOM objects known to be in or in proximity of GEO_{IADC}, but with no orbital data provided by any source, see section 5.2.

Some of objects with information provided initially by KIAM meanwhile have been catalogued by the USSTRATCOM. Therefore they were removed from the data blocks provided by KIAM. In order to retain consistency while referring to a particular object in different reports the complete list of such objects is provided in Table 2.

Table 2: Objects with information initially provided by KIAM with corresponding S-ID and later assigned international designation by the USSTRATCOM.

S-ID	COSPAR	Name	Page
UI089	1968-081R	Transtage 5 fragmentation debris	p. 152
UI094	1997-040A	PAS 6	p. 98
UI099	1977-092K	Ekran 2 fragmentation debris	p. 144
UI153	2008-006C	Briz-M (Proton-M/Briz-M)	p. 99
UI163	2010-006B	Briz-M (Proton-M/Briz-M)	p. 97
UU041	1988-051G	Meteosat 3 AKM (MAGE 1)	p. 133
UU061	1997-029D	Fengyun 2A operational debris (S-VISSR radiometre cover)	p. 172
UU065	2002-040E	Meteosat 8 (MSG 1) operational debris (SEVIRI Cooler Cover)	p. 155
UU066	2002-040F	Meteosat 8 (MSG 1) operational debris (SEVIRI Entry Baffle Cover)	p. 148
UU068	2004-042D	Fengyun 2C operational debris (S-VISSR radiometre cover)	p. 172
UU070	2008-066D	Fengyun 2E operational debris (S-VISSR radiometre cover)	p. 174
UU071	2012-002D	Fengyun 2F operational debris (S-VISSR radiometre cover)	p. 173
UU072	2012-035E	Meteosat 10 (MSG 3) operational debris (SEVIRI Cooler Cover)	p. 158
UU073	2012-035F	Meteosat 10 (MSG 3) operational debris (SEVIRI Entry Baffle Cover)	p. 148

Orbits were established by processing of optical measurements and propagation to the indicated reference epoch. For most of the orbits this epoch is within the orbit determination time interval but for some of them it is outside due to visibility constraints of the participating optical facilities.

The numerical integration model used in the data processing is taking into account the Earth gravity field (8x8, EGM-96), the Moon and the Sun gravity (DE-405 ephemeris) and solar radiation pressure (diffuse reflecting Lambertian sphere model).

All objects are usually relatively bright as a rule (brighter than 15th apparent magnitude at favorable phase angles) and have no significant short term variations in brightness. Though there are a few exceptions.

The osculating orbital elements are given in the standard inertial reference frame J2000 (Earth Mean Equator and Equinox of Julian Date 2451545.0).

3 LIST OF GEOSYNCHRONOUS OBJECTS

All the catalogued objects near the geostationary ring are listed here. They are ordered according to their international designation in COSPAR notation. The index at the end of the document gives a list sorted according to the object's common name. Catalogued objects crossing the geostationary protected region and well as catalogued objects that don't have a COSPAR designation are omited from the list in this section.

The table contains

COSPAR satellite designation assigned to an object in the USSTRATCOM catalogue in accordance with the designation system (international naming convention for satellites, sometimes referred to as COSPAR notation) established by the Committee on Space Research (COSPAR) of the International Council for Science and used since 1963. Prior to July 2011 the World Warning Agency for Satellites (WWAS), as part of the World Data Center of International Council for Science, was responsible for assignment of the designators on behalf of COSPAR. This service is no longer available due to changes in organization of the WWAS. Though the same designation system is used for catalogued objects by different space monitoring systems the COSPAR designation assigned to the same object by different systems can be different due to absence of coordination at the international level for the process of international satellite designation assignment;

Name object's common name (or names); an attempt is made to introduce a 'standard' approach for the 'naming scheme' which supposes 'official name' to be the first and other known names (if any) given in parentheses; in case of a rocket body the object name is given in italics as before and the name of launch vehicle is appended in parentheses;

Status the status of the object (see section 2 for explanations of the categories);

nn reference number;

page page number on where to find more detailed information about the object.

Please note, that all objects of the UU category, and all objects of UI category without COSPAR designation assigned in the USSTRATCOM catalogue, are not included in this list (even if their launch of origin is known).

COSPAR	Name	Status	nn	Page
1963-031A	Syncom 2	I	1.	p. 191
1964-047A	Syncom 3	D	594.	p. 146
1965-028A	Intelsat I F-1 (Early Bird)	L2	20.	p. 179
1966-053A	GGTS 1	D	815.	p. 165
1966-053B	OPS 9311 (IDSCS 1)	D	813.	p. 165
1966-053C	OPS 9312 (IDSCS 2)	D	811.	p. 164
1966-053D	OPS 9313 (IDSCS 3)	D	807.	p. 164
1966-053E	OPS 9314 (IDSCS 4)	D	805.	p. 164
1966-053F	OPS 9315 (IDSCS 5)	D	801.	p. 164
1966-053G	OPS 9316 (IDSCS 6)	D	798.	p. 163
1966-053H	OPS 9317 (IDSCS 7)	D	796.	p. 163
1966-053J	*Transtage 11 (Titan IIIC)*	D	794.	p. 163
1966-110A	ATS 1	D	626.	p. 149
1967-001A	Intelsat II F-2	D	595.	p. 146
1967-003A	OPS 9321 (IDSCS 8)	D	819.	p. 165
1967-003B	OPS 9322 (IDSCS 9)	D	818.	p. 165
1967-003C	OPS 9323 (IDSCS 10)	D	817.	p. 165
1967-003D	OPS 9324 (IDSCS 11)	D	816.	p. 165
1967-003E	OPS 9325 (IDSCS 12)	D	814.	p. 165
1967-003F	OPS 9326 (IDSCS 13)	D	808.	p. 164
1967-003G	OPS 9327 (IDSCS 14)	D	804.	p. 164
1967-003H	OPS 9328 (IDSCS 15)	D	799.	p. 163
1967-026A	Intelsat II F-3	L1	120.	p. 177
1967-066A	OPS 9331 (IDSCS 16)	D	826.	p. 166
1967-066B	OPS 9332 (IDSCS 17)	D	825.	p. 166
1967-066C	OPS 9333 (IDSCS 18)	D	824.	p. 165
1967-066D	OPS 9334 (IDSCS 19, DATS)	D	823.	p. 165
1967-066E	LES 5	D	822.	p. 165
1967-066F	DODGE 1	D	821.	p. 165
1967-066G	*Transtage 14 (Titan IIIC)*	D	820.	p. 165
1967-094A	Intelsat II F-4	L2	25.	p. 180
1967-111A	ATS 3	L2	44.	p. 181
1968-050A	OPS 9341 (IDSCS 20)	D	812.	p. 164
1968-050B	OPS 9342 (IDSCS 21)	D	810.	p. 164
1968-050C	OPS 9343 (IDSCS 22)	D	809.	p. 164
1968-050D	OPS 9344 (IDSCS 23)	D	806.	p. 164
1968-050E	OPS 9345 (IDSCS 24)	D	803.	p. 164
1968-050F	OPS 9346 (IDSCS 25)	D	800.	p. 163
1968-050G	OPS 9347 (IDSCS 26)	D	797.	p. 163
1968-050H	OPS 9348 (IDSCS 27)	D	795.	p. 163

COSPAR	Name	Status	nn	Page
1968-050J	*Transtage 16 (Titan IIIC)*	D	792.	p. 163
1968-063A	OPS 2222 (CANYON 1)	D	352.	p. 126
1968-063B	*Agena D (Atlas SLV3A)*	D	741.	p. 159
1968-081A	OV2-5 (DG7-2)	D	735.	p. 158
1968-081D	LES 6	L2	17.	p. 179
1968-081E	*Transtage 5 (Titan IIIC)*	D	730.	p. 158
1968-081G	Transtage 5 fragmentation debris	D	688.	p. 154
1968-081H	Transtage 5 fragmentation debris	D	739.	p. 158
1968-081J	Transtage 5 fragmentation debris	D	680.	p. 153
1968-081K	Transtage 5 fragmentation debris	D	747.	p. 159
1968-081L	Transtage 5 fragmentation debris	D	742.	p. 159
1968-081M	Transtage 5 fragmentation debris	D	669.	p. 152
1968-081N	Transtage 5 fragmentation debris	D	681.	p. 153
1968-081P	Transtage 5 fragmentation debris	D	724.	p. 157
1968-081Q	Transtage 5 fragmentation debris	D	378.	p. 128
1968-081R	Transtage 5 fragmentation debris	D	665.	p. 152
1968-081S	Transtage 5 fragmentation debris	D	606.	p. 147
1968-081T	Transtage 5 fragmentation debris	D	761.	p. 160
1968-081U	Transtage 5 fragmentation debris	D	775.	p. 161
1968-081V	Transtage 5 fragmentation debris	D	387.	p. 129
1968-081W	Transtage 5 fragmentation debris	D	607.	p. 147
1968-081X	Transtage 5 fragmentation debris	D	728.	p. 157
1968-081Y	Transtage 5 fragmentation debris	D	786.	p. 162
1968-081Z	Transtage 5 fragmentation debris	D	615.	p. 148
1968-081AA	Transtage 5 fragmentation debris	D	759.	p. 160
1968-081AB	Transtage 5 fragmentation debris	D	697.	p. 155
1968-081AC	Transtage 5 fragmentation debris	D	751.	p. 159
1968-081AD	Transtage 5 fragmentation debris	D	791.	p. 163
1968-081AE	Transtage 5 fragmentation debris	D	752.	p. 159
1968-081AF	Transtage 5 fragmentation debris	D	746.	p. 159
1968-081AG	Transtage 5 fragmentation debris	D	650.	p. 151
1968-081AH	Transtage 5 fragmentation debris	D	612.	p. 148
1968-081AJ	Transtage 5 fragmentation debris	D	571.	p. 144
1968-081AK	Transtage 5 fragmentation debris	D	613.	p. 148
1968-116A	Intelsat III F-2	D	6.	p. 97
1969-013A	TACSAT 1	D	631.	p. 149
1969-013B	*Transtage 17 (Titan IIIC)*	D	73.	p. 103
1969-013C	Titan 3C fragmentation debris	D	12.	p. 98
1969-013D	Titan 3C fragmentation debris	D	16.	p. 98
1969-013E	Titan 3C fragmentation debris	D	66.	p. 102
1969-013F	Titan 3C fragmentation debris	D	597.	p. 146

COSPAR	Name	Status	nn	Page
1969-013G	Titan 3C fragmentation debris	D	62.	p. 102
1969-013H	Titan 3C fragmentation debris	D	193.	p. 113
1969-013J	Titan 3C fragmentation debris	D	53.	p. 101
1969-013K	Titan 3C fragmentation debris	D	769.	p. 161
1969-013L	Transtage 17 fragmentation debris	D	802.	p. 164
1969-013M	Titan 3C fragmentation debris	D	762.	p. 160
1969-013N	Transtage 17 fragmentation debris	D	22.	p. 98
1969-013P	Transtage 17 fragmentation debris	D	622.	p. 148
1969-013Q	Transtage 17 fragmentation debris	D	601.	p. 147
1969-013R	Titan 3C fragmentation debris	D	33.	p. 99
1969-013S	Titan 3C fragmentation debris	D	96.	p. 105
1969-013T	Titan 3C fragmentation debris	D	36.	p. 100
1969-013U	Titan 3C fragmentation debris	D	50.	p. 101
1969-013V	Titan 3C fragmentation debris	D	599.	p. 146
1969-036A	OPS 3148 (CANYON 2)	D	632.	p. 149
1969-036B	*Agena D (Atlas SLV3A)*	D	778.	p. 162
1969-045A	Intelsat III F-4	D	5.	p. 97
1969-069A	ATS 5	D	422.	p. 132
1969-069C	ATS 5 AKM (JPL SR-28-3)	D	131.	p. 107
1969-101A	Skynet 1A	L2	41.	p. 181
1970-003A	Intelsat III F-6	D	318.	p. 123
1970-021A	NATO I	L2	2.	p. 178
1970-032A	Intelsat III F-7	L1	117.	p. 176
1970-046A	OPS 5346 (Rhyolite 1)	L1	20.	p. 168
1970-055A	Intelsat III F-8	D	754.	p. 160
1970-069A	OPS 7329 (CANYON 3)	L2	21.	p. 179
1970-069B	*Agena D (Atlas SLV3A)*	D	740.	p. 158
1971-006A	Intelsat IV F-2	D	228.	p. 116
1971-009A	NATO IIB	L2	40.	p. 181
1971-039A	OPS 3811 (DSP F2, DSP 3, DSP Block 1(PHASE I) F2)	D	128.	p. 107
1971-039B	*Transtage 20 (Titan IIIC)*	D	633.	p. 149
1971-095A	OPS 9431 (DSCS II F-1, DSCS 2-1, DSCS II A-1)	L2	3.	p. 178
1971-095B	OPS 9432 (DSCS II F-2, DSCS 2-2, DSCS II A-2)	L3	1.	p. 182
1971-095C	*Transtage 21 (Titan IIIC)*	D	64.	p. 102
1971-116A	Intelsat IV F-3	D	453.	p. 134
1972-003A	Intelsat IV F-4	D	493.	p. 138
1972-010A	OPS 1570 (DSP F3, DSP 4, DSP Block 1(PHASE I) F3)	D	477.	p. 136
1972-010B	*Transtage 22 (Titan IIIC)*	D	661.	p. 152
1972-041A	Intelsat IV F-5	D	561.	p. 143
1972-090A	Anik A1	D	229.	p. 116

COSPAR	Name	Status	nn	Page
1972-101A	OPS 9390 (CANYON 5)	L1	126.	p. 177
1972-101B	*Agena D (Atlas SLV3A)*	D	755.	p. 160
1973-013A	OPS 6063 (Rhyolite 2)	L1	121.	p. 177
1973-023A	Anik A2	D	485.	p. 137
1973-040A	OPS 6157 (DSP F4, DSP 2, DSP Block 1(PHASE I) F4)	D	494.	p. 138
1973-040B	*Transtage 24 (Titan IIIC)*	D	431.	p. 132
1973-058A	Intelsat IV F-7	D	309.	p. 122
1973-100A	OPS 9433 (DSCS II F-3, DSCS 2-3, DSCS II B-3)	D	84.	p. 104
1973-100B	OPS 9434 (DSCS II F-4, DSCS 2-4, DSCS II B-4)	D	74.	p. 103
1973-100D	*Transtage 26 (Titan IIIC)*	D	25.	p. 99
1974-017A	Cosmos-637	D	670.	p. 152
1974-017F	*Blok-DM (Proton-K/DM)*	D	684.	p. 154
1974-022A	Westar I	D	517.	p. 140
1974-033A	SMS 1	D	182.	p. 112
1974-033F	SMS 1 AKM (SVM-5)	D	831.	p. 166
1974-039A	ATS 6	D	745.	p. 159
1974-039C	*Transtage 27 (Titan IIIC)*	D	662.	p. 152
1974-060A	Molniya 1-S	L1	68.	p. 172
1974-060F	*Blok-DM (Proton-K/DM)*	L1	90.	p. 174
1974-075A	Westar II	D	503.	p. 138
1974-093A	Intelsat IV F-8	D	478.	p. 136
1974-094A	Skynet 2B	L1	115.	p. 176
1974-101A	Symphonie A	D	523.	p. 140
1975-011A	SMS 2	D	425.	p. 132
1975-011F	SMS 2 AKM (SVM-5)	D	178.	p. 111
1975-038A	Anik A3	D	547.	p. 142
1975-042A	Intelsat IV F-1	D	363.	p. 127
1975-055A	OPS 4966 (CANYON 6)	L1	125.	p. 177
1975-055B	*Agena D (Atlas SLV3A)*	D	748.	p. 159
1975-077A	Symphonie B	D	531.	p. 141
1975-091A	Intelsat IVA F-1	D	524.	p. 140
1975-097A	Cosmos-775	L1	76.	p. 173
1975-097F	*Blok-DM (Proton-K/DM)*	D	562.	p. 143
1975-100A	GOES 1	L2	8.	p. 178
1975-100F	GOES 1 AKM (SVM-5)	D	744.	p. 159
1975-117A	RCA Satcom I	D	449.	p. 134
1975-118A	OPS 3165 (DSP F5, DSP 8, DSP Block 2(PHASE II) F5)	D	614.	p. 148
1975-118C	*Transtage 29 (Titan IIIC)*	D	646.	p. 150
1975-118D	OPS 3165 debris (DSP F5 IR Sensor telescope sunshade cover)	U	1.	p. 205
1975-123A	Raduga 1	L1	19.	p. 168

COSPAR	Name	Status	nn	Page
1975-123F	*Blok-DM (Proton-K/DM)*	D	642.	p. 150
1976-004A	Hermes (CTS)	L2	15.	p. 179
1976-004E	Hermes (CTS) operational debris (solar array cover)	L2	9.	p. 178
1976-004F	Hermes (CTS) operational debris (solar array cover)	L2	7.	p. 178
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2015-019A	Beidou DW 17	I	14.	p. 192
2015-022A	Thor 7	C1	372.	p. 82
2015-022B	SICRAL 2	C1	46.	p. 54
2015-023A	TurkmenAlem52E/MonacoSAT	C1	70.	p. 56
2015-026A	DirecTV 15	C1	274.	p. 73
2015-026B	SKY Mexico-1	C1	300.	p. 76

COSPAR	Name	Status	nn	Page
2015-034A	Meteosat 11 (MSG 4)	C2	150.	p. 95
2015-034B	Star One C4	C1	311.	p. 76
2015-034E	Meteosat 11 (MSG 4) operational debris (Cooler Cover)	D	734.	p. 158
2015-034F	Meteosat 11 (MSG 4) operational debris (SEVIRI Entry Baffle Cover)	D	758.	p. 160
2015-036A	USA 263 (WGS SV-7)	C1	218.	p. 69
2015-039A	Intelsat 34 (Hispasat 55W-2)	C1	326.	p. 78
2015-039B	Eutelsat 8 West B	C1	361.	p. 81
2015-041A	GSAT 6	C1	120.	p. 61
2015-042A	Inmarsat-5 F3	C1	220.	p. 69
2015-044A	MUOS 4	C2	33.	p. 85
2015-046A	TJS	C1	205.	p. 68
2015-048A	Ekspress-AM 8	C1	356.	p. 80
2015-048B	*Blok-DM-3 (Proton-M/DM-3)*	D	197.	p. 113
2015-053A	Beidou DW 20	I	15.	p. 192
2015-054A	Sky Muster	C1	193.	p. 67
2015-054B	ARSAT-2	C1	299.	p. 75
2015-056A	Morelos 3	C2	105.	p. 91
2015-059A	Apstar 9	C1	196.	p. 67
2015-060A	Turksat 4B	C1	68.	p. 56
2015-063A	Chinasat 2C (Zhongxing 2C, ZX 2C, Shentong 2-2)	C1	146.	p. 63
2015-065A	GSAT 15	C1	134.	p. 62
2015-065B	Badr 7	C1	34.	p. 53
2015-067A	LaoSat 1	C1	182.	p. 66
2015-068A	Telstar 12 Vantage (Telstar 12V)	C1	355.	p. 80
2015-073A	Chinasat 1C (Zhongxing 1C, ZX 1C, Feng Huo 2-2)	C2	41.	p. 86
2015-074A	Elektro-L No. 2	C1	110.	p. 60
2015-074B	*Fregat-SB (Zenit-3F)*	D	765.	p. 161
2015-075A	Cosmos-2513	C1	115.	p. 60
2015-075B	*Briz-M (Proton-M/Briz-M)*	D	788.	p. 162
2015-075D	Briz-M fragmentation debris	D	624.	p. 149
2015-075E	Briz-M fragmentation debris	D	793.	p. 163
2015-075F	Briz-M fragmentation debris	D	625.	p. 149
2015-075G	Briz-M fragmentation debris	D	789.	p. 163
2015-075H	Briz-M fragmentation debris	D	771.	p. 161
2015-075J	Briz-M fragmentation debris	D	750.	p. 159
2015-082A	Ekspress-AMU 1	C1	45.	p. 54
2015-083A	Gaofen 4	C1	149.	p. 63
2016-001A	BelinterSat-1	C1	69.	p. 56
2016-003A	IRNSS-R1E	I	16.	p. 192
2016-004A	Intelsat 29e (IS-29e)	C1	330.	p. 78

COSPAR	Name	Status	nn	Page
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2016-013A	SES-9	C1	153.	p. 63
2016-014A	Eutelsat 65 West A	C1	314.	p. 77
2016-015A	IRNSS-R1F	C2	14.	p. 84
2016-021A	Beidou DW 22	I	17.	p. 192
2016-027A	IRNSS-R1G	C2	69.	p. 88
2016-028A	JCSAT 2B	C1	204.	p. 68
2016-031A	Thaicom 8	C1	114.	p. 60
2016-035A	Intelsat 31 (DLA 2, ISDLA 2)	C1	283.	p. 74
2016-036A	USA 268 (NROL 37, ORION)	C2	61.	p. 88
2016-036B	*Delta IV DCSS 5 (Delta 4H)*	D	783.	p. 162
2016-037A	Beidou DW 23	C2	64.	p. 88
2016-038A	ABS 2A	C1	108.	p. 60
2016-038B	Eutelsat 117 West B	C1	247.	p. 71
2016-039A	BRISat	C1	202.	p. 67
2016-039B	EchoStar 18	C1	319.	p. 77
2016-041A	MUOS 5	C2	112.	p. 92
2016-047A	USA 269 (Quasar 20, SDS-4 1)	C2	147.	p. 95
2016-048A	Tiantong-1 01	C2	58.	p. 87
2016-050A	JCSAT 16	C1	198.	p. 67
2016-052A	USA 270	C4	2.	p. 96
2016-052B	USA 271	C4	4.	p. 96
2016-052C	*Delta IV DCSS 4 (Delta 4M+(4,2))*	D	277.	p. 120
2016-053A	Intelsat 36 (IS-36)	C1	98.	p. 59
2016-053B	Intelsat 33e (IS-33e)	C1	87.	p. 58
2016-054A	INSAT 3DR	C1	107.	p. 59
2016-060A	GSAT-18	C1	103.	p. 59
2016-060B	Sky Muster 2	C1	199.	p. 67
2016-064A	Himawari-9	C1	195.	p. 67
2016-065A	Shi Jian 17	C2	50.	p. 87
2016-065C	*YZ-2 (Long March (CZ) 5/YZ-2)*	D	17.	p. 98
2016-071A	GOES 16	C1	304.	p. 76
2016-072A	Tian Lian 1-04	C2	36.	p. 86
2016-075A	USA 272 (WGS SV-8)	C1	201.	p. 67
2016-077A	Fengyun 4A	C1	147.	p. 63
2016-079A	Echostar 19	C1	279.	p. 74
2016-082A	JCSAT 15	C1	159.	p. 64
2016-082B	Star One D1	C1	296.	p. 75
2017-001A	TJS-2	C1	150.	p. 63
2017-004A	USA 273 (SBIRS GEO-3)	C2	97.	p. 91
2017-005A	Kirameki 2 (DSN-2)	C1	133.	p. 62

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2017-007A	Telkom-3S	C1	170.	p. 65
2017-007B	SkyBrasil-1	C1	334.	p. 78
2017-014A	Echostar 23	C1	333.	p. 78
2017-016A	USA 275 (WGS SV-9)	C1	80.	p. 57
2017-017A	SES-10	C1	313.	p. 77
2017-018A	Shi Jian 13	C1	161.	p. 64
2017-023A	Koreasat 7	C1	167.	p. 64
2017-023B	SGDC-1	C1	306.	p. 76
2017-024A	South Asia Satellite	C1	141.	p. 62
2017-025A	Inmarsat 5F4	C1	79.	p. 57
2017-026A	SES-15	C1	234.	p. 70
2017-028A	Michibiki-2 (QZS-2)	I	18.	p. 192
2017-029A	ViaSat-2	C1	312.	p. 77
2017-029B	Eutelsat 172B	C1	216.	p. 69
2017-031A	GSAT-19E	C1	64.	p. 56
2017-032A	Echostar 21	C2	5.	p. 83
2017-035A	Zhongxing 9A	C1	145.	p. 63
2017-038A	BulgariaSat-1	C1	1.	p. 51
2017-040A	Hellas Sat 3-Inmarsat S EAN	C1	50.	p. 55
2017-040B	GSAT-17	C1	135.	p. 62
2017-041A	Intelsat 35e (IS-35e)	C1	340.	p. 79
2017-046A	Cosmos-2520	C1	57.	p. 55
2017-046C	*Briz-M (Proton-M/Briz-M)*	D	7.	p. 97
2017-047A	TDRS 13	C2	129.	p. 93
2017-048A	Michibiki-3 (QZS-3)	C1	177.	p. 65
2017-053A	Amazonas 5	C1	323.	p. 77
2017-057A	Asiasat 9	C1	174.	p. 65
2017-059A	Intelsat 37e (IS-37e)	C1	353.	p. 80
2017-059B	BSAT 4a	C1	155.	p. 63
2017-062A	Michibiki-4 (QZS-4)	I	19.	p. 192
2017-063A	SES-11	C1	265.	p. 73
2017-066A	USA 279 (NROL-52, SDS-3, QUASAR)	C2	49.	p. 87
2017-067A	Mugunghwa 5A	C1	165.	p. 64
2017-078A	Alcomsat 1	C1	349.	p. 80
2017-086A	Angosat 1	D	401.	p. 130
2017-086B	*Fregat-SB (Zenit-3F)*	D	155.	p. 109
2018-012A	Al Yah 3	C1	352.	p. 80
2018-012B	SES-14	C1	331.	p. 78
2018-022A	GOES 17	C1	227.	p. 69
2018-023A	Hispasat 30W-6	C1	347.	p. 79

COSPAR	Name	Status	nn	Page
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2018-033B	Hylas 4	C1	342.	p. 79
2018-035A	IRNSS-R1I	I	20.	p. 192
2018-036E	USA-285	C4	6.	p. 96
2018-036F	USA-286	C4	7.	p. 96
2018-037A	Cosmos-2526	C1	179.	p. 65
2018-037B	*Briz-M (Proton-M/Briz-M)*	D	9.	p. 97
2018-037D	Briz-M debris	D	11.	p. 97
2018-041A	Apstar 6C	C1	188.	p. 66
2018-044A	Bangabandhu 1	C1	171.	p. 65
2018-049A	SES-12	C1	138.	p. 62
2018-050A	Fengyun 2H	C2	38.	p. 86
2018-050C	Fengyun 2H AKM (FG-36)	D	560.	p. 143
2018-050D	Fengyun 2H operational debris (imager cover)	L1	40.	p. 170
2018-057A	Beidou DW 32	I	21.	p. 192
2018-059A	Telstar 19 Vantage	C1	317.	p. 77
2018-064A	Merah Putih	C1	151.	p. 63
2018-069A	Telstar 18 Vantage	C1	189.	p. 66
2018-074A	Azerspace-2	C1	58.	p. 55
2018-074B	Horizons 3e	C1	215.	p. 68
2018-079A	USA 288 (AEHF 4)	C2	116.	p. 92
2018-085A	Beidou DW 41	C2	77.	p. 89
2018-089A	GSAT-29	C1	76.	p. 57
2018-090A	Es'hailsat-2	C1	30.	p. 53
2018-100A	Geo-Kompsat-2A	C1	181.	p. 66
2018-100B	GSAT-11	C1	106.	p. 59
2018-105A	GSAT-7A	C1	90.	p. 58
2018-107A	Cosmos-2533	C1	99.	p. 59
2018-107B	*Briz-M (Proton-M/Briz-M)*	D	8.	p. 97
2018-110A	Tongxin Jishu Shiyan 3	C1	85.	p. 58
2018-110C	TJS-3 subsatellite	C1	86.	p. 58
UI031	-	D	743.	p. 159
UI041	-	L1	75.	p. 173
UI044	-	L1	55.	p. 171
UI139	-	L2	12.	p. 179
UU020	Himawari 2 AKM (Star 27)	D	377.	p. 128
UU058	USA 107 debris (DSP F17 IR Sensor telescope sunshade cover)	D	705.	p. 155
UU064	Fengyun 2B debris (VISSR cover?)	L1	65.	p. 172

4 OBJECTS WITH EPHEMERIS

This section contains all objects for which a history of orbital data is available, enabling the determination of the status of such an object. Some of the categorized objects – mainly librating objects with such a small libration magnitude that the routine categorized them as controlled – needed some manual input. If so, the reference number is marked with an ^{m}.

The following symbols are used:

nn reference number, with the ones being outdated (i.e. epoch older than 180 days with respect to 1 January 2019) marked with $_o$,

COSPAR designation in COSPAR notation (see section 3 for detailed explanation),

Name object's common name (names); in case of a rocket body the name of the launch vehicle is appended in parentheses,

Type type of the object (PD: Payload Debris, PF: Payload Fragmentation Debris, PL: Payload, PM: Payload Mission Related Object, RB: Rocket Body, RD: Rocket Debris, RF: Rocket Fragmentation Debris),

Source source of the orbital data (see section 2),

S-ID source internal identifier,

Orbit orbital class, found as a top-down cascade of matching the object's inclination, semi-major axis, eccentricity, perigee and/or apogee to the filters defining an orbital class (see table 1 for all the class definitions),

$f_{\text{IADC}}^{\text{GEO}}$ dwell time within GEO_{IADC} (see table 1 for the definition) defined as the decimal fraction of the object's period, where (possibly multiple) crossings into and out of the protected region are found analytically assuming a closed orbit at the given epoch, and the dwell time being inferred from Kepler's second law; it is marked as '-' in case the object does not enter the protected region (i.e. $f_{\text{IADC}}^{\text{GEO}} = 0$) in order to distinguish it from objects very briefly entering (i.e. $f_{\text{IADC}}^{\text{GEO}} < 0.005$),

Date/Time epoch of the last available orbital data,

$\overline{\lambda}$ mean longitude of the satellite (in degrees East, ranging from 0 to 360 deg),

$\overline{\dot{\lambda}}$ mean drift of the satellite (in deg/days),

$\overline{\Delta a}$ difference between the satellite's mean semi-major axis and the geostationary semi-major axis (in km),

$\overline{\Delta r_p}$ perigee mean deviation from the geostationary altitude (in km),

$\overline{\Delta r_a}$ apogee mean deviation from the geostationary altitude (in km),

P_{lib} libration period (in days),

$\Delta\lambda$ libration magnitude (in degrees): $\Delta\lambda = \lambda_{max} - \lambda_{min}$

λ_{min} minimum longitude of the libration (in degrees East, ranging from 0 to 360 deg)

λ_{max} maximum longitude of the libration (in degrees East, ranging from 0 to 360 deg)

Frame coordinate frame in which the orbital elements are expressed in,

$a, e, i, \Omega, \omega, \lambda$ latest values of the satellite's semi-major axis (in km), eccentricity, inclination (in degrees), right-ascension of the ascending node (in degrees), argument of perigee (in degrees) and longitude (in degrees East, ranging from 0 to 360 deg)

4.1 Satellites under Longitude and Inclination Control (E-W and N-S Control)

The following list contains 372 satellites under longitude and inclination control (of which 2 are outdated), sorted according to the ascending order of the mean longitude.

For explanation of symbols, see the definitions at the beginning of section 4.

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.1	**2017-038A**	**BulgariaSat-1**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:15:43				1.90
42801	TEME	42165.073	0.0002709	0.0259	342.5569	294.8025	1.9727
C1.2	**2010-037B**	**RASCOM-QAF 1R**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:11:33				3.00
36831	TEME	42165.420	0.0006064	0.0217	33.0432	249.1599	3.0172
C1.3	**2014-030A**	**Eutelsat 3B**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:11:03				3.10
39773	TEME	42164.441	0.0003969	0.0701	41.7986	191.3145	3.0817
C1.4	**2007-057A**	**Sirius 4 (Astra 4A)**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:42:56				4.80
32299	TEME	42164.876	0.0002706	0.0106	23.6660	253.5409	4.8226
C1.5	**2012-036A**	**SES-5**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:43:04				5.00
38652	TEME	42164.958	0.0001870	0.0154	41.5212	254.7440	4.9863
C1.6^m	**2007-046A**	**USA 195 (WGS SV-1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:14:35				5.99
32258	TEME	42164.724	0.0000172	0.0195	37.3235	30.6414	5.9910
C1.7	**2004-008A**	**Eutelsat 7A (Eutelsat W3A)**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:14:55				7.00
28187	TEME	42164.397	0.0004624	0.0628	19.3637	244.3723	7.0213
C1.8	**2013-022A**	**Eutelsat 3D**					**PL**
TLEs	GEO (1.00)	2018-12-30	16:55:33				7.00
39163	TEME	42163.695	0.0004384	0.0429	350.2360	340.4678	7.0183
C1.9	**2010-069A**	**Eutelsat KA-SAT 9A (KA-SAT)**					**PL**
TLEs	GEO (1.00)	2018-12-30	16:47:11				9.00
37258	TEME	42164.810	0.0004631	0.0354	25.9935	298.5497	9.1254
C1.10	**2016-005A**	**Eutelsat 9B**					**PL**
TLEs	GEO (1.00)	2018-12-30	16:47:27				9.00
41310	TEME	42164.388	0.0005514	0.0624	79.3227	211.5227	9.0485
C1.11^m	**2012-035B**	**Meteosat 10 (MSG 3)**					**PL**
TLEs	GEO (1.00)	2018-12-30	16:46:30				9.29
38552	TEME	42165.915	0.0001242	0.9932	4.3732	274.0643	9.2874

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.12	**2009-016A**	**Eutelsat 10A (Eutelsat W2A)**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:14:11				10.00
34710	TEME	42164.990	0.0005442	0.0620	12.8230	266.4578	9.9957
C1.13	**2012-040A**	**Tian Lian 1-03**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:14:11				10.60
38730	TEME	42165.069	0.0002490	0.0927	261.3809	266.2291	10.5480
C1.14$_o$	**2009-020A**	**SICRAL 1B**					**PL**
TLEs	GEO (1.00)	2013-05-21	19:03:15				11.80
34810	TEME	42163.127	0.0005392	0.1028	82.0406	27.2992	12.0699
C1.15	**2006-007B**	**Eutelsat 9A (Eutelsat 9A, Eurobird 9A, Hot Bird 7A)**					**PL**
TLEs	GEO (1.00)	2018-12-30	16:31:29				13.00
28946	TEME	42164.675	0.0005015	0.0184	134.3898	126.4596	13.0612
C1.16	**2006-032A**	**Eutelsat Hot Bird 13B (Hot Bird 8)**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:45:19				13.00
29270	TEME	42164.200	0.0005029	0.0807	49.6515	251.2048	13.0616
C1.17	**2008-065A**	**Eutelsat Hot Bird 13C (Hot Bird 9)**					**PL**
TLEs	GEO (1.00)	2018-12-30	16:31:31				13.00
33459	TEME	42164.312	0.0001903	0.0882	71.9298	225.5878	13.0430
C1.18	**2010-021B**	**COMSATBw-2**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:45:19				13.20
36582	TEME	42164.915	0.0002128	0.0199	19.0793	277.5072	13.1787
C1.19	**2011-057A**	**Eutelsat 16A (Eutelsat W3C)**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:21:54				16.00
37836	TEME	42164.281	0.0004648	0.0644	23.2310	256.5007	16.0464
C1.20	**2006-012A**	**Astra 1KR**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:46:42				19.20
29055	TEME	42165.768	0.0004940	0.0389	264.9920	351.9800	19.2312
C1.21	**2007-016A**	**Astra 1L**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:47:05				19.20
31306	TEME	42165.606	0.0004877	0.0454	314.8149	336.1067	19.2436
C1.22	**2008-057A**	**Astra 1M**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:47:05				19.20
33436	TEME	42164.551	0.0001676	0.0361	112.3066	99.0040	19.1568
C1.23	**2011-041A**	**Astra 1N**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:47:05				19.20
37775	TEME	42164.346	0.0002976	0.0431	34.9703	309.1079	19.2238

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.24	**2011-049B**	**Arabsat 5C**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:47:20				20.00
37810	TEME	42164.004	0.0002652	0.0615	23.6710	250.8862	20.0325
C1.25	**2012-062B**	**Eutelsat 21B**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:57:19				21.60
38992	TEME	42164.244	0.0002392	0.0644	23.3684	251.4240	21.6163
C1.26^{m}	**2003-020A**	**Hellas Sat 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:02:02				23.49
27811	TEME	42285.560	0.0007183	0.6828	99.3324	147.0749	23.4897
C1.27	**2010-021A**	**Astra 3B**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:02:02				23.50
36581	TEME	42164.708	0.0003058	0.0262	2.2335	277.3342	23.4782
C1.28	**2007-056B**	**Skynet 5B**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:48:51				24.80
32294	TEME	42165.334	0.0004181	0.0682	0.6876	275.9034	25.1200
C1.29	**2013-044A**	**Eutelsat 25B / Es'hail 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:41:51				25.50
39233	TEME	42164.941	0.0001671	0.0436	17.8223	264.0807	25.4937
C1.30	**2018-090A**	**Es'hailsat-2**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:44:12				25.80
43700	TEME	42109.049	0.0001907	0.0339	154.4548	189.4533	24.9045
C1.31	**2006-051A**	**Badr 4**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:54:36				26.00
29526	TEME	42165.283	0.0005452	0.0509	335.4226	325.2008	26.0200
C1.32	**2008-034B**	**Badr 6**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:54:36				26.00
33154	TEME	42164.178	0.0003232	0.0657	50.9924	278.6557	26.0230
C1.33	**2010-025A**	**Badr 5**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:54:36				26.00
36592	TEME	42164.485	0.0002676	0.0241	119.2778	117.5846	25.9730
C1.34	**2015-065B**	**Badr 7**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:39:41				26.00
41029	TEME	42165.072	0.0005519	0.0545	255.5876	355.7790	26.0368
C1.35	**2012-051A**	**Astra 2F (Eutelsat 28F)**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:30:59				28.20
38778	TEME	42164.443	0.0003800	0.0688	225.8479	26.8632	28.2177

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.36	**2014-089A**	**Astra 2G (Eutelsat 28G)**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:31:10				28.20
40364	TEME	42164.643	0.0001982	0.0230	13.1641	7.6933	28.1719
C1.37	**2013-056A**	**Astra 2E (Eutelsat 28E)**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:29:49				28.50
39285	TEME	42165.206	0.0002445	0.0524	16.4016	257.6554	28.5102
C1.38	**2005-005A**	**XTAR-EUR**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:27:48				29.00
28542	TEME	42164.964	0.0002710	0.0525	95.3072	189.1863	29.0157
C1.39	**2010-032B**	**Arabsat 5A**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:50:21				30.50
36745	TEME	42165.632	0.0003407	0.0492	4.4069	273.8719	30.5351
C1.40	**2012-043B**	**HYLAS 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:42:45				31.00
38741	TEME	42164.774	0.0001937	0.0165	291.7164	347.9313	30.9942
C1.41	**2014-011B**	**Astra 5B (HYLAS 2B)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:40:42				31.50
39617	TEME	42165.584	0.0003538	0.0247	36.4945	244.8454	31.4917
C1.42	**2011-016A**	**Intelsat 28 (New Dawn)**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:50:59				32.80
37392	TEME	42163.668	0.0001142	0.0409	230.2928	4.6423	32.8202
C1.43	**2009-008B**	**Eutelsat Hot Bird 13D (Eutelsat 3C, Atlantic Bird 4A)**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:42:42				33.10
33750	TEME	42164.967	0.0003869	0.0404	14.8957	259.3164	33.0749
C1.44	**2009-065A**	**Eutelsat 36B (Eutelsat W7)**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:03:15				36.00
36101	TEME	42165.299	0.0004583	0.0620	8.0251	271.2221	35.8900
C1.45	**2015-082A**	**Ekspress-AMU 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	16:20:40				36.10
41191	TEME	42165.960	0.0002500	0.0033	250.6459	8.6851	36.1100
C1.46	**2015-022B**	**SICRAL 2**					**PL**
vimpel	GEO (1.00)	2018-12-31	23:59:01				37.00
143665	J2000	42164.000	0.0000730	0.1360	81.4690	216.5870	36.9550
C1.47	**2014-006B**	**ATHENA-FIDUS**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:52:47				37.80
39509	TEME	42164.655	0.0001130	0.0160	76.2391	227.9229	37.7940

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.48	**2011-042A**	**Paksat 1R**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:53:46				38.00
37779	TEME	42164.127	0.0002074	0.0494	216.6656	74.6347	37.9871
C1.49	**2003-014A**	**Asiasat 4**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:42:42				38.20
27718	TEME	42165.414	0.0000421	0.0096	42.4789	299.0048	38.2136
C1.50	**2017-040A**	**Hellas Sat 3-Inmarsat S EAN**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:47:55				39.00
42814	TEME	42163.964	0.0003343	0.0779	59.5118	273.4403	39.0139
C1.51	**2015-012A**	**Ekspress-AM 7**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:19:40				40.00
40505	TEME	42164.322	0.0002619	0.0073	48.6598	222.5479	39.9750
C1.52	**2008-030B**	**Turksat 3A**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:37:37				42.00
33056	TEME	42164.383	0.0002619	0.0719	90.6904	187.2829	41.9640
C1.53	**2014-007A**	**Turksat 4A**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:35:48				42.00
39522	TEME	42165.346	0.0005061	0.0645	272.4194	3.4350	42.0513
C1.54	**2011-077A**	**NigComSat 1R**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:57:58				42.50
38014	TEME	42164.022	0.0000906	0.0432	217.1579	97.5166	42.4530
C1.55	**1996-021A**	**Astra 1F**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:49:42				44.90
23842	TEME	42165.158	0.0004498	0.0317	349.7734	292.5527	44.2698
C1.56	**1999-071A**	**Galaxy 11**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:45:42				44.90
26038	TEME	42164.774	0.0000243	0.0729	118.3030	228.8820	44.9097
C1.57	**2017-046A**	**Cosmos-2520**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:24:10				45.00
42907	TEME	42163.674	0.0002202	0.0308	99.6004	314.9406	44.9678
C1.58	**2018-074A**	**Azerspace-2**					**PL**
TLEs	GEO (1.00)	2018-12-29	23:13:37				45.00
43632	TEME	42164.186	0.0001823	0.0489	198.5198	69.9311	43.7922
C1.59	**2002-007A**	**Intelsat 904**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:23:42				45.10
27380	TEME	42164.971	0.0000615	0.2266	100.6369	252.8755	45.0845

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.60	**2013-006B**	**Azerspace / Africasat-1a**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:20:06				46.00
39079	TEME	42164.399	0.0001855	0.0232	299.6247	22.1083	45.9873
C1.61	**2005-041B**	**Syracuse 3A**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:38:30				47.00
28885	TEME	42164.447	0.0002595	0.0362	66.2661	226.0486	46.9422
C1.62	**2012-016A**	**Yahsat 1B**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:13:33				47.60
38245	TEME	42165.367	0.0002780	0.0178	17.9426	267.8131	47.6391
C1.63$_o$	**2009-047A**	**USA 207 (PAN)**					**PL**
KIAM	GEO (1.00)	2018-01-01	00:00:00				47.65
UI158	J2000	42164.716	0.0007535	0.0664	54.0151	238.7198	47.6490
C1.64	**2017-031A**	**GSAT-19E**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:12:37				47.80
42747	TEME	42164.520	0.0001930	0.0472	104.8127	235.4986	47.8630
C1.65	**2007-037A**	**INSAT 4CR**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:45:42				47.90
32050	TEME	42165.202	0.0005883	0.1067	96.5701	189.9222	47.8657
C1.66	**2008-065B**	**Eutelsat 48D / Afghansat 1 (Eutelsat 28B, Eutelsat W2M)**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:45:42				48.10
33460	TEME	42164.302	0.0002305	0.0443	20.6093	267.1565	48.0470
C1.67	**2003-053A**	**Yamal 200 N2 (Yamal 202)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:27:42				49.00
28089	TEME	42164.304	0.0004677	0.0376	88.4476	175.8205	48.9677
C1.68	**2015-060A**	**Turksat 4B**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:04:03				50.00
40984	TEME	42165.559	0.0002178	0.0119	324.2038	320.1540	50.0107
C1.69	**2016-001A**	**BelinterSat-1**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:58:07				51.50
41238	TEME	42165.092	0.0001646	0.0317	67.6302	169.5173	51.4981
C1.70	**2015-023A**	**TurkmenAlem52E/MonacoSAT**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:56:00				51.90
40617	TEME	42164.378	0.0001630	0.0256	73.3066	209.2993	52.0287
C1.71	**2011-016B**	**Yahsat 1A**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:18:32				52.50
37393	TEME	42164.627	0.0001257	0.0205	13.0335	286.1762	52.5012

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.72	**2012-075A**	**Skynet 5D**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:18:32				52.70
39034	TEME	42164.463	0.0003847	0.0701	8.0144	266.9144	52.7111
C1.73	**2014-064A**	**Ekspress-AM 6**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:45:42				53.00
40277	TEME	42164.905	0.0000336	0.0524	209.0544	177.9746	52.9912
C1.74	**2012-070A**	**Yamal 402**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:44:27				54.90
39022	TEME	42164.819	0.0002829	0.0153	30.7750	260.8909	54.9241
C1.75	**2014-078A**	**GSAT 16**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:44:12				55.00
40332	TEME	42165.054	0.0002968	0.0942	99.7028	344.8746	54.9869
C1.76	**2018-089A**	**GSAT-29**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:44:00				55.00
43698	TEME	42165.007	0.0002900	0.0479	276.8418	356.3945	55.0369
C1.77	**2011-022A**	**GSAT 8**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:25:32				55.10
37605	TEME	42164.442	0.0008262	0.0185	8.7004	260.4292	55.0764
C1.78	**2014-010A**	**Ekspress-AT1**					**PL**
TLEs	GEO (1.00)	2018-12-30	16:32:42				56.00
39612	TEME	42164.671	0.0000528	0.0377	203.2171	78.8599	55.9894
C1.79[m]	**2017-025A**	**Inmarsat 5F4**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:38:12				56.49
42698	TEME	42165.305	0.0001128	0.0526	116.9033	251.4496	56.4908
C1.80[m]	**2017-016A**	**USA 275 (WGS SV-9)**					**PL**
vimpel	GEO (1.00)	2018-12-31	23:59:02				56.84
92400	J2000	42164.600	0.0000340	0.1200	79.7550	342.8190	56.8368
C1.81	**2009-058A**	**NSS 12**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:36:05				57.00
36032	TEME	42164.875	0.0002703	0.0269	60.1678	221.9102	57.0213
C1.82	**2014-058A**	**Luch**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:22:42				57.00
40258	TEME	42164.639	0.0001274	0.0360	115.4018	181.6367	57.0630
C1.83	**2014-023B**	**Kazsat-3**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:30:13				58.50
39728	TEME	42164.174	0.0000917	0.0124	309.7598	100.5018	58.4922

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.84^m	**2012-008A**	**Beidou DW 11**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:23:08				58.74
38091	TEME	42165.811	0.0004294	1.7961	67.4018	268.1729	58.7382
C1.85^m	**2018-110A**	**Tongxin Jishu Shiyan 3**					**PL**
TLEs	GEO (1.00)	2019-01-27	22:26:32				59.01
43874	TEME	42164.397	0.0001213	0.0566	234.8959	45.6912	59.0075
C1.86	**2018-110C**	**TJS-3 subsatellite**					**PL**
TLEs	GEO (1.00)	2019-01-27	22:26:31				59.10
43917	TEME	42164.326	0.0001512	0.0556	236.9983	37.6443	59.1305
C1.87	**2016-053B**	**Intelsat 33e (IS-33e)**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:24:06				60.00
41748	TEME	42165.165	0.0001891	0.0222	21.9446	262.3041	60.0256
C1.88^m	**2009-017A**	**USA 204 (WGS SV-2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:22:42				60.22
34713	TEME	42164.916	0.0000375	0.0159	34.9253	353.1303	60.2224
C1.89^m	**2004-007A**	**ABS 4 (Mobisat, ABS 2i, MBSat 1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:21:57				60.95
28184	TEME	42164.755	0.0002779	0.0276	53.2626	258.5952	60.9466
C1.90^m	**2018-105A**	**GSAT-7A**					**PL**
TLEs	GEO (1.00)	2018-12-30	09:35:42				61.99
43864	TEME	42246.056	0.0019490	0.1758	291.6633	73.3811	61.9910
C1.91	**2001-039A**	**Intelsat 902**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:17:42				62.00
26900	TEME	42164.405	0.0002901	0.0315	63.9004	235.1212	61.9675
C1.92	**2013-073A**	**Inmarsat-5 F1**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:13:46				62.60
39476	TEME	42165.611	0.0000536	0.0219	18.6308	298.9120	62.6257
C1.93	**2009-054B**	**COMSATBw-1**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:49:08				63.00
35943	TEME	42164.799	0.0002357	0.0454	49.8002	236.7258	62.9627
C1.94	**2002-041A**	**Intelsat 906**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:45:40				64.20
27513	TEME	42164.770	0.0002165	0.0047	319.5589	330.3310	64.1512
C1.95	**2013-045A**	**AMOS 4**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:16:53				65.00
39237	TEME	42164.955	0.0002069	0.0177	93.9420	273.3786	65.0153

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.96	**2010-065B**	**Intelsat 17 (IS 17)**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:43:55				66.00
37238	TEME	42164.513	0.0002610	0.0126	131.1913	170.6000	65.9928
C1.97	**2012-043A**	**Intelsat 20 (IS 20)**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:50:15				68.50
38740	TEME	42164.791	0.0003930	0.0064	48.8816	138.5666	68.5113
C1.98	**2016-053A**	**Intelsat 36 (IS-36)**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:50:22				68.50
41747	TEME	42165.125	0.0001349	0.0101	11.5638	359.9006	68.4821
C1.99	**2018-107A**	**Cosmos-2533**					**PL**
TLEs	EGO (0.62)	2018-12-30	23:31:41				69.90
43867	TEME	42020.008	0.0037106	0.1691	277.6839	180.7882	81.2730
C1.100	**2013-062A**	**Raduga 1M**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:56:26				70.00
39375	TEME	42164.609	0.0002718	0.0203	91.7305	202.8421	69.9999
C1.101	**2012-069A**	**Eutelsat 70B**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:42:02				70.50
39020	TEME	42164.534	0.0003383	0.0667	36.5189	225.8582	70.5710
C1.102	**2012-011A**	**Intelsat 22 (IS 22)**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:35:45				72.10
38098	TEME	42165.224	0.0002705	0.0227	345.6770	281.4339	72.1559
C1.103	**2016-060A**	**GSAT-18**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:28:24				73.90
41793	TEME	42164.680	0.0001588	0.0689	103.1049	175.9386	73.9887
C1.104	**2013-044B**	**GSAT 7**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:28:01				74.00
39234	TEME	42164.957	0.0009710	0.0331	101.6893	173.0281	74.0844
C1.105	**2014-001A**	**GSAT 14**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:28:10				74.00
39498	TEME	42165.154	0.0005283	0.0146	1.8284	273.2141	74.0570
C1.106	**2018-100B**	**GSAT-11**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:28:28				74.00
43824	TEME	42164.740	0.0002342	0.0453	260.5718	179.6831	73.9722
C1.107	**2016-054A**	**INSAT 3DR**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:27:52				74.10
41752	TEME	42164.325	0.0013651	0.0952	98.4669	175.0381	74.1216

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.108	**2016-038A**	**ABS 2A**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:25:38				74.70
41588	TEME	42165.157	0.0000693	0.0116	42.6784	158.5603	74.6822
C1.109	**2014-006A**	**ABS 2 (ST 3, Koreasat 8)**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:24:35				74.90
39508	TEME	42164.733	0.0003252	0.0231	63.2051	246.3008	74.9454
C1.110^{m}	**2015-074A**	**Elektro-L No. 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:15:15				75.99
41105	TEME	42164.438	0.0001054	0.0793	223.7033	85.3131	75.9871
C1.111	**2012-013A**	**Apstar 7**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:15:15				76.50
38107	TEME	42164.840	0.0002884	0.0192	43.1619	239.8619	76.4734
C1.112	**2006-020B**	**Thaicom 5**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:49:19				78.50
29163	TEME	42164.650	0.0007553	0.0371	111.2950	181.8884	78.4552
C1.113	**2014-002A**	**Thaicom 6**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:49:19				78.50
39500	TEME	42165.252	0.0000778	0.0709	122.9340	117.4780	78.4505
C1.114	**2016-031A**	**Thaicom 8**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:10:21				78.50
41552	TEME	42164.976	0.0002978	0.0729	55.1042	270.2671	78.5134
C1.115	**2015-075A**	**Cosmos-2513**					**PL**
TLEs	GEO (1.00)	2018-11-29	23:39:12				80.20
41121	TEME	42164.599	0.0004553	0.0693	106.6508	158.5838	80.2774
C1.116	**2013-038B**	**INSAT 3D**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:56:01				82.10
39216	TEME	42165.319	0.0000697	0.0113	89.0180	216.2391	82.1067
C1.117	**2005-049A**	**INSAT 4A**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:52:03				83.00
28911	TEME	42164.850	0.0006350	0.0389	269.5171	8.6786	83.1009
C1.118	**2011-034A**	**GSAT 12**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:48:49				83.00
37746	TEME	42164.989	0.0007702	0.1191	101.2968	336.5383	83.0704
C1.119	**2012-051B**	**GSAT 10**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:52:27				83.00
38779	TEME	42164.688	0.0000947	0.0314	100.6920	166.4559	83.0008

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.120	**2015-041A**	**GSAT 6**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:51:57				83.10
40880	TEME	42165.151	0.0009966	0.0673	98.3624	171.7051	83.1258
C1.121	**2007-063B**	**Horizons 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:49:19				84.80
32388	TEME	42164.740	0.0002775	0.0158	61.9239	231.5765	84.8248
C1.122	**2010-002A**	**Raduga 1M**					**PL**
TLEs	GEO (1.00)	2018-12-28	00:54:20				85.00
36358	TEME	42165.174	0.0003814	0.0059	253.1999	41.1306	84.9497
C1.123	**2009-067A**	**Intelsat 15 (IS 15)**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:30:37				85.10
36106	TEME	42164.857	0.0002456	0.0107	44.1727	241.6474	85.1403
C1.124	**2011-035B**	**Kazsat-2**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:51:43				86.50
37749	TEME	42164.537	0.0001004	0.0356	204.7725	155.7921	86.4896
C1.125	**2012-067A**	**Chinasat 15A (Zhongxing 15A, Chinasat 12, Zhongxing 12)**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:00:23				87.50
39017	TEME	42165.155	0.0002986	0.0204	43.0617	228.5056	87.5230
C1.126	**2011-022B**	**ST-2**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:23:32				88.00
37606	TEME	42165.040	0.0001719	0.0243	89.0716	216.6642	88.0168
C1.127	**2012-003A**	**USA 233 (WGS SV-4)**					**PL**
vimpel	GEO (1.00)	2018-12-24	23:58:59				88.40
143650	J2000	42165.000	0.0003100	0.1160	76.8600	347.7180	88.3539
C1.128	**2014-082A**	**Yamal 401**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:13:53				89.90
40345	TEME	42164.785	0.0000492	0.0084	196.6923	141.2593	89.9558
C1.129	**2006-056A**	**Measat 3**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:07:49				91.50
29648	TEME	42164.388	0.0001155	0.0440	160.9725	60.3105	91.4699
C1.130	**2009-032A**	**Measat 3A**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:18:26				91.50
35362	TEME	42165.536	0.0002893	0.0107	210.3074	58.5324	91.5381
C1.131	**2014-054B**	**Measat 3B**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:18:28				91.50
40147	TEME	42165.018	0.0002084	0.0256	33.4858	274.8111	91.5199

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.132	**2008-028A**	**Chinasat 9 (Zhongxing 9, ZX 9)**					**PL**
TLEs	GEO (1.00)	2018-12-28	21:36:54				92.20
33051	TEME	42165.342	0.0004281	0.0041	148.5335	136.4285	92.1459
C1.133	**2017-005A**	**Kirameki 2 (DSN-2)**					**PL**
vimpel	GEO (1.00)	2018-12-31	23:59:04				93.00
130501	J2000	42165.500	0.0001810	0.0960	81.3620	148.0480	93.0354
C1.134	**2015-065A**	**GSAT 15**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:10:27				93.50
41028	TEME	42164.345	0.0001832	0.0388	107.6012	172.1461	93.5295
C1.135	**2017-040B**	**GSAT-17**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:10:25				93.60
42815	TEME	42164.456	0.0006244	0.0721	105.5478	169.4578	93.5377
C1.136	**2002-057A**	**NSS 6**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:53:40				95.00
27603	TEME	42164.946	0.0003028	0.0324	89.2082	199.0310	94.9642
C1.137	**2013-071A**	**SES-8**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:04:35				95.00
39460	TEME	42164.987	0.0001177	0.0378	272.6796	55.0284	95.0003
C1.138	**2018-049A**	**SES-12**					**PL**
TLEs	GEO (1.00)	2018-12-30	09:50:09				95.00
43488	TEME	42163.445	0.0001738	0.0397	260.5159	43.1962	113.6596
C1.139	**2007-007B**	**Skynet 5A**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:52:20				95.20
30794	TEME	42164.392	0.0003718	0.0649	7.8873	270.4502	95.1309
C1.140	**2008-003A**	**Ekspress-AM 33**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:06:42				96.50
32478	TEME	42164.853	0.0000702	0.0330	202.5934	165.9641	96.4962
C1.141	**2017-024A**	**South Asia Satellite**					**PL**
TLEs	GEO (1.00)	2018-12-30	10:54:56				97.30
42695	TEME	42164.584	0.0002129	0.1075	277.2259	23.1374	97.4195
C1.142	**2013-020A**	**Chinasat 11 (Zhongxing 11, ZX 11, SupremeSat 2)**					**PL**
TLEs	GEO (1.00)	2018-12-29	09:42:14				98.00
39157	TEME	42165.625	0.0004511	0.0187	248.0150	39.3889	98.0369
C1.143	**2012-028A**	**Chinasat 2A (Zhongxing 2A, ZX 2A, Shentong 2-1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:27:45				98.30
38352	TEME	42165.280	0.0004953	0.0444	147.5776	195.3002	98.2279

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.144	**2009-042A**	**Asiasat 5**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:26:46				100.50
35696	TEME	42164.448	0.0001585	0.0165	74.6898	192.7901	100.4721
C1.145	**2017-035A**	**Zhongxing 9A**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:14:23				101.40
42763	TEME	42163.915	0.0001358	0.0354	233.3020	197.2268	101.3863
C1.146	**2015-063A**	**Chinasat 2C (Zhongxing 2C, ZX 2C, Shentong 2-2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:22:42				103.40
41021	TEME	42165.505	0.0004337	0.0446	141.7833	197.8041	103.4667
C1.147	**2016-077A**	**Fengyun 4A**					**PL**
TLEs	GEO (1.00)	2018-12-28	05:13:05				104.70
41882	TEME	42165.216	0.0003307	0.0385	305.1346	138.8940	104.6305
C1.148	**2011-069A**	**Asiasat 7**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:54:30				105.50
37933	TEME	42165.230	0.0001476	0.0427	96.4996	181.2147	105.4819
C1.149	**2015-083A**	**Gaofen 4**					**PL**
TLEs	GEO (1.00)	2018-12-28	05:46:42				105.80
41194	TEME	42165.223	0.0004333	0.0367	71.5800	177.6629	105.7966
C1.150	**2017-001A**	**TJS-2**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:55:51				107.50
41911	TEME	42165.802	0.0003794	0.2931	282.6364	36.1703	107.4493
C1.151	**2018-064A**	**Merah Putih**					**PL**
TLEs	GEO (1.00)	2018-12-30	10:12:44				108.00
43587	TEME	42164.829	0.0001289	0.0204	73.4171	244.2312	107.9983
C1.152	**2009-027A**	**Indostar II/Protostar II**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:54:59				108.10
34941	TEME	42164.940	0.0002037	0.0310	83.2440	207.7748	108.2331
C1.153	**2016-013A**	**SES-9**					**PL**
TLEs	GEO (1.00)	2018-12-30	10:11:33				108.30
41380	TEME	42164.906	0.0000518	0.0387	276.2691	104.4437	108.2951
C1.154	**2010-056B**	**BSAT 3B**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:58:39				109.80
37207	TEME	42164.448	0.0004690	0.0805	304.9942	356.8414	109.8075
C1.155	**2017-059B**	**BSAT 4a**					**PL**
TLEs	GEO (1.00)	2018-12-30	10:05:21				109.80
42951	TEME	42164.556	0.0002552	0.0442	4.7967	354.9875	109.8492

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.156	**2007-036B**	**BSAT 3A**					**PL**
TLEs	GEO (1.00)	2018-12-30	10:05:11				109.90
32019	TEME	42165.426	0.0004019	0.0703	240.9839	15.6168	109.8908
C1.157	**2011-041B**	**BSAT 3c**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:39:41				110.00
37776	TEME	42164.887	0.0000454	0.0231	309.4698	98.8989	109.9667
C1.158	**2000-060A**	**N-SAT-110**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:39:41				110.10
26559	TEME	42164.422	0.0000973	0.0627	93.0120	345.9057	110.0695
C1.159	**2016-082A**	**JCSAT 15**					**PL**
TLEs	GEO (1.00)	2018-12-30	10:04:26				110.10
41903	TEME	42164.933	0.0001442	0.0170	300.4707	351.3206	110.0791
C1.160	**2011-026A**	**Chinasat 10 (Zhongxing 10, ZX 10, Sinosat 5, Xinnuo 5)**					**PL**
TLEs	GEO (1.00)	2018-12-28	04:04:35				110.50
37677	TEME	42165.291	0.0003693	0.0348	232.0782	344.5755	110.5536
C1.161	**2017-018A**	**Shi Jian 13**					**PL**
TLEs	GEO (1.00)	2018-12-28	03:58:29				110.60
42662	TEME	42165.062	0.0007407	0.0757	90.6955	158.2812	110.5696
C1.162	**2007-007A**	**INSAT 4B**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:56:58				111.30
30793	TEME	42165.345	0.0003319	0.0131	83.3423	199.6250	111.2770
C1.163	**2006-034A**	**Mugunghwa 5 (Koreasat 5)**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:53:55				113.00
29349	TEME	42165.336	0.0000216	0.0192	25.1694	15.6779	113.0526
C1.164	**2009-046A**	**Palapa D**					**PL**
TLEs	GEO (1.00)	2018-12-30	09:52:54				113.00
35812	TEME	42165.020	0.0002274	0.0370	89.1707	216.6487	112.9702
C1.165	**2017-067A**	**Mugunghwa 5A**					**PL**
TLEs	GEO (1.00)	2018-12-30	09:52:08				113.20
42984	TEME	42164.598	0.0001020	0.0502	103.3457	178.3068	113.1624
C1.166	**2007-031A**	**Chinasat 6B (Zhongxing 6B, ZX 6B)**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:58:06				115.50
31800	TEME	42165.162	0.0002876	0.0130	68.0043	203.6901	115.4730
C1.167	**2017-023A**	**Koreasat 7**					**PL**
TLEs	GEO (1.00)	2018-12-30	09:41:07				115.90
42691	TEME	42164.574	0.0001384	0.0241	54.6933	213.3291	115.9241

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.168	**1999-046A**	**ABS 7 (Mugungwha 3, Koreasat 3)**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:58:21				116.00
25894	TEME	42164.962	0.0001416	0.0106	347.3926	332.7306	116.1327
C1.169	**2010-070B**	**Olleh 1 (Koreasat 6)**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:58:14				116.00
37265	TEME	42164.911	0.0000931	0.0160	68.5833	219.8324	115.9769
C1.170	**2017-007A**	**Telkom-3S**					**PL**
TLEs	GEO (1.00)	2018-12-30	09:32:44				118.00
41944	TEME	42164.335	0.0002260	0.0140	357.8683	279.7321	118.0258
C1.171	**2018-044A**	**Bangabandhu 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	09:28:26				119.10
43463	TEME	42165.158	0.0001467	0.0190	352.3593	273.5494	119.1134
C1.172	**2005-028A**	**Thaicom 4 (IPStar 1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:59:14				119.50
28786	TEME	42165.206	0.0002168	0.0123	42.2654	240.4400	119.4713
C1.173	**2014-052A**	**Asiasat 6**					**PL**
TLEs	GEO (1.00)	2018-12-30	16:49:19				119.90
40141	TEME	42165.708	0.0000853	0.0084	319.9450	349.8490	119.8852
C1.174	**2017-057A**	**Asiasat 9**					**PL**
TLEs	GEO (1.00)	2018-12-30	06:39:42				122.10
42942	TEME	42165.587	0.0002703	0.0022	27.4489	245.3435	122.1098
C1.175	**2012-023A**	**JCSAT 13**					**PL**
TLEs	GEO (1.00)	2018-12-30	09:08:52				124.00
38331	TEME	42164.849	0.0001119	0.0271	282.7315	326.2337	124.0088
C1.176	**2010-042A**	**Chinasat 6A (Zhongxing 6A, ZX 6A, Sinosat 6, Xinnuo 6)**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:17:29				125.00
37150	TEME	42164.526	0.0001512	0.0518	125.1064	71.5193	125.0629
C1.177	**2017-048A**	**Michibiki-3 (QZS-3)**					**PL**
TLEs	GEO (1.00)	2018-12-30	08:57:02				127.00
42917	TEME	42163.846	0.0002135	0.0252	157.8126	141.4250	126.9848
C1.178	**2006-033A**	**JCSAT 3A**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:01:45				128.00
29272	TEME	42164.903	0.0002072	0.0299	280.3379	13.2173	127.9855
C1.179	**2018-037A**	**Cosmos-2526**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:29:42				128.10
43432	TEME	42165.223	0.0000522	0.0420	108.4804	216.9790	128.0393

