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CLASSIFICATION OF GEOSYNCHRONOUS OBJECTS

Produced with the DISCOS Database

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Abstract

This is a status report on geosynchronous objects as of 1 January 2016.

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 From 1434 objects for which orbital data are available (of which 2 are outdated, i.e. the last available state dates back to 180 or more days before the reference date), 471 are actively controlled, 747 are drifting above, below or through GEO, 190 are in a libration orbit and 15 are in a highly inclined orbit. For 11 objects the status could not be determined.

Furthermore, there are 50 uncontrolled objects without orbital data (of which 44 have not been catalogued). Thus the total number of known objects in the geostationary region is 1484.

In issue 18 the previously used definition of "near the geostationary ring" has been slightly adapted.

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 epoch within either of the orbital classes GEO, EGO and IGO (see table 1 for the class definitions) are listed in this document. The main purpose is to classify all the objects residing in the former two orbital classes according to different categories (top level: controlled, drifting and librating).

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 IADC GEO protected region [1] defined by latitude ϕ [deg] and altitude h [km] is given.

Orbit	**Description**	**Definition**		
GEO	Geostationary Orbit	$i \in [0, 25]$	$h_p \in [35586, 35986]$	$h_a \in [35586, 35986]$
EGO	Extended Geostationary Orbit	$i \in [0, 25]$	$a \in [37948, 46380]$	$e \in [0, 0.25]$
IGO	Inclined Geosynchronous Orbit	$i \in [25, 180]$	$a \in [37948, 46380]$	$e \in [0, 0.25]$
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.

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. 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].

Eight 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 smaller than 0.3 degrees,

C2 objects under longitude control (only E-W control) – the longitude is nearly constant but the inclination is higher than 0.3 degrees,

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 degreesWest),

L3 objects in a libration orbit around both stable points,

I objects in highly inclined orbits with inclination larger than 25.0 degrees,

Ind objects of indeterminate status.

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 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 measurements obtained in 2015 and prepared by Vladimir Agapov, Keldysh Institute for Applied Mathematics, Moscow (KIAM). They 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 including the following observatories:
  - 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),
    - Milkovo (Kamchatka Krai, Russia),
  - 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).
- 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.

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

S-ID	COSPAR	Name	Page
UI089	1968-081R	Titan IIIC stage 3 fragmentation debris	p. 113
UI094	1997-040A	PAS 6	p. 75
UI099	1977-092K	Ekran 2 fragmentation debris	p. 109
UI153	2008-006C	Proton-M/Briz-M fourth stage (Briz-M)	p. 76
UI163	2010-006B	Proton-M/Briz-M fourth stage (Briz-M)	p. 75
UU065	2002-040E	Meteosat 8 (MSG 1) operational debris (SEVIRI Cooler Cover)	p. 116
UU066	2002-040F	Meteosat 8 (MSG 1) operational debris (SEVIRI Ent. Ba. Cov.)	p. 119
UU068	2004-042D	Fengyun 2C operational debris (S-VISSR radiometer cover?)	p. 129
UU070	2008-066D	Fengyun 2E operational debris (S-VISSR radiometer cover?)	p. 131
UU072	2012-035E	Meteosat 10 (MSG 3) operational debris (SEVIRI Cooler Cover)	p. 118
UU073	2012-035F	Meteosat 10 (MSG 3) operational debris (SEVIRI Ent. Ba. Cov)	p. 147

KIAM uses a more detailed system, extending the aforementioned categories (see section 2.1) by one more controlled drifting category.

C4 objects maintaining a drift orbit near or inside GEO_{IADC},

The objects for which 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.

Orbits were established by processing of optical measurements and propagation to 1 January 2016 00:00:00 UTC except for a few cases when the orbit was propagated to UTC midnight closest to the last obtained measurement. 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.

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;

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. 145
1964-047A	Syncom 3	D	537.	p. 110
1965-028A	Intelsat I F-1 (Early Bird)	L2	32.	p. 136
1966-053A	GGTS 1	D	731.	p. 123
1966-053B	OPS 9311 (IDSCS 1)	D	729.	p. 123
1966-053C	OPS 9312 (IDSCS 2)	D	727.	p. 123
1966-053D	OPS 9313 (IDSCS 3)	D	724.	p. 123
1966-053E	OPS 9314 (IDSCS 4)	D	721.	p. 123
1966-053F	OPS 9315 (IDSCS 5)	D	718.	p. 122
1966-053G	OPS 9316 (IDSCS 6)	D	715.	p. 122
1966-053H	OPS 9317 (IDSCS 7)	D	713.	p. 122
1966-053J	Titan IIIC stage 3 (Transtage 11)	D	711.	p. 122
1966-110A	ATS 1	D	542.	p. 111
1967-001A	Intelsat II F-2	D	539.	p. 111
1967-003A	OPS 9321 (IDSCS 8)	D	735.	p. 124
1967-003B	OPS 9322 (IDSCS 9)	D	734.	p. 124
1967-003C	OPS 9323 (IDSCS 10)	D	733.	p. 123
1967-003D	OPS 9324 (IDSCS 11)	D	732.	p. 123
1967-003E	OPS 9325 (IDSCS 12)	D	730.	p. 123
1967-003F	OPS 9326 (IDSCS 13)	D	723.	p. 123
1967-003G	OPS 9327 (IDSCS 14)	D	720.	p. 123
1967-003H	OPS 9328 (IDSCS 15)	D	716.	p. 122
1967-026A	Intelsat II F-3	L1	121.	p. 133
1967-066A	OPS 9331 (IDSCS 16)	D	742.	p. 124
1967-066B	OPS 9332 (IDSCS 17)	D	741.	p. 124
1967-066C	OPS 9333 (IDSCS 18)	D	740.	p. 124
1967-066D	OPS 9334 (IDSCS 19, DATS)	D	739.	p. 124
1967-066E	LES 5	D	738.	p. 124
1967-066F	DODGE 1	D	737.	p. 124
1967-066G	Titan IIIC stage 3 (Transtage 14)	D	736.	p. 124
1967-094A	Intelsat II F-4	L2	35.	p. 136
1967-111A	ATS 3	L2	19.	p. 135
1968-050A	OPS 9341 (IDSCS 20)	D	728.	p. 123
1968-050B	OPS 9342 (IDSCS 21)	D	726.	p. 123
1968-050C	OPS 9343 (IDSCS 22)	D	725.	p. 123
1968-050D	OPS 9344 (IDSCS 23)	D	722.	p. 123
1968-050E	OPS 9345 (IDSCS 24)	D	719.	p. 123
1968-050F	OPS 9346 (IDSCS 25)	D	717.	p. 122
1968-050G	OPS 9347 (IDSCS 26)	D	714.	p. 122
1968-050H	OPS 9348 (IDSCS 27)	D	712.	p. 122
1968-050J	Titan IIIC stage 3 (Transtage 16)	D	710.	p. 122
1968-063A	OPS 2222 (CANYON 1)	D	305.	p. 95
1968-063B	Atlas SLV-3A stage 2 (Agena D)	D	663.	p. 119
1968-081A	OV2-5 (DG7-2)	D	657.	p. 118
1968-081D	LES 6	L2	29.	p. 136
1968-081E	Titan IIIC stage 3 (Transtage 5)	D	654.	p. 118
1968-081G	Titan IIIC stage 3 fragmentation debris	D	607.	p. 115
1968-081H	Titan IIIC stage 3 fragmentation debris	D	661.	p. 119

COSPAR	Name	Status	nn	Page
1968-081J	Titan IIIC stage 3 fragmentation debris	D	599.	p. 115
1968-081K	Titan IIIC stage 3 fragmentation debris	D	670.	p. 119
1968-081L	Titan IIIC stage 3 fragmentation debris	D	664.	p. 119
1968-081M	Titan IIIC stage 3 fragmentation debris	D	588.	p. 114
1968-081N	Titan IIIC stage 3 fragmentation debris	D	600.	p. 115
1968-081P	Titan IIIC stage 3 fragmentation debris	D	647.	p. 118
1968-081Q	Titan IIIC stage 3 fragmentation debris	D	328.	p. 96
1968-081R	Titan IIIC stage 3 fragmentation debris	D	583.	p. 113
1968-081S	Titan IIIC stage 3 fragmentation debris	D	278.	p. 93
1968-081T	Titan IIIC stage 3 fragmentation debris	D	684.	p. 120
1968-081U	Titan IIIC stage 3 fragmentation debris	D	695.	p. 121
1968-081V	Titan IIIC stage 3 fragmentation debris	D	331.	p. 97
1968-081W	Titan IIIC stage 3 fragmentation debris	D	365.	p. 99
1968-081X	Titan IIIC stage 3 fragmentation debris	D	650.	p. 118
1968-081Y	Titan IIIC stage 3 fragmentation debris	D	705.	p. 122
1968-081Z	Titan IIIC stage 3 fragmentation debris	D	597.	p. 114
1968-081AA	Titan IIIC stage 3 fragmentation debris	D	682.	p. 120
1968-081AB	Titan IIIC stage 3 fragmentation debris	D	618.	p. 116
1968-081AC	Titan IIIC stage 3 fragmentation debris	D	674.	p. 120
1968-081AD	Titan IIIC stage 3 fragmentation debris	D	709.	p. 122
1968-081AE	Titan IIIC stage 3 fragmentation debris	D	675.	p. 120
1968-081AF	Titan IIIC stage 3 fragmentation debris	D	669.	p. 119
1968-081AG	Titan IIIC stage 3 fragmentation debris	D	574.	p. 113
1968-081AH	Titan IIIC stage 3 fragmentation debris	D	533.	p. 110
1968-081AJ	Titan IIIC stage 3 fragmentation debris	D	521.	p. 109
1968-081AK	Titan IIIC stage 3 fragmentation debris	D	549.	p. 111
1968-116A	Intelsat III F-2	D	6.	p. 75
1969-013A	TACSAT 1	D	551.	p. 111
1969-013B	Titan IIIC stage 3 (Transtage 17)	D	66.	p. 79
1969-036A	OPS 3148 (CANYON 2)	D	544.	p. 111
1969-036B	Atlas SLV-3A stage 2 (Agena D)	D	698.	p. 121
1969-045A	Intelsat III F-4	D	5.	p. 75
1969-069A	ATS 5	D	364.	p. 99
1969-069C	ATS 5 AKM (JPL SR-28-3)	D	119.	p. 83
1969-101A	Skynet 1A	L2	9.	p. 134
1970-003A	Intelsat III F-6	D	275.	p. 93
1970-021A	NATO I	L2	7.	p. 134
1970-032A	Intelsat III F-7	L1	117.	p. 132
1970-046A	OPS 5346 (Rhyolite 1)	L1	18.	p. 126
1970-055A	Intelsat III F-8	D	677.	p. 120
1970-069A	OPS 7329 (CANYON 3)	L2	45.	p. 137
1970-069B	Atlas SLV-3A stage 2 (Agena D)	D	662.	p. 119
1971-006A	Intelsat IV F-2	D	203.	p. 88
1971-009A	NATO IIB	L2	4.	p. 134
1971-039A	OPS 3811 (DSP F2, DSP 3, DSP Block 1(PHASE I) F2)	D	114.	p. 82
1971-039B	Titan IIIC stage 3 (Transtage 20)	D	552.	p. 111
1971-095A	OPS 9431 (DSCS II F-1, DSCS 2-1, DSCS II A-1)	L2	8.	p. 134
1971-095B	OPS 9432 (DSCS II F-2, DSCS 2-2, DSCS II A-2)	L3	2.	p. 138

COSPAR	Name	Status	nn	Page
1971-095C	Titan IIIC stage 3 (Transtage 21)	D	53.	p. 78
1971-116A	Intelsat IV F-3	D	396.	p. 101
1972-003A	Intelsat IV F-4	D	443.	p. 104
1972-010A	OPS 1570 (DSP F3, DSP 4, DSP Block 1(PHASE I) F3)	D	427.	p. 103
1972-010B	Titan IIIC stage 3 (Transtage 22)	D	579.	p. 113
1972-041A	Intelsat IV F-5	D	504.	p. 108
1972-090A	Anik A1	D	200.	p. 88
1972-101A	OPS 9390 (CANYON 5)	L1	94.	p. 131
1972-101B	Atlas SLV-3A stage 2 (Agena D)	D	678.	p. 120
1973-013A	OPS 6063 (Rhyolite 2)	L1	1.	p. 125
1973-023A	Anik A2	D	434.	p. 104
1973-040A	OPS 6157 (DSP F4, DSP 2, DSP Block 1(PHASE I) F4)	D	437.	p. 104
1973-040B	Titan IIIC stage 3 (Transtage 24)	D	378.	p. 100
1973-058A	Intelsat IV F-7	D	269.	p. 93
1973-100A	OPS 9433 (DSCS II F-3, DSCS 2-3, DSCS II B-3)	D	71.	p. 79
1973-100B	OPS 9434 (DSCS II F-4, DSCS 2-4, DSCS II B-4)	D	60.	p. 79
1973-100D	Titan IIIC stage 3 (Transtage 26)	D	18.	p. 76
1974-017A	Cosmos-637	D	589.	p. 114
1974-017F	Proton-K/DM fourth stage (Blok-DM)	D	604.	p. 115
1974-022A	Westar I	D	460.	p. 105
1974-033A	SMS 1	D	162.	p. 85
1974-033F	SMS 1 AKM (SVM-5)	D	747.	p. 124
1974-039A	ATS 6	D	668.	p. 119
1974-039C	Titan IIIC stage 3 (Transtage 27)	D	582.	p. 113
1974-060A	Molniya 1-S	L1	68.	p. 129
1974-060F	Proton-K/DM fourth stage (Blok-DM)	L1	88.	p. 131
1974-075A	Westar II	D	451.	p. 105
1974-093A	Intelsat IV F-8	D	429.	p. 103
1974-094A	Skynet 2B	L1	115.	p. 132
1974-101A	Symphonie A	D	474.	p. 106
1975-011A	SMS 2	D	367.	p. 99
1975-011F	SMS 2 AKM (SVM-5)	D	158.	p. 85
1975-038A	Anik A3	D	496.	p. 108
1975-042A	Intelsat IV F-1	D	313.	p. 95
1975-055A	OPS 4966 (CANYON 6)	L1	97.	p. 131
1975-055B	Atlas SLV-3A stage 2 (Agena D)	D	671.	p. 119
1975-077A	Symphonie B	D	477.	p. 106
1975-091A	Intelsat IVA F-1	D	467.	p. 106
1975-097A	Cosmos-775	L1	76.	p. 130
1975-097F	Proton-K/DM fourth stage (Blok-DM)	D	505.	p. 108
1975-100A	GOES 1	L2	17.	p. 135
1975-100F	GOES 1 AKM (SVM-5)	D	666.	p. 119
1975-117A	RCA Satcom I	D	393.	p. 101
1975-118A	OPS 3165 (DSP F5, DSP 8, DSP Block 2(PHASE II) F5)	D	554.	p. 112
1975-118C	Titan IIIC stage 3 (Transtage 29)	D	564.	p. 112
1975-118D	OPS 3165 debris (DSP F5 IR Sensor telescope sunshade cover)	U	1.	p. 152
1975-123A	Raduga 1	L1	22.	p. 126
1975-123F	Proton-K/DM fourth stage (Blok-DM)	D	561.	p. 112

COSPAR	Name	Status	nn	Page
1976-004A	Hermes (CTS)	L2	27.	p. 135
1976-004E	Hermes (CTS) operational debris (solar array cover)	L2	18.	p. 135
1976-004F	Hermes (CTS) operational debris (solar array cover)	L2	16.	p. 135
1976-010A	Intelsat IVA F-2	D	409.	p. 102
1976-017A	Marisat 1	D	294.	p. 94
1976-023A	LES 8	L2	11.	p. 134
1976-023B	LES 9	L2	12.	p. 134
1976-023F	Titan IIIC stage 3 (Transtage 30)	D	125.	p. 83
1976-023J	LES 8, LES 9 operational debris	D	124.	p. 83
1976-023K	LES 8, LES 9 operational debris	D	643.	p. 117
1976-029A	RCA Satcom II	D	165.	p. 86
1976-035A	NATO IIIA	D	447.	p. 104
1976-042A	Comstar 1A (D-1)	D	440.	p. 104
1976-053A	Marisat 2	D	33.	p. 77
1976-059A	OPS 2112 (DSP F6, DSP 7, DSP Block 2(PHASE II) F6)	D	362.	p. 99
1976-059C	Titan IIIC stage 3 (Transtage 28)	D	567.	p. 112
1976-059D	OPS 2112 debris (DSP F6 IR Sensor telescope sunshade cover)	U	2.	p. 152
1976-066A	Palapa 1	D	501.	p. 108
1976-073A	Comstar 1B (D-2)	D	480.	p. 107
1976-092A	Raduga 2	L1	24.	p. 126
1976-092F	Proton-K/DM fourth stage (Blok-DM)	L1	39.	p. 127
1976-101A	Marisat 3	D	64.	p. 79
1976-107A	Ekran 1	L1	38.	p. 127
1976-107F	Proton-K/DM fourth stage (Blok-DM)	D	649.	p. 118
1977-005A	NATO IIIB	D	25.	p. 76
1977-007A	OPS 3151 (DSP F7, DSP 9, DSP Block 2(PHASE II) F7)	D	61.	p. 79
1977-007C	Titan IIIC stage 3 (Transtage 23)	L2	25.	p. 135
1977-007D	OPS 3151 debris (DSP F7 IR Sensor telescope sunshade cover)	D	573.	p. 113
1977-014A	Kiku 2 (ETS II)	D	486.	p. 107
1977-018A	Palapa 2	D	491.	p. 107
1977-034A	OPS 9437 (DSCS II F-7, DSCS 2-7, DSCS II C-7)	D	44.	p. 78
1977-034B	OPS 9438 (DSCS II F-8, DSCS 2-8, DSCS II C-8)	D	27.	p. 76
1977-034C	Titan IIIC stage 3 (Transtage 32)	D	29.	p. 77
1977-038A	OPS 9751 (CANYON 7)	L1	44.	p. 128
1977-038C	Atlas SLV-3A stage 2 (Agena D)	D	679.	p. 120
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1988-036A	Ekran-M 18	D	23.	p. 76
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2008-003B	Proton-M/Briz-M fourth stage (Briz-M)	D	699.	p. 121
2008-006A	Thor 2R	C1	329.	p. 63
2008-006C	Proton-M/Briz-M fourth stage (Briz-M)	D	22.	p. 76
2008-007A	Kizuna (WINDS)	C1	171.	p. 52
2008-011A	AMC 14	C2	13.	p. 64
2008-013A	DirecTV 11	C1	242.	p. 57
2008-016A	EchoStar G1 (DBSD G1, ICO G1)	C2	101.	p. 70
2008-018A	VINASAT-1	C1	160.	p. 51
2008-018B	Star One C2	C1	276.	p. 59
2008-019A	Tian Lian 1-01	C2	40.	p. 66
2008-022A	AMOS 3	C1	324.	p. 62
2008-022B	Zenit-3SLB third stage (Blok-DM-SL-B)	D	28.	p. 76
2008-024A	Galaxy 18	C1	207.	p. 54
2008-028A	Chinasat 9 (Zhongxing 9, ZX 9)	C1	117.	p. 48
2008-030A	Skynet 5C	C1	311.	p. 61
2008-030B	Turksat 3A	C1	49.	p. 44
2008-033A	Cosmos-2440	L1	11.	p. 125
2008-033D	Proton-K/DM-2 fourth stage (Blok DM-2)	L1	30.	p. 127
2008-034A	Intelsat 25 (Protostar 1)	C1	303.	p. 61
2008-034B	Badr 6	C1	29.	p. 43
2008-035A	EchoStar 11	C1	224.	p. 56
2008-038A	Superbird C2	C1	172.	p. 52
2008-038B	AMC 21	C1	206.	p. 54
2008-039A	Inmarsat-4 F3	C2	98.	p. 70
2008-044A	Nimiq 4	C1	263.	p. 58
2008-045A	Galaxy 19	C1	246.	p. 57

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2008-055A	Simon Bolivar	C1	266.	p. 58
2008-057A	Astra 1M	C1	18.	p. 42
2008-063A	Ciel 2	C1	203.	p. 54
2008-065A	Eutelsat Hot Bird 13C (Hot Bird 9)	C1	12.	p. 41
2008-065B	Eutelsat 48D / Afghansat 1 (Eutelsat 28B, Eutelsat W2M)	C1	59.	p. 45
2008-066A	Fengyun 2E	C2	44.	p. 67
2008-066C	Fengyun 2E AKM (FG-36)	D	672.	p. 119
2008-066D	Fengyun 2E operational debris (S-VISSR radiometer cover?)	L1	90.	p. 131
2009-001A	USA 202 (NROL-26, ORION)	C2	19.	p. 65
2009-001B	Delta 4 second stage (Delta 337, DCSS-5 F03)	D	38.	p. 77
2009-007A	Ekspress-AM 44	C1	317.	p. 62
2009-007B	Ekspress MD-1	D	256.	p. 92
2009-007D	Proton-M/Briz-M fourth stage (Briz-M)	D	70.	p. 79
2009-008A	NSS 9	C1	193.	p. 53
2009-008B	Eutelsat Hot Bird 13D (Eutelsat 3C, Atlantic Bird 4A)	C1	14.	p. 42
2009-009A	Telstar 11N	C1	299.	p. 61
2009-010A	Raduga 1	D	441.	p. 104
2009-010B	Proton-K/DM-2 fourth stage (Blok DM-2)	D	485.	p. 107
2009-016A	Eutelsat 10A (Eutelsat W2A)	C1	10.	p. 41
2009-017A	USA 204 (WGS SV-2)	C1	74.	p. 46
2009-018A	Beidou DW 2	L1	102.	p. 131
2009-020A	SICRAL 1B	C1	11.	p. 41
2009-027A	Indostar II/Protostar II	C1	133.	p. 49
2009-032A	Measat 3A	C1	115.	p. 48
2009-033A	GOES 14	C1	231.	p. 56
2009-034A	Sirius FM-5 (Radiosat 5)	C1	247.	p. 57
2009-035A	Terrestar 1	C2	92.	p. 70
2009-042A	Asiasat 5	C1	127.	p. 49
2009-044A	JCSAT 12 (JCSAT-RA)	C1	154.	p. 51
2009-044B	Optus D3	C1	178.	p. 52
2009-046A	Palapa D	C1	142.	p. 50
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2009-050A	Nimiq 5	C1	273.	p. 59
2009-054A	Amazonas 2	C1	285.	p. 60
2009-054B	COMSATBw-1	C1	79.	p. 46
2009-058A	NSS 12	C1	70.	p. 45
2009-058B	Thor 6 (Intelsat 1W)	C1	328.	p. 62
2009-064A	Intelsat 14 (IS 14)	C1	296.	p. 60
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2009-067A	Intelsat 15 (IS 15)	C1	108.	p. 48
2009-068A	USA 211 (WGS SV-3)	C1	316.	p. 62
2009-075A	DirecTV 12	C1	235.	p. 56
2010-001A	Beidou DW 3	C1	165.	p. 52
2010-002A	Raduga 1M	C1	107.	p. 48
2010-002B	Proton-M/Briz-M fourth stage (Briz-M)	D	702.	p. 121
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2010-006A	Intelsat 16 (IS 16, PAS 11R)	C1	270.	p. 59
2010-006B	Proton-M/Briz-M fourth stage (Briz-M)	D	1.	p. 75

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2010-010A	EchoStar 14	C1	210.	p. 55
2010-016A	SES-1	C1	240.	p. 57
2010-021A	Astra 3B	C1	24.	p. 42
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2010-024A	Beidou DW 4	C1	140.	p. 50
2010-025A	Badr 5	C1	28.	p. 42
2010-032A	COMS 1 (Chollian)	C1	155.	p. 51
2010-032B	Arabsat 5A	C1	36.	p. 43
2010-034A	EchoStar 15	C1	282.	p. 59
2010-036A	Beidou DW 5	I	5.	p. 145
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2010-039A	USA 214 (AEHF 1)	C2	106.	p. 71
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2010-045A	Michibiki	I	6.	p. 145
2010-053A	Sirius XM-5	C1	258.	p. 58
2010-056B	BSAT 3B	C1	136.	p. 50
2010-057A	Beidou DW 6	C1	181.	p. 53
2010-061A	SkyTerra 1	C1	237.	p. 56
2010-063A	USA 223 (NROL-32, ORION)	C2	50.	p. 67
2010-063B	Delta 4 second stage (Delta 351, DCSS-5 F05)	D	701.	p. 121
2010-064A	Chinasat 20A (Zhongxing 20A, ZX 20A, Shentong 1-2)	C1	158.	p. 51
2010-065A	HYLAS 1	C1	302.	p. 61
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2010-068A	Beidou DW 7	I	7.	p. 145
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2011-001A	Elektro-L No. 1	C2	38.	p. 66
2011-001B	Zenit-3SLBF third stage (Fregat-SB)	D	683.	p. 120
2011-011A	USA 227 (NROL-27, SDS-3, QUASAR)	C2	47.	p. 67
2011-013A	Beidou DW 8	I	8.	p. 145
2011-016A	Intelsat 28 (New Dawn)	C1	39.	p. 43
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2011-019A	USA 230 (SBIRS GEO-1)	C2	48.	p. 67
2011-021A	Telstar 14R (Estrela do Sul 2)	C1	281.	p. 59
2011-022A	GSAT 8	C1	68.	p. 45
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2011-026A	Chinasat 10 (Zhongxing 10, ZX 10, Sinosat 5, Xinnuo 5)	C1	139.	p. 50
2011-032A	Tian Lian 1-02	C2	74.	p. 69
2011-034A	GSAT 12	C1	103.	p. 47
2011-035A	SES-3	C1	232.	p. 56
2011-035B	Kazsat-2	C1	109.	p. 48
2011-035D	Proton-M/Briz-M fourth stage (Briz-M)	D	746.	p. 124
2011-038A	Beidou DW 9	I	9.	p. 145
2011-041A	Astra 1N	C1	19.	p. 42
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2011-047A	Chinasat 1A (Zhongxing 1A, ZX 1A, Feng Huo 2-1)	C1	157.	p. 51
2011-048A	Cosmos-2473	C1	96.	p. 47
2011-048B	Proton-M/Briz-M fourth stage (Briz-M)	D	704.	p. 122
2011-049A	SES-2	C1	256.	p. 58
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2011-054A	QuetzSat-1	C1	268.	p. 58
2011-056A	Intelsat 18 (IS 18)	C1	191.	p. 53
2011-057A	Eutelsat 16A (Eutelsat W3C)	C1	16.	p. 42
2011-059A	ViaSat-1	C1	216.	p. 55
2011-069A	Asiasat 7	C1	131.	p. 49
2011-073A	Beidou DW 10	I	10.	p. 145
2011-074A	AMOS 5	L1	103.	p. 132
2011-074B	Luch 5A	C1	186.	p. 53
2011-074C	Proton-M/Briz-M fourth stage (Briz-M)	D	4.	p. 75
2011-077A	NigComSat 1R	C1	52.	p. 44
2012-002A	Fengyun 2F	C1	141.	p. 50
2012-002C	Fengyun 2F AKM (FG-36)	D	340.	p. 97
2012-003A	USA 233 (WGS SV-4)	C1	112.	p. 48
2012-007A	SES-4	C1	309.	p. 61
2012-008A	Beidou DW 11	C1	72.	p. 45
2012-009A	MUOS 1	C2	78.	p. 69
2012-011A	Intelsat 22 (IS 22)	C1	86.	p. 46
2012-012A	Cosmos-2479	L3	9.	p. 138
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2012-013A	Apstar 7	C1	93.	p. 47
2012-016A	Yahsat 1B	C1	57.	p. 44
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2012-026A	Nimiq 6	C1	252.	p. 57
2012-028A	Chinasat 2A (Zhongxing 2A, ZX 2A, Shentong 2-1)	C1	126.	p. 49
2012-030A	Intelsat 19 (IS 19)	C1	185.	p. 53
2012-033A	USA 236 (NROL-38, SDS-3, QUASAR)	C2	132.	p. 72
2012-034A	USA 237 (NROL-15, ORION)	C2	26.	p. 65
2012-034B	Delta 4 second stage (Delta 360, DCSS-5 F09)	D	690.	p. 121
2012-035A	EchoStar 17	C1	228.	p. 56
2012-035B	Meteosat 10 (MSG 3)	C1	331.	p. 63
2012-035E	Meteosat 10 (MSG 3) operational debris (SEVIRI Cooler Cover)	D	653.	p. 118
2012-035F	Meteosat 10 (MSG 3) operational debris (SEVIRI Ent. Ba. Cov)	Ind	10.	p. 147
2012-036A	SES-5	C1	4.	p. 41
2012-040A	Tian Lian 1-03	C1	17.	p. 42
2012-043A	Intelsat 20 (IS 20)	C1	83.	p. 46
2012-043B	HYLAS 2	C1	37.	p. 43
2012-045A	Intelsat 21 (IS 21)	C1	288.	p. 60
2012-051A	Astra 2F (Eutelsat 28F)	C1	33.	p. 43
2012-051B	GSAT 10	C1	102.	p. 47

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2012-057A	Intelsat 23 (IS 23)	C1	292.	p. 60
2012-057B	Proton-M/Briz-M fourth stage (Briz-M)	D	2.	p. 75
2012-059A	Beidou DW 16	C1	97.	p. 47
2012-061A	Luch 5B	C2	126.	p. 72
2012-061B	Yamal 300K	C1	192.	p. 53
2012-061D	Proton-M/Briz-M fourth stage (Briz-M)	D	745.	p. 124
2012-062A	Star One C3	C1	271.	p. 59
2012-062B	Eutelsat 21B	C1	23.	p. 42
2012-065A	EchoStar 16	C1	283.	p. 59
2012-067A	Chinasat 15A (Zhongxing 15A, Chinasat 12, Zhongxing 12)	C1	110.	p. 48
2012-069A	Eutelsat 70B	C1	85.	p. 46
2012-070A	Yamal 402	C1	66.	p. 45
2012-075A	Skynet 5D	C1	64.	p. 45
2012-075B	Mexsat Bicentenario	C1	218.	p. 55
2013-004A	TDRS 11	C1	194.	p. 54
2013-006A	Amazonas 3	C1	286.	p. 60
2013-006B	Azerspace / Africasat-1a	C1	55.	p. 44
2013-011A	USA 241 (SBIRS GEO-2)	C2	8.	p. 64
2013-012A	Eutelsat 117 West A (SATMEX 8)	C1	213.	p. 55
2013-014A	Anik G1	C1	226.	p. 56
2013-020A	Chinasat 11 (Zhongxing 11, ZX 11, SupremeSat 2)	C1	125.	p. 49
2013-022A	Eutelsat 3D	C1	6.	p. 41
2013-024A	USA 243 (WGS SV-5)	C1	293.	p. 60
2013-026A	SES-6	C1	298.	p. 60
2013-034A	IRNSS-R1A	I	11.	p. 145
2013-036A	MUOS 2	C2	96.	p. 70
2013-038A	Alphasat	C2	11.	p. 64
2013-038B	INSAT 3D	C1	101.	p. 47
2013-041A	USA 244 (WGS SV-6)	C1	196.	p. 54
2013-044A	Eutelsat 25B / Es'hail 1	C1	26.	p. 42
2013-044B	GSAT 7	C1	91.	p. 47
2013-045A	AMOS 4	C1	81.	p. 46
2013-050A	USA 246 (AEHF SV-3)	C2	71.	p. 68
2013-056A	Astra 2E (Eutelsat 28E)	C1	34.	p. 43
2013-058A	Sirius FM-6 (Radiosat 6)	C1	214.	p. 55
2013-062A	Raduga 1M	C1	84.	p. 46
2013-062B	Proton-M/Briz-M fourth stage (Briz-M)	D	703.	p. 121
2013-071A	SES-8	C1	122.	p. 49
2013-073A	Inmarsat-5 F1	C1	78.	p. 46
2013-075A	Tupac Katari (TKSat 1)	C1	255.	p. 58
2013-077A	Ekspress-AM 5	C1	166.	p. 52
2013-077B	Proton-M/Briz-M fourth stage (Briz-M)	D	3.	p. 75
2014-001A	GSAT 14	C1	90.	p. 47
2014-002A	Thaicom 6	C1	94.	p. 47
2014-004A	TDRS 12	C2	118.	p. 71
2014-006A	ABS 2 (ST 3, Koreasat 8)	C1	92.	p. 47
2014-006B	ATHENA-FIDUS	C1	45.	p. 44
2014-007A	Turksat 4A	C1	51.	p. 44

COSPAR	Name	Status	nn	Page
2014-010A	Ekspress-AT1	C1	69.	p. 45
2014-010B	Ekspress-AT2	C1	164.	p. 52
2014-010C	Proton-M/Briz-M fourth stage (Briz-M)	D	7.	p. 75
2014-011A	Amazonas 4A	C1	287.	p. 60
2014-011B	Astra 5B (HYLAS 2B)	C1	38.	p. 43
2014-017A	IRNSS-R1B	I	12.	p. 145
2014-020A	USA 250 (NROL-67)	C2	84.	p. 69
2014-023A	Luch 5V	C2	49.	p. 67
2014-023B	Kazsat-3	C1	71.	p. 45
2014-023C	Proton-M/Briz-M fourth stage (Briz-M)	D	9.	p. 75
2014-027A	USA 252 (NROL-33)	C2	85.	p. 69
2014-030A	Eutelsat 3B	C1	2.	p. 41
2014-043A	USA 253 (GSSAP 1, AFSPC-4 F1)	C4	3.	p. 74
2014-043B	USA 254 (GSSAP 2, AFSPC-4 F2)	C4	4.	p. 74
2014-043C	USA 255 (ANGELS)	C4	1.	p. 74
2014-043D	Delta 4M+(4,2) second stage (DCSS 4)	D	215.	p. 89
2014-046A	Asiasat 8	C1	130.	p. 49
2014-052A	Asiasat 6	C1	149.	p. 51
2014-054A	Optus 10	C1	184.	p. 53
2014-054B	Measat 3B	C1	116.	p. 48
2014-055A	USA 257 (CLIO)	C4	2.	p. 74
2014-058A	Luch	Ind	11.	p. 147
2014-058B	Proton-M/Briz-M fourth stage (Briz-M)	D	8.	p. 75
2014-060A	Himawari 8	C1	168.	p. 52
2014-061A	IRNSS-R1C	C2	42.	p. 66
2014-062A	Intelsat 30 (DLA 1, ISDLA 1)	C1	248.	p. 57
2014-062B	ARSAT-1	C1	275.	p. 59
2014-064A	Ekspress-AM 6	C1	65.	p. 45
2014-064B	Proton-M/Briz-M fourth stage (Briz-M)	D	24.	p. 76
2014-078A	GSAT 16	C1	67.	p. 45
2014-078B	DirecTV 14	C1	243.	p. 57
2014-082A	Yamal 401	C1	113.	p. 48
2014-082B	Proton-M/Briz-M fourth stage (Briz-M)	D	744.	p. 124
2014-085A	GVM/Briz-M	D	14.	p. 76
2014-089A	Astra 2G (Eutelsat 28G)	C1	32.	p. 43
2014-090A	Fengyun 2G	C2	57.	p. 67
2014-090C	Fengyun 2G AKM (FG-36)	D	385.	p. 100
2015-002A	MUOS 3	C2	130.	p. 72
2015-005A	Inmarsat-5 F2	C1	291.	p. 60
2015-010A	ABS 3A	C1	326.	p. 62
2015-010B	Eutelsat 115 West B	C1	217.	p. 55
2015-012A	Ekspress-AM 7	C1	48.	p. 44
2015-018A	IRNSS-R1D	I	13.	p. 145
2015-019A	Beidou DW 17	I	14.	p. 146
2015-022A	Thor 7	C1	330.	p. 63
2015-022B	SICRAL 2	C1	44.	p. 44
2015-023A	TurkmenAlem52E/MonacoSAT	C1	62.	p. 45
2015-026A	DirecTV 15	C1	236.	p. 56

COSPAR	Name	Status	nn	Page
2015-026B	SKY Mexico-1	C1	265.	p. 58
2015-034A	Meteosat 11 (MSG 4)	C1	325.	p. 62
2015-034B	Star One C4	C1	277.	p. 59
2015-034E	Meteosat 11 (MSG 4) operational debris (SEVIRI Cooler Cover)	D	655.	p. 118
2015-034F	Meteosat 11 (MSG 4) operational debris (SEVIRI Ent. Ba. Cov)	D	681.	p. 120
2015-036A	USA 263 (WGS SV-7)	C1	174.	p. 52
2015-039A	Intelsat 34 (Hispasat 55W-2)	C1	290.	p. 60
2015-039B	Eutelsat 8 West B	C1	318.	p. 62
2015-041A	GSAT 6	C1	105.	p. 48
2015-042A	Inmarsat-5 F3	C1	190.	p. 53
2015-044A	MUOS 4	C2	81.	p. 69
2015-046A	TJS	C1	177.	p. 52
2015-048A	Ekspress-AM 8	C1	314.	p. 62
2015-048B	Proton-M/DM-3 fourth stage (Block DM-3)	D	170.	p. 86
2015-053A	Beidou DW 20	I	15.	p. 146
2015-054A	Sky Muster	C1	167.	p. 52
2015-054B	ARSAT-2	C1	264.	p. 58
2015-056A	Morelos 3	C2	90.	p. 70
2015-059A	Apstar 9	C1	170.	p. 52
2015-060A	Turksat 4B	C1	61.	p. 45
2015-063A	Chinasat 2C (Zhongxing 2C, ZX 2C, Shentong 2-2)	C1	129.	p. 49
2015-065A	GSAT 15	C1	120.	p. 49
2015-065B	Badr 7	C1	27.	p. 42
2015-067A	LaoSat 1	C1	156.	p. 51
2015-068A	Telstar 12 Vantage (Telstar 12V)	C1	312.	p. 61
2015-073A	Chinasat 1C (Zhongxing 1C, ZX 1C, Feng Huo 2-2)	C1	100.	p. 47
2015-074A	Elektro-L No. 2	C1	87.	p. 46
2015-074B	Zenit-3SLBF third stage (Fregat-SB)	D	686.	p. 120
2015-075A	Cosmos-2513	C1	99.	p. 47
2015-075B	Proton-M/Briz-M fourth stage (Briz-M)	D	707.	p. 122

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 2016) marked with $_o$,

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

Name object's common name (names),

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

$f_{\mathrm{IADC}}^{\mathrm{GEO}} \in [0,1]$ dwell time within $\mathrm{GEO}_{\mathrm{IADC}}$ (see table 1 for the definition) as a fraction of the object's period, where (possibly mutliple) 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. $f_{\mathrm{IADC}}^{\mathrm{GEO}} = 0$) in order to distinguish it from objects very briefly entering (i.e. $f_{\mathrm{IADC}}^{\mathrm{GEO}} < 0.005$),

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 semimajor 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, Ω, ω, λ 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 331 satellites under longitude and inclination control, 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 ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.1	**2010-037B**	**RASCOM-QAF 1R**					**PL**
TLEs	GEO (1.00)	2015-12-31	17:08:40.772				2.90
36831	TEME	42165.593	0.0004609	0.0252	25.0813	262.2100	3.0239
C1.2	**2014-030A**	**Eutelsat 3B**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:20:35.608				3.04
39773	TEME	42164.418	0.0003348	0.0674	32.2212	233.2677	3.1051
C1.3	**2007-057A**	**Sirius 4 (Astra 4A)**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:19:56.604				4.81
32299	TEME	42164.467	0.0003001	0.0134	12.8183	268.3821	4.8211
C1.4	**2012-036A**	**SES-5**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:19:56.604				4.99
38652	TEME	42164.353	0.0002117	0.0499	268.3235	7.1229	4.9814
C1.5	**2004-008A**	**Eutelsat 7A (Eutelsat W3A)**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:16:41.602				6.99
28187	TEME	42164.352	0.0004762	0.0644	19.1957	249.4652	7.0041
C1.6	**2013-022A**	**Eutelsat 3D**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:52:42.896				7.00
39163	TEME	42164.369	0.0005199	0.0397	26.2589	301.9169	7.0188
C1.7	**2006-007B**	**Eutelsat 9A (Eutelsat 9A, Eurobird 9A, Hot Bird 7A)**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:44:29.972				8.99
28946	TEME	42165.270	0.0006459	0.0556	71.7116	206.9980	9.0784
C1.8	**2010-069A**	**Eutelsat KA-SAT 9A (KA-SAT)**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:44:53.522				9.00
37258	TEME	42166.332	0.0001251	0.0469	296.9769	141.6420	8.9787
C1.9^{m}	**2005-049B**	**Meteosat 9 (MSG 2)**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:16:02.599				9.45
28912	TEME	42162.887	0.0001892	1.1827	65.1151	254.0902	9.4476
C1.10	**2009-016A**	**Eutelsat 10A (Eutelsat W2A)**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:15:23.608				9.98
34710	TEME	42165.239	0.0005876	0.0625	354.8838	292.5379	10.0431
C1.11	**2009-020A**	**SICRAL 1B**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				11.64
UI179	J2000	42165.577	0.0002412	0.2244	86.2038	208.4851	11.6440
C1.12	**2008-065A**	**Eutelsat Hot Bird 13C (Hot Bird 9)**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:28:50.768				12.99
33459	TEME	42164.425	0.0003273	0.0753	63.8099	252.4016	13.0017
C1.13	**2006-032A**	**Eutelsat Hot Bird 13B (Hot Bird 8)**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:12:07.369				13.00
29270	TEME	42164.373	0.0005589	0.0714	30.3327	275.5203	13.0314

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\mathrm{IADC}}^{\mathrm{GEO}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.14	**2009-008B**	**Eutelsat Hot Bird 13D (Eutelsat 3C, Atlantic Bird 4A)**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:12:07.369				13.00
33750	TEME	42164.334	0.0005346	0.0319	41.0492	241.2660	13.0134
C1.15	**2010-021B**	**COMSATBw-2**					**PL**
TLEs	GEO (1.00)	2015-12-31	05:54:33.058				13.20
36582	TEME	42162.973	0.0003202	0.0459	261.8585	39.7537	13.2062
C1.16	**2011-057A**	**Eutelsat 16A (Eutelsat W3C)**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:11:28.005				15.93
37836	TEME	42164.476	0.0005118	0.0618	11.8071	271.9238	16.0105
C1.17	**2012-040A**	**Tian Lian 1-03**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:13:33.605				16.78
38730	TEME	42165.650	0.0002639	0.0486	258.7772	12.3029	16.8332
C1.18	**2008-057A**	**Astra 1M**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:55:55.086				19.19
33436	TEME	42164.345	0.0001350	0.0232	60.2025	161.4805	19.1533
C1.19	**2011-041A**	**Astra 1N**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:47:08.040				19.19
37775	TEME	42164.514	0.0002421	0.0616	18.9666	324.1744	19.1909
C1.20	**2007-016A**	**Astra 1L**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:14:14.883				19.20
31306	TEME	42162.306	0.0005104	0.0548	284.2025	340.3650	19.1613
C1.21^{m}	**2006-012A**	**Astra 1KR**					**PL**
TLEs	GEO (1.00)	2015-12-28	15:47:06.405				19.24
29055	TEME	42164.441	0.0005668	0.0581	323.6630	327.6226	19.2392
C1.22	**2011-049B**	**Arabsat 5C**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:46:55.040				19.98
37810	TEME	42164.340	0.0003256	0.0621	6.5315	252.0843	20.0000
C1.23	**2012-062B**	**Eutelsat 21B**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:54:30.350				21.60
38992	TEME	42164.449	0.0002560	0.0618	11.3653	274.3977	21.6087
C1.24	**2010-021A**	**Astra 3B**					**PL**
TLEs	GEO (1.00)	2015-12-30	05:36:56.136				23.49
36581	TEME	42165.068	0.0003047	0.0520	15.0847	263.6893	23.4492
C1.25	**2007-056B**	**Skynet 5B**					**PL**
TLEs	GEO (1.00)	2015-12-31	04:26:43.795				24.46
32294	TEME	42163.691	0.0003704	0.0650	351.2956	282.6783	25.0788
C1.26	**2013-044A**	**Eutelsat 25B / Es'hail 1**					**PL**
TLEs	GEO (1.00)	2015-12-30	21:01:23.637				25.50
39233	TEME	42165.386	0.0002094	0.0449	351.1120	293.1173	25.5203
C1.27	**2015-065B**	**Badr 7**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:53:15.855				25.99
41029	TEME	42163.583	0.0001389	0.0321	233.0715	330.2394	25.9729
C1.28	**2010-025A**	**Badr 5**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:53:15.855				25.99
36592	TEME	42164.499	0.0003200	0.0194	69.5902	178.7355	25.9484

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
C1.29	**2008-034B**	**Badr 6**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:55:36.810				26.00
33154	TEME	42164.500	0.0003175	0.0616	31.7643	285.2479	25.9555
C1.30	**2006-051A**	**Badr 4**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:51:21.485				26.00
29526	TEME	42163.853	0.0006903	0.0415	344.3666	313.9819	25.9473
C1.31	**1998-050A**	**Astra 2A**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:53:15.855				28.10
25462	TEME	42165.446	0.0000976	0.0930	253.2262	274.4195	27.9816
C1.32	**2014-089A**	**Astra 2G (Eutelsat 28G)**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:28:13.438				28.20
40364	TEME	42165.379	0.0002156	0.0317	348.1066	24.6771	28.1977
C1.33	**2012-051A**	**Astra 2F (Eutelsat 28F)**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:28:06.137				28.20
38778	TEME	42164.872	0.0004138	0.0746	241.9753	11.9249	28.2266
C1.34	**2013-056A**	**Astra 2E (Eutelsat 28E)**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:27:01.363				28.38
39285	TEME	42164.468	0.0002099	0.0494	25.5180	255.9830	28.4983
C1.35	**2005-005A**	**XTAR-EUR**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:24:56.629				29.01
28542	TEME	42165.153	0.0002437	0.0577	273.0969	359.7118	29.0206
C1.36	**2010-032B**	**Arabsat 5A**					**PL**
TLEs	GEO (1.00)	2015-12-29	22:19:21.816				30.49
36745	TEME	42163.824	0.0003038	0.0539	17.4412	271.4695	30.5296
C1.37	**2012-043B**	**HYLAS 2**					**PL**
TLEs	GEO (1.00)	2015-12-28	15:28:10.771				31.01
38741	TEME	42164.569	0.0001317	0.0165	351.8347	294.4263	31.1745
C1.38	**2014-011B**	**Astra 5B (HYLAS 2B)**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:50:00.928				31.52
39617	TEME	42165.393	0.0002884	0.0276	356.3957	272.8103	31.5029
C1.39	**2011-016A**	**Intelsat 28 (New Dawn)**					**PL**
TLEs	GEO (1.00)	2015-12-30	19:47:58.418				32.81
37392	TEME	42165.144	0.0000784	0.0285	267.1545	324.5744	32.8030
C1.40	**2002-038A**	**Eutelsat 33D (Eutelsat 8 West C, Hot Bird 6)**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:08:41.420				33.10
27499	TEME	42165.886	0.0002142	0.0785	306.4066	62.6263	33.0944
C1.41	**2001-011A**	**Eutelsat 33C (Eutelsat 28A, Europesat 1, Eurobird 1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	04:26:56.795				33.11
26719	TEME	42165.298	0.0005482	0.0653	347.9272	282.0750	33.0284
C1.42^{m}	**2009-065A**	**Eutelsat 36B (Eutelsat W7)**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:28:44.466				35.89
36101	TEME	42163.567	0.0004750	0.0631	353.4067	296.7384	35.8914
C1.43	**2000-028A**	**Eutelsat 36A (Eutelsat W4)**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:49:21.927				36.09
26369	TEME	42165.192	0.0004863	0.0641	358.2106	286.3743	36.0813

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
C1.44	**2015-022B**	**SICRAL 2**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				36.98
UI190	J2000	42165.653	0.0000974	0.1186	77.1878	187.7095	36.9760
C1.45	**2014-006B**	**ATHENA-FIDUS**					**PL**
TLEs	GEO (1.00)	2015-12-30	14:53:22.858				37.81
39509	TEME	42165.003	0.0000978	0.0257	25.0795	259.7687	37.9272
C1.46	**2011-042A**	**Paksat 1R**					**PL**
TLEs	GEO (1.00)	2015-12-31	04:27:39.739				38.00
37779	TEME	42165.061	0.0002863	0.0163	143.6408	109.7649	37.9766
C1.47	**2003-020A**	**Hellas Sat 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:11:34.046				39.00
27811	TEME	42163.830	0.0003690	0.0150	313.4212	331.3425	39.0712
C1.48	**2015-012A**	**Ekspress-AM 7**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:11:34.046				40.00
40505	TEME	42164.539	0.0001951	0.0050	39.2417	236.5462	39.9948
C1.49	**2008-030B**	**Turksat 3A**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:45:48.337				41.99
33056	TEME	42164.625	0.0004085	0.0517	151.3680	108.5756	41.9317
C1.50	**2001-002A**	**Turksat 2A (Eurasiasat 1)**					**PL**
TLEs	GEO (1.00)	2015-12-30	14:37:01.010				42.00
26666	TEME	42164.872	0.0003772	0.0771	52.6714	235.6004	42.0169
C1.51	**2014-007A**	**Turksat 4A**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:32:49.732				42.00
39522	TEME	42163.521	0.0005130	0.0763	271.5397	357.1224	42.0853
C1.52	**2011-077A**	**NigComSat 1R**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:45:48.337				42.50
38014	TEME	42164.719	0.0003447	0.0128	211.6579	50.1173	42.4501
C1.53	**1996-021A**	**Astra 1F**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:50:06.874				44.98
23842	TEME	42165.466	0.0003343	0.0448	336.0044	301.1068	44.3340
C1.54	**2000-068A**	**Intelsat 12 (PAS 12, Europe*Star 1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:50:06.874				45.01
26590	TEME	42163.682	0.0003337	0.0302	54.0280	231.6777	44.9958
C1.55	**2013-006B**	**Azerspace / Africasat-1a**					**PL**
TLEs	GEO (1.00)	2015-12-30	14:20:43.449				46.01
39079	TEME	42165.289	0.0002145	0.0217	32.6351	266.8107	46.1120
C1.56	**2005-041B**	**Syracuse 3A**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:04:39.586				46.99
28885	TEME	42163.730	0.0003993	0.0043	1.5326	273.3511	47.0437
C1.57	**2012-016A**	**Yahsat 1B**					**PL**
TLEs	GEO (1.00)	2015-12-29	20:06:28.171				47.61
38245	TEME	42164.358	0.0003177	0.0041	246.2886	25.8993	47.5956
C1.58	**2009-047A**	**USA 207 (PAN)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				47.77
UI158	J2000	42166.874	0.0010097	0.1199	45.3120	285.4426	47.7730