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.180	**2010-032A**	**COMS 1 (Chollian)**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:37:04				128.20
36744	TEME	42164.944	0.0000058	0.0170	60.3771	43.0126	128.1519
C1.181	**2018-100A**	**Geo-Kompsat-2A**					**PL**
TLEs	GEO (1.00)	2018-12-30	10:16:42				128.30
43823	TEME	42165.305	0.0000722	0.0254	149.9295	193.2615	128.2755
C1.182	**2015-067A**	**LaoSat 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	08:50:52				128.50
41034	TEME	42165.017	0.0001985	0.0440	156.5551	98.4438	128.5210
C1.183	**2011-047A**	**Chinasat 1A (Zhongxing 1A, ZX 1A, Feng Huo 2-1)**					**PL**
TLEs	GEO (1.00)	2018-12-29	09:51:24				129.90
37804	TEME	42165.219	0.0003812	0.0436	143.6692	166.5469	129.8717
C1.184	**2010-064A**	**Chinasat 20A (Zhongxing 20A, ZX 20A, Shentong 1-2)**					**PL**
TLEs	GEO (1.00)	2018-12-29	16:44:56				130.00
37234	TEME	42165.896	0.0007309	0.0796	258.7053	51.6258	129.9961
C1.185	**2012-023B**	**VINASAT-2**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:02:53				131.80
38332	TEME	42164.802	0.0001993	0.0157	328.7830	318.6391	131.8159
C1.186	**2008-018A**	**VINASAT-1**					**PL**
TLEs	GEO (1.00)	2018-12-30	08:37:11				131.90
32767	TEME	42165.069	0.0001325	0.0153	341.4218	316.3029	131.9513
C1.187	**2006-010A**	**JCSAT 9**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:02:53				132.00
29045	TEME	42165.590	0.0000734	0.0162	4.8410	273.3044	132.0405
C1.188	**2018-041A**	**Apstar 6C**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:52:13				134.20
43450	TEME	42164.548	0.0001163	0.0297	156.7104	211.6144	134.0230
C1.189	**2018-069A**	**Telstar 18 Vantage**					**PL**
TLEs	GEO (1.00)	2018-12-30	08:12:59				137.50
43611	TEME	42164.651	0.0002930	0.0192	46.2883	274.8597	138.0177
C1.190	**2004-024A**	**Telstar 18 (APStar 5)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:04:31				138.00
28364	TEME	42164.784	0.0002186	0.1886	100.8968	147.7583	137.9925
C1.191	**2014-010B**	**Ekspress-AT2**					**PL**
TLEs	GEO (1.00)	2018-12-27	05:37:08				139.80
39613	TEME	42165.475	0.0000016	0.0410	210.1619	104.4843	139.8323

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.192	**2013-077A**	**Ekspress-AM 5**					**PL**
TLEs	GEO (1.00)	2018-12-30	02:10:05				140.00
39487	TEME	42164.937	0.0000868	0.0356	214.1217	164.4592	140.0193
C1.193	**2015-054A**	**Sky Muster**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:25:07				140.20
40940	TEME	42165.412	0.0001718	0.0203	0.0417	281.2308	140.2101
C1.194	**2014-060A**	**Himawari 8**					**PL**
TLEs	GEO (1.00)	2018-12-30	08:02:26				140.70
40267	TEME	42165.046	0.0000948	0.0233	80.6965	213.2838	140.6625
C1.195	**2016-064A**	**Himawari-9**					**PL**
TLEs	GEO (1.00)	2018-12-30	08:01:59				140.80
41836	TEME	42164.800	0.0000925	0.0265	92.0910	192.6541	140.7754
C1.196	**2015-059A**	**Apstar 9**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:05:46				142.00
40982	TEME	42165.261	0.0002140	0.0284	241.2212	39.7319	141.9763
C1.197	**2008-038A**	**Superbird C2**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:06:16				143.90
33274	TEME	42165.232	0.0001776	0.0263	272.4573	31.5017	143.9108
C1.198	**2016-050A**	**JCSAT 16**					**PL**
TLEs	GEO (1.00)	2018-12-30	07:48:53				144.10
41729	TEME	42164.768	0.0002528	0.0345	77.0556	274.9194	144.0593
C1.199	**2016-060B**	**Sky Muster 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	07:45:54				144.80
41794	TEME	42164.727	0.0001530	0.0163	329.9891	320.1607	144.8072
C1.200	**2006-004A**	**Himawari 7 (MTSAT 2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:06:39				145.00
28937	TEME	42164.145	0.0003618	0.0373	94.4739	187.6373	144.9872
C1.201	**2016-075A**	**USA 272 (WGS SV-8)**					**PL**
TLEs	GEO (1.00)	2018-12-30	07:26:09				149.80
41879	TEME	42165.188	0.0000227	0.0213	32.4897	92.0673	149.7678
C1.202	**2016-039A**	**BRISat**					**PL**
TLEs	GEO (1.00)	2018-12-30	07:23:05				150.50
41591	TEME	42164.949	0.0002060	0.0187	340.7321	303.5636	150.5270
C1.203	**2007-044A**	**Optus D2**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:44:12				152.00
32252	TEME	42164.767	0.0003642	0.0242	288.9475	353.7840	151.9679

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.204	**2016-028A**	**JCSAT 2B**					**PL**
TLEs	GEO (1.00)	2018-12-30	07:09:12				154.00
41471	TEME	42164.276	0.0001881	0.0115	21.3726	283.9093	154.0073
C1.205	**2015-046A**	**TJS**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:32:54				155.00
40892	TEME	42164.761	0.0004314	0.0453	112.4435	239.6239	154.9726
C1.206	**2003-028B**	**Optus C1 (Defense C1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:07:48				156.00
27831	TEME	42165.022	0.0004292	0.1886	108.3900	177.1782	155.6476
C1.207	**2009-044B**	**Optus D3**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:43:01				156.00
35756	TEME	42164.953	0.0003716	0.0290	35.0900	266.5044	155.9656
C1.208	**2014-054A**	**Optus 10**					**PL**
TLEs	GEO (1.00)	2018-12-30	07:01:05				156.10
40146	TEME	42165.297	0.0003230	0.0163	132.2181	128.8793	156.0517
C1.209	**2005-046A**	**Telkom 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:43:16				157.00
28902	TEME	42164.887	0.0001274	0.0107	63.5734	38.0076	157.0169
C1.210	**1999-053A**	**LMI 1**					**PL**
TLEs	GEO (1.00)	2018-12-23	23:55:42				159.00
25924	TEME	42164.660	0.0001656	0.0099	353.3614	275.3367	159.0808
C1.211	**2006-043B**	**Optus D1**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:27:32				160.00
29495	TEME	42164.681	0.0003388	0.0274	98.5278	184.2905	159.9530
C1.212	**2018-033A**	**Kirameki 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	06:37:16				162.00
43271	TEME	42165.318	0.0001461	0.0176	28.8828	257.0273	162.0222
C1.213	**2012-030A**	**Intelsat 19 (IS 19)**					**PL**
TLEs	GEO (1.00)	2018-12-30	06:21:15				166.00
38356	TEME	42164.919	0.0002960	0.0223	48.3758	235.5907	166.0275
C1.214	**2009-044A**	**JCSAT 12 (JCSAT-RA)**					**PL**
TLEs	GEO (1.00)	2018-12-30	06:09:21				169.00
35755	TEME	42165.193	0.0001874	0.0312	268.4718	9.5062	169.0108
C1.215	**2018-074B**	**Horizons 3e**					**PL**
TLEs	GEO (1.00)	2018-12-30	06:12:17				169.00
43633	TEME	42125.117	0.0004691	0.0555	131.2630	314.2601	168.2756

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.216	**2017-029B**	**Eutelsat 172B**					**PL**
TLEs	GEO (1.00)	2018-12-30	05:57:13				172.00
42741	TEME	42165.458	0.0004715	0.0204	20.8175	251.3377	172.0621
C1.217	**2005-052A**	**Eutelsat 172A (GE 23, AMC 23)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:14:34				172.20
28924	TEME	42164.909	0.0005795	0.0625	14.1565	267.7324	173.9386
C1.218^{m}	**2015-036A**	**USA 263 (WGS SV-7)**					**PL**
vimpel	GEO (1.00)	2018-12-31	23:59:01				174.98
143728	J2000	42165.400	0.0000280	0.1210	80.3900	147.5420	174.9760
C1.219	**2000-059A**	**GE 1A**					**PL**
TLEs	GEO (1.00)	2018-12-30	05:41:25				176.00
26554	TEME	42164.752	0.0002420	0.0095	29.3453	272.0549	176.0133
C1.220	**2015-042A**	**Inmarsat-5 F3**					**PL**
TLEs	GEO (1.00)	2018-12-30	05:27:10				179.60
40882	TEME	42165.571	0.0000496	0.0221	20.2785	23.1144	179.5952
C1.221	**2011-056A**	**Intelsat 18 (IS 18)**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:32:51				180.00
37834	TEME	42164.949	0.0001865	0.0230	28.9880	273.0194	179.9734
C1.222	**2009-008A**	**NSS 9**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:33:18				183.00
33749	TEME	42164.709	0.0002144	0.0183	28.3790	256.6709	183.0308
C1.223	**2012-061B**	**Yamal 300K**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:34:11				183.00
38978	TEME	42165.378	0.0000509	0.0145	1.4045	79.9079	182.9439
C1.224	**2000-081B**	**AMC 8 (GE 8, Aurora 3)**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:18:21				221.00
26639	TEME	42164.750	0.0003001	0.0170	66.7714	215.6374	220.9636
C1.225	**2006-054B**	**AMC 18**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:18:21				221.00
29644	TEME	42165.485	0.0000072	0.0180	312.5059	103.5670	221.0062
C1.226	**2005-015A**	**Spaceway 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:18:21				221.10
28644	TEME	42164.903	0.0000265	0.0575	142.4613	188.0816	221.1007
C1.227	**2018-022A**	**GOES 17**					**PL**
TLEs	GEO (1.00)	2018-12-30	02:34:44				222.80
43226	TEME	42164.057	0.0003346	0.0550	102.5758	264.5101	222.8120

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.228^{m}	**2013-041A**	**USA 244 (WGS SV-6)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:29:23				224.81
39222	TEME	42164.778	0.0000043	0.0189	43.4728	311.4853	224.8141
C1.229	**2004-003A**	**AMC 10 (GE 10)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:29:38				225.00
28154	TEME	42165.106	0.0000383	0.0139	355.2520	305.4221	224.9932
C1.230^{m}	**2000-054B**	**AMC 7 (GE 7)**					**PL**
TLEs	GEO (1.00)	2018-12-30	02:25:53				225.03
26495	TEME	42164.523	0.0002601	0.0920	90.7852	190.4801	225.0303
C1.231	**1999-060A**	**AMC 4 (GE 4)**					**PL**
TLEs	GEO (1.00)	2018-12-30	02:25:32				225.10
25954	TEME	42164.943	0.0002436	0.0170	324.9032	316.3996	225.1184
C1.232	**2005-041A**	**Galaxy 15**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:53:12				227.00
28884	TEME	42165.180	0.0001827	0.0311	297.8791	332.1893	226.9741
C1.233	**2004-017A**	**AMC 11 (GE 11)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:30:46				229.00
28252	TEME	42164.630	0.0002987	0.0135	6.9796	290.4511	228.9912
C1.234	**2017-026A**	**SES-15**					**PL**
TLEs	GEO (1.00)	2018-12-30	02:02:40				230.30
42709	TEME	42164.934	0.0000551	0.0185	11.6066	308.9529	230.8506
C1.235^{m}	**2003-013B**	**Galaxy 12**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:31:16				230.99
27715	TEME	42164.681	0.0002755	0.2647	96.6552	203.2315	230.9943
C1.236	**2008-063A**	**Ciel 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:31:24				231.10
33453	TEME	42164.958	0.0002895	0.0207	27.6294	267.2130	231.1502
C1.237	**2010-008A**	**GOES 15**					**PL**
TLEs	GEO (1.00)	2018-12-30	02:00:06				231.70
36411	TEME	42163.802	0.0004682	0.1527	275.3904	312.3738	231.4942
C1.238	**2003-044A**	**Galaxy 13 / Horizons 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:31:54				233.00
27954	TEME	42165.427	0.0001414	0.0211	76.2237	291.4722	232.9795
C1.239	**2005-030A**	**Galaxy 14**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:32:24				235.00
28790	TEME	42164.390	0.0002346	0.0012	12.6274	271.2809	235.0069

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.240	**2008-038B**	**AMC 21**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:32:31				235.10
33275	TEME	42164.541	0.0002259	0.0396	304.1587	344.8606	235.1005
C1.241	**2008-024A**	**Galaxy 18**					**PL**
TLEs	GEO (1.00)	2018-12-30	01:38:02				237.00
32951	TEME	42164.779	0.0002896	0.0180	6.9635	278.1147	237.0354
C1.242	**2003-034A**	**EchoStar 9 (Galaxy 23, Intelsat Americas 13, Telstar 13)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:33:39				239.00
27854	TEME	42164.380	0.0002986	0.0385	76.0343	222.2211	239.0125
C1.243	**2004-016A**	**DirecTV 7S**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:34:09				240.90
28238	TEME	42164.586	0.0003019	0.0144	51.7733	236.5356	240.9465
C1.244	**2010-010A**	**EchoStar 14**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:34:09				241.10
36499	TEME	42166.009	0.0002724	0.0170	0.0754	279.6766	241.1108
C1.245	**2002-006A**	**EchoStar 7**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:34:17				241.20
27378	TEME	42164.600	0.0001542	0.0285	307.1370	311.2458	241.1931
C1.246	**2007-009A**	**Anik F3**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:34:17				241.30
31102	TEME	42164.777	0.0002028	0.0164	71.9481	228.9151	241.2784
C1.247	**2016-038B**	**Eutelsat 117 West B**					**PL**
TLEs	GEO (1.00)	2018-12-30	01:14:10				243.00
41589	TEME	42165.309	0.0000296	0.0042	176.3087	11.0229	243.0089
C1.248	**2013-012A**	**Eutelsat 117 West A (SATMEX 8)**					**PL**
TLEs	GEO (1.00)	2018-12-30	01:13:20				243.20
39122	TEME	42164.671	0.0002707	0.0099	24.9653	260.6218	243.2177
C1.249	**2013-058A**	**Sirius FM-6 (Radiosat 6)**					**PL**
TLEs	GEO (1.00)	2018-12-30	01:10:43				243.90
39360	TEME	42163.941	0.0000666	0.0212	8.7714	157.3919	243.8832
C1.250	**2006-049A**	**XM Radio 4 (Blues)**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:43:55				244.80
29520	TEME	42164.914	0.0000437	0.0130	255.3831	185.2062	244.6672
C1.251	**2011-059A**	**ViaSat-1**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:35:02				244.90
37843	TEME	42165.591	0.0002439	0.0191	24.3596	253.4171	244.9166

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.252	**2015-010B**	**Eutelsat 115 West B**					**PL**
TLEs	GEO (1.00)	2018-12-30	01:05:48				245.10
40425	TEME	42165.088	0.0000188	0.0071	170.7112	7.3585	245.1063
C1.253	**2012-075B**	**Mexsat Bicentenario**					**PL**
TLEs	GEO (1.00)	2018-12-30	01:05:23				245.20
39035	TEME	42164.759	0.0002170	0.0300	119.9445	165.5233	245.2106
C1.254	**2006-020A**	**Eutelsat 113 West A (SATMEX 6, Morelos 4, Solidaridad 1R)**					**PL**
TLEs	GEO (1.00)	2018-12-30	00:58:03				247.00
29162	TEME	42165.157	0.0002915	0.0041	312.6146	326.1778	247.0585
C1.255	**2006-054A**	**WildBlue 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:36:25				248.80
29643	TEME	42164.833	0.0001758	0.0233	107.4942	177.9694	248.8350
C1.256	**2004-027A**	**Anik F2**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:36:25				248.90
28378	TEME	42164.746	0.0000197	0.0086	352.5223	23.0206	248.9147
C1.257	**2006-003A**	**EchoStar 10**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:36:40				249.80
28935	TEME	42164.950	0.0001810	0.0201	317.7254	290.1958	249.8260
C1.258	**2002-023A**	**DirecTV 5**					**PL**
TLEs	GEO (1.00)	2018-12-30	00:46:39				249.90
27426	TEME	42165.184	0.0003233	0.0181	18.2141	276.8843	249.9164
C1.259	**2008-035A**	**EchoStar 11**					**PL**
TLEs	GEO (1.00)	2018-12-30	00:46:09				250.00
33207	TEME	42164.731	0.0002612	0.0268	286.3201	349.3863	250.0322
C1.260	**2000-076A**	**Anik F1**					**PL**
TLEs	GEO (1.00)	2018-12-30	00:35:32				252.70
26624	TEME	42164.964	0.0001143	0.0305	142.8212	104.2260	252.6937
C1.261	**2005-036A**	**Anik F1R**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:37:18				252.70
28868	TEME	42164.875	0.0002111	0.0297	64.2231	274.6164	252.6678
C1.262	**2013-014A**	**Anik G1**					**PL**
TLEs	GEO (1.00)	2018-12-30	08:46:41				252.70
39127	TEME	42164.939	0.0003258	0.0094	304.3307	336.9245	252.6721
C1.263	**2012-035A**	**EchoStar 17**					**PL**
TLEs	GEO (1.00)	2018-12-30	00:34:41				252.90
38551	TEME	42165.567	0.0001907	0.0229	17.1806	263.5645	252.9162

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.264	**2004-041A**	**AMC 15**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:44:38				254.90
28446	TEME	42164.833	0.0002799	0.0171	23.3166	237.4843	254.9255
C1.265	**2017-063A**	**SES-11**					**PL**
TLEs	GEO (1.00)	2018-12-30	00:26:03				255.10
42967	TEME	42164.868	0.0002663	0.0188	98.1522	195.4802	255.0709
C1.266	**2009-033A**	**GOES 14**					**PL**
TLEs	GEO (1.00)	2018-12-30	00:22:35				255.30
35491	TEME	42165.025	0.0010992	0.1146	279.1534	319.4255	255.9399
C1.267	**2011-035A**	**SES-3**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:38:48				257.00
37748	TEME	42164.889	0.0002334	0.0135	3.4676	266.5618	257.0122
C1.268	**2007-032A**	**DirecTV 10**					**PL**
TLEs	GEO (1.00)	2018-12-30	00:17:48				257.20
31862	TEME	42164.308	0.0000277	0.0437	204.5290	133.4786	257.1392
C1.269	**2009-075A**	**DirecTV 12**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:45:15				257.20
36131	TEME	42164.974	0.0000065	0.0122	215.0155	207.1246	257.2109
C1.270	**2001-052A**	**DirecTV 4S**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:39:18				258.80
26985	TEME	42164.923	0.0002293	0.0189	29.3466	256.6095	258.8167
C1.271	**2006-043A**	**DirecTV 9S**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:39:18				258.90
29494	TEME	42165.318	0.0002730	0.0102	14.3426	275.6381	258.9233
C1.272	**2010-016A**	**SES-1**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:39:18				259.00
36516	TEME	42164.650	0.0002112	0.0178	330.5738	302.5886	259.0188
C1.273	**2005-019A**	**DirecTV 8**					**PL**
TLEs	GEO (1.00)	2018-12-30	00:09:17				259.10
28659	TEME	42164.847	0.0002711	0.0089	58.9597	220.6389	259.2741
C1.274	**2015-026A**	**DirecTV 15**					**PL**
TLEs	GEO (1.00)	2018-12-30	00:09:47				259.20
40663	TEME	42166.010	0.0000080	0.0106	58.4425	130.9381	259.1489
C1.275	**2008-013A**	**DirecTV 11**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:39:49				260.80
32729	TEME	42165.141	0.0000193	0.0446	181.2838	337.5015	260.8034

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.276	**2014-078B**	**DirecTV 14**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:03:00				260.80
40333	TEME	42164.396	0.0000370	0.0299	291.7839	191.5908	260.7759
C1.277	**2005-046B**	**Spaceway 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:03:00				260.90
28903	TEME	42164.446	0.0000606	0.0268	180.0470	207.5063	260.9258
C1.278	**2006-023A**	**Galaxy 16**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:39:56				261.00
29236	TEME	42164.714	0.0002572	0.0147	78.4113	208.8927	261.0082
C1.279	**2016-079A**	**Echostar 19**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:50:56				262.90
41893	TEME	42165.309	0.0001265	0.0226	20.8562	261.7710	262.8979
C1.280	**2008-045A**	**Galaxy 19**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:50:24				263.00
33376	TEME	42164.951	0.0003260	0.0182	87.0594	208.8039	263.0216
C1.281	**2002-030A**	**Galaxy 3C**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:42:45				265.00
27445	TEME	42165.161	0.0001785	0.0120	336.2899	354.4421	264.9394
C1.282	**2014-062A**	**Intelsat 30 (DLA 1, ISDLA 1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:04:08				265.00
40271	TEME	42164.904	0.0001675	0.0186	20.9340	91.7094	264.9616
C1.283	**2016-035A**	**Intelsat 31 (DLA 2, ISDLA 2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:42:43				265.00
41581	TEME	42164.770	0.0002018	0.0324	258.2950	315.5939	264.9478
C1.284	**2007-036A**	**Spaceway 3**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:04:16				265.10
32018	TEME	42164.398	0.0000223	0.0413	174.0167	103.3072	265.0485
C1.285	**2012-026A**	**Nimiq 6**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:26:50				268.90
38342	TEME	42164.852	0.0002211	0.0096	358.5291	287.1485	268.9295
C1.286	**2007-016B**	**Galaxy 17**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:15:18				269.00
31307	TEME	42164.746	0.0003017	0.0134	32.7723	255.2781	269.0068
C1.287	**2005-022A**	**Galaxy 28 (Intelsat Americas 8, IA 8, Telstar 8)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:42:50				271.00
28702	TEME	42164.686	0.0000968	0.0156	54.4552	344.5279	270.9872

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.288	**2013-075A**	**Tupac Katari (TKSat 1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:06:24				272.80
39481	TEME	42164.692	0.0002206	0.0451	146.1821	155.1283	272.7963
C1.289^{m}	**2011-049A**	**SES-2**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:16:33				273.01
37809	TEME	42164.859	0.0002232	0.0134	333.2897	299.1035	273.0068
C1.290	**1999-027A**	**Nimiq**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:16:41				273.50
25740	TEME	42164.637	0.0005298	0.0422	291.5786	14.7033	273.4682
C1.291	**2003-033A**	**EchoStar 12 (Rainbow 1, Cablevision 1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:16:49				273.60
27852	TEME	42164.761	0.0001484	0.0184	317.4358	357.1864	273.6033
C1.292	**2009-034A**	**Sirius FM-5 (Radiosat 5)**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:16:49				273.90
35493	TEME	42165.094	0.0000371	0.0110	329.8038	67.8730	273.8385
C1.293	**2010-053A**	**Sirius XM-5**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:17:04				274.80
37185	TEME	42164.959	0.0000337	0.0183	14.2181	120.5921	274.7784
C1.294	**2005-008A**	**XM Radio 3 (Rhythm)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:43:57				274.90
28626	TEME	42164.620	0.0000102	0.0012	141.9970	109.8066	274.8932
C1.295	**2004-048A**	**AMC 16**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:17:11				275.00
28472	TEME	42164.634	0.0002206	0.0122	355.8511	283.6221	275.0097
C1.296	**2016-082B**	**Star One D1**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:58:28				276.00
41904	TEME	42164.551	0.0002693	0.0423	92.2908	194.0704	276.0405
C1.297	**2000-067A**	**AMC 6 (GE 6)**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:17:49				277.00
26580	TEME	42165.033	0.0002964	0.0095	24.2036	284.6194	276.9917
C1.298	**2008-044A**	**Nimiq 4**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:18:04				278.00
33373	TEME	42164.852	0.0002440	0.0134	73.5470	221.3032	278.0206
C1.299	**2015-054B**	**ARSAT-2**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:46:37				279.00
40941	TEME	42164.973	0.0001372	0.0300	122.9353	159.8168	279.0111

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.300	**2015-026B**	**SKY Mexico-1**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:37:46				281.20
40664	TEME	42164.631	0.0002062	0.0114	49.2300	244.4639	281.2297
C1.301	**2008-055A**	**Simon Bolivar**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:45:16				282.00
33414	TEME	42165.487	0.0002449	0.0222	142.8149	145.7000	281.9636
C1.302	**2011-054A**	**QuetzSat-1**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:19:27				283.00
37826	TEME	42164.812	0.0002711	0.0171	31.9919	252.6038	283.0140
C1.303	**2010-006A**	**Intelsat 16 (IS 16, PAS 11R)**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:19:42				283.80
36397	TEME	42164.770	0.0001988	0.0151	67.0875	217.8150	283.8156
C1.304	**2016-071A**	**GOES 16**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:23:30				284.80
41866	TEME	42164.992	0.0000525	0.0473	155.2974	173.5393	284.8061
C1.305	**2012-062A**	**Star One C3**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:26:32				285.00
38991	TEME	42165.135	0.0002374	0.0273	92.2150	216.7342	284.9673
C1.306	**2017-023B**	**SGDC-1**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:22:04				285.20
42692	TEME	42164.513	0.0002193	0.0092	24.6103	259.6108	285.1654
C1.307	**2014-011A**	**Amazonas 4A**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:18:44				286.00
39616	TEME	42165.287	0.0003113	0.0708	74.6245	216.9285	286.0010
C1.308	**2009-050A**	**Nimiq 5**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:20:42				287.30
35873	TEME	42164.630	0.0002366	0.0184	29.9920	269.9201	287.2988
C1.309	**2014-062B**	**ARSAT-1**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:20:57				288.20
40272	TEME	42165.088	0.0001263	0.0364	157.4827	130.1458	288.1998
C1.310	**2008-018B**	**Star One C2**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:02:44				290.00
32768	TEME	42164.426	0.0001894	0.0481	123.4250	151.0734	290.0120
C1.311	**2015-034B**	**Star One C4**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:02:43				290.00
40733	TEME	42164.659	0.0002760	0.0351	63.4337	261.7730	290.0162

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.312	**2017-029A**	**ViaSat-2**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:02:28				290.10
42740	TEME	42165.420	0.0000174	0.0226	23.1357	326.3182	290.0889
C1.313	**2017-017A**	**SES-10**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:50:19				293.00
42432	TEME	42164.770	0.0002519	0.0094	34.6706	247.5415	293.1247
C1.314	**2016-014A**	**Eutelsat 65 West A**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:43:35				294.80
41382	TEME	42164.359	0.0001723	0.0441	17.4317	267.2951	294.8128
C1.315	**2007-056A**	**Star One C1**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:42:42				295.00
32293	TEME	42164.518	0.0002902	0.0321	93.4898	204.8778	295.0341
C1.316	**2011-021A**	**Telstar 14R (Estrela do Sul 2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:30:03				297.00
37602	TEME	42164.984	0.0002577	0.0160	23.6788	307.9059	296.9650
C1.317	**2018-059A**	**Telstar 19 Vantage**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:34:53				297.00
43562	TEME	42165.366	0.0001991	0.0131	29.9144	223.8939	297.0036
C1.318	**2010-034A**	**EchoStar 15**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:11:23				298.40
36792	TEME	42164.339	0.0001894	0.0178	359.7030	271.6341	298.3788
C1.319	**2016-039B**	**EchoStar 18**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:28:17				298.40
41592	TEME	42164.462	0.0001599	0.0221	13.2112	272.1214	298.6581
C1.320	**2012-065A**	**EchoStar 16**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:28:49				298.50
39008	TEME	42164.937	0.0001861	0.0172	24.1055	257.0694	298.5145
C1.321	**2009-054A**	**Amazonas 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:11:23				299.00
35942	TEME	42164.528	0.0001374	0.0422	181.2561	52.6165	299.0196
C1.322	**2013-006A**	**Amazonas 3**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:26:41				299.00
39078	TEME	42165.668	0.0004020	0.0046	197.1903	62.1505	299.0592
C1.323	**2017-053A**	**Amazonas 5**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:26:44				299.20
42934	TEME	42164.068	0.0004303	0.0273	330.5369	330.7248	299.0367

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.324	**2006-018A**	**GOES N**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:23:12				300.00
29155	TEME	42162.533	0.0007183	0.2825	102.7638	316.6216	299.9224
C1.325	**2012-045A**	**Intelsat 21 (IS 21)**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:14:53				302.00
38749	TEME	42165.262	0.0001787	0.0208	5.4314	274.1207	302.0174
C1.326	**2015-039A**	**Intelsat 34 (Hispasat 55W-2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:05:03				304.50
40874	TEME	42163.261	0.0000619	0.0166	70.8019	232.5310	304.4724
C1.327	**2015-005A**	**Inmarsat-5 F2**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:25:51				305.00
40384	TEME	42165.512	0.0000506	0.0224	20.6956	292.8116	304.9818
C1.328	**2012-057A**	**Intelsat 23 (IS 23)**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:54:54				307.00
38867	TEME	42164.763	0.0001651	0.0170	341.1130	313.4037	307.0168
C1.329^{m}	**2013-024A**	**USA 243 (WGS SV-5)**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:53:07				307.47
39168	TEME	42166.064	0.0000313	0.0238	23.2854	47.1055	307.4739
C1.330	**2016-004A**	**Intelsat 29e (IS-29e)**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:42:59				310.00
41308	TEME	42165.450	0.0001456	0.0114	32.4288	260.8628	310.0141
C1.331	**2018-012B**	**SES-14**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:33:01				312.50
43175	TEME	42164.705	0.0000980	0.0142	21.6325	265.1719	312.5027
C1.332	**2009-064A**	**Intelsat 14 (IS 14)**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:22:59				315.00
36097	TEME	42164.950	0.0002235	0.0184	338.6106	310.9921	315.0179
C1.333	**2017-014A**	**Echostar 23**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:22:38				315.10
42070	TEME	42164.697	0.0002097	0.0225	17.8354	260.8967	315.1156
C1.334	**2017-007B**	**SkyBrasil-1**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:15:47				316.80
41945	TEME	42164.992	0.0000364	0.0225	23.2824	165.0107	316.8329
C1.335	**2007-044B**	**Intelsat 11 (IS 11, PAS 11)**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:29:15				317.00
32253	TEME	42164.699	0.0001542	0.0347	274.1623	28.7086	317.0189

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.336	**2013-026A**	**SES-6**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:05:05				319.50
39172	TEME	42164.849	0.0001691	0.0212	35.6307	257.1210	319.5051
C1.337	**2009-009A**	**Telstar 11N**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:30:45				322.40
34111	TEME	42164.986	0.0002481	0.0189	32.3736	246.5013	322.4568
C1.338	**2005-003A**	**AMC 12**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:30:53				322.60
28526	TEME	42164.994	0.0002855	0.0318	300.9719	340.0070	322.5716
C1.339	**2017-006A**	**Hispasat 36W-1**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:47:05				324.00
41942	TEME	42164.488	0.0001098	0.0126	268.0106	14.0976	324.0175
C1.340	**2017-041A**	**Intelsat 35e (IS-35e)**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:41:12				325.50
42818	TEME	42165.358	0.0001183	0.0136	277.3761	24.8902	325.4924
C1.341	**2010-065A**	**HYLAS 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:32:01				326.50
37237	TEME	42165.110	0.0003885	0.0160	339.6742	353.0585	326.5044
C1.342	**2018-033B**	**Hylas 4**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:37:12				326.50
43272	TEME	42165.120	0.0002616	0.0685	120.1481	78.5599	326.4950
C1.343	**2008-034A**	**Intelsat 25 (Protostar 1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:29:08				328.50
33153	TEME	42165.065	0.0002805	0.0119	356.0890	281.1533	328.5272
C1.344	**2002-044A**	**Hispasat 1D**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:12:04				330.00
27528	TEME	42164.532	0.0005691	0.0471	309.7304	350.5490	330.0685
C1.345	**2006-007A**	**Spainsat**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:22:56				330.00
28945	TEME	42164.525	0.0005478	0.0486	239.5446	26.9892	330.0713
C1.346	**2010-070A**	**Hispasat 1E**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:12:04				330.00
37264	TEME	42165.066	0.0002399	0.0529	114.2340	148.3894	330.0162
C1.347	**2018-023A**	**Hispasat 30W-6**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:23:06				330.00
43228	TEME	42165.062	0.0003694	0.0404	47.5684	259.7289	330.0295

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.348	**2003-007A**	**Intelsat 907**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:13:12				332.50
27683	TEME	42164.518	0.0002594	0.0112	278.3896	8.5542	332.5115
C1.349	**2017-078A**	**Alcomsat 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:02:35				335.20
43039	TEME	42165.580	0.0001635	0.0266	16.4298	235.0825	335.1829
C1.350	**2002-027A**	**Intelsat 905**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:34:31				335.50
27438	TEME	42165.050	0.0002006	0.0528	114.5222	146.3376	335.5218
C1.351	**2012-007A**	**SES-4**					**PL**
TLEs	GEO (1.00)	2018-12-30	16:08:30				337.90
38087	TEME	42164.710	0.0002407	0.0126	15.9405	277.3393	338.0212
C1.352	**2018-012A**	**Al Yah 3**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:43:40				339.90
43174	TEME	42164.950	0.0001889	0.0156	309.9457	338.1504	339.9150
C1.353	**2017-059A**	**Intelsat 37e (IS-37e)**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:35:16				342.00
42950	TEME	42165.362	0.0002689	0.0189	33.8222	242.3062	342.0307
C1.354	**2008-030A**	**Skynet 5C**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:36:32				342.20
33055	TEME	42164.762	0.0003703	0.0605	23.4086	255.3836	342.2215
C1.355	**2015-068A**	**Telstar 12 Vantage (Telstar 12V)**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:23:18				345.00
41036	TEME	42164.775	0.0002195	0.0139	68.4734	228.6016	345.0206
C1.356	**2015-048A**	**Ekspress-AM 8**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:37:32				346.00
40895	TEME	42164.915	0.0000729	0.0390	201.8434	80.7255	345.9974
C1.357	**2011-048A**	**Cosmos-2473**					**PL**
TLEs	GEO (1.00)	2018-12-30	07:10:42				346.50
37806	TEME	42164.890	0.0003782	0.0892	99.6842	189.6371	346.4500
C1.358	**2001-042A**	**Eutelsat 12 West B (Eutelsat 8 West A, Atlantic Bird 2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:38:02				347.50
26927	TEME	42164.706	0.0005661	0.0364	18.2176	270.5069	347.5553
C1.359^{m}	**2009-068A**	**USA 211 (WGS SV-3)**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:38:10				347.97
36108	TEME	42165.003	0.0000278	0.0159	18.7682	181.9958	347.9705

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.360	**2009-007A**	**Ekspress-AM 44**					**PL**
TLEs	GEO (1.00)	2018-12-30	07:11:46				349.00
33595	TEME	42164.729	0.0000429	0.0373	205.8391	104.2595	348.9966
C1.361	**2015-039B**	**Eutelsat 8 West B**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:55:20				352.00
40875	TEME	42164.762	0.0002982	0.0625	26.2850	249.5614	352.0314
C1.362	**2011-051A**	**Eutelsat 7 West A (Nilesat 104, Atlantic Bird 7)**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:52:31				352.70
37816	TEME	42164.586	0.0005455	0.0678	38.7793	183.7821	352.7374
C1.363	**2010-037A**	**Nilesat 201**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:39:33				353.00
36830	TEME	42164.970	0.0003246	0.0576	196.2413	91.2711	353.0280
C1.364	**2006-033B**	**Syracuse 3B**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:40:03				354.80
29273	TEME	42164.845	0.0003806	0.0273	82.2712	206.2756	354.8267
C1.365	**2002-035A**	**Eutelsat 5 West A (Atlantic Bird 3, Stellat 5)**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:43:19				355.00
27460	TEME	42164.817	0.0005375	0.0420	36.2138	250.3331	355.0437
C1.366	**2008-022A**	**AMOS 3**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:40:26				356.00
32794	TEME	42164.501	0.0001200	0.0498	122.1099	203.7309	355.8866
C1.367	**2014-046A**	**Asiasat 8**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:39:00				356.10
40107	TEME	42164.552	0.0001698	0.0294	87.1592	206.2525	356.1260
C1.368[m]	**2015-010A**	**ABS 3A**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:35:26				357.03
40424	TEME	42165.627	0.0001322	0.0210	24.3597	161.4321	357.0300
C1.369	**2004-022A**	**Intelsat 10-02 (Thor 10-02)**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:18:23				359.00
28358	TEME	42165.241	0.0002341	0.0221	29.5859	333.5390	359.0330
C1.370	**2009-058B**	**Thor 6 (Intelsat 1W)**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:18:23				359.20
36033	TEME	42164.637	0.0002101	0.0382	142.4645	167.8836	359.1620
C1.371	**2008-006A**	**Thor 2R**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:21:55				359.30
32487	TEME	42164.556	0.0002293	0.0443	260.7970	33.0817	359.2576

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.372	**2015-022A**	**Thor 7**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:26:05				359.30
40613	TEME	42165.419	0.0002568	0.0102	333.7073	311.8697	359.3740

4.2 Satellites under Longitude Control (only E-W Control)

The following list contains 150 satellites under longitude control only (of which 1 is outdated), sorted according to the ascending order of the mean longitude.

For explanation of symbols, see the definitions at the beginning of section 4.

C2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C2.1	**2005-049B**	**Meteosat 9 (MSG 2)**					**PL**
TLEs	GEO (1.00)	2018-12-27	22:47:27				3.40
28912	TEME	42165.457	0.0000208	3.3130	71.5228	325.4091	3.3024
C2.2^{m}	**2010-039A**	**USA 214 (AEHF 1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:36:42				4.05
36868	TEME	42165.727	0.0003521	1.5206	110.8411	180.0049	4.0492
C2.3	**2000-081A**	**Astra 2D**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:31:03				5.20
26638	TEME	42164.034	0.0002261	4.7360	67.4370	210.8769	5.2229
C2.4	**1997-008A**	**USA 130 (DSP F18, DSP 20, DSP Block 5(DSP-1) F18)**					**PL**
vimpel	GEO (1.00)	2018-12-31	18:28:48				7.90
143606	J2000	42166.800	0.0001080	13.3200	24.6600	45.6270	6.9262
C2.5	**2017-032A**	**Echostar 21**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:47:05				10.30
42749	TEME	42164.855	0.0001920	6.5280	315.8934	323.5220	10.2666
C2.6$_{o}$	**2001-005A**	**SICRAL**					**PL**
TLEs	GEO (1.00)	2013-05-22	17:47:57				16.20
26694	TEME	42164.775	0.0003775	4.6649	63.1619	17.7231	16.2414
C2.7	**2008-011A**	**AMC 14**					**PL**
TLEs	GEO (0.54)	2018-12-30	19:46:50				18.00
32708	TEME	42164.254	0.0038215	20.0974	54.6998	352.7420	17.9875
C2.8^{m}	**2002-001A**	**USA 164 (Milstar-2 F3)**					**PL**
vimpel	GEO (1.00)	2018-12-31	18:20:34				18.67
143523	J2000	42165.200	0.0001770	8.3080	34.5410	288.4630	18.6711
C2.9	**2000-054A**	**Astra 2B**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:08:57				19.40
26494	TEME	42164.367	0.0005016	3.3739	76.7230	206.6650	19.4203
C2.10	**2013-011A**	**USA 241 (SBIRS GEO-2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:57:45				20.60
39120	TEME	42164.637	0.0001825	2.8202	328.8079	313.5077	20.6236
C2.11	**2001-025A**	**Astra 2C**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:53:50				23.70
26853	TEME	42164.579	0.0002874	1.6155	89.2164	191.6322	23.6860

C2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C2.12	**2013-038A**	**Alphasat**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:21:27				24.80
39215	TEME	42164.204	0.0002237	2.1008	24.4454	258.4684	24.8586
C2.13^m	**1993-056A**	**USA 95 (UFO F2)**					**PL**
vimpel	GEO (1.00)	2018-12-31	16:42:00				28.11
143522	J2000	42165.500	0.0001460	11.1380	19.1750	297.2230	28.1143
C2.14	**2016-015A**	**IRNSS-R1F**					**PL**
TLEs	GEO (1.00)	2018-12-30	07:47:18				32.50
41384	TEME	42165.201	0.0018689	3.0311	247.6117	178.6817	32.4296
C2.15	**1990-079A**	**Skynet 4C**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:52:15				33.50
20776	TEME	42165.425	0.0003301	13.9731	10.6796	268.6244	33.5827
C2.16	**2002-040B**	**Meteosat 8 (MSG 1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:22:42				41.40
27509	TEME	42164.440	0.0002619	5.8034	56.2519	267.3841	41.3259
C2.17^m	**1994-054A**	**USA 105 (MERCURY 1)**					**PL**
vimpel	GEO (1.00)	2018-12-31	16:23:25				43.41
143513	J2000	42164.700	0.0028000	11.5730	29.7130	144.8050	43.4108
C2.18	**2003-026A**	**Thuraya 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:03:38				44.00
27825	TEME	42164.473	0.0005139	5.4140	31.2566	245.4439	43.9976
C2.19	**2009-001A**	**USA 202 (NROL-26, ORION)**					**PL**
vimpel	GEO (1.00)	2018-12-24	16:56:10				44.00
143633	J2000	42163.800	0.0009930	5.4330	32.2940	304.8120	44.1814
C2.20	**2000-068A**	**Intelsat 12 (PAS 12, Europe*Star 1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:06:42				45.00
26590	TEME	42163.955	0.0006352	1.7028	89.3087	174.5427	45.0657
C2.21	**2001-019A**	**Intelsat 10 (PAS 10)**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:45:42				47.50
26766	TEME	42164.401	0.0003301	2.7110	82.3270	195.3887	47.4726
C2.22^m	**1996-026A**	**USA 118 (MERCURY 2)**					**PL**
vimpel	EGO (0.08)	2018-12-24	14:16:41				50.29
143509	J2000	42165.500	0.0402440	9.3570	358.1220	256.2240	50.2894
C2.23	**1997-053A**	**NSS 5 (NSS 803, Intelsat 803)**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:12:42				50.50
24957	TEME	42164.083	0.0002643	4.9199	66.5545	237.1333	50.5145

C2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C2.24	**2012-034A**	**USA 237 (NROL-15, ORION)**					**PL**
vimpel	GEO (1.00)	2018-12-31	17:09:04				52.30
143653	J2000	42166.200	0.0043520	1.4580	52.1950	338.4230	52.2491
C2.25^m	**2000-043A**	**Intelsat 9 (PAS 9)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:27:42				52.76
26451	TEME	42127.924	0.0003873	4.6296	68.5607	197.2567	52.7584
C2.26	**1997-076A**	**Astra 1G**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:41:24				57.10
25071	TEME	42164.299	0.0003612	3.4803	76.0703	208.7507	57.1816
C2.27	**1997-007A**	**Intelsat 26 (JCSAT R, JCSAT 4)**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:37:23				62.20
24732	TEME	42164.453	0.0003617	8.2873	46.2459	224.3565	62.1879
C2.28	**2005-044A**	**Inmarsat-4 F2**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:38:39				63.90
28899	TEME	42164.595	0.0003157	2.7584	22.6622	276.4232	63.9333
C2.29	**1996-020A**	**Inmarsat-3 F1**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:00:01				64.50
23839	TEME	42164.302	0.0005456	5.0452	64.9260	216.2116	64.4525
C2.30^m	**2003-041A**	**USA 171 (Advanced ORION 3)**					**PL**
vimpel	EGO (0.66)	2018-12-31	16:46:30				67.71
143517	J2000	42166.200	0.0055150	10.4700	59.6970	217.6670	67.7082
C2.31	**2000-028A**	**Eutelsat 36A (Eutelsat W4)**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:45:10				70.30
26369	TEME	42165.085	0.0005023	2.2072	84.0914	219.4940	70.2559
C2.32	**2011-019A**	**USA 230 (SBIRS GEO-1)**					**PL**
vimpel	GEO (1.00)	2018-12-31	10:43:53				72.10
143648	J2000	42167.900	0.0001830	2.7170	330.2620	336.0150	67.5756
C2.33^m	**2015-044A**	**MUOS 4**					**PL**
TLEs	EGO (0.62)	2018-12-30	10:43:31				75.06
40887	TEME	42164.696	0.0057435	3.5952	334.6276	359.9378	75.0573
C2.34	**2001-046A**	**USA 162 (SDS 3 F3)**					**PL**
vimpel	GEO (1.00)	2018-12-24	16:02:28				75.20
143515	J2000	42164.700	0.0012090	10.1240	49.3160	183.8160	75.1652
C2.35^m	**2003-057A**	**USA 174 (UFO F11)**					**PL**
TLEs	GEO (1.00)	2018-12-30	16:59:12				75.59
28117	TEME	42163.885	0.0007608	5.5063	36.5051	262.2873	75.5878

C2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C2.36	**2016-072A**	**Tian Lian 1-04**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:47:11				77.00
41869	TEME	42165.282	0.0009129	1.4526	285.3722	158.1256	77.0861
C2.37	**2008-019A**	**Tian Lian 1-01**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:47:56				78.70
32779	TEME	42165.393	0.0037531	2.9973	73.8206	236.2601	79.8777
C2.38	**2018-050A**	**Fengyun 2H**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:50:13				79.10
43491	TEME	42165.163	0.0003208	1.8932	284.0366	269.5146	78.9588
C2.39	**2010-024A**	**Beidou DW 4**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:11:07				80.00
36590	TEME	42165.168	0.0002273	1.4804	31.0013	206.7759	80.0279
C2.40	**2003-060A**	**Ekspress-AM 22 (SESAT 2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:47:56				80.10
28134	TEME	42165.032	0.0000306	1.6609	88.6707	193.5991	80.1033
C2.41	**2015-073A**	**Chinasat 1C (Zhongxing 1C, ZX 1C, Feng Huo 2-2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:11:36				81.50
41103	TEME	42164.934	0.0004646	0.3858	98.4068	175.7990	81.5440
C2.42	**2012-059A**	**Beidou DW 16**					**PL**
TLEs	GEO (1.00)	2018-12-21	18:50:42				81.60
38953	TEME	42165.741	0.0007897	1.4855	82.7267	201.6625	83.9458
C2.43	**2014-020A**	**USA 250 (NROL-67)**					**PL**
vimpel	GEO (1.00)	2018-12-24	10:27:40				82.00
143662	J2000	42165.700	0.0003940	1.9120	334.5770	313.2110	81.9554
C2.44	**2014-061A**	**IRNSS-R1C**					**PL**
TLEs	GEO (1.00)	2018-12-30	02:39:30				83.00
40269	TEME	42163.970	0.0020933	2.1158	221.0254	5.9193	82.9717
C2.45	**1995-035B**	**TDRS 7**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:32:49				84.70
23613	TEME	42165.388	0.0028689	14.5080	9.3974	8.2979	84.8535
C2.46	**2008-066A**	**Fengyun 2E**					**PL**
TLEs	GEO (1.00)	2018-12-29	18:15:53				86.60
33463	TEME	42166.228	0.0005421	3.2578	69.2062	250.4850	86.9737
C2.47	**2004-004A**	**USA 176 (DSP F22, DSP Block 5(DSP-1) F22)**					**PL**
vimpel	GEO (1.00)	2018-12-31	14:18:10				87.30
143511	J2000	42166.000	0.0001270	8.5710	42.5420	12.8760	87.5381

C2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C2.48	**2000-034A**	**TDRS 8**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:51:43				89.10
26388	TEME	42165.641	0.0013598	8.3989	51.3725	272.2453	89.3936
C2.49	**2017-066A**	**USA 279 (NROL-52, SDS-3, QUASAR)**					**PL**
vimpel	GEO (1.00)	2018-12-24	09:17:27				92.00
64807	J2000	42165.900	0.0003270	4.3080	325.4360	330.7650	92.1166
C2.50	**2016-065A**	**Shi Jian 17**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:26:26				94.20
41838	TEME	42164.145	0.0002386	0.3836	98.7899	249.5461	94.2071
C2.51	**2014-023A**	**Luch 5V**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:52:12				94.80
39727	TEME	42165.759	0.0003430	1.5700	301.2032	11.4641	94.6999
C2.52	**2010-063A**	**USA 223 (NROL-32, ORION)**					**PL**
vimpel	EGO (0.71)	2018-12-31	21:21:35				95.40
143535	J2000	42165.200	0.0052690	3.3260	154.3030	134.2010	95.2551
C2.53	**1989-035A**	**USA 37 (VORTEX 6)**					**PL**
vimpel	EGO (0.03)	2018-12-25	11:51:18				95.70
143608	J2000	42164.200	0.0984980	8.0300	7.3710	290.0140	94.8981
C2.54	**2008-001A**	**Thuraya 3**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:59:47				98.60
32404	TEME	42165.006	0.0004961	3.8438	0.9802	275.3103	98.5284
C2.55^{m}	**2014-090A**	**Fengyun 2G**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:02:44				99.73
40367	TEME	42163.417	0.0002604	0.8531	105.8487	269.2532	99.7260
C2.56^{m}	**1986-096A**	**USA 20 (FLTSATCOM F7)**					**PL**
vimpel	GEO (1.00)	2018-12-25	11:07:11				99.81
143614	J2000	42167.800	0.0007400	14.6720	0.9270	229.6100	99.8135
C2.57	**1998-050A**	**Astra 2A**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:02:44				100.00
25462	TEME	42164.089	0.0002920	0.3950	101.0574	169.9729	99.9814
C2.58	**2016-048A**	**Tiantong-1 01**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:54:05				101.40
41725	TEME	42165.371	0.0006688	3.7688	327.5724	356.2607	101.3486
C2.59	**2005-023A**	**Ekspress-AM 3**					**PL**
TLEs	GEO (1.00)	2018-12-28	09:36:21				103.00
28707	TEME	42165.593	0.0001554	0.6001	93.7620	119.3365	103.0054

C2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C2.60^m	**1995-038A**	**USA 113 (DSCS III F9, DSCS 3-9, DSCS III B-7)**					**PL**
vimpel	GEO (1.00)	2018-12-25	13:05:25				103.60
143512	J2000	42165.200	0.0001750	10.9970	34.3490	215.4050	103.5962
C2.61	**2016-036A**	**USA 268 (NROL 37, ORION)**					**PL**
vimpel	EGO (0.86)	2018-12-31	09:47:59				104.80
143118	J2000	42165.300	0.0048610	7.0050	352.3650	36.1060	104.7918
C2.62	**2000-016A**	**Asiastar**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:55:05				105.00
26107	TEME	42165.383	0.0004031	2.8532	80.0486	202.9033	104.9711
C2.63	**2000-080A**	**USA 155 (SDS 3 F2)**					**PL**
vimpel	GEO (1.00)	2018-12-31	12:12:30				110.00
143520	J2000	42167.600	0.0006080	8.6300	33.4750	181.9300	109.8737
C2.64	**2016-037A**	**Beidou DW 23**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:58:39				110.60
41586	TEME	42165.771	0.0008828	0.7449	17.8821	10.4821	110.5809
C2.65^m	**2001-009A**	**USA 157 (Milstar-2 F2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:12:59				111.03
26715	TEME	42163.786	0.0001667	8.8341	33.1869	239.0448	111.0331
C2.66	**2012-002A**	**Fengyun 2F**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:53:55				112.00
38049	TEME	42167.276	0.0001001	0.8767	79.0081	289.6701	112.3596
C2.67	**2006-053A**	**Fengyun 2D**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:06:57				123.60
29640	TEME	42166.680	0.0005955	5.4740	61.6833	318.8527	123.8001
C2.68	**1995-022A**	**USA 110 (Advanced ORION 1)**					**PL**
vimpel	GEO (1.00)	2018-12-24	11:35:47				126.60
143519	J2000	42164.100	0.0042700	14.5080	33.2410	112.3990	126.0436
C2.69	**2016-027A**	**IRNSS-R1G**					**PL**
TLEs	GEO (1.00)	2018-12-30	01:28:15				129.50
41469	TEME	42166.360	0.0002157	3.0873	249.6377	220.1522	129.4738
C2.70	**2000-065A**	**USA 153 (DSCS III F12, DSCS 3-12, DSCS III B-11)**					**PL**
vimpel	GEO (1.00)	2018-12-24	12:20:34				134.00
143609	J2000	42165.200	0.0002830	7.1260	53.0640	240.9710	134.4401
C2.71	**2005-012A**	**Apstar 6**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:59:10				134.00
28638	TEME	42165.127	0.0002274	0.4589	96.5624	189.8387	133.7720

C2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C2.72^{m}	**2002-015A**	**JCSAT 8**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:20:37				135.83
27399	TEME	42164.525	0.0011354	1.6951	89.1816	179.7983	135.8304
C2.73	**2002-035B**	**N-Star 3 (N-Star c)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:04:08				136.00
27461	TEME	42165.112	0.0001773	5.6613	61.7921	308.6272	136.0453
C2.74	**2010-001A**	**Beidou DW 3**					**PL**
TLEs	GEO (1.00)	2018-12-29	18:31:05				140.00
36287	TEME	42166.411	0.0003664	1.4883	15.1865	186.0940	139.8677
C2.75	**2008-007A**	**Kizuna (WINDS)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:06:01				143.00
32500	TEME	42164.703	0.0002001	2.0427	86.9438	191.9555	142.9865
C2.76	**2005-009A**	**Inmarsat-4 F1**					**PL**
TLEs	GEO (1.00)	2018-12-30	09:10:38				143.50
28628	TEME	42164.957	0.0002783	2.9466	19.9963	270.6752	143.5194
C2.77	**2018-085A**	**Beidou DW 41**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:39:45				144.60
43683	TEME	42164.078	0.0002572	2.9571	273.2366	1.8501	144.4718
C2.78	**2002-029A**	**Ekspress A1R (Express 4A)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:06:54				145.40
27441	TEME	42165.028	0.0007730	6.9836	53.1591	91.2475	145.7096
C2.79^{m}	**1999-013A**	**Asiasat 3S**					**PL**
TLEs	GEO (1.00)	2018-12-29	06:39:35				146.07
25657	TEME	42165.425	0.0004043	3.6572	75.5007	206.6613	146.0717
C2.80	**1999-006A**	**JCSAT 6**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:08:02				150.00
25630	TEME	42164.348	0.0002273	3.4594	77.1637	201.1948	150.0090
C2.81^{m}	**2013-050A**	**USA 246 (AEHF SV-3)**					**PL**
TLEs	GEO (1.00)	2018-12-30	03:54:34				152.21
39256	TEME	42163.987	0.0006210	1.4705	308.7771	7.4654	152.2075
C2.82	**2000-072A**	**Intelsat 1R (PAS 1R)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:10:02				157.10
26608	TEME	42164.687	0.0002534	1.4899	90.1879	137.6177	157.1169
C2.83	**2010-057A**	**Beidou DW 6**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:10:55				160.00
37210	TEME	42164.721	0.0007115	0.8642	47.6901	186.8925	160.0510

C2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C2.84	**2011-074B**	**Luch 5A**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:12:33				165.80
37951	TEME	42165.297	0.0003991	2.1700	136.6566	155.5195	165.7857
C2.85	**1998-037A**	**Intelsat 805**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:30:10				169.00
25371	TEME	42164.805	0.0003250	1.2326	91.7894	197.1790	169.0473
C2.86	**2014-027A**	**USA 252 (NROL-33)**					**PL**
vimpel	GEO (1.00)	2018-12-31	18:45:09				170.00
64502	J2000	42165.600	0.0001990	2.3870	188.9780	108.7340	169.9455
C2.87^m	**1995-003A**	**USA 108 (UFO F4)**					**PL**
vimpel	GEO (1.00)	2018-12-31	07:29:05				171.72
143607	J2000	42165.700	0.0002470	9.9830	24.1720	285.8300	171.7189
C2.88^m	**1998-016A**	**USA 138 (UFO F8)**					**PL**
vimpel	GEO (1.00)	2018-12-24	08:40:54				171.74
143610	J2000	42165.300	0.0005500	8.1920	35.3940	254.4960	171.7371
C2.89	**2011-032A**	**Tian Lian 1-02**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:32:26				176.80
37737	TEME	42163.952	0.0008102	2.7444	76.0587	182.0260	176.7679
C2.90	**1996-070A**	**Inmarsat-3 F3**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:01:14				178.10
24674	TEME	42165.212	0.0004987	4.5332	69.0547	209.6487	178.0688
C2.91^m	**2000-001A**	**USA 148 (DSCS III F11, DSCS 3-11, DSCS III B-8)**					**PL**
vimpel	GEO (1.00)	2018-12-31	08:38:36				180.08
143518	J2000	42166.900	0.0002180	7.6990	49.9550	292.8680	180.0751
C2.92^m	**2012-009A**	**MUOS 1**					**PL**
TLEs	EGO (0.68)	2018-12-30	20:34:19				183.50
38093	TEME	42164.525	0.0054048	2.7506	350.7147	184.5252	183.4951
C2.93	**2013-004A**	**TDRS 11**					**PL**
TLEs	GEO (1.00)	2018-12-30	03:00:19				185.70
39070	TEME	42164.185	0.0004681	4.6176	329.0960	304.1845	185.6240
C2.94	**2002-055A**	**TDRS 10**					**PL**
TLEs	GEO (1.00)	2018-12-30	08:32:29				185.80
27566	TEME	42166.157	0.0010308	5.9914	55.9848	239.9707	189.0254
C2.95	**1991-054B**	**TDRS 5**					**PL**
TLEs	GEO (1.00)	2018-12-30	16:11:21				192.40
21639	TEME	42163.935	0.0023152	14.6360	15.6750	339.1487	192.2957

C2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C2.96	**2000-024A**	**USA 149 (DSP F20, DSP Block 5(DSP-1) F20)**					**PL**
vimpel	GEO (1.00)	2018-12-31	06:23:24				194.40
143521	J2000	42161.500	0.0004280	11.1670	30.6420	2.1330	194.6547
C2.97	**2017-004A**	**USA 273 (SBIRS GEO-3)**					**PL**
TLEs	GEO (1.00)	2018-12-30	00:55:54				200.60
41937	TEME	42164.758	0.0002036	4.8378	312.8634	330.0458	200.6156
C2.98^m	**2011-011A**	**USA 227 (NROL-27, SDS-3, QUASAR)**					**PL**
vimpel	GEO (1.00)	2018-12-25	03:31:23				218.79
143647	J2000	42163.800	0.0004330	4.5660	6.5380	193.7740	218.7865
C2.99	**1997-046A**	**Badr C (Intelsat 5, Arabsat 2C, PAS 5)**					**PL**
TLEs	GEO (1.00)	2018-12-30	07:05:54				223.00
24916	TEME	42164.364	0.0003718	4.6411	68.3590	209.3195	223.0237
C2.100	**2001-011A**	**Eutelsat 33C (Eutelsat 28A, Europesat 1, Eurobird 1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:30:16				227.10
26719	TEME	42165.057	0.0005327	0.7530	90.6329	191.2856	227.1497
C2.101^m	**1996-054A**	**AMC 1 (GE 1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	07:35:51				229.10
24315	TEME	42164.989	0.0002728	2.7567	82.1467	204.2004	229.1015
C2.102^m	**2003-008A**	**USA 167 (DSCS III F13, DSCS 3-13, DSCS III A-3)**					**PL**
vimpel	GEO (1.00)	2018-12-31	06:07:03				229.91
143514	J2000	42166.200	0.0003390	5.7660	61.7950	291.1080	229.9064
C2.103^m	**2001-033A**	**USA 159 (DSP F21, DSP Block 5(DSP-1) F21)**					**PL**
vimpel	GEO (1.00)	2018-12-25	04:23:08				234.40
143503	J2000	42082.300	0.0001460	10.3250	34.3220	173.6330	234.3976
C2.104^m	**2003-012A**	**USA 169 (Milstar-2 F4)**					**PL**
vimpel	GEO (1.00)	2018-12-25	04:57:49				240.00
143510	J2000	42165.100	0.0002990	8.3630	48.6210	260.7360	240.0020
C2.105	**2015-056A**	**Morelos 3**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:48:16				246.90
40946	TEME	42164.791	0.0002639	5.6447	328.2116	358.4022	246.9109
C2.106^m	**1997-065A**	**USA 134 (DSCS III F10, DSCS 3-10, DSCS III B-13)**					**PL**
vimpel	GEO (1.00)	2018-12-25	03:50:05				248.32
143501	J2000	42163.400	0.0010710	9.6710	39.9550	242.9540	248.3157

C2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C2.107	**2009-035A**	**Terrestar 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	00:46:45				249.00
35496	TEME	42164.637	0.0003287	2.5531	359.0630	293.4631	249.0295
C2.108	**1999-059A**	**Telstar 12 (Orion 2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:37:03				250.80
25949	TEME	42164.705	0.0003056	2.1079	88.0900	199.3199	250.7923
C2.109^m	**2002-062A**	**Nimiq 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	05:57:26				250.97
27632	TEME	42329.016	0.0006678	3.1768	79.2795	186.1974	250.9668
C2.110	**1996-022A**	**MSAT**					**PL**
TLEs	GEO (1.00)	2018-12-29	03:39:04				253.20
23846	TEME	42164.638	0.0005345	8.5545	44.9096	247.2309	252.5590
C2.111	**1995-019A**	**AMSC 1 (M-Sat 2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	02:52:38				253.50
23553	TEME	42164.590	0.0004660	10.7256	35.2037	284.5474	253.5305
C2.112	**2016-041A**	**MUOS 5**					**PL**
TLEs	EGO (0.15)	2018-12-30	21:09:50				255.60
41622	TEME	42164.716	0.0202224	8.3278	312.7355	205.9114	256.1056
C2.113	**2010-061A**	**SkyTerra 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:52:39				258.70
37218	TEME	42164.879	0.0003139	2.5631	341.0048	335.3870	258.6852
C2.114^m	**2013-036A**	**MUOS 2**					**PL**
TLEs	EGO (0.61)	2018-12-30	22:54:02				260.08
39206	TEME	42164.801	0.0057728	3.0427	342.7925	356.1920	260.0844
C2.115	**2008-039A**	**Inmarsat-4 F3**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:40:11				262.20
33278	TEME	42164.881	0.0002895	3.0220	7.1805	275.5990	262.0488
C2.116	**2018-079A**	**USA 288 (AEHF 4)**					**PL**
TLEs	EGO (0.06)	2018-12-28	16:59:59				265.90
43651	TEME	38925.512	0.1033138	6.0308	304.7371	174.9943	257.8834
C2.117	**1997-026A**	**Galaxy 25 (Intelsat Americas 5, IA 5, Telstar 5)**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:34:45				266.90
24812	TEME	42165.007	0.0003372	0.6974	94.4567	189.3702	266.9439
C2.118	**2008-016A**	**EchoStar G1 (DBSD G1, ICO G1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:48:09				267.10
32763	TEME	42164.808	0.0002459	3.6575	3.2030	274.5459	267.1357

C2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C2.119	**2000-046A**	**Brasilsat B4**					**PL**
TLEs	GEO (1.00)	2018-12-30	04:59:34				268.00
26469	TEME	42165.024	0.0002932	2.8261	81.8633	223.8038	268.0082
C2.120^{m}	**1995-060A**	**USA 115 (Milstar DFS-2)**					**PL**
vimpel	GEO (1.00)	2018-12-25	01:22:55				270.09
143612	J2000	42163.900	0.0003490	12.9510	24.7410	256.4600	270.0941
C2.121	**1997-002A**	**AMC 2 (GE 2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	09:26:57				277.30
24713	TEME	42164.374	0.0005184	5.3712	63.1279	218.0808	275.0912
C2.122	**1999-033A**	**Astra 1H**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:24:54				279.20
25785	TEME	42164.517	0.0003253	4.9026	66.6950	214.3938	279.1829
C2.123	**1994-070A**	**Astra 1D**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:27:09				287.10
23331	TEME	42165.351	0.0003706	8.3719	45.4799	231.2112	286.9473
C2.124	**1997-050A**	**AMC 3 (GE 3)**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:20:57				288.00
24936	TEME	42164.942	0.0002816	1.5906	89.4980	203.5004	288.0068
C2.125^{m}	**2012-019A**	**USA 235 (AEHF 2)**					**PL**
vimpel	GEO (1.00)	2018-12-31	23:03:03				292.16
143652	J2000	42167.600	0.0003140	1.5530	21.8450	261.8360	292.1610
C2.126	**1988-091B**	**TDRS 3**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:52:27				297.70
19548	TEME	42165.630	0.0038994	14.3888	2.3813	313.5321	297.2986
C2.127	**1998-006B**	**Inmarsat-3 F5**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:42:43				306.00
25153	TEME	42164.252	0.0005111	3.7036	72.6062	206.8624	306.0605
C2.128	**1994-084A**	**USA 107 (DSP F17, DSP 17, DSP Block 5(DSP-1) F17)**					**PL**
vimpel	GEO (1.00)	2018-12-31	21:38:14				310.80
143611	J2000	42166.300	0.0000390	14.4710	17.0360	138.6280	311.8142
C2.129	**2017-047A**	**TDRS 13**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:43:53				311.10
42915	TEME	42162.145	0.0027353	6.3668	330.8613	7.5373	310.8043
C2.130	**2002-015B**	**Astra 3A**					**PL**
TLEs	GEO (1.00)	2018-12-30	00:58:08				313.00
27400	TEME	42164.717	0.0003093	4.8815	66.1681	223.0532	313.0459

C2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C2.131	**1993-003B**	**TDRS 6**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:11:51				314.10
22314	TEME	42164.970	0.0006635	14.2201	18.7129	304.5176	314.1874
C2.132^m	**2003-040A**	**USA 170 (DSCS III F14, DSCS 3-14, DSCS III B-6)**					**PL**
vimpel	GEO (1.00)	2018-12-25	01:02:12				317.65
143516	J2000	42165.600	0.0001440	4.9350	67.2040	171.4060	317.6504
C2.133	**2014-004A**	**TDRS 12**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:33:05				319.00
39504	TEME	42166.855	0.0003224	5.3251	336.2261	305.6140	318.8853
C2.134^m	**1994-009A**	**USA 99 (Milstar DFS-1)**					**PL**
vimpel	GEO (1.00)	2018-12-31	23:42:50				321.08
143508	J2000	42165.500	0.0001470	13.3450	57.3400	294.9590	321.0829
C2.135	**2001-005B**	**Skynet 4F**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:58:32				326.00
26695	TEME	42165.234	0.0003433	9.4864	32.8865	251.6145	325.9954
C2.136	**2002-016A**	**Intelsat 903**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:32:31				328.50
27403	TEME	42164.825	0.0000616	1.0637	92.8847	236.6595	328.4974
C2.137	**2001-024A**	**Intelsat 901**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:12:04				330.50
26824	TEME	42165.032	0.0002784	0.6788	94.1855	193.1510	330.5197
C2.138	**1998-029A**	**USA 139 (Advanced ORION 2)**					**PL**
vimpel	GEO (1.00)	2018-12-31	18:44:07				333.50
143603	J2000	42165.500	0.0043820	8.8160	355.1860	267.1330	333.3125
C2.139	**2012-033A**	**USA 236 (NROL-38, SDS-3, QUASAR)**					**PL**
vimpel	GEO (1.00)	2018-12-25	05:44:11				336.00
143543	J2000	42166.200	0.0008530	1.5430	152.2690	148.0960	336.1266
C2.140^m	**1999-063A**	**USA 146 (UFO F10)**					**PL**
vimpel	GEO (1.00)	2018-12-31	21:18:11				337.18
143618	J2000	42169.300	0.0005520	7.3470	37.5770	270.0690	337.1814
C2.141^m	**2002-019A**	**NSS 7**					**PL**
TLEs	GEO (1.00)	2018-12-30	00:05:09				340.01
27414	TEME	42164.742	0.0002410	3.0708	80.0224	196.6918	340.0122

C2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C2.142^m	**1989-077A**	**USA 46 (FLTSATCOM F8)**					**PL**
vimpel	GEO (1.00)	2018-12-31	19:02:52				343.74
143616	J2000	42166.000	0.0006800	13.0860	10.1090	300.9660	343.7352
C2.143	**2012-061A**	**Luch 5B**					**PL**
TLEs	GEO (1.00)	2018-12-30	10:59:21				343.80
38977	TEME	42165.088	0.0004278	4.6626	70.9469	247.6210	343.6565
C2.144^m	**2015-002A**	**MUOS 3**					**PL**
vimpel	EGO (0.71)	2018-12-31	16:48:50				344.32
73802	J2000	42165.300	0.0052730	3.3800	338.1980	181.5450	344.3243
C2.145	**1996-053A**	**Inmarsat-3 F2**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:37:10				344.50
24307	TEME	42164.774	0.0006631	3.7757	74.8863	216.2235	344.5867
C2.146	**2002-011A**	**TDRS 9**					**PL**
TLEs	GEO (1.00)	2018-12-30	07:17:46				348.00
27389	TEME	42164.472	0.0022933	6.3955	72.7921	252.5382	347.7009
C2.147	**2016-047A**	**USA 269 (Quasar 20, SDS-4 1)**					**PL**
vimpel	GEO (1.00)	2018-12-31	16:01:43				350.00
75203	J2000	42165.100	0.0001250	3.8190	331.7690	299.2670	349.9067
C2.148^m	**1998-035A**	**Thor III**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:23:56				355.73
25358	TEME	42164.635	0.0001956	6.3636	56.0719	230.5464	355.7261
C2.149	**1999-009B**	**Skynet 4E**					**PL**
TLEs	GEO (1.00)	2018-12-30	04:21:30				358.80
25639	TEME	42164.066	0.0003740	10.5608	24.5030	237.9250	358.7872
C2.150^m	**2015-034A**	**Meteosat 11 (MSG 4)**					**PL**
TLEs	GEO (1.00)	2018-12-30	08:59:22				359.94
40732	TEME	42163.011	0.0001440	1.0287	232.7193	90.9479	359.9436

4.3 Satellites in a Controlled Drift Orbit

The following list contains 7 controlled drifting satellites (of which 1 is outdated), sorted according to the ascending order of the mean drift rate (which is equivalent to the decreasing order of the mean semi-major axis).