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
C1.59	**2008-065B**	**Eutelsat 48D / Afghansat 1 (Eutelsat 28B, Eutelsat W2M)**					**PL**
TLEs	GEO (1.00)	2015-12-31	18:15:00.158				48.10
33460	TEME	42164.358	0.0002915	0.0458	19.9769	256.9600	48.1021
C1.60	**2003-053A**	**Yamal 200 N2 (Yamal 202)**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:04:44.194				48.99
28089	TEME	42164.742	0.0002782	0.0252	61.7654	219.5988	48.9851
C1.61	**2015-060A**	**Turksat 4B**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:01:05.985				50.07
40984	TEME	42163.527	0.0002423	0.0166	317.5122	323.1575	50.0405
C1.62	**2015-023A**	**TurkmenAlem52E/MonacoSAT**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:53:06.904				52.05
40617	TEME	42164.722	0.0002565	0.0226	44.4786	232.4016	52.0416
C1.63	**2011-016B**	**Yahsat 1A**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:04:52.757				52.50
37393	TEME	42164.774	0.0002725	0.0115	306.5914	337.8493	52.5120
C1.64	**2012-075A**	**Skynet 5D**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:04:53.416				52.72
39034	TEME	42164.835	0.0003966	0.0681	2.2681	275.7799	52.7277
C1.65	**2014-064A**	**Ekspress-AM 6**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:04:54.074				53.00
40277	TEME	42164.803	0.0001299	0.0420	179.5718	171.8977	52.9893
C1.66	**2012-070A**	**Yamal 402**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:54:49.944				54.89
39022	TEME	42163.979	0.0000720	0.0298	286.6581	29.2795	54.8972
C1.67	**2014-078A**	**GSAT 16**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:41:23.437				55.04
40332	TEME	42164.939	0.0002383	0.0163	20.8604	99.1848	54.9866
C1.68	**2011-022A**	**GSAT 8**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:12:04.258				55.05
37605	TEME	42164.043	0.0008392	0.0346	81.5461	188.1487	55.1730
C1.69	**2014-010A**	**Ekspress-AT1**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:05:00.661				56.02
39612	TEME	42164.394	0.0000386	0.0531	215.3818	85.6683	56.0011
C1.70	**2009-058A**	**NSS 12**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:33:12.858				57.00
36032	TEME	42164.960	0.0002720	0.0136	6.9939	274.2472	57.0302
C1.71	**2014-023B**	**Kazsat-3**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:05:06.588				58.51
39728	TEME	42164.200	0.0000827	0.0092	6.6084	312.5987	58.5202
C1.72^{m}	**2012-008A**	**Beidou DW 11**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:05:07.247				58.70
38091	TEME	42163.882	0.0002994	1.3918	41.1080	213.3649	58.7029
C1.73	**2002-007A**	**Intelsat 904**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:54:41.067				60.01
27380	TEME	42164.748	0.0003374	0.0293	307.8034	339.1798	59.9982

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
C1.74	**2009-017A**	**USA 204 (WGS SV-2)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				60.22
UI156	J2000	42166.107	0.0000945	0.0988	79.8118	190.2632	60.2240
C1.75	**2001-025A**	**Astra 2C**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:54:41.067				60.32
26853	TEME	42164.890	0.0003070	0.0549	312.1961	320.3515	60.2978
C1.76^{m}	**2004-007A**	**ABS 4 (Mobisat, ABS 2i, MBSat 1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:05:12.516				60.99
28184	TEME	42164.847	0.0001908	0.0120	352.9811	294.7889	60.9892
C1.77	**2001-039A**	**Intelsat 902**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:54:41.067				62.00
26900	TEME	42164.833	0.0002956	0.0378	61.9589	229.2410	61.9868
C1.78	**2013-073A**	**Inmarsat-5 F1**					**PL**
TLEs	GEO (1.00)	2015-12-31	18:15:29.346				62.61
39476	TEME	42165.003	0.0000515	0.0190	28.1483	335.4416	62.6167
C1.79	**2009-054B**	**COMSATBw-1**					**PL**
TLEs	GEO (1.00)	2015-12-31	20:59:24.513				63.01
35943	TEME	42164.552	0.0002901	0.0601	60.5044	230.2884	62.9436
C1.80	**2002-041A**	**Intelsat 906**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:54:15.066				64.15
27513	TEME	42164.429	0.0003161	0.0340	52.0444	238.8060	64.1364
C1.81	**2013-045A**	**AMOS 4**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:01:17.990				65.01
39237	TEME	42164.996	0.0002564	0.0064	24.9901	252.9401	65.0312
C1.82	**2010-065B**	**Intelsat 17 (IS 17)**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:05:25.030				66.00
37238	TEME	42164.611	0.0002939	0.0300	282.3762	358.1369	66.0034
C1.83	**2012-043A**	**Intelsat 20 (IS 20)**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:47:22.839				68.52
38740	TEME	42165.274	0.0000997	0.0236	27.3126	153.6788	68.5277
C1.84	**2013-062A**	**Raduga 1M**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:41:53.860				70.01
39375	TEME	42164.553	0.0003897	0.0345	66.8498	217.4008	69.9634
C1.85	**2012-069A**	**Eutelsat 70B**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:39:22.652				70.50
39020	TEME	42164.551	0.0003723	0.0656	29.7698	239.5385	70.5253
C1.86	**2012-011A**	**Intelsat 22 (IS 22)**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:32:58.731				72.11
38098	TEME	42164.691	0.0002034	0.0194	6.2243	273.7180	72.1297
C1.87^{m}	**2015-074A**	**Elektro-L No. 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:43:47.709				72.50
41105	TEME	42132.537	0.0014423	0.4316	276.4678	8.0510	72.5034
C1.88	**2002-002A**	**INSAT 3C**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:05:44.129				73.98
27298	TEME	42164.498	0.0003158	0.0498	273.3010	22.1806	74.0045

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
C1.89	**2007-037A**	**INSAT 4CR**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:05:44.129				73.99
32050	TEME	42164.819	0.0008550	0.1164	271.4835	1.9630	73.9793
C1.90	**2014-001A**	**GSAT 14**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:25:15.206				74.00
39498	TEME	42164.677	0.0005407	0.0924	91.9614	183.1305	74.0640
C1.91	**2013-044B**	**GSAT 7**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:25:00.606				74.01
39234	TEME	42164.495	0.0011733	0.0616	94.9663	183.5891	74.1263
C1.92	**2014-006A**	**ABS 2 (ST 3, Koreasat 8)**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:21:45.389				74.92
39508	TEME	42165.268	0.0003201	0.0365	32.0448	261.1080	74.9494
C1.93	**2012-013A**	**Apstar 7**					**PL**
TLEs	GEO (1.00)	2015-12-31	23:44:29.383				76.50
38107	TEME	42164.869	0.0002508	0.0324	39.3051	239.1214	76.4641
C1.94	**2014-002A**	**Thaicom 6**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:20:56.527				78.50
39500	TEME	42164.642	0.0000947	0.0634	127.9034	154.2147	78.5688
C1.95^{m}	**2006-020B**	**Thaicom 5**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:20:56.527				78.57
29163	TEME	42164.496	0.0007328	0.0467	281.0541	7.8199	78.5745
C1.96	**2011-048A**	**Cosmos-2473**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:20:17.077				79.94
37806	TEME	42164.768	0.0000972	0.0529	61.2597	279.3416	79.9383
C1.97^{m}	**2012-059A**	**Beidou DW 16**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:20:17.077				80.04
38953	TEME	42164.824	0.0004066	0.5778	74.3235	186.1466	80.0436
C1.98	**2003-060A**	**Ekspress-AM 22 (SESAT 2)**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:38:41.317				80.15
28134	TEME	42164.706	0.0000410	0.0443	79.1518	199.8431	80.1182
C1.99^{m}	**2015-075A**	**Cosmos-2513**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:20:17.077				80.22
41121	TEME	42164.252	0.0002550	0.0430	273.1339	172.3845	80.2157
C1.100	**2015-073A**	**Chinasat 1C (Zhongxing 1C, ZX 1C, Feng Huo 2-2)**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:28:29.704				81.45
41103	TEME	42165.045	0.0001886	0.0938	282.3901	331.6943	81.4745
C1.101	**2013-038B**	**INSAT 3D**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:53:12.636				82.08
39216	TEME	42165.009	0.0001470	0.0527	272.3644	3.0498	82.0986
C1.102	**2012-051B**	**GSAT 10**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:49:23.228				82.98
38779	TEME	42164.627	0.0002613	0.0145	295.7027	338.1766	83.0554
C1.103	**2011-034A**	**GSAT 12**					**PL**
TLEs	GEO (1.00)	2015-12-31	20:55:31.818				83.00
37746	TEME	42164.281	0.0002927	0.0635	265.6853	228.3727	83.0094

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
C1.104	**2005-049A**	**INSAT 4A**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:49:12.440				83.00
28911	TEME	42164.882	0.0007514	0.0366	90.4024	184.0747	83.1010
C1.105^{m}	**2015-041A**	**GSAT 6**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:49:07.007				83.12
40880	TEME	42164.921	0.0010692	0.9341	274.5634	358.1354	83.1228
C1.106	**2007-063B**	**Horizons 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:08:23.593				84.85
32388	TEME	42164.600	0.0003006	0.0116	342.7995	307.7152	84.8190
C1.107	**2010-002A**	**Raduga 1M**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:09:53.597				85.00
36358	TEME	42164.718	0.0002641	0.0141	357.2044	319.8085	84.9856
C1.108	**2009-067A**	**Intelsat 15 (IS 15)**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:09:53.597				85.15
36106	TEME	42164.612	0.0003511	0.0372	295.4296	3.6648	85.1238
C1.109	**2011-035B**	**Kazsat-2**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:09:53.597				86.49
37749	TEME	42163.876	0.0000860	0.0389	171.7311	171.3824	86.5038
C1.110	**2012-067A**	**Chinasat 15A (Zhongxing 15A, Chinasat 12, Zhongxing 12)**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:39:19.012				87.50
39017	TEME	42164.667	0.0003328	0.0189	60.3787	222.1964	87.4733
C1.111	**2011-022B**	**ST-2**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:39:19.012				87.95
37606	TEME	42164.694	0.0002155	0.0135	66.3662	223.8162	87.9892
C1.112	**2012-003A**	**USA 233 (WGS SV-4)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				88.39
UI169	J2000	42165.847	0.0001335	0.1008	79.2582	148.5727	88.3910
C1.113	**2014-082A**	**Yamal 401**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:18:36.817				89.94
40345	TEME	42165.356	0.0000632	0.0578	114.8122	169.9665	89.8984
C1.114	**2006-056A**	**Measat 3**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:00:26.768				91.49
29648	TEME	42165.797	0.0001302	0.0446	189.3860	43.7218	91.4601
C1.115	**2009-032A**	**Measat 3A**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:15:33.785				91.50
35362	TEME	42164.620	0.0002790	0.0506	213.9258	45.5510	91.5369
C1.116	**2014-054B**	**Measat 3B**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:15:38.334				91.51
40147	TEME	42164.587	0.0002494	0.0215	16.3428	301.5650	91.5159
C1.117	**2008-028A**	**Chinasat 9 (Zhongxing 9, ZX 9)**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:00:28.085				92.19
33051	TEME	42165.094	0.0004599	0.0080	331.4819	300.2671	92.2399
C1.118^{m}	**2007-007A**	**INSAT 4B**					**PL**
TLEs	GEO (1.00)	2015-12-30	17:56:54.564				93.48
30793	TEME	42164.779	0.0008820	0.1323	89.7834	186.9693	93.4792

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
C1.119	**2003-013A**	**INSAT 3A**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:00:31.379				93.49
27714	TEME	42164.459	0.0000665	0.0580	268.2219	165.7311	93.4881
C1.120	**2015-065A**	**GSAT 15**					**PL**
TLEs	GEO (1.00)	2015-12-30	15:05:45.318				93.52
41028	TEME	42165.309	0.0003040	0.0093	301.0714	326.7490	93.5200
C1.121	**2002-057A**	**NSS 6**					**PL**
TLEs	GEO (1.00)	2015-12-31	18:11:33.139				94.99
27603	TEME	42164.724	0.0003182	0.0187	27.4797	247.3949	94.9865
C1.122	**2013-071A**	**SES-8**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:01:43.457				95.00
39460	TEME	42165.023	0.0001360	0.0415	273.2878	49.0403	95.0048
C1.123	**2007-007B**	**Skynet 5A**					**PL**
TLEs	GEO (1.00)	2015-12-31	18:11:33.139				95.18
30794	TEME	42165.580	0.0003467	0.0664	356.0451	278.2605	95.1364
C1.124	**2008-003A**	**Ekspress-AM 33**					**PL**
TLEs	GEO (1.00)	2015-12-31	18:11:33.139				96.50
32478	TEME	42165.172	0.0000803	0.0510	203.8521	171.7031	96.4900
C1.125	**2013-020A**	**Chinasat 11 (Zhongxing 11, ZX 11, SupremeSat 2)**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:10:11.817				98.01
39157	TEME	42165.655	0.0004463	0.0078	295.6419	312.2205	97.9450
C1.126	**2012-028A**	**Chinasat 2A (Zhongxing 2A, ZX 2A, Shentong 2-1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:10:11.817				98.27
38352	TEME	42164.681	0.0005430	0.0477	204.3840	118.6570	98.3229
C1.127	**2009-042A**	**Asiasat 5**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:02:36.735				100.51
35696	TEME	42165.488	0.0001970	0.0289	263.6977	358.4473	100.4482
C1.128	**2005-023A**	**Ekspress-AM 3**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:24:09.247				103.09
28707	TEME	42164.675	0.0000765	0.0313	149.6240	178.4142	103.0140
C1.129^{m}	**2015-063A**	**Chinasat 2C (Zhongxing 2C, ZX 2C, Shentong 2-2)**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:24:09.247				103.43
41021	TEME	42165.074	0.0002312	0.4588	271.6666	104.6135	103.4332
C1.130	**2014-046A**	**Asiasat 8**					**PL**
TLEs	GEO (1.00)	2015-12-31	10:20:28.747				105.30
40107	TEME	42164.766	0.0001690	0.0222	315.1631	292.9094	105.3453
C1.131	**2011-069A**	**Asiasat 7**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:51:29.692				105.49
37933	TEME	42164.551	0.0001535	0.0233	294.7080	308.8956	105.5043
C1.132	**1999-042A**	**Telkom 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:50:11.687				108.00
25880	TEME	42165.030	0.0002022	0.0064	330.1568	345.7435	108.0452
C1.133	**2009-027A**	**Indostar II/Protostar II**					**PL**
TLEs	GEO (1.00)	2015-12-31	17:48:42.412				108.08
34941	TEME	42164.437	0.0002724	0.0395	64.2353	221.6213	108.2540

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
C1.134	**2000-059A**	**GE 1A**					**PL**
TLEs	GEO (1.00)	2015-12-31	17:48:42.412				108.19
26554	TEME	42164.343	0.0001340	0.0255	317.2628	351.8269	108.1987
C1.135	**2007-036B**	**BSAT 3A**					**PL**
TLEs	GEO (1.00)	2015-12-31	10:02:48.569				109.85
32019	TEME	42165.473	0.0004296	0.0290	261.6833	352.0081	109.7820
C1.136	**2010-056B**	**BSAT 3B**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:27:14.003				109.85
37207	TEME	42165.415	0.0004995	0.0578	325.9352	337.6950	109.8039
C1.137	**2011-041B**	**BSAT 3c**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:01:57.658				109.96
37776	TEME	42165.747	0.0000368	0.0184	342.5101	97.3294	109.9529
C1.138	**2000-060A**	**N-SAT-110**					**PL**
TLEs	GEO (1.00)	2015-12-31	17:49:13.018				110.07
26559	TEME	42165.478	0.0000309	0.0200	52.3941	37.1305	110.0630
C1.139	**2011-026A**	**Chinasat 10 (Zhongxing 10, ZX 10, Sinosat 5, Xinnuo 5)**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:27:41.894				110.52
37677	TEME	42164.429	0.0004432	0.0117	312.9008	290.0203	110.4984
C1.140^{m}	**2010-024A**	**Beidou DW 4**					**PL**
TLEs	GEO (1.00)	2015-12-30	23:36:32.002				110.53
36590	TEME	42165.113	0.0004695	1.4340	27.4118	280.9516	110.5294
C1.141^{m}	**2012-002A**	**Fengyun 2F**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:27:41.894				111.89
38049	TEME	42162.982	0.0000494	0.6518	71.2048	185.1986	111.8858
C1.142	**2009-046A**	**Palapa D**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:50:01.506				112.96
35812	TEME	42164.531	0.0001966	0.0259	60.9686	243.3215	112.9786
C1.143	**2006-034A**	**Mugunghwa 5 (Koreasat 5)**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:46:56.686				113.05
29349	TEME	42165.253	0.0000837	0.0131	10.1275	293.7602	113.0456
C1.144	**2007-031A**	**Chinasat 6B (Zhongxing 6B, ZX 6B)**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:46:30.681				115.54
31800	TEME	42164.468	0.0004056	0.0140	13.9471	256.4688	115.5533
C1.145	**2010-070B**	**Olleh 1 (Koreasat 6)**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:46:30.681				116.00
37265	TEME	42165.109	0.0002313	0.0120	31.2095	259.9638	116.0075
C1.146	**1999-046A**	**ABS 7 (Mugungwha 3, Koreasat 3)**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:46:30.681				116.03
25894	TEME	42165.832	0.0002001	0.0117	14.0688	293.1712	116.1246
C1.147	**2005-046A**	**Telkom 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	23:49:52.743				118.01
28902	TEME	42164.990	0.0001474	0.0059	132.3660	175.9089	118.0175
C1.148	**2005-028A**	**Thaicom 4 (IPStar 1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:43:00.204				119.50
28786	TEME	42164.991	0.0002771	0.0186	24.1960	253.6545	119.5022

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
C1.149	**2014-052A**	**Asiasat 6**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:11:00.054				119.90
40141	TEME	42165.036	0.0000760	0.0146	55.9553	270.2827	119.8926
C1.150	**2003-014A**	**Asiasat 4**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:20:11.375				122.16
27718	TEME	42164.708	0.0001024	0.0058	314.8551	306.0284	122.1187
C1.151	**2012-023A**	**JCSAT 13**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:39:26.632				124.09
38331	TEME	42164.412	0.0002361	0.0099	347.7096	315.6638	124.0106
C1.152	**2010-042A**	**Chinasat 6A (Zhongxing 6A, ZX 6A, Sinosat 6, Xinnuo 6)**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:17:40.240				125.03
37150	TEME	42164.034	0.0000814	0.0401	185.3115	49.3835	125.0653
C1.153	**2006-033A**	**JCSAT 3A**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:17:27.164				127.85
29272	TEME	42164.333	0.0001652	0.0229	311.1613	329.7823	127.9889
C1.154	**2009-044A**	**JCSAT 12 (JCSAT-RA)**					**PL**
TLEs	GEO (1.00)	2015-12-31	08:50:19.078				127.93
35755	TEME	42164.887	0.0001003	0.0454	33.1484	204.5180	127.9446
C1.155	**2010-032A**	**COMS 1 (Chollian)**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:17:27.164				128.21
36744	TEME	42164.905	0.0001783	0.0324	132.9742	195.2729	128.1818
C1.156	**2015-067A**	**LaoSat 1**					**PL**
TLEs	GEO (1.00)	2015-12-28	23:03:11.966				128.55
41034	TEME	42166.213	0.0001746	0.0828	265.0064	282.6200	128.5090
C1.157	**2011-047A**	**Chinasat 1A (Zhongxing 1A, ZX 1A, Feng Huo 2-1)**					**PL**
TLEs	GEO (1.00)	2015-12-30	20:28:01.072				129.86
37804	TEME	42163.989	0.0003672	0.0633	208.6592	100.5286	129.7744
C1.158	**2010-064A**	**Chinasat 20A (Zhongxing 20A, ZX 20A, Shentong 1-2)**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:36:17.847				130.03
37234	TEME	42165.601	0.0005005	0.0310	126.2994	190.2804	130.0371
C1.159	**2012-023B**	**VINASAT-2**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:33:43.279				131.84
38332	TEME	42165.110	0.0002753	0.0148	324.1936	342.8943	131.8294
C1.160	**2008-018A**	**VINASAT-1**					**PL**
TLEs	GEO (1.00)	2015-12-31	08:34:47.427				131.93
32767	TEME	42165.014	0.0001660	0.0291	354.1965	291.5356	131.8465
C1.161	**2006-010A**	**JCSAT 9**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:33:43.279				132.03
29045	TEME	42164.252	0.0002087	0.0094	358.5591	286.3020	132.0412
C1.162	**2005-012A**	**Apstar 6**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:19:56.646				134.00
28638	TEME	42165.692	0.0002193	0.0327	56.5873	225.1462	133.9406
C1.163	**2004-024A**	**Telstar 18 (APStar 5)**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:29:05.251				138.00
28364	TEME	42165.771	0.0002705	0.0318	56.5136	237.4135	138.0255

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
C1.164	**2014-010B**	**Ekspress-AT2**					**PL**
TLEs	GEO (1.00)	2015-12-31	20:50:04.653				139.85
39613	TEME	42165.026	0.0000394	0.0529	212.3459	75.0697	139.8135
C1.165^{m}	**2010-001A**	**Beidou DW 3**					**PL**
TLEs	GEO (1.00)	2015-12-31	20:50:04.653				139.97
36287	TEME	42165.567	0.0004545	1.5628	7.3375	233.7576	139.9729
C1.166	**2013-077A**	**Ekspress-AM 5**					**PL**
TLEs	GEO (1.00)	2015-12-31	20:50:04.653				140.04
39487	TEME	42164.485	0.0000214	0.0415	218.9150	101.2443	140.0263
C1.167	**2015-054A**	**Sky Muster**					**PL**
TLEs	GEO (1.00)	2015-12-30	08:05:29.801				140.27
40940	TEME	42164.805	0.0002053	0.0161	12.9169	263.0593	140.1771
C1.168	**2014-060A**	**Himawari 8**					**PL**
TLEs	GEO (1.00)	2015-12-31	07:59:52.047				140.68
40267	TEME	42165.065	0.0000711	0.0205	27.5541	260.3063	140.5996
C1.169	**1998-033A**	**APStar 9A (Chinasat 5A, Zhongxing 5A, ZX 5A, Zhongwei 1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	20:53:00.572				142.01
25354	TEME	42166.712	0.0002113	0.1348	88.7947	339.5019	141.7885
C1.170	**2015-059A**	**Apstar 9**					**PL**
TLEs	GEO (1.00)	2015-12-31	07:54:05.835				142.05
40982	TEME	42164.197	0.0002930	0.0318	227.8483	30.5016	142.0413
C1.171	**2008-007A**	**Kizuna (WINDS)**					**PL**
TLEs	GEO (1.00)	2015-12-31	20:50:17.923				142.99
32500	TEME	42165.067	0.0002228	0.0737	267.2714	20.3222	142.9775
C1.172	**2008-038A**	**Superbird C2**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:19:17.839				143.93
33274	TEME	42164.711	0.0001624	0.0145	18.6003	273.6115	143.9684
C1.173	**2006-004A**	**Himawari 7 (MTSAT 2)**					**PL**
TLEs	GEO (1.00)	2015-12-31	20:38:07.711				145.01
28937	TEME	42164.481	0.0003648	0.0720	98.3210	177.2793	144.9726
C1.174	**2015-036A**	**USA 263 (WGS SV-7)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				149.80
UI191	J2000	42164.158	0.0000651	0.1641	82.3900	263.1682	149.7960
C1.175	**2007-044A**	**Optus D2**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:23:12.273				152.01
32252	TEME	42167.513	0.0002568	0.0318	323.5796	317.0425	151.9981
C1.176	**2002-015A**	**JCSAT 8**					**PL**
TLEs	GEO (1.00)	2015-12-31	17:44:51.762				154.00
27399	TEME	42165.088	0.0001773	0.0136	86.4857	208.6015	153.9800
C1.177	**2015-046A**	**TJS**					**PL**
TLEs	GEO (1.00)	2015-12-31	17:44:51.762				155.07
40892	TEME	42165.608	0.0002855	0.0592	170.0530	102.9263	154.9479
C1.178	**2009-044B**	**Optus D3**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:16:18.405				156.01
35756	TEME	42164.835	0.0004047	0.0381	11.1245	291.3279	155.9753

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\mathrm{IADC}}^{\mathrm{GEO}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.179	**2003-028B**	**Optus C1 (Defense C1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:16:18.405				156.01
27831	TEME	42164.318	0.0003104	0.0418	131.2480	132.9207	155.9746
C1.180	**1999-053A**	**LMI 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:46:10.510				159.03
25924	TEME	42164.813	0.0001273	0.0248	57.1772	215.6211	159.0669
C1.181^{m}	**2010-057A**	**Beidou DW 6**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:43:26.658				159.89
37210	TEME	42164.168	0.0008221	0.8448	45.2052	186.4788	159.8856
C1.182	**2006-043B**	**Optus D1**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:43:26.971				160.00
29495	TEME	42164.880	0.0003157	0.0346	312.9727	329.3977	159.9752
C1.183	**2000-012A**	**Superbird 4**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:55:49.190				162.00
26095	TEME	42165.189	0.0002302	0.0298	71.9414	228.2236	162.0125
C1.184	**2014-054A**	**Optus 10**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:26:30.998				164.00
40146	TEME	42165.089	0.0001681	0.0451	78.2917	212.3967	163.9970
C1.185	**2012-030A**	**Intelsat 19 (IS 19)**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:18:20.059				166.01
38356	TEME	42165.240	0.0002832	0.0413	30.7250	248.7668	166.0524
C1.186^{m}	**2011-074B**	**Luch 5A**					**PL**
TLEs	GEO (1.00)	2015-12-31	20:41:20.548				166.88
37951	TEME	42165.075	0.0002392	1.9353	225.4328	44.0502	166.8826
C1.187	**1998-065A**	**Intelsat 8 (PAS 8)**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:57:03.847				168.99
25522	TEME	42164.630	0.0003096	0.0046	338.2287	289.3267	168.9850
C1.188	**2005-052A**	**Eutelsat 172A (GE 23, AMC 23)**					**PL**
TLEs	GEO (1.00)	2015-12-31	17:25:39.071				172.00
28924	TEME	42164.968	0.0006717	0.0616	2.0638	279.5175	171.9199
C1.189	**2007-046A**	**USA 195 (WGS SV-1)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				175.03
UI152	J2000	42165.283	0.0000670	0.1004	78.6247	227.9872	175.0300
C1.190	**2015-042A**	**Inmarsat-5 F3**					**PL**
TLEs	GEO (1.00)	2015-12-31	05:24:13.657				179.38
40882	TEME	42165.218	0.0000300	0.0222	55.6233	170.3499	179.6104
C1.191	**2011-056A**	**Intelsat 18 (IS 18)**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:01:56.863				180.00
37834	TEME	42164.381	0.0002329	0.0314	54.7932	249.9018	179.9388
C1.192	**2012-061B**	**Yamal 300K**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:18:05.696				182.97
38978	TEME	42164.447	0.0000248	0.0332	109.1422	85.1733	182.9298
C1.193	**2009-008A**	**NSS 9**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:22:33.790				183.02
33749	TEME	42164.480	0.0002148	0.0307	313.3636	328.9433	183.0647

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\mathrm{IADC}}^{\mathrm{GEO}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.194^{m}	**2013-004A**	**TDRS 11**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:45:30.036				189.03
39070	TEME	42166.204	0.0012129	6.0369	329.5115	278.3627	189.0288
C1.195	**2000-081B**	**GE 8 (Aurora 3)**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:55:43.668				220.99
26639	TEME	42164.740	0.0002304	0.0151	23.0286	257.1984	220.9828
C1.196	**2013-041A**	**USA 244 (WGS SV-6)**					**PL**
KIAM	GEO (1.00)	2016-01-10	00:00:00.000				224.83
UI180	J2000	42165.666	0.0000676	0.1053	74.2887	171.7625	224.8260
C1.197	**2010-008A**	**GOES 15**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:21:30.773				224.93
36411	TEME	42160.987	0.0002800	0.1555	260.0631	14.9581	225.4144
C1.198	**2004-003A**	**AMC 10 (GE 10)**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:47:27.769				225.00
28154	TEME	42165.021	0.0000542	0.0251	315.8292	313.3075	224.9780
C1.199	**2000-054B**	**GE 7**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:23:01.491				225.01
26495	TEME	42162.765	0.0003366	0.0364	61.6894	208.5230	225.0341
C1.200	**2005-041A**	**Galaxy 15**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:36:08.469				226.99
28884	TEME	42164.624	0.0002080	0.0184	342.1436	313.8345	227.0003
C1.201	**2004-017A**	**AMC 11 (GE 11)**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:06:20.507				228.99
28252	TEME	42164.296	0.0002576	0.0221	339.4029	318.1120	228.9974
C1.202^{m}	**2003-013B**	**Galaxy XII**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:18:27.387				230.99
27715	TEME	42164.523	0.0002138	0.0418	170.2478	109.8169	230.9941
C1.203	**2008-063A**	**Ciel 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:08:43.773				231.15
33453	TEME	42164.324	0.0003144	0.0127	358.8864	287.7959	231.1469
C1.204	**2003-044A**	**Galaxy 13 / Horizons 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:14:07.346				232.99
27954	TEME	42164.289	0.0002038	0.0373	64.5962	210.7816	232.9450
C1.205	**2005-030A**	**Galaxy 14**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:44:52.480				234.99
28790	TEME	42164.671	0.0002622	0.0143	15.3089	265.9987	234.9677
C1.206	**2008-038B**	**AMC 21**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:44:52.480				235.10
33275	TEME	42164.497	0.0002625	0.0156	2.0305	289.1177	235.0596
C1.207	**2008-024A**	**Galaxy 18**					**PL**
TLEs	GEO (1.00)	2015-12-31	01:35:01.341				236.99
32951	TEME	42165.108	0.0002893	0.0229	33.6482	246.2458	237.0754
C1.208	**2003-034A**	**EchoStar 9 (Galaxy 23, Intelsat Americas 13, Telstar 13)**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:20:50.739				238.99
27854	TEME	42164.503	0.0003193	0.0155	49.9105	235.1679	238.9766

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
C1.209	**2004-016A**	**DirecTV 7S**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:09:06.166				240.92
28238	TEME	42164.796	0.0003530	0.0213	17.7881	282.4731	240.9231
C1.210	**2010-010A**	**EchoStar 14**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:09:06.166				241.10
36499	TEME	42164.586	0.0002653	0.0172	343.9360	293.5448	241.0891
C1.211	**2002-006A**	**EchoStar 7**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:51:58.150				241.16
27378	TEME	42165.202	0.0001379	0.0280	313.8499	14.6935	241.2149
C1.212	**2007-009A**	**Anik F3**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:09:06.825				241.29
31102	TEME	42164.545	0.0002220	0.0165	38.1489	261.5030	241.2767
C1.213	**2013-012A**	**Eutelsat 117 West A (SATMEX 8)**					**PL**
TLEs	GEO (1.00)	2015-12-31	01:10:21.640				243.20
39122	TEME	42165.202	0.0002663	0.0206	2.7723	276.2675	243.2590
C1.214	**2013-058A**	**Sirius FM-6 (Radiosat 6)**					**PL**
TLEs	GEO (1.00)	2015-12-31	01:07:50.863				243.86
39360	TEME	42165.365	0.0000147	0.0366	30.4839	282.6055	243.8898
C1.215	**2006-049A**	**XM Radio 4 (Blues)**					**PL**
TLEs	GEO (1.00)	2015-12-31	10:17:07.411				244.85
29520	TEME	42164.935	0.0000065	0.0282	198.8847	279.3682	244.7661
C1.216	**2011-059A**	**ViaSat-1**					**PL**
TLEs	GEO (1.00)	2015-12-30	14:05:47.141				244.89
37843	TEME	42164.896	0.0002814	0.0228	17.0975	265.8359	244.8698
C1.217	**2015-010B**	**Eutelsat 115 West B**					**PL**
TLEs	GEO (1.00)	2015-12-30	14:05:47.096				245.13
40425	TEME	42164.634	0.0000552	0.0290	140.0863	246.8451	245.0924
C1.218	**2012-075B**	**Mexsat Bicentenario**					**PL**
TLEs	GEO (1.00)	2015-12-31	01:02:27.117				245.20
39035	TEME	42164.302	0.0002495	0.0421	214.8131	67.2169	245.2309
C1.219	**2006-020A**	**Eutelsat 113 West A (SATMEX 6, Morelos 4, Solidaridad 1R)**					**PL**
TLEs	GEO (1.00)	2015-12-31	00:55:17.486				246.99
29162	TEME	42164.779	0.0003012	0.0125	248.3002	35.7039	247.0274
C1.220	**2006-054A**	**WildBlue 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:06:45.201				248.86
29643	TEME	42164.616	0.0001961	0.0228	97.0030	194.4485	248.7932
C1.221	**2004-027A**	**Anik F2**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:06:45.201				248.92
28378	TEME	42163.898	0.0000450	0.0199	9.5225	287.7688	248.9143
C1.222	**2006-003A**	**EchoStar 10**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:09:25.266				249.80
28935	TEME	42164.257	0.0001771	0.0334	309.0413	333.8304	249.8147
C1.223	**2002-023A**	**DirecTV 5**					**PL**
TLEs	GEO (1.00)	2015-12-31	00:43:42.710				249.91
27426	TEME	42165.243	0.0003177	0.0206	10.2741	268.8609	249.9398

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
C1.224	**2008-035A**	**EchoStar 11**					**PL**
TLEs	GEO (1.00)	2015-12-31	00:43:13.594				250.00
33207	TEME	42165.163	0.0003133	0.0263	352.3941	302.1847	250.0609
C1.225	**2005-036A**	**Anik F1R**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:43:59.043				252.69
28868	TEME	42164.630	0.0002302	0.0195	41.4914	289.7943	252.6686
C1.226	**2013-014A**	**Anik G1**					**PL**
TLEs	GEO (1.00)	2015-12-30	00:36:28.804				252.70
39127	TEME	42167.074	0.0002687	0.0185	299.5385	339.3253	252.7291
C1.227	**2000-076A**	**Anik F1**					**PL**
TLEs	EGO (0.67)	2015-12-31	00:29:51.152				252.70
26624	TEME	42166.370	0.0054712	0.0136	13.7424	173.8372	253.4116
C1.228	**2012-035A**	**EchoStar 17**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:43:59.043				252.89
38551	TEME	42164.551	0.0002234	0.0244	16.7569	255.8835	252.8656
C1.229	**2004-041A**	**AMC 15**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:09:36.463				254.95
28446	TEME	42164.609	0.0002391	0.0191	346.4852	304.3116	254.9401
C1.230	**2006-054B**	**AMC 18**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:09:37.121				255.04
29644	TEME	42164.638	0.0002463	0.0212	32.8235	248.1023	255.0371
C1.231^{m}	**2009-033A**	**GOES 14**					**PL**
TLEs	GEO (1.00)	2015-12-31	00:21:48.032				255.42
35491	TEME	42164.893	0.0005682	0.1118	265.2053	324.0243	255.4212
C1.232^{m}	**2011-035A**	**SES-3**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:23:42.623				256.97
37748	TEME	42164.637	0.0002842	0.0374	297.9478	344.0724	256.9713
C1.233	**2005-015A**	**Spaceway 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:23:42.623				257.10
28644	TEME	42165.567	0.0000340	0.0107	200.7188	153.6692	257.0682
C1.234	**2007-032A**	**DirecTV 10**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:23:42.623				257.21
31862	TEME	42163.874	0.0000110	0.0458	202.3915	39.9176	257.1366
C1.235	**2009-075A**	**DirecTV 12**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:23:42.623				257.21
36131	TEME	42165.475	0.0000140	0.0109	192.9688	116.8610	257.2032
C1.236	**2015-026A**	**DirecTV 15**					**PL**
TLEs	GEO (1.00)	2015-12-31	00:14:32.813				257.27
40663	TEME	42162.627	0.0000401	0.0250	66.5698	203.6661	257.2429
C1.237^{m}	**2010-061A**	**SkyTerra 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:49:32.914				258.71
37218	TEME	42165.022	0.0003912	3.8770	325.9023	203.5592	258.7142
C1.238	**2001-052A**	**DirecTV 4S**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:51:29.092				258.84
26985	TEME	42165.578	0.0002469	0.0212	20.3030	286.9206	258.7915

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\mathrm{IADC}}^{\mathrm{GEO}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.239	**2006-043A**	**DirecTV 9S**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:51:28.954				258.88
29494	TEME	42164.635	0.0003485	0.0243	272.3525	11.0671	258.8759
C1.240	**2010-016A**	**SES-1**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:51:29.051				259.00
36516	TEME	42164.404	0.0002219	0.0314	308.5963	327.5143	258.9768
C1.241	**2005-019A**	**DirecTV 8**					**PL**
TLEs	GEO (1.00)	2015-12-31	00:06:52.266				259.14
28659	TEME	42165.236	0.0003196	0.0319	21.6684	260.4383	259.1734
C1.242	**2008-013A**	**DirecTV 11**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:44:17.149				260.76
32729	TEME	42163.768	0.0002189	0.0256	198.6498	220.4993	260.8100
C1.243	**2014-078B**	**DirecTV 14**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:09:49.635				260.77
40333	TEME	42163.273	0.0000668	0.0217	23.3397	218.3749	260.7593
C1.244	**2005-046B**	**Spaceway 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:44:17.149				260.87
28903	TEME	42164.618	0.0000253	0.0431	186.2761	171.2124	260.9147
C1.245	**2006-023A**	**Galaxy 16**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:44:17.149				260.98
29236	TEME	42165.340	0.0002814	0.0432	203.3691	85.0730	260.9836
C1.246	**2008-045A**	**Galaxy 19**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:09:54.246				262.94
33376	TEME	42165.498	0.0003053	0.0291	56.0114	239.7703	263.0058
C1.247	**2009-034A**	**Sirius FM-5 (Radiosat 5)**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:09:56.222				264.00
35493	TEME	42164.636	0.0000383	0.0308	304.0107	224.6728	263.9891
C1.248	**2014-062A**	**Intelsat 30 (DLA 1, ISDLA 1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	01:05:10.744				264.94
40271	TEME	42164.940	0.0001400	0.0147	89.4702	91.8170	264.9335
C1.249	**2002-030A**	**Galaxy 3C**					**PL**
TLEs	GEO (1.00)	2015-12-30	23:43:49.055				264.95
27445	TEME	42164.775	0.0001371	0.0100	1.7951	357.8766	264.9430
C1.250	**2007-036A**	**Spaceway 3**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:09:58.198				265.05
32018	TEME	42164.629	0.0000282	0.0348	170.1337	76.8465	265.0486
C1.251	**1997-026A**	**Galaxy 25 (Intelsat Americas 5, IA 5, Telstar 5)**					**PL**
TLEs	GEO (1.00)	2015-12-31	23:31:54.895				266.89
24812	TEME	42164.595	0.0003066	0.0178	57.3862	227.8827	266.9460
C1.252	**2012-026A**	**Nimiq 6**					**PL**
TLEs	GEO (1.00)	2015-12-31	23:24:11.863				268.89
38342	TEME	42165.662	0.0002193	0.0271	15.6444	262.1102	268.8877
C1.253	**2007-016B**	**Galaxy 17**					**PL**
TLEs	GEO (1.00)	2015-12-31	08:41:13.339				268.99
31307	TEME	42164.757	0.0003749	0.0220	4.2468	289.2200	268.9790

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
C1.254	**2005-022A**	**Galaxy 28 (Intelsat Americas 8, IA 8, Telstar 8)**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:10:10.712				270.99
28702	TEME	42160.848	0.0001048	0.0249	28.7281	353.5500	270.9565
C1.255	**2013-075A**	**Tupac Katari (TKSat 1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:44:28.040				272.80
39481	TEME	42164.064	0.0001952	0.0433	193.5769	72.7448	272.7689
C1.256^{m}	**2011-049A**	**SES-2**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:30:52.460				272.97
37809	TEME	42164.635	0.0002662	0.0308	308.4604	342.6223	272.9730
C1.257	**1999-027A**	**Nimiq**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:44:27.919				273.48
25740	TEME	42164.748	0.0006282	0.0102	18.3127	284.1847	273.4321
C1.258	**2010-053A**	**Sirius XM-5**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:19:51.721				274.78
37185	TEME	42164.828	0.0000193	0.0147	325.9797	245.1497	274.7880
C1.259	**2005-008A**	**XM Radio 3 (Rhythm)**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:39:50.921				274.91
28626	TEME	42163.757	0.0000445	0.0331	178.8566	158.8326	274.8971
C1.260	**2004-048A**	**AMC 16**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:39:50.921				274.99
28472	TEME	42165.956	0.0002329	0.0229	332.1710	307.7233	274.9863
C1.261	**2000-007A**	**Hispasat 1C**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:39:05.837				276.15
26071	TEME	42164.840	0.0001955	0.0406	53.2325	256.1888	276.1583
C1.262	**2003-024A**	**AMC 9 (GE 12)**					**PL**
TLEs	GEO (1.00)	2015-12-31	10:58:56.346				276.98
27820	TEME	42165.061	0.0002893	0.0143	17.1910	262.2449	276.9624
C1.263	**2008-044A**	**Nimiq 4**					**PL**
TLEs	GEO (1.00)	2015-12-31	10:58:56.346				277.99
33373	TEME	42166.297	0.0002438	0.0372	61.6216	241.3881	278.0085
C1.264	**2015-054B**	**ARSAT-2**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:44:26.074				278.92
40941	TEME	42165.362	0.0001694	0.0264	37.0948	247.5017	278.8524
C1.265	**2015-026B**	**SKY Mexico-1**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:35:15.296				281.20
40664	TEME	42165.492	0.0002061	0.0189	351.8050	314.7638	281.1545
C1.266	**2008-055A**	**Simon Bolivar**					**PL**
TLEs	GEO (1.00)	2015-12-31	10:56:02.701				282.00
33414	TEME	42164.135	0.0001380	0.0411	113.9893	150.9650	282.0070
C1.267	**1995-073A**	**EchoStar 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	10:56:02.701				282.84
23754	TEME	42165.335	0.0002433	0.0172	9.2994	275.6101	282.8180
C1.268	**2011-054A**	**QuetzSat-1**					**PL**
TLEs	GEO (1.00)	2015-12-31	10:56:02.701				282.98
37826	TEME	42164.351	0.0003099	0.0158	13.3710	281.7529	282.9660

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\mathrm{IADC}}^{\mathrm{GEO}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.269	**2002-039A**	**EchoStar 8**					**PL**
TLEs	GEO (1.00)	2015-12-31	10:56:02.701				283.02
27501	TEME	42163.921	0.0003017	0.0147	338.5340	307.9249	283.0731
C1.270	**2010-006A**	**Intelsat 16 (IS 16, PAS 11R)**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:28:49.482				283.81
36397	TEME	42166.276	0.0001794	0.0222	60.7329	222.0834	283.8216
C1.271	**2012-062A**	**Star One C3**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:30:39.070				284.99
38991	TEME	42164.919	0.0003704	0.0206	76.5771	218.6407	284.9471
C1.272	**2006-018A**	**GOES N**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:18:17.074				285.14
29155	TEME	42163.700	0.0001488	0.2458	98.2533	313.9788	285.4004
C1.273	**2009-050A**	**Nimiq 5**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:30:26.070				287.29
35873	TEME	42164.251	0.0002048	0.0195	296.6830	338.3676	287.2744
C1.274	**2000-067A**	**GE 6**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:29:49.797				287.99
26580	TEME	42164.935	0.0002522	0.0310	313.1522	329.9458	287.9695
C1.275	**2014-062B**	**ARSAT-1**					**PL**
TLEs	GEO (1.00)	2015-12-31	05:17:21.391				288.19
40272	TEME	42164.750	0.0001686	0.0113	49.7322	241.3368	288.2145
C1.276	**2008-018B**	**Star One C2**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:59:51.306				290.00
32768	TEME	42164.503	0.0002012	0.0488	205.6094	24.7024	290.0215
C1.277	**2015-034B**	**Star One C4**					**PL**
TLEs	GEO (1.00)	2015-12-31	05:17:21.390				290.03
40733	TEME	42165.214	0.0002448	0.0220	353.1382	310.4780	289.9914
C1.278	**1999-060A**	**GE 4**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:28:23.482				292.99
25954	TEME	42164.550	0.0000494	0.0257	46.9072	334.2879	292.9982
C1.279	**1997-050A**	**GE 3**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:28:23.482				292.99
24936	TEME	42164.789	0.0002926	0.0155	321.4179	316.5878	292.9650
C1.280	**2007-056A**	**Star One C1**					**PL**
TLEs	GEO (1.00)	2015-12-30	21:43:47.134				295.00
32293	TEME	42165.005	0.0002362	0.0325	78.6307	209.5743	295.0333
C1.281	**2011-021A**	**Telstar 14R (Estrela do Sul 2)**					**PL**
TLEs	GEO (1.00)	2015-12-29	04:32:32.528				296.99
37602	TEME	42165.146	0.0002998	0.0214	313.6459	303.4547	296.9706
C1.282	**2010-034A**	**EchoStar 15**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:15:15.632				298.37
36792	TEME	42163.105	0.0002282	0.0206	8.1471	280.0785	298.3187
C1.283	**2012-065A**	**EchoStar 16**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:25:54.671				298.49
39008	TEME	42164.610	0.0002605	0.0195	20.7939	259.0837	298.5322

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\mathrm{IADC}}^{\mathrm{GEO}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.284	**2003-033A**	**EchoStar 12 (Rainbow 1, Cablevision 1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:35:50.802				298.54
27852	TEME	42163.948	0.0001778	0.0155	343.0915	256.2123	298.6621
C1.285	**2009-054A**	**Amazonas 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	05:05:59.792				298.99
35942	TEME	42165.130	0.0002493	0.0480	138.7879	97.2258	298.9658
C1.286	**2013-006A**	**Amazonas 3**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:23:46.527				299.01
39078	TEME	42165.429	0.0004514	0.0093	247.8649	0.7569	299.0742
C1.287	**2014-011A**	**Amazonas 4A**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:23:48.023				299.05
39616	TEME	42164.003	0.0003006	0.0581	64.9126	260.1647	299.0586
C1.288^{m}	**2012-045A**	**Intelsat 21 (IS 21)**					**PL**
TLEs	GEO (1.00)	2015-12-31	05:37:37.949				301.98
38749	TEME	42156.232	0.0004465	0.0139	344.4343	290.6804	301.9807
C1.289	**1998-037A**	**Intelsat 805**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:37:05.765				304.49
25371	TEME	42164.468	0.0003599	0.0278	49.0035	246.6615	304.4603
C1.290	**2015-039A**	**Intelsat 34 (Hispasat 55W-2)**					**PL**
TLEs	GEO (1.00)	2015-12-31	05:14:04.119				304.52
40874	TEME	42164.863	0.0000393	0.0101	314.0694	39.5251	304.4941
C1.291	**2015-005A**	**Inmarsat-5 F2**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:37:05.765				305.00
40384	TEME	42165.238	0.0000390	0.0233	24.4908	308.6789	305.0043
C1.292	**2012-057A**	**Intelsat 23 (IS 23)**					**PL**
TLEs	GEO (1.00)	2015-12-31	03:54:37.939				307.00
38867	TEME	42164.103	0.0002210	0.0124	311.6959	323.2480	306.9907
C1.293	**2013-024A**	**USA 243 (WGS SV-5)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				307.53
UI176	J2000	42164.931	0.0000408	0.1037	77.6277	247.5730	307.5290
C1.294	**2000-072A**	**Intelsat 1R (PAS 1R)**					**PL**
TLEs	GEO (1.00)	2015-12-31	03:59:26.585				310.00
26608	TEME	42165.571	0.0002618	0.0242	234.6566	135.4484	310.0044
C1.295	**1998-014A**	**NSS 806 (Intelsat 806)**					**PL**
TLEs	GEO (1.00)	2015-12-31	04:03:44.563				312.49
25239	TEME	42164.238	0.0004684	0.0520	8.3919	258.1269	312.4787
C1.296	**2009-064A**	**Intelsat 14 (IS 14)**					**PL**
TLEs	GEO (1.00)	2015-12-31	20:20:26.684				314.99
36097	TEME	42165.009	0.0002791	0.0222	359.0817	287.0678	314.9509
C1.297	**2007-044B**	**Intelsat 11 (IS 11, PAS 11)**					**PL**
TLEs	GEO (1.00)	2015-12-31	10:50:16.977				316.98
32253	TEME	42165.172	0.0002992	0.0534	256.3923	27.6506	316.9605
C1.298	**2013-026A**	**SES-6**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:26:09.032				319.50
39172	TEME	42164.651	0.0001694	0.0187	8.7186	283.8449	319.5206

C1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\mathrm{IADC}}^{\mathrm{GEO}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C1.299	**2009-009A**	**Telstar 11N**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:26:15.618				322.44
34111	TEME	42164.151	0.0002837	0.0186	29.2323	250.6922	322.4385
C1.300	**2005-003A**	**AMC 12**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:26:15.618				322.59
28526	TEME	42164.430	0.0003103	0.0339	313.4563	338.8805	322.5966
C1.301	**2002-016A**	**Intelsat 903**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:28:32.071				325.50
27403	TEME	42164.731	0.0003128	0.0250	58.9454	223.3228	325.4654
C1.302	**2010-065A**	**HYLAS 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:28:32.071				326.50
37237	TEME	42165.210	0.0002636	0.0398	312.4111	342.5498	326.4527
C1.303	**2008-034A**	**Intelsat 25 (Protostar 1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	04:52:53.669				328.49
33153	TEME	42163.698	0.0002792	0.0514	281.6358	330.7133	328.4811
C1.304	**2002-044A**	**Hispasat 1D**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:16:30.700				329.99
27528	TEME	42164.342	0.0005643	0.0536	300.6098	350.8899	329.9387
C1.305	**2006-007A**	**Spainsat**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:20:12.027				330.00
28945	TEME	42164.362	0.0005088	0.0596	247.5384	7.0105	330.0430
C1.306	**2010-070A**	**Hispasat 1E**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:16:30.700				330.00
37264	TEME	42164.767	0.0002782	0.0450	116.4156	136.8891	329.9868
C1.307	**2003-007A**	**Intelsat 907**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:10:28.597				332.50
27683	TEME	42165.196	0.0003093	0.0257	38.3334	241.3255	332.4905
C1.308	**2002-027A**	**Intelsat 905**					**PL**
TLEs	GEO (1.00)	2015-12-30	08:45:32.494				335.50
27438	TEME	42166.105	0.0001890	0.0357	54.9310	221.6484	335.5032
C1.309	**2012-007A**	**SES-4**					**PL**
TLEs	GEO (1.00)	2015-12-31	01:06:01.819				337.99
38087	TEME	42164.618	0.0002362	0.0172	2.3378	268.2451	338.0091
C1.310	**2001-024A**	**Intelsat 901**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:33:32.120				342.00
26824	TEME	42164.538	0.0002775	0.0147	359.9760	286.0849	342.0111
C1.311	**2008-030A**	**Skynet 5C**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:32:02.125				342.19
33055	TEME	42164.604	0.0004135	0.0613	8.1474	264.1372	342.1992
C1.312	**2015-068A**	**Telstar 12 Vantage (Telstar 12V)**					**PL**
TLEs	GEO (1.00)	2015-12-29	18:28:22.320				344.87
41036	TEME	42165.289	0.0002069	0.0223	184.7872	57.5964	345.0156
C1.313	**1999-059A**	**Telstar 12 (Orion 2)**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:57:33.447				345.00
25949	TEME	42164.664	0.0003293	0.0154	68.2259	257.7592	345.0357