For explanation of symbols, see the definitions at the beginning of section 4.

C4.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
C4.1^m	**2014-055A**	**USA 257 (CLIO)**					**PL**
vimpel	GEO (1.00)	2018-12-31	22:55:16	0.02	-1.600	-66.172	62.972
143663	J2000	42157.000	0.0014540	0.1400	137.2640	218.4540	100.7311
C4.2$_o$	**2016-052A**	**USA 270**					**PL**
KIAM	GEO (1.00)	2018-01-01	00:00:00	0.27	-21.146	-30.531	-11.761
UI202	J2000	42143.027	0.0002227	0.1735	92.3721	223.0440	143.3330
C4.3^m	**2014-043B**	**USA 254 (GSSAP 2, AFSPC-4 F2)**					**PL**
vimpel	GEO (1.00)	2018-12-31	23:08:37	0.50	-39.500	-49.700	-29.500
145303	J2000	42100.400	0.0001970	0.2560	89.1880	306.3710	1.7085
C4.4^m	**2016-052B**	**USA 271**					**PL**
vimpel	GEO (1.00)	2018-12-24	18:22:40	0.50	-48.900	-53.000	-44.300
143809	J2000	42040.000	0.0000090	0.2390	83.3020	277.1790	69.9052
C4.5^m	**2014-043A**	**USA 253 (GSSAP 1, AFSPC-4 F1)**					**PL**
vimpel	GEO (1.00)	2018-12-18	17:42:36	0.75	-4.500	-9.900	0.900
145205	J2000	42097.300	0.0000820	0.2130	86.5690	290.5700	91.2302
C4.6^m	**2018-036E**	**USA-285**					**PL**
vimpel	EGO (-)	2018-12-31	20:31:28	6.60	-508.300	-537.500	-479.000
141010	J2000	41656.100	0.0006060	0.7020	90.4810	96.5000	42.5965
C4.7^m	**2018-036F**	**USA-286**					**PL**
vimpel	EGO (-)	2018-12-31	20:54:09	6.70	-510.100	-539.800	-480.400
141011	J2000	41657.800	0.0006930	0.7030	90.8160	96.4130	37.3452

4.4 Objects in a Drift Orbit

The following list contains 831 drifting objects (of which 7 are outdated), sorted according to the ascending order of the mean drift rate (which is equivalent to the decreasing order of the mean semi-major axis).

For explanation of symbols, see the definitions at the beginning of section 4.

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\mathrm{IADC}}^{\mathrm{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.1	**2010-006B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (-)	2018-12-29	23:14:20	-4147200.00	4206.400	2042.700	6370.100
36398	TEME	46370.913	0.0478072	7.4621	61.8785	10.3841	334.8628
D.2	**2012-057B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (-)	2018-12-30	16:54:16	-3697920.00	3700.800	1335.600	6066.000
38868	TEME	45864.961	0.0533537	5.0798	73.2534	352.1175	200.6199
D.3	**2013-077B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (-)	2018-12-30	17:12:42	-3326400.00	3296.900	1019.400	5574.500
39488	TEME	45461.226	0.0505035	3.5687	73.3210	128.2975	75.7240
D.4	**2011-074C**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (0.11)	2018-12-30	07:35:51	-3309120.00	3276.400	-44.800	6597.600
37952	TEME	45440.640	0.0724137	5.0405	60.0170	126.9353	352.6821
D.5	**1969-045A**	**Intelsat III F-4**					**PL**
TLEs	EGO (-)	2018-12-30	21:43:47	-3179520.00	3135.800	3019.200	3252.500
3947	TEME	45300.059	0.0030406	10.8666	308.9963	12.3114	66.1086
D.6	**1968-116A**	**Intelsat III F-2**					**PL**
TLEs	EGO (-)	2018-12-30	13:46:10	-3136320.00	3085.600	2636.900	3534.400
3623	TEME	45249.802	0.0101120	10.8562	312.6573	25.0582	203.3120
D.7	**2017-046C**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (0.11)	2018-12-30	13:18:17	-3093120.00	3039.500	-28.900	6107.800
42909	TEME	45203.600	0.0676937	1.2616	88.4062	96.2918	148.8604
D.8	**2018-107B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (0.12)	2018-12-30	10:34:16	-3049920.00	2993.700	-209.700	6197.000
43868	TEME	45158.334	0.0711347	0.1565	226.7414	109.9917	102.6578
D.9	**2018-037B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (0.12)	2018-12-30	11:31:04	-3032640.00	2978.800	-28.700	5986.300
43433	TEME	45142.930	0.0668015	0.5462	98.4952	324.8028	88.3900
D.10	**2014-010C**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (0.12)	2018-12-30	09:35:03	-3015360.00	2956.900	-150.100	6063.800
39614	TEME	45121.059	0.0703822	3.8886	77.0424	356.2749	194.2412
D.11	**2018-037D**	**Briz-M debris**					**RD**
TLEs	EGO (0.05)	2018-08-07	19:46:07	-2989440.00	2927.200	-864.800	6719.100
43469	TEME	45091.346	0.0840954	0.0375	91.1128	332.6454	193.4876

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.12	**1969-013C**	**Titan 3C fragmentation debris**					**RF**
vimpel	EGO (-)	2018-12-31	06:20:06	-2756160.00	2684.400	1437.400	3931.500
157502	J2000	44848.500	0.0283600	5.2820	303.5210	313.3120	108.2609
D.13	**2014-058B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (0.14)	2018-12-30	05:06:34	-2669760.00	2593.000	-10.200	5196.300
40259	TEME	44757.206	0.0594754	3.4876	78.2700	141.4831	262.6913
D.14	**2014-023C**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (0.10)	2018-12-30	15:48:50	-2401920.00	2316.100	-289.600	4921.800
39729	TEME	44480.474	0.0596051	3.7937	60.8645	152.0616	84.3716
D.15	**2006-048A**	**Xinnuo 2**					**PL**
TLEs	EGO (-)	2018-12-30	07:31:02	-2298240.00	2208.600	2026.000	2391.300
29516	TEME	44372.605	0.0042077	7.6847	83.5131	212.3520	231.9148
D.16	**1969-013D**	**Titan 3C fragmentation debris**					**RF**
vimpel	EGO (-)	2018-12-24	14:58:38	-2229120.00	2138.700	725.900	3551.600
154601	J2000	44304.800	0.0315890	5.8200	294.2260	252.7790	336.0772
D.17	**2016-065C**	**YZ-2 (Long March (CZ) 5/YZ-2)**					**RB**
TLEs	EGO (0.18)	2018-12-30	16:11:00	-2116800.00	2020.800	-158.000	4199.700
41840	TEME	44185.045	0.0497384	2.1946	94.5784	165.3958	112.2010
D.18	**1997-040A**	**PAS 6**					**PL**
TLEs	EGO (0.05)	2018-12-30	19:27:07	-2047680.00	1950.000	-1104.600	5004.700
24891	TEME	44114.224	0.0680916	12.9254	341.1571	192.1156	310.7256
D.19	**1978-113D**	**Transtage 36 (Titan IIIC)**					**RB**
TLEs	EGO (-)	2018-12-30	09:44:36	-2030400.00	1931.800	736.700	3126.900
11147	TEME	44096.341	0.0275708	16.3809	330.6729	358.7084	80.8608
D.20	**1978-113A**	**OPS 9441 (DSCS II F-11, DSCS 2-11, DSCS II C-11)**					**PL**
TLEs	EGO (-)	2018-12-30	12:57:41	-1944000.00	1845.600	1726.100	1965.100
11144	TEME	44009.854	0.0021199	15.7097	336.6486	133.7190	33.5651
D.21	**2014-085A**	**GVM/Briz-M**					**PL**
TLEs	EGO (-)	2018-12-30	01:35:45	-1935360.00	1836.800	372.600	3300.900
40355	TEME	44000.907	0.0335065	3.4688	83.6992	285.4060	320.9980
D.22	**1969-013N**	**Transtage 17 fragmentation debris**					**RF**
TLEs	EGO (0.17)	2018-12-30	12:06:16	-1883520.00	1787.000	-350.400	3924.500
43455	TEME	43949.294	0.0424398	6.6084	285.4801	292.7016	5.2795
D.23	**1985-024A**	**Ekran 14**					**PL**
TLEs	EGO (-)	2018-12-30	13:02:50	-1702080.00	1608.600	1528.600	1688.700
15626	TEME	43772.905	0.0024532	16.2063	342.9203	304.5837	51.7237

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.24	**1984-115A**	**NATO IIID**					**PL**
TLEs	EGO (-)	2018-12-30	11:32:08	-1650240.00	1560.200	1118.500	2001.900
15391	TEME	43724.564	0.0097503	14.4652	12.5086	65.1023	95.4713
D.25	**1973-100D**	**Transtage 26 (Titan IIIC)**					**RB**
TLEs	EGO (-)	2018-12-30	15:21:04	-1641600.00	1547.200	389.400	2705.000
6976	TEME	43711.388	0.0260241	13.1627	314.1956	54.1616	188.6607
D.26	**1983-016A**	**Ekran 10**					**PL**
TLEs	EGO (-)	2018-12-30	20:15:59	-1632960.00	1537.100	1396.000	1678.100
13878	TEME	43701.216	0.0037884	15.6070	333.9773	322.4591	120.3195
D.27	**1981-122A**	**MARECS A**					**PL**
TLEs	EGO (-)	2018-12-30	22:39:34	-1624320.00	1534.200	1025.000	2043.300
13010	TEME	43698.547	0.0114020	15.1357	348.0619	202.1576	259.8940
D.28	**1982-106A**	**OPS 9445 (DSCS II F-16, DSCS 2-16)**					**PL**
TLEs	EGO (-)	2018-12-30	19:26:21	-1615680.00	1518.700	1498.100	1539.300
13636	TEME	43682.870	0.0002996	15.7882	347.3214	313.5000	306.8955
D.29	**2008-006C**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (-)	2018-12-30	12:29:41	-1598400.00	1509.100	360.500	2657.600
37381	TEME	43672.966	0.0263998	8.3582	38.1925	245.9742	151.3811
D.30	**1988-036A**	**Ekran-M 18**					**PL**
TLEs	EGO (-)	2018-12-30	20:21:53	-1581120.00	1491.700	1443.900	1539.400
19090	TEME	43655.556	0.0014033	16.3661	353.3095	2.1855	141.2823
D.31	**1998-065A**	**Intelsat 8 (PAS 8)**					**PL**
TLEs	EGO (0.02)	2018-12-30	19:53:46	-1581120.00	1489.400	192.200	2786.600
25522	TEME	43653.744	0.0296158	2.2875	85.8943	232.4723	38.3883
D.32	**2014-064B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (0.06)	2018-12-30	01:51:12	-1572480.00	1478.100	-997.600	3953.800
40278	TEME	43642.242	0.0583139	2.3957	83.7641	157.2222	317.0156
D.33	**1969-013R**	**Titan 3C fragmentation debris**					**RF**
vimpel	EGO (-)	2018-12-25	04:29:20	-1563840.00	1468.400	1207.400	1729.300
151101	J2000	43633.400	0.0068630	6.3270	287.8760	38.8220	126.5973
D.34	**1977-005A**	**NATO IIIB**					**PL**
TLEs	EGO (-)	2018-12-30	21:52:35	-1555200.00	1464.000	1272.100	1655.800
9785	TEME	43628.284	0.0049428	13.5200	330.8457	343.4848	96.7060
D.35	**1979-098C**	**Transtage 37 (Titan IIIC)**					**RB**
TLEs	EGO (0.14)	2018-12-30	16:11:01	-1537920.00	1448.900	83.300	2814.400
11623	TEME	43612.878	0.0316226	15.6985	331.0167	4.7109	346.4811

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.36	**1969-013T**	**Titan 3C fragmentation debris**					**RF**
vimpel	EGO (0.13)	2018-12-24	15:59:43	-1503360.00	1412.600	34.200	2791.000
150801	J2000	43577.500	0.0304040	5.2900	304.0440	211.5020	330.3826
D.37	**1977-034B**	**OPS 9438 (DSCS II F-8, DSCS 2-8, DSCS II C-8)**					**PL**
TLEs	EGO (-)	2018-12-30	16:10:15	-1503360.00	1415.900	1266.900	1564.900
10001	TEME	43579.969	0.0031853	14.6842	325.5579	77.6961	344.2127
D.38	**2008-022B**	**Blok-DM-SL-B (Zenit-3SLB)**					**RB**
TLEs	EGO (0.07)	2018-12-30	08:02:42	-1477440.00	1383.300	-861.300	3627.900
33059	TEME	43547.392	0.0538433	9.1025	50.1366	354.6465	188.7404
D.39	**1977-034C**	**Transtage 32 (Titan IIIC)**					**RB**
TLEs	EGO (0.14)	2018-12-30	23:17:32	-1468800.00	1376.600	73.900	2679.400
10002	TEME	43540.914	0.0298617	14.8371	322.8617	30.6479	17.0760
D.40	**1979-098A**	**OPS 9443 (DSCS II F-13, DSCS 2-13, DSCS II D-13)**					**PL**
TLEs	EGO (-)	2018-12-30	21:53:50	-1451520.00	1363.600	1323.100	1404.100
11621	TEME	43527.959	0.0009570	15.2269	335.7149	29.1429	101.2872
D.41	**2007-054B**	**Delta IV DCSS 5 (Delta 4H)**					**RB**
vimpel	EGO (-)	2018-12-25	00:05:49	-1373760.00	1282.200	203.500	2361.000
150100	J2000	43445.500	0.0239400	5.4040	72.5190	68.1750	337.2999
D.42	**1987-109A**	**Ekran-M 17**					**PL**
TLEs	EGO (-)	2018-12-30	17:54:01	-1365120.00	1277.800	1095.000	1460.500
18715	TEME	43441.850	0.0037734	16.1468	355.7192	177.0760	345.5556
D.43	**1976-053A**	**Marisat 2**					**PL**
TLEs	EGO (-)	2018-12-30	16:08:22	-1356480.00	1272.600	734.000	1811.200
8882	TEME	43436.565	0.0125460	13.5974	325.0293	266.6753	337.7504
D.44	**1984-114B**	**MARECS B2**					**PL**
TLEs	EGO (-)	2018-12-30	23:29:48	-1347840.00	1264.000	767.500	1760.500
15386	TEME	43428.307	0.0119652	16.3714	354.2678	344.4979	74.5626
D.45	**1987-028A**	**Raduga 20**					**PL**
TLEs	EGO (-)	2018-12-30	16:19:26	-1339200.00	1253.700	1135.100	1372.300
17611	TEME	43417.768	0.0022676	16.6694	350.7003	99.4649	16.5289
D.46	**1984-090A**	**Ekran 13**					**PL**
TLEs	EGO (-)	2018-12-30	13:51:49	-1321920.00	1235.200	1159.500	1310.800
15219	TEME	43399.232	0.0012927	15.4627	339.3152	131.2687	222.5631
D.47	**1984-028A**	**Ekran 12**					**PL**
TLEs	EGO (-)	2018-12-30	13:00:27	-1313280.00	1223.800	1190.200	1257.400
14821	TEME	43387.910	0.0005993	15.2570	335.9117	42.7897	43.3913

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.48	**1991-084B**	**Inmarsat-2 F3**					**PL**
TLEs	EGO (-)	2018-12-30	08:44:42	-1313280.00	1223.400	1171.100	1275.600
21814	TEME	43387.453	0.0012623	11.9024	30.0230	356.9844	341.4063
D.49	**1997-029A**	**Fengyun 2A (Fengyun 2-1R)**					**PL**
TLEs	EGO (-)	2018-12-30	12:36:42	-1313280.00	1226.900	801.200	1652.500
24834	TEME	43391.259	0.0097932	14.1874	25.8766	174.2678	96.2785
D.50	**1969-013U**	**Titan 3C fragmentation debris**					**RF**
vimpel	EGO (-)	2018-12-31	17:00:45	-1175040.00	1090.300	680.600	1500.100
149202	J2000	43253.300	0.0093840	5.3560	302.0050	101.3190	306.1439
D.51	**1987-073A**	**Ekran 16**					**PL**
TLEs	EGO (-)	2018-12-30	10:41:53	-1175040.00	1096.900	1074.500	1119.300
18328	TEME	43261.206	0.0003271	15.7206	349.1765	303.6698	281.2249
D.52	**1986-038A**	**Ekran 15**					**PL**
TLEs	EGO (-)	2018-12-30	17:10:36	-1157760.00	1078.300	1034.800	1121.800
16729	TEME	43242.461	0.0015262	15.5021	344.1788	311.9512	22.2788
D.53	**1969-013J**	**Titan 3C fragmentation debris**					**RF**
vimpel	EGO (-)	2018-12-25	05:40:47	-1149120.00	1066.200	548.300	1584.100
149002	J2000	43231.800	0.0104500	5.4920	299.6610	159.7070	120.2709
D.54	**1977-034A**	**OPS 9437 (DSCS II F-7, DSCS 2-7, DSCS II C-7)**					**PL**
TLEs	EGO (-)	2018-12-29	23:20:22	-1123200.00	1040.400	967.000	1113.900
10000	TEME	43204.945	0.0021499	14.2380	321.4532	303.6143	233.0153
D.55	**1988-108A**	**Ekran-M 19**					**PL**
TLEs	EGO (-)	2018-12-30	11:31:15	-1123200.00	1046.900	923.300	1170.400
19683	TEME	43211.224	0.0022346	16.0013	357.6637	150.0405	93.0554
D.56	**1986-090A**	**Gorizont 13**					**PL**
TLEs	EGO (-)	2018-12-30	16:39:05	-1105920.00	1024.900	957.000	1092.900
17083	TEME	43189.278	0.0020652	15.6085	349.9968	304.7341	88.2963
D.57	**1988-051A**	**Meteosat 3**					**PL**
TLEs	EGO (-)	2018-12-30	13:08:52	-1036800.00	959.000	935.900	982.100
19215	TEME	43123.514	0.0009334	16.0576	3.2859	307.8462	72.8657
D.58	**1985-028C**	**LEASAT 3 (Syncom-4 3)**					**PL**
TLEs	EGO (-)	2018-12-29	20:55:49	-1028160.00	954.500	626.200	1282.700
15643	TEME	43118.854	0.0075162	16.4631	334.1677	234.9720	284.2715
D.59	**1992-060B**	**Satcom C-3**					**PL**
TLEs	EGO (-)	2018-12-30	12:24:24	-1010880.00	940.200	838.500	1041.900
22117	TEME	43104.532	0.0027875	10.8859	37.6939	307.1440	277.3217

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.60	**1989-020B**	**Meteosat 4 (MOP 1)**					**PL**
TLEs	EGO (-)	2018-12-30	05:44:00	-984960.00	911.000	828.600	993.400
19876	TEME	43075.423	0.0013480	15.9955	7.8224	140.7369	228.7590
D.61	**1996-030B**	**Intelsat 24 (AMOS 1)**					**PL**
TLEs	EGO (-)	2018-12-30	16:16:22	-984960.00	908.700	865.500	951.800
23865	TEME	43073.157	0.0007731	7.9861	50.7871	171.8192	74.2617
D.62	**1969-013G**	**Titan 3C fragmentation debris**					**RF**
vimpel	EGO (-)	2018-12-31	18:39:38	-976320.00	903.300	324.500	1482.100
148201	J2000	43067.600	0.0131310	5.5950	297.3430	127.3370	276.7934
D.63	**1995-040A**	**Intelsat 4 (PAS 4)**					**PL**
TLEs	EGO (-)	2018-12-30	18:52:41	-976320.00	905.800	795.000	1016.600
23636	TEME	43069.636	0.0031143	6.7917	57.1765	186.1491	189.7697
D.64	**1971-095C**	**Transtage 21 (Titan IIIC)**					**RB**
TLEs	EGO (-)	2018-12-30	18:34:58	-959040.00	887.700	226.300	1549.200
5589	TEME	43051.853	0.0152746	10.0795	306.6925	109.3710	128.4216
D.65	**1992-032A**	**NSS K (Intelsat K)**					**PL**
TLEs	EGO (-)	2018-12-30	22:34:58	-959040.00	890.000	516.800	1263.100
21989	TEME	43054.369	0.0089457	12.7242	31.9423	292.4767	61.9370
D.66	**1969-013E**	**Titan 3C fragmentation debris**					**RF**
TLEs	EGO (-)	2018-12-30	11:04:05	-950400.00	875.100	267.200	1483.100
43284	TEME	43039.386	0.0140674	5.6031	298.2913	141.9938	33.5936
D.67	**1984-023A**	**Intelsat V F-8**					**PL**
TLEs	EGO (-)	2018-12-30	12:00:56	-924480.00	857.300	771.700	942.900
14786	TEME	43021.591	0.0012832	15.8576	359.2051	176.5056	265.1583
D.68	**2000-003A**	**Chinasat 22 (Zhongxing 22, ZX 22, Feng Huo 1-1)**					**PL**
TLEs	EGO (-)	2018-12-30	15:18:34	-915840.00	848.100	825.100	871.100
26058	TEME	43012.553	0.0009696	8.0996	48.1186	252.7604	247.5962
D.69	**1998-024A**	**Nilesat 101**					**PL**
TLEs	EGO (-)	2018-12-30	19:49:28	-898560.00	827.200	715.500	938.800
25311	TEME	42991.295	0.0031762	4.6539	70.0728	222.9065	27.6556
D.70	**1989-070A**	**Himawari 4 (GMS 4)**					**PL**
TLEs	EGO (-)	2018-12-30	19:41:05	-889920.00	821.900	621.500	1022.300
20217	TEME	42985.883	0.0042677	15.8347	8.3411	73.1342	135.8501
D.71	**1984-093C**	**LEASAT 2 (Syncom-4 2)**					**PL**
TLEs	EGO (-)	2018-12-30	11:37:26	-872640.00	808.900	676.500	941.200
15236	TEME	42973.344	0.0028289	15.6352	337.2460	217.5578	237.3591

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.72	**1985-107F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	20:14:21	-864000.00	797.200	721.300	873.100
16339	TEME	42961.547	0.0017942	15.0301	344.6439	41.3051	113.7459
D.73	**1969-013B**	**Transtage 17 (Titan IIIC)**					**RB**
TLEs	EGO (0.18)	2018-12-30	14:33:02	-855360.00	785.500	91.100	1479.800
3692	TEME	42949.416	0.0162439	5.6136	298.0921	134.9907	5.7167
D.74	**1973-100B**	**OPS 9434 (DSCS II F-4, DSCS 2-4, DSCS II B-4)**					**PL**
TLEs	EGO (-)	2018-12-30	16:57:37	-855360.00	790.400	485.700	1095.100
6974	TEME	42954.275	0.0076112	11.2558	312.0431	5.8277	149.3535
D.75	**1977-007A**	**OPS 3151 (DSP F7, DSP 9, DSP Block 2(PHASE II) F7)**					**PL**
vimpel	EGO (-)	2018-12-31	17:32:46	-855360.00	788.400	443.500	1133.300
147600	J2000	42951.200	0.0086300	11.1780	313.3120	329.0040	309.6249
D.76	**1976-101A**	**Marisat 3**					**PL**
TLEs	EGO (-)	2018-12-30	20:13:50	-838080.00	769.200	338.000	1200.500
9478	TEME	42933.496	0.0106139	11.2516	326.5929	292.5883	112.4266
D.77	**1978-073F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	17:42:35	-838080.00	775.700	712.100	839.400
11941	TEME	42939.641	0.0013008	12.7901	317.1848	85.6329	305.7577
D.78	**1982-113F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	21:48:11	-838080.00	775.000	678.200	871.700
13954	TEME	42939.667	0.0020733	14.2957	334.1342	226.9032	80.7113
D.79	**1983-066F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	17:04:27	-829440.00	761.500	715.900	807.200
15141	TEME	42925.602	0.0006566	14.5581	336.4509	100.1284	19.4917
D.80	**1983-088F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	21:47:56	-829440.00	762.200	696.100	828.300
14333	TEME	42926.824	0.0014359	14.6343	336.6882	58.2070	79.7967
D.81	**1986-082F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	16:18:48	-829440.00	767.000	648.500	885.500
17065	TEME	42931.157	0.0023945	15.1980	347.8784	95.0944	14.1594
D.82	**1980-016D**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	22:33:01	-820800.00	760.000	695.400	824.700
11728	TEME	42924.314	0.0012997	13.3713	321.7389	239.5937	63.3961
D.83	**2009-007D**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (0.27)	2018-12-30	14:10:10	-820800.00	757.400	-78.500	1593.400
33598	TEME	42921.727	0.0203139	7.6091	53.9361	358.4970	286.4229

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.84	**1973-100A**	**OPS 9433 (DSCS II F-3, DSCS 2-3, DSCS II B-3)**					**PL**
TLEs	EGO (-)	2018-12-30	22:33:32	-812160.00	750.400	616.800	883.900
6973	TEME	42914.805	0.0027180	11.7589	310.2104	158.7032	239.2772
D.85	**1979-062D**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	17:43:13	-812160.00	746.300	724.500	768.100
14005	TEME	42910.130	0.0002040	13.3697	321.1901	276.1765	308.2816
D.86	**1981-027F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	23:46:18	-812160.00	748.100	672.000	824.300
14194	TEME	42912.449	0.0013239	13.9332	324.5111	140.5675	55.7219
D.87	**1986-044F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	09:12:42	-812160.00	746.300	702.700	789.900
16797	TEME	42910.608	0.0005094	15.0890	346.8208	127.0700	295.5788
D.88	**1987-040A**	**Gorizont 14**					**PL**
TLEs	EGO (-)	2018-12-30	16:17:40	-812160.00	749.500	620.900	878.200
17969	TEME	42913.345	0.0024763	14.9703	342.1166	142.9492	10.3642
D.89	**1996-005D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	13:59:22	-812160.00	744.900	687.500	802.300
23778	TEME	42909.631	0.0008167	14.9615	18.5980	119.6177	248.3254
D.90	**1981-069F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	09:11:38	-803520.00	737.600	645.200	829.900
12850	TEME	42901.790	0.0018177	13.8921	326.1820	109.9183	222.3901
D.91	**1986-027F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	18:43:08	-803520.00	740.600	589.400	891.800
16676	TEME	42904.269	0.0033567	15.6296	345.6574	69.4345	156.8554
D.92	**1982-113A**	**Raduga 11**					**PL**
TLEs	EGO (-)	2018-12-30	15:21:35	-794880.00	734.900	560.400	909.400
13669	TEME	42898.672	0.0038506	14.1973	334.4592	226.2363	187.8280
D.93	**1977-071F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	07:18:08	-786240.00	726.200	680.400	772.100
11570	TEME	42890.614	0.0011058	12.1575	314.0065	51.1718	291.0857
D.94	**2001-045A**	**Raduga 1-6**					**PL**
TLEs	EGO (-)	2018-12-30	13:16:47	-786240.00	724.200	651.700	796.700
26936	TEME	42888.688	0.0013181	12.0795	34.0814	153.4125	100.2545
D.95	**1988-028D**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	10:39:45	-777600.00	712.400	625.100	799.800
19020	TEME	42876.901	0.0019295	15.7464	352.9543	47.4265	273.1695

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.96	**1969-013S**	**Titan 3C fragmentation debris**					**RF**
vimpel	EGO (0.22)	2018-12-24	13:54:05	-768960.00	705.900	-93.600	1505.400
147209	J2000	42870.900	0.0154310	5.3550	302.5990	127.4250	0.4319
D.97	**1977-108D**	**Meteosat 1 AKM (MAGE 1)**					**PM**
TLEs	EGO (-)	2018-12-30	22:02:29	-768960.00	707.200	337.900	1076.400
13907	TEME	42872.241	0.0083956	12.8247	314.1076	68.4377	77.4606
D.98	**1985-070F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	21:54:20	-768960.00	706.700	657.200	756.100
15963	TEME	42871.232	0.0007514	14.8964	343.2376	94.4184	102.8092
D.99	**1985-076D**	**LEASAT 4 (Syncom-4 3)**					**PL**
TLEs	EGO (-)	2018-12-30	17:25:59	-768960.00	708.300	678.600	738.000
15995	TEME	42872.444	0.0011364	13.4094	347.9466	303.6403	28.2187
D.100	**1986-007F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	12:59:43	-768960.00	708.600	571.700	845.400
16870	TEME	42872.988	0.0028422	15.0164	344.6377	101.7388	229.7506
D.101	**1988-028A**	**Gorizont 15**					**PL**
TLEs	EGO (-)	2018-12-30	13:02:12	-760320.00	699.800	546.100	853.600
19017	TEME	42864.176	0.0030067	15.7109	353.1795	122.7750	49.1068
D.102	**1992-043D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	18:46:09	-760320.00	698.600	591.500	805.700
22044	TEME	42862.553	0.0019453	15.6877	8.1918	125.1855	166.9335
D.103	**1989-098D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	10:42:31	-751680.00	692.500	612.900	772.200
20370	TEME	42857.011	0.0013384	15.8661	359.3361	115.3357	284.5048
D.104	**1989-101G**	**Proton-K/DM-2 fragmentation debris**					**RF**
TLEs	EGO (-)	2018-12-30	13:52:42	-751680.00	693.300	573.600	813.000
21648	TEME	42857.721	0.0033676	15.6115	359.3808	264.9746	224.9418
D.105	**1990-102D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	17:05:09	-751680.00	688.300	607.200	769.300
21046	TEME	42852.213	0.0013621	15.6880	2.4593	142.5523	174.8919
D.106	**1989-048D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	17:10:11	-743040.00	681.300	587.800	774.800
20086	TEME	42845.457	0.0019106	15.5494	357.5662	65.1154	193.1569
D.107	**1989-030D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	18:42:46	-734400.00	672.200	596.100	748.300
19931	TEME	42836.068	0.0012446	15.4435	356.8057	132.9068	155.0822

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.108	**1980-049F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	04:40:40	-725760.00	667.900	539.800	795.900
11862	TEME	42831.959	0.0025910	13.5815	323.6339	141.6281	222.1954
D.109	**1988-095F**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	17:54:24	-725760.00	667.300	605.900	728.700
19777	TEME	42831.223	0.0012472	15.4320	355.2243	212.5160	347.0211
D.110	**1990-116D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	14:45:05	-725760.00	666.200	526.300	806.200
21041	TEME	42830.939	0.0033710	15.6856	2.8212	21.4241	47.7436
D.111	**1992-021B**	**Inmarsat-2 F4**					**PL**
TLEs	EGO (-)	2018-12-30	14:01:52	-725760.00	666.000	645.900	686.000
21940	TEME	42830.674	0.0001599	9.9092	28.6694	314.8807	257.0995
D.112	**1995-067A**	**Telecom 2C**					**PL**
TLEs	EGO (-)	2018-12-30	00:18:26	-725760.00	666.900	598.000	735.900
23730	TEME	42831.440	0.0021034	11.4745	34.6416	244.1312	291.6255
D.113	**1996-034D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	23:42:07	-725760.00	665.100	534.400	795.900
23883	TEME	42829.549	0.0030322	14.8420	19.2874	23.1943	118.2338
D.114	**1988-018B**	**Telecom 1C**					**PL**
TLEs	EGO (-)	2018-12-30	12:58:25	-717120.00	662.300	230.600	1094.100
18952	TEME	42827.082	0.0094065	15.7535	11.3456	83.6043	72.4401
D.115	**1994-008D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	10:04:47	-717120.00	659.300	571.400	747.300
22984	TEME	42824.120	0.0024284	15.5349	13.0147	348.4391	245.3320
D.116	**2001-014C**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (0.28)	2018-12-30	10:54:57	-717120.00	659.600	-58.900	1378.200
26738	TEME	42823.734	0.0170380	12.6974	35.3082	168.5802	326.1692
D.117	**1989-004F**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	20:19:22	-708480.00	651.400	553.300	749.500
19776	TEME	42815.568	0.0021830	15.4154	356.0450	49.6483	131.6880
D.118	**1991-087D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	08:58:42	-699840.00	644.200	571.800	716.600
21824	TEME	42808.238	0.0019349	15.7247	6.0412	354.1622	318.1819
D.119	**1992-082D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	17:06:28	-699840.00	642.600	602.700	682.500
22248	TEME	42806.774	0.0009929	15.6590	8.9627	8.7447	19.4571

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.120	**1993-013D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	10:44:46	-699840.00	645.600	575.600	715.600
22624	TEME	42809.907	0.0014533	15.6600	10.1990	39.6036	243.1180
D.121	**1999-010D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	08:51:42	-691200.00	636.500	546.400	726.600
25645	TEME	42800.491	0.0025162	15.0169	27.4194	276.0515	334.6429
D.122	**2000-046B**	**Nilesat 102**					**PL**
TLEs	EGO (-)	2018-12-30	22:34:55	-691200.00	637.200	622.900	651.500
26470	TEME	42801.885	0.0003175	2.8764	81.1217	238.8811	243.6734
D.123	**2004-042A**	**Fengyun 2C**					**PL**
TLEs	EGO (-)	2018-12-29	22:56:17	-682560.00	625.500	602.600	648.400
28451	TEME	42789.243	0.0007951	8.2110	47.3953	283.8322	343.7039
D.124	**1994-012D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	22:48:06	-673920.00	617.900	472.700	763.200
23013	TEME	42782.409	0.0032277	15.4613	12.8534	46.4630	289.4948
D.125	**1996-053D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	15:36:28	-673920.00	622.400	393.200	851.600
25339	TEME	42786.719	0.0056800	14.0425	24.0817	251.1048	227.5608
D.126	**1997-031A**	**Intelsat 802**					**PL**
TLEs	EGO (-)	2018-12-30	14:09:02	-673920.00	618.000	503.600	732.300
24846	TEME	42782.423	0.0031786	6.0509	59.9455	228.4673	282.0811
D.127	**1988-012A**	**Sakura 3A (CS 3A)**					**PL**
TLEs	EGO (-)	2018-12-30	17:06:19	-665280.00	610.000	573.100	647.000
18877	TEME	42774.137	0.0013279	15.5675	13.7854	281.0835	20.1196
D.128	**1971-039A**	**OPS 3811 (DSP F2, DSP 3, DSP Block 1(PHASE I) F2)**					**PL**
vimpel	EGO (-)	2018-12-31	21:20:22	-656640.00	604.800	514.300	695.300
146601	J2000	42768.800	0.0023670	6.4570	301.5950	318.2730	240.7521
D.129	**1983-088A**	**Raduga 13**					**PL**
TLEs	EGO (-)	2018-12-30	13:14:34	-656640.00	599.100	529.800	668.400
14307	TEME	42763.238	0.0019885	14.3657	336.1102	356.9872	209.5243
D.130	**1988-063B**	**Eutelsat I F-5 (ECS 5)**					**PL**
TLEs	EGO (-)	2018-12-30	09:48:36	-656640.00	601.600	551.900	651.200
19331	TEME	42765.837	0.0006443	15.6731	7.8758	55.7074	293.1719
D.131	**1969-069C**	**ATS 5 AKM (JPL SR-28-3)**					**PM**
TLEs	EGO (0.23)	2018-12-30	07:16:52	-648000.00	597.000	37.500	1156.600
21052	TEME	42761.301	0.0123183	7.4112	301.4384	229.4537	286.5887

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.132	**1982-019A**	**OPS 8701 (DSP F10, DSP 13, DSP Block 3(MOS/PIM) F10)**					**PL**
vimpel	EGO (-)	2018-12-31	19:33:14	-648000.00	595.500	569.400	621.600
146602	J2000	42759.000	0.0004570	14.3380	333.8120	301.6560	299.9257
D.133	**2000-049D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	12:29:17	-648000.00	594.100	528.100	660.100
26480	TEME	42758.083	0.0018778	12.6511	29.9627	309.7995	294.9082
D.134	**2000-052A**	**Eutelsat 4A (Eurobird 4A, Eutelsat W1)**					**PL**
TLEs	EGO (-)	2018-12-30	20:34:04	-648000.00	597.300	550.700	643.800
26487	TEME	42761.085	0.0017059	5.6997	64.9827	225.2606	182.6470
D.135	**1998-052A**	**Intelsat 7 (PAS 7)**					**PL**
TLEs	EGO (-)	2018-12-30	10:12:52	-639360.00	588.100	557.600	618.500
25473	TEME	42751.863	0.0006993	4.3859	71.5701	167.4658	179.3364
D.136	**2001-002A**	**Turksat 2A (Eurasiasat 1)**					**PL**
TLEs	EGO (-)	2018-12-30	18:10:21	-639360.00	589.100	541.300	636.900
26666	TEME	42753.878	0.0014198	2.3824	84.1622	233.8541	71.9702
D.137	**1989-101D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	19:35:16	-630720.00	577.400	533.400	621.400
20394	TEME	42741.477	0.0005995	15.4756	359.1106	182.5669	338.7692
D.138	**2000-013A**	**Ekspress 2A (Ekspress 6A)**					**PL**
TLEs	EGO (-)	2018-12-30	13:58:42	-630720.00	575.000	541.300	608.700
26098	TEME	42739.539	0.0010211	9.7166	40.3207	310.2470	103.2161
D.139	**1976-023F**	**Transtage 30 (Titan IIIC)**					**RB**
TLEs	EGO (0.28)	2018-12-30	10:17:23	-622080.00	573.300	-66.700	1213.300
8751	TEME	42737.370	0.0141296	15.9716	79.0966	16.8556	195.5193
D.140	**1976-023J**	**LES 8, LES 9 operational debris**					**PM**
TLEs	EGO (0.29)	2018-12-30	23:28:11	-622080.00	573.900	-80.500	1228.300
8832	TEME	42738.450	0.0143279	15.9719	79.1030	15.9371	104.6457
D.141	**1983-118A**	**Gorizont 8**					**PL**
TLEs	EGO (-)	2018-12-30	11:25:29	-622080.00	571.400	456.100	686.600
14532	TEME	42736.002	0.0023459	14.2772	337.4615	110.7508	72.7062
D.142	**1985-025A**	**Intelsat VA F-10**					**PL**
TLEs	EGO (-)	2018-12-30	17:57:31	-622080.00	566.700	430.700	702.600
15629	TEME	42730.955	0.0038128	15.5943	2.2664	308.5828	357.1482
D.143	**1991-001A**	**NATO IVA**					**PL**
TLEs	EGO (-)	2018-12-30	18:46:47	-622080.00	567.200	542.900	591.500
21047	TEME	42730.914	0.0004117	13.2532	12.4236	246.9207	169.0109

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.144	**1998-013A**	**Eutelsat 16B (Eurobird 16, Nilesat 103, Hot Bird 4)**					**PL**
TLEs	EGO (-)	2018-12-30	23:44:23	-622080.00	569.300	547.300	591.300
25237	TEME	42733.353	0.0010655	5.4437	64.1174	240.4584	125.4889
D.145	**1997-049B**	**Meteosat 7 (MTP)**					**PL**
TLEs	EGO (-)	2018-12-30	02:28:15	-613440.00	559.700	509.700	609.700
24932	TEME	42724.421	0.0012881	11.2626	32.8634	320.4838	257.3071
D.146	**2002-040A**	**Eutelsat 12 West A (Atlantic Bird 1)**					**PL**
TLEs	EGO (-)	2018-12-30	17:08:40	-613440.00	564.500	539.400	589.600
27508	TEME	42728.286	0.0006687	0.4834	89.0069	243.1681	3.7292
D.147	**1988-109B**	**Astra 1A**					**PL**
TLEs	EGO (-)	2018-12-30	17:13:04	-604800.00	551.800	485.800	617.700
19688	TEME	42715.695	0.0010946	13.3405	26.3157	31.1295	203.5856
D.148	**2002-043A**	**KALPANA-1 (METSAT-1)**					**PL**
TLEs	EGO (-)	2018-12-30	03:08:48	-604800.00	551.300	541.900	560.700
27525	TEME	42715.929	0.0001511	8.6065	51.3542	39.5046	265.5894
D.149	**2007-021A**	**Eutelsat 8 West D (Eutelsat 3A, Chinasat 5C, Zhongxing 5C)**					**PL**
TLEs	EGO (-)	2018-12-30	07:14:52	-604800.00	552.200	533.000	571.400
31577	TEME	42716.478	0.0005608	4.0438	57.1248	44.4875	209.5492
D.150	**1979-098B**	**OPS 9444 (DSCS II F-14, DSCS 2-14, DSCS II D-14)**					**PL**
TLEs	EGO (-)	2018-12-30	21:51:34	-596160.00	547.800	527.200	568.400
11622	TEME	42712.444	0.0007406	13.8416	330.4433	356.2449	93.0200
D.151	**1983-066A**	**Gorizont 7**					**PL**
TLEs	EGO (-)	2018-12-30	17:04:01	-596160.00	548.800	499.400	598.100
14160	TEME	42712.298	0.0014924	14.1791	335.8153	295.6029	171.5828
D.152	**1987-097A**	**USA 28 (DSP F13, DSP 5R, DSP Block 4(PHASE II UG) F13)**					**PL**
vimpel	EGO (-)	2018-12-31	22:05:16	-587520.00	538.500	432.700	644.300
146300	J2000	42702.500	0.0022830	14.3230	357.9070	222.7900	285.9083
D.153	**1990-095A**	**USA 65 (DSP F15, DSP 15, DSP Block 5(DSP-1) F15)**					**PL**
vimpel	EGO (-)	2018-12-31	19:18:59	-587520.00	535.600	514.500	556.700
146301	J2000	42698.300	0.0009110	15.4140	5.7420	347.1870	335.4280
D.154	**1996-067A**	**Eutelsat 48A (Eutelsat W48, Eurobird 9, Hot Bird 2)**					**PL**
TLEs	EGO (-)	2018-12-30	20:36:04	-587520.00	538.700	509.500	567.800
24665	TEME	42702.548	0.0001521	7.2904	52.0580	78.5249	190.0914
D.155	**2017-086B**	**Fregat-SB (Zenit-3F)**					**RB**
TLEs	EGO (0.25)	2018-12-30	11:53:58	-587520.00	536.400	77.100	995.800
43088	TEME	42701.029	0.0113455	0.8415	80.0861	331.6383	82.6232

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.156	**1982-097A**	**Intelsat V F-5**					**PL**
TLEs	EGO (-)	2018-12-30	23:08:31	-578880.00	531.200	436.300	626.200
13595	TEME	42695.868	0.0026685	15.1192	352.8940	330.2512	32.1339
D.157	**1984-081B**	**Telecom 1A**					**PL**
TLEs	EGO (-)	2018-12-30	23:31:19	-578880.00	533.400	384.600	682.300
15159	TEME	42698.904	0.0040521	15.4082	355.8049	335.2675	79.7953
D.158	**1978-113B**	**OPS 9442 (DSCS II F-12, DSCS 2-12, DSCS II C-12)**					**PL**
TLEs	EGO (-)	2018-12-30	18:35:59	-570240.00	521.600	493.200	550.000
11145	TEME	42685.540	0.0003799	13.7531	328.6755	49.8487	131.7010
D.159	**1990-056A**	**Intelsat VI F-4**					**PL**
TLEs	EGO (-)	2018-12-30	07:11:31	-570240.00	523.700	494.900	552.400
20667	TEME	42687.531	0.0011213	12.6796	29.9900	269.8257	330.6123
D.160	**1991-015B**	**Meteosat 5 (MOP 2)**					**PL**
TLEs	EGO (-)	2018-12-30	21:40:05	-570240.00	518.700	486.400	551.000
21140	TEME	42683.065	0.0010203	15.2535	11.6600	243.0444	112.2555
D.161	**1991-074A**	**Gorizont 24**					**PL**
TLEs	EGO (-)	2018-12-30	15:31:11	-570240.00	521.200	439.200	603.100
21759	TEME	42685.231	0.0018134	15.4681	5.2694	210.8158	208.0788
D.162	**1996-044B**	**Telecom 2D**					**PL**
TLEs	EGO (-)	2018-12-30	18:07:35	-570240.00	519.700	453.100	586.400
24209	TEME	42684.028	0.0020388	9.5284	41.7807	296.2052	32.8402
D.163	**1999-018A**	**Eutelsat 21A (Eutelsat W6, Eutelsat W3)**					**PL**
TLEs	EGO (-)	2018-12-30	20:00:54	-570240.00	525.000	508.100	541.800
25673	TEME	42689.744	0.0005592	4.6045	69.7727	259.4857	67.4289
D.164	**1986-082A**	**Raduga 19**					**PL**
TLEs	EGO (-)	2018-12-30	13:08:20	-561600.00	516.200	467.900	564.400
17046	TEME	42680.692	0.0006167	14.8016	347.1565	108.2476	239.5222
D.165	**1996-015A**	**Intelsat VIIA F-2**					**PL**
TLEs	EGO (-)	2018-12-30	09:22:46	-561600.00	510.000	226.400	793.600
23816	TEME	42674.204	0.0069622	4.6718	69.1524	287.2679	301.9464
D.166	**1998-057A**	**Eutelsat 4B (Eutelsat 25A, Badr 2, Arabsat 2D, Hot Bird 5)**					**PL**
TLEs	EGO (-)	2018-12-30	19:40:10	-561600.00	517.200	483.500	550.900
25495	TEME	42680.853	0.0008158	4.5775	69.6732	305.6312	354.9654
D.167	**2004-031A**	**Amazonas**					**PL**
TLEs	EGO (-)	2018-12-30	19:17:04	-561600.00	517.500	469.900	565.200
28393	TEME	42682.097	0.0008217	2.9611	81.1046	10.3206	274.8260

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.168	**1978-106A**	**NATO IIIC**					**PL**
TLEs	EGO (-)	2018-12-30	11:23:20	-552960.00	509.200	487.300	531.200
11115	TEME	42674.210	0.0008691	13.7862	337.2824	302.4671	64.7806
D.169	**1989-021B**	**TDRS 4**					**PL**
TLEs	EGO (-)	2018-12-30	15:30:49	-552960.00	509.500	438.800	580.300
19883	TEME	42673.763	0.0022603	13.0278	12.3342	264.6751	206.5768
D.170	**2002-039A**	**EchoStar 8**					**PL**
TLEs	EGO (-)	2018-12-30	19:04:49	-552960.00	502.000	470.000	534.000
27501	TEME	42666.024	0.0006422	2.2527	84.2976	307.3471	19.4027
D.171	**1982-020A**	**Gorizont 5**					**PL**
TLEs	EGO (-)	2018-12-30	11:19:57	-544320.00	495.600	350.900	640.200
13092	TEME	42660.072	0.0029778	13.9419	327.7924	181.9637	52.8836
D.172	**1991-015A**	**Astra 1B**					**PL**
TLEs	EGO (-)	2018-12-30	14:04:31	-544320.00	501.700	470.500	532.900
21139	TEME	42666.370	0.0013941	10.0610	40.0936	284.1588	266.1129
D.173	**1993-074A**	**USA 97 (DSCS III F8, DSCS 3-8, DSCS III B-10)**					**PL**
vimpel	EGO (-)	2018-12-24	14:42:51	-544320.00	495.800	461.400	530.100
143600	J2000	42659.700	0.0011620	11.3340	34.0690	292.1600	79.8769
D.174	**1993-076A**	**NATO IVB**					**PL**
TLEs	EGO (-)	2018-12-30	11:34:24	-544320.00	499.600	479.000	520.200
22921	TEME	42664.184	0.0006970	12.3803	17.9046	305.8556	103.4051
D.175	**1979-038A**	**OPS 6392 (FLTSATCOM F2)**					**PL**
TLEs	EGO (-)	2018-12-30	18:34:51	-535680.00	492.100	424.100	560.200
11353	TEME	42655.940	0.0020453	13.2817	327.5519	0.6246	127.6516
D.176	**1984-113C**	**LEASAT 1 (Syncom-4 1)**					**PL**
TLEs	EGO (-)	2018-12-30	13:07:06	-535680.00	491.900	366.800	617.000
15384	TEME	42656.637	0.0031128	13.7630	356.3831	242.5315	66.3264
D.177	**1990-001B**	**JCSAT 2**					**PL**
TLEs	EGO (-)	2018-12-30	22:53:15	-535680.00	493.700	230.400	757.100
20402	TEME	42657.822	0.0065613	13.7126	33.8505	256.5720	307.5982
D.178	**1975-011F**	**SMS 2 AKM (SVM-5)**					**PM**
TLEs	EGO (0.26)	2018-12-30	10:23:33	-527040.00	479.600	65.900	893.300
20835	TEME	42643.788	0.0095929	10.4351	308.1941	55.3403	216.4331
D.179	**1988-040A**	**Intelsat VA F-13 (NSS 513)**					**PL**
TLEs	EGO (-)	2018-12-30	02:13:20	-527040.00	482.900	427.100	538.600
19121	TEME	42647.864	0.0012435	15.4073	10.8049	10.4277	239.0000

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.180	**1990-097B**	**USA 67 (SDS 2 F2)(QUASAR 2)**					**PL**
vimpel	EGO (-)	2018-12-31	08:22:39	-527040.00	481.400	408.700	554.000
143617	J2000	42644.700	0.0013930	16.5060	358.3330	231.5170	132.5516
D.181	**1994-079A**	**Telstar 11 (Orion 1)**					**PL**
TLEs	EGO (-)	2018-12-30	17:42:34	-527040.00	481.100	403.000	559.200
23413	TEME	42645.766	0.0022995	11.1341	35.3694	304.4079	47.9502
D.182	**1974-033A**	**SMS 1**					**PL**
TLEs	EGO (-)	2018-12-30	08:51:58	-518400.00	472.200	401.000	543.500
7298	TEME	42636.892	0.0021766	10.8993	298.6030	352.8660	257.8922
D.183	**1981-073A**	**FLTSATCOM F5**					**PL**
TLEs	EGO (-)	2018-12-30	11:23:28	-518400.00	474.100	431.500	516.700
12635	TEME	42639.121	0.0006241	18.7856	338.4767	61.0351	65.2249
D.184	**1989-069A**	**USA 43 (DSCS II F-15, DSCS 2-15, DSCS II E-15)**					**PL**
vimpel	EGO (-)	2018-12-31	20:51:54	-518400.00	473.500	397.100	549.800
146000	J2000	42637.300	0.0014090	15.2570	358.2530	215.7640	304.6462
D.185	**1990-063A**	**TDF 2**					**PL**
TLEs	EGO (-)	2018-12-30	17:46:48	-518400.00	472.000	270.800	673.300
20705	TEME	42637.311	0.0051141	14.6741	20.1321	258.7004	50.6532
D.186	**1991-079D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	03:10:27	-518400.00	470.100	448.700	491.600
21792	TEME	42635.130	0.0006395	15.5340	4.9478	12.5886	245.0450
D.187	**2006-024A**	**USA 187 (MITEx OSC satellite)**					**PL**
vimpel	EGO (-)	2018-12-25	07:18:30	-518400.00	473.600	411.000	536.200
143304	J2000	42638.900	0.0016560	1.9540	79.6640	191.4990	235.7779
D.188	**1976-029A**	**RCA Satcom II**					**PL**
TLEs	EGO (-)	2018-12-30	15:20:11	-509760.00	468.900	221.600	716.300
8774	TEME	42632.765	0.0055040	14.0139	333.2113	170.0279	186.3949
D.189	**1980-049A**	**Gorizont 4**					**PL**
TLEs	EGO (-)	2018-12-30	22:35:32	-509760.00	467.400	450.100	484.700
11841	TEME	42632.019	0.0006753	13.1167	322.9190	323.3988	246.1129
D.190	**1982-020F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	18:36:36	-509760.00	465.400	347.900	582.800
13899	TEME	42629.235	0.0023223	13.9538	327.1709	130.8799	133.8607
D.191	**1984-041D**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	10:39:38	-509760.00	468.300	401.700	534.800
14943	TEME	42632.665	0.0010540	14.2155	337.9798	150.1984	273.1358

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.192	**1994-047A**	**DirecTV-2**					**PL**
TLEs	EGO (-)	2018-12-30	17:22:20	-509760.00	465.700	424.000	507.500
23192	TEME	42630.309	0.0014488	9.1604	43.8313	266.2263	39.9203
D.193	**1969-013H**	**Titan 3C fragmentation debris**					**RF**
vimpel	EGO (0.12)	2018-12-24	23:52:45	-501120.00	456.300	-774.500	1687.100
145915	J2000	42620.400	0.0270480	5.8190	294.1470	164.6000	202.1035
D.194	**1984-037A**	**OPS 7641 (DSP F11, DSP 12, DSP Block 3(MOS/PIM) F11)**					**PL**
vimpel	EGO (-)	2018-12-25	03:38:45	-501120.00	453.800	414.800	492.800
145900	J2000	42617.000	0.0006560	14.6830	339.7610	254.8420	191.0628
D.195	**1988-066D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	17:16:37	-501120.00	458.600	318.400	598.700
19347	TEME	42622.730	0.0030416	15.0867	353.5464	66.8984	24.8989
D.196	**1997-075A**	**JCSAT 5**					**PL**
TLEs	EGO (-)	2018-12-30	15:18:34	-501120.00	460.400	386.100	534.600
25067	TEME	42625.074	0.0015293	6.5336	55.9388	135.4719	247.8516
D.197	**2015-048B**	**Blok-DM-3 (Proton-M/DM-3)**					**RB**
TLEs	EGO (0.27)	2018-12-30	03:31:03	-501120.00	460.000	53.100	866.900
40896	TEME	42624.247	0.0091526	2.5778	83.3198	72.9128	291.6027
D.198	**1979-105E**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	14:30:16	-492480.00	451.700	380.400	523.100
11684	TEME	42615.147	0.0014960	12.9271	320.8266	242.2348	356.4329
D.199	**1987-078B**	**Eutelsat I F-4 (ECS 4)**					**PL**
TLEs	EGO (-)	2018-12-30	16:18:33	-492480.00	450.200	412.700	487.700
18351	TEME	42614.098	0.0015930	15.4428	4.0352	321.4641	12.6838
D.200	**1992-010B**	**INSAT 2DT (Arabsat 1C)**					**PL**
TLEs	EGO (-)	2018-12-30	19:40:33	-492480.00	451.400	336.500	566.300
21894	TEME	42615.188	0.0031812	12.2248	31.3803	221.2068	356.5605
D.201	**1994-055A**	**Optus B3**					**PL**
TLEs	EGO (-)	2018-12-30	12:35:12	-492480.00	447.900	419.700	476.200
23227	TEME	42611.976	0.0009014	8.2407	46.8076	284.7586	315.1743
D.202	**1981-057A**	**Meteosat 2**					**PL**
TLEs	EGO (-)	2018-12-30	19:27:52	-483840.00	440.000	309.500	570.600
12544	TEME	42604.013	0.0035979	14.4931	341.8984	313.0696	312.4254
D.203	**1989-048A**	**Raduga 1-1**					**PL**
TLEs	EGO (-)	2018-12-30	16:19:48	-483840.00	444.600	362.700	526.600
20083	TEME	42608.455	0.0016866	15.2215	356.9303	69.2007	17.4695

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.204	**1991-018A**	**Inmarsat-2 F2**					**PL**
TLEs	EGO (-)	2018-12-30	04:28:24	-483840.00	440.300	420.000	460.500
21149	TEME	42604.840	0.0007702	11.2134	25.1617	269.2592	277.7455
D.205	**1998-070A**	**Eutelsat 115 West A (SATMEX 5)**					**PL**
TLEs	EGO (-)	2018-12-30	11:58:09	-483840.00	441.000	426.000	456.000
25558	TEME	42604.483	0.0004800	4.3188	71.4618	261.8047	152.8325
D.206	**2014-043C**	**USA 255 (ANGELS)**					**PL**
vimpel	EGO (-)	2018-12-31	22:47:07	-483840.00	441.300	379.900	502.700
145503	J2000	42605.400	0.0015670	3.0630	75.1100	250.7990	352.5202
D.207	**1979-053A**	**OPS 7484 (DSP F8, DSP 11, DSP Block 3(MOS/PIM) F8)**					**PL**
vimpel	EGO (-)	2018-12-24	13:11:05	-475200.00	434.600	391.100	478.100
145801	J2000	42599.400	0.0008330	13.0360	324.0700	258.8930	32.8823
D.208	**1983-026B**	**TDRS 1**					**PL**
TLEs	EGO (-)	2018-12-30	12:59:19	-475200.00	434.300	341.800	526.800
13969	TEME	42598.810	0.0017334	12.9789	339.4212	211.5142	39.1321
D.209	**1995-027A**	**USA 111 (UFO F5)**					**PL**
vimpel	EGO (-)	2018-12-25	05:49:10	-475200.00	433.300	414.100	452.500
145800	J2000	42595.900	0.0008150	10.5000	24.1540	280.8980	202.6623
D.210	**1997-009A**	**Intelsat 801**					**PL**
TLEs	EGO (-)	2018-12-30	10:51:49	-475200.00	436.800	394.000	479.500
24742	TEME	42600.668	0.0013651	7.8067	50.1151	285.5714	315.1828
D.211	**1997-016A**	**Thaicom 3**					**PL**
TLEs	EGO (0.28)	2018-12-30	07:17:46	-475200.00	432.400	73.200	791.500
24768	TEME	42595.455	0.0086653	9.3977	42.7631	341.4423	346.4951
D.212	**1998-049A**	**ST-1**					**PL**
TLEs	EGO (-)	2018-12-30	19:04:49	-475200.00	433.300	408.200	458.500
25460	TEME	42597.195	0.0011129	5.5417	63.2031	221.0246	19.0178
D.213	**1999-050A**	**Ciel 1 (EchoStar 5)**					**PL**
TLEs	EGO (-)	2018-12-30	18:16:30	-475200.00	433.700	412.100	455.300
25913	TEME	42598.623	0.0009198	7.2547	53.0515	236.7326	63.7319
D.214	**1984-093B**	**SBS IV**					**PL**
TLEs	EGO (-)	2018-12-30	17:12:04	-466560.00	428.900	390.500	467.400
15235	TEME	42592.905	0.0009209	15.2356	3.3969	5.8149	199.6216
D.215	**1987-022F**	**GOES 7 AKM (Star 27)**					**PM**
TLEs	EGO (0.03)	2018-12-29	20:57:04	-466560.00	427.000	-4102.500	4956.400
28520	TEME	42591.660	0.1058352	14.4925	342.1802	15.4135	287.0774

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.216	**1989-070C**	**Himawari 4 (GMS 4) AKM (Star 27)**					**PM**
TLEs	EGO (0.13)	2018-12-30	17:54:16	-466560.00	428.600	-605.700	1463.000
20317	TEME	42592.501	0.0245873	14.8883	358.2356	351.1582	346.2147
D.217	**1995-057A**	**USA 114 (UFO F6)**					**PL**
vimpel	EGO (-)	2018-12-31	20:49:47	-466560.00	429.100	417.100	441.200
143604	J2000	42593.300	0.0000650	9.5710	26.8580	283.0710	333.5818
D.218	**2000-031A**	**Ekspress 3A**					**PL**
TLEs	EGO (-)	2018-12-30	17:25:00	-466560.00	427.700	405.200	450.300
26378	TEME	42592.105	0.0007965	7.9703	49.1438	201.4736	244.4808
D.219	**1983-081A**	**Sakura 2B (CS 2B)**					**PL**
TLEs	EGO (-)	2018-12-30	16:18:48	-457920.00	414.800	394.800	434.800
14248	TEME	42578.578	0.0008532	14.7938	346.7066	329.7440	14.3212
D.220	**1984-081A**	**Eutelsat I F-2 (ECS 2)**					**PL**
TLEs	EGO (-)	2018-12-30	17:05:54	-457920.00	419.100	379.600	458.600
15158	TEME	42582.747	0.0004478	15.2458	354.9405	185.4583	177.9858
D.221	**1986-007A**	**Raduga 18**					**PL**
TLEs	EGO (0.24)	2018-12-30	17:26:09	-457920.00	414.600	100.900	728.400
16497	TEME	42578.768	0.0068903	14.5593	343.5700	130.6741	28.4645
D.222	**1990-077A**	**Yuri 3A (BS 3A)**					**PL**
TLEs	EGO (-)	2018-12-30	01:27:36	-457920.00	415.200	367.700	462.800
20771	TEME	42580.037	0.0013601	15.1534	20.1335	235.0454	259.7935
D.223	**1991-060A**	**Yuri 3B (BS 3B)**					**PL**
TLEs	EGO (-)	2018-12-30	07:03:24	-457920.00	421.100	396.700	445.500
21668	TEME	42584.363	0.0001900	13.2578	15.6285	317.9968	171.1064
D.224	**1992-037A**	**USA 82 (DSCS III F6, DSCS 3-6, DSCS III B-12)**					**PL**
vimpel	EGO (-)	2018-12-25	00:59:08	-457920.00	416.000	377.900	454.100
143507	J2000	42580.029	0.0010676	12.3868	29.2410	323.5908	280.9608
D.225	**1995-025A**	**GOES 9**					**PL**
TLEs	EGO (-)	2018-12-30	22:02:30	-457920.00	418.100	397.200	439.000
23581	TEME	42582.035	0.0001967	11.5160	33.5902	272.8915	130.6324
D.226	**1995-055A**	**Astra 1E**					**PL**
TLEs	EGO (-)	2018-12-30	12:26:39	-457920.00	420.500	387.700	453.200
23686	TEME	42585.003	0.0010657	6.4239	57.5187	276.7548	285.5051
D.227	**2000-038A**	**Bermudasat 1 (EchoStar 6)**					**PL**
TLEs	EGO (-)	2018-12-30	23:45:08	-457920.00	421.000	407.300	434.800
26402	TEME	42585.079	0.0005993	5.2463	64.4008	228.6934	128.2390

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.228	**1971-006A**	**Intelsat IV F-2**					**PL**
TLEs	EGO (-)	2018-12-30	22:23:30	-449280.00	407.500	350.600	464.400
4881	TEME	42572.185	0.0017317	10.9332	310.1350	9.8788	100.3616
D.229	**1972-090A**	**Anik A1**					**PL**
TLEs	EGO (-)	2018-12-30	16:54:51	-449280.00	410.200	350.200	470.200
6278	TEME	42573.881	0.0009875	12.2699	320.2046	113.4311	139.3595
D.230	**1981-025A**	**OPS 7350 (DSP F9, DSP 10, DSP Block 3(MOS/PIM) F9)**					**PL**
vimpel	EGO (-)	2018-12-31	16:21:10	-449280.00	410.900	328.000	493.800
145700	J2000	42573.900	0.0015260	13.4300	329.8550	227.3890	344.1169
D.231	**1989-046A**	**USA 39 (DSP F14, DSP 14, DSP Block 5(DSP-1) F14)**					**PL**
vimpel	EGO (-)	2018-12-24	23:21:19	-449280.00	413.500	397.800	429.100
145701	J2000	42577.100	0.0005310	14.6880	2.3820	295.6800	278.2183
D.232	**1993-031A**	**Astra 1C**					**PL**
TLEs	EGO (-)	2018-12-30	14:07:39	-449280.00	406.600	388.200	424.900
22653	TEME	42571.207	0.0007524	9.2109	42.8354	270.6885	277.3011
D.233	**2001-020A**	**USA 158 (GeoLITE)**					**PL**
vimpel	EGO (-)	2018-12-31	17:11:02	-449280.00	407.800	331.900	483.700
145601	J2000	42573.100	0.0016590	7.2100	45.3190	36.6130	46.8801
D.234	**2004-001A**	**Estrela do Sul 1 (Telstar 14)**					**PL**
TLEs	EGO (-)	2018-12-30	18:21:17	-449280.00	409.100	387.900	430.400
28137	TEME	42574.089	0.0009632	5.6329	62.1137	247.1386	80.6508
D.235	**1981-050A**	**Intelsat V F-1**					**PL**
TLEs	EGO (-)	2018-12-30	19:29:37	-440640.00	402.500	377.800	427.300
12474	TEME	42566.967	0.0007042	14.6657	346.6551	276.5527	318.4466
D.236	**1983-058A**	**Eutelsat I F-1 (ECS 1)**					**PL**
TLEs	EGO (-)	2018-12-30	12:24:19	-440640.00	398.200	353.000	443.400
14128	TEME	42563.276	0.0004655	14.9663	351.6309	77.9547	66.6564
D.237	**1984-129A**	**USA 7 (DSP F12, DSP 6R, DSP Block 4(PHASE II UG) F12)**					**PL**
vimpel	EGO (-)	2018-12-25	00:16:46	-440640.00	402.900	386.700	419.200
145600	J2000	42567.500	0.0004940	15.4580	345.1960	301.0520	247.1319
D.238	**1994-065A**	**Solidaridad 2**					**PL**
TLEs	EGO (-)	2018-12-30	17:24:52	-440640.00	399.600	379.500	419.700
23313	TEME	42564.488	0.0008515	8.1190	48.1742	264.6730	244.2144
D.239	**2000-012A**	**Superbird 4**					**PL**
TLEs	EGO (-)	2018-12-30	11:58:48	-440640.00	403.800	343.700	463.800
26095	TEME	42567.180	0.0011423	1.6199	90.1264	99.4937	170.8377

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.240	**2006-024B**	**USA 188 (MITEx Lockheed satellite)**					**PL**
vimpel	EGO (-)	2018-12-31	23:21:08	-440640.00	400.800	366.500	435.200
145602	J2000	42565.300	0.0005130	6.9840	55.0370	88.8240	323.9197
D.241	**1980-098A**	**Intelsat V F-2**					**PL**
TLEs	EGO (-)	2018-12-30	17:10:18	-432000.00	392.800	341.100	444.600
12089	TEME	42556.267	0.0016881	14.7408	348.7872	271.9975	21.1872
D.242	**1990-093A**	**Inmarsat-2 F1**					**PL**
TLEs	EGO (-)	2018-12-30	14:09:23	-432000.00	396.300	365.300	427.300
20918	TEME	42561.121	0.0013472	11.7691	23.2416	292.8273	91.9968
D.243	**1997-059A**	**EchoStar 3**					**PL**
TLEs	EGO (-)	2018-12-30	03:09:00	-432000.00	397.000	358.400	435.600
25004	TEME	42561.618	0.0011913	3.3150	74.3297	259.8313	288.2726
D.244	**2003-043A**	**Eutelsat 31A (Eutelsat 33A, Eurobird 3, eBird 1)**					**PL**
TLEs	EGO (-)	2018-12-30	21:43:55	-432000.00	393.900	375.300	412.500
27948	TEME	42558.950	0.0005304	3.5126	75.9280	187.3971	66.1432
D.245	**1977-118A**	**Sakura 1 (CS 1)**					**PL**
TLEs	EGO (-)	2018-12-30	11:19:49	-423360.00	385.500	368.700	402.200
10516	TEME	42550.176	0.0005883	13.1985	324.3263	342.9760	52.4758
D.246	**1984-113B**	**Arabsat 1D**					**PL**
TLEs	EGO (-)	2018-12-30	16:17:17	-423360.00	387.600	273.100	502.000
15383	TEME	42551.238	0.0032048	15.2646	3.4603	316.2116	8.3563
D.247	**1987-078A**	**Optus A3**					**PL**
TLEs	EGO (-)	2018-12-30	18:46:32	-423360.00	387.700	359.800	415.600
18350	TEME	42551.129	0.0011212	14.8340	12.6660	306.7856	167.9715
D.248	**1987-095A**	**TV-Sat 1**					**PL**
TLEs	EGO (0.22)	2018-12-30	23:18:06	-423360.00	384.300	130.700	637.900
18570	TEME	42548.622	0.0056769	14.6073	349.4213	57.8570	39.1181
D.249	**1991-046A**	**Gorizont 23**					**PL**
TLEs	EGO (-)	2018-12-30	14:46:05	-423360.00	387.200	360.100	414.400
21533	TEME	42551.848	0.0010509	15.4204	3.5705	285.2045	51.1911
D.250	**1994-022A**	**GOES 8**					**PL**
TLEs	EGO (-)	2018-12-30	13:19:17	-423360.00	388.000	362.100	413.900
23051	TEME	42552.509	0.0009498	12.0242	33.8796	270.8740	108.9644
D.251	**2000-069A**	**Beidou**					**PL**
TLEs	EGO (-)	2018-12-30	12:26:09	-423360.00	386.900	330.900	442.900
26599	TEME	42551.698	0.0012970	8.0023	49.5567	288.1431	283.6847

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.252	**2005-006A**	**Himawari 6 (MTSAT 1R)**					**PL**
TLEs	EGO (-)	2018-12-30	21:46:10	-423360.00	385.600	311.200	460.000
28622	TEME	42550.742	0.0019743	2.9908	80.4676	228.5884	73.9981
D.253	**2014-043D**	**Delta IV DCSS 4 (Delta 4M+(4,2))**					**RB**
vimpel	EGO (-)	2018-12-25	01:43:07	-423360.00	386.500	334.700	438.300
145504	J2000	42550.700	0.0013630	3.0170	75.2890	239.9120	315.4783
D.254	**1991-003B**	**Eutelsat II F-2**					**PL**
TLEs	EGO (-)	2018-12-30	15:35:20	-414720.00	378.000	354.000	402.000
21056	TEME	42542.429	0.0001959	13.9688	22.9078	295.7489	222.2328
D.255	**1991-084A**	**Telecom 2A**					**PL**
TLEs	EGO (-)	2018-12-30	23:42:45	-414720.00	374.900	356.200	393.500
21813	TEME	42539.101	0.0007081	13.0977	26.9951	262.1139	120.2106
D.256	**1994-034A**	**Intelsat VII F-2**					**PL**
TLEs	EGO (-)	2018-12-30	23:14:10	-414720.00	378.300	357.100	399.500
23124	TEME	42541.870	0.0007077	5.5875	62.5319	297.8600	334.5124
D.257	**1995-073A**	**EchoStar 1**					**PL**
TLEs	EGO (-)	2018-12-30	19:38:40	-414720.00	380.200	368.000	392.300
23754	TEME	42543.738	0.0004233	2.0244	87.1595	219.0162	349.9549
D.258	**1998-028A**	**EchoStar 4**					**PL**
TLEs	EGO (-)	2018-12-30	14:10:17	-414720.00	375.000	321.700	428.200
25331	TEME	42539.754	0.0017390	7.6228	45.7553	237.9262	286.3900
D.259	**1995-013A**	**Intelsat VII F-5**					**PL**
TLEs	EGO (-)	2018-12-30	18:22:19	-406080.00	368.400	293.600	443.300
23528	TEME	42532.775	0.0013506	6.8656	54.7123	21.5548	113.8887
D.260	**1997-025A**	**Thor II**					**PL**
TLEs	EGO (-)	2018-12-30	17:25:00	-406080.00	368.900	347.900	389.900
24808	TEME	42533.712	0.0008962	7.6924	48.9366	258.4972	244.5705
D.261	**1999-056A**	**DirecTV 1R**					**PL**
TLEs	EGO (-)	2018-12-30	12:29:17	-406080.00	372.200	348.600	395.800
25937	TEME	42536.550	0.0007973	4.9068	67.0378	214.2645	294.6111
D.262	**2000-019A**	**Eutelsat 16C (SESAT 1)**					**PL**
TLEs	EGO (-)	2018-12-30	17:24:30	-406080.00	373.900	359.600	388.200
26243	TEME	42538.652	0.0002526	5.3243	63.7931	159.2942	242.5980
D.263	**1985-092B**	**USA 11 (DSCS III F2, DSCS 3-2, DSCS III B-4)**					**PL**
vimpel	EGO (-)	2018-12-24	07:35:32	-397440.00	364.400	345.100	383.800
145400	J2000	42526.400	0.0005740	15.3700	8.6290	346.4800	161.5585

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.264	**1989-087A**	**Intelsat VI F-2**					**PL**
TLEs	EGO (-)	2018-12-30	12:25:31	-397440.00	359.000	337.700	380.400
20315	TEME	42523.640	0.0003563	12.7069	27.5176	238.5146	281.3571
D.265	**1990-001A**	**Skynet 4A**					**PL**
TLEs	EGO (-)	2018-12-30	09:19:12	-397440.00	361.700	305.100	418.200
20401	TEME	42525.790	0.0017394	13.3793	7.7468	264.2968	299.9366
D.266	**1990-091A**	**SBS VI**					**PL**
TLEs	EGO (-)	2018-12-30	17:25:08	-397440.00	363.100	332.700	393.400
20872	TEME	42527.911	0.0001382	8.6473	46.2338	34.1791	246.0213
D.267	**1993-073B**	**Meteosat 6 (MOP 3)**					**PL**
TLEs	EGO (-)	2018-12-30	10:50:41	-397440.00	365.500	340.300	390.600
22912	TEME	42529.484	0.0005821	13.6475	21.8708	233.0428	311.4407
D.268	**1993-078A**	**DirecTV 1**					**PL**
TLEs	EGO (-)	2018-12-30	13:25:42	-397440.00	364.900	323.200	406.600
22930	TEME	42528.756	0.0007207	7.6242	50.9761	166.9880	131.3125
D.269	**1995-029A**	**DirecTV 3**					**PL**
TLEs	EGO (-)	2018-12-30	12:34:05	-397440.00	360.400	339.800	381.000
23598	TEME	42524.165	0.0007010	7.3841	52.2695	293.3456	124.7779
D.270	**1996-030A**	**Palapa C2**					**PL**
TLEs	EGO (-)	2018-12-30	13:26:27	-397440.00	360.200	343.000	377.300
23864	TEME	42523.905	0.0000964	6.7404	55.6884	8.0973	133.9726
D.271	**1998-033A**	**Apstar 9A**					**PL**
TLEs	EGO (-)	2018-12-13	15:56:32	-397440.00	362.800	351.900	373.600
25354	TEME	42526.453	0.0004915	2.4127	84.1073	195.6003	6.9027
D.272	**1998-063A**	**AfriStar 1**					**PL**
TLEs	EGO (-)	2018-12-30	22:08:47	-397440.00	358.800	338.300	379.200
25515	TEME	42522.138	0.0006480	4.4245	66.7611	237.7831	153.2982
D.273	**1999-005A**	**Galaxy 26 (Intelsat Americas 6, IA 6, Telstar 6)**					**PL**
TLEs	EGO (-)	2018-12-30	20:37:50	-397440.00	361.600	343.800	379.400
25626	TEME	42525.383	0.0004179	5.9036	69.1341	213.1189	195.9727
D.274	**2000-066A**	**Thuraya 1**					**PL**
TLEs	EGO (-)	2018-12-30	17:18:43	-397440.00	364.800	335.900	393.700
26578	TEME	42529.378	0.0012795	7.3044	26.4705	285.6080	222.5717
D.275	**2001-018A**	**XM Radio 1 (Roll)**					**PL**
TLEs	EGO (-)	2018-12-30	19:18:04	-397440.00	358.900	330.600	387.200
26761	TEME	42523.523	0.0010045	2.2987	85.5299	208.7534	278.2940

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.276	**2006-059A**	**Kiku 8 (ETS VIII)**					**PL**
TLEs	EGO (-)	2018-12-30	19:28:14	-397440.00	359.100	329.200	388.900
29656	TEME	42523.010	0.0010239	6.5762	56.2614	229.1316	24.9230
D.277	**2016-052C**	**Delta IV DCSS 4 (Delta 4M+(4,2))**					**RB**
vimpel	EGO (-)	2018-12-25	04:02:12	-397440.00	363.900	329.300	398.400
145411	J2000	42528.400	0.0009090	2.5640	71.5950	256.7780	276.7182
D.278	**1991-037A**	**Aurora II**					**PL**
TLEs	EGO (-)	2018-12-30	14:05:16	-388800.00	356.600	332.700	380.500
21392	TEME	42521.208	0.0009112	13.3286	26.0891	254.4175	269.1255
D.279	**1992-006A**	**USA 78 (DSCS III F5, DSCS 3-5, DSCS III B-14)**					**PL**
vimpel	EGO (-)	2018-12-25	00:49:12	-388800.00	350.500	321.600	379.400
145300	J2000	42513.400	0.0010700	13.8200	24.0950	278.6010	277.9003
D.280	**1992-057A**	**Satcom C-4**					**PL**
TLEs	EGO (-)	2018-12-30	10:02:01	-388800.00	356.000	339.700	372.300
22096	TEME	42519.380	0.0007331	11.1185	35.0626	261.8383	145.7504
D.281	**1997-011A**	**Tempo 2**					**PL**
TLEs	EGO (-)	2018-12-30	17:18:43	-388800.00	351.800	228.900	474.800
24748	TEME	42516.626	0.0034710	9.7831	40.5886	252.2261	222.3021
D.282	**1998-056B**	**Sirius 3**					**PL**
TLEs	EGO (-)	2018-12-30	22:18:34	-388800.00	350.900	338.600	363.100
25492	TEME	42514.394	0.0005086	7.3002	50.2630	279.1965	336.2513
D.283	**1999-052A**	**Galaxy 27 (Intelsat Americas 7, IA 7, Telstar 7)**					**PL**
TLEs	EGO (-)	2018-12-30	21:00:36	-388800.00	355.500	330.300	380.700
25922	TEME	42519.291	0.0007025	4.3075	70.2020	268.7630	15.5887
D.284	**2003-024A**	**AMC 9 (GE 12)**					**PL**
TLEs	EGO (-)	2018-12-30	23:45:00	-388800.00	351.900	281.500	422.300
27820	TEME	42515.938	0.0018445	1.2400	90.0735	250.2479	127.8567
D.285	**1984-005A**	**Yuri 2A (BS 2A)**					**PL**
TLEs	EGO (-)	2018-12-30	17:49:52	-380160.00	346.000	291.900	400.000
14659	TEME	42509.844	0.0010711	14.7270	346.9416	207.1598	330.5763
D.286	**1992-010A**	**Superbird B1**					**PL**
TLEs	EGO (-)	2018-12-30	21:06:25	-380160.00	345.200	286.100	404.300
21893	TEME	42508.735	0.0009634	13.0810	26.8936	37.4313	331.0369
D.287	**1993-046A**	**USA 93 (DSCS III F7, DSCS 3-7, DSCS III B-9)**					**PL**
vimpel	EGO (-)	2018-12-24	23:14:57	-380160.00	347.500	333.800	361.100
145301	J2000	42509.600	0.0004450	11.5770	33.5470	297.0280	310.9793

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.288	**1994-049B**	**Turksat 1B**					**PL**
TLEs	EGO (-)	2018-12-30	20:34:04	-380160.00	347.400	278.900	415.900
23200	TEME	42510.860	0.0012786	11.0385	35.3052	21.9374	183.1125
D.289	**1995-023A**	**Intelsat VIIA F-1**					**PL**
TLEs	EGO (-)	2018-12-30	20:51:27	-380160.00	346.000	333.800	358.200
23571	TEME	42511.185	0.0003227	5.5069	62.2618	241.7740	74.9578
D.290	**1996-002B**	**MEASAT 1**					**PL**
TLEs	EGO (-)	2018-12-30	19:49:21	-380160.00	342.900	321.100	364.700
23765	TEME	42507.055	0.0008985	8.4133	46.2195	263.9849	27.2855
D.291	**1998-068A**	**Bonum 1**					**PL**
TLEs	EGO (-)	2018-12-30	02:14:29	-380160.00	350.000	332.600	367.400
25546	TEME	42514.424	0.0006839	5.2937	64.6077	263.1723	292.3633
D.292	**2000-022A**	**GOES 11**					**PL**
TLEs	EGO (-)	2018-12-30	21:11:03	-380160.00	348.700	327.700	369.600
26352	TEME	42512.214	0.0006678	6.0830	69.0876	203.8055	3.5371
D.293	**2005-010A**	**Ekspress-AM 2**					**PL**
TLEs	EGO (-)	2018-12-30	19:34:24	-380160.00	349.200	267.300	431.000
28629	TEME	42512.777	0.0017801	3.5171	75.0932	33.5816	334.7908
D.294	**1989-004A**	**Gorizont 17**					**PL**
TLEs	EGO (-)	2018-12-30	15:38:18	-371520.00	342.000	254.600	429.500
19765	TEME	42505.627	0.0016337	14.9794	355.0554	89.5997	191.1201
D.295	**1992-041B**	**Eutelsat II F-4**					**PL**
TLEs	EGO (-)	2018-12-30	10:47:40	-371520.00	338.500	308.400	368.500
22028	TEME	42502.784	0.0008993	13.3381	26.3888	239.2049	301.9011
D.296	**1996-002A**	**Intelsat 3R (PAS 3R)**					**PL**
TLEs	EGO (-)	2018-12-30	22:08:47	-371520.00	335.800	277.600	394.100
23764	TEME	42498.904	0.0020031	7.0015	53.6277	221.1058	152.6967
D.297	**1997-036A**	**Superbird C**					**PL**
TLEs	EGO (-)	2018-12-30	01:04:11	-371520.00	340.300	307.200	373.400
24880	TEME	42504.551	0.0012510	7.5924	50.7951	277.6321	296.2595
D.298	**1998-014A**	**NSS 806 (Intelsat 806)**					**PL**
TLEs	EGO (-)	2018-12-30	19:21:12	-371520.00	338.500	322.000	355.000
25239	TEME	42503.056	0.0003746	0.3361	109.2329	167.5502	289.2838
D.299	**2001-012A**	**XM Radio 2 (Rock)**					**PL**
TLEs	EGO (-)	2018-12-30	05:51:56	-371520.00	337.400	316.300	358.500
26724	TEME	42502.248	0.0002000	3.3155	77.2397	300.1732	250.3255

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.300	**2007-063A**	**Rascom-QAF 1**					**PL**
TLEs	EGO (-)	2018-12-30	17:21:52	-371520.00	341.900	302.400	381.400
32387	TEME	42506.721	0.0004891	6.1920	59.2666	339.0475	233.4965
D.301	**1985-087A**	**Intelsat VA F-12**					**PL**
TLEs	EGO (-)	2018-12-30	17:13:50	-362880.00	328.200	297.300	359.100
16101	TEME	42492.783	0.0013141	15.4634	6.1335	273.3788	36.9557
D.302	**1989-006A**	**Intelsat VA F-15**					**PL**
TLEs	EGO (-)	2018-12-30	17:25:14	-362880.00	330.700	239.100	422.300
19772	TEME	42495.042	0.0018451	14.9092	16.2979	34.3390	28.7546
D.303	**1989-069B**	**USA 44 (DSCS III F4, DSCS 3-4, DSCS III A-2)**					**PL**
vimpel	EGO (-)	2018-12-25	08:40:10	-362880.00	327.800	291.200	364.400
145200	J2000	42489.300	0.0015620	13.5480	25.2770	308.2780	161.0183
D.304	**1992-084A**	**Superbird A1**					**PL**
TLEs	EGO (-)	2018-12-30	18:02:42	-362880.00	326.800	264.300	389.400
22253	TEME	42491.641	0.0008134	9.3613	38.6027	118.2972	55.4601
D.305	**1997-016B**	**BSAT 1a**					**PL**
TLEs	EGO (-)	2018-12-30	10:53:12	-362880.00	326.400	308.600	344.100
24769	TEME	42490.153	0.0008065	6.0649	57.0203	234.1017	319.9334
D.306	**1998-024B**	**BSAT 1b**					**PL**
TLEs	EGO (-)	2018-12-30	12:46:52	-362880.00	326.700	305.400	348.000
25312	TEME	42490.385	0.0007815	5.9802	64.6028	217.1685	133.8467
D.307	**2003-052A**	**Chinasat 20 (Zhongxing 20, ZX 20, Shentong 1-1)**					**PL**
TLEs	EGO (-)	2018-12-30	03:30:23	-362880.00	328.900	321.100	336.800
28082	TEME	42493.950	0.0001385	4.6175	68.7987	251.4708	277.4870
D.308	**2009-007B**	**Ekspress MD-1**					**PL**
TLEs	EGO (-)	2018-12-30	20:36:04	-362880.00	329.000	292.000	365.900
33596	TEME	42492.446	0.0013135	4.1325	72.7357	263.2586	189.9443
D.309	**1973-058A**	**Intelsat IV F-7**					**PL**
TLEs	EGO (-)	2018-12-30	16:59:45	-354240.00	319.300	294.500	344.100
6796	TEME	42482.422	0.0001563	13.0532	324.1284	56.7549	156.8221
D.310	**1978-044A**	**OTS 2**					**PL**
TLEs	EGO (-)	2018-12-30	21:49:11	-354240.00	320.900	288.700	353.100
10855	TEME	42486.146	0.0012634	13.4202	329.1975	305.1381	84.2216
D.311	**1983-059B**	**Anik C2**					**PL**
TLEs	EGO (0.19)	2018-12-30	02:45:57	-354240.00	325.700	171.000	480.400
14133	TEME	42490.156	0.0035583	15.2432	358.3362	41.9717	218.3521

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.312	**1990-100B**	**GStar 4**					**PL**
TLEs	EGO (-)	2018-12-30	17:09:31	-354240.00	319.800	279.900	359.800
20946	TEME	42484.164	0.0012030	12.3382	30.0994	280.1876	34.8048
D.313	**1991-026A**	**Anik E2**					**PL**
TLEs	EGO (-)	2018-12-30	19:43:41	-354240.00	324.000	295.600	352.400
21222	TEME	42487.336	0.0010658	11.8745	31.9582	292.4361	7.6648
D.314	**1995-043A**	**JCSAT 3**					**PL**
TLEs	EGO (-)	2018-12-30	03:12:48	-354240.00	318.400	256.700	380.200
23649	TEME	42483.624	0.0013968	10.2626	34.4003	341.6425	247.6704
D.315	**1995-044A**	**N-Star 1**					**PL**
TLEs	EGO (-)	2018-12-30	14:05:16	-354240.00	324.200	272.100	376.300
23651	TEME	42489.063	0.0022200	10.0206	39.3166	299.8370	268.9063
D.316	**1997-019A**	**GOES 10**					**PL**
TLEs	EGO (-)	2018-12-30	11:14:28	-354240.00	325.800	207.100	444.500
24786	TEME	42489.281	0.0028473	9.9814	38.8017	183.4957	131.3164
D.317	**2001-031A**	**GOES 12**					**PL**
TLEs	EGO (-)	2018-12-30	18:56:58	-354240.00	321.400	286.000	356.800
26871	TEME	42485.492	0.0011338	7.3146	56.1441	244.1290	204.5812
D.318	**1970-003A**	**Intelsat III F-6**					**PL**
TLEs	EGO (-)	2018-12-30	17:48:22	-345600.00	316.000	269.900	362.000
4297	TEME	42479.536	0.0015564	5.7551	296.6587	9.3955	325.9217
D.319	**1983-047A**	**Intelsat V F-6**					**PL**
TLEs	EGO (0.25)	2018-12-30	17:56:02	-345600.00	314.300	192.500	436.000
14077	TEME	42477.984	0.0043016	15.1123	355.6833	277.6282	352.5902
D.320	**1991-067A**	**Anik E1**					**PL**
TLEs	EGO (-)	2018-12-30	17:18:21	-345600.00	311.700	278.300	345.200
21726	TEME	42475.194	0.0016845	11.8850	32.2940	258.1150	221.5412
D.321	**1994-040B**	**BS-3N**					**PL**
TLEs	EGO (-)	2018-12-30	11:04:56	-345600.00	317.600	299.800	335.400
23176	TEME	42481.285	0.0008552	10.3317	38.2919	293.2326	133.2003
D.322	**1998-002A**	**Skynet 4D**					**PL**
TLEs	EGO (-)	2018-12-30	13:01:27	-345600.00	316.900	293.700	340.100
25134	TEME	42482.160	0.0000584	11.0139	27.1239	320.0438	85.2959
D.323	**1998-075A**	**Intelsat 6B (PAS 6B)**					**PL**
TLEs	EGO (-)	2018-12-30	15:48:39	-345600.00	317.000	241.100	392.900
25585	TEME	42481.911	0.0011595	8.1590	47.8822	115.8246	269.0679

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.324	**2007-003A**	**Beidou 2A**					**PL**
TLEs	EGO (0.36)	2018-12-30	15:38:01	-345600.00	317.300	60.600	574.000
30323	TEME	42481.534	0.0065414	3.5576	80.8473	202.3502	107.0150
D.325	**1978-068A**	**Comstar 1C (D-3)**					**PL**
TLEs	EGO (-)	2018-12-30	11:39:47	-336960.00	304.300	216.900	391.800
10975	TEME	42469.268	0.0022738	14.0852	338.3386	263.0421	244.5890
D.326	**1988-098A**	**TDF 1**					**PL**
TLEs	EGO (-)	2018-12-30	20:08:27	-336960.00	305.000	265.500	344.600
19621	TEME	42468.400	0.0010395	15.2240	12.7217	229.3837	156.9296
D.327	**1989-027A**	**Tele-X**					**PL**
TLEs	EGO (-)	2018-12-30	11:07:46	-336960.00	308.900	284.300	333.500
19919	TEME	42473.896	0.0004512	15.1222	14.7133	257.0255	215.0404
D.328	**1989-067A**	**Sirius 1 (Marcopolo 1)**					**PL**
TLEs	EGO (-)	2018-12-30	18:02:03	-336960.00	307.500	278.400	336.700
20193	TEME	42471.309	0.0010945	14.0598	21.8490	312.0890	13.5661
D.329	**1990-100A**	**Satcom C-1**					**PL**
TLEs	EGO (-)	2018-12-30	20:30:18	-336960.00	308.300	275.300	341.200
20945	TEME	42471.393	0.0015525	10.9671	33.5479	311.4529	169.6669
D.330	**1991-080B**	**USA 75 (DSP F16, DSP 16, DSP Block 5(DSP-1) F16)**					**PL**
vimpel	EGO (-)	2018-12-25	03:20:11	-336960.00	304.500	286.400	322.600
143502	J2000	42468.100	0.0006310	15.1920	7.6770	339.2320	223.6331
D.331	**1993-078B**	**Thaicom 1**					**PL**
TLEs	EGO (-)	2018-12-30	14:07:39	-336960.00	308.500	285.700	331.400
22931	TEME	42473.371	0.0005576	7.3586	51.6194	204.9669	277.1717
D.332	**1994-040A**	**Intelsat 2 (PAS 2)**					**PL**
TLEs	EGO (-)	2018-12-30	16:34:07	-336960.00	305.500	282.500	328.500
23175	TEME	42470.835	0.0006279	7.6377	52.5620	281.0515	67.3847
D.333	**1995-001A**	**Intelsat VII F-4**					**PL**
TLEs	EGO (-)	2018-12-30	23:00:40	-336960.00	309.100	290.400	327.800
23461	TEME	42472.577	0.0001765	7.2143	52.6027	247.5512	333.1749
D.334	**1996-035A**	**Intelsat VII F-6**					**PL**
TLEs	EGO (-)	2018-12-30	18:55:20	-336960.00	309.300	257.900	360.700
23915	TEME	42473.177	0.0016320	5.0519	66.1971	197.5243	198.9276
D.335	**1996-039A**	**Chinasat 5D (Zhongxing 5D, ZX 5D, APStar 1A)**					**PL**
TLEs	EGO (0.10)	2018-12-30	14:09:55	-336960.00	306.100	209.100	403.200
23943	TEME	42470.807	0.0026428	9.7245	36.2577	281.1132	285.2842

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.336	**1998-044A**	**PSN 5 (Chinasat 5B, Zhongxing 5B, ZX 5B, Intelsat APR-1)**					**PL**
TLEs	EGO (-)	2018-12-30	20:34:34	-336960.00	309.200	266.900	351.500
25404	TEME	42470.760	0.0012326	5.4690	63.2362	199.1143	184.3215
D.337	**2000-007A**	**Hispasat 1C**					**PL**
TLEs	EGO (-)	2018-12-30	17:14:34	-336960.00	302.800	281.000	324.600
26071	TEME	42467.044	0.0007417	1.7887	87.9710	190.1956	208.1731
D.338	**2001-011B**	**BSAT 2a**					**PL**
TLEs	EGO (-)	2018-12-30	13:16:03	-336960.00	310.100	286.900	333.300
26720	TEME	42474.223	0.0007229	5.0630	65.8978	202.1063	210.2508
D.339	**2003-028A**	**BSAT 2c**					**PL**
TLEs	EGO (-)	2018-12-30	23:13:29	-336960.00	303.500	273.700	333.300
27830	TEME	42467.300	0.0010566	4.1929	71.4763	230.2637	18.1345
D.340	**2004-043A**	**Ekspress-AM 1**					**PL**
TLEs	EGO (-)	2018-12-30	21:26:04	-336960.00	304.900	262.000	347.700
28463	TEME	42468.800	0.0012947	6.4198	57.1228	204.7851	356.2393
D.341	**1976-017A**	**Marisat 1**					**PL**
TLEs	EGO (-)	2018-12-30	23:17:17	-328320.00	301.800	254.300	349.300
8697	TEME	42465.895	0.0006740	11.8063	320.7023	121.3803	28.0184
D.342	**1980-074A**	**GOES 4**					**PL**
TLEs	EGO (0.28)	2018-12-30	23:19:20	-328320.00	295.100	156.000	434.200
11964	TEME	42460.073	0.0035020	13.4453	328.6882	25.3340	55.7562
D.343	**1982-017A**	**Intelsat V F-4**					**PL**
TLEs	EGO (-)	2018-12-30	19:32:38	-328320.00	295.700	156.600	434.700
13083	TEME	42459.624	0.0019125	14.7269	349.5820	201.0301	329.1492
D.344	**1982-058A**	**Westar V**					**PL**
TLEs	EGO (-)	2018-12-30	10:41:38	-328320.00	299.300	230.500	368.100
13269	TEME	42464.059	0.0016128	15.3276	359.5178	225.8460	279.7097
D.345	**1988-086A**	**Sakura 3B (CS 3B)**					**PL**
TLEs	EGO (-)	2018-12-30	21:53:00	-328320.00	296.700	273.900	319.500
19508	TEME	42461.515	0.0009910	14.9557	15.9563	286.9768	103.4219
D.346	**1990-074A**	**Thor I (Marcopolo 2)**					**PL**
TLEs	EGO (-)	2018-12-30	19:41:33	-328320.00	300.900	283.600	318.100
20762	TEME	42464.423	0.0006508	13.0297	27.3557	256.4593	0.1120
D.347	**1992-054A**	**Optus B1**					**PL**
TLEs	EGO (-)	2018-12-30	19:47:50	-328320.00	302.100	264.100	340.100
22087	TEME	42466.202	0.0003644	9.4534	41.7980	19.2147	21.8170

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.348	**1994-013A**	**Galaxy IR-A**					**PL**
TLEs	EGO (-)	2018-12-30	08:54:22	-328320.00	297.400	282.800	312.000
23016	TEME	42460.566	0.0006937	9.6429	39.8476	264.5951	167.4811
D.349	**1996-040A**	**Arabsat 2A**					**PL**
TLEs	EGO (-)	2018-12-30	18:55:20	-328320.00	295.300	267.500	323.100
23948	TEME	42459.272	0.0004299	12.4524	29.0712	296.6557	199.4198
D.350	**1997-062A**	**Apstar 2R (Telstar 10)**					**PL**
TLEs	EGO (-)	2018-12-30	16:06:11	-328320.00	300.800	253.700	348.000
25010	TEME	42465.326	0.0016536	5.0303	66.3706	224.2971	109.2347
D.351	**1998-006A**	**Brazilsat B3**					**PL**
TLEs	EGO (-)	2018-12-30	14:31:44	-328320.00	298.600	288.500	308.800
25152	TEME	42463.202	0.0004477	5.1124	66.5553	239.8208	109.4769
D.352	**1968-063A**	**OPS 2222 (CANYON 1)**					**PL**
vimpel	EGO (0.03)	2018-12-25	01:50:25	-319680.00	291.000	-3704.600	4286.500
145001	J2000	42455.700	0.0949710	12.4470	315.9660	153.3250	194.4253
D.353	**1977-065A**	**Himawari 1 (GMS 1)**					**PL**
TLEs	EGO (-)	2018-12-30	22:33:01	-319680.00	289.600	213.800	365.400
10143	TEME	42454.747	0.0012825	12.5464	320.8092	174.8600	63.0742
D.354	**1990-030A**	**AsiaSat 1**					**PL**
TLEs	EGO (-)	2018-12-30	13:59:07	-319680.00	291.300	275.300	307.400
20558	TEME	42456.398	0.0007849	14.3108	20.8437	285.4844	247.3268
D.355	**1990-095D**	**IUS second stage (IUS-6 SRM-2, Orbus 6E) (Titan IVA IUS)**					**RB**
vimpel	EGO (-)	2018-12-24	09:54:05	-319680.00	288.900	260.000	317.800
145000	J2000	42451.500	0.0011310	15.4380	4.7670	324.3820	122.9642
D.356	**1992-043A**	**Gorizont 26**					**PL**
TLEs	EGO (0.26)	2018-12-30	20:24:54	-319680.00	291.400	155.500	427.400
22041	TEME	42454.764	0.0031791	15.0930	6.6447	211.6401	141.6696
D.357	**1993-015A**	**USA 98 (UFO F1)**					**PL**
TLEs	EGO (-)	2018-12-30	23:26:42	-319680.00	288.800	261.300	316.300
22563	TEME	42453.588	0.0007623	19.5396	118.6632	172.6632	103.7839
D.358	**1994-049A**	**Brazilsat B1**					**PL**
TLEs	EGO (-)	2018-12-30	06:19:27	-319680.00	289.700	266.900	312.500
23199	TEME	42454.280	0.0003691	8.9498	44.1363	216.7622	221.3351
D.359	**1995-016A**	**Brazilsat B2**					**PL**
TLEs	EGO (-)	2018-12-30	12:35:49	-319680.00	292.600	275.900	309.400
23536	TEME	42456.451	0.0005527	7.8846	48.2219	237.1894	319.5086

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.360	**2000-082A**	**Beidou 1B**					**PL**
TLEs	EGO (0.41)	2018-12-29	01:47:34	-319680.00	288.800	-52.800	630.300
26643	TEME	42453.675	0.0080775	8.7765	44.5572	18.8097	280.1641
D.361	**2004-015A**	**Ekspress-AM 11**					**PL**
TLEs	EGO (-)	2018-12-30	17:32:25	-319680.00	293.200	268.400	318.000
28234	TEME	42457.986	0.0012467	9.5934	41.0610	252.2484	44.0138
D.362	**2006-022A**	**KAZSAT**					**PL**
TLEs	EGO (-)	2018-12-30	15:40:06	-319680.00	294.100	275.100	313.100
29230	TEME	42459.065	0.0004179	7.1843	53.1245	206.7596	239.0078
D.363	**1975-042A**	**Intelsat IV F-1**					**PL**
TLEs	EGO (-)	2018-12-30	00:20:33	-311040.00	286.400	233.500	339.200
7815	TEME	42451.148	0.0008669	13.5159	330.9300	219.1976	227.4013
D.364	**1996-007A**	**N-Star 2**					**PL**
TLEs	EGO (-)	2018-12-30	18:54:19	-311040.00	286.400	254.900	317.900
23781	TEME	42450.212	0.0014945	9.1134	43.3795	239.9902	195.1433
D.365	**1997-042A**	**ABS 3 (Agila 2/ABS 5, Agila 2, Mabuhay 1)**					**PL**
TLEs	EGO (-)	2018-12-30	19:42:03	-311040.00	286.500	260.800	312.200
24901	TEME	42449.858	0.0008357	5.9101	60.3579	215.6994	1.6928
D.366	**1998-056A**	**Eutelsat W2**					**PL**
TLEs	EGO (-)	2018-12-30	07:50:30	-311040.00	285.900	266.600	305.100
25491	TEME	42449.741	0.0004036	6.7618	55.5727	216.4272	199.1541
D.367	**2002-029D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	EGO (-)	2018-12-30	17:14:04	-311040.00	283.900	234.100	333.700
27444	TEME	42447.677	0.0014942	12.2576	29.9721	311.4911	206.2366
D.368	**2002-042B**	**Kodama (DRTS)**					**PL**
TLEs	EGO (0.10)	2018-12-30	19:52:06	-311040.00	282.400	197.500	367.200
27516	TEME	42446.865	0.0020546	6.0485	59.2274	180.1844	36.6013
D.369	**2004-036A**	**GSAT 3 (EDUSAT)**					**PL**
TLEs	EGO (-)	2018-12-30	00:35:46	-311040.00	284.600	270.400	298.700
28417	TEME	42448.075	0.0002520	6.1894	58.9227	222.1583	330.0517
D.370	**1986-016A**	**Yuri 2B (BS 2B)**					**PL**
TLEs	EGO (-)	2018-12-30	19:28:37	-302400.00	277.800	205.200	350.400
16597	TEME	42441.604	0.0008996	15.0680	354.4998	172.9636	314.6608
D.371	**1991-083A**	**Eutelsat II F-3**					**PL**
TLEs	EGO (-)	2018-12-30	17:49:56	-302400.00	276.100	260.700	291.500
21803	TEME	42440.921	0.0006727	13.8606	23.0770	279.3811	51.5320

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.372	**1992-013A**	**Galaxy V**					**PL**
TLEs	EGO (-)	2018-12-30	05:58:32	-302400.00	278.500	217.600	339.400
21906	TEME	42442.708	0.0013413	10.6118	36.9394	5.2545	208.6618
D.373	**1994-064A**	**Intelsat VII F-3 (NSS 703)**					**PL**
TLEs	EGO (-)	2018-12-30	09:49:42	-302400.00	273.800	245.100	302.500
23305	TEME	42437.152	0.0012075	6.9727	53.8353	210.1135	337.8360
D.374	**1995-064A**	**AsiaSat 2**					**PL**
TLEs	EGO (-)	2018-12-30	20:17:59	-302400.00	273.700	234.600	312.800
23723	TEME	42437.263	0.0014518	6.1068	59.1190	248.0749	133.5073
D.375	**2001-029A**	**Artemis**					**PL**
TLEs	EGO (-)	2018-12-30	13:01:27	-302400.00	277.600	250.500	304.700
26863	TEME	42442.949	0.0003973	13.2201	27.6553	109.5809	85.3717
D.376	**2002-002A**	**INSAT 3C**					**PL**
TLEs	EGO (-)	2018-12-30	21:45:42	-302400.00	274.800	236.600	312.900
27298	TEME	42439.907	0.0007405	1.8544	88.4360	104.6343	53.6889
D.377	**UU020**	**Himawari 2 AKM (Star 27)**					**PL**
vimpel	EGO (0.43)	2018-12-31	11:32:32	-302400.00	272.800	-77.200	622.800
144901	J2000	42437.000	0.0084850	13.1290	327.2630	39.8750	53.8808
D.378	**1968-081Q**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.11)	2018-12-30	05:32:47	-293760.00	266.700	-891.000	1424.400
38690	TEME	42430.549	0.0284040	5.8232	314.7181	346.8535	133.0111
D.379	**1985-092C**	**USA 12 (DSCS III F3, DSCS 3-3, DSCS III B-5)**					**PL**
vimpel	EGO (-)	2018-12-31	14:08:01	-293760.00	269.000	254.500	283.500
144900	J2000	42434.000	0.0004000	15.2810	9.9320	321.3190	57.5725
D.380	**1987-070A**	**Kiku 5 (ETS V)**					**PL**
TLEs	EGO (-)	2018-12-30	20:20:45	-293760.00	265.500	236.600	294.400
18316	TEME	42429.119	0.0011313	15.2183	357.6069	325.7217	136.4208
D.381	**1991-055A**	**Intelsat VI F-5**					**PL**
TLEs	EGO (-)	2018-12-30	17:33:51	-293760.00	267.900	254.300	281.500
21653	TEME	42432.174	0.0005439	10.7905	36.3465	258.7915	31.4547
D.382	**1992-060A**	**Hispasat 1A**					**PL**
TLEs	EGO (-)	2018-12-30	19:44:12	-293760.00	270.400	245.200	295.500
22116	TEME	42433.925	0.0011226	12.2386	30.2532	255.5345	9.7018
D.383	**1993-066A**	**Intelsat VII F-1**					**PL**
TLEs	EGO (-)	2018-12-30	19:08:43	-293760.00	269.000	257.900	280.100
22871	TEME	42433.961	0.0003223	5.2642	64.3944	251.7645	103.4208

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.384	**1995-016B**	**Hot Bird 1**					**PL**
TLEs	EGO (-)	2018-12-30	12:34:42	-293760.00	270.800	256.200	285.300
23537	TEME	42435.269	0.0002900	9.7490	40.7456	314.4874	109.4919
D.385	**1998-063B**	**AMC 5 (GE 5)**					**PL**
TLEs	EGO (-)	2018-12-30	10:49:25	-293760.00	265.800	251.200	280.400
25516	TEME	42429.821	0.0006087	6.3729	57.5632	267.1576	306.8432
D.386	**2002-038A**	**Eutelsat 33D (Eutelsat 8 West C, Hot Bird 6)**					**PL**
TLEs	EGO (-)	2018-12-30	00:58:38	-293760.00	267.800	250.000	285.600
27499	TEME	42431.198	0.0006383	2.0086	86.5373	217.8951	332.9035
D.387	**1968-081V**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.06)	2018-12-30	09:48:15	-285120.00	259.700	-1699.200	2218.500
38695	TEME	42423.562	0.0476729	5.4462	315.2379	302.6523	93.9437
D.388	**1978-062A**	**GOES 3**					**PL**
TLEs	EGO (-)	2018-12-30	20:13:43	-285120.00	257.800	241.100	274.500
10953	TEME	42422.305	0.0005467	12.6103	324.9568	337.8119	112.0314
D.389	**1981-057F**	**Meteosat 2 AKM (MAGE 1)**					**PM**
TLEs	EGO (0.44)	2018-12-30	15:19:45	-285120.00	255.300	-65.000	575.600
20837	TEME	42419.060	0.0070436	13.2838	325.6638	137.4388	167.9345
D.390	**1990-079B**	**Eutelsat II F-1**					**PL**
TLEs	EGO (-)	2018-12-30	17:28:09	-285120.00	261.900	240.500	283.300
20777	TEME	42426.113	0.0007444	14.4143	19.8952	255.9814	30.0253
D.391	**2006-053C**	**Fengyun 2D AKM (FG-36)**					**PM**
TLEs	EGO (0.45)	2018-12-30	23:01:17	-285120.00	259.300	-170.200	688.700
29642	TEME	42422.652	0.0104457	6.9347	55.6927	341.4674	335.2830
D.392	**1977-048A**	**GOES 2**					**PL**
TLEs	EGO (0.29)	2018-12-30	21:49:11	-276480.00	247.400	184.800	310.000
10061	TEME	42412.791	0.0018802	12.4080	321.1883	338.7576	84.6454
D.393	**1978-071A**	**ESA GEOS 2**					**PL**
TLEs	EGO (-)	2018-12-30	17:46:36	-276480.00	253.000	234.200	271.800
10981	TEME	42416.648	0.0007795	11.8364	316.5586	323.9821	319.8337
D.394	**1982-106D**	**IUS second stage (IUS-2 SRM-2, Orbus 6E) (Titan 34D IUS)**					**RB**
TLEs	EGO (0.41)	2018-12-30	11:24:06	-276480.00	251.800	61.500	442.100
13643	TEME	42417.205	0.0048259	14.2842	335.2143	353.1979	67.5649
D.395	**1988-051C**	**PAS 1 (PanAmSat 1)**					**PL**
TLEs	EGO (-)	2018-12-30	14:01:52	-276480.00	249.000	230.100	268.000
19217	TEME	42414.203	0.0008620	13.2738	25.6040	281.9470	256.8701

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.396	**1994-043A**	**Chinasat 5E (Zhongxing 5E, ZX 5E, APStar 1)**					**PL**
TLEs	EGO (-)	2018-12-30	14:56:08	-276480.00	253.300	234.700	271.800
23185	TEME	42418.637	0.0008014	10.5373	36.1322	297.4207	86.3819
D.397	**1997-002B**	**Nahuel 1A**					**PL**
TLEs	EGO (-)	2018-12-30	18:25:41	-276480.00	250.600	225.900	275.300
24714	TEME	42414.995	0.0004991	8.5622	45.7474	194.5445	115.3965
D.398	**2003-059A**	**AMOS 2**					**PL**
TLEs	EGO (-)	2018-12-30	23:50:32	-276480.00	248.400	237.700	259.100
28132	TEME	42410.609	0.0002320	1.9518	87.5312	203.7868	146.8124
D.399	**2007-058A**	**Cosmos-2434 (Raduga-1M1)**					**PL**
TLEs	EGO (-)	2018-12-30	18:59:51	-276480.00	247.400	235.400	259.400
32373	TEME	42411.846	0.0005559	4.2126	71.2087	234.0000	214.7112
D.400	**2012-002C**	**Fengyun 2F AKM (FG-36)**					**PM**
TLEs	EGO (0.44)	2018-12-30	19:37:32	-276480.00	248.600	6.100	491.000
38072	TEME	42411.494	0.0058863	2.8653	77.4950	147.0966	345.9492
D.401	**2017-086A**	**Angosat 1**					**PL**
TLEs	EGO (0.23)	2018-12-30	20:31:19	-276480.00	252.400	181.800	323.000
43087	TEME	42416.301	0.0016667	0.8689	94.5507	115.1801	312.9275
D.402	**1983-006A**	**Sakura 2A (CS 2A)**					**PL**
TLEs	EGO (0.22)	2018-12-30	15:27:18	-267840.00	245.000	202.800	287.100
13782	TEME	42408.546	0.0013540	14.3599	343.1405	280.9795	194.3441
D.403	**1983-094A**	**RCA Satcom IIR**					**PL**
TLEs	EGO (0.31)	2018-12-30	17:59:25	-267840.00	243.200	179.900	306.600
14328	TEME	42407.145	0.0018413	15.3799	8.5264	346.3333	4.3212
D.404	**1984-031F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (0.14)	2018-12-30	13:07:11	-267840.00	239.900	174.600	305.200
14951	TEME	42404.731	0.0010599	13.8474	336.1969	190.0390	238.3333
D.405	**1985-016F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (0.34)	2018-12-30	16:14:54	-267840.00	245.700	136.000	355.500
15581	TEME	42408.752	0.0021703	14.1035	339.3974	186.9277	0.4424
D.406	**1989-035C**	**Titan 34D third stage (Transtage D-16) (Titan 34D Transtage)**					**RB**
vimpel	EGO (0.03)	2018-12-25	15:42:03	-267840.00	239.500	-3998.800	4477.900
144800	J2000	42403.100	0.0992710	8.1930	5.3170	3.5460	34.9987
D.407	**1989-052A**	**Gorizont 18**					**PL**
TLEs	EGO (0.41)	2018-12-30	14:44:27	-267840.00	246.600	93.200	400.000
20107	TEME	42411.290	0.0040184	14.9449	356.3697	285.2751	45.7259

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.408	**1995-011B**	**Himawari 5 (GMS 5)**					**PL**
TLEs	EGO (-)	2018-12-30	14:04:46	-267840.00	245.200	213.800	276.600
23522	TEME	42410.343	0.0003303	13.0660	24.8502	36.6013	267.3351
D.409	**1996-063A**	**Arabsat 2B**					**PL**
TLEs	EGO (-)	2018-12-30	17:21:21	-267840.00	243.300	226.400	260.100
24652	TEME	42408.145	0.0004927	4.8232	67.8775	228.3035	231.7489
D.410	**1997-071A**	**Astra 5A (Sirius 2, GE 1E)**					**PL**
TLEs	EGO (-)	2018-12-30	16:40:09	-267840.00	245.400	228.400	262.300
25049	TEME	42410.807	0.0005859	7.5294	51.1095	251.3021	88.1678
D.411	**1977-041A**	**Intelsat IVA F-4**					**PL**
TLEs	EGO (0.19)	2018-12-30	19:27:44	-259200.00	234.600	180.100	289.000
10024	TEME	42398.368	0.0009720	13.7840	335.0201	218.3237	311.9137
D.412	**1979-053C**	**Transtage 31 (Titan IIIC)**					**RB**
vimpel	EGO (0.45)	2018-12-24	11:46:33	-259200.00	234.700	-19.900	489.300
144701	J2000	42400.400	0.0056170	12.7480	322.7620	229.7660	52.7655
D.413	**1984-009C**	**Titan 34D third stage (Transtage D-10) (Titan 34D Transtage)**					**RB**
vimpel	EGO (0.03)	2018-12-24	13:36:36	-259200.00	234.400	-3997.700	4466.600
144703	J2000	42399.200	0.1010400	7.5530	349.9190	67.0550	51.9347
D.414	**1994-038D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (0.36)	2018-12-30	00:19:11	-259200.00	237.900	131.800	344.000
23171	TEME	42403.038	0.0021142	14.3128	15.1702	69.1968	272.2927
D.415	**2000-031D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	EGO (0.23)	2018-12-30	08:44:42	-259200.00	235.400	182.200	288.600
26381	TEME	42398.553	0.0010895	13.4774	24.5031	17.9551	337.2456
D.416	**1978-062D**	**GOES 3 AKM (SVM-5)**					**PM**
TLEs	EGO (0.31)	2018-12-30	18:24:37	-250560.00	225.000	-252.000	702.000
20801	TEME	42389.431	0.0116724	12.7259	317.0587	9.2934	114.6932
D.417	**1981-119A**	**Intelsat V F-3**					**PL**
TLEs	EGO (0.40)	2018-12-30	17:22:55	-250560.00	227.000	125.000	328.900
12994	TEME	42391.577	0.0021818	14.6524	349.2567	194.8133	26.8780
D.418	**1985-048B**	**Morelos 1**					**PL**
TLEs	EGO (-)	2018-12-29	22:42:43	-250560.00	227.200	209.200	245.200
15824	TEME	42391.563	0.0004442	15.3944	5.5734	346.9153	296.6116
D.419	**1990-021A**	**Intelsat VI F-3**					**PL**
TLEs	EGO (0.27)	2018-12-30	11:39:42	-250560.00	223.900	201.600	246.300
20523	TEME	42388.178	0.0008549	12.1977	29.0792	316.4718	117.2627

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.420	**1994-002D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	EGO (0.39)	2018-12-30	17:25:32	-250560.00	227.000	46.700	407.400
22966	TEME	42391.204	0.0039145	15.2538	6.4503	71.1155	28.7133
D.421	**2004-011A**	**Superbird A2 (Superbird 6)**					**PL**
TLEs	EGO (0.42)	2018-12-30	12:26:01	-250560.00	229.100	132.600	325.700
28218	TEME	42394.115	0.0030331	10.6755	36.2601	325.7905	283.0511
D.422	**1969-069A**	**ATS 5**					**PL**
TLEs	EGO (0.22)	2018-12-30	13:01:37	-241920.00	220.600	200.400	240.900
4068	TEME	42385.627	0.0006599	6.7129	298.1862	325.8182	232.0561
D.423	**1997-008D**	**IUS second stage (IUS-4 SRM-2, Orbus 6E) (Titan IVB IUS)**					**RB**
vimpel	EGO (0.42)	2018-12-25	15:19:18	-241920.00	219.600	119.800	319.300
144700	J2000	42383.400	0.0019010	13.4680	25.3810	124.8500	61.0658
D.424	**1997-027A**	**Inmarsat-3 F4**					**PL**
TLEs	EGO (0.33)	2018-12-30	18:18:16	-241920.00	218.700	184.700	252.700
24819	TEME	42384.511	0.0009353	6.7104	54.5188	313.2088	70.0830
D.425	**1975-011A**	**SMS 2**					**PL**
TLEs	EGO (0.37)	2018-12-30	16:55:29	-233280.00	215.300	160.700	270.000
7648	TEME	42378.362	0.0008810	11.8183	315.0508	207.6125	141.5276
D.426	**1983-077A**	**Arabsat 1D-R**					**PL**
TLEs	EGO (0.39)	2018-12-30	10:39:09	-233280.00	211.400	100.800	322.000
14234	TEME	42376.258	0.0020419	15.3602	4.5573	93.5407	105.9504
D.427	**1989-020A**	**JCSAT 1**					**PL**
TLEs	EGO (0.33)	2018-12-30	09:59:18	-233280.00	208.400	190.000	226.700
19874	TEME	42371.867	0.0003675	14.9569	15.6337	309.2441	132.3189
D.428	**1989-090D**	**IUS second stage (IUS-5 SRM-2, Orbus 6E) (Discovery (OV-103))**					**RB**
vimpel	EGO (0.02)	2018-12-31	08:54:12	-233280.00	213.900	-1181.300	1609.000
144601	J2000	42377.000	0.0332040	18.4720	9.9360	27.1170	136.3455
D.429	**1990-034A**	**Palapa B-2R**					**PL**
TLEs	EGO (0.38)	2018-12-30	10:05:08	-233280.00	210.200	166.700	253.600
20570	TEME	42373.579	0.0006295	13.6480	24.4164	39.5875	134.3360
D.430	**1992-021A**	**Telecom 2B**					**PL**
TLEs	EGO (0.40)	2018-12-30	13:59:37	-233280.00	210.400	152.900	267.900
21939	TEME	42377.281	0.0009887	13.3685	24.7926	3.1508	248.8948
D.431	**1973-040B**	**Transtage 24 (Titan IIIC)**					**RB**
vimpel	EGO (0.50)	2018-12-31	16:30:37	-224640.00	202.100	62.900	341.300
144602	J2000	42365.300	0.0035640	7.6330	297.8070	347.0000	309.6999

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.432	**1981-076A**	**Himawari 2 (GMS 2)**					**PL**
TLEs	EGO (0.48)	2018-12-30	15:23:47	-224640.00	203.400	160.400	246.400
12677	TEME	42366.330	0.0011420	13.3534	329.5419	276.5305	182.1377
D.433	**1985-015B**	**Brazilsat 1**					**PL**
TLEs	EGO (0.39)	2018-12-30	13:08:29	-224640.00	204.300	184.200	224.400
15561	TEME	42370.095	0.0009293	15.3120	7.4691	294.2825	71.0486
D.434	**1985-109B**	**Morelos 2**					**PL**
TLEs	EGO (0.51)	2018-12-30	18:01:48	-224640.00	200.100	177.200	223.000
16274	TEME	42363.498	0.0003228	14.4426	18.7196	347.5950	12.6444
D.435	**1986-003B**	**Satcom Ku-1**					**PL**
TLEs	EGO (0.44)	2018-12-30	09:04:32	-224640.00	202.800	183.200	222.300
16482	TEME	42365.760	0.0005503	15.0731	13.6324	281.2788	138.7453
D.436	**1988-051G**	**Meteosat 3 AKM (MAGE 1)**					**PM**
vimpel	EGO (0.49)	2018-12-25	03:15:05	-224640.00	207.500	-30.500	445.500
144605	J2000	42371.600	0.0052450	14.9900	352.8060	101.2830	210.0406
D.437	**1990-063B**	**DFS-Kopernikus 2**					**PL**
TLEs	EGO (0.47)	2018-12-30	10:04:12	-224640.00	204.600	186.400	222.900
20706	TEME	42367.429	0.0009489	13.3994	24.7924	267.9892	149.8139
D.438	**1996-026B**	**Centaur-T (Titan IVA Centaur-T)**					**RB**
vimpel	EGO (0.07)	2018-12-25	04:11:41	-224640.00	201.200	-1731.500	2133.800
144600	J2000	42364.100	0.0455570	8.9160	350.5450	343.6120	193.2909
D.439	**1996-033A**	**Galaxy IX**					**PL**
TLEs	EGO (0.37)	2018-12-30	12:33:19	-224640.00	206.800	168.000	245.700
23877	TEME	42370.789	0.0004181	7.7530	49.5634	127.0374	308.7317
D.440	**2000-019D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	EGO (0.50)	2018-12-30	20:28:40	-224640.00	201.800	137.300	266.300
26246	TEME	42364.306	0.0018906	13.7600	23.4494	261.7522	164.3605
D.441	**1981-107C**	**Transtage 39 (Titan IIIC)**					**RB**
vimpel	EGO (0.03)	2018-12-25	12:50:55	-216000.00	192.000	-4085.100	4469.100
144501	J2000	42358.400	0.1016460	6.7240	346.2560	89.0930	58.6382
D.442	**1982-004A**	**RCA Satcom IV**					**PL**
TLEs	EGO (0.48)	2018-12-30	23:34:42	-216000.00	192.800	154.400	231.300
13035	TEME	42358.248	0.0016900	15.1675	358.0184	132.2027	92.1216
D.443	**1991-028A**	**Spacenet 4**					**PL**
TLEs	EGO (0.50)	2018-12-30	12:24:54	-216000.00	198.600	180.600	216.700
21227	TEME	42363.876	0.0010528	11.3995	33.1647	276.4695	279.2579

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.444	**1991-075A**	**Intelsat VI F-1**					**PL**
TLEs	EGO (0.56)	2018-12-30	14:16:56	-216000.00	192.600	175.900	209.200
21765	TEME	42358.418	0.0007567	10.7021	35.4985	270.8800	82.2800
D.445	**1994-054B**	**Centaur-T (Titan IVA Centaur-T)**					**RB**
vimpel	EGO (0.27)	2018-12-31	18:37:38	-216000.00	195.600	-313.600	704.800
144502	J2000	42358.200	0.0123240	12.5790	11.7620	288.2800	351.7138
D.446	**1994-065B**	**Thaicom 2**					**PL**
TLEs	EGO (0.62)	2018-12-30	12:31:11	-216000.00	192.600	176.100	209.000
23314	TEME	42356.844	0.0004416	6.5772	55.6803	223.0180	301.2414
D.447	**2001-014A**	**Ekran-M 21**					**PL**
TLEs	EGO (0.52)	2018-12-30	09:49:42	-216000.00	193.400	70.700	316.000
26736	TEME	42356.277	0.0030150	12.2472	34.4868	355.1364	338.3891
D.448	**2014-090C**	**Fengyun 2G AKM (FG-36)**					**PM**
TLEs	EGO (0.51)	2018-12-30	10:35:02	-216000.00	193.900	11.200	376.600
40369	TEME	42358.981	0.0041370	0.8149	106.6369	91.5928	102.4067
D.449	**1975-117A**	**RCA Satcom I**					**PL**
TLEs	EGO (0.55)	2018-12-30	22:35:47	-207360.00	189.400	106.900	271.800
8476	TEME	42354.721	0.0014511	13.3317	329.8304	215.6659	246.6197
D.450	**1985-109D**	**Satcom Ku-2**					**PL**
TLEs	EGO (0.57)	2018-12-30	11:39:42	-207360.00	187.900	147.400	228.500
16276	TEME	42351.757	0.0012590	14.9351	14.8517	240.2808	306.1085
D.451	**1990-002B**	**LEASAT 5 (Syncom-4 5)**					**PL**
TLEs	EGO (0.58)	2018-12-30	16:19:57	-207360.00	191.300	170.500	212.100
20410	TEME	42355.149	0.0008058	11.7892	7.3179	328.8533	23.8389
D.452	**1996-006A**	**Palapa C1**					**PL**
TLEs	EGO (0.59)	2018-12-30	12:29:33	-207360.00	191.900	159.700	224.000
23779	TEME	42356.300	0.0006648	5.3305	64.3196	180.9121	295.5108
D.453	**1971-116A**	**Intelsat IV F-3**					**PL**
TLEs	EGO (0.59)	2018-12-30	23:17:17	-198720.00	183.700	135.500	232.000
5709	TEME	42347.803	0.0013689	12.4610	320.0614	24.7754	28.6529
D.454	**1986-026B**	**Brazilsat 2**					**PL**
TLEs	EGO (0.68)	2018-12-30	02:17:15	-198720.00	178.300	160.700	195.900
16650	TEME	42343.733	0.0008455	15.0153	12.8712	292.0774	240.0841
D.455	**1997-070D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	EGO (0.65)	2018-12-30	18:00:56	-198720.00	179.900	114.400	245.400
25048	TEME	42342.749	0.0010966	14.7228	16.5505	76.4733	9.6395