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
C1.314	**2015-048A**	**Ekspress-AM 8**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:57:33.447				346.02
40895	TEME	42164.991	0.0000222	0.0411	185.8207	75.9191	345.9693
C1.315	**2001-042A**	**Eutelsat 12 West B (Eutelsat 8 West A, Atlantic Bird 2)**					**PL**
TLEs	GEO (1.00)	2015-12-31	05:59:45.705				347.32
26927	TEME	42164.304	0.0005976	0.0621	350.3872	293.2683	347.3687
C1.316	**2009-068A**	**USA 211 (WGS SV-3)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				348.03
UI159	J2000	42165.161	0.0000324	0.1110	79.8806	243.1968	348.0310
C1.317	**2009-007A**	**Ekspress-AM 44**					**PL**
TLEs	GEO (1.00)	2015-12-31	23:16:01.401				349.01
33595	TEME	42164.769	0.0000810	0.0138	197.5379	127.4295	349.0032
C1.318	**2015-039B**	**Eutelsat 8 West B**					**PL**
TLEs	GEO (1.00)	2015-12-31	17:52:30.700				352.04
40875	TEME	42164.863	0.0003308	0.0525	0.4063	283.8066	352.0280
C1.319	**2011-051A**	**Eutelsat 7 West A (Nilesat 104, Atlantic Bird 7)**					**PL**
TLEs	GEO (1.00)	2015-12-31	17:49:35.685				352.69
37816	TEME	42164.512	0.0004735	0.0696	34.7791	239.6343	352.7591
C1.320	**2010-037A**	**Nilesat 201**					**PL**
TLEs	GEO (1.00)	2015-12-31	03:40:23.719				352.98
36830	TEME	42164.416	0.0003574	0.0524	199.2549	81.4616	352.9543
C1.321	**2006-033B**	**Syracuse 3B**					**PL**
TLEs	GEO (1.00)	2015-12-31	04:11:50.309				354.80
29273	TEME	42164.697	0.0005992	0.0195	61.2427	219.8299	354.7308
C1.322	**2002-035A**	**Eutelsat 5 West A (Atlantic Bird 3, Stellat 5)**					**PL**
TLEs	GEO (1.00)	2015-12-30	17:44:15.444				354.99
27460	TEME	42165.119	0.0005895	0.0386	13.9954	264.5921	355.0803
C1.323	**2003-059A**	**AMOS 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:14:01.188				355.99
28132	TEME	42164.024	0.0004096	0.0180	12.2153	287.3714	355.9162
C1.324	**2008-022A**	**AMOS 3**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:14:01.188				356.02
32794	TEME	42164.605	0.0001234	0.0379	87.0497	197.4058	356.0005
C1.325^{m}	**2015-034A**	**Meteosat 11 (MSG 4)**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:03:08.521				356.54
40732	TEME	42163.423	0.0001967	2.8491	261.4804	33.6031	356.5400
C1.326	**2015-010A**	**ABS 3A**					**PL**
TLEs	GEO (1.00)	2015-12-31	17:32:34.137				357.09
40424	TEME	42162.261	0.0001287	0.0091	53.1426	158.2378	357.0252
C1.327	**2004-022A**	**Intelsat 10-02 (Thor 10-02)**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:36:22.120				359.04
28358	TEME	42164.937	0.0000806	0.0255	102.3533	149.1600	359.0015
C1.328	**2009-058B**	**Thor 6 (Intelsat 1W)**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:36:22.120				359.16
36033	TEME	42164.588	0.0002153	0.0360	166.9942	136.3536	359.1628

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
C1.329	**2008-006A**	**Thor 2R**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:36:22.120				359.25
32487	TEME	42164.383	0.0002995	0.0142	194.7455	99.9889	359.2702
C1.330	**2015-022A**	**Thor 7**					**PL**
TLEs	GEO (1.00)	2015-12-31	17:23:09.830				359.37
40613	TEME	42165.203	0.0002406	0.0178	257.0626	25.4347	359.3856
C1.331^{m}	**2012-035B**	**Meteosat 10 (MSG 3)**					**PL**
TLEs	GEO (1.00)	2015-12-31	17:22:01.257				359.67
38552	TEME	42164.313	0.0001025	0.4478	87.1090	178.7070	359.6693

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

The following list contains 136 satellites under longitude control only, 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	**2002-040B**	**Meteosat 8 (MSG 1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:20:35.608				3.62
27509	TEME	42164.569	0.0001441	3.9028	60.3785	228.5351	3.5231
C2.2	**2002-001A**	**USA 164 (Milstar-2 F3)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				4.05
UI063	J2000	42164.742	0.0002421	7.0401	40.2529	232.2809	4.0500
C2.3	**1999-009B**	**Skynet 4E**					**PL**
TLEs	GEO (1.00)	2015-12-30	19:31:47.713				6.04
25639	TEME	42164.778	0.0002726	9.5957	32.9309	253.1165	5.9973
C2.4	**1997-008A**	**USA 130 (DSP F18, DSP 20, DSP Block 5(DSP-1) F18)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				8.10
UI125	J2000	42167.766	0.0000457	12.3109	35.6959	83.2603	8.1020
C2.5	**2000-019A**	**Eutelsat 16C (SESAT 1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:12:20.371				14.80
26243	TEME	42164.659	0.0003452	3.2562	69.1291	216.3522	14.4909
C2.6	**2001-005A**	**SICRAL**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				16.19
UI178	J2000	42165.053	0.0001441	6.5466	54.7012	252.1854	16.1880
C2.7	**2012-019A**	**USA 235 (AEHF 2)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				18.99
UI171	J2000	42165.923	0.0003225	2.1957	326.6423	301.4534	18.9880
C2.8	**2013-011A**	**USA 241 (SBIRS GEO-2)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				20.64
UI175	J2000	42166.759	0.0002026	4.3429	321.8711	293.3332	20.6400
C2.9	**1998-063A**	**AfriStar 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:55:55.086				21.00
25515	TEME	42165.620	0.0004389	2.2682	70.9386	204.9993	21.0031
C2.10	**2001-029A**	**Artemis**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:46:41.470				21.41
26863	TEME	42164.129	0.0005824	12.1089	38.8125	259.8983	21.4469
C2.11	**2013-038A**	**Alphasat**					**PL**
TLEs	GEO (1.00)	2015-12-31	17:51:02.839				24.85
39215	TEME	42164.004	0.0001762	1.1089	32.7177	244.3549	24.8881
C2.12	**1993-056A**	**USA 95 (UFO F2)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				28.84
UI069	J2000	42167.183	0.0002013	10.3939	27.8129	253.0954	28.8370
C2.13^{m}	**2008-011A**	**AMC 14**					**PL**
TLEs	GEO (0.63)	2015-12-30	23:35:46.141				29.83
32708	TEME	42164.073	0.0043560	18.1186	71.2303	356.1969	29.8253

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
C2.14	**2003-043A**	**Eutelsat 31A (Eutelsat 33A, Eurobird 3, eBird 1)**					**PL**
TLEs	GEO (1.00)	2015-12-29	18:25:52.957				30.81
27948	TEME	42163.794	0.0001892	1.3023	80.3667	197.1836	30.8968
C2.15	**2000-054A**	**Astra 2B**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:58:48.390				31.35
26494	TEME	42164.443	0.0003192	1.1258	80.1686	211.3922	31.3100
C2.16	**1993-076A**	**NATO IVB**					**PL**
TLEs	GEO (1.00)	2015-12-30	22:31:22.969				32.45
22921	TEME	42163.721	0.0003598	11.8267	28.3386	255.7511	32.5700
C2.17	**1994-034A**	**Intelsat VII F-2**					**PL**
TLEs	GEO (1.00)	2015-12-30	19:44:38.292				32.93
23124	TEME	42164.768	0.0002320	3.5231	68.2160	186.1617	32.9032
C2.18	**2003-026A**	**Thuraya 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:29:28.317				44.05
27825	TEME	42164.013	0.0005343	4.4441	26.8098	250.2800	44.0583
C2.19	**2009-001A**	**USA 202 (NROL-26, ORION)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				44.07
UI155	J2000	42166.953	0.0008791	4.4363	27.7600	338.9625	44.0670
C2.20	**2002-062A**	**Nimiq 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:23:12.885				44.50
27632	TEME	42164.571	0.0001032	0.8962	85.1695	303.2890	44.4954
C2.21	**1994-054A**	**USA 105 (MERCURY 1)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				45.88
UI008	J2000	42165.771	0.0031041	10.3962	39.5446	132.5969	45.8790
C2.22	**1996-026A**	**USA 118 (MERCURY 2)**					**PL**
KIAM	EGO (0.07)	2016-01-01	00:00:00.000				47.37
UI073	J2000	42164.398	0.0407981	9.5485	4.3793	228.6985	47.3720
C2.23	**2001-019A**	**Intelsat 10 (PAS 10)**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:04:40.903				47.51
26766	TEME	42164.968	0.0002331	0.4131	87.1645	191.0050	47.5049
C2.24	**1996-067A**	**Eutelsat 48A (Eutelsat W48, Eurobird 9, Hot Bird 2)**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:17:43.719				48.25
24665	TEME	42164.232	0.0006218	5.4474	58.8398	226.6604	48.2229
C2.25	**1997-053A**	**NSS 5 (NSS 803, Intelsat 803)**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:04:48.146				50.49
24957	TEME	42164.332	0.0003773	2.8049	72.0815	215.4259	50.5170
C2.26	**2012-034A**	**USA 237 (NROL-15, ORION)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				52.55
UI173	J2000	42166.300	0.0045094	1.3958	321.8517	2.5183	52.5470
C2.27	**2000-065A**	**USA 153 (DSCS III F12, DSCS 3-12, DSCS III B-11)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				56.68
UI105	J2000	42167.088	0.0001432	5.2869	59.9795	220.8060	56.6820
C2.28	**1997-049B**	**Meteosat 7 (MTP)**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:19:31.269				57.52
24932	TEME	42165.096	0.0001540	9.9685	42.3098	266.8510	57.6484

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
C2.29	**1997-076A**	**Astra 1G**					**PL**
TLEs	GEO (1.00)	2015-12-31	18:06:41.818				59.84
25071	TEME	42164.320	0.0003892	1.2424	79.8021	214.2337	59.8715
C2.30	**1997-007A**	**Intelsat 26 (JCSAT R, JCSAT 4)**					**PL**
TLEs	GEO (1.00)	2015-12-31	20:26:51.686				62.19
24732	TEME	42164.634	0.0003883	6.6048	54.1463	205.1498	62.1513
C2.31	**1996-020A**	**Inmarsat-3 F1**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:05:21.078				64.44
23839	TEME	42164.174	0.0007044	2.9658	70.0391	214.9266	64.4995
C2.32	**2004-004A**	**USA 176 (DSP F22, DSP Block 5(DSP-1) F22)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				66.10
UI108	J2000	42166.254	0.0001708	7.0115	49.9721	238.6877	66.1000
C2.33	**1999-052A**	**Galaxy 27 (Intelsat Americas 7, IA 7, Telstar 7)**					**PL**
TLEs	GEO (1.00)	2015-12-31	17:57:09.938				66.20
25922	TEME	42164.085	0.0005949	2.1684	75.7668	190.2968	66.2122
C2.34	**2003-041A**	**USA 171 (Advanced ORION 3)**					**PL**
KIAM	EGO (0.67)	2016-01-01	00:00:00.000				68.00
UI118	J2000	42166.081	0.0054603	8.3947	73.3810	198.8066	68.0040
C2.35	**1999-063A**	**USA 146 (UFO F10)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				71.88
UI065	J2000	42167.507	0.0003858	6.0085	41.2865	232.9426	71.8840
C2.36	**2002-043A**	**KALPANA-1 (METSAT-1)**					**PL**
TLEs	GEO (1.00)	2015-12-30	16:24:21.096				73.98
27525	TEME	42164.523	0.0015669	5.4358	58.9578	217.7629	73.9746
C2.37	**2003-057A**	**USA 174 (UFO F11)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				74.66
UI117	J2000	42166.191	0.0005701	4.4885	34.7247	226.0110	74.6570
C2.38	**2011-001A**	**Elektro-L No. 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	23:44:29.383				76.02
37344	TEME	42165.705	0.0003323	1.3732	80.0317	124.1601	76.0464
C2.39	**2005-010A**	**Ekspress-AM 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:20:17.077				80.01
28629	TEME	42164.610	0.0000519	1.2516	81.4005	246.0814	80.0476
C2.40^{m}	**2008-019A**	**Tian Lian 1-01**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:20:17.077				80.39
32779	TEME	42164.360	0.0038451	1.7267	78.5541	217.3049	80.3896
C2.41	**1999-006A**	**JCSAT 6**					**PL**
TLEs	GEO (1.00)	2015-12-31	18:10:36.387				81.95
25630	TEME	42164.769	0.0001991	1.2067	82.6698	210.9292	81.9482
C2.42	**2014-061A**	**IRNSS-R1C**					**PL**
TLEs	GEO (1.00)	2015-12-31	05:30:46.406				83.04
40269	TEME	42163.964	0.0022113	4.0806	264.6464	10.4608	82.9173
C2.43	**1995-035B**	**TDRS 7**					**PL**
TLEs	GEO (1.00)	2015-12-31	17:35:51.819				84.79
23613	TEME	42165.532	0.0018723	14.6836	20.9412	12.5477	84.9439

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
C2.44	**2008-066A**	**Fengyun 2E**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:09:53.597				86.48
33463	TEME	42164.932	0.0003803	1.2049	58.2333	206.5535	86.1354
C2.45	**2000-034A**	**TDRS 8**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:26:46.853				89.07
26388	TEME	42163.863	0.0006541	6.5679	60.7496	194.7902	89.2405
C2.46	**2002-042B**	**Kodama (DRTS)**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:00:25.451				90.74
27516	TEME	42164.927	0.0002918	4.0660	65.2893	229.7097	90.7806
C2.47	**2011-011A**	**USA 227 (NROL-27, SDS-3, QUASAR)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				92.11
UI165	J2000	42166.632	0.0004037	4.7207	357.7735	221.5542	92.1130
C2.48	**2011-019A**	**USA 230 (SBIRS GEO-1)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				94.04
UI166	J2000	42165.997	0.0002294	4.3141	321.4580	303.2489	94.0370
C2.49	**2014-023A**	**Luch 5V**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:23:56.245				94.89
39727	TEME	42163.794	0.0004140	3.7139	300.4613	343.9023	94.6480
C2.50	**2010-063A**	**USA 223 (NROL-32, ORION)**					**PL**
KIAM	EGO (0.72)	2016-01-01	00:00:00.000				95.49
UI160	J2000	42165.547	0.0052398	3.2802	215.7054	56.6336	95.4880
C2.51	**2008-001A**	**Thuraya 3**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:58:58.648				98.62
32404	TEME	42164.116	0.0004357	4.2935	348.7590	283.8499	98.6769
C2.52	**1986-096A**	**USA 20 (FLTSATCOM F7)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				100.34
UI134	J2000	42168.717	0.0019742	14.6614	12.2058	158.8454	100.3360
C2.53^{m}	**2006-038A**	**Chinasat 22A (Zhongxing 22A, ZX 22A, Feng Huo 1-2)**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:27:27.300				101.41
29398	TEME	42163.774	0.0006456	4.8536	61.2560	201.8531	101.4080
C2.54	**1989-035A**	**USA 37 (VORTEX 6)**					**PL**
KIAM	EGO (0.03)	2016-01-01	00:00:00.000				101.91
UI018	J2000	42165.134	0.0986679	7.9206	10.7175	265.9508	101.9080
C2.55^{m}	**2003-052A**	**Chinasat 20 (Zhongxing 20, ZX 20, Shentong 1-1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:20:26.001				103.14
28082	TEME	42164.123	0.0005607	2.4623	73.9652	221.0357	103.1434
C2.56	**1995-038A**	**USA 113 (DSCS III F9, DSCS 3-9, DSCS III B-7)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				103.82
UI115	J2000	42164.749	0.0001782	9.6739	44.0248	247.6999	103.8240
C2.57	**2014-090A**	**Fengyun 2G**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:52:21.686				104.44
40367	TEME	42166.444	0.0001455	1.5384	274.6506	260.8710	104.4784
C2.58	**2000-016A**	**Asiastar**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:51:29.692				104.99
26107	TEME	42164.855	0.0004990	0.5851	79.9015	207.3541	105.0601

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
C2.59	**2000-080A**	**USA 155 (SDS 3 F2)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				110.07
UI007	J2000	42166.908	0.0008187	7.4029	39.6341	189.6159	110.0690
C2.60	**2001-009A**	**USA 157 (Milstar-2 F2)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				110.99
UI112	J2000	42164.288	0.0001667	7.6815	40.0614	209.8243	110.9900
C2.61	**2006-053A**	**Fengyun 2D**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:11:01.476				123.49
29640	TEME	42168.056	0.0001378	3.4620	67.1520	323.9676	123.2378
C2.62	**1995-022A**	**USA 110 (Advanced ORION 1)**					**PL**
KIAM	EGO (0.56)	2016-01-01	00:00:00.000				126.90
UI128	J2000	42164.215	0.0061685	13.1815	45.7273	74.7006	126.9010
C2.63	**2001-033A**	**USA 159 (DSP F21, DSP Block 5(DSP-1) F21)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				130.94
UI001	J2000	42164.370	0.0000132	9.0218	43.2762	21.0104	130.9430
C2.64	**2002-035B**	**N-Star 3 (N-Star c)**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:29:31.582				136.00
27461	TEME	42165.255	0.0002852	3.6311	68.0066	247.3396	136.0178
C2.65	**2005-009A**	**Inmarsat-4 F1**					**PL**
TLEs	GEO (1.00)	2015-12-31	08:06:33.554				143.50
28628	TEME	42164.460	0.0003295	2.8026	4.5336	277.8611	143.5452
C2.66	**2006-059A**	**Kiku 8 (ETS VIII)**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:48:07.717				145.81
29656	TEME	42163.974	0.0005498	4.5962	62.4948	238.9921	145.7383
C2.67	**1996-030A**	**Palapa C2**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:42:41.807				146.06
23864	TEME	42165.168	0.0001520	4.5944	62.4728	255.0726	146.0353
C2.68	**1996-063B**	**MEASAT 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:46:46.878				148.01
24653	TEME	42163.902	0.0010050	6.6354	53.8848	171.7656	147.9351
C2.69^{m}	**1997-075A**	**JCSAT 5**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:36:17.906				150.06
25067	TEME	42164.694	0.0007554	4.6130	62.3313	206.8390	150.0577
C2.70	**1999-013A**	**Asiasat 3S**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:06:24.876				150.50
25657	TEME	42164.793	0.0004822	1.4280	80.7796	188.1236	150.4636
C2.71	**2013-050A**	**USA 246 (AEHF SV-3)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				152.14
UI181	J2000	42165.019	0.0003149	3.4815	303.8476	338.2507	152.1400
C2.72	**1997-046A**	**Badr C (Intelsat 5, Arabsat 2C, PAS 5)**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:47:22.566				157.01
24916	TEME	42164.718	0.0004350	2.5021	73.8265	212.7322	157.0399
C2.73	**1994-055A**	**Optus B3**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:23:30.193				164.02
23227	TEME	42164.507	0.0006084	6.5370	54.3056	220.2860	164.1445

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
C2.74	**2011-032A**	**Tian Lian 1-02**					**PL**
TLEs	GEO (1.00)	2015-12-31	20:41:20.548				166.99
37737	TEME	42165.129	0.0034871	1.5099	79.9073	193.9645	166.7069
C2.75	**1998-016A**	**USA 138 (UFO F8)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				171.52
UI111	J2000	42164.358	0.0004910	6.9048	40.9508	242.2486	171.5180
C2.76	**2000-001A**	**USA 148 (DSCS III F11, DSCS 3-11, DSCS III B-8)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				171.89
UI104	J2000	42126.341	0.0006124	5.9247	57.4182	230.6208	171.8910
C2.77	**1996-070A**	**Inmarsat-3 F3**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:12:50.050				178.10
24674	TEME	42166.747	0.0005519	2.3840	74.4219	213.1846	178.0891
C2.78	**2012-009A**	**MUOS 1**					**PL**
KIAM	EGO (0.74)	2016-01-01	00:00:00.000				183.04
UI170	J2000	42166.102	0.0051818	3.7267	334.2478	181.3990	183.0410
C2.79	**2002-015B**	**Astra 3A**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:53:40.186				183.15
27400	TEME	42163.774	0.0001279	2.7934	71.4581	213.6052	183.2265
C2.80	**2002-055A**	**TDRS 10**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:02:12.437				185.66
27566	TEME	42163.654	0.0011558	4.0949	60.8449	212.3045	185.6648
C2.81	**2015-044A**	**MUOS 4**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				188.09
UI192	J2000	42165.955	0.0005280	4.9113	329.8345	298.7615	188.0890
C2.82^{m}	**1991-054B**	**TDRS 5**					**PL**
TLEs	GEO (1.00)	2015-12-31	18:12:20.464				192.07
21639	TEME	42165.097	0.0022931	13.9501	27.2497	318.0066	192.0702
C2.83	**2000-024A**	**USA 149 (DSP F20, DSP Block 5(DSP-1) F20)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				194.44
UI004	J2000	42167.715	0.0003277	9.9629	40.2187	288.7153	194.4380
C2.84	**2014-020A**	**USA 250 (NROL-67)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				197.01
UI182	J2000	42165.310	0.0003666	3.5181	316.8297	339.8002	197.0060
C2.85	**2014-027A**	**USA 252 (NROL-33)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				215.87
UI183	J2000	42165.713	0.0000979	3.6737	247.4496	159.0777	215.8690
C2.86	**2003-008A**	**USA 167 (DSCS III F13, DSCS 3-13, DSCS III A-3)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				229.94
UI106	J2000	42166.281	0.0009132	3.7279	67.7899	320.4283	229.9420
C2.87	**1996-054A**	**GE 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	01:59:40.114				230.87
24315	TEME	42164.522	0.0002849	0.4671	87.7754	202.3638	230.8871
C2.88	**2001-046A**	**USA 162 (SDS 3 F3)**					**PL**
KIAM	GEO (1.00)	2016-01-10	00:00:00.000				232.93
UI151	J2000	42164.946	0.0008849	8.3938	60.4562	203.5075	232.9320

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
C2.89	**2003-012A**	**USA 169 (Milstar-2 F4)**					**PL**
KIAM	GEO (1.00)	2016-01-10	00:00:00.000				240.01
UI109	J2000	42164.657	0.0002425	6.6350	56.9774	240.1707	240.0120
C2.90	**2015-056A**	**Morelos 3**					**PL**
TLEs	GEO (1.00)	2015-12-30	23:02:53.369				246.89
40946	TEME	42164.502	0.0002104	7.0426	331.6166	0.4363	246.9178
C2.91	**1997-065A**	**USA 134 (DSCS III F10, DSCS 3-10, DSCS III B-13)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				248.12
UI110	J2000	42166.233	0.0016441	8.1736	48.6988	328.0419	248.1170
C2.92	**2009-035A**	**Terrestar 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	23:06:40.819				248.99
35496	TEME	42164.700	0.0003199	3.3476	335.5511	302.1657	249.0259
C2.93	**1996-022A**	**MSAT**					**PL**
TLEs	GEO (1.00)	2015-12-31	04:04:42.727				253.45
23846	TEME	42164.558	0.0005551	6.9100	53.0510	230.6927	252.5494
C2.94	**1995-057A**	**USA 114 (UFO F6)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				254.82
UI119	J2000	42165.936	0.0005472	8.5697	33.5062	209.0945	254.8230
C2.95^{m}	**1995-019A**	**AMSC 1 (M-Sat 2)**					**PL**
TLEs	GEO (1.00)	2015-12-31	03:15:30.965				256.73
23553	TEME	42164.489	0.0004671	9.3574	44.8606	213.1533	256.7325
C2.96	**2013-036A**	**MUOS 2**					**PL**
KIAM	EGO (0.61)	2016-01-01	00:00:00.000				260.08
UI177	J2000	42165.851	0.0058200	4.1978	331.7956	356.4086	260.0800
C2.97	**1995-003A**	**USA 108 (UFO F4)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				260.30
UI121	J2000	42166.480	0.0006481	9.1815	31.7902	264.2530	260.3020
C2.98	**2008-039A**	**Inmarsat-4 F3**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:52:48.412				262.28
33278	TEME	42164.901	0.0003096	3.0203	356.1657	285.5027	261.9919
C2.99	**1991-080B**	**USA 75 (DSP F16, DSP 16, DSP Block 5(DSP-1) F16)**					**PL**
KIAM	GEO (1.00)	2016-01-10	00:00:00.000				263.30
UI133	J2000	42162.909	0.0001692	14.8836	18.8689	282.8411	263.3030
C2.100	**2000-038A**	**Bermudasat 1 (EchoStar 6)**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:09:55.563				263.79
26402	TEME	42164.581	0.0003404	3.1668	70.0149	207.6719	263.7653
C2.101	**2008-016A**	**EchoStar G1 (DBSD G1, ICO G1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:10:02.809				267.14
32763	TEME	42164.776	0.0003405	4.0621	349.0689	293.1866	267.1457
C2.102	**1998-006A**	**Brazilsat B3**					**PL**
TLEs	GEO (1.00)	2015-12-31	04:14:38.843				268.00
25152	TEME	42164.702	0.0003068	3.0123	71.3349	204.9023	268.1165
C2.103	**1995-060A**	**USA 115 (Milstar DFS-2)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				270.04
UI124	J2000	42165.621	0.0003029	11.9732	35.3777	195.9867	270.0430

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
C2.104	**2000-046A**	**Brasilsat B4**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:55:39.328				275.99
26469	TEME	42165.002	0.0002951	0.5656	88.9834	197.8902	276.0328
C2.105	**1997-002A**	**GE 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:14:50.063				279.13
24713	TEME	42164.926	0.0005116	3.3350	68.8467	213.6071	279.1372
C2.106	**2010-039A**	**USA 214 (AEHF 1)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				291.81
UI167	J2000	42163.990	0.0002923	1.0608	249.1226	35.5657	291.8100
C2.107	**1995-016A**	**Brazilsat B2**					**PL**
TLEs	GEO (1.00)	2015-12-31	03:16:31.752				296.79
23536	TEME	42165.408	0.0002497	6.3384	55.2289	249.7939	296.7870
C2.108	**1988-091B**	**TDRS 3**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:04:22.561				297.72
19548	TEME	42166.905	0.0040444	14.7397	13.8526	302.9400	297.5211
C2.109	**1997-059A**	**EchoStar 3**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:56:01.565				298.38
25004	TEME	42164.162	0.0001492	1.0605	82.4170	220.1100	298.2045
C2.110	**2004-031A**	**Amazonas**					**PL**
TLEs	GEO (1.00)	2015-12-30	02:27:48.089				304.61
28393	TEME	42165.171	0.0002175	0.6490	86.1629	203.8850	304.6025
C2.111	**1997-027A**	**Inmarsat-3 F4**					**PL**
TLEs	GEO (1.00)	2015-12-31	03:51:29.346				305.98
24819	TEME	42164.664	0.0004760	4.8229	60.7824	217.6196	306.0334
C2.112	**1994-084A**	**USA 107 (DSP F17, DSP 17, DSP Block 5(DSP-1) F17)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				310.97
UI131	J2000	42164.655	0.0001230	13.7721	28.4722	269.4453	310.9680
C2.113	**1999-033A**	**Astra 1H**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:37:35.236				312.29
25785	TEME	42164.773	0.0002868	2.7895	72.2794	208.1744	312.3066
C2.114	**1994-070A**	**Astra 1D**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:37:35.236				312.69
23331	TEME	42164.377	0.0003730	6.7185	53.4331	226.8493	312.6552
C2.115	**1993-003B**	**TDRS 6**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:57:49.502				314.10
22314	TEME	42164.263	0.0008388	13.4348	30.1016	271.8380	314.2839
C2.116	**2000-043A**	**Intelsat 9 (PAS 9)**					**PL**
TLEs	GEO (1.00)	2015-12-31	10:50:16.977				316.89
26451	TEME	42164.265	0.0003069	2.4880	74.0586	205.3017	316.8668
C2.117	**2003-040A**	**USA 170 (DSCS III F14, DSCS 3-14, DSCS III B-6)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				317.68
UI107	J2000	42164.007	0.0002620	2.8108	72.7650	207.5146	317.6830
C2.118	**2014-004A**	**TDRS 12**					**PL**
TLEs	GEO (1.00)	2015-12-31	18:32:48.235				318.98
39504	TEME	42166.339	0.0005367	6.4969	336.9831	293.6493	319.0025

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
C2.119	**1994-009A**	**USA 99 (Milstar DFS-1)**					**PL**
KIAM	GEO (1.00)	2016-01-10	00:00:00.000				321.08
UI142	J2000	42165.403	0.0001278	11.3407	72.2331	247.3428	321.0790
C2.120	**2001-005B**	**Skynet 4F**					**PL**
TLEs	GEO (1.00)	2015-12-31	04:01:16.819				326.01
26695	TEME	42164.180	0.0003067	8.2352	40.6405	250.3675	326.0097
C2.121	**1993-066A**	**Intelsat VII F-1**					**PL**
TLEs	GEO (1.00)	2015-12-31	00:14:01.963				330.49
22871	TEME	42164.932	0.0004741	3.1781	69.9569	206.3665	330.5230
C2.122	**1998-029A**	**USA 139 (Advanced ORION 2)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				333.59
UI074	J2000	42165.145	0.0042521	9.1688	0.9158	238.2021	333.5900
C2.123	**1996-042A**	**USA 127 (UFO F7)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				337.06
UI116	J2000	42163.101	0.0004360	7.8032	35.4390	250.9892	337.0650
C2.124^{m}	**2002-019A**	**NSS 7**					**PL**
TLEs	GEO (1.00)	2015-12-31	18:40:21.441				340.03
27414	TEME	42164.546	0.0002661	0.7951	86.0748	203.3992	340.0320
C2.125	**1998-052A**	**Intelsat 7 (PAS 7)**					**PL**
TLEs	GEO (1.00)	2015-12-31	23:37:51.885				341.80
25473	TEME	42165.067	0.0003846	2.1005	76.7791	178.6247	341.7974
C2.126	**2012-061A**	**Luch 5B**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:09:27.163				343.92
38977	TEME	42164.698	0.0004197	2.4789	78.9653	193.9612	343.7502
C2.127	**1997-042A**	**ABS 3 (Agila 2/ABS 5, Agila 2, Mabuhay 1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:09:27.163				344.25
24901	TEME	42164.663	0.0006845	3.9001	66.5283	217.3930	344.1744
C2.128	**1989-077A**	**USA 46 (FLTSATCOM F8)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				344.37
UI130	J2000	42165.445	0.0004973	12.6951	20.3849	237.1393	344.3730
C2.129	**1996-053A**	**Inmarsat-3 F2**					**PL**
TLEs	GEO (1.00)	2015-12-31	04:11:29.891				344.50
24307	TEME	42164.661	0.0007274	1.5461	80.4280	198.5491	344.4546
C2.130	**2015-002A**	**MUOS 3**					**PL**
KIAM	EGO (0.73)	2016-01-01	00:00:00.000				344.53
UI189	J2000	42165.518	0.0051893	4.6839	330.2260	182.5396	344.5330
C2.131	**2002-011A**	**TDRS 9**					**PL**
TLEs	GEO (1.00)	2015-12-31	18:28:23.649				348.00
27389	TEME	42164.653	0.0021225	4.1559	86.8415	217.8111	348.3965
C2.132	**2012-033A**	**USA 236 (NROL-38, SDS-3, QUASAR)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000				349.95
UI172	J2000	42164.839	0.0006707	2.1989	246.5560	6.5589	349.9500
C2.133	**2000-046B**	**Nilesat 102**					**PL**
TLEs	GEO (1.00)	2015-12-31	03:40:26.819				353.00
26470	TEME	42164.455	0.0006318	0.5782	85.1611	195.8511	352.9367

C2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\mathrm{IADC}}^{\mathrm{GEO}}$)	Date	Time				$\overline{\lambda}$
S-ID	Frame	a	e	i	Ω	ω	λ
C2.134^{m}	**2002-029A**	**Ekspress A1R (Express 4A)**					**PL**
TLEs	GEO (1.00)	2015-12-31	07:48:08.978				353.40
27441	TEME	42046.254	0.0002972	5.1394	60.1767	98.6285	353.3995
C2.135	**1998-035A**	**Thor III**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:46:41.821				355.70
25358	TEME	42164.696	0.0003031	4.4934	62.5343	214.9485	355.7233
C2.136	**1990-079A**	**Skynet 4C**					**PL**
TLEs	GEO (1.00)	2015-12-31	18:51:56.798				358.72
20776	TEME	42164.999	0.0003198	13.5091	21.6304	258.5646	358.7810

4.3 Satellites in a Controlled Drift Orbit

The following list contains 4 controlled drifting satellites, 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 ($f_{\mathrm{IADC}}^{\mathrm{GEO}}$)	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
C4.1	**2014-043C**	**USA 255 (ANGELS)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-4.92	387.616	338.094	437.138
UI186	J2000	42551.789	0.0011638	0.8135	63.8341	232.6139	245.7500
C4.2	**2014-055A**	**USA 257 (CLIO)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	-0.09	6.811	-62.978	76.600
UI188	J2000	42170.984	0.0016549	0.1043	28.8179	323.9174	91.8010
C4.3	**2014-043A**	**USA 253 (GSSAP 1, AFSPC-4 F1)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	0.23	-18.186	-22.704	-13.668
UI184	J2000	42145.987	0.0001072	0.0216	103.1374	77.3895	36.9800
C4.4	**2014-043B**	**USA 254 (GSSAP 2, AFSPC-4 F2)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	0.91	-70.579	-73.580	-67.578
UI185	J2000	42093.594	0.0000713	0.0548	78.8463	85.1062	22.3610

4.4 Objects in a Drift Orbit

The following list contains 747 drifting objects (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.

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**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (-)	2015-12-31	11:48:33.257	-47.99	4206.312	2071.516	6341.109
36398	TEME	46370.606	0.0469494	5.0979	66.8459	350.2488	299.0786
D.2	**2012-057B**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (-)	2015-12-31	06:36:48.023	-42.80	3700.915	1371.024	6030.805
38868	TEME	45864.824	0.0515100	2.5459	77.8350	331.5246	280.3831
D.3	**2013-077B**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (-)	2015-12-31	09:48:21.033	-38.55	3297.015	1023.943	5570.088
39488	TEME	45461.045	0.0499924	1.1744	62.0151	119.2072	174.6719
D.4	**2011-074C**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (0.11)	2015-12-31	13:21:23.563	-38.33	3276.451	-68.521	6621.423
37952	TEME	45440.580	0.0727116	2.9234	55.1054	111.4908	185.0269
D.5	**1969-045A**	**Intelsat III F-4**					**PL**
TLEs	EGO (-)	2015-12-30	19:00:01.094	-36.83	3135.833	3019.561	3252.105
3947	TEME	45300.027	0.0025459	12.9482	319.3984	342.5596	109.9582
D.6	**1968-116A**	**Intelsat III F-2**					**PL**
TLEs	EGO (-)	2015-12-24	05:01:57.323	-36.29	3085.674	2633.759	3537.590
3623	TEME	45249.887	0.0097511	12.8509	322.5482	358.2839	244.1932
D.7	**2014-010C**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (0.14)	2015-12-31	05:53:29.087	-34.90	2956.954	-108.047	6021.955
39614	TEME	45121.186	0.0683335	1.3591	78.8417	338.1691	250.3478
D.8	**2014-058B**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (0.11)	2015-12-31	04:52:10.792	-30.91	2593.095	26.918	5159.271
40259	TEME	44757.149	0.0575967	1.0099	78.1661	121.6988	264.7065
D.9	**2014-023C**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (0.11)	2015-12-30	22:25:38.733	-27.82	2316.118	-265.621	4897.857
39729	TEME	44480.193	0.0582971	1.8246	44.2777	148.1374	328.5405
D.10	**2006-048A**	**Xinnuo 2**					**PL**
TLEs	EGO (-)	2015-12-31	10:37:55.197	-26.61	2208.520	2031.192	2385.847
29516	TEME	44372.414	0.0041747	5.1940	101.1588	174.3904	201.8867
D.11	**1997-040A**	**PAS 6**					**PL**
TLEs	EGO (0.05)	2015-12-31	07:43:38.626	-23.67	1950.051	-1117.534	5017.637
24891	TEME	44114.326	0.0691372	13.8390	350.1153	164.3248	319.7630
D.12	**1978-113D**	**Titan IIIC stage 3 (Transtage 36)**					**RB**
TLEs	EGO (-)	2015-12-31	13:31:07.343	-23.46	1931.776	730.660	3132.892
11147	TEME	44096.077	0.0269942	17.6575	342.2057	329.5275	205.5641
D.13	**1978-113A**	**OPS 9441 (DSCS II F-11, DSCS 2-11, DSCS II C-11)**					**PL**
TLEs	EGO (-)	2015-12-30	11:06:21.627	-22.47	1845.600	1726.448	1964.752
11144	TEME	44009.693	0.0024677	16.7525	347.5365	115.2601	179.0145

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.14	**2014-085A**	**GVM/Briz-M**					**PL**
TLEs	EGO (-)	2015-12-31	02:03:02.562	-22.37	1836.775	374.144	3299.406
40355	TEME	44000.864	0.0332068	1.0038	97.5152	250.5503	326.3285
D.15	**—**	**—**					**—**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-21.41	1753.856	1611.799	1895.913
UI058	J2000	43918.029	0.0032346	16.8554	339.8628	324.9404	202.4060
D.16	**1985-024A**	**Ekran 14**					**PL**
TLEs	EGO (-)	2015-12-31	01:26:14.197	-19.72	1608.702	1530.965	1686.439
15626	TEME	43772.835	0.0022985	16.9745	353.8722	261.8752	46.8622
D.17	**1984-115A**	**NATO IIID**					**PL**
TLEs	EGO (-)	2015-12-31	15:26:17.449	-19.15	1560.232	1123.049	1997.416
15391	TEME	43724.284	0.0097210	13.9357	21.9305	40.1104	179.8261
D.18	**1973-100D**	**Titan IIIC stage 3 (Transtage 26)**					**RB**
TLEs	EGO (-)	2015-12-30	18:59:31.680	-18.99	1547.134	375.821	2718.446
6976	TEME	43711.450	0.0260903	14.9673	326.4309	24.0101	123.0537
D.19	**1983-016A**	**Ekran 10**					**PL**
TLEs	EGO (-)	2015-12-31	09:39:05.837	-18.88	1537.179	1395.275	1679.084
13878	TEME	43701.391	0.0034384	16.7367	345.3091	286.9596	276.4605
D.20	**1981-122A**	**MARECS A**					**PL**
TLEs	EGO (-)	2015-12-31	05:57:14.815	-18.84	1534.137	1025.671	2042.603
13010	TEME	43698.425	0.0119098	15.6927	358.2963	172.0389	24.6566
D.21	**1982-106A**	**OPS 9445 (DSCS II F-16, DSCS 2-16)**					**PL**
TLEs	EGO (-)	2015-12-30	15:24:14.887	-18.66	1518.701	1499.583	1537.818
13636	TEME	43683.045	0.0004210	16.3695	357.9513	181.6547	240.4880
D.22	**2008-006C**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (-)	2015-12-31	12:28:23.482	-18.55	1509.152	366.210	2652.094
37381	TEME	43673.134	0.0265425	6.9037	42.2479	222.6444	292.3769
D.23	**1988-036A**	**Ekran-M 18**					**PL**
TLEs	EGO (-)	2015-12-31	13:30:30.068	-18.34	1491.651	1448.570	1534.733
19090	TEME	43655.834	0.0009201	16.6773	4.0188	335.4083	67.7983
D.24	**2014-064B**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (0.06)	2015-12-31	13:18:46.264	-18.18	1478.105	-948.203	3904.414
40278	TEME	43642.453	0.0561073	0.0917	327.7316	253.9764	60.6420
D.25	**1977-005A**	**NATO IIIB**					**PL**
TLEs	EGO (-)	2015-12-29	18:45:55.518	-18.02	1463.968	1270.146	1657.791
9785	TEME	43628.348	0.0045077	14.7825	341.4845	311.1052	60.9227
D.26	**1979-098C**	**Titan IIIC stage 3 (Transtage 37)**					**RB**
TLEs	EGO (0.12)	2015-12-30	22:06:14.427	-17.84	1448.872	74.537	2823.208
11623	TEME	43613.224	0.0311390	16.9390	342.7276	334.9997	89.6999
D.27	**1977-034B**	**OPS 9438 (DSCS II F-8, DSCS 2-8, DSCS II C-8)**					**PL**
TLEs	EGO (-)	2015-12-30	21:17:57.414	-17.45	1415.914	1265.413	1566.415
10001	TEME	43580.064	0.0029780	16.1173	337.3209	55.4623	23.0634
D.28	**2008-022B**	**Zenit-3SLB third stage (Blok-DM-SL-B)**					**RB**
TLEs	EGO (0.07)	2015-12-31	13:45:34.270	-17.06	1383.312	-827.659	3594.283
33059	TEME	43547.310	0.0522163	7.2027	58.4250	327.6619	149.9461

D.nn	COSPAR	Name					Type
Source	Orbit (f^{GEO}_{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.29	**1977-034C**	**Titan IIIC stage 3 (Transtage 32)**					**RB**
TLEs	EGO (0.13)	2015-12-31	09:09:52.930	-16.98	1376.181	65.813	2686.550
10002	TEME	43541.141	0.0296613	16.3611	335.0141	0.8213	262.0808
D.30	**1979-098A**	**OPS 9443 (DSCS II F-13, DSCS 2-13, DSCS II D-13)**					**PL**
TLEs	EGO (-)	2015-12-31	12:50:15.912	-16.83	1363.617	1321.347	1405.887
11621	TEME	43527.634	0.0004903	16.2827	346.9181	20.7067	174.1563
D.31	**2007-054B**	**Delta 4 second stage (Delta 329, DCSS-5 F02)**					**RB**
KIAM	EGO (0.04)	2016-01-01	00:00:00.000	-15.86	1281.853	190.389	2373.317
UI147	J2000	43446.026	0.0251223	3.0781	81.3362	40.1831	329.8510
D.32	**1987-109A**	**Ekran-M 17**					**PL**
TLEs	EGO (-)	2015-12-31	04:26:43.795	-15.81	1277.674	1095.157	1460.190
18715	TEME	43442.034	0.0043446	16.3455	6.4876	147.3967	24.8782
D.33	**1976-053A**	**Marisat 2**					**PL**
TLEs	EGO (-)	2015-12-28	04:30:54.595	-15.75	1272.583	734.633	1810.534
8882	TEME	43436.580	0.0128182	15.0500	336.5048	233.6410	350.1222
D.34	**1984-114B**	**MARECS B2**					**PL**
TLEs	EGO (-)	2015-12-25	02:55:38.283	-15.65	1264.039	761.426	1766.652
15386	TEME	43428.183	0.0113947	16.6312	5.2649	314.2037	29.9737
D.35	**1987-028A**	**Raduga 20**					**PL**
TLEs	EGO (-)	2015-12-30	22:20:07.461	-15.52	1253.725	1133.224	1374.226
17611	TEME	43417.977	0.0023805	17.0839	1.8902	81.0633	102.5681
D.36	**1984-090A**	**Ekran 13**					**PL**
TLEs	EGO (-)	2015-12-29	00:33:12.066	-15.30	1235.310	1162.431	1308.189
15219	TEME	43399.466	0.0016151	16.3677	350.5383	120.8851	91.5953
D.37	**1997-029A**	**Fengyun 2A (Fengyun 2-1R)**					**PL**
TLEs	EGO (-)	2015-12-31	11:10:09.599	-15.20	1226.857	805.834	1647.879
24834	TEME	43390.883	0.0101567	13.0868	36.1169	143.6144	178.9587
D.38	**2009-001B**	**Delta 4 second stage (Delta 337, DCSS-5 F03)**					**RB**
KIAM	EGO (0.11)	2016-01-01	00:00:00.000	-15.18	1225.193	131.451	2318.935
UI154	J2000	43389.366	0.0252076	4.5703	30.5166	6.4355	123.5220
D.39	**1984-028A**	**Ekran 12**					**PL**
TLEs	EGO (-)	2015-12-30	22:03:15.691	-15.17	1223.937	1187.505	1260.369
14821	TEME	43388.183	0.0003135	16.2966	347.2617	65.4967	94.8734
D.40	**1991-084B**	**Inmarsat-2 F3**					**PL**
TLEs	EGO (-)	2015-12-31	06:00:15.960	-15.16	1223.318	1171.555	1275.082
21814	TEME	43387.540	0.0008449	10.6755	38.7050	348.3150	20.3188
D.41	**1987-073A**	**Ekran 16**					**PL**
TLEs	EGO (-)	2015-12-30	10:00:55.224	-13.64	1096.913	1076.080	1117.745
18328	TEME	43261.219	0.0004997	16.2042	0.1401	180.4508	111.3739
D.42	**1986-038A**	**Ekran 15**					**PL**
TLEs	EGO (-)	2015-12-30	07:34:33.825	-13.42	1078.351	1034.252	1122.450
16729	TEME	43242.297	0.0012760	16.1991	355.2903	268.0667	330.9227
D.43	**1988-108A**	**Ekran-M 19**					**PL**
TLEs	EGO (-)	2015-12-30	06:07:48.871	-13.04	1046.932	922.263	1171.602
19683	TEME	43210.780	0.0027943	16.1078	8.5790	125.1924	343.3127

D.nn	COSPAR	Name					Type
Source	Orbit (f^{GEO}_{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.44	**1977-034A**	**OPS 9437 (DSCS II F-7, DSCS 2-7, DSCS II C-7)**					**PL**
TLEs	EGO (-)	2015-12-31	02:28:14.169	-12.96	1040.412	967.918	1112.907
10000	TEME	43204.561	0.0020852	15.7814	333.7933	257.5190	20.4805
D.45	**1986-090A**	**Gorizont 13**					**PL**
TLEs	EGO (-)	2015-12-31	03:02:20.904	-12.77	1025.038	957.833	1092.244
17083	TEME	43189.194	0.0018129	16.0553	0.9450	260.4148	38.9362
D.46	**1988-051A**	**Meteosat 3**					**PL**
TLEs	EGO (-)	2015-12-25	10:33:28.033	-11.97	958.993	936.862	981.124
19215	TEME	43123.262	0.0006135	15.9082	14.3225	251.0110	295.8139
D.47	**1985-028C**	**LEASAT 3 (Syncom-4 3)**					**PL**
TLEs	EGO (-)	2015-12-31	04:27:24.422	-11.92	954.492	628.685	1280.299
15643	TEME	43118.524	0.0079669	17.5431	346.4263	201.7567	9.7533
D.48	**1992-060B**	**Satcom C-3**					**PL**
TLEs	EGO (-)	2015-12-31	08:12:40.025	-11.75	940.213	840.941	1039.486
22117	TEME	43104.088	0.0023867	9.3964	46.5568	276.2670	177.1587
D.49	**1989-020B**	**Meteosat 4 (MOP 1)**					**PL**
TLEs	EGO (-)	2015-12-31	11:58:26.779	-11.39	911.021	825.730	996.312
19876	TEME	43075.507	0.0017743	15.6476	18.8336	114.7318	97.2916
D.50	**1996-030B**	**Intelsat 24 (AMOS 1)**					**PL**
TLEs	EGO (-)	2015-12-31	09:10:17.956	-11.36	908.679	860.829	956.529
23865	TEME	43073.078	0.0009854	6.1335	57.8158	126.4714	274.2353
D.51	**1995-040A**	**Intelsat 4 (PAS 4)**					**PL**
TLEs	EGO (-)	2015-12-31	06:01:19.894	-11.33	905.956	803.198	1008.713
23636	TEME	43069.596	0.0029992	4.7906	63.3811	155.7919	352.4277
D.52	**1992-032A**	**NSS K (Intelsat K)**					**PL**
TLEs	EGO (-)	2015-12-31	05:55:50.693	-11.14	890.197	506.655	1273.739
21989	TEME	43053.911	0.0086796	11.4141	42.0028	261.2191	15.7625
D.53	**1971-095C**	**Titan IIIC stage 3 (Transtage 21)**					**RB**
TLEs	EGO (-)	2015-12-29	00:42:12.715	-11.11	887.735	222.673	1552.798
5589	TEME	43052.292	0.0149828	12.0355	319.0627	78.0601	76.5586
D.54	**1984-023A**	**Intelsat V F-8**					**PL**
TLEs	EGO (-)	2015-12-30	20:35:53.205	-10.74	857.459	769.112	945.806
14786	TEME	43021.000	0.0017727	15.8923	10.2309	136.1013	142.6665
D.55	**2000-003A**	**Chinasat 22 (Zhongxing 22, ZX 22, Feng Huo 1-1)**					**PL**
TLEs	EGO (-)	2015-12-30	19:32:40.297	-10.62	848.162	831.635	864.689
26058	TEME	43012.058	0.0007841	6.3286	54.7862	206.1915	4.5017
D.56	**1998-024A**	**Nilesat 101**					**PL**
TLEs	EGO (-)	2015-12-31	14:26:39.406	-10.37	827.255	721.733	932.777
25311	TEME	42991.489	0.0030885	2.4245	74.9785	196.2138	216.2594
D.57	**1989-070A**	**Himawari 4 (GMS 4)**					**PL**
TLEs	EGO (-)	2015-12-31	01:36:24.784	-10.30	821.890	622.539	1021.241
20217	TEME	42986.407	0.0042961	15.4642	19.3864	50.3702	262.6695
D.58	**1984-093C**	**LEASAT 2 (Syncom-4 2)**					**PL**
TLEs	EGO (-)	2015-12-31	17:25:24.791	-10.14	808.883	678.069	939.697
15236	TEME	42972.788	0.0033228	16.5954	349.1094	182.9383	180.5000

D.nn	COSPAR	Name					Type
Source	Orbit (f^{GEO}_{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.59	**1985-107F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	02:08:59.888	-10.00	797.138	719.053	875.224
16339	TEME	42961.688	0.0013579	15.6991	355.7927	22.8367	270.1389
D.60	**1973-100B**	**OPS 9434 (DSCS II F-4, DSCS 2-4, DSCS II B-4)**					**PL**
TLEs	EGO (-)	2015-12-31	12:36:11.383	-9.92	790.451	486.137	1094.766
6974	TEME	42954.604	0.0071812	13.0671	324.3330	334.2437	206.8689
D.61	**1977-007A**	**OPS 3151 (DSP F7, DSP 9, DSP Block 2(PHASE II) F7)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-9.88	787.198	433.425	1140.971
UI057	J2000	42951.371	0.0082366	12.9872	325.4297	295.6514	332.0860
D.62	**1978-073F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	17:33:50.087	-9.74	775.861	710.802	840.921
11941	TEME	42939.463	0.0010962	14.4505	329.6116	74.7764	163.0614
D.63	**1982-113F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-26	04:42:06.243	-9.73	774.875	680.562	869.188
13954	TEME	42938.887	0.0025670	15.3879	345.6770	189.7634	347.1753
D.64	**1976-101A**	**Marisat 3**					**PL**
TLEs	EGO (-)	2015-12-31	14:34:02.409	-9.66	769.310	345.661	1192.960
9478	TEME	42933.761	0.0104703	12.6366	336.9489	259.6646	246.7243
D.65	**1986-082F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-30	20:51:46.597	-9.63	766.948	647.489	886.407
17065	TEME	42931.199	0.0024538	15.7286	358.9923	77.6057	127.3202
D.66	**1969-013B**	**Titan IIIC stage 3 (Transtage 17)**					**RB**
TLEs	EGO (0.17)	2015-12-31	19:04:31.829	-9.59	763.575	136.933	1390.218
3692	TEME	42927.959	0.0153014	7.7687	308.4278	108.0642	148.4753
D.67	**1983-088F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	08:39:01.122	-9.57	762.117	694.158	830.076
14333	TEME	42926.371	0.0011159	15.6226	348.1706	46.4360	123.4365
D.68	**1983-066F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	01:22:44.838	-9.56	761.461	715.648	807.275
15141	TEME	42926.097	0.0008119	15.5562	347.9134	110.1191	55.6304
D.69	**1980-016D**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-29	15:06:45.664	-9.55	760.196	697.511	822.880
11728	TEME	42924.492	0.0017746	14.8935	333.9697	198.6377	91.2682
D.70	**2009-007D**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (0.26)	2015-12-31	09:09:50.952	-9.51	757.505	-67.579	1582.588
33598	TEME	42921.932	0.0195864	5.6806	61.3402	332.6730	261.6267
D.71	**1973-100A**	**OPS 9433 (DSCS II F-3, DSCS 2-3, DSCS II B-3)**					**PL**
TLEs	EGO (-)	2015-12-30	18:58:15.292	-9.43	750.439	621.418	879.460
6973	TEME	42914.438	0.0029235	13.6094	323.0779	134.6428	128.0678
D.72	**1987-040A**	**Gorizont 14**					**PL**
TLEs	EGO (-)	2015-12-30	09:46:33.455	-9.42	749.636	621.277	877.994
17969	TEME	42914.002	0.0028684	15.7408	353.4360	120.0491	249.0106
D.73	**1981-027F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	08:21:37.593	-9.40	748.293	673.529	823.057
14194	TEME	42912.556	0.0016109	15.3604	336.7177	125.3387	268.2513