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.456	**2000-002A**	**Galaxy 10R**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:25:42	-198720.00	178.200	160.500	195.900
26056	TEME	42341.614	0.0003308	7.9730	48.4255	224.6219	131.0188
D.457	**1979-086C**	**Transtage 34 (Titan IIIC)**					**RB**
vimpel	EGO (0.02)	2018-12-31	12:32:24	-190080.00	168.400	-5530.100	5867.000
144401	J2000	42334.100	0.1363490	6.4810	352.5490	97.1290	63.6591
D.458	**1985-028B**	**Anik C1**					**PL**
TLEs	EGO (0.71)	2018-12-30	18:13:18	-190080.00	171.900	109.000	234.700
15642	TEME	42334.775	0.0010879	15.0097	14.7589	55.9128	2.3049
D.459	**1988-018A**	**Spacenet 3R**					**PL**
TLEs	EGO (0.96)	2018-12-30	23:07:55	-190080.00	172.300	153.600	190.900
18951	TEME	42336.975	0.0006439	14.0054	21.4214	263.4904	38.8770
D.460	**1993-069A**	**Gorizont 28**					**PL**
TLEs	EGO (0.57)	2018-12-30	07:27:40	-190080.00	175.000	37.400	312.600
22880	TEME	42338.147	0.0027489	14.9352	10.1620	95.9848	325.4842
D.461	**1995-041A**	**Europe*Star B (Mugunghwa 1, Koreasat 1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	10:15:57	-190080.00	170.600	153.600	187.600
23639	TEME	42334.031	0.0005907	14.1570	20.4834	280.0238	132.5180
D.462	**1996-063B**	**MEASAT 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:47:01	-190080.00	174.100	160.400	187.800
24653	TEME	42337.241	0.0002988	8.2985	45.9275	206.8161	134.7995
D.463	**1999-016A**	**INSAT 2E (Intelsat APR-2)**					**PL**
TLEs	EGO (0.67)	2018-12-30	05:20:02	-190080.00	173.900	140.800	207.100
25666	TEME	42338.312	0.0012191	6.2918	57.7939	234.5994	300.0186
D.464	**2000-016B**	**INSAT 3B**					**PL**
TLEs	EGO (0.71)	2018-12-30	15:27:13	-190080.00	173.100	150.200	196.100
26108	TEME	42338.735	0.0009852	5.3616	63.8036	212.5469	92.8336
D.465	**1976-010A**	**Intelsat IVA F-2**					**PL**
TLEs	GEO (1.00)	2018-12-30	16:56:59	-181440.00	165.100	139.800	190.300
8620	TEME	42327.547	0.0005956	13.2790	329.3394	276.5500	146.5038
D.466	**1983-105A**	**Intelsat V F-7**					**PL**
TLEs	GEO (1.00)	2018-12-30	09:05:42	-181440.00	162.900	139.200	186.600
14421	TEME	42326.839	0.0007825	14.8846	353.4897	337.5655	308.9795
D.467	**1988-109A**	**Skynet 4B**					**PL**
TLEs	EGO (0.74)	2018-12-30	21:26:54	-181440.00	167.100	144.700	189.500
19687	TEME	42332.675	0.0008992	15.3023	359.6106	277.0636	298.6191

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.468	**1992-072A**	**Galaxy VII**					**PL**
TLEs	EGO (0.80)	2018-12-30	10:51:03	-181440.00	161.900	126.800	197.100
22205	TEME	42325.400	0.0011339	13.3854	24.4819	315.6856	312.6726
D.469	**1997-078A**	**Galaxy VIII-i**					**PL**
TLEs	EGO (0.81)	2018-12-30	14:55:23	-181440.00	161.500	132.800	190.200
25086	TEME	42327.563	0.0010416	12.1448	29.9536	310.0873	83.5649
D.470	**2000-024D**	**IUS second stage (IUS-22 SRM-2, Orbus 6E) (Titan IVB IUS)**					**RB**
vimpel	GEO (1.00)	2018-12-31	11:46:57	-181440.00	160.700	131.700	189.700
144400	J2000	42325.500	0.0003080	11.2570	31.1140	57.7150	114.0177
D.471	**1991-074D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (0.92)	2018-12-30	16:47:41	-172800.00	159.900	144.500	175.300
21762	TEME	42323.065	0.0003305	15.1171	3.6635	307.5096	10.0822
D.472	**1992-066A**	**DFS-Kopernikus 3**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:03:38	-172800.00	152.800	135.300	170.400
22175	TEME	42318.777	0.0004361	12.6694	27.6014	288.7240	263.1403
D.473	**1993-048A**	**Hispasat 1B**					**PL**
TLEs	EGO (0.84)	2018-12-30	12:26:01	-172800.00	154.800	121.100	188.500
22723	TEME	42319.907	0.0011814	11.4619	32.4683	256.0439	283.2993
D.474	**1984-080E**	**Himawari 3 (GMS 3) AKM (Star 27)**					**PM**
TLEs	EGO (0.24)	2018-12-30	19:23:28	-164160.00	148.900	-418.300	716.200
22266	TEME	42313.042	0.0134423	13.9652	339.3223	35.5377	296.3920
D.475	**1984-114A**	**Chinasat 5R (Zhongxing 5R, ZX 5R, Spacenet 2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:32:12	-164160.00	145.400	110.600	180.300
15385	TEME	42309.598	0.0010559	14.9294	14.5797	341.3652	211.0836
D.476	**1989-041A**	**Superbird A**					**PL**
TLEs	GEO (1.00)	2018-12-30	09:04:11	-164160.00	148.500	120.500	176.400
20040	TEME	42312.876	0.0011613	14.9497	354.7250	326.3859	306.9698
D.477	**1972-010A**	**OPS 1570 (DSP F3, DSP 4, DSP Block 1(PHASE I) F3)**					**PL**
vimpel	GEO (1.00)	2018-12-31	13:47:34	-155520.00	141.400	98.400	184.400
144300	J2000	42303.000	0.0011580	6.2850	299.0470	322.7090	351.7140
D.478	**1974-093A**	**Intelsat IV F-8**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:45:36	-155520.00	137.000	115.300	158.600
7544	TEME	42300.380	0.0002902	13.2990	329.8930	11.0290	315.7418
D.479	**1982-014A**	**Westar IV**					**PL**
TLEs	GEO (0.93)	2018-12-30	17:06:55	-155520.00	141.500	122.600	160.300
13069	TEME	42304.918	0.0007037	15.0863	357.4645	282.6339	20.2024

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.480	**1984-093D**	**Telstar 3C (Telstar 302)**					**PL**
TLEs	GEO (0.88)	2018-12-30	08:39:45	-155520.00	139.100	119.700	158.500
15237	TEME	42301.765	0.0003295	15.2586	8.0849	327.1585	139.4098
D.481	**1985-076B**	**Optus A1**					**PL**
TLEs	GEO (0.89)	2018-12-30	21:54:20	-155520.00	143.900	125.400	162.300
15993	TEME	42309.342	0.0008370	15.2540	1.4879	311.1852	102.0882
D.482	**1990-091B**	**Galaxy VI**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:03:04	-155520.00	144.000	124.400	163.600
20873	TEME	42307.344	0.0005311	12.1082	30.0737	238.6978	16.9940
D.483	**1995-067B**	**INSAT 2C**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:07:24	-155520.00	138.300	119.700	156.900
23731	TEME	42300.268	0.0007507	12.5695	28.9702	289.3446	147.9730
D.484	**2003-021A**	**Beidou 3**					**PL**
TLEs	EGO (0.80)	2018-12-30	21:53:00	-155520.00	140.400	97.800	183.000
27813	TEME	42305.952	0.0016766	6.2235	59.5146	230.4405	103.4770
D.485	**1973-023A**	**Anik A2**					**PL**
TLEs	GEO (1.00)	2018-12-30	16:10:15	-146880.00	133.800	85.200	182.400
6437	TEME	42296.064	0.0015931	12.7547	323.5500	351.2990	344.1497
D.486	**1978-116A**	**Anik B1**					**PL**
TLEs	EGO (0.81)	2018-12-30	11:25:51	-146880.00	129.300	48.200	210.300
11153	TEME	42296.039	0.0019232	13.9567	339.3032	267.5699	74.0073
D.487	**1985-010B**	**USA 8 (MAGNUM 1)**					**PL**
vimpel	EGO (0.09)	2018-12-31	14:03:48	-146880.00	130.600	-411.500	672.700
144202	J2000	42294.000	0.0138880	17.0530	342.3070	336.1550	31.1046
D.488	**1986-026A**	**GStar 2**					**PL**
TLEs	GEO (0.88)	2018-12-30	18:45:46	-146880.00	134.300	115.200	153.500
16649	TEME	42296.003	0.0008181	15.2597	8.6121	320.1759	165.6660
D.489	**1988-081B**	**SBS V**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:40:14	-146880.00	135.700	108.000	163.500
19484	TEME	42301.598	0.0011341	13.7590	22.5284	272.7114	239.9166
D.490	**1992-059D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (0.90)	2018-12-30	18:45:54	-146880.00	134.200	85.400	182.900
22115	TEME	42296.357	0.0015121	15.2009	6.0439	277.2525	165.8660
D.491	**1996-003A**	**ABS 1A (Mugungwha 2, Koreasat 2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:27:01	-146880.00	134.800	122.000	147.700
23768	TEME	42297.105	0.0004055	8.9907	43.1220	272.5968	342.0665

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.492	**2003-013A**	**INSAT 3A**					**PL**
TLEs	EGO (0.90)	2018-12-30	17:18:28	-146880.00	131.900	69.800	193.900
27714	TEME	42296.935	0.0016631	2.3652	84.9206	237.9184	221.7377
D.493	**1972-003A**	**Intelsat IV F-4**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:20:16	-138240.00	124.800	107.000	142.600
5775	TEME	42286.452	0.0005267	12.6400	322.5042	3.8548	169.7593
D.494	**1973-040A**	**OPS 6157 (DSP F4, DSP 2, DSP Block 1(PHASE I) F4)**					**PL**
vimpel	GEO (1.00)	2018-12-25	05:36:36	-138240.00	128.300	93.500	163.200
144201	J2000	42293.800	0.0011030	7.4480	297.3630	332.1850	119.1216
D.495	**1976-042A**	**Comstar 1A (D-1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:36:33	-138240.00	126.800	108.100	145.600
8838	TEME	42292.967	0.0007773	13.2910	329.9667	314.4484	249.2965
D.496	**1980-091A**	**SBS I**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:24:58	-138240.00	127.000	92.900	161.100
12065	TEME	42291.279	0.0002992	14.2728	341.2405	55.1857	302.1027
D.497	**1984-080A**	**Himawari 3 (GMS 3)**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:29:33	-138240.00	124.100	95.100	153.000
15152	TEME	42287.707	0.0006348	14.3622	346.1393	24.6581	202.7423
D.498	**1984-101A**	**Galaxy III**					**PL**
TLEs	GEO (0.88)	2018-12-30	19:18:38	-138240.00	122.400	94.900	149.900
15308	TEME	42284.639	0.0011296	15.2552	7.8675	317.0315	339.0332
D.499	**1994-067A**	**Ekspress 1 (Ekspress 11L)**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:59:48	-138240.00	126.000	104.200	147.800
23319	TEME	42288.482	0.0006052	13.5456	23.4105	237.5921	5.2709
D.500	**2000-020A**	**Galaxy IVR**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:00:02	-138240.00	123.200	103.400	143.000
26298	TEME	42289.131	0.0006254	9.2823	41.8590	227.1292	99.7328
D.501	**2004-004D**	**IUS second stage (IUS-10 SRM-2, Orbus 6E) (Titan IVB IUS)**					**RB**
vimpel	GEO (1.00)	2018-12-31	13:31:08	-138240.00	128.400	111.200	145.600
144200	J2000	42294.800	0.0007650	8.6370	42.7530	311.7360	99.5396
D.502	**2009-010A**	**Raduga 1**					**PL**
TLEs	GEO (1.00)	2018-12-29	22:57:17	-138240.00	126.600	85.200	168.000
34264	TEME	42288.716	0.0012379	6.8045	63.6037	308.9460	346.7846
D.503	**1974-075A**	**Westar II**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:50:53	-129600.00	118.000	97.600	138.300
7466	TEME	42280.230	0.0001680	12.8843	326.1103	328.2729	335.4211

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.504	**1976-035A**	**NATO IIIA**					**PL**
TLEs	EGO (0.78)	2018-12-30	05:44:25	-129600.00	120.900	19.500	222.200
8808	TEME	42283.650	0.0024695	10.8474	320.7188	265.7321	324.8704
D.505	**1983-030A**	**RCA Satcom IR**					**PL**
TLEs	GEO (0.90)	2018-12-30	11:32:38	-129600.00	117.600	81.900	153.300
13984	TEME	42283.922	0.0006187	15.2076	1.1711	7.7506	97.3336
D.506	**1984-022F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (0.92)	2018-12-30	16:10:08	-129600.00	113.700	18.500	208.800
14948	TEME	42275.488	0.0021598	14.6656	332.5475	63.9456	343.2913
D.507	**1987-028D**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (0.71)	2018-12-30	11:13:44	-129600.00	113.300	2.400	224.200
17705	TEME	42278.125	0.0027182	15.0663	345.1313	33.3067	217.4068
D.508	**1989-062A**	**TV-SAT 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:53:32	-129600.00	119.500	94.600	144.500
20168	TEME	42285.988	0.0005686	14.4802	18.0372	243.7397	52.3135
D.509	**1992-017A**	**Gorizont 25**					**PL**
TLEs	EGO (0.71)	2018-12-30	12:36:25	-129600.00	119.100	9.800	228.300
21922	TEME	42285.180	0.0025912	15.0329	4.8985	32.6398	243.0914
D.510	**1999-047A**	**Yamal 100 No. 1**					**PL**
TLEs	EGO (0.39)	2018-12-30	05:10:53	-129600.00	114.800	-247.500	477.100
25896	TEME	42278.853	0.0088991	13.9438	21.2980	350.0363	207.9220
D.511	**2003-018A**	**GSAT 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:31:23	-129600.00	119.200	100.300	138.000
27807	TEME	42283.411	0.0009257	6.0059	59.4005	256.2214	117.6768
D.512	**1985-048D**	**Telstar 3D (Telstar 303)**					**PL**
TLEs	GEO (0.90)	2018-12-30	20:08:54	-120960.00	111.700	94.900	128.500
15826	TEME	42274.231	0.0004944	15.2038	9.0324	277.5843	327.5973
D.513	**1991-064B**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (0.91)	2018-12-30	20:20:37	-120960.00	106.800	89.000	124.600
21703	TEME	42269.502	0.0007509	15.1533	2.4975	317.3522	135.8259
D.514	**1995-063A**	**Gals 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:41:08	-120960.00	108.800	78.600	139.000
23717	TEME	42272.213	0.0012274	13.4370	23.9505	280.0365	197.2274
D.515	**1996-005A**	**Gorizont 31**					**PL**
TLEs	GEO (1.00)	2018-12-30	00:21:19	-120960.00	107.500	19.600	195.500
23775	TEME	42273.369	0.0017617	14.3722	16.5117	183.7709	279.7119

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.516	**2001-033D**	**IUS second stage (IUS-16 SRM-2, Orbus 6E) (Titan IVB IUS)**					**RB**
vimpel	GEO (1.00)	2018-12-31	23:25:24	-120960.00	107.500	81.200	133.700
144100	J2000	42272.200	0.0011710	10.4040	34.5170	310.5440	302.3302
D.517	**1974-022A**	**Westar I**					**PL**
TLEs	GEO (1.00)	2018-12-30	00:09:42	-112320.00	105.400	81.000	129.700
7250	TEME	42271.403	0.0010015	12.8203	324.9913	329.6909	48.4993
D.518	**1978-002A**	**Intelsat IVA F-3**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:49:26	-112320.00	102.400	83.600	121.300
10557	TEME	42267.022	0.0004825	13.7262	336.4258	292.4644	213.5385
D.519	**1982-110C**	**Anik C3**					**PL**
TLEs	GEO (0.97)	2018-12-30	19:29:22	-112320.00	103.300	87.400	119.300
13652	TEME	42266.372	0.0006053	15.0130	356.7337	318.7558	317.4231
D.520	**1987-022A**	**GOES 7**					**PL**
TLEs	GEO (0.95)	2018-12-29	08:12:55	-112320.00	105.100	88.900	121.300
17561	TEME	42266.759	0.0008020	15.0500	0.0788	323.7783	147.5251
D.521	**1987-029A**	**Agila 1**					**PL**
TLEs	GEO (0.92)	2018-12-30	22:50:26	-112320.00	101.800	83.500	120.100
17706	TEME	42267.121	0.0007737	15.1267	10.9339	316.3746	289.0052
D.522	**2000-011A**	**Garuda 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:45:42	-112320.00	101.800	83.400	120.200
26089	TEME	42268.108	0.0007052	3.0163	100.5391	186.8403	51.2840
D.523	**1974-101A**	**Symphonie A**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:20:01	-103680.00	90.000	71.600	108.400
7578	TEME	42250.869	0.0006200	11.0583	311.3418	331.8782	169.3584
D.524	**1975-091A**	**Intelsat IVA F-1**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:17:13	-103680.00	96.800	71.600	122.000
8330	TEME	42263.233	0.0002031	13.2087	329.6725	256.4999	98.9554
D.525	**1979-072A**	**Westar III**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:40:30	-103680.00	91.700	74.700	108.800
11484	TEME	42252.920	0.0007113	14.2327	343.9279	304.7196	147.1366
D.526	**1982-009A**	**Ekran 8**					**PL**
TLEs	EGO (0.83)	2018-12-30	17:46:21	-103680.00	93.900	-20.500	208.300
13056	TEME	42257.111	0.0029225	12.8441	324.1242	278.3676	318.9282
D.527	**1982-110B**	**SBS III**					**PL**
TLEs	GEO (0.97)	2018-12-30	15:32:34	-103680.00	96.400	64.300	128.500
13651	TEME	42261.458	0.0008140	15.0146	356.9369	3.9003	213.3414

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.528	**1985-109C**	**Optus A2**					**PL**
TLEs	GEO (0.91)	2018-12-30	13:06:59	-103680.00	92.600	73.800	111.300
16275	TEME	42260.031	0.0008319	15.1601	2.7566	287.2749	65.9145
D.529	**1992-027A**	**Palapa B4**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:52:36	-103680.00	93.800	77.100	110.400
21964	TEME	42260.328	0.0007270	10.5196	35.8634	286.0141	52.0375
D.530	**1997-008E**	**USA 130 debris (DSP F18 IR Sensor telescope sunshade cover)**					**PM**
vimpel	EGO (0.67)	2018-12-24	08:49:35	-103680.00	92.300	-113.900	298.600
144002	J2000	42251.400	0.0051400	13.4110	24.4110	198.6710	158.7773
D.531	**1975-077A**	**Symphonie B**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:21:38	-95040.00	84.800	62.600	107.000
8132	TEME	42245.396	0.0009601	10.5769	309.6370	334.7681	174.8657
D.532	**1976-073A**	**Comstar 1B (D-2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:49:07	-95040.00	82.900	67.000	98.700
9047	TEME	42244.699	0.0004535	13.2051	330.2595	338.3397	328.5254
D.533	**1980-081F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	GEO (1.00)	2018-12-30	15:17:38	-95040.00	86.600	64.600	108.600
12447	TEME	42248.148	0.0008829	12.2411	319.6415	342.4291	183.6742
D.534	**1988-071A**	**Gorizont 16**					**PL**
TLEs	GEO (1.00)	2018-12-30	08:03:25	-95040.00	83.600	26.900	140.400
19397	TEME	42250.660	0.0016138	14.5990	352.0212	359.5994	264.3801
D.535	**1991-003A**	**Italsat 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:39:03	-95040.00	86.800	30.800	142.800
21055	TEME	42247.876	0.0016679	14.8791	14.1247	327.0486	351.5229
D.536	**1993-048B**	**INSAT 2B**					**PL**
TLEs	GEO (1.00)	2018-12-30	04:45:26	-95040.00	84.600	19.400	149.800
22724	TEME	42246.827	0.0011852	13.4043	23.9749	174.2933	319.9708
D.537	**1993-074B**	**IABS (Atlas II)**					**RB**
vimpel	EGO (0.54)	2018-12-25	11:20:42	-95040.00	89.700	-178.300	357.800
144000	J2000	42254.600	0.0063460	15.3460	5.1790	26.0790	100.6771
D.538	**1977-014A**	**Kiku 2 (ETS II)**					**PL**
TLEs	GEO (1.00)	2018-12-30	16:57:52	-86400.00	74.300	58.400	90.100
9852	TEME	42234.511	0.0005083	11.5922	315.0066	332.6268	149.8600
D.539	**1984-049A**	**Chinasat 5 (Zhongxing 5, ZX 5, Spacenet 1)**					**PL**
TLEs	GEO (0.93)	2018-12-30	21:39:15	-86400.00	81.000	60.700	101.300
14985	TEME	42245.677	0.0008559	15.0893	11.0839	256.1227	115.9851

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.540	**1993-073E**	**Meteosat 6 AKM (MAGE 1)**					**PM**
TLEs	EGO (0.60)	2018-12-29	22:40:20	-86400.00	80.300	-195.600	356.200
23118	TEME	42245.622	0.0065100	15.1026	9.8339	33.4239	287.4395
D.541	**1997-041D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (0.08)	2018-12-30	17:16:36	-86400.00	75.600	-1425.300	1576.600
24897	TEME	42240.596	0.0361890	14.0183	20.0057	232.8443	37.8328
D.542	**1999-047B**	**Yamal 100 No. 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:32:03	-86400.00	80.400	62.700	98.000
25897	TEME	42241.054	0.0010167	11.4746	32.2572	283.3681	175.8104
D.543	**2009-010B**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	14:08:24	-86400.00	74.600	61.700	87.500
34265	TEME	42241.441	0.0005451	6.8073	63.7296	242.3780	279.7613
D.544	**1981-057B**	**APPLE**					**PL**
TLEs	GEO (1.00)	2018-12-30	16:09:15	-77760.00	66.500	-40.500	173.600
12545	TEME	42226.793	0.0020686	12.7904	324.3577	151.9357	340.3514
D.545	**1990-016D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (0.83)	2018-12-29	15:50:57	-77760.00	69.700	-100.800	240.100
20502	TEME	42230.399	0.0036436	14.8874	357.5571	175.0421	145.3654
D.546	**1990-112D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	11:28:14	-77760.00	69.300	-44.400	183.100
21019	TEME	42238.301	0.0022215	14.9657	0.4556	106.0379	81.5299
D.547	**1975-038A**	**Anik A3**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:33:39	-69120.00	62.800	46.500	79.200
7790	TEME	42223.932	0.0005885	13.1227	328.6297	331.0919	7.5112
D.548	**1977-018A**	**Palapa 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:11:12	-69120.00	64.900	45.100	84.600
9862	TEME	42231.886	0.0006550	13.5710	334.5367	355.6303	102.8410
D.549	**1977-092J**	**Ekran 2 fragmentation debris**					**PF**
TLEs	GEO (1.00)	2018-12-30	12:54:55	-69120.00	65.100	-2.200	132.500
12996	TEME	42228.526	0.0010822	10.8261	310.1680	239.2651	24.1039
D.550	**1983-028F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	GEO (1.00)	2018-12-30	16:14:54	-69120.00	63.500	-45.300	172.300
13983	TEME	42223.761	0.0021192	13.4115	331.5336	148.1047	0.4089
D.551	**1987-084D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	17:06:40	-69120.00	64.000	-59.400	187.400
18387	TEME	42224.454	0.0025257	14.3682	348.8862	182.1333	180.5142

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.552	**1992-088D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	18:32:51	-69120.00	59.000	17.300	100.800
22272	TEME	42219.272	0.0006263	14.5308	10.1951	59.8493	179.3113
D.553	**1998-025D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	20:26:24	-69120.00	62.800	-71.900	197.500
25318	TEME	42221.837	0.0028593	12.8358	24.3063	55.8789	156.8376
D.554	**2003-053E**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	EGO (0.13)	2018-12-30	17:16:12	-69120.00	64.800	-889.700	1019.200
28119	TEME	42229.754	0.0230075	11.3797	32.9705	236.0734	213.6938
D.555	**1976-066A**	**Palapa 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:35:55	-60480.00	51.100	29.600	72.600
9009	TEME	42212.958	0.0001723	13.1753	330.2328	294.7745	15.8313
D.556	**1994-060D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-29	22:41:50	-60480.00	55.800	20.200	91.400
23270	TEME	42222.054	0.0006106	14.7844	12.5119	39.3635	293.0903
D.557	**1994-087D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	11:36:02	-60480.00	54.800	11.300	98.400
23451	TEME	42221.480	0.0008332	14.7384	13.4066	35.8424	109.1683
D.558	**2000-032A**	**Fengyun 2B**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:37:02	-60480.00	52.200	36.800	67.600
26382	TEME	42211.707	0.0006935	10.5901	35.6991	269.0231	343.8604
D.559	**2006-038A**	**Chinasat 22A (Zhongxing 22A, ZX 22A, Feng Huo 1-2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:54:19	-60480.00	53.800	39.200	68.400
29398	TEME	42214.551	0.0004577	6.7226	54.6674	277.9524	195.2824
D.560	**2018-050C**	**Fengyun 2H AKM (FG-36)**					**PM**
TLEs	EGO (0.37)	2018-12-30	15:27:28	-60480.00	57.000	-304.300	418.300
43497	TEME	42219.604	0.0086651	1.9470	283.6796	62.5315	313.3534
D.561	**1972-041A**	**Intelsat IV F-5**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:48:51	-51840.00	45.500	25.600	65.300
6052	TEME	42208.662	0.0002884	11.9203	317.3971	305.1689	311.0925
D.562	**1975-097F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	GEO (1.00)	2018-12-30	17:42:13	-51840.00	45.300	-50.100	140.700
11676	TEME	42209.887	0.0019814	9.0390	303.4291	135.1138	304.2323
D.563	**1978-058A**	**OPS 9454 (VORTEX 1) (CHALET 1)**					**PL**
vimpel	EGO (0.02)	2018-12-31	23:54:50	-51840.00	47.200	-6060.200	6154.500
143800	J2000	42213.500	0.1445620	8.1660	26.3060	6.8300	286.5407

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.564	**1981-114A**	**RCA Satcom IIIR**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:30:00	-51840.00	44.100	24.200	64.100
12967	TEME	42206.128	0.0008505	14.8832	354.5809	290.6524	319.3365
D.565	**1982-082A**	**Anik D1**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:03:16	-51840.00	43.800	18.600	69.000
13431	TEME	42201.195	0.0010784	14.8868	355.5330	294.7311	168.3735
D.566	**1985-055A**	**Intelsat VA F-11**					**PL**
TLEs	GEO (0.91)	2018-12-30	13:06:28	-51840.00	49.200	-3.600	102.000
15873	TEME	42219.915	0.0014011	15.1548	1.5416	358.9502	63.8051
D.567	**1988-034D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	18:24:50	-51840.00	48.300	-54.700	151.300
19076	TEME	42218.253	0.0019768	14.5655	350.1047	114.0846	57.8062
D.568	**1993-003D**	**IUS second stage (IUS-13 SRM-2, Orbus 6E) (Endeavour (OV-105))**					**RB**
TLEs	EGO (0.52)	2018-12-30	17:06:37	-51840.00	43.400	-240.300	327.100
22316	TEME	42206.052	0.0066485	13.3397	3.3910	53.2849	19.7969
D.569	**1994-069D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (0.94)	2018-12-30	10:23:03	-51840.00	43.200	-54.200	140.600
23330	TEME	42208.000	0.0019150	15.0679	12.2887	69.9475	304.4578
D.570	**2004-010F**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	10:55:50	-51840.00	43.800	-73.300	160.900
28256	TEME	42204.260	0.0030545	10.4749	41.4625	298.1984	329.1106
D.571	**1968-081AJ**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.17)	2018-12-30	17:49:07	-43200.00	35.900	-706.600	778.400
39298	TEME	42195.047	0.0178625	5.6989	312.2709	344.3307	328.4042
D.572	**1977-092K**	**Ekran 2 fragmentation debris**					**PF**
TLEs	GEO (1.00)	2018-12-30	18:36:27	-43200.00	40.100	-35.300	115.500
29014	TEME	42204.494	0.0017790	10.6608	309.7478	274.3431	120.7439
D.573	**1981-096A**	**SBS II**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:28:14	-43200.00	38.100	10.500	65.600
12855	TEME	42201.078	0.0002741	14.1943	344.2907	247.3881	313.5401
D.574	**1983-065A**	**Galaxy I**					**PL**
TLEs	GEO (0.90)	2018-12-30	13:55:51	-43200.00	40.800	25.100	56.500
14158	TEME	42210.427	0.0006459	15.1842	4.5369	291.7159	236.1254
D.575	**1991-010F**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	18:46:24	-43200.00	41.200	-32.000	114.400
21129	TEME	42198.181	0.0013276	14.7103	4.3004	167.2879	167.6786

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.576	**1991-015E**	**Meteosat 5 AKM (MAGE 1)**					**PM**
TLEs	EGO (0.20)	2018-12-30	12:10:25	-43200.00	37.100	-633.600	707.700
21904	TEME	42209.552	0.0152582	14.3606	359.6452	165.6775	78.1603
D.577	**1993-072A**	**Gorizont 29**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:45:43	-43200.00	37.200	-12.500	87.000
22907	TEME	42206.853	0.0016383	14.8724	9.7951	298.4295	281.0774
D.578	**1999-047E**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	EGO (0.30)	2018-12-30	15:39:51	-43200.00	38.700	-385.300	462.700
25900	TEME	42209.346	0.0103540	13.8818	21.1003	349.5342	238.3905
D.579	**2004-043D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	GEO (1.00)	2018-12-30	17:15:05	-43200.00	39.400	8.800	69.900
28466	TEME	42202.629	0.0003095	10.5948	35.1394	65.1849	22.7897
D.580	**1979-035E**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	GEO (1.00)	2018-12-30	16:06:44	-34560.00	30.500	-92.500	153.400
17873	TEME	42189.004	0.0025187	11.5588	314.4942	173.1641	332.4461
D.581	**1979-086A**	**OPS 1948 (VORTEX 2) (CHALET 2)**					**PL**
vimpel	EGO (0.02)	2018-12-31	16:28:41	-34560.00	28.500	-5208.800	5265.800
143615	J2000	42186.000	0.1239130	6.3410	353.5180	46.0640	5.3956
D.582	**1985-107A**	**Raduga 17**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:17:14	-34560.00	32.100	-19.600	83.700
16250	TEME	42196.318	0.0006947	13.8474	341.1610	163.2880	124.0547
D.583	**1995-045D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	13:09:55	-34560.00	32.400	-49.800	114.500
23656	TEME	42201.118	0.0022640	14.5540	15.4021	337.1565	221.1055
D.584	**1999-009A**	**Arabsat 3A**					**PL**
TLEs	GEO (1.00)	2018-12-30	10:54:42	-34560.00	34.800	12.500	57.000
25638	TEME	42195.239	0.0009825	7.6217	49.8757	263.6243	325.2159
D.585	**2000-032C**	**Fengyun 2B AKM (FG-36)**					**PM**
TLEs	GEO (1.00)	2018-12-30	12:34:43	-34560.00	29.700	-69.900	129.200
26460	TEME	42201.916	0.0027129	12.9124	27.6435	324.2820	100.0617
D.586	**1981-102F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	GEO (1.00)	2018-12-30	03:57:02	-25920.00	21.000	-25.700	67.700
14195	TEME	42172.168	0.0006012	12.4790	322.5527	138.6183	164.7653
D.587	**1983-059C**	**Palapa Pacific 1 (Palapa B1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:08:33	-25920.00	26.800	7.900	45.700
14134	TEME	42185.625	0.0006374	14.6627	352.0819	341.7661	187.5384

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.588	**1983-098A**	**Galaxy II**					**PL**
TLEs	GEO (0.91)	2018-12-30	12:19:37	-25920.00	22.200	-2.400	46.900
14365	TEME	42199.441	0.0007503	15.1556	4.8794	341.0497	260.9772
D.589	**1992-041A**	**INSAT 2A**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:02:00	-25920.00	22.500	-2.300	47.200
22027	TEME	42189.913	0.0009714	14.7701	14.5589	252.8310	205.8212
D.590	**1992-082A**	**Gorizont 27**					**PL**
TLEs	GEO (0.97)	2018-12-30	20:22:38	-25920.00	24.100	-29.900	78.200
22245	TEME	42181.476	0.0017336	15.0193	6.6271	315.7208	143.3099
D.591	**1996-034A**	**Gorizont 32**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:11:51	-25920.00	25.800	-13.800	65.500
23880	TEME	42190.004	0.0013754	14.2879	17.1073	299.4366	313.1785
D.592	**2000-036D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	22:08:32	-25920.00	24.200	-53.200	101.600
26397	TEME	42178.820	0.0019407	12.3647	27.7764	354.0788	151.8306
D.593	**2002-001B**	**Centaur-T (Titan IVB Centaur-T)**					**RB**
vimpel	EGO (0.80)	2018-12-25	00:17:22	-25920.00	23.400	-198.000	244.800
143700	J2000	42192.200	0.0049680	6.6240	38.4720	73.9540	299.9574
D.594	**1964-047A**	**Syncom 3**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:42:00	-17280.00	15.900	1.300	30.600
858	TEME	42170.994	0.0004696	0.6683	47.6303	217.8856	152.2921
D.595	**1967-001A**	**Intelsat II F-2**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:04:09	-17280.00	15.300	-37.100	67.700
2639	TEME	42158.804	0.0012573	3.4906	293.8042	315.2709	171.7648
D.596	**1987-091D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	17:11:03	-17280.00	18.300	-69.800	106.500
18446	TEME	42192.289	0.0018256	14.2911	348.1149	201.7966	35.4664
D.597^{m}	**1969-013F**	**Titan 3C fragmentation debris**					**RF**
vimpel	EGO (-)	2018-12-31	06:24:55	-24.85	2053.127	694.506	3411.748
154201	J2000	44217.300	0.0307260	5.9800	291.3830	286.9820	95.1155
D.598$_{o}$	—	—					—
KIAM	EGO (-)	2018-01-01	00:00:00	-21.42	1755.299	1593.513	1917.085
UI058	J2000	43919.472	0.0036837	16.0332	332.1641	343.9658	28.2700
D.599^{m}	**1969-013V**	**Titan 3C fragmentation debris**					**RF**
vimpel	EGO (0.03)	2018-12-31	06:54:03	-21.31	1745.727	-2972.567	6464.021
152601	J2000	43909.900	0.1074540	5.8360	291.4540	213.8500	87.8832

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.600^m	**2009-001B**	**Delta IV DCSS 5 (Delta 4H)**					**RB**
vimpel	EGO (0.13)	2018-12-25	09:59:25	-15.18	1224.884	96.497	2353.272
149900	J2000	43389.057	0.0260063	5.6917	34.8580	21.5187	151.1745
D.601^m	**1969-013Q**	**Transtage 17 fragmentation debris**					**RF**
TLEs	EGO (-)	2018-11-20	03:37:07	-13.00	1043.715	366.699	1720.730
43512	TEME	43207.887	0.0156688	6.3791	289.4621	238.9010	176.0358
D.602^m	**1982-106B**	**DSCS III F1 (DSCS 3-1, DSCS III A-1)**					**PL**
vimpel	EGO (-)	2018-12-31	20:42:39	-8.81	700.227	645.232	755.222
147100	J2000	42864.400	0.0012830	15.1510	354.8230	115.3670	303.5351
D.603^m	**1998-058A**	**USA 140 (UFO F9)**					**PL**
vimpel	EGO (-)	2018-12-31	22:36:31	-7.50	598.000	537.400	658.600
146600	J2000	42763.400	0.0014510	8.5930	31.8340	303.5120	311.8014
D.604^m	**1980-087A**	**OPS 6394 (FLTSATCOM F4)**					**PL**
vimpel	EGO (-)	2018-12-31	23:53:12	-4.77	375.227	353.234	397.220
145500	J2000	42539.400	0.0005170	13.3470	329.4550	342.4760	230.3991
D.605^m	**1978-016A**	**OPS 6391 (FLTSATCOM F1)**					**PL**
vimpel	EGO (-)	2018-12-31	17:41:17	-4.57	359.527	348.939	370.115
145401	J2000	42523.700	0.0002490	13.1180	321.1700	240.7170	315.3479
D.606^m	**1968-081S**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.09)	2018-12-30	23:11:27	-3.91	306.908	-1151.489	1765.306
38692	TEME	42471.081	0.0343386	5.8358	315.2665	318.2685	228.1670
D.607^m	**1968-081W**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.13)	2018-12-30	05:39:51	-2.90	227.607	-810.682	1265.896
38696	TEME	42391.780	0.0244927	5.3753	314.7934	306.4407	131.3353
D.608^m	**1976-059A**	**OPS 2112 (DSP F6, DSP 7, DSP Block 2(PHASE II) F6)**					**PL**
vimpel	EGO (-)	2018-12-31	21:02:34	-2.90	227.027	220.965	233.089
144702	J2000	42391.200	0.0001430	9.9410	306.5920	112.8030	250.3113
D.609^m	**1978-058B**	**Transtage 33 (Titan IIIC)**					**RB**
vimpel	EGO (0.02)	2018-12-25	13:23:07	-2.33	182.527	-6196.326	6561.380
144500	J2000	42346.700	0.1506340	7.9630	27.0230	72.5350	91.5331
D.610$_o$	**—**	**USA 197 debris (DSP F23 IR Sensor telescope sunshade cover)**					**PM**
KIAM	EGO (0.36)	2018-01-01	00:00:00	-1.54	120.261	-278.688	519.210
UU069	J2000	42284.434	0.0094349	4.6178	71.1632	49.7466	114.4340
D.611$_o$	**—**	**—**					**—**
KIAM	EGO (0.11)	2018-01-01	00:00:00	-0.44	34.104	-1150.207	1218.416
UI168	J2000	42198.277	0.0280654	14.3742	356.2164	100.1121	104.0080

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.612^m	**1968-081AH**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.10)	2018-12-30	19:03:37	0.37	-28.780	-1252.164	1194.604
39297	TEME	42135.393	0.0290346	5.7335	312.1959	333.4032	287.2330
D.613^m	**1968-081AK**	**Transtage 5 fragmentation debris**					**RF**
vimpel	EGO (0.25)	2018-12-31	21:38:43	0.57	-44.173	-566.756	478.410
143400	J2000	42120.000	0.0124070	5.6470	311.9320	36.5270	246.2890
D.614^m	**1975-118A**	**OPS 3165 (DSP F5, DSP 8, DSP Block 2(PHASE II) F5)**					**PL**
vimpel	GEO (1.00)	2018-12-31	20:57:43	0.78	-60.673	-198.309	76.963
143202	J2000	42103.500	0.0032690	8.8800	302.8810	305.7860	247.8161
D.615^m	**1968-081Z**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.33)	2018-09-15	10:18:02	2.19	-169.431	-615.990	277.129
38699	TEME	41994.742	0.0106337	5.2449	311.3085	317.5213	272.7335
D.616$_o$	**—**	**Himawari 1 AKM (Star 27)**					**RB**
KIAM	EGO (0.11)	2018-01-01	00:00:00	3.06	-236.872	-1444.366	970.622
UU010	J2000	41927.301	0.0287997	11.2865	314.8546	19.6452	270.9140
D.617$_o$	**—**	**USA 75 debris (DSP F16 IR Sensor telescope sunshade cover)**					**PM**
KIAM	EGO (0.44)	2018-01-01	00:00:00	3.88	-299.077	-764.462	166.308
UU052	J2000	41865.096	0.0111163	14.9568	9.9080	233.3022	172.0960
D.618$_o$	**—**	**OPS 7641 debris (DSP F11 IR Sensor telescope sunshade cover)**					**PM**
KIAM	EGO (-)	2018-01-01	00:00:00	4.63	-356.734	-412.334	-301.134
UU028	J2000	41807.439	0.0013299	13.9119	339.1595	305.5024	99.1590
D.619^m	**2002-040F**	**Meteosat 8 (MSG 1) operational debris (SEVIRI Entry Baffle Cover)**					**PM**
TLEs	EGO (0.24)	2018-09-12	18:32:35	6.14	-471.103	-838.936	-103.270
39999	TEME	41693.070	0.0088224	9.8397	32.5921	57.2412	51.9552
D.620^m	**1993-046C**	**IABS (Atlas II)**					**RB**
vimpel	EGO (0.13)	2018-12-25	03:49:01	6.70	-513.673	-854.791	-172.555
140900	J2000	41650.500	0.0081900	14.5670	0.8080	64.3090	209.5361
D.621^m	**2012-035F**	**Meteosat 10 (MSG 3) operational debris (SEVIRI Entry Baffle Cover)**					**PM**
vimpel	EGO (-)	2018-12-31	15:26:20	8.86	-675.973	-1075.214	-276.732
140104	J2000	41488.200	0.0096230	3.4900	85.5730	159.0960	113.8807
D.622^m	**1969-013P**	**Transtage 17 fragmentation debris**					**RF**
TLEs	EGO (0.17)	2018-12-29	17:37:09	10.01	-761.768	-1867.518	343.983
43456	TEME	41402.405	0.0267074	5.1560	307.4610	196.4740	305.2122

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.623^m	**2012-034B**	**Delta IV DCSS 5 (Delta 4H)**					**RB**
vimpel	EGO (0.20)	2018-12-24	09:40:46	10.37	-788.773	-1512.346	-65.200
139601	J2000	41375.400	0.0174880	1.2190	49.8930	137.8920	168.5285
D.624^m	**2015-075D**	**Briz-M fragmentation debris**					**RF**
vimpel	EGO (-)	2018-12-31	21:44:19	18.11	-1353.873	-2362.581	-345.165
136701	J2000	40810.300	0.0247170	2.4250	86.7570	92.4180	20.3102
D.625^m	**2015-075F**	**Briz-M fragmentation debris**					**RF**
vimpel	EGO (-)	2018-12-24	18:39:28	19.26	-1435.773	-2464.857	-406.688
136303	J2000	40728.400	0.0252670	2.3630	90.4740	93.0130	77.4657
D.626	**1966-110A**	**ATS 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:37:32	17280.00	-15.900	-42.200	10.400
2608	TEME	42155.880	0.0006165	1.7356	300.3293	298.9392	175.1783
D.627	**1980-060G**	**Ekran 5 debris**					**PD**
vimpel	GEO (1.00)	2018-12-25	14:36:19	25920.00	-22.400	-97.700	53.000
143524	J2000	42148.900	0.0017410	11.5830	315.8410	284.6250	2.3010
D.628	**1982-103E**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	GEO (1.00)	2018-12-30	16:12:31	25920.00	-24.000	-77.800	29.700
13630	TEME	42147.648	0.0009395	12.7763	327.6170	104.5078	351.8749
D.629	**2000-029B**	**Briz-M (Proton-K/Briz-M)**					**RB**
TLEs	EGO (0.11)	2018-12-30	20:28:32	25920.00	-22.200	-1170.500	1126.200
26373	TEME	42154.244	0.0271318	12.0702	26.5585	268.4159	163.6772
D.630	**1981-027A**	**Raduga 8**					**PL**
TLEs	EGO (0.40)	2018-12-30	19:23:20	34560.00	-29.700	-394.800	335.300
12351	TEME	42130.816	0.0081785	12.3502	319.6974	192.9930	296.6496
D.631	**1969-013A**	**TACSAT 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:27:37	43200.00	-41.900	-121.800	38.000
3691	TEME	42123.190	0.0018937	3.8589	297.2582	280.2171	311.2293
D.632	**1969-036A**	**OPS 3148 (CANYON 2)**					**PL**
vimpel	EGO (0.03)	2018-12-25	04:40:48	43200.00	-39.600	-3849.100	3770.000
143301	J2000	42124.000	0.0900690	8.2620	65.8210	118.5740	261.6678
D.633	**1971-039B**	**Transtage 20 (Titan IIIC)**					**RB**
vimpel	GEO (1.00)	2018-12-25	02:49:58	43200.00	-40.600	-178.200	96.900
143300	J2000	42132.800	0.0035190	4.9810	296.4520	36.3620	159.8830
D.634	**1985-015A**	**Arabsat 1A**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:19:07	43200.00	-41.600	-59.100	-24.200
15560	TEME	42116.250	0.0008624	14.7075	353.8480	301.2120	259.5086

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.635	**1985-048C**	**Arabsat 1B**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:04:47	43200.00	-38.700	-99.400	22.100
15825	TEME	42132.461	0.0021590	14.8925	356.9315	310.9184	173.3751
D.636	**1989-020E**	**Meteosat 4 AKM (MAGE 1)**					**PM**
TLEs	EGO (0.25)	2018-12-30	18:45:54	51840.00	-49.100	-597.200	499.000
20800	TEME	42121.004	0.0125398	13.9349	352.4290	185.1546	166.4900
D.637	**1978-038A**	**OPS 8790 (AQUACADE 4)**					**PL**
vimpel	GEO (1.00)	2018-12-25	02:53:26	60480.00	-57.000	-133.600	19.500
143303	J2000	42110.800	0.0018990	8.4960	325.4470	260.1240	187.9090
D.638	**1979-087C**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (0.79)	2018-12-30	16:56:06	60480.00	-57.200	-222.100	107.700
17939	TEME	42111.203	0.0044188	11.6107	315.4548	283.7570	143.8132
D.639	**1988-091D**	**IUS second stage (IUS-7 SRM-2, Orbus 6E) (Discovery (OV-103))**					**RB**
TLEs	GEO (0.95)	2018-12-30	15:31:19	60480.00	-55.300	-129.000	18.300
19550	TEME	42108.698	0.0019046	15.0549	354.4268	248.7967	208.3653
D.640	**2001-009B**	**Centaur-T (Titan IVB Centaur-T)**					**RB**
vimpel	GEO (1.00)	2018-12-25	07:36:26	60480.00	-55.100	-114.400	4.100
143302	J2000	42111.500	0.0011600	10.6690	29.8460	62.0270	181.4642
D.641	**2003-015A**	**Cosmos-2397**					**PL**
TLEs	EGO (0.79)	2018-12-30	22:10:10	60480.00	-55.400	-234.400	123.500
27775	TEME	42114.420	0.0045775	9.7124	37.9208	298.1169	157.3846
D.642	**1975-123F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	GEO (1.00)	2018-12-30	13:42:32	69120.00	-62.100	-125.200	0.900
11568	TEME	42104.612	0.0012106	9.1831	304.5090	121.3661	189.8586
D.643	**1990-054D**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	GEO (1.00)	2018-12-30	03:16:36	69120.00	-64.800	-127.500	-2.000
20662	TEME	42099.309	0.0015977	14.8731	358.2634	15.5332	210.5951
D.644	**1993-069D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	19:34:46	69120.00	-59.500	-81.600	-37.500
22883	TEME	42108.606	0.0008464	14.8117	9.3384	323.8440	336.2490
D.645	**1995-035D**	**IUS second stage (IUS-26 SRM-2, Orbus 6E) (Discovery (OV-103))**					**RB**
TLEs	GEO (0.69)	2018-12-30	03:21:54	69120.00	-62.300	-107.200	-17.300
23615	TEME	42098.028	0.0006553	17.0260	7.8806	79.1502	250.3432
D.646	**1975-118C**	**Transtage 29 (Titan IIIC)**					**RB**
vimpel	GEO (1.00)	2018-12-31	11:46:55	77760.00	-73.500	-120.500	-26.600
143201	J2000	42089.800	0.0010560	8.8530	302.9850	112.9500	25.9971

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.647	**1976-059C**	**Transtage 28 (Titan IIIC)**					**RB**
vimpel	GEO (1.00)	2018-12-31	18:57:03	86400.00	-77.700	-129.000	-26.400
143102	J2000	42082.900	0.0008820	9.3000	304.1480	170.6620	279.3323
D.648	**1988-071D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	19:30:45	86400.00	-76.700	-159.400	6.000
19400	TEME	42089.731	0.0015255	14.3791	351.4446	171.9509	322.2887
D.649	**1995-022B**	**Centaur-T (Titan IVA Centaur-T)**					**RB**
vimpel	GEO (0.73)	2018-12-25	12:00:23	86400.00	-76.500	-115.300	-37.700
143200	J2000	42086.400	0.0013140	16.4560	34.2730	278.9270	119.9231
D.650	**1968-081AG**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.16)	2018-12-29	12:06:49	95040.00	-88.100	-815.600	639.400
39296	TEME	42074.223	0.0194747	5.5704	310.9776	338.0342	241.8917
D.651	**1977-007D**	**OPS 3151 debris (DSP F7 IR Sensor telescope sunshade cover)**					**PM**
vimpel	EGO (0.21)	2018-12-31	06:52:08	95040.00	-87.900	-1025.400	849.600
143104	J2000	42073.300	0.0147440	9.4930	303.9310	20.4110	100.8407
D.652	**1977-048G**	**GOES 2 AKM (SVM-5)**					**PM**
TLEs	EGO (0.14)	2018-12-30	19:22:05	95040.00	-83.600	-1024.500	857.400
20799	TEME	42079.647	0.0225268	10.5787	310.4120	20.5036	291.9093
D.653	**1987-096D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	16:48:18	95040.00	-82.300	-177.000	12.300
18578	TEME	42084.038	0.0018271	14.2513	348.7071	179.5219	11.3026
D.654	**1994-009B**	**Centaur-T (Titan IVA Centaur-T)**					**RB**
vimpel	GEO (1.00)	2018-12-31	22:32:50	95040.00	-88.000	-144.500	-31.600
143101	J2000	42079.100	0.0011730	13.1420	50.5360	183.5320	331.7268
D.655	**1995-060B**	**Centaur-T (Titan IVA Centaur-T)**					**RB**
vimpel	EGO (0.85)	2018-12-31	22:01:13	95040.00	-87.900	-232.000	56.200
143103	J2000	42076.900	0.0030150	13.8400	21.1230	154.6690	310.1396
D.656	**2003-012B**	**Centaur-T (Titan IVB Centaur-T)**					**RB**
vimpel	GEO (1.00)	2018-12-31	12:06:03	95040.00	-85.600	-184.900	13.600
143100	J2000	42078.300	0.0025060	8.1600	36.3110	228.1840	114.3267
D.657	**1989-021D**	**IUS second stage (IUS-9 SRM-2, Orbus 6E) (Discovery (OV-103))**					**RB**
TLEs	GEO (1.00)	2018-12-30	20:18:25	103680.00	-94.200	-199.900	11.500
19913	TEME	42071.808	0.0021008	12.8428	340.9620	122.8178	133.5859
D.658	**1989-081D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (0.94)	2018-12-30	20:20:30	103680.00	-94.000	-206.600	18.500
20266	TEME	42072.383	0.0026213	14.5591	355.3091	43.8857	135.6519

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.659	**1985-102D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-01	14:42:41	112320.00	-98.500	-183.300	-13.700
16214	TEME	42063.517	0.0017552	13.7259	341.2897	76.5220	53.3567
D.660	**1997-049E**	**Meteosat 7 AKM (MAGE 1)**					**PM**
TLEs	EGO (0.43)	2018-12-30	16:15:15	112320.00	-104.200	-431.800	223.300
25353	TEME	42059.401	0.0082126	13.5486	20.9721	266.2601	38.1054
D.661	**1972-010B**	**Transtage 22 (Titan IIIC)**					**RB**
vimpel	EGO (0.62)	2018-12-31	19:00:08	120960.00	-109.200	-354.100	135.700
143000	J2000	42052.100	0.0059380	5.7300	297.6480	78.2300	271.9594
D.662	**1974-039C**	**Transtage 27 (Titan IIIC)**					**RB**
TLEs	EGO (0.84)	2018-12-30	19:21:20	120960.00	-109.400	-209.300	-9.500
7324	TEME	42053.843	0.0024449	9.3846	303.5496	284.7408	289.7993
D.663	**1988-034A**	**Cosmos-1940**					**PL**
TLEs	GEO (1.00)	2018-12-30	00:57:13	120960.00	-109.100	-191.500	-26.700
19073	TEME	42052.907	0.0019200	14.3425	349.3342	235.0220	250.5295
D.664	**1989-041B**	**DFS-Kopernikus 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:29:33	120960.00	-108.600	-163.600	-53.600
20041	TEME	42057.949	0.0017636	14.9322	9.5998	256.3914	338.0286
D.665	**1968-081R**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.15)	2018-12-30	07:49:03	138240.00	-122.000	-944.700	700.800
38691	TEME	42040.062	0.0206782	4.5748	311.8197	314.1687	96.0081
D.666	**1989-090B**	**USA 48 (MAGNUM 2)**					**PL**
vimpel	EGO (0.07)	2018-12-25	06:07:39	138240.00	-127.200	-1301.600	1047.200
142900	J2000	42036.200	0.0279060	18.2710	8.9560	37.2950	183.0309
D.667	**2004-015D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	EGO (0.82)	2018-12-30	22:58:24	138240.00	-122.800	-201.400	-44.100
28240	TEME	42042.738	0.0022259	10.9237	33.8280	267.2609	325.6963
D.668	**2003-040C**	**IABS**					**PM**
vimpel	GEO (1.00)	2018-12-31	18:32:46	146880.00	-129.500	-188.600	-70.400
142901	J2000	42036.400	0.0015910	11.2890	32.2450	260.7090	13.5168
D.669	**1968-081M**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.21)	2018-12-30	13:39:16	155520.00	-139.500	-761.000	482.000
33511	TEME	42026.847	0.0148221	5.3360	310.6561	351.5617	178.0870
D.670	**1974-017A**	**Cosmos-637**					**PL**
TLEs	EGO (0.60)	2018-12-30	21:45:17	155520.00	-141.200	-308.600	26.200
7229	TEME	42020.783	0.0044586	7.4888	300.9545	346.2931	70.8188

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.671	**1996-044A**	**Italsat 2**					**PL**
TLEs	EGO (0.76)	2018-12-30	22:44:06	155520.00	-142.700	-249.200	-36.200
24208	TEME	42021.932	0.0018743	12.2676	27.4474	74.0550	307.1009
D.672	**2000-013D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	GEO (1.00)	2018-12-29	22:44:36	155520.00	-135.900	-167.300	-104.600
26101	TEME	42028.486	0.0009885	13.4839	22.8254	339.2358	302.4533
D.673	**1985-010D**	**IUS second stage (IUS-11 SRM-2, Orbus 6E) (Discovery (OV-103))**					**RB**
vimpel	EGO (0.49)	2018-12-31	21:28:48	164160.00	-150.400	-273.400	-27.400
142800	J2000	42012.100	0.0024440	17.1630	342.2880	234.9840	279.5310
D.674	**1994-082D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (0.67)	2018-12-30	20:08:14	164160.00	-146.200	-267.100	-25.400
23429	TEME	42020.216	0.0025879	14.5330	17.1810	58.5155	154.4652
D.675	**2003-043E**	**INSAT 3E**					**PL**
TLEs	EGO (0.72)	2018-12-30	21:58:59	164160.00	-147.200	-223.700	-70.800
27951	TEME	42016.973	0.0019512	3.6549	75.5563	194.9294	118.4763
D.676	**2005-023H**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (0.74)	2018-12-30	22:57:24	164160.00	-150.100	-209.800	-90.400
28704	TEME	42015.315	0.0017833	10.0212	37.5794	268.9047	322.0834
D.677	**1987-109D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (0.56)	2018-12-30	17:54:46	172800.00	-156.000	-426.300	114.400
18718	TEME	42010.047	0.0062512	14.2478	349.3642	209.2578	348.0544
D.678	**1990-094D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (0.59)	2018-12-30	09:05:42	181440.00	-163.800	-309.700	-18.000
20926	TEME	42001.078	0.0031566	14.7632	358.9143	76.8745	312.7668
D.679	**2003-041B**	**Centaur-T (Titan IVB Centaur-T)**					**RB**
vimpel	EGO (0.59)	2018-12-25	05:15:15	181440.00	-160.400	-315.800	-4.900
142700	J2000	42001.200	0.0032750	10.5430	67.6750	29.6300	254.9857
D.680	**1968-081J**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.23)	2018-12-30	17:51:45	198720.00	-175.900	-726.100	374.300
30000	TEME	41989.110	0.0143384	5.0640	310.5256	353.3445	337.7004
D.681	**1968-081N**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.10)	2018-12-30	23:42:27	198720.00	-180.500	-1137.100	776.200
33512	TEME	41983.662	0.0298185	4.9763	310.9166	342.0192	216.0909
D.682	**1991-046D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (0.61)	2018-12-30	18:44:01	207360.00	-183.100	-257.400	-108.800
21536	TEME	41982.884	0.0013839	14.7836	1.4486	187.5546	159.2743

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.683	**1994-080A**	**DFH 3-1**					**PL**
TLEs	EGO (0.37)	2018-12-30	12:42:49	216000.00	-192.900	-602.400	216.500
23415	TEME	41969.905	0.0102536	14.8682	7.7005	310.1867	78.0881
D.684	**1974-017F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (0.50)	2018-12-30	13:44:32	224640.00	-202.900	-399.800	-6.100
11567	TEME	41961.907	0.0051959	7.3368	300.6344	354.8403	196.8665
D.685	**1981-061F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (0.45)	2018-12-30	12:56:18	224640.00	-204.400	-220.800	-188.100
12851	TEME	41959.583	0.0006652	11.9767	320.2195	350.2988	28.7769
D.686	**1982-009F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (0.51)	2018-12-30	14:31:54	224640.00	-197.600	-357.200	-38.000
14117	TEME	41967.625	0.0034922	12.2927	322.4712	121.2080	1.4627
D.687	**2006-022D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	EGO (0.50)	2018-12-30	22:57:24	224640.00	-204.200	-413.100	4.600
29233	TEME	41960.487	0.0052050	9.2448	40.6965	329.9834	321.8481
D.688	**1968-081G**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.28)	2018-12-30	21:46:55	233280.00	-211.600	-713.900	290.700
25000	TEME	41951.163	0.0126952	5.0378	310.1746	335.6892	76.6589
D.689	**1983-100F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (0.43)	2018-12-30	12:44:16	241920.00	-216.400	-296.800	-136.100
14394	TEME	41947.260	0.0017817	12.6281	328.3761	74.2740	222.4610
D.690	**1997-065C**	**IABS (Atlas IIA)**					**RB**
TLEs	EGO (0.45)	2018-12-30	06:18:34	241920.00	-219.000	-362.300	-75.600
25021	TEME	41945.282	0.0027997	14.4027	15.0052	95.8504	219.0893
D.691	**1985-092E**	**IUS second stage (IUS-12 SRM-2, Orbus 6E) (Atlantis (OV-104))**					**RB**
vimpel	EGO (0.47)	2018-12-25	02:20:28	250560.00	-224.900	-460.100	10.300
142401	J2000	41938.900	0.0054130	14.4360	340.5540	106.5140	211.4802
D.692	**1992-017D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (0.42)	2018-12-30	16:19:11	250560.00	-226.700	-317.700	-135.600
21925	TEME	41938.167	0.0025233	14.7632	3.5677	349.2828	14.8353
D.693	**1983-016F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (0.34)	2018-12-30	20:13:35	259200.00	-229.800	-290.300	-169.400
14086	TEME	41933.952	0.0014805	12.2945	324.2562	265.3555	111.5283
D.694	**1988-036E**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (0.36)	2018-12-30	19:31:08	259200.00	-234.400	-329.600	-139.200
19094	TEME	41930.683	0.0018757	13.9203	345.6134	106.4328	323.7943

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.695	**2003-008C**	**IABS**					**PM**
vimpel	EGO (0.37)	2018-12-25	06:13:50	259200.00	-235.000	-312.700	-157.400
142305	J2000	41928.000	0.0021280	11.6050	30.7580	186.3520	203.1828
D.696	**1992-074D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (0.32)	2018-12-30	07:21:07	267840.00	-242.200	-333.100	-151.200
22213	TEME	41921.992	0.0018724	14.6874	5.7231	65.1892	217.1531
D.697	**1968-081AB**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.11)	2018-12-03	06:15:52	276480.00	-246.300	-1193.500	701.000
38701	TEME	41919.622	0.0276240	4.6108	310.5466	316.3093	144.7398
D.698	**1984-037B**	**Titan 34D third stage (Transtage D-11) (Titan 34D Transtage)**					**RB**
vimpel	EGO (0.38)	2018-12-31	16:54:21	276480.00	-246.200	-380.100	-112.200
142301	J2000	41918.100	0.0030310	13.5070	336.1290	259.8130	342.0723
D.699	**1984-129B**	**Titan 34D third stage (Transtage D-13) (Titan 34D Transtage)**					**RB**
vimpel	EGO (-)	2018-12-31	16:53:16	276480.00	-244.600	-274.300	-214.900
142300	J2000	41919.800	0.0001610	14.5660	341.6650	177.0040	347.8799
D.700	**2005-049E**	**Meteosat 9 (MSG 2) operational debris (SEVIRI Cooler Cover)**					**PM**
TLEs	EGO (0.29)	2018-12-30	06:49:52	276480.00	-249.400	-334.900	-163.900
29106	TEME	41915.514	0.0018604	8.7858	49.7367	204.7266	192.4878
D.701	**1994-084D**	**IUS second stage (IUS-20 SRM-2, Orbus 6E) (Titan IVA IUS)**					**RB**
vimpel	EGO (-)	2018-12-25	05:38:25	285120.00	-251.800	-260.700	-242.800
142302	J2000	41911.600	0.0003480	14.2840	16.2760	337.4650	197.5792
D.702	**2000-001C**	**IABS (Atlas IIA)**					**RB**
vimpel	EGO (0.28)	2018-12-25	06:44:17	285120.00	-251.500	-319.300	-183.600
142304	J2000	41911.900	0.0019140	13.4750	21.8660	301.8170	186.6574
D.703	**2000-065C**	**IABS (Atlas IIA)**					**RB**
vimpel	EGO (0.43)	2018-12-24	18:24:14	285120.00	-251.900	-500.700	-3.100
142303	J2000	41911.400	0.0060110	13.0930	23.4710	215.2990	13.7815
D.704	**2002-040E**	**Meteosat 8 (MSG 1) operational debris (SEVIRI Cooler Cover)**					**PM**
TLEs	EGO (0.33)	2018-10-06	00:02:00	285120.00	-252.700	-327.400	-178.000
39998	TEME	41912.212	0.0024784	9.9957	33.0684	217.4550	17.9782
D.705	**UU058**	**USA 107 debris (DSP F17 IR Sensor telescope sunshade cover)**					**PM**
vimpel	EGO (0.44)	2018-12-31	21:32:32	285120.00	-253.600	-606.500	99.300
142205	J2000	41910.500	0.0062950	14.2900	16.1180	302.5370	312.3251

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.706	**1985-024D**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	21:46:25	293760.00	-265.600	-327.900	-203.300
15630	TEME	41897.141	0.0010353	13.1093	333.5924	184.0964	74.2649
D.707	**1982-019B**	**Transtage 38 (Titan IIIC)**					**RB**
vimpel	EGO (-)	2018-12-31	18:05:32	302400.00	-272.200	-318.000	-226.300
142201	J2000	41891.300	0.0013030	12.8690	328.6220	54.7410	316.7208
D.708	**1982-093F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	17:00:00	302400.00	-272.500	-299.900	-245.000
14115	TEME	41892.950	0.0006158	12.1479	324.0932	270.3942	157.4778
D.709	**1987-097B**	**Titan 34D third stage (Transtage D-14) (Titan 34D Transtage)**					**RB**
vimpel	EGO (-)	2018-12-25	05:50:51	302400.00	-267.200	-303.100	-231.300
142200	J2000	41897.200	0.0006360	13.4850	354.5370	238.9800	172.7234
D.710	**1989-069D**	**Titan 34D third stage (Transtage D-2) (Titan 34D Transtage)**					**RB**
vimpel	EGO (0.43)	2018-12-25	11:45:57	302400.00	-269.200	-569.000	30.600
142202	J2000	41893.700	0.0073950	14.2780	350.8620	279.3390	80.0303
D.711	**1995-011D**	**Himawari 5 (GMS 5) AKM (Star 27)**					**PM**
TLEs	EGO (0.14)	2018-12-30	00:18:34	302400.00	-273.500	-1226.900	680.000
23524	TEME	41889.623	0.0230078	14.3598	10.8840	301.4808	269.7160
D.712	**1977-092G**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	07:12:51	311040.00	-280.600	-323.900	-237.300
11571	TEME	41882.615	0.0009326	10.0504	307.7381	79.6394	272.4147
D.713	**1984-090F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-29	22:30:09	311040.00	-275.200	-343.900	-206.500
17875	TEME	41888.283	0.0014200	12.8693	331.5679	80.9378	252.2642
D.714	**1991-080D**	**IUS second stage (IUS-14 SRM-2, Orbus 6E) (Atlantis (OV-104))**					**RB**
vimpel	EGO (0.23)	2018-12-31	12:16:56	311040.00	-278.400	-372.800	-184.000
142100	J2000	41884.400	0.0025270	14.9030	6.2680	288.6260	81.7554
D.715	**1995-038C**	**IABS (Atlas IIA)**					**RB**
vimpel	EGO (0.20)	2018-12-31	18:23:17	311040.00	-274.900	-353.700	-196.000
142103	J2000	41890.100	0.0021990	14.8240	8.7750	250.6560	352.4241
D.716	**1989-046D**	**IUS second stage (IUS-8 SRM-2, Orbus 6E) (Titan IVA IUS)**					**RB**
vimpel	EGO (0.37)	2018-12-24	07:42:16	319680.00	-284.600	-475.400	-93.800
142102	J2000	41879.100	0.0049530	14.2160	0.6170	302.7250	151.8586

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.717	**1989-046E**	**USA 39 debris (DSP F14 IR Sensor telescope sunshade cover)**					**PM**
vimpel	EGO (0.17)	2018-12-25	04:49:00	319680.00	-287.700	-1260.900	685.400
142106	J2000	41875.800	0.0200330	14.2550	0.4470	99.8630	194.1382
D.718	**1976-023K**	**LES 8, LES 9 operational debris**					**PM**
TLEs	EGO (-)	2018-12-30	17:42:58	328320.00	-297.100	-313.100	-281.000
13753	TEME	41867.347	0.0006700	11.1135	313.9682	343.0600	306.8707
D.719	**1979-015D**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	19:22:13	328320.00	-296.500	-336.900	-256.200
13900	TEME	41867.256	0.0008783	10.7576	311.8138	268.9442	292.5363
D.720	**1980-104E**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (0.20)	2018-12-30	11:51:06	328320.00	-296.500	-428.000	-164.900
12471	TEME	41866.837	0.0028846	11.5946	317.8644	116.7827	255.6520
D.721	**1981-025C**	**Transtage 40 (Titan IIIC)**					**RB**
vimpel	EGO (0.36)	2018-12-25	16:37:01	328320.00	-294.200	-522.400	-65.900
142101	J2000	41871.700	0.0052450	12.2160	325.7540	254.4230	341.9564
D.722	**2004-042C**	**Fengyun 2C AKM (FG-36)**					**PM**
TLEs	EGO (0.17)	2018-12-30	02:03:12	328320.00	-296.700	-393.500	-199.900
28491	TEME	41867.159	0.0026883	9.6747	36.9569	269.9819	274.3188
D.723	**1989-053A**	**Olympus 1**					**PL**
TLEs	EGO (-)	2018-12-30	11:42:33	336960.00	-304.700	-364.200	-245.200
20122	TEME	41858.929	0.0019937	14.7165	357.3526	281.8047	246.8399
D.724	**1968-081P**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.41)	2018-12-29	10:29:05	345600.00	-311.300	-714.300	91.600
33513	TEME	41852.127	0.0097674	4.7863	309.1577	339.7467	261.3497
D.725	**1986-038D**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	21:57:38	345600.00	-304.800	-393.000	-216.700
16732	TEME	41859.173	0.0017825	13.2940	337.5852	99.9960	113.4630
D.726	**1987-073D**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	18:39:07	345600.00	-307.900	-378.600	-237.300
18331	TEME	41857.080	0.0014877	13.6233	342.8368	70.7025	142.1338
D.727	**1984-028F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	12:57:11	362880.00	-320.600	-403.500	-237.600
15139	TEME	41843.560	0.0024199	12.4356	327.3849	339.9078	31.6878
D.728	**1968-081X**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.13)	2018-12-29	22:47:10	371520.00	-333.800	-1662.700	995.100
38697	TEME	41830.778	0.0255433	3.7111	339.0414	7.8797	258.6265

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.729	**1976-107F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	19:17:45	371520.00	-328.800	-374.300	-283.300
11569	TEME	41834.497	0.0009014	9.3354	304.4813	97.9891	87.9265
D.730	**1968-081E**	**Transtage 5 (Titan IIIC)**					**RB**
TLEs	EGO (0.40)	2018-12-30	19:21:05	388800.00	-345.200	-753.900	63.500
3432	TEME	41818.692	0.0104735	4.8399	308.6598	332.6836	288.5866
D.731	**1979-007A**	**SCATHA (P78-2)**					**PL**
TLEs	EGO (0.02)	2018-12-30	00:54:29	388800.00	-348.100	-7852.300	7156.100
11256	TEME	41816.257	0.1775430	16.0058	318.8633	43.9434	36.5409
D.732	**1988-108D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	10:38:30	388800.00	-344.200	-408.400	-280.000
19686	TEME	41819.162	0.0010331	14.3298	351.2537	125.7534	268.4168
D.733	**2012-035E**	**Meteosat 10 (MSG 3) operational debris (SEVIRI Cooler Cover)**					**PM**
TLEs	EGO (0.13)	2018-12-30	16:48:27	388800.00	-344.700	-487.800	-201.600
40871	TEME	41819.201	0.0037586	3.4358	86.2156	214.7382	116.8078
D.734	**2015-034E**	**Meteosat 11 (MSG 4) operational debris (Cooler Cover)**					**PM**
TLEs	EGO (0.06)	2018-12-30	13:15:06	388800.00	-348.700	-493.200	-204.300
40989	TEME	41813.751	0.0036546	1.2569	189.0335	115.3011	251.3267
D.735	**1968-081A**	**OV2-5 (DG7-2)**					**PL**
TLEs	EGO (0.37)	2018-12-30	19:27:22	397440.00	-356.200	-708.900	-3.500
3428	TEME	41808.077	0.0090600	4.8006	308.8879	338.0720	310.2638
D.736	**1979-007C**	**SCATHA AKM (FW-5)**					**PM**
TLEs	EGO (0.02)	2018-12-30	07:18:15	406080.00	-364.700	-7782.500	7053.100
29000	TEME	41799.024	0.1755986	15.9499	318.9558	43.6986	292.2325
D.737	**1980-060F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	22:36:40	414720.00	-369.300	-446.100	-292.600
14193	TEME	41793.994	0.0015108	11.3046	315.7435	220.2898	249.6453
D.738	**1992-037C**	**IABS (Atlas II)**					**RB**
vimpel	EGO (-)	2018-12-31	23:22:54	423360.00	-380.300	-462.200	-298.400
141600	J2000	41782.400	0.0023150	14.5210	357.4510	8.2340	265.9909
D.739	**1968-081H**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.27)	2018-12-30	20:15:13	440640.00	-395.400	-686.700	-104.100
25001	TEME	41769.865	0.0070679	4.7204	308.1295	30.1900	116.9523
D.740	**1970-069B**	**Agena D (Atlas SLV3A)**					**RB**
vimpel	EGO (0.02)	2018-12-31	23:06:06	440640.00	-395.700	-6222.400	5431.100
141500	J2000	41769.700	0.1430570	10.3960	217.9490	67.8460	131.5004

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.741	**1968-063B**	**Agena D (Atlas SLV3A)**					**RB**
vimpel	EGO (0.03)	2018-12-31	17:01:57	466560.00	-414.400	-5021.300	4192.600
141400	J2000	41748.800	0.1112850	10.9990	308.8390	174.3010	312.9771
D.742	**1968-081L**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.29)	2018-12-30	19:57:38	483840.00	-433.900	-733.300	-134.400
33510	TEME	41729.357	0.0090266	4.6909	307.7756	353.0275	55.2132
D.743	**UI031**	**—**					**—**
vimpel	EGO (0.15)	2018-12-31	23:22:58	501120.00	-447.400	-1375.500	480.700
141300	J2000	41715.600	0.0237420	2.8750	311.9570	288.1530	219.4802
D.744	**1975-100F**	**GOES 1 AKM (SVM-5)**					**PM**
TLEs	EGO (0.11)	2018-12-30	10:19:47	518400.00	-458.600	-1669.700	752.500
20962	TEME	41705.093	0.0301093	8.8866	301.9490	356.0572	48.2656
D.745	**1974-039A**	**ATS 6**					**PL**
TLEs	EGO (-)	2018-12-30	12:53:42	527040.00	-471.600	-599.400	-343.800
7318	TEME	41692.665	0.0028000	8.5058	300.7464	249.8552	217.9157
D.746	**1968-081AF**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.13)	2018-12-30	10:25:51	552960.00	-491.700	-1542.800	559.400
38705	TEME	41669.918	0.0264437	3.4893	308.5500	79.7915	53.5015
D.747	**1968-081K**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (-)	2018-12-30	17:20:00	561600.00	-495.900	-713.900	-278.000
33509	TEME	41666.270	0.0059735	4.8194	306.8017	43.7577	39.0884
D.748	**1975-055B**	**Agena D (Atlas SLV3A)**					**RB**
vimpel	EGO (0.02)	2018-12-31	07:42:37	561600.00	-500.400	-6073.400	5072.500
141000	J2000	41662.600	0.1339600	15.6900	292.0150	35.5760	76.5693
D.749	**2008-066C**	**Fengyun 2E AKM (FG-36)**					**PM**
TLEs	EGO (-)	2018-12-30	21:20:42	570240.00	-502.700	-653.700	-351.800
33465	TEME	41661.816	0.0039187	4.6717	59.1064	253.3903	359.5148
D.750	**2015-075J**	**Briz-M fragmentation debris**					**RF**
TLEs	EGO (0.09)	2018-12-30	13:27:15	596160.00	-529.800	-2136.200	1076.600
41548	TEME	41634.781	0.0377185	2.6765	73.5739	62.8854	132.4555
D.751	**1968-081AC**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.23)	2018-12-25	23:16:15	604800.00	-533.900	-1350.100	282.400
38702	TEME	41629.166	0.0193600	5.5706	305.6899	78.4892	222.3943
D.752	**1968-081AE**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.20)	2018-12-30	18:58:14	604800.00	-532.900	-1320.700	255.000
38704	TEME	41631.838	0.0204518	2.5261	310.4074	293.6304	287.0126

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.753	**2005-049F**	**Meteosat 9 (MSG 2) operational debris (SEVIRI Entry Baffle Cover)**					**PM**
TLEs	EGO (-)	2018-07-19	01:02:38	604800.00	-540.000	-761.200	-318.700
29676	TEME	41624.165	0.0034866	8.4413	50.6093	338.9675	263.0246
D.754	**1970-055A**	**Intelsat III F-8**					**PL**
TLEs	EGO (0.10)	2018-12-30	22:32:24	622080.00	-548.900	-1989.500	891.700
4478	TEME	41614.847	0.0335785	1.1180	300.5603	190.4151	235.1187
D.755	**1972-101B**	**Agena D (Atlas SLV3A)**					**RB**
vimpel	EGO (0.03)	2018-12-25	12:37:31	630720.00	-561.600	-5799.400	4676.100
140700	J2000	41603.700	0.1225630	14.4110	285.4280	70.7730	1.9693
D.756	**1977-038B**	**Agena D (Atlas SLV3A)**					**RB**
vimpel	EGO (0.02)	2018-12-29	08:16:50	639360.00	-566.600	-6804.300	5671.200
140701	J2000	41598.729	0.1521902	10.3310	341.3803	118.0143	119.3343
D.757	**1997-049A**	**Eutelsat W75 (ABS 1B, Eurobird 10, Eurobird 4, Hot Bird 3)**					**PL**
TLEs	EGO (-)	2018-12-30	15:41:14	682560.00	-607.300	-705.200	-509.500
24931	TEME	41556.451	0.0025105	7.1575	50.1675	323.4299	242.7367
D.758	**2015-034F**	**Meteosat 11 (MSG 4) operational debris (SEVIRI Entry Baffle Cover)**					**PM**
TLEs	EGO (-)	2018-12-08	23:42:41	743040.00	-654.200	-974.500	-333.900
40990	TEME	41510.067	0.0084067	1.2547	192.8717	39.8917	120.2961
D.759	**1968-081AA**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (0.06)	2018-12-28	03:09:20	760320.00	-674.600	-1149.400	-199.700
38700	TEME	41489.904	0.0116431	4.3165	304.7911	286.2838	161.1301
D.760	**2011-001B**	**Fregat-SB (Zenit-3F)**					**RB**
TLEs	EGO (0.23)	2018-12-30	20:30:40	786240.00	-693.400	-1317.900	-68.900
37345	TEME	41471.055	0.0155360	5.1653	59.9236	4.7826	170.8966
D.761	**1968-081T**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (-)	2018-12-30	20:03:10	794880.00	-699.800	-1145.200	-254.400
38693	TEME	41464.097	0.0108315	3.5360	305.3649	279.3066	265.6041
D.762	**1969-013M**	**Titan 3C fragmentation debris**					**RF**
vimpel	EGO (0.06)	2018-12-30	08:37:23	794880.00	-704.100	-2910.700	1502.500
140008	J2000	41459.450	0.0531846	5.9642	292.8608	134.5346	64.7716
D.763$_o$	**2011-001J**	**Fregat-SB No. 2001 debris**					**RD**
vimpel	EGO (0.19)	2018-02-19	00:24:42	803520.00	-710.900	-1320.300	-101.400
139900	J2000	41453.579	0.0146639	4.6153	62.4342	325.4846	87.0445
D.764	**1997-029C**	**Fengyun 2A AKM (FG-36)**					**PM**
TLEs	EGO (0.30)	2018-12-30	18:47:09	812160.00	-714.600	-1612.100	182.900
25611	TEME	41449.943	0.0220970	13.8603	17.1637	4.1771	170.7007

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.765	**2015-074B**	**Fregat-SB (Zenit-3F)**					**RB**
TLEs	EGO (0.26)	2018-12-30	13:22:31	812160.00	-719.500	-1475.200	36.200
41106	TEME	41445.184	0.0183200	1.7943	88.1160	280.0953	147.9480
D.766	**1985-007D**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	15:19:08	855360.00	-753.400	-821.100	-685.700
15487	TEME	41410.945	0.0015395	12.4397	335.2088	240.1191	185.7356
D.767	**1987-040D**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	12:57:36	855360.00	-752.100	-815.700	-688.400
17972	TEME	41412.464	0.0016375	12.5550	333.6955	260.7466	206.9578
D.768	**1989-052D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	10:37:22	864000.00	-763.600	-892.900	-634.300
20110	TEME	41400.564	0.0029349	13.6885	352.0015	207.5057	264.1040
D.769	**1969-013K**	**Titan 3C fragmentation debris**					**RF**
vimpel	EGO (0.08)	2018-12-31	12:52:34	881280.00	-777.900	-2627.600	1071.700
139607	J2000	41386.100	0.0434070	5.8250	293.3640	146.6540	359.9186
D.770	**1993-072D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	13:58:36	898560.00	-791.600	-870.400	-712.700
22910	TEME	41372.539	0.0014658	14.0580	6.7676	87.8889	245.7445
D.771	**2015-075H**	**Briz-M fragmentation debris**					**RF**
vimpel	EGO (0.19)	2018-12-31	19:30:06	907200.00	-797.200	-1889.300	294.900
139506	J2000	41368.100	0.0262880	2.4050	93.7380	50.5390	61.2372
D.772	**1984-063F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (-)	2018-12-30	19:29:00	941760.00	-824.700	-898.600	-750.800
15693	TEME	41339.680	0.0013818	12.1050	331.4207	190.2922	316.4478
D.773	**1987-100D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	11:23:58	976320.00	-854.000	-921.500	-786.500
18634	TEME	41309.834	0.0013276	13.5934	344.6851	203.7512	66.5294
D.774	**1991-014D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	13:01:21	984960.00	-862.500	-965.800	-759.200
21135	TEME	41301.764	0.0023268	14.4723	356.5999	62.1239	229.9321
D.775	**1968-081U**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (-)	2018-12-30	08:01:16	1010880.00	-884.000	-1244.200	-523.800
38694	TEME	41280.028	0.0084286	4.6472	301.5371	151.4183	82.6882
D.776	**1994-030D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	EGO (-)	2018-12-30	17:26:57	1105920.00	-971.000	-1163.200	-778.900
23111	TEME	41193.297	0.0041582	13.8782	7.1310	114.5704	42.2155

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.777	**2001-015A**	**GSAT 1**					**PL**
TLEs	EGO (0.23)	2018-12-30	19:43:26	1105920.00	-966.400	-1921.900	-11.000
26745	TEME	41198.034	0.0241403	11.6347	25.3625	223.8268	6.7034
D.778	**1969-036B**	**Agena D (Atlas SLV3A)**					**RB**
vimpel	EGO (0.03)	2018-12-25	10:53:10	1114560.00	-974.400	-5226.800	3278.000
138600	J2000	41188.800	0.1057100	10.2920	54.5560	172.2360	157.0563
D.779	**2008-003B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (-)	2018-12-30	19:45:04	1157760.00	-1014.200	-1774.700	-253.700
32479	TEME	41150.189	0.0189818	7.6580	45.4967	172.5238	11.9924
D.780	**2006-024C**	**USA 189 (NRL POTV)**					**PL**
vimpel	EGO (-)	2018-12-31	22:44:11	1166400.00	-1020.200	-1038.900	-1001.500
138401	J2000	41144.000	0.0003410	8.7070	39.8480	181.8690	317.9935
D.781	**2010-063B**	**Delta IV DCSS 5 (Delta 4H)**					**RB**
vimpel	EGO (0.18)	2018-12-31	07:55:10	1166400.00	-1022.900	-1987.500	-58.400
138300	J2000	41141.200	0.0234710	3.5490	155.4790	303.0670	298.5872
D.782	**2010-002B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (0.13)	2018-12-30	19:43:49	1175040.00	-1024.400	-1871.500	-177.400
36359	TEME	41140.075	0.0216218	6.2939	56.2439	187.6425	7.7891
D.783	**2016-036B**	**Delta IV DCSS 5 (Delta 4H)**					**RB**
vimpel	EGO (0.10)	2018-12-31	21:05:35	1183680.00	-1033.500	-1908.300	-158.600
135103	J2000	41130.800	0.0211740	7.0510	350.6670	208.6140	293.2300
D.784	**2013-062B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (0.18)	2018-12-30	23:40:11	1226880.00	-1068.100	-2104.700	-31.500
39376	TEME	41096.276	0.0246539	3.6571	74.7954	38.1317	340.1280
D.785	**2011-048B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (0.15)	2018-12-30	18:23:40	1244160.00	-1082.700	-2050.200	-115.200
37807	TEME	41081.192	0.0239841	4.9662	62.0211	15.1796	88.1278
D.786	**1968-081Y**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (-)	2018-12-30	21:20:28	1278720.00	-1116.500	-1769.900	-463.100
38698	TEME	41046.455	0.0181106	2.9034	299.2074	285.6169	240.1488
D.787	**2007-058C**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (0.09)	2018-12-30	19:50:28	1296000.00	-1126.100	-2099.900	-152.200
32375	TEME	41038.054	0.0233933	7.8266	43.9825	147.7585	31.1983
D.788	**2015-075B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (0.23)	2018-12-30	04:56:27	1356480.00	-1181.300	-2492.000	129.400
41122	TEME	40982.762	0.0314697	2.3472	86.1383	79.4013	272.9749

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.789	**2015-075G**	**Briz-M fragmentation debris**					**RF**
vimpel	EGO (-)	2018-12-25	11:02:38	1356480.00	-1179.300	-2148.400	-210.100
137601	J2000	40984.600	0.0237050	2.3620	92.9900	75.2060	193.6171
D.790	**1997-027B**	**INSAT 2D**					**PL**
TLEs	EGO (0.23)	2018-12-30	02:47:10	1408320.00	-1221.100	-2550.000	107.900
24820	TEME	40942.559	0.0326367	13.6337	10.1833	52.7410	283.1323
D.791	**1968-081AD**	**Transtage 5 fragmentation debris**					**RF**
TLEs	EGO (-)	2018-12-29	15:28:17	1598400.00	-1384.200	-2442.400	-326.100
38703	TEME	40780.295	0.0259782	3.5624	294.0936	164.9201	324.2556
D.792	**1968-050J**	**Transtage 16 (Titan IIIC)**					**RB**
TLEs	EGO (-)	2018-12-30	23:44:15	1658880.00	-1428.800	-2112.100	-745.500
3292	TEME	40735.587	0.0163766	2.1830	58.1049	306.3449	124.9627
D.793	**2015-075E**	**Briz-M fragmentation debris**					**RF**
TLEs	EGO (-)	2018-12-30	22:45:15	1684800.00	-1450.700	-2650.500	-250.800
41544	TEME	40713.657	0.0291761	2.2670	90.6093	89.4857	9.4734
D.794	**1966-053J**	**Transtage 11 (Titan IIIC)**					**RB**
TLEs	EGO (-)	2018-12-30	22:36:48	2004480.00	-1715.600	-2384.500	-1046.700
2222	TEME	40448.292	0.0154520	3.1962	62.0290	98.8385	249.9384
D.795	**1968-050H**	**OPS 9348 (IDSCS 27)**					**PL**
TLEs	EGO (-)	2018-12-30	23:03:11	2021760.00	-1727.400	-2052.400	-1402.400
3291	TEME	40436.966	0.0074590	1.5608	48.8156	82.4198	341.7342
D.796	**1966-053H**	**OPS 9317 (IDSCS 7)**					**PL**
TLEs	EGO (-)	2018-12-30	23:18:19	2047680.00	-1753.300	-2080.200	-1426.300
2221	TEME	40411.125	0.0073962	3.3049	60.7797	105.2648	331.6257
D.797	**1968-050G**	**OPS 9347 (IDSCS 26)**					**PL**
TLEs	EGO (-)	2018-12-30	17:03:31	2099520.00	-1795.000	-2053.900	-1536.100
3290	TEME	40369.414	0.0058754	1.6563	49.6353	83.6410	169.1369
D.798	**1966-053G**	**OPS 9316 (IDSCS 6)**					**PL**
TLEs	EGO (-)	2018-12-30	19:37:10	2142720.00	-1825.400	-2084.500	-1566.400
2220	TEME	40338.931	0.0058866	3.4088	60.1217	113.6981	344.1979
D.799	**1967-003H**	**OPS 9328 (IDSCS 15)**					**PL**
TLEs	EGO (-)	2018-12-30	23:07:34	2160000.00	-1843.800	-2119.700	-1567.900
2655	TEME	40320.547	0.0069298	2.9467	58.5866	333.0878	356.8652
D.800	**1968-050F**	**OPS 9346 (IDSCS 25)**					**PL**
TLEs	EGO (-)	2018-12-30	19:43:41	2177280.00	-1858.300	-2052.800	-1663.700
3289	TEME	40306.054	0.0043062	1.7887	51.8547	83.9330	7.0994

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.801	**1966-053F**	**OPS 9315 (IDSCS 5)**					**PL**
TLEs	EGO (-)	2018-12-28	15:05:31	2211840.00	-1886.100	-2090.700	-1681.400
2219	TEME	40278.018	0.0046896	3.5476	60.0150	123.5386	96.4118
D.802	**1969-013L**	**Transtage 17 fragmentation debris**					**RF**
TLEs	EGO (0.07)	2018-12-30	13:51:21	2211840.00	-1879.800	-5458.100	1698.500
43453	TEME	40282.834	0.0674810	6.1226	290.0639	144.8534	343.4242
D.803	**1968-050E**	**OPS 9345 (IDSCS 24)**					**PL**
TLEs	EGO (-)	2018-12-30	16:37:39	2237760.00	-1906.000	-2054.700	-1757.200
3288	TEME	40258.050	0.0031911	1.8490	51.8765	86.1751	79.0334
D.804	**1967-003G**	**OPS 9327 (IDSCS 14)**					**PL**
TLEs	EGO (-)	2018-12-30	15:07:04	2255040.00	-1914.200	-2132.700	-1695.700
2654	TEME	40250.065	0.0055036	3.0868	59.0294	342.9307	123.4576
D.805	**1966-053E**	**OPS 9314 (IDSCS 4)**					**PL**
TLEs	EGO (-)	2018-12-28	19:30:39	2272320.00	-1932.600	-2097.800	-1767.400
2218	TEME	40231.710	0.0038725	3.6037	59.4826	134.4201	12.3173
D.806	**1968-050D**	**OPS 9344 (IDSCS 23)**					**PL**
TLEs	EGO (-)	2018-12-30	19:54:37	2289600.00	-1946.300	-2053.700	-1839.000
3287	TEME	40217.762	0.0022077	1.9459	53.2630	89.3663	45.0145
D.807	**1966-053D**	**OPS 9313 (IDSCS 3)**					**PL**
TLEs	EGO (-)	2018-12-30	05:00:33	2324160.00	-1974.800	-2109.300	-1840.300
2217	TEME	40189.331	0.0032311	3.7166	59.4535	148.3034	245.5380
D.808	**1967-003F**	**OPS 9326 (IDSCS 13)**					**PL**
TLEs	EGO (-)	2018-12-26	17:02:23	2324160.00	-1973.400	-2149.600	-1797.200
2653	TEME	40190.811	0.0044008	3.1794	58.2340	356.0385	67.2696
D.809	**1968-050C**	**OPS 9343 (IDSCS 22)**					**PL**
TLEs	EGO (-)	2018-12-30	07:11:59	2324160.00	-1975.500	-2054.100	-1897.000
3286	TEME	40188.532	0.0015235	1.9984	53.6490	93.6863	269.1607
D.810	**1968-050B**	**OPS 9342 (IDSCS 21)**					**PL**
TLEs	EGO (-)	2018-12-30	18:13:22	2350080.00	-1990.800	-2055.100	-1926.500
3285	TEME	40173.257	0.0011782	2.0263	53.8359	98.3746	52.2722
D.811	**1966-053C**	**OPS 9312 (IDSCS 2)**					**PL**
TLEs	EGO (-)	2018-12-30	18:16:45	2358720.00	-1998.700	-2118.800	-1878.500
2216	TEME	40165.333	0.0030029	3.7608	59.2732	158.1580	64.0095
D.812	**1968-050A**	**OPS 9341 (IDSCS 20)**					**PL**
TLEs	EGO (-)	2018-12-30	10:23:03	2358720.00	-1999.600	-2056.700	-1942.400
3284	TEME	40164.615	0.0009972	2.0151	53.2340	99.5435	214.6218

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.813	**1966-053B**	**OPS 9311 (IDSCS 1)**					**PL**
TLEs	EGO (-)	2018-12-28	14:58:54	2376000.00	-2013.200	-2132.100	-1894.300
2215	TEME	40150.984	0.0028868	3.7856	59.1857	165.0935	97.2594
D.814	**1967-003E**	**OPS 9325 (IDSCS 12)**					**PL**
TLEs	EGO (-)	2018-12-29	15:19:56	2384640.00	-2021.600	-2175.900	-1867.300
2652	TEME	40142.517	0.0037627	3.2857	58.6602	10.7526	90.4445
D.815	**1966-053A**	**GGTS 1**					**PL**
TLEs	EGO (-)	2018-12-30	12:27:32	2393280.00	-2031.100	-2144.900	-1917.300
2207	TEME	40131.058	0.0029216	3.7920	58.7839	178.4910	287.9001
D.816	**1967-003D**	**OPS 9324 (IDSCS 11)**					**PL**
TLEs	EGO (-)	2018-12-30	11:12:32	2436480.00	-2061.800	-2205.400	-1918.100
2651	TEME	40102.474	0.0033792	3.3480	57.8843	27.4176	26.9618
D.817	**1967-003C**	**OPS 9323 (IDSCS 10)**					**PL**
TLEs	EGO (-)	2018-12-30	16:41:40	2471040.00	-2090.600	-2234.000	-1947.200
2650	TEME	40073.467	0.0032773	3.4012	57.7484	40.7971	92.7790
D.818	**1967-003B**	**OPS 9322 (IDSCS 9)**					**PL**
TLEs	EGO (-)	2018-12-30	06:13:20	2488320.00	-2105.400	-2251.200	-1959.600
2649	TEME	40058.815	0.0032938	3.4273	57.6741	47.6674	209.5150
D.819	**1967-003A**	**OPS 9321 (IDSCS 8)**					**PL**
TLEs	EGO (-)	2018-12-30	14:58:39	2505600.00	-2114.000	-2263.600	-1964.500
2645	TEME	40050.030	0.0033385	3.4580	58.2138	50.6630	94.1798
D.820	**1967-066G**	**Transtage 14 (Titan IIIC)**					**RB**
TLEs	EGO (-)	2018-12-30	16:49:49	2687040.00	-2258.800	-2563.300	-1954.300
2868	TEME	39905.390	0.0077103	4.2343	287.2572	296.1203	200.1762
D.821	**1967-066F**	**DODGE 1**					**PL**
TLEs	EGO (-)	2018-12-30	22:01:42	2764800.00	-2322.400	-2522.500	-2122.400
2867	TEME	39841.654	0.0053800	4.1238	285.8205	317.9212	62.5990
D.822	**1967-066E**	**LES 5**					**PL**
TLEs	EGO (-)	2018-12-30	15:22:54	2842560.00	-2383.800	-2590.600	-2177.000
2866	TEME	39779.389	0.0059009	3.9823	285.0107	336.3178	178.8413
D.823	**1967-066D**	**OPS 9334 (IDSCS 19, DATS)**					**PL**
TLEs	EGO (-)	2018-12-29	22:56:17	2911680.00	-2433.000	-2651.800	-2214.200
2865	TEME	39731.263	0.0060943	3.8842	284.2487	347.2342	342.7451
D.824	**1967-066C**	**OPS 9333 (IDSCS 18)**					**PL**
TLEs	EGO (-)	2018-12-28	07:16:27	2954880.00	-2472.100	-2710.400	-2233.700
2864	TEME	39691.993	0.0066307	3.8397	283.5020	355.9624	66.5146

D.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time	$\overline{\dot{\lambda}}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.825	**1967-066B**	**OPS 9332 (IDSCS 17)**					**PL**
TLEs	EGO (-)	2018-12-30	18:30:34	2989440.00	-2498.800	-2754.500	-2243.100
2863	TEME	39665.347	0.0070335	3.7418	283.2160	1.3570	112.2815
D.826	**1967-066A**	**OPS 9331 (IDSCS 16)**					**PL**
TLEs	EGO (-)	2018-12-30	20:10:50	3015360.00	-2512.800	-2775.000	-2250.700
2862	TEME	39651.249	0.0072030	3.7493	282.7896	4.0721	101.4898
D.827	**1992-006C**	**IABS (Atlas II)**					**RB**
vimpel	EGO (-)	2018-12-24	20:16:33	3265920.00	-2710.500	-5215.900	-205.000
129900	J2000	39453.700	0.0634900	10.8810	347.3280	17.0480	309.3824
D.828	**2014-082B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (-)	2018-12-30	12:15:43	3438720.00	-2841.200	-5266.300	-416.000
40346	TEME	39323.128	0.0610201	3.0819	83.8548	97.9014	160.6886
D.829	**2012-061D**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (0.11)	2018-12-30	04:35:57	3801600.00	-3109.800	-6210.400	-9.100
38980	TEME	39054.258	0.0782960	4.4728	61.5456	50.3543	253.8398
D.830	**2011-035D**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	EGO (-)	2018-12-30	19:53:37	3870720.00	-3162.300	-6025.400	-299.200
37751	TEME	39001.853	0.0754908	5.1174	58.0302	344.5044	40.5258
D.831	**1974-033F**	**SMS 1 AKM (SVM-5)**					**PM**
TLEs	EGO (-)	2018-12-30	17:21:05	4950720.00	-3943.400	-4928.500	-2958.200
9998	TEME	38221.190	0.0257736	1.8158	158.7044	236.8979	159.0106

4.5 Objects in a Libration Orbit around the Eastern Stable Point

The following list contains 127 objects in libration orbit around the Eastern stable point at longitude $75E$ (of which 1 is outdated), sorted according to the ascending order of the libration period (which is equivalent to the ascending order of the libration magnitude).

For explanation of symbols, see the definitions at the beginning of section 4.

L1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.1	**1993-039A**	**Galaxy IV**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:33:59	123.10	6.80	71.60	78.40
22694	TEME	42162.822	0.0015410	14.4358	17.4750	255.5870	73.1619
L1.2	**2000-036A**	**Cosmos-2371**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:53:53	123.25	9.70	70.10	79.80
26394	TEME	42162.117	0.0002694	12.3821	27.8744	296.8859	78.3257
L1.3	**1990-061A**	**Cosmos-2085**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:26:59	123.27	10.10	69.90	80.00
20693	TEME	42161.250	0.0004294	14.9256	358.9343	336.2746	77.0614
L1.4	**1988-066A**	**Cosmos-1961**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:08:06	123.28	10.40	69.80	80.20
19344	TEME	42165.128	0.0004135	14.5334	351.9290	359.9592	69.9356
L1.5	**1994-087A**	**Raduga 32**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:08:22	123.28	10.40	69.80	80.20
23448	TEME	42165.588	0.0008014	14.7184	13.3812	241.7117	70.4019
L1.6	**1984-022A**	**Cosmos-1540**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:47:26	123.30	10.80	69.60	80.40
14783	TEME	42167.460	0.0003954	14.5259	332.2315	223.5964	78.0313
L1.7	**1991-010A**	**Cosmos-2133**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:08:06	123.30	10.70	69.60	80.30
21111	TEME	42165.159	0.0000562	14.7454	4.7515	111.3971	69.7449
L1.8	**2008-033A**	**Cosmos-2440**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:18:23	123.30	10.70	69.60	80.30
33108	TEME	42166.545	0.0007736	5.5877	55.6476	210.7960	70.5757
L1.9	**1981-018A**	**Comstar 1D (D-4)**					**PL**
TLEs	GEO (1.00)	2018-12-30	10:30:35	123.33	11.20	69.40	80.60
12309	TEME	42161.702	0.0007231	13.5334	335.1709	347.5127	78.7119
L1.10	**1998-025A**	**Cosmos-2350**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:53:38	123.38	11.80	69.10	80.90
25315	TEME	42168.087	0.0001471	12.8179	24.2790	28.9073	77.7166
L1.11	**1993-062A**	**Raduga 30**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:01:12	123.40	12.10	68.90	81.00
22836	TEME	42165.273	0.0007813	14.9199	9.6421	288.2697	69.3324

L1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.12	**1990-051A**	**INSAT 1D**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:52:23	123.43	12.50	68.70	81.20
20643	TEME	42166.690	0.0010015	14.6188	16.5077	126.1325	69.4611
L1.13	**1984-031A**	**Cosmos-1546**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:25:51	123.47	13.00	68.50	81.50
14867	TEME	42160.536	0.0027055	13.4959	335.2722	311.1418	73.9205
L1.14	**1994-069A**	**Elektro 1**					**PL**
TLEs	GEO (0.94)	2018-12-30	13:01:41	123.57	14.20	67.80	82.10
23327	TEME	42169.086	0.0006787	15.0731	12.2297	231.6962	74.9524
L1.15	**1982-044A**	**Cosmos-1366**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:54:14	123.58	14.40	67.80	82.20
13177	TEME	42169.220	0.0008391	13.9479	326.6106	20.8187	74.0010
L1.16	**1983-028A**	**Raduga 12**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:47:33	124.13	19.90	65.00	84.90
13974	TEME	42158.387	0.0005200	13.3745	331.4692	339.5081	78.4068
L1.17	**1981-102A**	**Raduga 10**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:48:41	124.23	20.80	64.60	85.30
12897	TEME	42169.093	0.0000361	12.5531	322.8399	145.2591	82.8825
L1.18	**1979-035A**	**Raduga 5**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:46:18	124.30	21.30	64.30	85.60
11343	TEME	42171.492	0.0002088	11.6117	314.7195	50.0025	74.2142
L1.19	**1975-123A**	**Raduga 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:45:10	124.33	21.60	64.10	85.70
8513	TEME	42158.221	0.0003299	9.4376	305.3146	224.5916	70.6281
L1.20	**1970-046A**	**OPS 5346 (Rhyolite 1)**					**PL**
vimpel	GEO (1.00)	2018-12-25	08:28:45	124.40	22.00	63.90	85.90
143525	J2000	42173.600	0.0000570	4.4410	294.2650	201.8760	72.6683
L1.21	**1984-016A**	**Raduga 14**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:47:11	124.55	23.10	63.40	86.50
14725	TEME	42172.018	0.0002792	13.4383	334.6987	358.5761	76.8393
L1.22	**1976-092A**	**Raduga 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:06:18	124.57	23.30	63.30	86.60
9416	TEME	42163.624	0.0030942	10.0715	307.1454	321.7122	86.2736
L1.23	**2006-053D**	**Fengyun 2D operational debris (S-VISSR radiometre cover)**					**PM**
TLEs	EGO (0.45)	2018-12-30	14:55:46	124.73	24.50	62.70	87.20
33458	TEME	42159.912	0.0072919	6.8898	55.2372	322.4652	84.5032

L1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.24	**1988-014A**	**DFH-2A 2 (Chinasat 1, Zhongxing 1, ZX 1, STTW 2)**					**PL**
TLEs	GEO (0.93)	2018-12-30	12:35:13	125.28	28.00	60.90	88.90
18922	TEME	42173.564	0.0002811	15.1054	2.3848	36.4394	74.6801
L1.25	**1999-042A**	**Telkom 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:56:50	125.33	28.10	60.90	88.90
25880	TEME	42158.178	0.0025399	1.0562	93.1845	187.2644	66.6257
L1.26	**1979-062A**	**Gorizont 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:02:29	125.70	30.40	59.70	90.10
11440	TEME	42154.837	0.0006713	11.9448	316.9612	308.8323	77.3071
L1.27	**2008-033D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	16:40:39	125.87	31.20	59.30	90.50
33111	TEME	42167.876	0.0034616	5.5574	55.7531	269.4463	90.1254
L1.28	**2003-053B**	**Yamal 200 N1 (Yamal 201)**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:47:26	126.08	32.40	58.70	91.00
28094	TEME	42175.818	0.0005742	3.4511	77.1282	270.7492	78.3260
L1.29	**1983-118F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	EGO (0.91)	2018-12-30	21:48:03	126.45	34.20	57.80	91.90
14548	TEME	42154.266	0.0046953	13.3994	334.7583	278.4759	80.1831
L1.30	**1997-070A**	**Kupon 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:38:20	126.57	34.70	57.50	92.20
25045	TEME	42161.312	0.0007826	14.4847	17.0100	278.8827	58.4438
L1.31	**1988-063A**	**INSAT 1C**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:54:39	127.30	38.00	55.80	93.80
19330	TEME	42152.283	0.0003827	14.5903	350.3509	15.1677	74.6201
L1.32	**1985-102A**	**Cosmos-1700**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:24:28	127.57	39.10	55.20	94.40
16199	TEME	42176.310	0.0001487	13.9008	341.6179	224.7898	68.5425
L1.33	**1990-112A**	**Raduga 26**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:32:23	128.73	43.70	52.90	96.60
21016	TEME	42162.442	0.0006019	14.9206	0.3022	358.3129	96.8181
L1.34	**1990-054A**	**Gorizont 20**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:03:31	128.78	43.90	52.80	96.70
20659	TEME	42177.499	0.0002649	14.9767	358.6456	198.7445	67.2907
L1.35	**1984-041A**	**Gorizont 9**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:25:17	128.85	44.10	52.70	96.80
14940	TEME	42167.605	0.0004188	13.4995	335.9274	257.8516	53.3509

L1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.36	**1976-092F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	GEO (1.00)	2018-12-30	20:05:18	128.93	44.40	52.60	96.90
17872	TEME	42151.252	0.0014078	10.0520	307.3230	104.6174	82.6460
L1.37	**1979-087A**	**Ekran 4**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:22:42	128.97	44.60	52.40	97.10
11561	TEME	42162.509	0.0004910	11.8392	316.2447	27.3243	52.7508
L1.38	**1976-107A**	**Ekran 1**					**PL**
TLEs	EGO (0.56)	2018-12-30	21:46:18	129.00	44.60	52.50	97.00
9503	TEME	42150.259	0.0061512	10.1556	307.4669	101.1425	74.2208
L1.39	**1987-096A**	**Cosmos-1897**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:24:50	129.12	45.00	52.20	97.30
18575	TEME	42173.267	0.0006499	14.4009	349.2290	6.9548	57.3050
L1.40	**2018-050D**	**Fengyun 2H operational debris (imager cover)**					**PM**
vimpel	GEO (1.00)	2018-12-25	06:58:57	129.23	45.30	52.10	97.40
143581	J2000	42178.900	0.0029520	1.8070	285.5830	336.2790	86.1977
L1.41	**1980-104A**	**Ekran 6**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:09:12	129.38	46.00	51.70	97.70
12120	TEME	42170.191	0.0010461	12.2740	320.0208	350.4743	96.2020
L1.42	**1990-011A**	**DFH-2A 4 (Chinasat 3, Zhongxing 3, ZX 3, STTW 4)**					**PL**
TLEs	GEO (0.92)	2018-12-30	14:46:21	129.38	46.00	51.80	97.70
20473	TEME	42162.876	0.0003134	15.1308	9.2998	356.3705	51.8745
L1.43	**2003-060D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	GEO (1.00)	2018-12-30	13:14:23	129.98	48.00	50.70	98.70
28139	TEME	42175.443	0.0014890	11.2299	33.1690	180.8747	91.5956
L1.44	**1992-074A**	**Ekran-M 20**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:11:15	130.25	48.90	50.30	99.10
22210	TEME	42179.477	0.0001249	14.9594	6.7735	285.8539	80.8134
L1.45	**1984-016F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	GEO (1.00)	2018-12-30	23:29:33	130.33	49.10	50.10	99.30
17874	TEME	42180.064	0.0033509	13.4346	334.7674	154.9743	73.9344
L1.46	**1977-092A**	**Ekran 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:22:42	130.43	49.40	50.00	99.40
10365	TEME	42152.733	0.0041908	10.7462	310.0219	301.3776	58.9998
L1.47	**2014-090D**	**Fengyun 2G operational debris (imager cover)**					**PM**
vimpel	EGO (0.24)	2018-12-31	18:05:41	130.55	50.00	49.70	99.70
143664	J2000	42153.500	0.0127910	0.9550	102.5730	180.2070	92.6342

L1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.48	**1979-015A**	**Ekran 3**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:22:42	130.70	50.30	49.50	99.80
11273	TEME	42176.370	0.0040768	11.4635	314.1321	298.2589	58.2021
L1.49	**1977-038A**	**OPS 9751 (CANYON 7)**					**PL**
vimpel	EGO (0.02)	2018-12-25	13:13:03	130.90	50.80	49.30	100.10
143620	J2000	42157.000	0.1250770	10.9670	343.4950	70.6310	50.7287
L1.50	**1981-061A**	**Ekran 7**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:26:55	130.92	50.90	49.20	100.10
12564	TEME	42149.814	0.0007872	12.4552	321.6705	348.9782	65.1469
L1.51	**1990-116A**	**Raduga 1-2**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:29:22	131.12	51.60	48.90	100.40
21038	TEME	42149.735	0.0005686	14.9555	0.4056	18.4456	85.6862
L1.52	**1994-008A**	**Raduga 1-3**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:46:36	131.22	51.80	48.70	100.60
22981	TEME	42172.606	0.0004152	14.9270	10.8265	304.4718	52.5723
L1.53	**1985-102G**	**Cosmos-1700 debris**					**PD**
TLEs	GEO (1.00)	2018-12-30	21:40:02	131.72	53.40	47.90	101.30
40924	TEME	42167.508	0.0022872	13.8893	341.5435	40.2267	101.4757
L1.54	**1983-100A**	**Ekran 11**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:53:20	132.02	54.20	47.50	101.70
14377	TEME	42155.160	0.0005540	13.0791	329.7673	314.6353	52.5685
L1.55	**UI044**	**—**					**—**
vimpel	GEO (1.00)	2018-12-31	08:15:40	132.18	54.60	47.30	101.90
143500	J2000	42166.500	0.0042290	12.6960	325.9590	23.6940	101.9282
L1.56	**1986-010A**	**DFH-2A 1 (STTW 1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:25:38	132.77	56.30	46.50	102.70
16526	TEME	42149.437	0.0004189	14.3261	346.2615	296.7396	89.1459
L1.57	**1996-058A**	**Ekspress 2 (Ekspress 12L)**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:40:03	132.85	56.50	46.40	102.80
24435	TEME	42160.430	0.0013152	14.5317	16.8128	299.0138	47.4927
L1.58	**2001-045D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	21:53:00	133.28	57.60	45.80	103.40
26939	TEME	42163.366	0.0029611	11.7161	32.2742	314.7143	103.5771
L1.59	**2005-010F**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	GEO (1.00)	2018-12-30	13:16:54	133.67	58.60	45.20	103.90
28634	TEME	42173.240	0.0023634	10.2816	36.9914	214.5317	100.5833

L1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.60	**1982-093A**	**Ekran 9**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:49:19	134.32	60.20	44.40	104.70
13554	TEME	42147.084	0.0028881	12.6950	325.9691	304.2571	84.9849
L1.61	**1989-098A**	**Raduga 24**					**PL**
TLEs	GEO (0.95)	2018-12-30	16:41:58	134.45	60.60	44.20	104.80
20367	TEME	42148.184	0.0004510	15.0574	356.6842	295.6346	60.6744
L1.62	**1994-012A**	**Raduga 31**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:34:39	134.65	61.10	44.00	105.10
23010	TEME	42168.974	0.0004062	14.8959	10.7939	336.8500	104.6731
L1.63	**2000-049A**	**Raduga 1-5**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:09:37	134.90	61.70	43.70	105.40
26477	TEME	42152.455	0.0004740	12.2894	28.4154	307.1539	98.3874
L1.64	**2004-042D**	**Fengyun 2C operational debris (S-VISSR radiometre cover)**					**PM**
TLEs	EGO (0.50)	2018-12-30	16:27:01	135.18	62.20	43.40	105.60
40000	TEME	42177.294	0.0067153	9.8373	37.3911	4.5473	51.5587
L1.65	**UU064**	**Fengyun 2B debris (VISSR cover?)**					**PM**
vimpel	GEO (1.00)	2018-12-25	14:31:55	135.23	62.40	43.30	105.70
143556	J2000	42183.300	0.0031530	12.9910	27.7530	342.9020	75.3160
L1.66	**1997-029D**	**Fengyun 2A operational debris (S-VISSR radiometre cover)**					**PM**
vimpel	EGO (0.21)	2018-12-31	15:09:17	135.42	62.90	43.10	105.90
143538	J2000	42154.400	0.0144100	14.5060	19.8240	312.0010	52.1059
L1.67	**1980-016A**	**Raduga 6**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:11:27	136.72	65.90	41.50	107.40
11708	TEME	42173.168	0.0003061	11.9024	317.2895	305.5857	104.2991
L1.68	**1974-060A**	**Molniya 1-S**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:45:42	137.13	66.80	41.00	107.80
7392	TEME	42147.992	0.0006020	8.0680	300.5897	180.7486	56.3278
L1.69	**2007-018A**	**NigComSat 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:01:40	137.25	67.00	40.90	107.90
31395	TEME	42156.654	0.0001310	7.5279	50.1173	14.0760	105.2188
L1.70	**1978-039A**	**Yuri 1 (BSE)**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:23:30	137.50	67.50	40.60	108.20
10792	TEME	42177.591	0.0017164	11.7440	315.7023	259.6854	100.2833
L1.71	**1986-044A**	**Gorizont 12**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:05:43	138.57	69.70	39.50	109.20
16769	TEME	42145.167	0.0006169	14.0236	343.7074	294.1081	61.6507

L1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.72	**1979-105A**	**Gorizont 3**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:11:42	138.65	69.90	39.40	109.30
11648	TEME	42174.822	0.0009134	12.0685	318.1801	192.5639	104.8833
L1.73	**1978-073A**	**Raduga 4**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:44:00	140.45	73.40	37.60	111.00
10987	TEME	42159.275	0.0013570	11.2096	312.3859	324.9751	109.9517
L1.74	**1988-111A**	**DFH-2A 3 (Chinasat 2, Zhongxing 2, ZX 2, STTW 3)**					**PL**
TLEs	GEO (0.92)	2018-12-30	12:43:42	140.83	74.10	37.20	111.30
19710	TEME	42186.625	0.0002199	15.1343	8.4486	31.3916	78.8924
L1.75	**UI041**	**—**					**—**
vimpel	EGO (0.63)	2018-12-31	09:31:51	140.88	74.20	37.20	111.40
143624	J2000	42186.100	0.0057370	12.4510	326.6420	307.8210	83.5132
L1.76	**1975-097A**	**Cosmos-775**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:33:25	143.18	78.30	35.00	113.30
8357	TEME	42187.548	0.0010195	9.0299	303.3389	73.7575	66.9816
L1.77	**1989-081A**	**Gorizont 19**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:02:44	143.33	78.60	34.90	113.50
20263	TEME	42181.936	0.0006745	14.7021	355.7407	275.7013	99.6430
L1.78	**2012-002D**	**Fengyun 2F operational debris (S-VISSR radiometre cover)**					**PM**
vimpel	EGO (0.19)	2018-12-31	15:48:42	143.33	78.90	34.70	113.60
143545	J2000	42147.100	0.0162450	2.9910	77.5870	221.5720	99.9878
L1.79	**1999-010A**	**Raduga 1-4**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:36:54	143.35	78.60	34.90	113.50
25642	TEME	42169.948	0.0006186	14.5677	25.4023	256.9474	112.6807
L1.80	**1981-069A**	**Raduga 9**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:10:34	143.87	79.50	34.40	113.90
12618	TEME	42181.720	0.0003720	12.4934	322.0406	1.1074	100.8406
L1.81	**1977-071A**	**Raduga 3**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:15:48	143.88	79.50	34.40	113.90
10159	TEME	42155.416	0.0006466	10.6477	309.4360	230.4482	38.4338
L1.82	**1996-058D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	GEO (1.00)	2018-12-30	17:10:08	144.67	80.80	33.70	114.50
24438	TEME	42169.267	0.0008266	14.7626	13.6327	22.2176	34.5191
L1.83	**1994-002A**	**Gals 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:26:48	144.97	81.30	33.50	114.80
22963	TEME	42150.711	0.0006305	14.5588	16.3312	176.9583	42.3394

L1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.84	**1984-078F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	GEO (1.00)	2018-12-30	20:12:50	146.98	84.50	31.80	116.20
15181	TEME	42150.625	0.0018921	13.6061	337.2071	138.0490	108.5724
L1.85	**1991-087A**	**Raduga 28**					**PL**
TLEs	GEO (0.95)	2018-12-30	13:57:23	148.35	86.60	30.60	117.30
21821	TEME	42142.415	0.0002369	15.0414	3.6873	14.9686	55.2311
L1.86	**1997-071B**	**Cakrawatra 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:12:36	148.85	87.10	30.40	117.50
25050	TEME	42154.285	0.0006771	9.9383	38.3410	266.5599	35.6918
L1.87	**2001-037D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	14:50:52	149.17	87.50	30.20	117.70
26895	TEME	42189.492	0.0021182	10.8740	33.2531	2.1536	67.5190
L1.88	**1989-030A**	**Raduga 23**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:31:23	150.98	90.20	28.80	118.90
19928	TEME	42187.653	0.0015108	14.6090	354.1970	131.7686	93.1644
L1.89	**1982-031A**	**INSAT 1A**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:33:50	153.18	93.10	27.20	120.30
13129	TEME	42159.879	0.0022625	12.7935	325.4375	337.8051	119.7242
L1.90	**1974-060F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	GEO (1.00)	2018-12-30	18:27:14	154.30	94.50	26.50	120.90
20836	TEME	42175.302	0.0015080	8.0480	300.3129	127.0928	116.7098
L1.91	**1990-061D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	22:02:44	156.17	96.70	25.30	122.00
20696	TEME	42187.294	0.0028563	14.8997	358.8549	146.0921	99.0703
L1.92	**2008-066D**	**Fengyun 2E operational debris (S-VISSR radiometre cover)**					**PM**
TLEs	EGO (0.24)	2018-12-30	15:37:03	157.47	98.50	24.30	122.80
40987	TEME	42136.552	0.0129444	4.8737	59.0899	277.6206	85.6562
L1.93	**1997-021A**	**DFH 3-2 (Chinasat 6, Zhongxing 6, ZX 6)**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:30:46	164.75	105.90	20.30	126.20
24798	TEME	42179.207	0.0004928	11.1685	33.2055	4.7079	30.7129
L1.94	**1986-090D**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	GEO (1.00)	2018-12-30	14:06:45	167.18	108.20	19.00	127.30
17125	TEME	42182.434	0.0006222	14.1489	345.3196	86.3785	34.6674
L1.95	**2002-051A**	**Eutelsat 33B (Eutelsat 25C, Eutelsat 70A, Eutelsat W5)**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:24:03	169.27	110.20	18.00	128.10
27554	TEME	42135.027	0.0015765	2.5880	83.8503	240.8949	83.3139

L1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.96	**1991-014A**	**Raduga 27**					**PL**
TLEs	GEO (0.84)	2018-12-30	21:44:00	169.58	110.40	17.80	128.30
21132	TEME	42194.242	0.0004893	15.4746	0.4196	327.6869	74.5876
L1.97	**2009-018A**	**Beidou DW 2**					**PL**
TLEs	EGO (0.29)	2018-12-30	16:57:04	170.48	111.20	17.40	128.60
34779	TEME	42135.953	0.0107029	6.3031	56.4312	213.8555	62.9810
L1.98	**1984-063A**	**Raduga 15**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:58:11	171.27	111.90	17.00	128.90
15057	TEME	42145.552	0.0001336	13.5205	335.6714	6.3944	34.8431
L1.99	**2011-074A**	**AMOS 5**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:48:43	171.48	112.10	16.90	129.00
37950	TEME	42152.628	0.0003473	2.3930	85.0767	243.5127	24.5842
L1.100	**2004-010A**	**Raduga 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:55:16	171.78	112.30	16.80	129.10
28194	TEME	42134.678	0.0005377	10.4647	41.2413	242.9832	83.1364
L1.101	**1996-040B**	**Turksat 1C**					**PL**
TLEs	GEO (1.00)	2018-12-30	16:33:22	172.43	112.90	16.50	129.30
23949	TEME	42194.367	0.0004447	7.9856	47.4285	182.0069	64.6330
L1.102	**1977-092H**	**Ekran 2 fragmentation debris**					**PF**
TLEs	GEO (1.00)	2018-12-30	18:30:28	173.08	113.40	16.20	129.60
11581	TEME	42181.566	0.0002895	10.6591	309.7061	206.4810	117.6106
L1.103	**1983-089B**	**INSAT 1B**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:04:05	177.68	117.00	14.20	131.20
14318	TEME	42136.210	0.0007595	14.5171	349.6631	214.2431	55.7924
L1.104	**2003-015F**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	19:46:12	178.00	117.20	14.00	131.30
27780	TEME	42158.860	0.0013406	9.7214	38.1820	318.3148	16.1583
L1.105	**2001-037A**	**Cosmos-2379**					**PL**
TLEs	GEO (1.00)	2018-12-30	18:38:01	182.45	120.40	12.20	132.70
26892	TEME	42158.549	0.0004627	10.9041	33.0817	228.0243	14.4163
L1.106	**1995-054D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	13:15:46	183.17	121.00	11.90	132.90
23683	TEME	42136.326	0.0019912	14.3205	21.9584	16.0434	96.9295
L1.107	**1977-108A**	**Meteosat 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:02:29	186.43	123.10	10.70	133.80
10489	TEME	42196.378	0.0015861	11.4287	313.9469	8.4763	77.0585

L1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.108	**1993-013A**	**Raduga 29**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:14:40	186.77	123.30	10.60	133.90
22557	TEME	42163.900	0.0003421	14.9927	7.8033	5.8290	10.0459
L1.109	**1988-095A**	**Raduga 22**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:18:12	188.82	124.60	9.80	134.40
19596	TEME	42157.023	0.0001853	14.5634	352.4936	6.9465	132.8739
L1.110	**1984-035A**	**DFH-2 2 (STTW T2)**					**PL**
TLEs	GEO (1.00)	2018-12-29	23:19:16	189.03	124.70	9.70	134.50
14899	TEME	42133.574	0.0004750	13.7420	340.6791	99.5457	62.9404
L1.111	**2007-054A**	**USA 197 (DSP F23, DSP Block 5(DSP-1) F23)**					**PL**
vimpel	GEO (1.00)	2018-12-31	18:15:52	191.75	126.40	8.80	135.20
143706	J2000	42136.500	0.0004320	5.2600	69.0380	228.4100	54.5464
L1.112	**1995-063D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	17:15:51	194.05	127.70	8.00	135.70
23720	TEME	42180.849	0.0037576	14.9106	10.8687	118.9164	23.4347
L1.113	**1998-029B**	**Centaur-T (Titan IVB Centaur-T)**					**RB**
vimpel	EGO (0.85)	2018-12-31	11:37:54	207.23	134.20	4.00	138.30
143601	J2000	42132.000	0.0044600	10.1420	350.0680	116.0470	75.1404
L1.114	**1990-102A**	**Gorizont 22**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:24:54	216.25	137.90	1.70	139.60
20953	TEME	42164.342	0.0008001	14.8844	359.7282	305.7273	141.0843
L1.115	**1974-094A**	**Skynet 2B**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:11:12	225.38	141.00	359.60	140.60
7547	TEME	42135.949	0.0003549	9.9999	311.2207	6.5821	103.0814
L1.116	**1978-035A**	**Intelsat IVA F-6**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:15:13	232.35	143.10	358.20	141.30
10778	TEME	42187.058	0.0008143	13.5577	335.7040	277.3537	117.4155
L1.117	**1970-032A**	**Intelsat III F-7**					**PL**
TLEs	GEO (1.00)	2018-12-30	03:29:46	238.20	144.60	357.20	141.70
4376	TEME	42170.195	0.0006344	4.4262	290.9102	355.9373	140.1621
L1.118	**1993-062D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	20:24:08	253.42	147.70	354.80	142.50
22839	TEME	42164.074	0.0012041	14.8857	9.4587	357.0178	143.9204
L1.119	**1992-088A**	**Cosmos-2224**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:58:17	270.65	150.10	352.90	143.00
22269	TEME	42171.269	0.0006778	14.4808	9.8393	258.1900	0.4238

L1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.120	**1967-026A**	**Intelsat II F-3**					**PL**
TLEs	GEO (1.00)	2018-12-30	21:58:21	281.18	151.20	352.00	143.20
2717	TEME	42188.300	0.0023170	2.6480	303.4890	306.9912	116.3228
L1.121^{m}	**1973-013A**	**OPS 6063 (Rhyolite 2)**					**PL**
vimpel	GEO (1.00)	2018-12-31	08:22:42	738.00	3.50	73.00	76.50
143622	J2000	42165.900	0.0017920	6.9610	300.1080	196.8070	74.3140
L1.122^{m}	**1995-054A**	**Luch 1-1**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:05:08	740.00	5.00	72.50	77.50
23680	TEME	42162.873	0.0004042	14.3364	22.0452	19.6844	74.4997
L1.123^{m}	**1977-080A**	**SIRIO 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:32:34	750.00	1.50	74.40	75.90
10294	TEME	42164.414	0.0006419	12.8460	325.9090	54.0518	74.4206
L1.124$_{o}$	**—**	**Fengyun 2G debris (VISSR cover?)**					**PM**
KIAM	EGO (0.28)	2018-01-01	00:00:00	788.95	52.45	48.43	100.87
UU074	J2000	42173.496	0.0111738	0.1821	143.6814	130.0857	53.3570
L1.125^{m}	**1975-055A**	**OPS 4966 (CANYON 6)**					**PL**
vimpel	EGO (0.01)	2018-12-31	10:00:15	939.62	97.53	24.84	122.37
143506	J2000	42191.100	0.1348770	17.0000	298.3060	336.7050	48.2578
L1.126^{m}	**1972-101A**	**OPS 9390 (CANYON 5)**					**PL**
vimpel	EGO (0.01)	2018-12-24	12:19:54	1298.65	137.87	1.71	139.58
143703	J2000	42153.500	0.1390290	15.5790	292.7490	12.2610	14.5922
L1.127^{m}	**1985-035B**	**Telecom 1B**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:41:27	1677.99	151.04	352.10	143.14
15678	TEME	42180.075	0.0006207	14.1124	343.8573	315.7587	195.4798

4.6 Objects in a Libration Orbit around the Western Stable Point

The following list contains 46 objects in libration orbit around the Western stable point at longitude $105W$, sorted according to the ascending order of the libration period (which is equivalent to the ascending order of the libration magnitude).

For explanation of symbols, see the definitions at the beginning of section 4.

L2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L2.1	**1993-073A**	**Solidaridad 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	03:45:59	151.37	8.00	250.80	258.80
22911	TEME	42162.730	0.0006398	13.3600	23.8379	238.4891	256.7656
L2.2	**1970-021A**	**NATO I**					**PL**
TLEs	GEO (1.00)	2018-12-30	07:47:50	151.45	10.20	249.80	259.90
4353	TEME	42162.031	0.0003103	6.9461	303.8109	326.3760	255.5592
L2.3	**1971-095A**	**OPS 9431 (DSCS II F-1, DSCS 2-1, DSCS II A-1)**					**PL**
TLEs	GEO (1.00)	2018-12-30	09:12:30	151.60	13.20	248.30	261.40
5587	TEME	42166.448	0.0005604	8.2797	301.2938	315.5190	260.3921
L2.4	**1993-077A**	**Telstar 401**					**PL**
TLEs	GEO (1.00)	2018-12-30	01:24:40	151.80	16.10	246.80	262.90
22927	TEME	42160.166	0.0005013	14.8564	13.6082	25.9490	254.0034
L2.5	**1995-049A**	**Telstar 4 (Telstar 402R)**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:05:46	153.57	32.00	239.00	271.00
23670	TEME	42166.345	0.0007435	11.3784	32.2005	267.8410	270.5171
L2.6	**1985-076C**	**ASC 1**					**PL**
TLEs	GEO (0.91)	2018-12-30	22:43:57	156.12	45.90	232.30	278.10
15994	TEME	42158.415	0.0009912	15.1703	6.2438	323.9745	274.8622
L2.7	**1976-004F**	**Hermes (CTS) operational debris (solar array cover)**					**PM**
TLEs	EGO (0.17)	2018-12-29	20:12:26	156.30	46.70	231.90	278.60
39689	TEME	42176.741	0.0178082	9.8947	306.1099	341.8921	264.8367
L2.8	**1975-100A**	**GOES 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	11:33:40	156.72	48.50	231.00	279.50
8366	TEME	42157.847	0.0006427	11.0580	311.6930	321.6566	234.6285
L2.9	**1976-004E**	**Hermes (CTS) operational debris (solar array cover)**					**PM**
TLEs	GEO (1.00)	2018-12-30	07:11:51	156.83	49.00	230.80	279.70
39688	TEME	42154.367	0.0017081	9.8637	305.7638	101.3627	269.0467
L2.10	**1983-041A**	**GOES 6**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:58:39	159.70	59.50	225.70	285.20
14050	TEME	42157.945	0.0003245	14.1429	344.0630	309.5190	228.2819
L2.11	**1995-069A**	**Galaxy IIIR**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:08:54	160.28	61.50	224.80	286.20
23741	TEME	42156.981	0.0006030	10.6847	35.1629	277.2660	281.9340

L2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L2.12	**UI139**	**—**					**—**
vimpel	EGO (0.85)	2018-12-31	23:10:44	161.28	64.60	223.20	287.90
143623	J2000	42179.900	0.0045400	15.0780	0.1870	224.0870	271.7769
L2.13	**1977-007C**	**Transtage 23 (Titan IIIC)**					**RB**
vimpel	GEO (1.00)	2018-12-31	18:11:14	164.35	73.20	219.10	292.40
143602	J2000	42160.600	0.0019180	9.9310	306.7240	332.2340	293.3939
L2.14	**1981-049A**	**GOES 5**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:51:34	165.32	75.30	218.10	293.50
12472	TEME	42156.628	0.0005900	13.8207	339.1047	301.6941	221.3693
L2.15	**1976-004A**	**Hermes (CTS)**					**PL**
TLEs	GEO (1.00)	2018-12-30	10:26:34	167.10	79.50	216.20	295.60
8585	TEME	42151.132	0.0011242	10.4859	308.6736	209.6243	226.9160
L2.16	**1996-055A**	**EchoStar 2**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:48:09	171.42	88.30	212.00	300.30
24313	TEME	42185.602	0.0006526	7.7504	48.8725	345.5721	267.0692
L2.17	**1968-081D**	**LES 6**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:24:51	172.30	90.10	211.20	301.30
3431	TEME	42163.943	0.0013286	5.4579	308.5965	346.4278	301.8749
L2.18	**1987-100A**	**Raduga 21**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:54:28	182.42	105.80	203.90	309.70
18631	TEME	42186.432	0.0003237	14.7935	348.7203	325.6850	231.3480
L2.19	**1981-107A**	**OPS 4029 (VORTEX 3)**					**PL**
vimpel	EGO (0.03)	2018-12-25	02:12:32	185.40	109.30	202.30	311.60
143505	J2000	42187.000	0.0890860	7.2320	352.7110	340.1170	225.2260
L2.20	**1965-028A**	**Intelsat I F-1 (Early Bird)**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:24:28	186.38	110.90	201.60	312.50
1317	TEME	42150.279	0.0002687	0.8441	56.7046	159.3931	300.3206
L2.21	**1970-069A**	**OPS 7329 (CANYON 3)**					**PL**
vimpel	EGO (0.03)	2018-12-31	13:38:38	194.85	120.50	197.20	317.70
143405	J2000	42141.200	0.0865850	11.9840	236.9740	355.3570	292.6804
L2.22	**1997-086A**	**HGS-1**					**PL**
TLEs	EGO (0.89)	2018-12-30	10:50:48	212.62	134.90	191.00	325.90
25126	TEME	42149.959	0.0047037	8.7433	53.4545	332.9409	311.4473
L2.23	**1984-078A**	**Gorizont 10**					**PL**
TLEs	GEO (1.00)	2018-12-30	13:14:34	216.47	137.50	189.90	327.40
15144	TEME	42183.981	0.0005690	13.5503	336.9222	315.4880	209.3872

L2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L2.24	**1990-016A**	**Raduga 25**					**PL**
TLEs	GEO (1.00)	2018-12-30	22:47:51	219.50	139.40	189.10	328.50
20499	TEME	42189.375	0.0003571	14.7912	357.1496	303.3380	289.0372
L2.25	**1967-094A**	**Intelsat II F-4**					**PL**
TLEs	GEO (1.00)	2018-12-30	06:25:14	219.58	139.40	189.10	328.50
2969	TEME	42134.549	0.0012356	2.6547	293.9186	258.2187	248.8485
L2.26	**1982-103A**	**Gorizont 6**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:21:25	222.30	141.00	188.50	329.40
13624	TEME	42160.599	0.0003309	12.8162	327.6899	317.3216	188.7924
L2.27	**1985-070A**	**Raduga 16**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:31:51	224.28	142.10	188.00	330.10
15946	TEME	42157.453	0.0004304	13.7833	339.9487	308.5045	190.2910
L2.28	**1980-081A**	**Raduga 7**					**PL**
TLEs	GEO (1.00)	2018-12-30	04:15:42	237.82	148.70	185.50	334.20
12003	TEME	42166.118	0.0011197	12.0403	318.9700	262.8071	334.4090
L2.29	**1994-038A**	**Cosmos-2282**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:37:28	246.42	152.00	184.40	336.30
23168	TEME	42136.037	0.0007738	14.1139	14.2519	12.8376	229.9463
L2.30	**1985-016A**	**Cosmos-1629**					**PL**
TLEs	GEO (1.00)	2018-12-29	20:56:49	246.97	152.20	184.30	336.50
15574	TEME	42137.664	0.0003091	13.6956	338.0358	235.8977	287.2265
L2.31	**1992-059A**	**Cosmos-2209**					**PL**
TLEs	GEO (0.95)	2018-12-30	16:53:14	248.82	152.80	184.10	336.90
22112	TEME	42181.097	0.0013359	15.0506	5.4317	271.4470	199.2808
L2.32	**1980-004A**	**OPS 6393 (FLTSATCOM F3)**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:24:02	255.30	154.80	183.40	338.30
11669	TEME	42164.435	0.0021768	11.5054	327.6219	179.2190	182.9276
L2.33	**1987-091A**	**Cosmos-1894**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:33:19	262.73	156.90	182.80	339.70
18443	TEME	42177.336	0.0007088	14.2711	347.9896	312.8716	192.1445
L2.34	**1989-101A**	**Cosmos-2054**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:31:30	263.92	157.20	182.70	339.90
20391	TEME	42152.291	0.0004720	14.7672	356.6812	314.4715	324.7669
L2.35	**1995-045A**	**Cosmos-2319**					**PL**
TLEs	GEO (1.00)	2018-12-30	09:03:15	302.02	163.40	181.30	344.70
23653	TEME	42177.066	0.0005123	14.5302	15.1624	233.1713	325.2717

L2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L2.36	**1994-082A**	**Luch 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:27:51	303.40	163.50	181.30	344.80
23426	TEME	42165.032	0.0001347	14.6524	17.4925	255.0609	346.3491
L2.37^m	**1985-035A**	**GStar 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	01:57:25	800.00	0.30	254.50	254.80
15677	TEME	42164.489	0.0006995	15.0001	11.5554	343.7134	254.5118
L2.38^m	**1988-081A**	**GStar 3**					**PL**
TLEs	GEO (0.90)	2018-12-30	06:59:18	850.00	0.30	254.50	254.80
19483	TEME	42164.480	0.0001560	15.1980	343.6719	80.8554	254.6173
L2.39^m	**1993-058B**	**ACTS**					**PL**
TLEs	GEO (1.00)	2018-12-30	14:01:00	890.00	1.20	254.10	255.30
22796	TEME	42164.397	0.0032152	14.3838	17.9503	6.1491	253.9678
L2.40^m	**1971-009A**	**NATO IIB**					**PL**
TLEs	GEO (1.00)	2018-12-30	10:04:42	900.00	0.90	254.20	255.10
4902	TEME	42164.625	0.0002390	7.8354	299.9505	47.0572	255.2173
L2.41^m	**1969-101A**	**Skynet 1A**					**PL**
TLEs	GEO (1.00)	2018-12-30	08:51:36	910.00	4.10	252.60	256.70
4250	TEME	42165.367	0.0021571	6.2690	299.8866	258.3314	256.3176
L2.42^m	**1976-023A**	**LES 8**					**PL**
TLEs	GEO (0.69)	2018-12-30	10:07:45	912.00	5.70	252.00	257.70
8746	TEME	42165.989	0.0020799	16.9823	73.7100	58.4206	253.9146
L2.43^m	**1976-023B**	**LES 9**					**PL**
TLEs	GEO (0.70)	2018-12-30	05:24:57	920.00	5.00	252.50	257.50
8747	TEME	42165.275	0.0020105	16.9431	73.7075	106.2743	256.7630
L2.44^m	**1967-111A**	**ATS 3**					**PL**
TLEs	GEO (1.00)	2018-12-30	07:48:16	950.00	0.30	254.60	254.90
3029	TEME	42164.660	0.0014014	3.5793	293.0570	127.5182	254.9410
L2.45^m	**1982-105A**	**Aurora I**					**PL**
TLEs	GEO (1.00)	2018-12-30	00:14:10	950.00	0.80	254.30	255.10
13631	TEME	42164.313	0.0009049	14.8237	355.0774	324.1281	254.7032
L2.46^m	**1977-114A**	**OPS 4258 (AQUACADE 3)**					**PL**
vimpel	GEO (0.73)	2018-12-24	22:47:11	1677.73	168.63	179.84	348.48
143526	J2000	42137.019	0.0016952	16.5272	315.0978	295.9337	239.8753

4.7 Objects in a Libration Orbit around both Stable Points

The following list contains 22 objects in libration orbit around both stable points (of which 1 is outdated), sorted according to the ascending order of the libration period (which is equivalent to the ascending order of the libration magnitude).