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.74	**1979-062D**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-30	08:07:12.494	-9.38	746.428	726.890	765.966
14005	TEME	42910.094	0.0006148	14.9069	333.4847	193.1102	142.2135
D.75	**1986-044F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-30	20:36:21.235	-9.37	746.183	702.951	789.416
16797	TEME	42910.449	0.0009209	15.6642	357.9467	126.5686	125.6985
D.76	**1996-005D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	02:51:45.316	-9.36	744.782	686.131	803.434
23778	TEME	42909.503	0.0012716	14.1580	29.5113	103.8601	59.7146
D.77	**1986-027F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	02:08:59.885	-9.31	740.558	588.437	892.679
16676	TEME	42905.083	0.0031649	16.2475	357.1231	47.5404	269.9827
D.78	**1981-069F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	11:02:11.319	-9.27	737.602	645.628	829.577
12850	TEME	42901.955	0.0018384	15.2628	338.2082	94.8000	287.4510
D.79	**1982-113A**	**Raduga 11**					**PL**
TLEs	EGO (-)	2015-12-31	12:36:35.092	-9.24	734.972	561.600	908.344
13669	TEME	42899.122	0.0043674	15.2722	345.9114	191.8611	217.7969
D.80	**1977-071F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	15:58:50.156	-9.13	726.195	678.294	774.096
11570	TEME	42890.390	0.0006823	13.9051	326.5659	32.0113	201.4394
D.81	**2001-045A**	**Raduga 1-6**					**PL**
TLEs	EGO (-)	2015-12-28	06:36:17.699	-9.11	724.244	650.831	797.658
26936	TEME	42888.245	0.0017649	10.7004	44.0448	119.5528	16.0354
D.82	**1988-028D**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	04:12:07.432	-8.96	712.613	623.280	801.947
19020	TEME	42876.286	0.0016307	16.0519	4.2206	30.7176	3.1262
D.83	**1986-007F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	02:08:59.902	-8.91	708.462	572.752	844.172
16870	TEME	42873.160	0.0029201	15.6812	355.8773	82.2866	270.0125
D.84	**1985-076D**	**LEASAT 4 (Syncom-4 3)**					**PL**
TLEs	EGO (-)	2015-12-30	14:05:06.000	-8.91	708.321	680.506	736.137
15995	TEME	42872.936	0.0009440	13.9570	358.0483	250.5822	70.0707
D.85	**1977-108D**	**Meteosat 1 AKM (MAGE 1)**					**PM**
TLEs	EGO (-)	2015-12-28	20:29:02.614	-8.89	706.854	331.619	1082.089
13907	TEME	42871.504	0.0082061	14.5683	327.0341	37.7401	124.8223
D.86	**1985-070F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	22:17:53.492	-8.89	706.608	656.368	756.847
15963	TEME	42871.001	0.0008863	15.6198	354.4877	100.9198	114.1545
D.87	**1982-106B**	**DSCS III F1 (DSCS 3-1, DSCS III A-1)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-8.82	701.089	632.998	769.181
UI135	J2000	42865.262	0.0015885	15.4088	5.7229	103.3577	234.9930
D.88	**1988-028A**	**Gorizont 15**					**PL**
TLEs	EGO (-)	2015-12-30	07:17:46.061	-8.81	700.006	544.525	855.486
19017	TEME	42863.672	0.0033606	16.0061	4.4456	99.5040	337.6041

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.89	**1992-043D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	13:59:45.275	-8.79	698.533	588.892	808.174
22044	TEME	42863.305	0.0023768	15.3244	19.2939	102.9474	71.3794
D.90	**1989-101G**	**Cosmos-2054 debris**					**PD**
TLEs	EGO (-)	2015-12-27	12:12:33.293	-8.72	693.359	576.724	809.995
21648	TEME	42857.912	0.0033634	15.6360	10.4997	226.8738	91.7669
D.91	**1989-098D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	12:32:20.205	-8.71	692.407	611.660	773.154
20370	TEME	42857.053	0.0016986	15.8910	10.5461	100.6556	104.7786
D.92	**1990-102D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	05:59:52.369	-8.66	688.184	605.723	770.646
21046	TEME	42852.535	0.0018451	15.5770	13.5574	119.6562	302.2996
D.93	**1989-048D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	06:56:36.091	-8.58	681.262	586.221	776.303
20086	TEME	42845.818	0.0017940	15.6553	8.6550	50.8392	226.6256
D.94	**1989-030D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-30	17:41:42.394	-8.46	672.039	595.485	748.594
19931	TEME	42836.956	0.0016986	15.5835	7.8689	115.1997	70.3313
D.95	**1980-049F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	19:16:23.317	-8.41	667.978	541.971	793.985
11862	TEME	42832.398	0.0028247	15.0324	335.8337	119.7229	60.6964
D.96	**1988-095F**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	10:24:33.148	-8.40	667.287	608.770	725.804
19777	TEME	42831.244	0.0017106	15.6411	6.3159	171.7987	188.6786
D.97	**1995-067A**	**Telecom 2C**					**PL**
TLEs	EGO (-)	2015-12-31	12:16:07.833	-8.40	666.897	603.539	730.255
23730	TEME	42831.090	0.0020414	10.0931	44.1219	206.5078	120.4744
D.98	**1990-116D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	09:28:33.418	-8.39	666.041	523.454	808.627
21041	TEME	42830.880	0.0029235	15.5583	13.9400	356.2895	237.2852
D.99	**1992-021B**	**Inmarsat-2 F4**					**PL**
TLEs	EGO (-)	2015-12-31	16:23:07.852	-8.39	665.994	639.558	692.430
21940	TEME	42830.756	0.0001625	8.7959	35.5546	142.6104	76.5405
D.100	**1996-034D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-28	22:16:12.025	-8.38	665.083	532.763	797.403
23883	TEME	42829.276	0.0027053	14.0088	30.2834	1.0460	314.5881
D.101	**1988-018B**	**Telecom 1C**					**PL**
TLEs	EGO (-)	2015-12-31	15:52:40.266	-8.34	662.314	233.200	1091.428
18952	TEME	42826.456	0.0096289	15.2515	22.5777	55.5973	205.2810
D.102	**2001-014C**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (0.28)	2015-12-30	16:04:16.590	-8.31	659.582	-59.925	1379.090
26738	TEME	42824.372	0.0171679	11.2669	46.0172	137.2922	65.8062
D.103	**1994-008D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-30	19:38:14.907	-8.30	659.194	569.028	749.360
22984	TEME	42823.312	0.0018391	14.9626	24.1742	319.8525	344.3069

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.104	**1989-004F**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-30	21:52:02.898	-8.20	651.225	551.841	750.609
19776	TEME	42815.612	0.0019012	15.5882	7.1326	32.2815	125.1166
D.105	**1993-013D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	20:53:00.572	-8.14	645.762	573.923	717.602
22624	TEME	42809.340	0.0012608	15.2093	21.3723	29.3217	141.8983
D.106	**1991-087D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	06:53:24.544	-8.12	644.120	569.109	719.132
21824	TEME	42808.466	0.0014592	15.4550	17.2089	325.8244	206.6692
D.107	**1992-082D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-30	05:03:15.980	-8.10	642.581	600.550	684.611
22248	TEME	42807.228	0.0005287	15.2608	20.1398	0.1059	257.3232
D.108	**1999-010D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	12:32:47.867	-8.02	636.432	547.529	725.336
25645	TEME	42800.798	0.0022507	13.8553	39.0043	234.3255	116.6511
D.109	**2004-042A**	**Fengyun 2C**					**PL**
TLEs	EGO (-)	2015-12-29	23:13:52.824	-7.89	625.538	611.408	639.668
28451	TEME	42789.263	0.0004776	6.4688	54.4750	239.1379	340.9766
D.110	**1996-053D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	08:12:53.565	-7.85	622.577	400.202	844.952
25339	TEME	42786.184	0.0056347	13.0261	34.8446	216.2542	180.0188
D.111	**1997-031A**	**Intelsat 802**					**PL**
TLEs	EGO (-)	2015-12-31	12:34:51.031	-7.79	617.948	509.780	726.115
24846	TEME	42781.685	0.0030638	4.0179	65.4665	199.5074	170.7901
D.112	**1994-012D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	15:37:14.792	-7.79	617.914	472.227	763.602
23013	TEME	42781.786	0.0030330	14.8968	24.0140	25.0253	183.1647
D.113	**1988-012A**	**Sakura 3A (CS 3A)**					**PL**
TLEs	EGO (-)	2015-12-31	08:26:00.184	-7.69	610.017	575.213	644.822
18877	TEME	42773.775	0.0011520	14.9618	25.0411	229.2431	166.6775
D.114	**1971-039A**	**OPS 3811 (DSP F2, DSP 3, DSP Block 1(PHASE I) F2)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-7.62	604.385	508.382	700.388
UI042	J2000	42768.558	0.0022447	8.5499	312.4217	276.1391	299.6110
D.115	**1988-063B**	**Eutelsat I F-5 (ECS 5)**					**PL**
TLEs	EGO (-)	2015-12-28	06:52:19.726	-7.59	601.678	550.018	653.338
19331	TEME	42765.323	0.0006823	15.3206	19.1143	67.6676	343.9143
D.116	**1983-088A**	**Raduga 13**					**PL**
TLEs	EGO (-)	2015-12-31	14:17:50.322	-7.56	599.206	526.495	671.916
14307	TEME	42763.209	0.0015050	15.3686	347.6730	322.1073	203.0130
D.117	**1998-058A**	**USA 140 (UFO F9)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-7.56	598.921	539.241	658.601
UI113	J2000	42763.094	0.0013956	7.4147	36.7165	291.6758	303.5820
D.118	**2000-052A**	**Eutelsat 4A (Eurobird 4A, Eutelsat W1)**					**PL**
TLEs	EGO (-)	2015-12-31	15:57:27.144	-7.54	597.330	558.069	636.592
26487	TEME	42761.003	0.0015499	3.5586	71.8294	193.7693	151.0547

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.119	**1969-069C**	**ATS 5 AKM (JPL SR-28-3)**					**PM**
TLEs	EGO (0.25)	2015-12-31	11:00:32.304	-7.54	597.202	32.264	1162.140
21052	TEME	42761.606	0.0130800	9.4637	313.1563	197.7226	248.7981
D.120	**1982-019A**	**OPS 8701 (DSP F10, DSP 13, DSP Block 3(MOS/PIM) F10)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-7.53	596.383	571.531	621.236
UI046	J2000	42760.556	0.0005812	15.4571	345.5699	217.0871	246.9200
D.121	**2000-049D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	17:17:39.541	-7.50	594.341	524.567	664.115
26480	TEME	42758.294	0.0014617	11.4261	40.1513	272.7820	216.0117
D.122	**1989-101D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	02:45:35.337	-7.29	577.274	534.489	620.058
20394	TEME	42742.065	0.0011326	15.5117	10.2591	147.7629	47.1563
D.123	**2000-013A**	**Ekspress 2A (Ekspress 6A)**					**PL**
TLEs	EGO (-)	2015-12-31	22:18:07.343	-7.26	575.059	546.920	603.197
26098	TEME	42739.145	0.0006870	8.1734	48.5921	273.9999	126.0809
D.124	**1976-023J**	**LES 8, LES 9 operational debris**					**PM**
TLEs	EGO (0.30)	2015-12-30	18:33:00.271	-7.25	573.917	-67.820	1215.653
8832	TEME	42738.074	0.0149616	13.6767	97.7720	342.1508	124.0278
D.125	**1976-023F**	**Titan IIIC stage 3 (Transtage 30)**					**RB**
TLEs	EGO (0.29)	2015-12-31	12:35:52.281	-7.24	573.309	-55.052	1201.670
8751	TEME	42737.320	0.0147497	13.6793	97.7409	343.1302	198.9422
D.126	**1983-118A**	**Gorizont 8**					**PL**
TLEs	EGO (-)	2015-12-31	01:24:55.212	-7.22	571.487	457.044	685.931
14532	TEME	42735.909	0.0024500	15.2280	348.9141	92.7381	52.7701
D.127	**1998-013A**	**Eutelsat 16B (Eurobird 16, Nilesat 103, Hot Bird 4)**					**PL**
TLEs	EGO (-)	2015-12-31	19:05:42.813	-7.19	569.280	548.300	590.259
25237	TEME	42734.048	0.0003792	3.3325	69.4804	184.5701	73.5398
D.128	**1991-001A**	**NATO IVA**					**PL**
TLEs	EGO (-)	2015-12-29	23:16:53.957	-7.16	567.244	540.893	593.594
21047	TEME	42731.764	0.0006081	12.7393	22.1691	173.3565	102.7645
D.129	**1985-025A**	**Intelsat VA F-10**					**PL**
TLEs	EGO (-)	2015-12-31	01:05:30.545	-7.15	566.502	430.468	702.535
15629	TEME	42731.300	0.0034408	15.4902	13.4622	272.8375	280.6352
D.130	**2007-021A**	**Eutelsat 8 West D (Eutelsat 3A, Chinasat 5C, Zhongxing 5C)**					**PL**
TLEs	EGO (-)	2015-12-31	01:27:38.146	-6.98	552.167	536.748	567.586
31577	TEME	42716.631	0.0001016	2.2430	47.3760	121.4537	286.0809
D.131	**1988-109B**	**Astra 1A**					**PL**
TLEs	EGO (-)	2015-12-31	02:08:14.847	-6.97	551.855	483.118	620.592
19688	TEME	42716.285	0.0010145	12.2463	36.8201	22.5689	276.6269
D.132	**1983-066A**	**Gorizont 7**					**PL**
TLEs	EGO (-)	2015-12-31	06:38:21.430	-6.94	548.872	501.537	596.207
14160	TEME	42712.795	0.0014596	15.1925	347.3638	243.7476	203.3706
D.133	**1979-098B**	**OPS 9444 (DSCS II F-14, DSCS 2-14, DSCS II D-14)**					**PL**
TLEs	EGO (-)	2015-12-31	21:01:57.658	-6.92	547.830	526.531	569.128
11622	TEME	42712.179	0.0003009	15.0538	342.2560	296.9010	109.6612

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.134	**1987-097A**	**USA 28 (DSP F13, DSP 5R, DSP Block 4(PHASE II UG) F13)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-6.79	536.843	423.160	650.526
UI030	J2000	42701.016	0.0026623	14.4519	8.4252	184.0631	169.0810
D.135	**1990-095A**	**USA 65 (DSP F15, DSP 15, DSP Block 5(DSP-1) F15)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-6.75	534.064	518.624	549.504
UI083	J2000	42698.237	0.0003616	15.1842	16.8453	310.0857	178.5770
D.136	**1984-081B**	**Telecom 1A**					**PL**
TLEs	EGO (-)	2015-12-31	02:02:04.267	-6.74	533.135	380.957	685.313
15159	TEME	42698.240	0.0035997	15.5878	7.0334	300.8134	274.2493
D.137	**1982-097A**	**Intelsat V F-5**					**PL**
TLEs	EGO (-)	2015-12-31	09:56:01.004	-6.71	531.070	430.133	632.006
13595	TEME	42695.292	0.0023538	15.4278	4.0443	298.4185	191.0775
D.138	**1999-018A**	**Eutelsat 21A (Eutelsat W6, Eutelsat W3)**					**PL**
TLEs	EGO (-)	2015-12-31	18:46:48.310	-6.64	525.047	511.795	538.299
25673	TEME	42688.985	0.0004797	2.4036	74.8250	205.1296	130.4437
D.139	**1990-056A**	**Intelsat VI F-4**					**PL**
TLEs	EGO (-)	2015-12-31	04:07:17.573	-6.62	523.680	497.337	550.023
20667	TEME	42687.711	0.0009422	11.4540	40.3022	219.1637	19.1588
D.140	**1978-113B**	**OPS 9442 (DSCS II F-12, DSCS 2-12, DSCS II C-12)**					**PL**
TLEs	EGO (-)	2015-12-30	14:29:42.012	-6.60	521.577	492.921	550.233
11145	TEME	42685.237	0.0002819	15.0270	340.6452	114.0943	159.0126
D.141	**1991-074A**	**Gorizont 24**					**PL**
TLEs	EGO (-)	2015-12-30	04:16:08.490	-6.59	521.207	442.792	599.622
21759	TEME	42685.677	0.0022288	15.2324	16.4552	170.6118	231.0346
D.142	**1996-044B**	**Telecom 2D**					**PL**
TLEs	EGO (-)	2015-12-29	17:33:41.236	-6.57	519.746	459.326	580.167
24209	TEME	42684.095	0.0016750	7.9380	50.1366	265.0445	38.9363
D.143	**1991-015B**	**Meteosat 5 (MOP 2)**					**PL**
TLEs	EGO (-)	2015-12-30	17:36:13.711	-6.56	518.712	491.780	545.644
21140	TEME	42683.308	0.0011433	14.7420	22.8033	191.2406	100.7339
D.144	**1998-057A**	**Eutelsat 4B (Eutelsat 25A, Badr 2, Arabsat 2D, Hot Bird 5)**					**PL**
TLEs	EGO (-)	2015-12-31	09:16:59.611	-6.54	517.296	486.408	548.184
25495	TEME	42681.262	0.0006123	2.3793	74.4910	282.4692	314.0973
D.145	**1986-082A**	**Raduga 19**					**PL**
TLEs	EGO (-)	2015-12-31	11:02:34.081	-6.53	516.244	467.588	564.899
17046	TEME	42679.927	0.0008986	15.3557	358.3718	111.2335	184.9115
D.146	**1996-015A**	**Intelsat VIIA F-2**					**PL**
TLEs	EGO (-)	2015-12-31	12:34:26.661	-6.45	510.010	231.775	788.246
23816	TEME	42673.589	0.0066098	2.4824	74.1344	260.5792	160.0730
D.147	**1989-021B**	**TDRS 4**					**PL**
TLEs	EGO (-)	2015-12-31	13:59:28.810	-6.45	509.562	449.203	569.922
19883	TEME	42674.343	0.0022066	12.5228	21.9545	232.1387	62.7059
D.148	**1978-106A**	**NATO IIIC**					**PL**
TLEs	EGO (-)	2015-12-30	07:38:19.841	-6.44	509.077	488.771	529.383
11115	TEME	42673.817	0.0008261	14.7460	348.5543	239.1096	285.1175

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.149	**1991-015A**	**Astra 1B**					**PL**
TLEs	EGO (-)	2015-12-31	21:12:33.471	-6.35	501.736	477.833	525.640
21139	TEME	42665.612	0.0010112	8.5200	48.9180	232.8251	11.3104
D.150	**1993-074A**	**USA 97 (DSCS III F8, DSCS 3-8, DSCS III B-10)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-6.29	496.744	466.463	527.025
UI066	J2000	42660.917	0.0007098	9.9995	43.4004	255.3900	54.0930
D.151	**1982-020A**	**Gorizont 5**					**PL**
TLEs	EGO (-)	2015-12-30	22:16:15.172	-6.27	495.698	352.887	638.510
13092	TEME	42660.337	0.0034641	15.2416	339.9615	153.1040	79.4012
D.152	**1990-001B**	**JCSAT 2**					**PL**
TLEs	EGO (-)	2015-12-23	20:21:50.182	-6.25	493.812	233.540	754.084
20402	TEME	42657.445	0.0064637	12.3161	45.4435	221.9660	356.5602
D.153	**1979-038A**	**OPS 6392 (FLTSATCOM F2)**					**PL**
TLEs	EGO (-)	2015-12-31	21:03:41.857	-6.23	492.262	421.679	562.844
11353	TEME	42656.652	0.0016424	14.5949	339.3996	327.5642	101.9329
D.154	**1984-113C**	**LEASAT 1 (Syncom-4 1)**					**PL**
TLEs	EGO (-)	2015-12-31	15:11:34.046	-6.23	491.945	370.549	613.341
15384	TEME	42656.286	0.0033120	13.9383	6.6348	204.1923	39.3480
D.155	**1988-040A**	**Intelsat VA F-13 (NSS 513)**					**PL**
TLEs	EGO (-)	2015-12-31	14:00:20.841	-6.11	482.776	424.364	541.187
19121	TEME	42647.700	0.0008652	14.9321	22.0441	355.3843	89.3173
D.156	**1994-079A**	**Telstar 11 (Orion 1)**					**PL**
TLEs	EGO (-)	2015-12-31	15:43:54.954	-6.09	481.127	403.137	559.116
23413	TEME	42645.806	0.0019649	9.7375	44.8416	270.8894	234.8234
D.157	**1990-097B**	**USA 67 (SDS 2 F2)(QUASAR 2)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-6.09	480.760	404.814	556.706
UI092	J2000	42644.933	0.0017809	16.5880	10.1097	185.7141	313.3920
D.158	**1975-011F**	**SMS 2 AKM (SVM-5)**					**PM**
TLEs	EGO (0.25)	2015-12-30	16:48:57.247	-6.07	479.664	58.030	901.298
20835	TEME	42643.629	0.0094086	12.3192	320.9345	23.7611	24.0424
D.159	**2006-024A**	**USA 187 (MITEx OSC satellite)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-6.01	474.307	408.857	539.757
UI149	J2000	42638.480	0.0015350	0.4757	312.3260	295.2549	269.9920
D.160	**1981-073A**	**FLTSATCOM F5**					**PL**
TLEs	EGO (-)	2015-12-30	07:10:55.034	-6.00	474.070	430.257	517.884
12635	TEME	42637.859	0.0005605	19.6568	351.7869	68.9767	167.0108
D.161	**1989-069A**	**USA 43 (DSCS II F-15, DSCS 2-15, DSCS II E-15)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-5.99	473.268	392.815	553.721
UI087	J2000	42637.441	0.0018869	15.3562	9.4015	173.2296	23.0920
D.162	**1974-033A**	**SMS 1**					**PL**
TLEs	EGO (-)	2015-12-29	07:19:32.246	-5.98	472.279	401.768	542.790
7298	TEME	42635.931	0.0018730	12.9726	313.1243	312.6105	333.0590
D.163	**1990-063A**	**TDF 2**					**PL**
TLEs	EGO (-)	2015-12-31	12:32:52.478	-5.98	472.103	269.053	675.153
20705	TEME	42636.234	0.0052560	13.8122	31.2739	221.8454	119.0594

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.164	**1991-079D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	12:04:59.833	-5.95	470.095	446.488	493.702
21792	TEME	42634.709	0.0001309	15.3117	16.2113	38.4628	282.4078
D.165	**1976-029A**	**RCA Satcom II**					**PL**
TLEs	EGO (-)	2015-12-31	14:26:52.406	-5.94	468.922	222.837	715.007
8774	TEME	42633.144	0.0056933	15.1203	344.9662	141.6661	207.9739
D.166	**1984-041D**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	04:48:51.907	-5.93	468.406	403.177	533.634
14943	TEME	42632.718	0.0014800	15.1412	349.4783	132.1769	283.4462
D.167	**1980-049A**	**Gorizont 4**					**PL**
TLEs	EGO (-)	2015-12-31	14:09:06.960	-5.92	467.565	449.491	485.639
11841	TEME	42632.108	0.0006100	14.5808	335.1902	246.2125	246.3824
D.168	**1994-047A**	**DirecTV-2**					**PL**
TLEs	EGO (-)	2015-12-30	16:08:57.342	-5.90	465.719	423.660	507.778
23192	TEME	42629.715	0.0012722	7.5142	52.0793	230.0364	21.4874
D.169	**1982-020F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-30	20:15:21.772	-5.90	465.423	349.132	581.715
13899	TEME	42629.798	0.0025266	15.2730	339.4415	110.3557	111.1299
D.170	**2015-048B**	**Proton-M/DM-3 fourth stage (Block DM-3)**					**RB**
TLEs	EGO (0.28)	2015-12-31	05:00:11.851	-5.83	460.106	37.997	882.215
40896	TEME	42623.767	0.0098118	0.2411	83.6761	51.9187	185.6393
D.171	**1988-066D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	07:17:59.524	-5.81	458.629	317.925	599.334
19347	TEME	42623.259	0.0028889	15.3650	4.7435	45.6328	266.9263
D.172	**1984-037A**	**OPS 7641 (DSP F11, DSP 12, DSP Block 3(MOS/PIM) F11)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-5.74	452.801	410.453	495.150
UI037	J2000	42616.974	0.0009937	15.5531	351.3475	187.3191	314.5130
D.173	**1979-105E**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-30	06:09:30.546	-5.73	451.851	382.852	520.850
11684	TEME	42615.318	0.0019500	14.4566	333.2598	201.5769	146.4849
D.174	**1992-010B**	**INSAT 2DT (Arabsat 1C)**					**PL**
TLEs	EGO (-)	2015-12-31	12:33:35.947	-5.72	451.366	345.110	557.621
21894	TEME	42615.180	0.0032440	10.9555	41.5280	188.5858	138.4104
D.175	**1987-078B**	**Eutelsat I F-4 (ECS 4)**					**PL**
TLEs	EGO (-)	2015-12-30	20:35:53.205	-5.71	450.258	415.369	485.147
18351	TEME	42613.951	0.0009871	15.2606	15.2844	278.2467	142.5313
D.176	**1989-048A**	**Raduga 1-1**					**PL**
TLEs	EGO (-)	2015-12-31	13:59:32.761	-5.64	444.725	361.933	527.516
20083	TEME	42609.481	0.0016149	15.3519	8.1296	57.2789	65.3616
D.177	**1991-018A**	**Inmarsat-2 F2**					**PL**
TLEs	EGO (-)	2015-12-31	04:17:15.568	-5.58	440.253	427.014	453.493
21149	TEME	42604.977	0.0005429	10.2090	33.7488	215.8343	264.0170
D.178	**1981-057A**	**Meteosat 2**					**PL**
TLEs	EGO (-)	2015-12-29	10:19:52.569	-5.58	440.058	311.707	568.409
12544	TEME	42604.100	0.0033257	15.2619	353.3433	276.5348	309.4524