It is important to note that this category is special and more sensitive to errors in the measurements. The estimated libration period may have a lower accuracy.

For explanation of symbols, see the definitions at the beginning of section 4.

L3.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L3.1	**1971-095B**	**OPS 9432 (DSCS II F-2, DSCS 2-2, DSCS II A-2)**					**PL**
TLEs	GEO (1.00)	2018-12-30	23:22:39	488.42	335.60	174.20	149.80
5588	TEME	42196.464	0.0007758	8.2369	301.6311	1.6050	49.9832
L3.2	**1997-083A**	**Intelsat 804**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:39:25	488.73	336.10	173.90	150.10
25110	TEME	42173.396	0.0008929	10.3920	36.3585	276.0587	352.0937
L3.3	**1991-054D**	**IUS second stage (IUS-15 SRM-2, Orbus 6E) (Atlantis (OV-104))**					**RB**
TLEs	GEO (0.75)	2018-12-29	17:51:39	488.90	333.00	175.50	148.60
21641	TEME	42152.948	0.0039346	16.2631	358.1299	282.5493	2.6497
L3.4	**1991-064A**	**Cosmos-2155**					**PL**
TLEs	GEO (0.97)	2018-12-30	17:05:24	488.92	333.20	175.40	148.60
21702	TEME	42159.614	0.0005947	15.0195	1.9923	309.2213	175.7693
L3.5	**2011-001A**	**Elektro-L No. 1**					**PL**
TLEs	GEO (1.00)	2018-12-30	10:23:42	500.88	328.50	177.90	146.30
37344	TEME	42160.732	0.0005858	3.5919	75.4981	284.7349	180.4882
L3.6	**1994-035A**	**USA 104 (UFO F3)**					**PL**
vimpel	GEO (1.00)	2018-12-31	06:12:47	508.42	327.10	178.60	145.70
143701	J2000	42154.200	0.0006440	11.2810	22.5610	280.9890	189.2351
L3.7	**1990-094A**	**Gorizont 21**					**PL**
TLEs	GEO (1.00)	2018-12-30	17:57:40	511.57	326.70	178.80	145.50
20923	TEME	42172.554	0.0005310	14.9427	359.4367	252.8283	358.5847
L3.8$_o$	**1977-092L**	**Ekran 2 fragmentation debris**					**PF**
TLEs	EGO (0.29)	2018-01-07	16:54:35	513.77	346.20	168.80	155.00
33519	TEME	42141.874	0.0106936	11.3493	313.9624	322.4872	313.1088
L3.9	**2012-012A**	**Cosmos-2479**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:28:40	522.28	347.80	168.00	155.80
38101	TEME	42162.754	0.0009513	2.7350	72.3450	234.4196	163.8304
L3.10	**2000-029A**	**Gorizont 33**					**PL**
TLEs	GEO (1.00)	2018-12-30	19:36:39	523.00	325.50	179.40	144.90
26372	TEME	42170.338	0.0004250	12.3615	27.1310	288.0272	342.6396

L3.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L3.11	**1986-027A**	**Cosmos-1738**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:17:14	542.63	321.00	181.80	142.70
16667	TEME	42145.037	0.0012676	14.4783	342.0499	33.4308	124.1431
L3.12	**1982-044F**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	GEO (1.00)	2018-12-30	18:30:55	566.58	321.60	181.40	143.00
14114	TEME	42141.813	0.0012650	13.8720	326.1839	113.2636	118.3815
L3.13	**1987-084A**	**Cosmos-1888**					**PL**
TLEs	GEO (1.00)	2018-12-30	12:56:40	574.98	321.70	181.40	143.10
18384	TEME	42131.944	0.0003743	14.2678	348.4140	293.6516	59.5841
L3.14	**1994-060A**	**Cosmos-2291**					**PL**
TLEs	GEO (1.00)	2018-12-30	20:20:52	585.37	321.90	181.30	143.20
23267	TEME	42175.911	0.0002610	14.7292	12.1166	222.2447	136.3757
L3.15	**1985-007A**	**Gorizont 11**					**PL**
TLEs	GEO (1.00)	2018-12-30	15:23:24	590.92	323.10	180.70	143.70
15484	TEME	42160.692	0.0003210	13.6436	338.7355	331.7803	180.6449
L3.16	**1994-067D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	GEO (0.95)	2018-12-30	15:42:13	614.27	322.80	180.80	143.60
23322	TEME	42148.306	0.0005768	15.0458	7.7078	30.4695	195.8719
L3.17	**2012-012D**	**Blok-DM-2 (Proton-K/DM-2)**					**RB**
TLEs	GEO (1.00)	2018-12-30	19:39:03	630.63	322.30	181.10	143.30
38104	TEME	42162.110	0.0016176	2.7077	72.5184	235.3548	351.1827
L3.18	**1991-079A**	**Cosmos-2172**					**PL**
TLEs	GEO (0.98)	2018-12-30	15:39:47	639.08	322.30	181.10	143.40
21789	TEME	42150.337	0.0009330	15.0107	3.0568	308.2705	192.6595
L3.19	**1994-030A**	**Gorizont 30**					**PL**
TLEs	GEO (1.00)	2018-12-29	22:39:27	643.88	322.30	181.00	143.40
23108	TEME	42136.129	0.0005923	14.8302	10.7723	272.3242	284.4810
L3.20^{m}	**1980-060A**	**Ekran 5**					**PL**
vimpel	GEO (1.00)	2018-12-31	23:16:36	2952.99	331.06	176.54	147.60
143702	J2000	42136.200	0.0007280	11.6610	315.9340	151.8470	226.0532
L3.21^{m}	**1997-041A**	**Cosmos-2345**					**PL**
TLEs	EGO (0.18)	2018-12-30	20:29:40	2960.73	339.72	172.11	151.83
24894	TEME	42168.864	0.0167214	13.9476	19.7544	233.4409	167.5047
L3.22^{m}	**1984-009A**	**OPS 0441 (VORTEX 4)**					**PL**
vimpel	EGO (0.03)	2018-12-25	07:13:21	3376.27	323.62	80.37	143.99
143621	J2000	42167.400	0.1010520	7.0760	348.7530	1.5080	145.8579

The longitude histories of TLE-based objects in this category are plotted in Fig. 4.1 to 4.19.

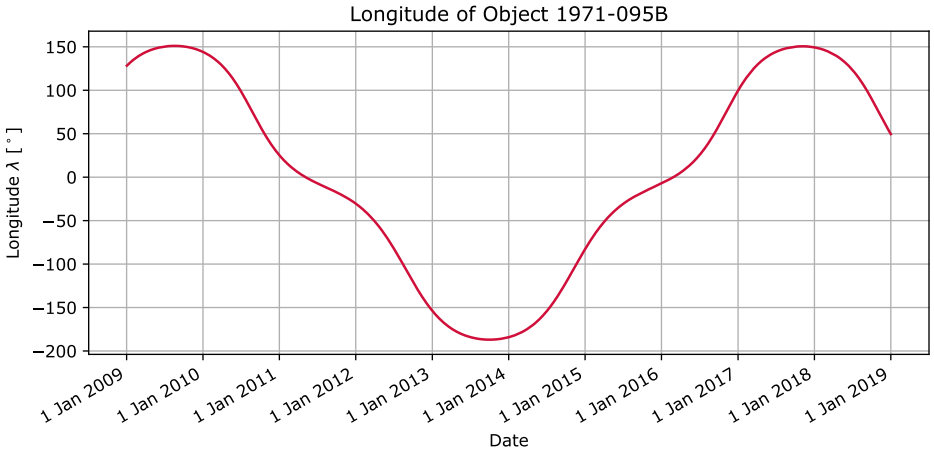


Figure 4.1: Longitude history of object 1971-095B

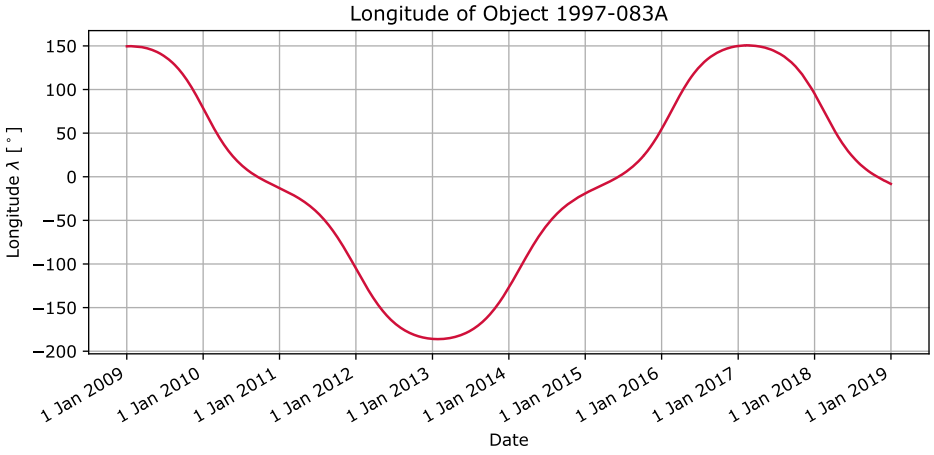


Figure 4.2: Longitude history of object 1997-083A

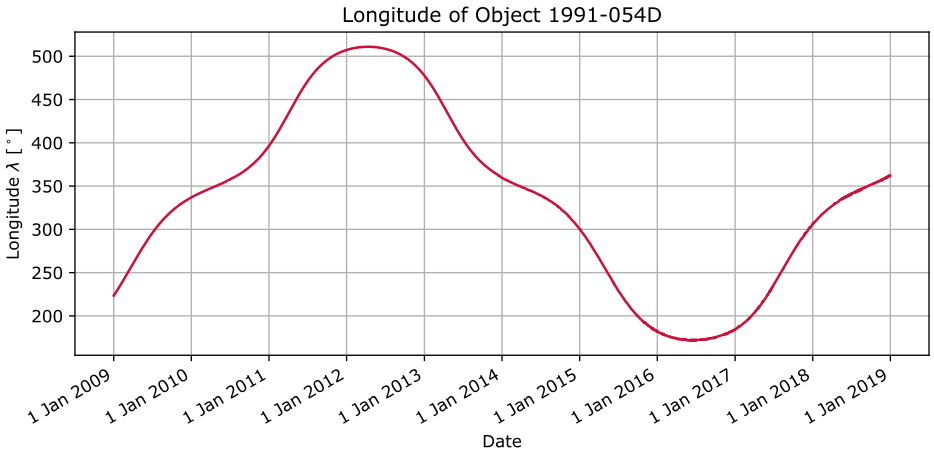


Figure 4.3: Longitude history of object 1991-054D

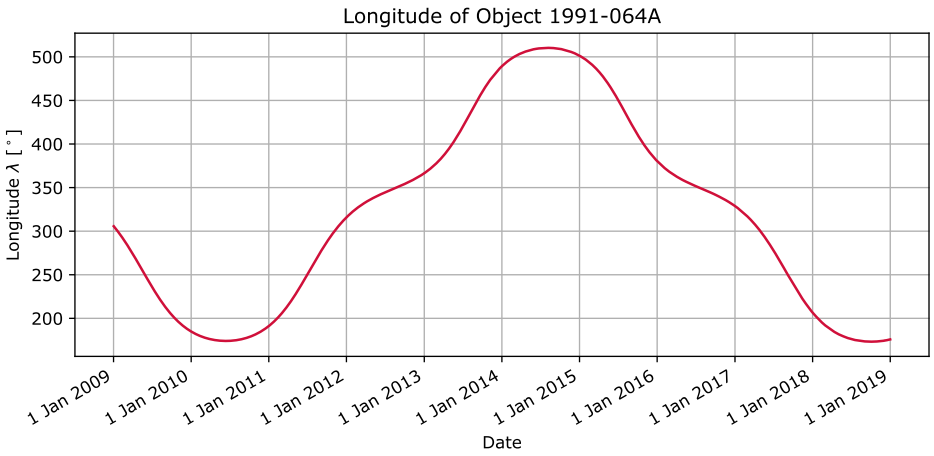


Figure 4.4: Longitude history of object 1991-064A

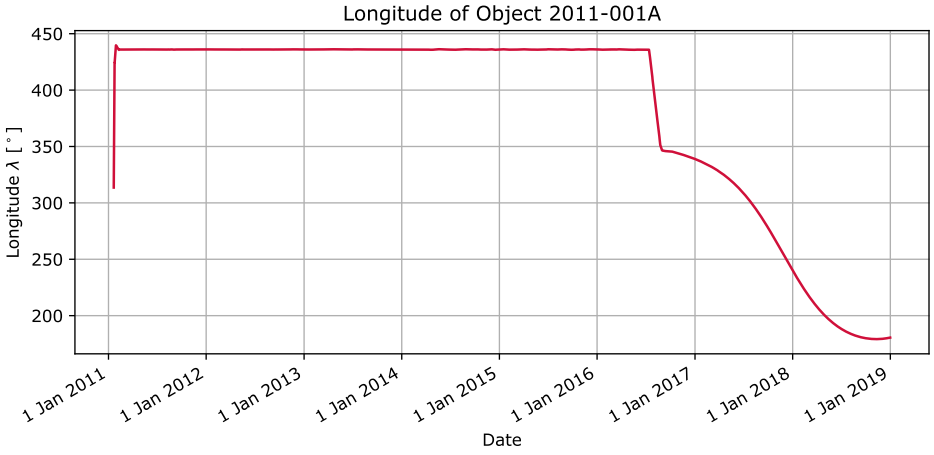


Figure 4.5: Longitude history of object 2011-001A

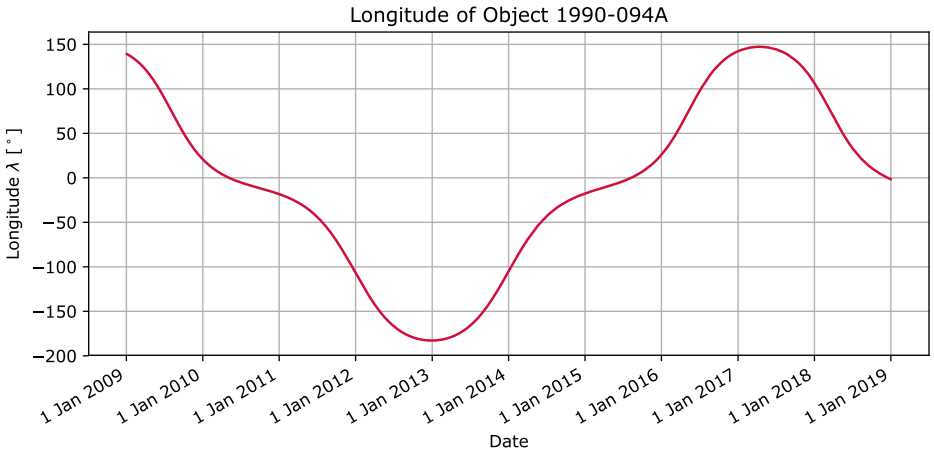


Figure 4.6: Longitude history of object 1990-094A

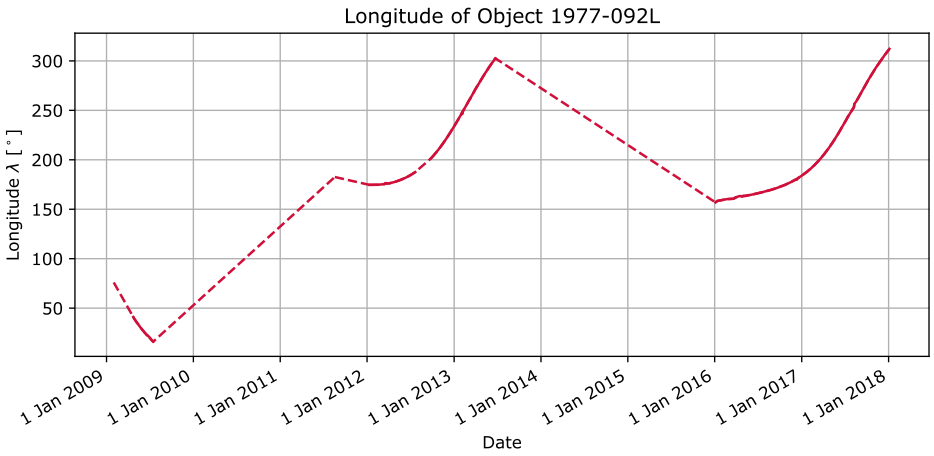


Figure 4.7: Longitude history of object 1977-092L

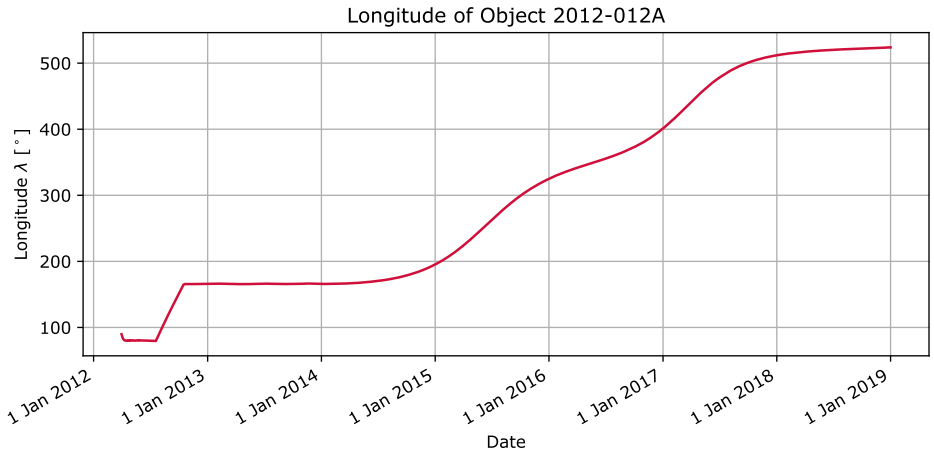


Figure 4.8: Longitude history of object 2012-012A

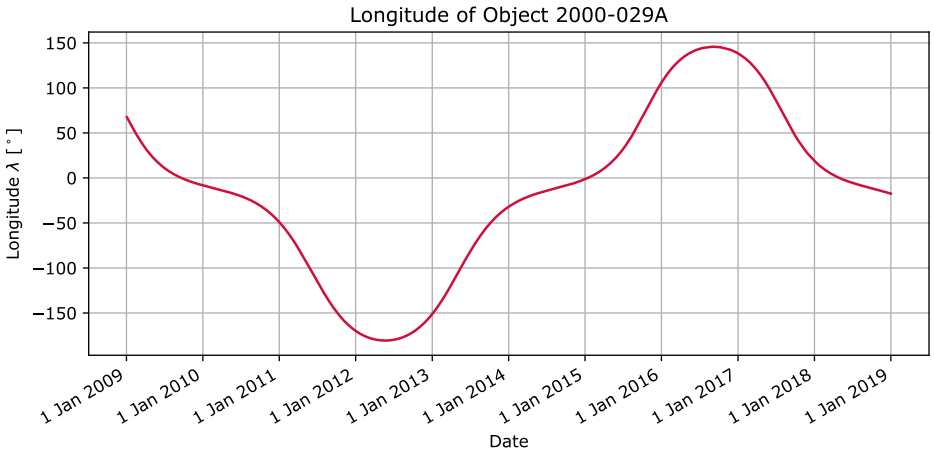


Figure 4.9: Longitude history of object 2000-029A

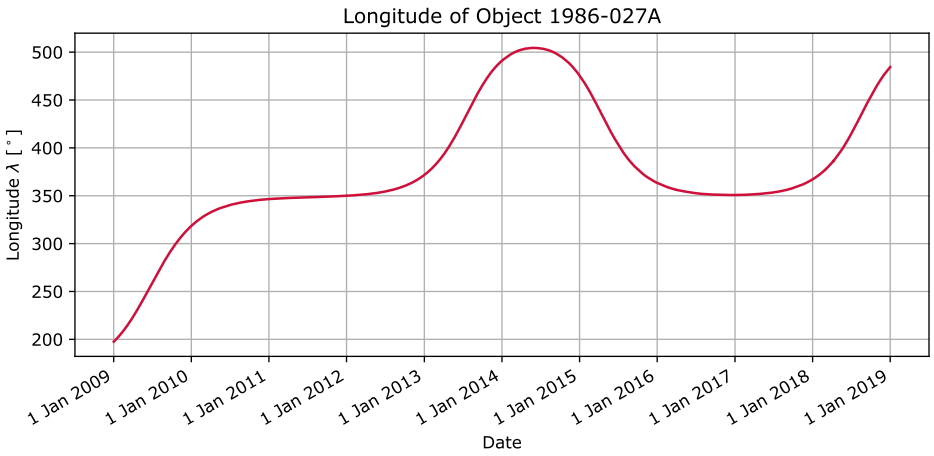


Figure 4.10: Longitude history of object 1986-027A

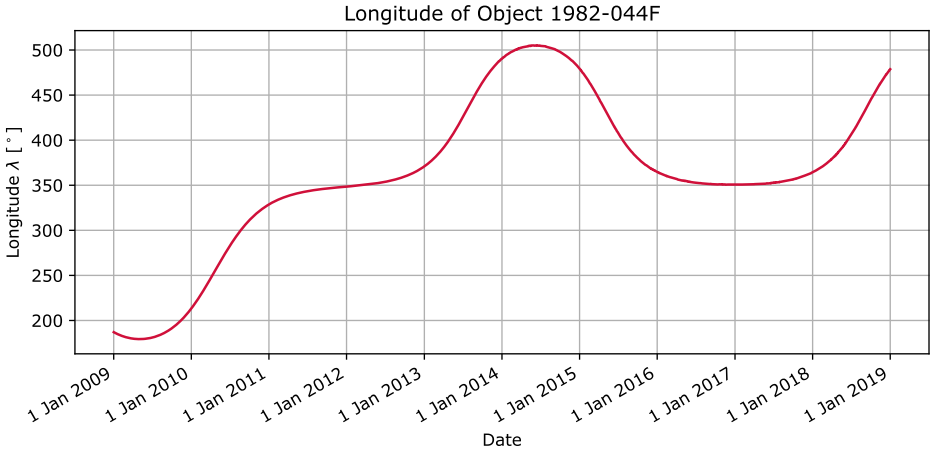


Figure 4.11: Longitude history of object 1982-044F

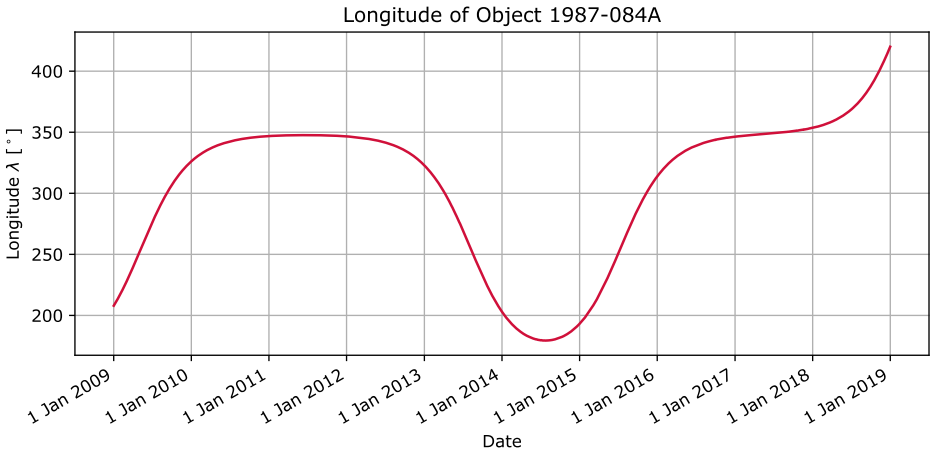


Figure 4.12: Longitude history of object 1987-084A

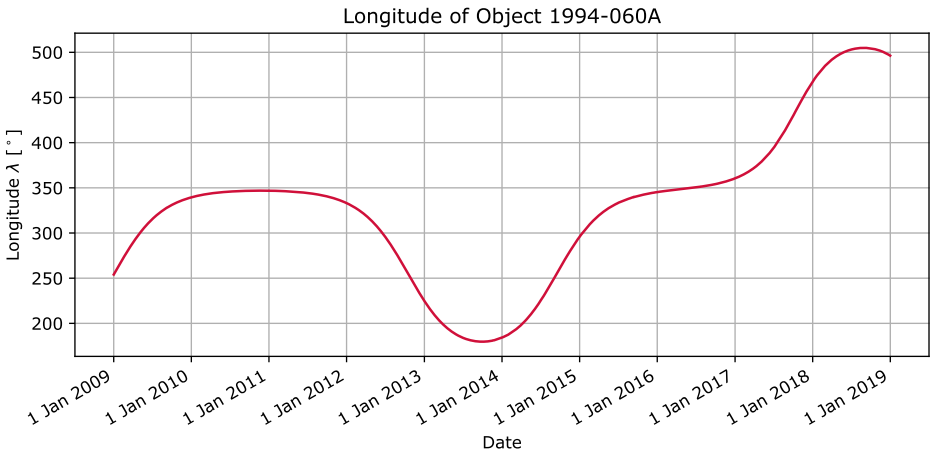


Figure 4.13: Longitude history of object 1994-060A

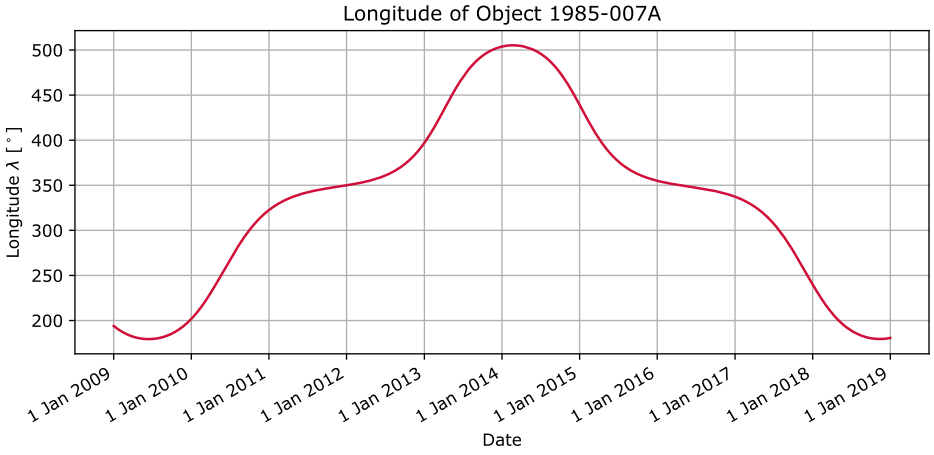


Figure 4.14: Longitude history of object 1985-007A

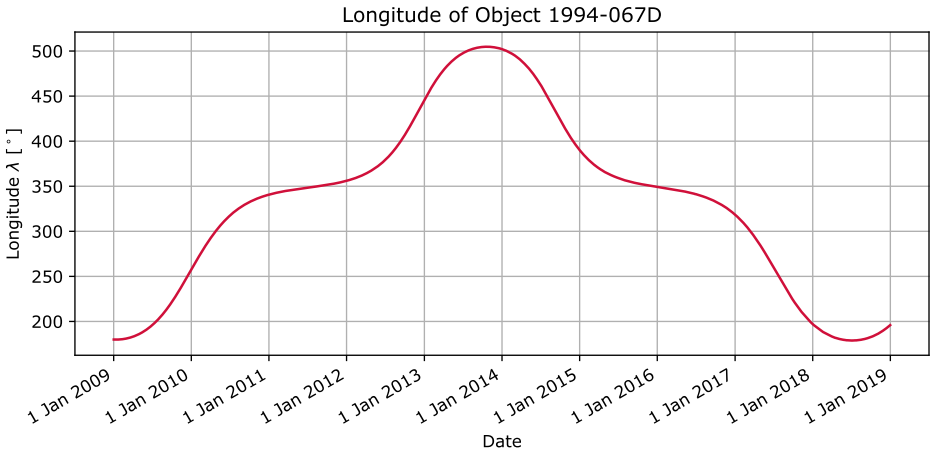


Figure 4.15: Longitude history of object 1994-067D

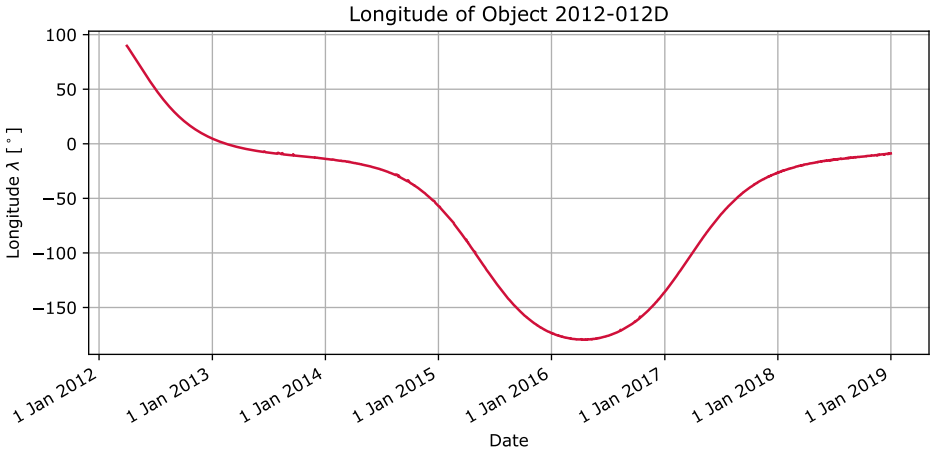


Figure 4.16: Longitude history of object 2012-012D

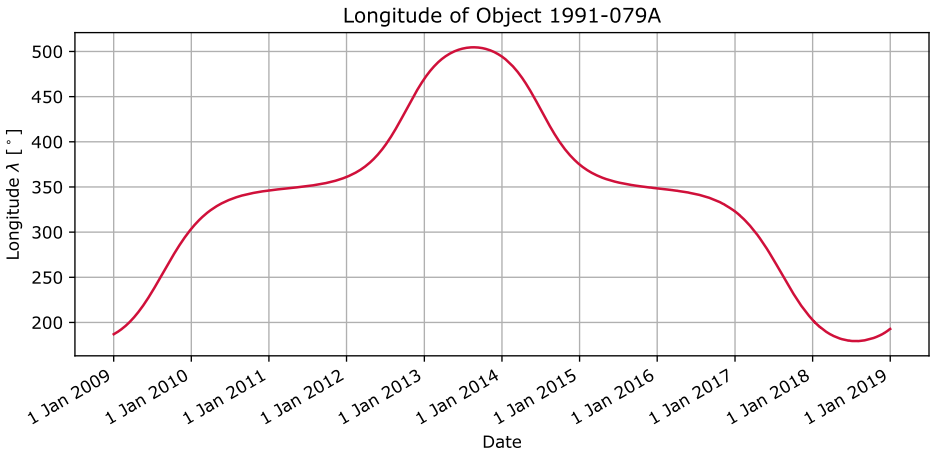


Figure 4.17: Longitude history of object 1991-079A

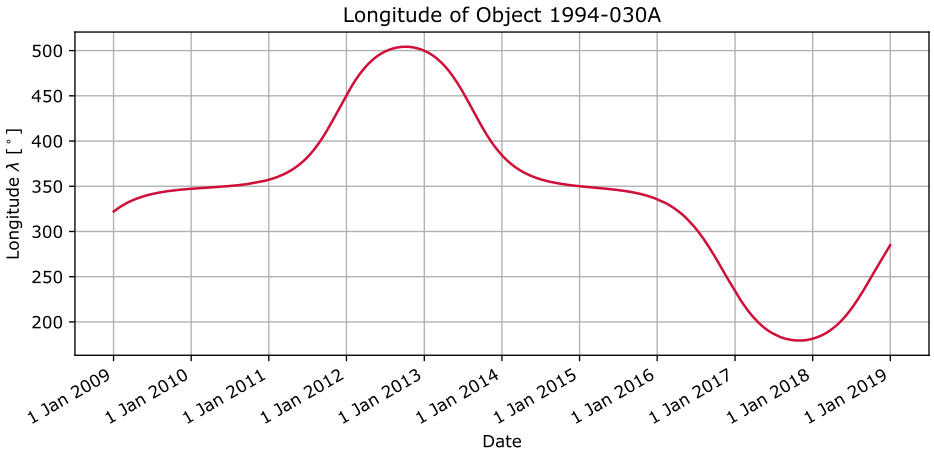


Figure 4.18: Longitude history of object 1994-030A

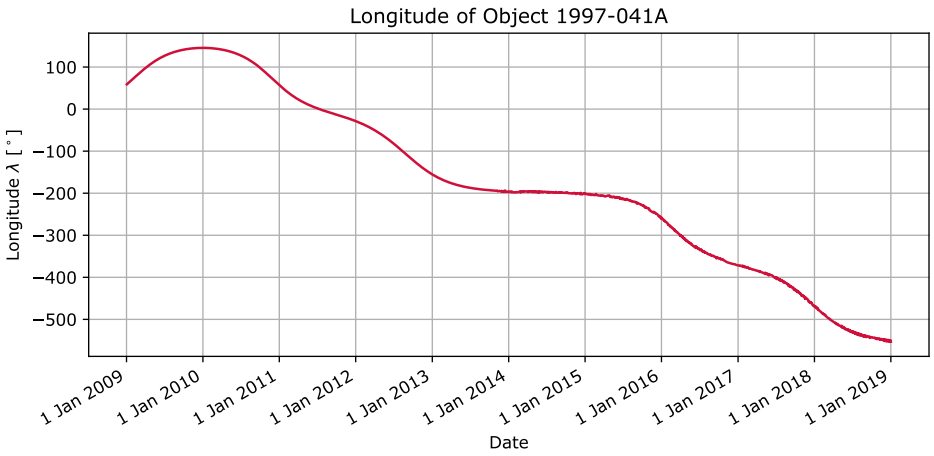


Figure 4.19: Longitude history of object 1997-041A

4.8 Objects in Highly Inclined Orbits

The following list contains 21 objects in highly inclined orbits (of which 1 is outdated), sorted according to the ascending order of the COSPAR designation.

For explanation of symbols, see the definitions at the beginning of section 4.

I.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\mathrm{IADC}}^{\mathrm{GEO}}$)	Date	Time				
S-ID	Frame	a	e	i	Ω	ω	λ
I.1	**1963-031A**	**Syncom 2**					**PL**
TLEs	IGO (0.30)	2018-12-30	14:18:17				
634	TEME	42166.823	0.0003722	34.9028	338.1805	148.1722	85.1943
I.2	**1978-012A**	**IUE**					**PL**
TLEs	IGO (-)	2018-12-27	14:15:40				
10637	TEME	42219.242	0.1605544	42.3710	328.2758	220.9019	23.2274
I.3$_o$	**1978-012D**	**IUE dust cover**					**PM**
TLEs	IGO (-)	2018-02-11	07:47:42				
33000	TEME	42122.970	0.2145129	42.4919	325.9845	232.0854	250.9309
I.4	**2010-005A**	**SDO**					**PL**
TLEs	IGO (0.35)	2018-12-30	08:52:06				
36395	TEME	42165.266	0.0001126	29.4839	130.4982	70.9495	258.2558
I.5	**2010-036A**	**Beidou DW 5**					**PL**
TLEs	IGO (0.12)	2018-12-30	21:59:14				
36828	TEME	42168.254	0.0071041	54.1461	188.0424	230.8639	119.4268
I.6	**2010-045A**	**Michibiki-1 (QZS-1)**					**PL**
TLEs	IGO (0.04)	2018-12-30	17:49:46				
37158	TEME	42164.875	0.0752456	41.2081	151.2154	270.5060	144.5684
I.7	**2010-068A**	**Beidou DW 7**					**PL**
TLEs	IGO (-)	2018-12-30	21:33:41				
37256	TEME	42165.570	0.0064098	52.3436	304.6649	202.8920	119.9257
I.8	**2011-013A**	**Beidou DW 8**					**PL**
TLEs	IGO (0.20)	2018-12-30	22:13:26				
37384	TEME	42171.149	0.0039316	58.5514	67.0889	206.7775	115.3700
I.9	**2011-038A**	**Beidou DW 9**					**PL**
TLEs	IGO (0.15)	2018-12-30	21:33:55				
37763	TEME	42161.570	0.0056482	54.4396	190.4517	220.4427	96.0720
I.10	**2011-073A**	**Beidou DW 10**					**PL**
TLEs	IGO (0.08)	2018-12-30	23:12:13				
37948	TEME	42159.397	0.0058096	52.4193	304.1915	210.2717	94.2665
I.11	**2013-034A**	**IRNSS-R1A**					**PL**
TLEs	IGO (0.35)	2018-12-30	20:44:48				
39199	TEME	42164.205	0.0022239	29.8059	105.5020	181.4887	54.9882

I.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time				
S-ID	Frame	a	e	i	Ω	ω	λ
I.12	**2014-017A**	**IRNSS-R1B**					**PL**
TLEs	IGO (0.36)	2018-12-30	08:48:40				
39635	TEME	42164.865	0.0017295	28.8351	285.9352	184.5496	55.0510
I.13	**2015-018A**	**IRNSS-R1D**					**PL**
TLEs	IGO (0.36)	2018-12-30	05:02:53				
40547	TEME	42165.766	0.0019127	28.7638	286.0416	184.1449	111.7581
I.14	**2015-019A**	**Beidou DW 17**					**PL**
TLEs	IGO (0.21)	2018-12-30	21:48:46				
40549	TEME	42159.707	0.0038972	53.7861	327.3448	191.5120	95.2599
I.15	**2015-053A**	**Beidou DW 20**					**PL**
TLEs	IGO (0.21)	2018-12-30	18:25:33				
40938	TEME	42167.410	0.0046606	53.4136	290.3122	179.7808	95.2835
I.16	**2016-003A**	**IRNSS-R1E**					**PL**
TLEs	IGO (0.36)	2018-12-29	17:01:03				
41241	TEME	42163.024	0.0022220	28.9566	105.1266	177.6642	111.6943
I.17	**2016-021A**	**Beidou DW 22**					**PL**
TLEs	IGO (0.20)	2018-12-30	22:16:26				
41434	TEME	42161.193	0.0035853	56.3006	66.2671	196.4227	95.8684
I.18	**2017-028A**	**Michibiki-2 (QZS-2)**					**PL**
TLEs	IGO (0.04)	2018-12-30	02:19:52				
42738	TEME	42161.216	0.0752680	43.8811	281.8665	269.8733	148.4723
I.19	**2017-062A**	**Michibiki-4 (QZS-4)**					**PL**
TLEs	IGO (0.04)	2018-12-30	09:09:01				
42965	TEME	42171.287	0.0752586	40.6956	18.7114	272.9685	142.6916
I.20	**2018-035A**	**IRNSS-R1I**					**PL**
TLEs	IGO (0.36)	2018-12-30	21:36:53				
43286	TEME	42164.375	0.0021032	28.9616	118.5353	179.9422	54.9458
I.21	**2018-057A**	**Beidou DW 32**					**PL**
TLEs	IGO (0.20)	2018-12-30	23:28:11				
43539	TEME	42162.484	0.0021658	55.0375	187.1830	177.5279	112.9464

4.9 Objects of Indeterminate Status

The following list contains 2 objects for which no status could be determined by our software, sorted according to the ascending order of the COSPAR designation. The main reason for the difficulty to classify an object is that there are not enough orbital states available or that the status has recently changed (satellite newly launched or recently manoeuvred). Outliers in the dataset can also cause the failure to classify an object status correctly.

For explanation of symbols, see the definitions at the beginning of section 4.

Ind.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time				
S-ID	Frame	a	e	i	Ω	ω	λ
Ind.1^m	**1996-042A**	**USA 127 (UFO F7)**					**PL**
vimpel	GEO (1.00)	2018-12-25	06:06:41				
143613	J2000	42183.100	0.0004980	8.8780	29.3390	338.9160	203.3562
Ind.2	**2000-024E**	**USA 149 debris (DSP F20 IR Sensor telescope sunshade cover)**					**PM**
vimpel	EGO (0.13)	2018-12-25	04:56:00				
144402	J2000	42320.300	0.0238280	11.6710	30.6240	241.0750	222.5604

4.10 Rocket Bodies crossing Geostationary Orbits

The following list contains 130 rocket bodies crossing the GEO protected region, sorted according to the ascending order of the COSPAR designation.

For explanation of symbols, see the definitions at the beginning of section 4.

X.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\mathrm{IADC}}^{\mathrm{GEO}}$)	Date	Time				
S-ID	Frame	a	e	i	Ω	ω	λ
X.1	**1964-047B**	**Altair 2 (Delta D)**					**RB**
TLEs	GTO (0.02)	2018-12-30	14:02:53.176				
862.0	TEME	26167.714	0.7113765	16.7206	33.1734	9.5911	260.3713
X.2	**1965-028B**	**Altair 2 (Delta D)**					**RB**
TLEs	GTO (0.03)	2018-12-30	01:09:38.689				
1318.0	TEME	25611.029	0.6953275	17.8152	304.7818	189.9650	285.6071
X.5	**1969-046F**	**Transtage 15 (Titan IIIC)**					**RB**
TLEs	HEO (0.00)	2018-12-29	07:10:55.231				
3956.0	TEME	70689.271	0.8081038	20.2597	348.9288	249.9440	48.0087
X.6	**1969-069B**	**CENTAUR D/E (Atlas SLV3C)**					**RB**
TLEs	MGO (0.03)	2018-12-30	15:19:33.951				
4069.0	TEME	26192.464	0.6647248	16.8412	181.5966	180.5293	212.7008
X.7	**1970-093B**	**Transtage 19 (Titan IIIC)**					**RB**
TLEs	MGO (0.06)	2018-12-30	08:55:45.474				
4632.0	TEME	37358.342	0.1442941	10.0925	90.7122	160.2198	249.0944
X.10	**1972-041B**	**CENTAUR D/E (Atlas SLV3C)**					**RB**
TLEs	GTO (0.05)	2018-12-30	08:22:44.333				
6058.0	TEME	24797.902	0.7215076	26.8563	74.2201	3.2677	210.4525
X.11	**1972-072E**	**Blok-2BL (Molniya-M Blok-2BL)**					**RB**
TLEs	MGO (0.02)	2018-12-29	01:52:26.355				
6302.0	TEME	26280.614	0.6313454	66.0100	111.8443	338.9236	345.9845
X.13	**1971-116B**	**CENTAUR D/E (Atlas SLV3C)**					**RB**
TLEs	GTO (0.04)	2018-12-30	21:01:35.230				
6779.0	TEME	25001.844	0.7164109	27.7345	175.0507	162.4243	265.7254
X.15	**1975-042B**	**CENTAUR D/E (Atlas SLV3D)**					**RB**
TLEs	GTO (0.04)	2018-12-30	15:08:04.979				
7902.0	TEME	24895.315	0.7210501	25.8656	86.7072	191.2260	128.4045
X.18	**1976-010B**	**CENTAUR D/E (Atlas SLV3D)**					**RB**
TLEs	GTO (0.04)	2018-12-30	21:47:48.727				
8621.0	TEME	24926.121	0.7194426	21.7326	321.7920	24.4069	78.3314
X.20	**1976-042B**	**CENTAUR D/E (Atlas SLV3D)**					**RB**
TLEs	GTO (0.06)	2018-12-30	15:47:24.122				
8840.0	TEME	24787.876	0.7175394	21.7683	53.4710	16.9806	264.8187

X.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time				
S-ID	Frame	a	e	i	Ω	ω	λ
X.24	**1977-047D**	**Blok-2BL (Molniya-M Blok-2BL)**					**RB**
TLEs	MGO (0.01)	2018-12-30	14:00:11.511				
10089.0	TEME	26669.016	0.6468802	66.9148	296.2209	352.2051	346.5403
X.25	**1978-002B**	**CENTAUR D/E (Atlas SLV3D)**					**RB**
TLEs	GTO (0.03)	2018-12-30	22:48:44.267				
10722.0	TEME	24837.653	0.7172629	21.0780	193.5106	311.5750	285.5122
X.26	**1978-035B**	**CENTAUR D/E (Atlas SLV3D)**					**RB**
TLEs	GTO (0.06)	2018-12-30	17:14:18.552				
10779.0	TEME	24772.742	0.7171607	21.3648	234.8262	359.8374	302.0651
X.34	**1980-050B**	**Blok-2BL (Molniya-M Blok-2BL)**					**RB**
TLEs	GTO (0.01)	2018-12-30	10:16:02.759				
11847.0	TEME	26653.465	0.7273061	64.9937	318.3189	351.6832	63.7109
X.35	**1978-118C**	**Blok-DM (Proton-K/DM)**					**RB**
TLEs	HEO (0.01)	2018-12-30	15:16:22.241				
11926.0	TEME	41796.014	0.3526098	12.8719	245.9178	224.6722	228.1197
X.37	**1981-018B**	**CENTAUR D/E (Atlas SLV3D)**					**RB**
TLEs	GTO (0.06)	2018-12-30	21:53:19.586				
12363.0	TEME	24822.192	0.7155276	20.1732	199.8598	169.1389	270.7653
X.43	**1982-016D**	**Blok-2BL (Molniya-M Blok-2BL)**					**RB**
TLEs	GTO (0.01)	2018-12-30	21:21:21.568				
13090.0	TEME	26334.746	0.7037208	65.5690	99.1706	23.0672	38.8972
X.50	**1983-070D**	**Blok-2BL (Molniya-M Blok-2BL)**					**RB**
TLEs	MGO (0.01)	2018-12-30	07:49:32.220				
14191.0	TEME	26313.731	0.6575967	68.2649	63.9831	350.9495	208.7021
X.55	**1984-033D**	**Blok-2BL (Molniya-M Blok-2BL)**					**RB**
TLEs	MGO (0.02)	2018-12-24	11:11:48.058				
14894.0	TEME	26277.362	0.6200523	70.1471	69.3205	338.2008	169.1753
X.59	**1984-071D**	**Blok-2BL (Molniya-M Blok-2BL)**					**RB**
TLEs	MGO (0.02)	2018-12-30	19:28:29.976				
15098.0	TEME	26256.719	0.6362660	68.9109	164.7543	23.3122	313.3748
X.61	**1984-088F**	**Star 37E (Delta 3924)**					**RB**
TLEs	HEO (0.00)	2018-12-30	05:34:19.212				
15206.0	TEME	31089.290	0.7772832	28.4231	19.8511	351.2254	357.9294
X.64	**1985-048H**	**PAM-D (Telstar 3D) (Discovery (OV-103))**					**RB**
TLEs	GTO (0.05)	2018-12-30	17:35:46.579				
15837.0	TEME	24442.836	0.7206158	25.3748	217.6229	172.9275	214.5887

X.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time				
S-ID	Frame	a	e	i	Ω	ω	λ
X.67	**1986-026C**	**H10 (Ariane 3)**					**RB**
TLEs	GTO (0.08)	2018-12-30	01:58:28.196				
16657.0	TEME	24629.141	0.7232107	7.0462	45.4795	282.5705	276.7343
X.91	**1990-074C**	**PAM-D (Delta 6925)**					**RB**
TLEs	GTO (0.03)	2018-12-30	19:27:32.126				
20764.0	TEME	25147.589	0.7280794	20.9355	125.7867	187.0865	94.7319
X.101	**1991-083B**	**CENTAUR (Atlas II)**					**RB**
TLEs	HEO (0.01)	2018-12-30	05:34:49.608				
21804.0	TEME	27424.739	0.7367591	17.6479	327.7666	296.7376	248.9893
X.105	**1992-027C**	**PAM-D (Delta 7925)**					**RB**
TLEs	MGO (0.04)	2018-12-26	18:52:36.872				
21966.0	TEME	26147.851	0.6480008	22.3726	273.4125	178.7786	255.0759
X.111	**1993-058D**	**Transfer Orbit Stage (Discovery (OV-103))**					**RB**
TLEs	GTO (0.02)	2018-12-30	16:21:13.745				
22797.0	TEME	25709.335	0.7380402	15.3400	335.8451	22.1692	351.0702
X.116	**1994-034D**	**H10+ (Ariane 44LP H10+)**					**RB**
TLEs	GTO (0.08)	2018-12-30	21:36:18.271				
23127.0	TEME	24594.210	0.7243669	7.4599	304.3958	178.9945	241.1274
X.126	**1995-040B**	**H10 (Ariane 42L H10)**					**RB**
TLEs	GTO (0.04)	2018-12-30	23:15:44.527				
23637.0	TEME	25073.186	0.7221541	4.0487	252.5928	204.6003	289.5145
X.128	**1995-049B**	**H10 (Ariane 42L H10)**					**RB**
TLEs	GTO (0.07)	2018-12-30	17:56:44.983				
23671.0	TEME	24468.513	0.7229096	7.5376	75.5146	264.2530	66.8572
X.130	**1995-055B**	**H10 (Ariane 42L H10)**					**RB**
TLEs	GTO (0.04)	2018-12-30	16:50:10.272				
23687.0	TEME	24841.853	0.7249105	4.5171	217.3319	86.3246	225.7166
X.132	**1995-062B**	**H10 (Ariane 44P)**					**RB**
TLEs	HEO (0.00)	2018-12-30	07:28:15.892				
23716.0	TEME	43711.372	0.8352672	3.6549	48.4425	12.2330	205.0432
X.134	**1996-003C**	**PAM-D (Delta 7925)**					**RB**
TLEs	GTO (0.08)	2018-12-30	17:08:45.804				
23770.0	TEME	24990.006	0.6880499	20.7209	196.1814	18.7298	35.6313
X.135	**1996-021D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	MGO (0.09)	2018-12-30	21:22:18.505				
23845.0	TEME	30332.448	0.3982259	8.5573	28.2580	312.3241	278.6514

X.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time				
S-ID	Frame	a	e	i	Ω	ω	λ
X.138	**1997-015D**	**Blok-2BL (Molniya-M Blok-2BL)**					**RB**
TLEs	MGO (0.02)	2018-12-30	21:06:40.413				
24764.0	TEME	26334.672	0.6655594	66.3381	321.3611	175.3147	265.5008
X.139	**1997-025C**	**PAM-D (Delta 7925)**					**RB**
TLEs	GTO (0.04)	2018-12-30	05:17:20.114				
24810.0	TEME	25270.907	0.6965671	19.3117	266.8084	192.4790	179.6794
X.140	**1997-026D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	MGO (0.09)	2018-12-30	20:59:56.818				
24815.0	TEME	27548.601	0.5327598	18.3830	324.9263	220.9150	88.4579
X.142	**1997-046D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	MGO (0.08)	2018-12-30	14:50:14.697				
24919.0	TEME	28565.529	0.4832258	15.0840	9.9662	256.2486	60.8442
X.145	**1997-076D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	MGO (0.09)	2018-12-30	15:06:42.649				
25074.0	TEME	29431.076	0.4343265	10.8252	225.4530	12.8746	102.1593
X.146	**1998-002C**	**PAM-D (Delta 7925)**					**RB**
TLEs	GTO (0.11)	2018-12-30	14:36:12.035				
25136.0	TEME	24982.861	0.6952058	23.1930	187.2066	332.3939	58.7907
X.148	**1998-027D**	**Blok-2BL (Molniya-M Blok-2BL)**					**RB**
TLEs	GTO (0.01)	2018-12-29	15:30:30.137				
25330.0	TEME	26306.525	0.7066224	64.1116	314.9156	196.6414	344.3278
X.149	**1998-028D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	MGO (0.10)	2018-12-30	02:07:56.608				
25334.0	TEME	28318.687	0.4916614	15.0548	248.8886	234.9274	293.5480
X.152	**1998-035C**	**PAM-D (Delta 7925)**					**RB**
TLEs	GTO (0.02)	2018-12-30	20:28:53.103				
25360.0	TEME	25669.686	0.6940694	18.6371	196.3130	121.0475	270.4532
X.153	**1998-050D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	MGO (0.03)	2018-12-30	17:02:33.706				
25465.0	TEME	28251.478	0.5005782	15.8957	352.2513	284.5590	162.7406
X.154	**1998-065D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	MGO (0.05)	2018-12-30	12:43:48.750				
25525.0	TEME	27715.193	0.5271961	18.5313	40.9205	55.4877	208.1036
X.155	**1999-013D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	MGO (0.07)	2018-12-30	18:40:22.842				
25660.0	TEME	29096.793	0.4595902	14.4931	332.3128	19.8311	147.0583

X.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time				
S-ID	Frame	a	e	i	Ω	ω	λ
X.156	**1999-014B**	**Blok-DM-SL (Zenit-3SL)**					**RB**
TLEs	GTO (0.11)	2018-12-30	21:58:52.894				
25662.0	TEME	24651.789	0.7177281	0.8065	234.1529	185.6037	97.6284
X.157	**1999-027D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	MGO (0.03)	2018-12-30	13:02:20.248				
25743.0	TEME	27747.002	0.5142606	16.4345	167.1039	0.7347	49.2441
X.158	**1999-033D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	MGO (0.00)	2018-12-30	14:17:31.681				
25788.0	TEME	27947.812	0.5042257	16.1416	290.5866	288.3012	154.9284
X.160	**1999-053D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	MGO (0.10)	2018-12-30	21:38:14.697				
25927.0	TEME	27598.884	0.5356925	16.0642	266.5582	60.6548	101.7040
X.161	**1999-056B**	**Blok-DM-SL (Zenit-3SL)**					**RB**
TLEs	MGO (0.05)	2018-12-30	18:14:11.256				
25938.0	TEME	25583.380	0.6444105	0.3393	329.2928	220.4039	347.3301
X.169	**2000-043B**	**Blok-DM-SL (Zenit-3SL)**					**RB**
TLEs	GTO (0.07)	2018-12-30	22:02:44.844				
26452.0	TEME	25221.205	0.6707059	1.5300	96.4760	231.9114	99.2319
X.170	**2000-054D**	**EPS L9 (Ariane 5G)**					**RB**
TLEs	GTO (0.01)	2018-12-30	17:44:14.194				
26497.0	TEME	24426.648	0.7174363	7.1230	111.7119	171.0758	110.7433
X.171	**2000-059D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	MGO (0.08)	2018-12-30	09:27:42.535				
26557.0	TEME	27865.858	0.5122681	16.1715	8.0081	242.5025	129.3688
X.173	**2000-072E**	**EPS L9 (Ariane 5G)**					**RB**
TLEs	GTO (0.02)	2018-12-30	13:59:32.494				
26612.0	TEME	26457.165	0.7331385	6.2414	232.3142	129.4842	283.6990
X.175	**2001-011C**	**EPS L9 (Ariane 5G)**					**RB**
TLEs	GTO (0.05)	2018-12-30	23:21:56.155				
26721.0	TEME	24632.335	0.7060976	1.0849	159.0940	97.7227	0.6306
X.176	**2001-012B**	**Blok-DM-SL (Zenit-3SL)**					**RB**
TLEs	GTO (0.08)	2018-12-30	23:17:41.928				
26725.0	TEME	24704.729	0.7067804	0.7345	267.5561	8.5838	261.2726
X.178	**2001-018B**	**Blok-DM-SL (Zenit-3SL)**					**RB**
TLEs	GTO (0.07)	2018-12-30	21:45:42.697				
26762.0	TEME	24685.036	0.7061558	1.3151	333.6373	334.2329	54.1956

X.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\mathrm{IADC}}^{\mathrm{GEO}}$)	Date	Time				
S-ID	Frame	a	e	i	Ω	ω	λ
X.179	**2001-019D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	MGO (0.09)	2018-12-29	23:19:42.636				
26769.0	TEME	27859.624	0.5206630	17.5100	297.0355	182.7553	209.7401
X.180	**2001-025C**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	MGO (0.03)	2018-12-30	18:22:51.239				
26855.0	TEME	28050.908	0.4992773	16.8241	18.2405	117.5054	19.6930
X.185	**2002-002B**	**H10 (Ariane 42L H10)**					**RB**
TLEs	GTO (0.04)	2018-12-30	13:54:38.138				
27299.0	TEME	24888.089	0.7269019	4.2810	57.8579	203.6241	110.2128
X.186	**2002-023D**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	MGO (0.05)	2018-12-30	18:38:44.858				
27429.0	TEME	27479.643	0.5305648	17.6035	148.7471	215.2915	140.7840
X.187	**2002-030B**	**Blok-DM-SL (Zenit-3SL)**					**RB**
TLEs	HEO (0.01)	2018-12-30	02:36:46.900				
27446.0	TEME	27061.901	0.7515396	1.1125	339.8290	130.2344	202.0748
X.188	**2002-035C**	**EPS L9 (Ariane 5G)**					**RB**
TLEs	GTO (0.06)	2018-12-30	17:42:44.050				
27462.0	TEME	24771.647	0.7176991	5.8579	27.1623	245.4123	50.1317
X.189	**2002-039B**	**Blok-DM-2M (Proton-K/DM-2M)**					**RB**
TLEs	MGO (0.07)	2018-12-30	14:28:21.356				
27504.0	TEME	26448.087	0.5929729	22.2412	208.5609	192.8121	252.4805
X.191	**2003-013C**	**EPS L9 (Ariane 5G)**					**RB**
TLEs	GTO (0.05)	2018-12-30	21:03:29.217				
27716.0	TEME	24671.418	0.7061284	1.3078	89.5046	300.8274	280.2599
X.196	**2003-026B**	**Blok-DM-SL (Zenit-3SL)**					**RB**
TLEs	GTO (0.07)	2018-12-30	19:55:15.398				
27826.0	TEME	24818.214	0.6966741	5.7450	252.3302	343.4289	45.1653
X.197	**2003-028C**	**EPS L9 (Ariane 5G)**					**RB**
TLEs	GTO (0.10)	2018-12-30	09:53:42.557				
27832.0	TEME	24618.191	0.7172664	7.1957	68.2913	76.1209	30.2808
X.198	**2003-034B**	**Blok-DM-SL (Zenit-3SL)**					**RB**
TLEs	GTO (0.09)	2018-12-30	22:22:42.532				
27855.0	TEME	24626.477	0.7145777	0.3286	307.3624	6.5132	70.9796
X.200	**2003-043B**	**EPS L9 (Ariane 5G)**					**RB**
TLEs	GTO (0.11)	2018-12-30	17:32:10.986				
27946.0	TEME	24711.131	0.7158520	7.5796	263.7317	274.0760	262.0641

X.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time				
S-ID	Frame	a	e	i	Ω	ω	λ
X.201	**2003-044B**	**Blok-DM-SL (Zenit-3SL)**					**RB**
TLEs	MGO (0.07)	2018-12-30	19:16:19.026				
27953.0	TEME	25403.119	0.6587293	0.2267	341.5299	336.5976	330.9411
X.203	**2003-059B**	**Fregat (Soyuz-FG Fregat)**					**RB**
TLEs	MGO (0.08)	2018-12-30	16:45:23.575				
28133.0	TEME	26480.434	0.5928063	23.6809	315.4459	8.9875	324.3558
X.204	**2004-001B**	**Blok-DM-SL (Zenit-3SL)**					**RB**
TLEs	GTO (0.09)	2018-12-30	21:08:35.788				
28138.0	TEME	24622.532	0.7150026	0.6555	324.8758	102.5108	304.2505
X.209	**2004-022C**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	MGO (0.10)	2018-12-30	17:58:24.822				
28360.0	TEME	26480.605	0.5963946	23.6578	148.9466	332.6734	139.6115
X.210	**2004-027B**	**EPS L10 (Ariane 5G+)**					**RB**
TLEs	GTO (0.02)	2018-12-30	21:26:55.057				
28379.0	TEME	25928.882	0.7286815	6.5284	134.2397	91.1934	252.3425
X.211	**2004-041B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	MGO (0.08)	2018-12-30	22:54:39.813				
28447.0	TEME	27832.142	0.5228587	16.4318	156.7504	305.4202	74.3023
X.212	**2004-029B**	**CZ-2C SM kick stage (Long March (CZ) 2C)**					**RB**
TLEs	GTO (0.02)	2018-12-30	05:08:18.407				
28448.0	TEME	25099.051	0.7288168	87.2580	284.3581	22.0708	108.2275
X.214	**2004-050B**	**Delta IV DCSS 5 (Delta 4H)**					**RB**
TLEs	MGO (0.05)	2018-12-30	15:44:23.229				
28546.0	TEME	34104.631	0.2562059	16.6615	35.4304	182.0526	248.5817
X.215	**2005-008B**	**Blok-DM-SL (Zenit-3SL)**					**RB**
TLEs	MGO (0.08)	2018-12-30	21:45:42.697				
28627.0	TEME	25446.347	0.6555956	1.1397	26.0425	279.8058	56.3832
X.217	**2004-008C**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	MGO (0.04)	2018-12-30	08:57:52.650				
28656.0	TEME	26850.634	0.6082998	13.5682	0.1011	254.7516	251.1832
X.218	**2005-019B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	MGO (0.07)	2018-12-30	18:27:56.660				
28660.0	TEME	31624.659	0.3318709	10.7224	280.2433	111.7202	98.7277
X.220	**2005-028B**	**EPS L10 (Ariane 5GS)**					**RB**
TLEs	GTO (0.06)	2018-12-30	22:46:22.683				
28787.0	TEME	24486.984	0.7177704	6.5793	183.2988	261.8927	286.5283

X.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				
S-ID	Frame	a	e	i	Ω	ω	λ
X.221	**2005-041C**	**EPS L10 (Ariane 5GS)**					**RB**
TLEs	GTO (0.09)	2018-12-30	18:39:22.544				
28886.0	TEME	24648.996	0.7194148	7.6747	147.5670	156.8659	139.6280
X.222	**2005-049C**	**EPS L10 (Ariane 5GS)**					**RB**
TLEs	GTO (0.08)	2018-12-30	22:08:17.291				
28913.0	TEME	24610.804	0.7134371	3.8594	256.8112	113.8362	148.0837
X.223	**2006-003B**	**Blok-DM-SL (Zenit-3SL)**					**RB**
TLEs	GTO (0.04)	2018-12-30	22:04:16.101				
28936.0	TEME	25010.357	0.6792059	0.6129	308.3717	114.4879	132.8590
X.224	**2003-024C**	**Briz-M (Proton-K/Briz-M)**					**RB**
TLEs	MGO (0.03)	2018-12-30	16:54:02.422				
28998.0	TEME	28295.426	0.5068666	18.8472	39.2562	301.7272	209.4998
X.225	**2006-010B**	**Blok-DM-SL (Zenit-3SL)**					**RB**
TLEs	GTO (0.06)	2018-12-30	22:31:54.283				
29046.0	TEME	25016.195	0.6805145	0.4530	317.8209	143.9476	230.9879
X.227	**2006-023B**	**Blok-DM-SL (Zenit-3SL)**					**RB**
TLEs	MGO (0.06)	2018-12-30	18:58:58.735				
29237.0	TEME	25288.080	0.6630011	0.8950	38.1072	50.8147	208.0307
X.228	**2006-049B**	**Blok-DM-SL (Zenit-3SL)**					**RB**
TLEs	GTO (0.08)	2018-12-30	21:40:16.494				
29521.0	TEME	25057.796	0.6929676	0.0910	288.2770	45.3652	48.1964
X.229	**2006-051B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	MGO (0.08)	2018-12-30	05:09:05.366				
29527.0	TEME	25802.951	0.6346675	13.3169	184.4803	306.3681	8.1497
X.230	**2007-004G**	**PAM-D (Delta 7925)**					**RB**
TLEs	HEO (0.00)	2018-12-30	05:42:10.297				
30799.0	TEME	49274.449	0.8577372	11.5284	56.2881	334.0750	232.0549
X.231	**2007-009C**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	MGO (0.08)	2018-12-30	16:55:16.643				
31104.0	TEME	26929.828	0.5659598	11.9533	303.7397	85.9208	164.9886
X.233	**2008-001B**	**Blok-DM-SL (Zenit-3SL)**					**RB**
TLEs	GTO (0.06)	2018-12-30	23:23:52.056				
32405.0	TEME	24586.360	0.7126162	5.8317	276.8602	141.1584	279.3333
X.236	**2008-039C**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	MGO (0.10)	2018-12-30	22:39:01.321				
33280.0	TEME	26484.062	0.5975087	22.5438	70.6953	323.0161	282.4996

X.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\text{GEO}}_{\text{IADC}}$)	Date	Time				
S-ID	Frame	a	e	i	Ω	ω	λ
X.237	**2008-044C**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	MGO (0.01)	2018-12-30	13:55:28.339				
33375.0	TEME	26289.281	0.5973076	12.3606	51.3469	153.9937	271.3594
X.239	**1981-049D**	**Star 27 (Delta 3914)**					**RB**
TLEs	GHO (0.01)	2018-12-30	17:03:31.664				
33521.0	TEME	48110.541	0.1630944	21.9616	338.1811	83.9618	171.3985
X.242	**2009-017B**	**Centaur-5 SEC (Atlas V 421)**					**RB**
TLEs	HEO (0.00)	2018-12-29	20:11:38.921				
34714.0	TEME	38298.988	0.8173057	19.1702	96.0451	241.5628	54.4827
X.243	**2009-020B**	**Blok-DM-SL (Zenit-3SL)**					**RB**
TLEs	MGO (0.04)	2018-12-30	19:21:54.379				
34811.0	TEME	28390.230	0.4791163	0.2140	227.2257	51.3688	18.3625
X.244	**2009-027B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	MGO (0.05)	2018-12-30	18:55:57.842				
34942.0	TEME	31233.866	0.3451482	9.4789	48.4612	24.8525	200.6396
X.245	**2009-032B**	**Blok-DM-SL-B (Zenit-3SLB)**					**RB**
TLEs	MGO (0.01)	2018-12-30	19:31:38.406				
35363.0	TEME	29807.875	0.4068997	11.9936	4.9844	102.4761	321.5096
X.246	**2009-067B**	**Blok-DM-SL-B (Zenit-3SLB)**					**RB**
TLEs	MGO (0.11)	2018-12-30	18:38:07.173				
36107.0	TEME	29244.819	0.4459415	10.3610	141.8167	130.0176	135.4262
X.248	**2010-061B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	MGO (0.02)	2018-12-30	12:54:42.185				
37219.0	TEME	27100.938	0.5482634	18.3647	309.6033	329.8338	205.4131
X.251	**2011-011B**	**Delta IV DCSS 4 (Delta 4M+(4,2))**					**RB**
vimpel	GTO (0.02)	2018-12-24	19:19:51.000				
71000.0	J2000	26460.800	0.7372600	26.3520	202.7410	15.3520	179.7093
X.254	**2012-003B**	**Delta IV DCSS 5 (Delta 4M+(5,4))**					**RB**
TLEs	HEO (0.00)	2018-12-29	07:52:37.846				
38071.0	TEME	38364.276	0.8239596	20.5016	228.2508	215.2461	12.2974
X.256	**2012-030B**	**Blok-DM-SL (Zenit-3SL)**					**RB**
TLEs	GTO (0.05)	2018-12-30	09:10:42.771				
38357.0	TEME	24577.098	0.7099554	0.8306	19.5331	108.3944	123.5393
X.259	**2012-070B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	MGO (0.04)	2018-12-30	14:13:16.939				
39023.0	TEME	25759.036	0.6316000	25.0599	212.1891	11.2281	260.6056

X.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time				
S-ID	Frame	a	e	i	Ω	ω	λ
X.260	**2013-024B**	**Delta IV DCSS 5 (Delta 4M+(5,4))**					**RB**
TLEs	HEO (0.00)	2018-12-29	04:26:50.507				
39169.0	TEME	39690.827	0.8215516	23.8368	105.6856	6.5115	297.7348
X.261	**2013-026B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	HEO (0.00)	2018-12-30	10:18:03.465				
39173.0	TEME	39517.349	0.7522043	23.9008	199.6962	146.0198	306.4564
X.267	**2014-090B**	**H-18 (Long March (CZ) 3A)**					**RB**
TLEs	GTO (0.03)	2018-12-30	14:42:05.969				
40368.0	TEME	25018.734	0.7327181	24.8350	306.9827	348.8406	346.2249
X.268	**2015-005B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	HEO (0.00)	2018-12-30	04:35:08.389				
40385.0	TEME	39375.938	0.7725447	22.8007	183.8641	57.6883	18.0389
X.269	**2015-010C**	**Falcon 9 Merlin-V (1D) (Falcon 9 v1.1)**					**RB**
TLEs	HEO (0.00)	2018-12-29	16:43:48.008				
40426.0	TEME	38073.701	0.8183106	22.5108	163.5780	226.6283	174.5102
X.270	**2015-036B**	**Delta IV DCSS 5 (Delta 4M+(5,4))**					**RB**
TLEs	HEO (0.00)	2018-12-30	02:17:59.509				
40747.0	TEME	39606.131	0.8281895	25.5465	290.1820	155.0224	157.3193
X.271	**2015-042B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	HEO (0.00)	2018-12-30	23:12:51.418				
40883.0	TEME	39587.512	0.7850822	31.7359	27.0994	31.5105	303.7588
X.275	**2016-013B**	**Falcon 9 Merlin-V (1D+) (Falcon 9 v1.2)**					**RB**
TLEs	HEO (0.02)	2018-12-30	13:43:42.195				
41381.0	TEME	26734.423	0.7485928	27.9290	27.5509	344.1506	83.0433
X.276	**2016-031B**	**Falcon 9 Merlin-V (1D+) (Falcon 9 v1.2)**					**RB**
TLEs	HEO (0.00)	2018-12-30	04:52:25.809				
41553.0	TEME	49378.949	0.8671013	19.8569	307.0941	352.6124	122.9734
X.277	**2016-035B**	**Briz-M (Proton-M/Briz-M)**					**RB**
TLEs	HEO (0.00)	2018-12-30	06:43:52.734				
41582.0	TEME	39012.253	0.7892824	28.9479	267.9483	350.2563	70.2400
X.279	**2016-038C**	**Falcon 9 Merlin-V (1D+) (Falcon 9 v1.2)**					**RB**
TLEs	HEO (0.00)	2018-12-29	23:18:46.145				
41590.0	TEME	37803.305	0.8245999	21.2982	138.3225	104.6903	50.7047
X.281	**2013-073C**	**Proton-M third stage (Proton-M/Briz-M)**					**RB**
TLEs	HEO (0.00)	2018-12-30	10:05:50.811				
39494.0	TEME	39673.356	0.7636254	26.8234	81.8075	117.4720	191.2097

X.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time				
S-ID	Frame	a	e	i	Ω	ω	λ
X.282	**2015-019C**	**YZ-1 (Long March (CZ) 3C/YZ-1)**					**RB**
TLEs	HEO (0.00)	2018-12-28	06:58:19.866				
41929.0	TEME	98846.505	0.6582353	24.5880	288.1487	71.3517	85.9085
X.283	**2017-018B**	**H-18 (Long March (CZ) 3B)**					**RB**
TLEs	GTO (0.02)	2018-12-30	11:48:14.258				
42663.0	TEME	26025.740	0.7440966	20.2597	149.3938	205.1836	233.4510
X.284	**2017-025B**	**Falcon 9 Merlin-V (1D+) (Falcon 9 v1.2)**					**RB**
TLEs	HEO (0.00)	2018-12-30	16:11:45.577				
42699.0	TEME	41479.865	0.8362086	25.2952	329.9238	325.6955	341.7175
X.285	**2017-029C**	**ESC-A (Ariane 5ECA)**					**RB**
TLEs	GTO (0.05)	2018-12-30	03:59:51.287				
42742.0	TEME	24348.838	0.7269018	5.5456	198.1748	285.4955	39.2298
X.286	**2017-040C**	**ESC-A (Ariane 5ECA)**					**RB**
TLEs	GTO (0.03)	2018-12-30	17:31:37.317				
42816.0	TEME	24303.349	0.7282897	2.4095	204.2433	261.7460	202.0969
X.289	**2018-012C**	**ESC-A (Ariane 5ECA)**					**RB**
TLEs	HEO (0.01)	2018-12-30	15:56:25.750				
43176.0	TEME	27797.957	0.7587929	21.1931	128.4530	57.6116	149.5189
X.290	**2018-013B**	**Falcon 9 Merlin-V (1D+) (Falcon 9 v1.2)**					**RB**
TLEs	HEO (0.00)	2018-12-30	15:57:37.949				
43179.0	TEME	30941.697	0.7842906	23.4097	202.4125	313.6040	223.0761
X.292	**2018-049B**	**Falcon 9 Merlin-V (1D+) (Falcon 9 v1.2)**					**RB**
TLEs	HEO (0.00)	2018-12-30	09:42:20.701				
43489.0	TEME	35796.537	0.8147031	26.1748	122.7945	235.7792	238.3474
X.293	**2018-074C**	**ESC-A (Ariane 5ECA)**					**RB**
TLEs	GTO (0.03)	2018-12-30	19:17:24.829				
43634.0	TEME	24342.862	0.7262477	5.8034	133.5993	255.3340	104.9318
X.294	**2018-090B**	**Falcon 9 Merlin-V (1D+) (Falcon 9 v1.2)**					**RB**
TLEs	GTO (0.03)	2018-12-29	17:29:00.161				
43701.0	TEME	25143.721	0.7392233	24.9457	183.9307	205.1649	183.5512
X.295	**2018-105B**	**GS3 (GSLV Mk II)**					**RB**
TLEs	GTO (0.02)	2018-12-24	11:20:52.543				
43865.0	TEME	25848.320	0.7471279	19.4452	191.1240	181.6816	287.9179

5 OBJECTS WITHOUT EPHEMERIS

This section contains all objects for which no orbital data is available, prohibiting the determination of the status of such an object. The following symbols are used:

Source source of the orbital data (see section 2),

S-ID source internal identifier,

COSPAR designation in COSPAR notation (see section 3 for detailed explanation); incomplete in case of not being catalogued,

Name object's common name (names),

Type type of the object (PD: Payload Debris, PF: Payload Fragmentation Debris, PL: Payload, PM: Payload Mission Related Object, RB: Rocket Body, RD: Rocket Debris, RF: Rocket Fragmentation Debris),

5.1 Catalogued Objects

The following list contains 5 objects, which have been catalogued by USSTRATCOM, but having no orbital data available from whichever source.

For explanation of symbols, see the definitions at the beginning of section 5.

Source	S-ID	COSPAR	Name	Type
KIAM	U001	1975-118D	OPS 3165 debris (DSP F5 IR Sensor telescope sunshade cover)	PM
KIAM	U002	1976-059D	OPS 2112 debris (DSP F6 IR Sensor telescope sunshade cover)	PM
KIAM	U003	1979-053D	OPS 7484 debris (DSP F8 IR Sensor telescope sunshade cover)	PM
KIAM	U004	1990-095E	USA 65 debris (DSP F15 IR Sensor telescope sunshade cover)	PM
KIAM	U005	2001-033E	USA 159 debris (DSP F21 IR Sensor telescope sunshade cover)	PM

5.2 Uncatalogued Objects

The following list contains 55 objects, which are known to have been released from satellites in GEO, but which have been neither catalogued by USSTRATCOM nor identified yet by KIAM among objects dicovered and tracked by ISON network.

For explanation of symbols, see the definitions at the beginning of section 5.

Source	S-ID	COSPAR	Name	Type
KIAM	UU001	1971-039	OPS 3811 debris (DSP F2 IR Sensor telescope sunshade cover)	PM
KIAM	UU003	1973-040	OPS 6157 debris (DSP F4 IR Sensor telescope sunshade cover)	PM
KIAM	UU004	1975-011	SMS 2 debris (VISSR cover)	PM
KIAM	UU005	1975-100	GOES 1 debris (VISSR cover)	PM
KIAM	UU008	1977-048	GOES 2 debris (VISSR cover)	PM
KIAM	UU009	1977-065	Himawari 1 debris (VISSR cover)	PM
KIAM	UU011	1977-108	Meteosat 1 debris (MVIRI cover)	PM
KIAM	UU012	1977-108	Meteosat 1 debris (MVIRI cooler cover)	PM
KIAM	UU013	1978-062	GOES 3 debris (VISSR cover)	PM
KIAM	UU014	1980-074	GOES 4 debris (VAS cover)	PM

Source	S-ID	COSPAR	Name	Type
KIAM	UU015	1981-025	OPS 7350 debris (DSP F9 IR Sensor telescope sunshade cover)	PM
KIAM	UU016	1981-049	GOES 5 debris (VAS cover)	PM
KIAM	UU017	1981-057	Meteosat 2 debris (MVIRI cover)	PM
KIAM	UU018	1981-057	Meteosat 2 debris (MVIRI cooler cover)	PM
KIAM	UU019	1981-076	Himawari 2 debris (VISSR cover)	PM
KIAM	UU021	1981-114	Satcom IIIR debris (Array restraint cable)	PM
KIAM	UU022	1982-004	Satcom IV debris (Array restraint cable)	PM
KIAM	UU023	1982-019	OPS 8701 debris (DSP F10 IR Sensor telescope sunshade cover)	PM
KIAM	UU024	1982-105	Aurora I debris (Array restraint cable)	PM
KIAM	UU025	1983-030	Satcom IR debris (Array restraint cable)	PM
KIAM	UU026	1983-041	GOES 6 debris (VAS cover)	PM
KIAM	UU027	1983-094	Satcom IIR debris (Array restraint cable)	PM
KIAM	UU029	1984-049	Spacenet 1 debris (Array restraint cable)	PM
KIAM	UU030	1984-080	Himawari 3 debris (VISSR cover)	PM
KIAM	UU031	1984-114	Spacenet 2 debris (Array restraint cable)	PM
KIAM	UU032	1984-129	USA 7 debris (DSP F12 IR Sensor telescope sunshade cover)	PM
KIAM	UU033	1985-035	GStar 1 debris (Array restraint cable)	PM
KIAM	UU034	1985-076	ASC 1 debris (Array restraint cable)	PM
KIAM	UU035	1986-026	GStar 2 debris (Array restraint cable)	PM
KIAM	UU036	1987-022	GOES 7 debris (VAS cover)	PM
KIAM	UU037	1987-097	USA 28 debris (DSP F13 IR Sensor telescope sunshade cover)	PM
KIAM	UU038	1988-018	Spacenet 3R debris (Array restraint cable)	PM
KIAM	UU039	1988-051	Meteosat 3 debris (MVIRI cover)	PM
KIAM	UU040	1988-051	Meteosat 3 debris (MVIRI cooler cover)	PM
KIAM	UU041	1988-051	Meteosat 3 AKM (MAGE 1)	RB
KIAM	UU042	1988-051	PAS 1 debris (Array restraint cable)	PM
KIAM	UU043	1989-020	Meteosat 4 debris (MVIRI cover)	PM
KIAM	UU044	1989-020	Meteosat 4 debris (MVIRI cooler cover)	PM
KIAM	UU045	1989-070	Himawari 4 debris (VISSR cover)	PM
KIAM	UU046	1990-100	Satcom C-1 debris (Array restraint cable)	PM
KIAM	UU047	1990-100	GStar 4 debris (Array restraint cable)	PM
KIAM	UU048	1991-015	Meteosat 5 debris (MVIRI cover)	PM
KIAM	UU049	1991-015	Meteosat 5 debris (MVIRI cooler cover)	PM
KIAM	UU050	1991-028	Spacenet 4 debris (Array restraint cable)	PM
KIAM	UU051	1991-037	Aurora II debris (Array restraint cable)	PM
KIAM	UU053	1992-057	Satcom C-4 debris (Array restraint cable)	PM
KIAM	UU054	1992-060	Satcom C-3 debris (Array restraint cable)	PM
KIAM	UU055	1993-073	Meteosat 6 debris (MVIRI cover)	PM
KIAM	UU056	1993-073	Meteosat 6 debris (MVIRI cooler cover)	PM
KIAM	UU057	1994-040	BS-3N debris (Array restraint cable)	PM
KIAM	UU059	1995-011	Himawari 5 debris (VISSR cover)	PM

Source	S-ID	COSPAR	Name	Type
KIAM	UU060	1996-003	Koreasat 2 debris (Array restraint cable)	PM
KIAM	UU062	1997-049	Meteosat 7 debris (MVIRI cover)	PM
KIAM	UU063	1997-049	Meteosat 7 debris (MVIRI cooler cover)	PM
KIAM	UU067	2004-004	USA 176 debris (DSP F22 IR Sensor telescope sunshade cover)	PM

6 FIGURES

The following graphs illustrate the evolution of the object population near GEO_{IADC}, as well as the environment at the reference date. Only objects with recent ephemeris with respect to the reference date were used to produce the figures:

6.1 trend of absolute number of objects in each category,

6.2 trend of relative number of objects in each category,

6.3 number of objects under control, in drift orbit or in libration orbit according to the launch year,

6.4 distribution of the longitude of the satellites under control,

6.5 trend of adherence to the IADC re-orbiting guidelines,

6.6 distribution and altitude range of the objects in drift orbit,

6.7 zoom in the distribution and altitude range of the objects in drift orbit,

6.8 distribution of the perigee mean deviation from the geostationary altitude for the objects in drift orbit,

6.9 distribution of objects in libration orbit,

6.10 polar representation of the orbital poles of objects.

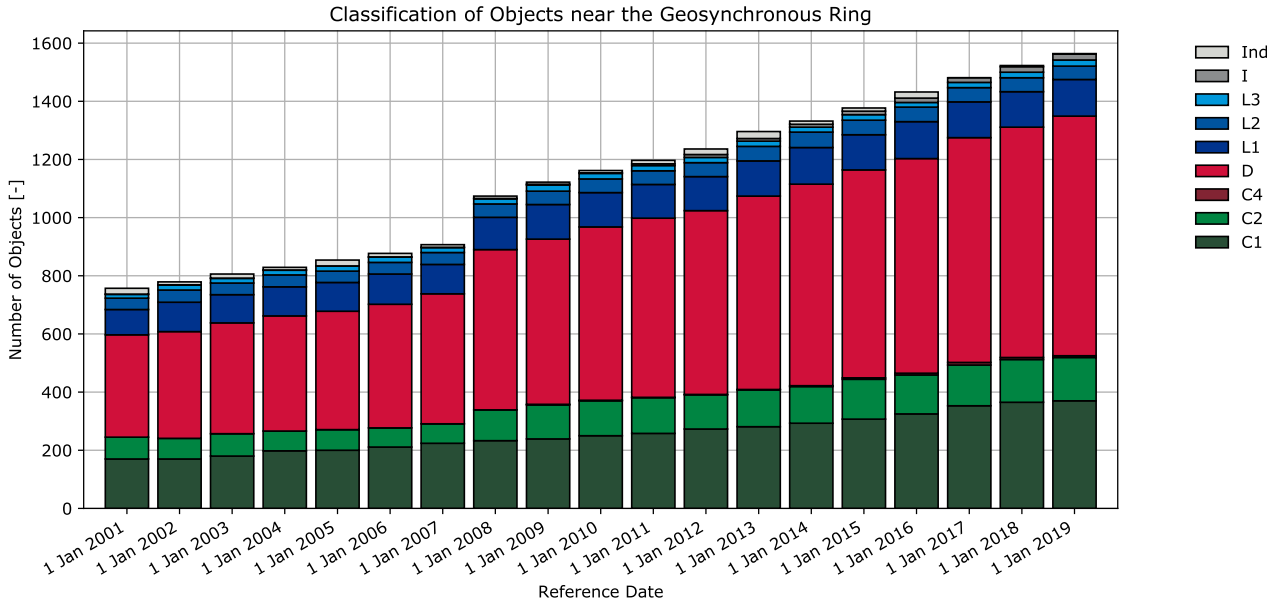


Figure 6.1: Absolute number of geosynchronous objects in their respective category bins. Please note that the apparent jump for reference date Jan 1 2008 is due to the addition of the KIAM catalogue.

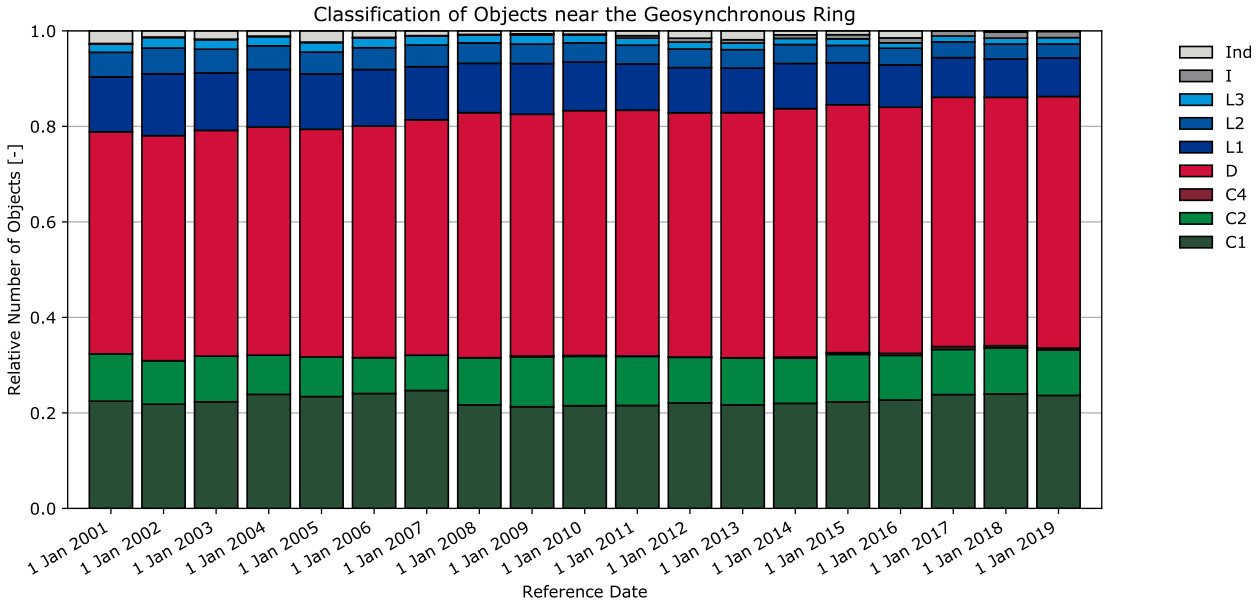


Figure 6.2: Relative number of geosynchronous objects in their respective category bins.

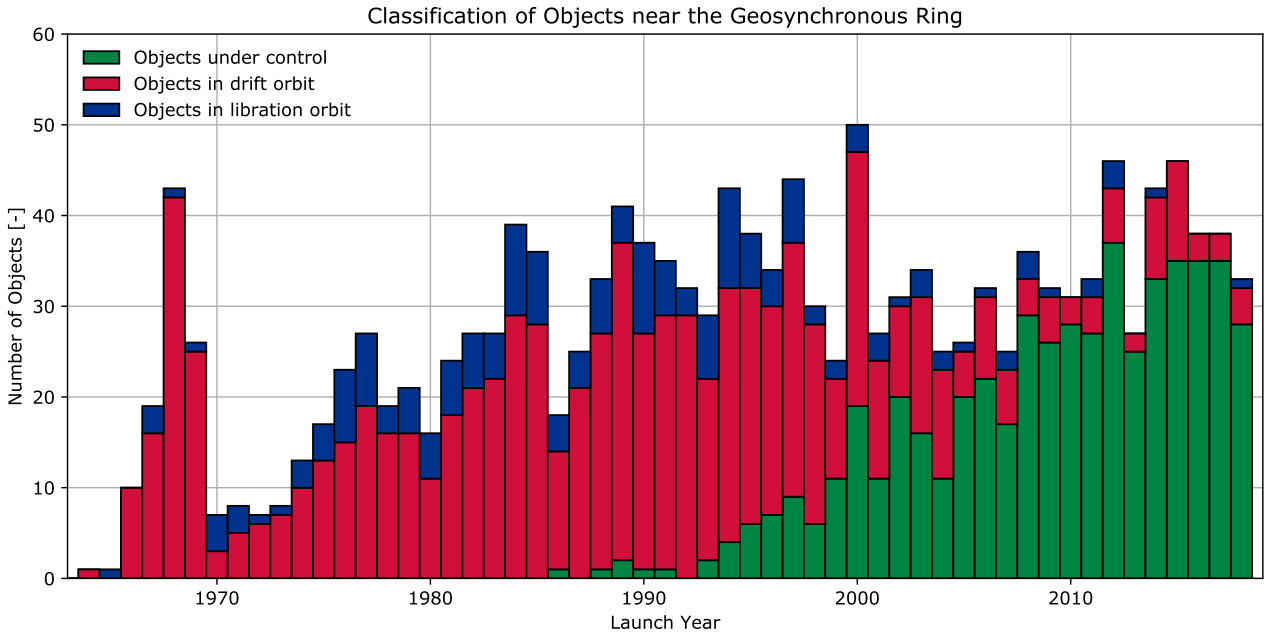


Figure 6.3: Number of objects in each category according to launch year (without categories I and Ind).

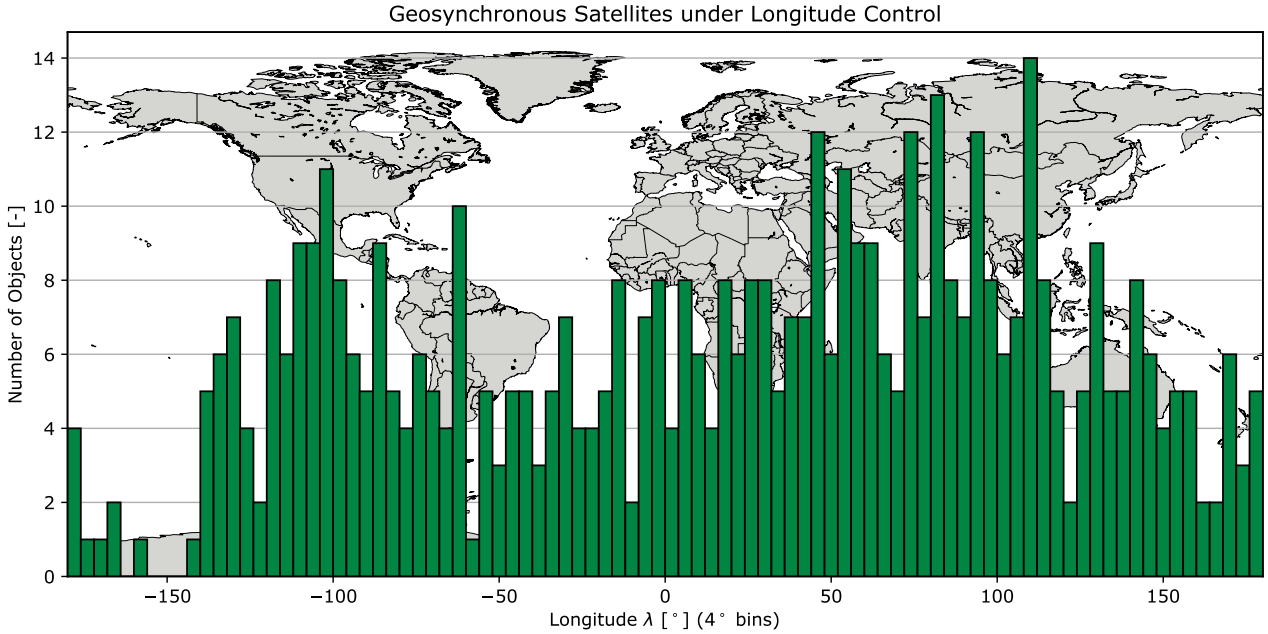
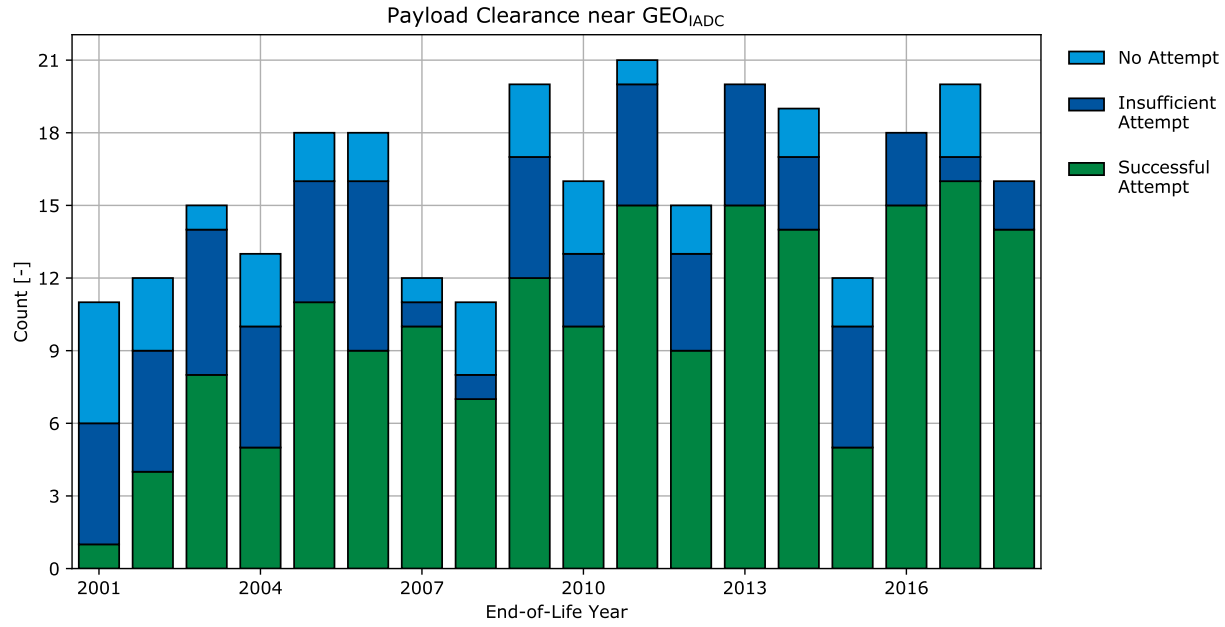
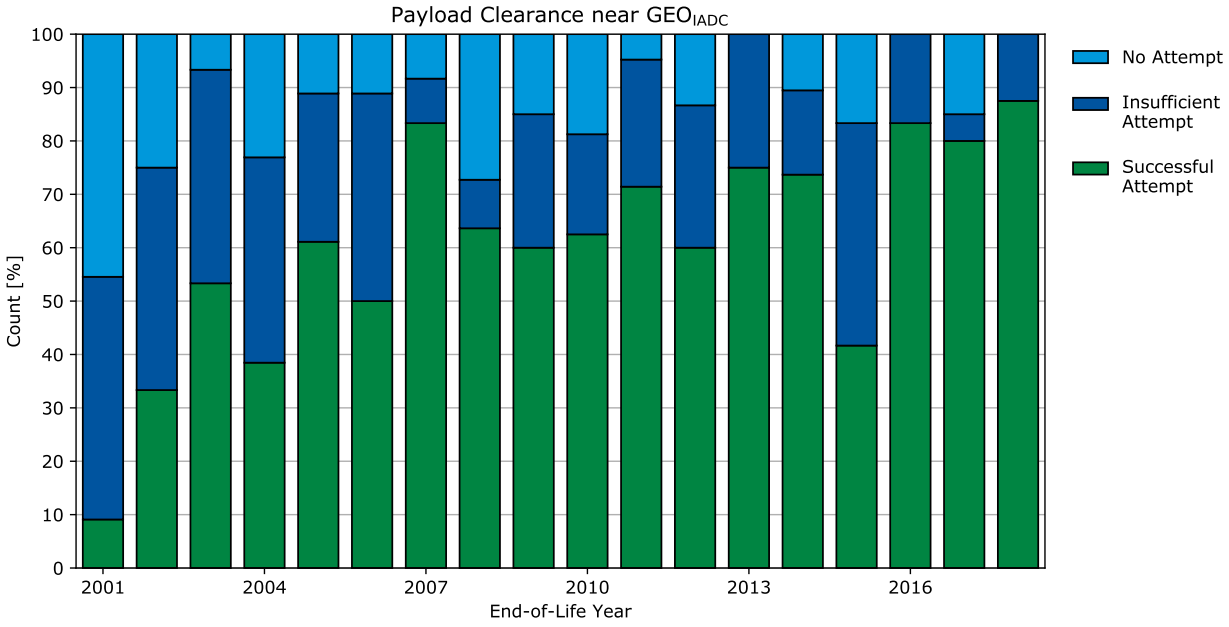


Figure 6.4: Distribution of the longitude of the satellites under control (without category C4).



(a) Absolute number of payloads



(b) Relative number of payloads

Figure 6.5: Trend plots for the overall adherence to the IADC re-orbiting guidelines for payloads with as reference epoch the 1th of January of the identified year. An attempt is identified when a re-orbit manoeuvre is detected, and identified as successful when the IADC re-orbiting guidelines condition is estimated to be met.

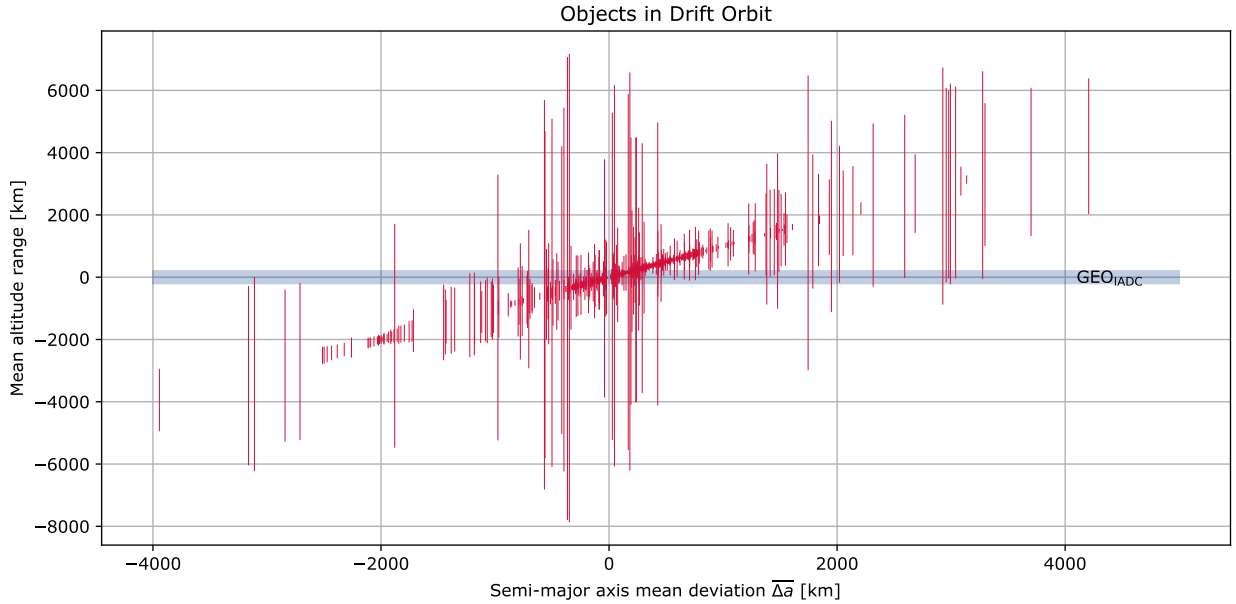


Figure 6.6: Distribution and altitude range of the objects in drift orbit.

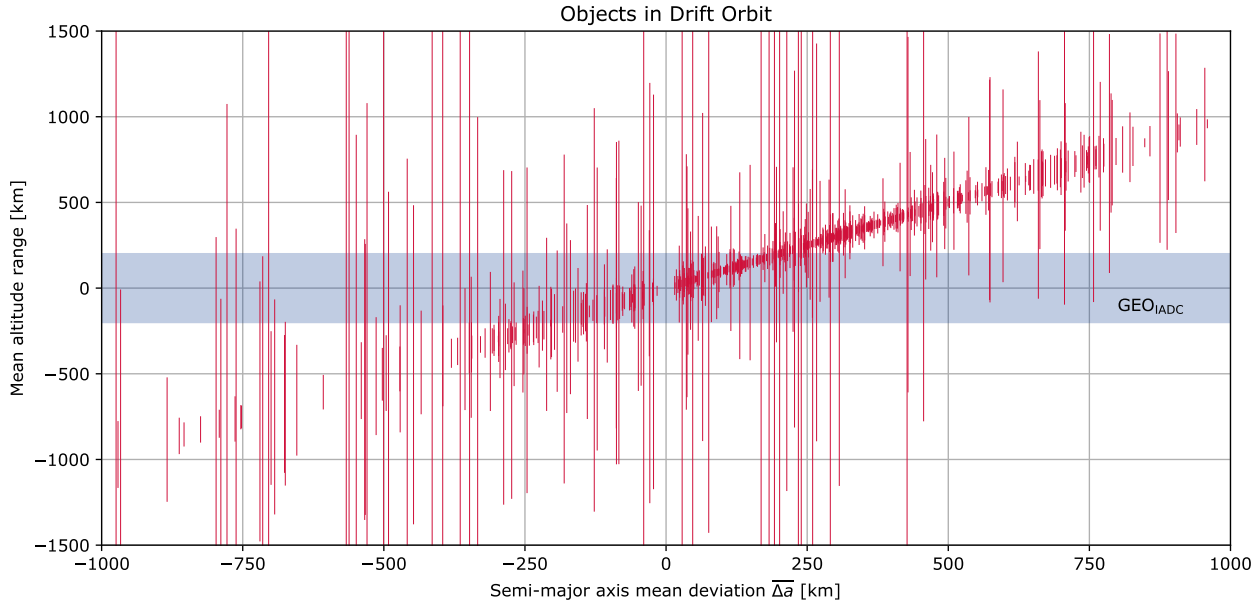


Figure 6.7: Zoom in the distribution and altitude range of the objects in drift orbit.

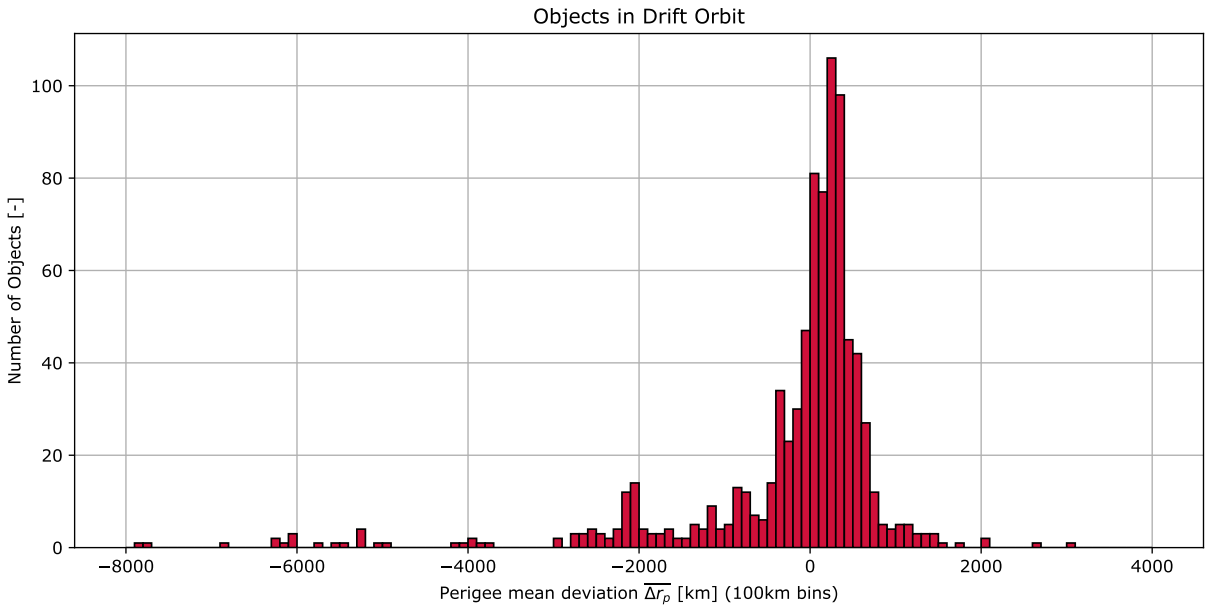


Figure 6.8: Distribution of the perigee mean deviation from the geostationary altitude.

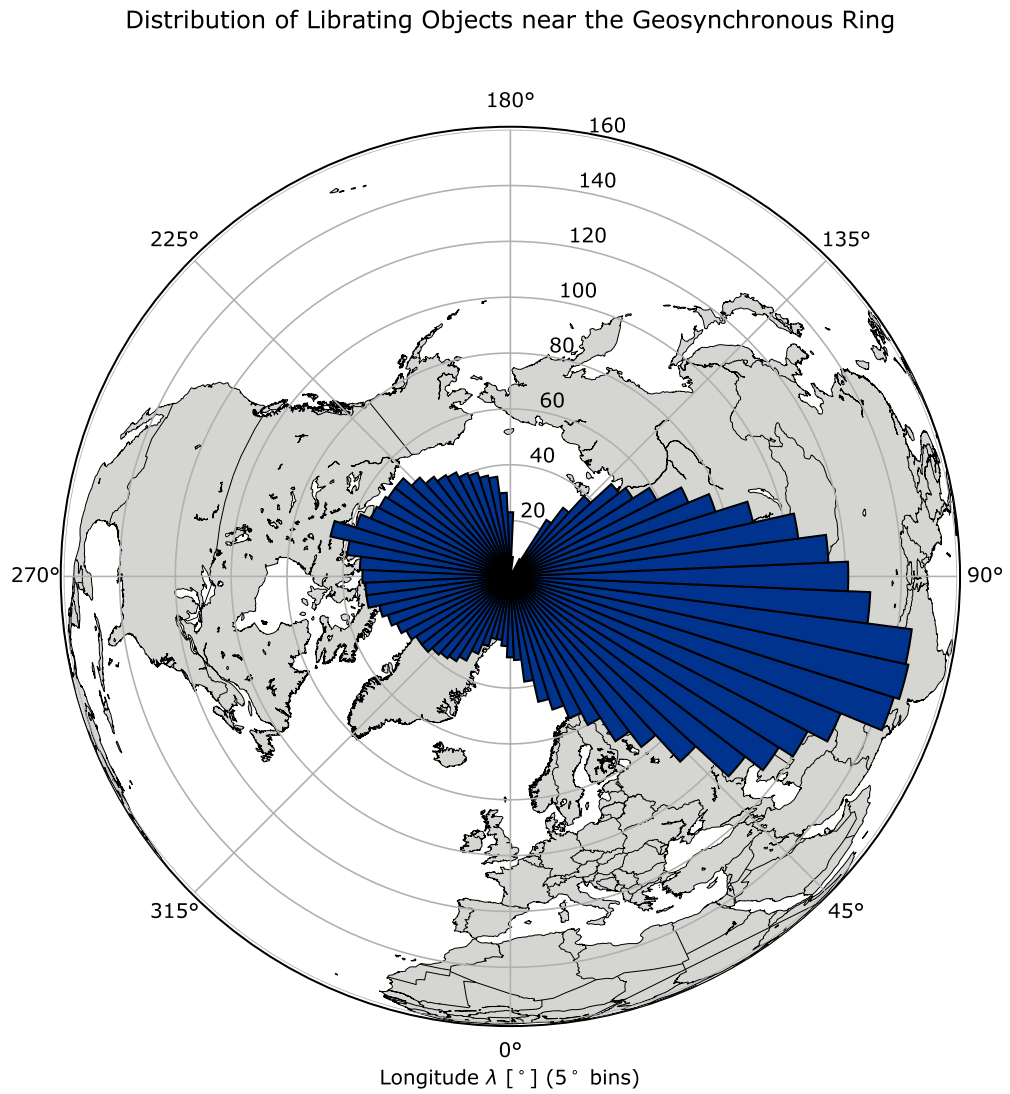


Figure 6.9: Distribution of objects in libration orbit. For every longitude interval, the number of objects librating through this interval is given, e.g. the interval encompassing the Eastern stable point (75°) contains the sum of the objects in classes L1 and L3.

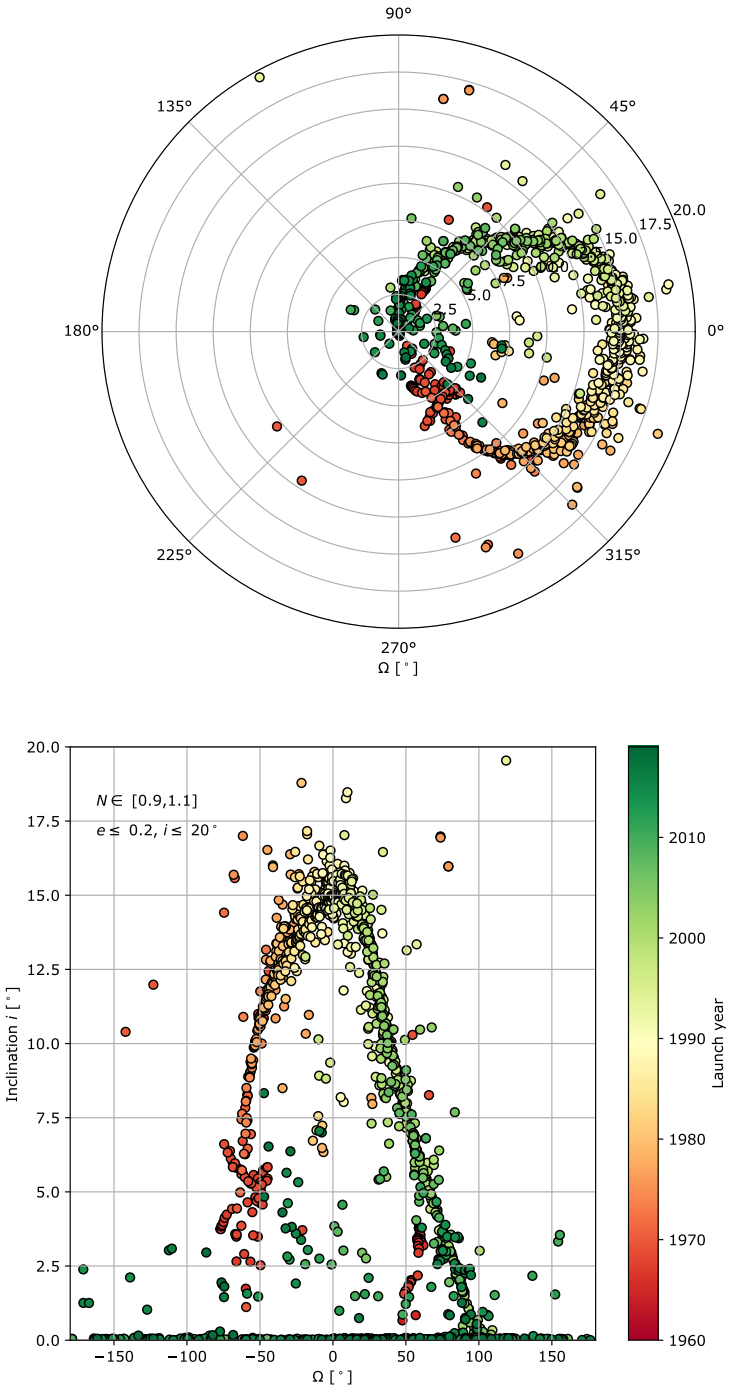


Figure 6.10: Polar representation of the orbital poles of objects listed in this report. N indicates the mean motion.

7 SUMMARY

All objects catalogued in ESA's DISCOS Database (Database and Information System Characterising Objects in Space) and residing at the reference date within one of the orbital regimes GEO, IGO and EGO (see table 1 for the class definitions) are listed in this document.

1578 objects met these criteria as of 1 January 2019. A total of 14 objects have only old orbital data available (i.e. older than 180 days compared to the reference date). The classification of outdated objects are used in the classification statistics given that their overall number is small. For 206 of the total amount of objects, the classification was performed using data from the JSC Vimpel Space Data catalogue. For 9 of the total amount of objects, KIAM provided orbital elements. A total of 60 additional objects are also known to be present in this orbital region. Of these only 5 objects have been correlated by USSTRATCOM with a launch but orbital data for them are not available from whichever source. 55 objects are known to have been released from satellites in GEO, but they have been neither catalogued by USSTRATCOM nor identified yet by KIAM among objects discovered and tracked by ISON network. Thus, the total number of known objects in the geostationary region is 1638.

The 1578 objects with orbital data can be classified as follows:

- 529 are controlled (of which 4 are outdated),
- 831 are in a drift orbit (of which 7 are outdated),
- 195 are in a libration orbit (of which 2 are outdated),
- 21 are in a highly inclined orbit (of which 1 is outdated),
- 2 could not be classified.

Out of those objects, 252 are identified as rocket bodies. In addition, 130 rocket bodies were found to be crossing the GEO protected region.

In 2018 at least 16 spacecraft reached end of life as far as can be inferred from the orbital elements stored in DISCOS, from data provided by KIAM, or declared by spacecraft operators (for information on the registration of space objects see [4]). From issue 19 of this document onwards, the International Organization for Standardization's requirement derived from the IADC re-orbiting guidelines is adopted as a measures to verify compliance [5]. Prior to issue 19 of this document, the compliance was established by applying the IADC re-orbiting guidelines' formulation for re-orbit perigee height and eccentricity, which is included in the current measures as well. According to these measures, fourteen spacecraft were re-orbited sufficiently above GEO_{IADC} and complied with the IADC re-orbiting guidelines:

- Brazilsat B2 (1995-016A, 275.50×309.80 km, see p. 126),
- EchoStar 1 (1995-073A, 367.80×392.40 km, see p. 118),
- Brazilsat B3 (1998-006A, 287.70×309.70 km, see p. 126),
- NSS 806 (Intelsat 806) (1998-014A, 322.30×354.90 km, see p. 121),
- Apstar 9A (1998-033A, 351.40×374.40 km, see p. 119),
- AfriStar 1 (1998-063A, 379.60×338.00 km, see p. 119),
- Superbird 4 (2000-012A, 344.60×462.90 km, see p. 116),
- Eutelsat 16C (SESAT 1) (2000-019A, 359.90×388.00 km, see p. 118),
- Bermudasat 1 (EchoStar 6) (2000-038A, 406.70×435.40 km, see p. 115),
- Nilesat 102 (2000-046B, 623.00×651.40 km, see p. 107),
- Eutelsat 12 West A (Atlantic Bird 1) (2002-040A, 538.30×590.70 km, see p. 109),
- KALPANA-1 (METSAT-1) (2002-043A, 542.20×560.40 km, see p. 109),
- Eutelsat 31A (Eutelsat 33A, Eurobird 3, eBird 1) (2003-043A, 375.20×412.60 km, see p. 117),
- Chinasat 20 (Zhongxing 20, ZX 20, Shentong 1-1) (2003-052A, 321.20×336.70 km, see p. 122).

Two spacecraft were re-orbited, however too low with respect to the IADC re-orbiting guidelines:

- MEASAT 2 (1996-063B, 160.60×187.70 km, see p. 135),
- Chinasat 22A (Zhongxing 22A, ZX 22A, Feng Huo 1-2) (2006-038A, 38.90×68.40 km, see p. 143).

In 2018 a total of 30 new payloads have been launched into GEO_{IADC}.

Whereas the scope of this document is focussing on spacecraft activities in GEO, it is important to mention that two rocket bodies have been left in a drift orbit close to or crossing the GEO_{IADC}:

- Briz-M (Proton-M/Briz-M) (2018-037B, see p. 97),
- Briz-M (Proton-M/Briz-M) (2018-107B, see p. 97).

For more information on the penetration of GEO_{IADC} by spacecraft and rocket bodies on orbits which cross the protected regions, the reader is advised to consult [6]. In the previous issue of this document, Telkom 1 (1999-042A, see p. 169) was classified as C1 whereas it experienced a failure on-orbit in 2017. This has been corrected for the classification statistics.

This analysis has shown that in 2018, twenty-one years after the IADC guidelines were established and seventeen years after their adoption, there is in general a pronounced willingness to comply with the guidelines. Notwithstanding the slightly lower amount of payloads reaching end of life in GEO when compared to the median of the current decade, 2018 stands out as the best year on record when it comes to the share of successful attempts to clear the protected region. However, rocket bodies were still left in the protected region in 2018 and many more relics from the past are regularly crossing the protected region.

8 ACKNOWLEDGEMENTS

The authors, Francesca Letizia and Stijn Lemmens, take the opportunity to thank Vladimir Agapov (KIAM) for his suggestions and valuable contributions. They also would like to thank Jan Siminski, Tim Flohrer, and Benjamin Bastida Virgili for providing technical support and further input.

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Glossary

ABS	Asia Broadcast Satellite. 58, 60, 65, 81, 127, 137, 160
ACTS	Advanced Communications Technology Satellite. 181
AEHF	Advanced Extremely High Frequency. 83, 89, 92, 93
AKM	Apogee Kick Motor. 9, 105, 107, 111, 114, 115, 128–131, 133, 134, 136, 142, 143, 145, 148, 150–152, 156–160, 166, 206
Alcomsat	Algerian Communication Satellite. 80
AMC	Americom. 69–71, 73, 75, 79, 83, 91, 93, 120, 129
AMOS	Affordable Modular Optimized Satellite. 58, 81, 102, 130, 175
AMSC	American Mobile Satellite Corporation. 92
ANGELS	Automated Navigation and Guidance Experiment for Local Space. 114
APPLE	Ariane Passenger PayLoad Experiment. 142
Artemis	Advanced Relay and Technology Mission. 128
ASC	American Satellite Company. 178, 206
ATHENA-FIDUS	Access on theatres for European allied forces nations-French Italian dual use satellite. 54
ATS	Applications Technology Satellite. 107, 132, 149, 159, 181
BRISat	Bank Rakyat Indonesia Satellite. 67
BS	Broadcasting Satellite. 115, 120, 123, 127, 206
BSAT	Broadcasting Satellite. 63, 64, 122, 125
BSE	Broadcasting Satellite Experimental. 172
COMS	Communication, Ocean and Meteorological Satellite. 66
COMSATBw	Communication Satellite for Bundeswehr. 52, 58
CS	Communication Satellite. 107, 115, 117, 125, 130
CTS	Communications Technology Satellite. 178, 179
CZ	Chang Zheng. 98
DATS	Despun Antenna Test Satellite. 165
DCSS	Delta Cryogenic Second Stage. 100, 118, 120, 147, 149, 162
DFH	Dōngfānghóng. 154, 169–171, 173, 174, 176
DFS	Deutscher Fernmeldesatellit. 133, 136, 152
DLA	DIRECTV Latin America. 74
DODGE	Department of Defense Gravity Experiment. 165
DRTS	Data Relay & Tracking Satellite. 127
DSCS	Defense Satellite Communications System. 88, 90, 91, 94, 98–101, 103, 104, 109–112, 115, 118, 120, 122, 128, 147, 178, 182
DSP	Defense Support Program. 83, 86, 91, 93, 103, 107–109, 113, 114, 116, 124, 136, 138, 141, 147, 148, 151, 155, 157, 176, 193, 205–207
DW	Daohang Weixing. 58, 86, 88, 89, 175, 191, 192

ECS	European Communications Satellite. 107, 113, 115, 116
EDUSAT	Education Satellite. 127
ETS	Engineering Test Satellite. 120, 128, 141
FLTSATCOM	Fleet Satellite Communications. 87, 95, 111, 112, 147, 180
GeoLITE	Geosynchronous Lightweight Technology Experiment. 116
GEOS	Geostationary Scientific Satellite. 129
GGTS	Gravity Gradient Test Satellite. 165
GMS	Geostationary Meteorological Satellite. 102, 115, 126, 131, 133, 136, 138, 156
GOES	Geostationary Operational Environmental Satellite. 69, 70, 73, 76, 78, 114, 115, 117, 121, 123, 125, 129, 131, 140, 151, 159, 178, 179, 205, 206
GSAT	Geosynchronous Satellite. 56–62, 127, 139, 162
GSSAP	Geosynchronous Space Situational Awareness Program. 96
HGS	Hughes Global Services. 179
HYLAS	Highly Adaptable Satellite. 54, 79
IABS	Integrated Apogee Boost System. 141, 148, 152, 154–156, 158, 166
IDSCS	Initial Defense Satellite Communications System. 163–166
INSAT	Indian National Satellite. 56, 59, 60, 64, 113, 128, 135, 137, 138, 141, 146, 153, 163, 168, 169, 174, 175
Intelsat	International Telecommunications Satellite. 54, 55, 58, 59, 61, 68, 69, 71, 74, 76, 78–81, 84, 85, 89–92, 94, 97, 99, 102, 107, 108, 110, 111, 114, 116–125, 127, 128, 131, 134–136, 138, 140, 143, 144, 146, 160, 176, 177, 179, 180, 182, 216
IRNSS	Indian Regional Navigation Satellite System. 84, 86, 88, 191, 192
IUE	International Ultraviolet Explorer. 191
IUS	Inertial Upper Stage (originally - Interim Upper Stage). 126, 129, 132, 136, 138, 140, 144, 150, 151, 153–156, 182
JCSAT	Japan Communications Satellite. 64–68, 85, 89, 111, 113, 123, 132
JPL	Jet Propulsion Laboratory. 107
KAZSAT	Kazakh Satellite. 127
LEASAT	Leased Satellite. 101, 102, 105, 111, 134
LES	Lincoln Experimental Satellite. 108, 157, 165, 179, 181
LMI	Lockheed Martin Intersputnik. 68
MAGE	Moteur d'Apogée Géostationnaire Européen. 9, 105, 129, 133, 142, 145, 150, 152, 206
MARECS	Maritime European Communications Satellite. 99, 100
MEASAT	Malaysia East Asia Satellite. 121, 135, 217
METSAT	Meteorological Satellite. 109, 216

Milstar DFS	Military Strategic and Tactical Relay Development Flight Satellite. 93, 94
MITEx	Micro-satellite Technology Experiment. 112, 117
MOP	Meteosat Operational Programme. 102, 110, 119
MOS/PIM	Multi-Orbit Satellite/Performance Improvement Modification. 108, 113, 114, 116
MSAT	Mobile Satellite. 92
MSG	Meteosat Second Generation. 9, 51, 83, 84, 95, 148, 155, 158, 160
MTP	Meteosat Transition Programme. 109
MTSAT	Multi-Functional Transport Satellite. 67, 118
MUOS	Mobile User Objective System. 85, 90, 92, 95
MVIRI	Meteosat Visible and InfraRed Imager. 205–207
NATO	North Atlantic Treaty Organization. 99, 108, 111, 139, 178, 181
NigComSat	Nigerian Communication Satellite. 55, 172
NRL	Naval Research Laboratory. 162
NROL	NRO Launch. 84–88, 90, 91, 94
NSS	New Skies Satellites. 57, 62, 69, 84, 94, 102, 111, 121, 128, 216
OPS	Operations (?). 98–101, 103, 104, 107–111, 113, 114, 116, 126, 136, 138, 143, 145, 147–151, 163–166, 168, 171, 177–183, 205, 206
OSC	Orbital Sciences Corporation. 112
OTS	Orbital Test Satellite. 122
OV	Orbiting Vehicle. 132, 144, 150, 151, 153, 154, 156, 158, 182
PAS	PanAmSat. 9, 76, 78, 84, 85, 89, 91, 98, 99, 102, 108, 121, 123, 124, 129, 206
POTV	Precision Orbital Transfer Vehicle. 162
PSN	Pasifik Satelit Nusantara. 125
QZS	Quasi-Zenith Satellite. 65, 191, 192
RASCOM	Regional African Satellite Communication (Organization). 51
RCA	Radio Corporation of America. 112, 130, 133, 134, 139, 144
S-VISSR	Stretched Visible and Infrared Spin Scan Radiometer. 9, 168, 172–174
SBIRS	Space-Based Infrared System. 83, 85, 91
SBS	Satellite Business Systems. 114, 119, 137, 138, 140, 144
SCATHA	Spacecraft Charging AT High Altitudes. 158
SDO	Solar Dynamics Observatory. 191
SDS	Satellite Data System. 85, 87, 88, 91, 94, 95, 112
SES	Société Européenne des Satellites. 51, 62, 63, 70, 73, 75, 77–80
SESAT	Siberian-European Satellite. 86, 118, 216
SEVIRI	Spinning Enhanced Visible and Infrared Imager. 9, 148, 155, 158, 160
SGDC	Satélite Geoestacionário de Defesa e Comunicações Estratégicas. 76

SICRAL	Sistema Italiano per Comunicazioni Riservate ed Allarmi. 52, 54, 83
SIRIO	Satellite Italiano di Ricerca Industriale Orientata. 177
SMS	Synchronous Meteorological Satellite. 111, 112, 132, 166, 205
ST	Singapore-Taiwan. 60, 61, 114
STTW	Shiyan Tongbu Tongxing Weixing. 169–171, 173, 176
Syncom	Synchronous Communication. 101, 102, 105, 111, 134, 146, 191
Syracuse	Système de Radiocommunication utilisant un satellite. 56, 81
TACSAT	Tactical Communications. 149
TDF	TéléDiffusion de France. 112, 124
TDRS	Tracking and Data Relay Satellite. 86, 87, 90, 93–95, 111, 114
TJS	Tōngxùn Jishù Shiyàn. 58, 63, 68
UFO	UHF (Ultra High Frequency) Follow-On. 84, 85, 90, 94, 114, 115, 126, 147, 182, 193
VAS	VISSR Atmospheric Sounder. 205, 206
VINASAT	Vietnamese Satellite. 66
VISSR	Visible and Infrared Spin Scan Radiometer. 172, 177, 205, 206
WGS	Wideband Global SATCOM (initially - Wideband Gapfiller Satellite). 51, 57, 58, 61, 67, 69, 70, 78, 80
WINDS	Wideband InterNetworking engineering test and Demonstration Satellite. 89
YZ	Yuanzheng. 98
ZX	Zhongxing. 62–66, 86, 102, 122, 124, 125, 130, 136, 141, 143, 169, 170, 173, 174, 216, 217

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Please note that alternative names are being omitted throughout the index to facilitate readability.