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.179	**1997-009A**	**Intelsat 801**					**PL**
TLEs	EGO (-)	2015-12-31	08:30:29.119	-5.54	436.924	400.671	473.178
24742	TEME	42601.554	0.0011385	6.0019	57.3511	250.5158	252.8971
D.180	**1979-053A**	**OPS 7484 (DSP F8, DSP 11, DSP Block 3(MOS/PIM) F8)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-5.52	435.615	391.592	479.638
UI053	J2000	42599.788	0.0010334	14.4766	336.1648	202.1239	255.2380
D.181	**1995-027A**	**USA 111 (UFO F5)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-5.51	434.381	408.992	459.770
UI122	J2000	42598.554	0.0005960	9.5751	31.6575	230.9102	51.4330
D.182	**1983-026B**	**TDRS 1**					**PL**
TLEs	EGO (-)	2015-12-29	08:32:22.517	-5.51	434.285	339.548	529.022
13969	TEME	42598.256	0.0022192	13.8617	350.1271	175.8749	317.8734
D.183	**1999-050A**	**Ciel 1 (EchoStar 5)**					**PL**
TLEs	EGO (-)	2015-12-30	02:28:42.755	-5.50	433.688	414.329	453.047
25913	TEME	42597.523	0.0008744	5.3771	59.8813	193.8795	329.1419
D.184	**1998-049A**	**ST-1**					**PL**
TLEs	EGO (-)	2015-12-31	09:10:10.053	-5.50	433.421	411.926	454.916
25460	TEME	42598.101	0.0008019	3.4562	68.7534	190.7116	270.5822
D.185	**1997-016A**	**Thaicom 3**					**PL**
TLEs	EGO (0.27)	2015-12-31	12:36:31.140	-5.48	432.449	74.213	790.686
24768	TEME	42596.174	0.0082963	7.7843	51.2212	313.5544	216.3628
D.186	**1984-093B**	**SBS IV**					**PL**
TLEs	EGO (-)	2015-12-28	15:48:40.137	-5.44	428.954	388.083	469.825
15235	TEME	42593.565	0.0004918	15.0824	14.5803	354.3327	49.1609
D.187	**1989-070C**	**Himawari 4 (GMS 4) AKM (Star 27)**					**PM**
TLEs	EGO (0.14)	2015-12-31	11:36:11.858	-5.43	428.463	-621.728	1478.653
20317	TEME	42592.362	0.0241701	14.9669	9.2555	320.3728	181.3160
D.188	**2000-031A**	**Ekspress 3A**					**PL**
TLEs	EGO (-)	2015-12-31	19:04:52.757	-5.43	428.065	410.222	445.909
26378	TEME	42592.103	0.0007215	6.1908	56.4825	155.3904	52.5572
D.189	**1987-022F**	**GOES 7 AKM (Star 27)**					**PM**
TLEs	EGO (0.03)	2015-12-29	21:40:33.538	-5.41	426.866	-4148.022	5001.754
28520	TEME	42591.573	0.1059981	15.2805	353.9393	343.9382	102.3778
D.190	**1991-060A**	**Yuri 3B (BS 3B)**					**PL**
TLEs	EGO (-)	2015-12-31	13:10:12.728	-5.34	421.214	396.600	445.828
21668	TEME	42585.876	0.0003412	12.6075	25.6406	138.6189	252.2182
D.191	**1995-055A**	**Astra 1E**					**PL**
TLEs	EGO (-)	2015-12-30	19:32:53.296	-5.33	420.460	398.923	441.997
23686	TEME	42584.178	0.0008315	4.4515	63.6328	257.5796	3.2693
D.192	**1984-081A**	**Eutelsat I F-2 (ECS 2)**					**PL**
TLEs	EGO (-)	2015-12-31	05:13:09.731	-5.32	419.128	382.216	456.040
15158	TEME	42583.915	0.0008437	15.4610	6.2343	146.5440	239.9014
D.193	**1995-025A**	**GOES 9**					**PL**
TLEs	EGO (-)	2015-12-31	08:14:27.712	-5.31	418.240	395.383	441.096
23581	TEME	42581.707	0.0002681	10.1779	43.3446	140.7338	176.9907

D.nn	COSPAR	Name					Type
Source	Orbit (f^{GEO}_{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.194	**1992-037A**	**USA 82 (DSCS III F6, DSCS 3-6, DSCS III B-12)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-5.29	416.897	377.369	456.425
UI123	J2000	42581.070	0.0009283	11.2437	39.4489	274.8173	253.5620
D.195	**1990-077A**	**Yuri 3A (BS 3A)**					**PL**
TLEs	EGO (-)	2015-12-28	13:07:17.193	-5.27	415.351	374.017	456.684
20771	TEME	42579.889	0.0015200	14.2826	31.6610	185.6667	276.7925
D.196	**1983-081A**	**Sakura 2B (CS 2B)**					**PL**
TLEs	EGO (-)	2015-12-31	03:07:14.262	-5.26	414.823	394.179	435.466
14248	TEME	42578.632	0.0005038	15.3619	358.0639	267.6676	15.3372
D.197	**1986-007A**	**Raduga 18**					**PL**
TLEs	EGO (0.19)	2015-12-31	02:58:48.390	-5.26	414.678	102.062	727.294
16497	TEME	42578.845	0.0071867	15.2582	354.9645	103.3821	29.7340
D.198	**1989-046A**	**USA 39 (DSP F14, DSP 14, DSP Block 5(DSP-1) F14)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-5.25	413.818	398.741	428.895
UI150	J2000	42577.991	0.0003541	14.6109	13.1491	205.3392	219.5060
D.199	**1981-025A**	**OPS 7350 (DSP F9, DSP 10, DSP Block 3(MOS/PIM) F9)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-5.22	411.405	326.650	496.160
UI045	J2000	42575.578	0.0019907	14.6876	341.6894	189.0768	281.4340
D.200	**1972-090A**	**Anik A1**					**PL**
TLEs	EGO (-)	2015-12-31	22:43:47.709	-5.20	410.211	351.068	469.353
6278	TEME	42575.159	0.0010350	13.8185	332.3889	106.3030	72.7743
D.201	**2004-001A**	**Estrela do Sul 1 (Telstar 14)**					**PL**
TLEs	EGO (-)	2015-12-31	04:12:03.481	-5.19	409.178	391.603	426.753
28137	TEME	42572.796	0.0007328	3.5714	67.5059	205.7410	1.6636
D.202	**2001-020A**	**USA 158 (GeoLITE)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-5.17	407.597	338.644	476.551
UI114	J2000	42571.770	0.0016197	5.5892	49.5714	30.4453	299.5350
D.203	**1971-006A**	**Intelsat IV F-2**					**PL**
TLEs	EGO (-)	2015-12-31	02:04:37.175	-5.17	407.588	348.299	466.878
4881	TEME	42571.174	0.0013334	12.7627	322.9368	331.4814	1.9145
D.204	**1993-031A**	**Astra 1C**					**PL**
TLEs	EGO (-)	2015-12-31	12:34:29.953	-5.16	406.653	389.758	423.547
22653	TEME	42570.055	0.0005272	7.6002	51.0563	223.1027	161.7425
D.205	**1984-129A**	**USA 7 (DSP F12, DSP 6R, DSP Block 4(PHASE II UG) F12)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-5.12	403.633	385.708	421.558
UI034	J2000	42567.806	0.0004211	16.1013	356.9188	204.2615	42.8180
D.206	**1981-050A**	**Intelsat V F-1**					**PL**
TLEs	EGO (-)	2015-12-30	08:02:02.728	-5.11	402.274	379.118	425.429
12474	TEME	42566.199	0.0008090	15.2372	357.9675	210.2115	161.7549
D.207	**2006-024B**	**USA 188 (MITEx Lockheed satellite)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-5.08	400.564	369.671	431.458
UI148	J2000	42564.737	0.0007258	5.0625	61.5118	84.3917	120.2730
D.208	**1994-065A**	**Solidaridad 2**					**PL**
TLEs	EGO (-)	2015-12-31	02:28:43.810	-5.07	399.672	383.606	415.739
23313	TEME	42563.960	0.0006753	6.3649	55.6233	214.4217	35.4099

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.209	**1983-058A**	**Eutelsat I F-1 (ECS 1)**					**PL**
TLEs	EGO (-)	2015-12-31	08:38:59.394	-5.05	398.172	352.427	443.917
14128	TEME	42562.115	0.0007917	15.3261	2.8918	121.0676	198.7137
D.210	**1990-093A**	**Inmarsat-2 F1**					**PL**
TLEs	EGO (-)	2015-12-31	13:37:07.326	-5.03	396.299	378.115	414.484
20918	TEME	42560.146	0.0009319	10.8303	32.3452	248.5793	195.0170
D.211	**1980-098A**	**Intelsat V F-2**					**PL**
TLEs	EGO (-)	2015-12-31	13:59:47.909	-4.99	393.220	344.052	442.389
12089	TEME	42557.604	0.0015075	15.2221	0.0419	230.3545	73.5472
D.212	**1994-022A**	**GOES 8**					**PL**
TLEs	EGO (-)	2015-12-31	14:58:58.648	-4.93	388.052	364.035	412.069
23051	TEME	42552.802	0.0009531	10.6676	44.1927	217.1047	98.4705
D.213	**1987-078A**	**Optus A3**					**PL**
TLEs	EGO (-)	2015-12-31	08:43:25.375	-4.92	387.748	360.926	414.570
18350	TEME	42551.142	0.0007581	14.2849	23.7379	255.0286	156.9799
D.214	**1984-113B**	**Arabsat 1D**					**PL**
TLEs	EGO (-)	2015-12-22	22:59:31.269	-4.92	387.617	270.429	504.805
15383	TEME	42551.863	0.0027794	15.1042	14.7714	279.2621	35.6441
D.215	**2014-043D**	**Delta 4M+(4,2) second stage (DCSS 4)**					**RB**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-4.92	387.350	332.378	442.322
UI187	J2000	42551.523	0.0012919	0.8143	63.7543	235.1022	245.7090
D.216	**1991-046A**	**Gorizont 23**					**PL**
TLEs	EGO (-)	2015-12-31	04:26:56.795	-4.92	387.326	362.723	411.930
21533	TEME	42551.504	0.0009399	15.2576	14.8800	224.9401	32.7287
D.217	**2000-069A**	**Beidou**					**PL**
TLEs	EGO (-)	2015-12-31	09:09:46.342	-4.91	386.895	323.177	450.612
26599	TEME	42551.779	0.0009037	6.2108	57.1373	281.8926	259.5254
D.218	**1977-118A**	**Sakura 1 (CS 1)**					**PL**
TLEs	EGO (-)	2015-12-31	04:27:24.422	-4.90	385.534	367.613	403.456
10516	TEME	42549.170	0.0003645	14.6109	336.5813	259.8508	8.6777
D.219	**1987-095A**	**TV-Sat 1**					**PL**
TLEs	EGO (0.21)	2015-12-28	08:12:53.742	-4.88	384.452	132.044	636.860
18570	TEME	42547.768	0.0055151	15.0635	0.6199	30.6808	354.8139
D.220	**1991-003B**	**Eutelsat II F-2**					**PL**
TLEs	EGO (-)	2015-12-31	13:59:53.179	-4.80	378.114	352.969	403.258
21056	TEME	42543.070	0.0003109	13.0045	33.8586	138.7948	74.9824
D.221	**1980-087A**	**OPS 6394 (FLTSATCOM F4)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-4.78	376.446	361.672	391.220
UI096	J2000	42540.619	0.0003473	14.6181	341.3218	247.6788	45.1120
D.222	**1998-028A**	**EchoStar 4**					**PL**
TLEs	EGO (-)	2015-12-31	14:59:25.008	-4.76	374.881	329.093	420.670
25331	TEME	42539.991	0.0018168	5.9648	51.5532	209.9106	97.1310
D.223	**1991-084A**	**Telecom 2A**					**PL**
TLEs	EGO (-)	2015-12-31	12:28:23.482	-4.76	374.863	358.168	391.559
21813	TEME	42539.327	0.0006746	11.9837	37.5941	200.5010	292.7091

D.nn	COSPAR	Name					Type
Source	Orbit (f^{GEO}_{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.224	**1999-056A**	**DirecTV 1R**					**PL**
TLEs	EGO (-)	2015-12-31	19:54:28.018	-4.73	372.240	350.242	394.237
25937	TEME	42537.213	0.0006779	2.7624	72.0764	167.9706	63.0644
D.225	**1997-025A**	**Thor II**					**PL**
TLEs	EGO (-)	2015-12-30	07:18:12.065	-4.69	368.918	354.894	382.943
24808	TEME	42532.443	0.0006858	5.9277	55.7262	212.1534	336.5819
D.226	**1995-013A**	**Intelsat VII F-5**					**PL**
TLEs	EGO (-)	2015-12-31	13:13:56.635	-4.68	368.420	286.890	449.950
23528	TEME	42532.213	0.0013399	4.9590	61.1768	12.9683	193.7705
D.227	**1993-073B**	**Meteosat 6 (MOP 3)**					**PL**
TLEs	EGO (-)	2015-12-31	07:48:08.978	-4.64	365.511	341.467	389.555
22912	TEME	42528.996	0.0007397	12.7301	32.5491	170.7716	352.3647
D.228	**1993-078A**	**DirecTV 1**					**PL**
TLEs	EGO (-)	2015-12-31	12:34:32.588	-4.64	364.911	321.278	408.543
22930	TEME	42528.276	0.0009628	5.8022	58.1687	125.5196	162.6602
D.229	**2000-066A**	**Thuraya 1**					**PL**
TLEs	EGO (-)	2015-12-31	12:43:59.043	-4.63	364.807	336.892	392.722
26578	TEME	42529.732	0.0009828	6.3889	28.2717	252.5662	253.7272
D.230	**1985-092B**	**USA 11 (DSCS III F2, DSCS 3-2, DSCS III B-4)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-4.61	363.100	352.923	373.277
UI079	J2000	42527.273	0.0002393	15.0119	19.8685	288.0223	148.8760
D.231	**1990-091A**	**SBS VI**					**PL**
TLEs	EGO (-)	2015-12-29	07:40:48.997	-4.61	363.073	326.718	399.428
20872	TEME	42527.940	0.0003953	6.9381	54.2965	72.9431	262.6214
D.232	**1990-001A**	**Skynet 4A**					**PL**
TLEs	EGO (-)	2015-12-31	12:30:58.578	-4.60	361.755	310.145	413.366
20401	TEME	42526.200	0.0017162	13.0645	17.7659	218.7718	286.2668
D.233	**1999-005A**	**Galaxy 26 (Intelsat Americas 6, IA 6, Telstar 6)**					**PL**
TLEs	EGO (-)	2015-12-31	13:22:46.742	-4.60	361.657	338.998	384.315
25626	TEME	42525.103	0.0003433	3.6928	79.4564	141.9164	181.8229
D.234	**1978-016A**	**OPS 6391 (FLTSATCOM F1)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-4.59	361.187	328.358	394.017
UI101	J2000	42525.360	0.0007720	14.6573	333.7914	203.1866	280.6400
D.235	**1995-029A**	**DirecTV 3**					**PL**
TLEs	EGO (-)	2015-12-31	15:17:14.779	-4.58	360.479	342.039	378.918
23598	TEME	42525.278	0.0006116	5.5319	59.2916	268.7357	90.1524
D.236	**1989-087A**	**Intelsat VI F-2**					**PL**
TLEs	EGO (-)	2015-12-31	05:00:56.115	-4.56	359.100	333.833	384.367
20315	TEME	42523.761	0.0005254	11.5792	37.8620	154.6056	233.5647
D.237	**1991-037A**	**Aurora II**					**PL**
TLEs	EGO (-)	2015-12-31	18:55:30.128	-4.54	356.975	337.946	376.003
21392	TEME	42520.083	0.0008283	12.2476	36.8150	193.9669	184.3017
D.238	**1992-057A**	**Satcom C-4**					**PL**
TLEs	EGO (-)	2015-12-31	19:04:52.098	-4.53	356.079	343.385	368.774
22096	TEME	42520.852	0.0006216	9.7371	44.6498	192.4808	52.7223

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.239	**1992-006A**	**USA 78 (DSCS III F5, DSCS 3-5, DSCS III B-14)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-4.47	351.806	318.499	385.113
UI127	J2000	42515.979	0.0007834	12.8319	34.9192	225.8155	70.5300
D.240	**1997-011A**	**Tempo 2**					**PL**
TLEs	EGO (-)	2015-12-31	16:23:20.852	-4.47	351.772	231.886	471.658
24748	TEME	42517.078	0.0033515	8.2360	49.3419	219.0308	76.5283
D.241	**1998-056B**	**Sirius 3**					**PL**
TLEs	EGO (-)	2015-12-31	09:24:34.617	-4.46	351.027	341.728	360.326
25492	TEME	42514.240	0.0002226	5.5099	56.5018	222.8646	175.7781
D.242	**1998-068A**	**Bonum 1**					**PL**
TLEs	EGO (-)	2015-12-31	14:21:52.300	-4.45	349.988	338.627	361.349
25546	TEME	42514.310	0.0004203	3.1912	70.0481	224.4008	114.6300
D.243	**2000-022A**	**GOES 11**					**PL**
TLEs	EGO (-)	2015-12-31	12:34:53.006	-4.43	348.627	327.078	370.176
26352	TEME	42511.993	0.0005066	3.8710	79.8747	139.9231	171.4986
D.244	**1993-046A**	**USA 93 (DSCS III F7, DSCS 3-7, DSCS III B-9)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-4.43	348.578	343.846	353.310
UI120	J2000	42512.751	0.0001113	10.2607	43.2771	165.1474	60.1110
D.245	**1994-049B**	**Turksat 1B**					**PL**
TLEs	EGO (-)	2015-12-31	06:20:19.432	-4.42	347.418	278.294	416.543
23200	TEME	42510.965	0.0011707	9.6491	44.8602	11.3265	336.1579
D.246	**1995-023A**	**Intelsat VIIA F-1**					**PL**
TLEs	EGO (-)	2015-12-31	15:52:40.266	-4.40	346.041	330.837	361.244
23571	TEME	42510.132	0.0003819	3.4510	67.3224	171.9657	206.0825
D.247	**1984-005A**	**Yuri 2A (BS 2A)**					**PL**
TLEs	EGO (-)	2015-12-30	22:10:00.222	-4.40	345.924	292.080	399.769
14659	TEME	42510.577	0.0011289	15.2827	358.3355	167.7605	109.0435
D.248	**1992-010A**	**Superbird B1**					**PL**
TLEs	EGO (-)	2015-12-31	14:00:28.085	-4.39	345.340	280.374	410.306
21893	TEME	42510.123	0.0008705	11.9719	37.5069	39.5349	92.2449
D.249	**1996-002B**	**MEASAT 1**					**PL**
TLEs	EGO (-)	2015-12-30	18:26:59.866	-4.36	342.977	328.660	357.294
23765	TEME	42507.071	0.0006765	6.7144	53.8743	215.2670	120.2250
D.250	**1989-004A**	**Gorizont 17**					**PL**
TLEs	EGO (-)	2015-12-31	01:53:30.929	-4.35	342.134	253.685	430.582
19765	TEME	42506.864	0.0017433	15.1902	6.2918	75.9481	270.8359
D.251	**2007-063A**	**Rascom-QAF 1**					**PL**
TLEs	EGO (-)	2015-12-31	10:57:51.981	-4.35	341.923	297.484	386.361
32387	TEME	42506.016	0.0004694	4.1868	65.5048	342.2911	309.0161
D.252	**1992-041B**	**Eutelsat II F-4**					**PL**
TLEs	EGO (-)	2015-12-31	07:53:49.361	-4.30	338.471	313.054	363.887
22028	TEME	42502.081	0.0009541	12.2448	37.1719	185.4785	331.2098
D.253	**2001-012A**	**XM Radio 2 (Rock)**					**PL**
TLEs	EGO (-)	2015-12-31	05:15:27.200	-4.29	337.469	313.490	361.449
26724	TEME	42502.292	0.0004520	1.0432	79.5314	303.4814	260.3726

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.254	**1996-002A**	**Intelsat 3R (PAS 3R)**					**PL**
TLEs	EGO (-)	2015-12-31	11:29:11.485	-4.27	335.938	288.691	383.185
23764	TEME	42499.322	0.0017046	5.1222	60.1531	186.1723	143.9411
D.255	**1989-006A**	**Intelsat VA F-15**					**PL**
TLEs	EGO (-)	2015-12-31	10:53:38.409	-4.21	330.652	237.595	423.710
19772	TEME	42494.701	0.0016653	14.2048	27.5996	17.5486	313.5846
D.256	**2009-007B**	**Ekspress MD-1**					**PL**
TLEs	EGO (-)	2015-12-31	22:10:45.160	-4.18	329.034	301.526	356.541
33596	TEME	42494.110	0.0009707	1.9055	77.8062	234.7068	83.9893
D.257	**1985-087A**	**Intelsat VA F-12**					**PL**
TLEs	EGO (-)	2015-12-30	10:38:49.828	-4.17	327.995	305.602	350.389
16101	TEME	42492.876	0.0011288	15.1870	17.5552	221.4922	292.9864
D.258	**1992-084A**	**Superbird A1**					**PL**
TLEs	EGO (-)	2015-12-31	12:31:05.462	-4.16	326.986	260.469	393.503
22253	TEME	42491.492	0.0011630	7.8948	46.4494	75.7411	281.5248
D.259	**1998-024B**	**BSAT 1b**					**PL**
TLEs	EGO (-)	2015-12-30	21:14:27.159	-4.16	326.774	308.556	344.992
25312	TEME	42490.219	0.0006985	3.8558	72.7346	166.9342	0.4115
D.260	**1997-016B**	**BSAT 1a**					**PL**
TLEs	EGO (-)	2015-12-31	13:25:24.765	-4.15	326.417	313.234	339.601
24769	TEME	42489.742	0.0006714	4.1256	61.8686	188.9616	178.9615
D.261	**1989-069B**	**USA 44 (DSCS III F4, DSCS 3-4, DSCS III A-2)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-4.15	326.275	289.317	363.233
UI126	J2000	42490.448	0.0008698	12.5172	36.0159	265.7709	1.5590
D.262	**1997-019A**	**GOES 10**					**PL**
TLEs	EGO (0.09)	2015-12-29	23:14:03.363	-4.14	325.827	210.720	440.934
24786	TEME	42489.017	0.0030714	8.4898	47.5961	148.4012	346.3317
D.263	**1983-059B**	**Anik C2**					**PL**
TLEs	EGO (0.13)	2015-12-29	17:14:12.875	-4.14	325.762	169.313	482.210
14133	TEME	42490.874	0.0032560	15.3085	9.6811	17.6206	77.9582
D.264	**1995-044A**	**N-Star 1**					**PL**
TLEs	EGO (-)	2015-12-31	14:57:52.122	-4.12	324.261	281.821	366.702
23651	TEME	42489.031	0.0014509	8.5129	48.2308	259.7675	99.3126
D.265	**1991-026A**	**Anik E2**					**PL**
TLEs	EGO (-)	2015-12-31	13:37:04.492	-4.12	324.229	294.598	353.861
21222	TEME	42487.874	0.0008291	10.5931	42.0154	264.3886	195.1950
D.266	**2001-031A**	**GOES 12**					**PL**
TLEs	EGO (-)	2015-12-30	21:14:27.159	-4.09	321.467	293.200	349.733
26871	TEME	42484.940	0.0010216	5.3572	64.3189	209.4098	0.4658
D.267	**1978-044A**	**OTS 2**					**PL**
TLEs	EGO (-)	2015-12-31	02:16:15.721	-4.08	320.869	291.418	350.319
10855	TEME	42485.753	0.0011647	14.6650	341.1661	251.0627	234.8160
D.268	**1990-100B**	**GStar 4**					**PL**
TLEs	EGO (-)	2015-12-31	14:32:37.981	-4.07	319.884	287.777	351.990
20946	TEME	42483.113	0.0010454	11.1187	40.4030	223.8932	165.8635

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.269	**1973-058A**	**Intelsat IV F-7**					**PL**
TLEs	EGO (-)	2015-12-31	09:33:48.028	-4.06	319.350	294.728	343.971
6796	TEME	42483.961	0.0003508	14.4688	336.4041	155.1808	280.7435
D.270	**1995-043A**	**JCSAT 3**					**PL**
TLEs	EGO (-)	2015-12-30	19:35:04.775	-4.05	318.425	253.432	383.419
23649	TEME	42482.032	0.0010822	8.9245	42.9447	328.7254	1.7370
D.271	**1994-040B**	**BS-3N**					**PL**
TLEs	EGO (-)	2015-12-30	06:55:13.135	-4.04	317.657	302.935	332.380
23176	TEME	42482.462	0.0005006	8.8506	47.4689	244.0080	236.7009
D.272	**2007-003A**	**Beidou 4**					**PL**
TLEs	EGO (0.36)	2015-12-31	10:22:24.631	-4.04	317.510	66.458	568.562
30323	TEME	42480.884	0.0064792	1.2337	93.0552	169.4950	196.9961
D.273	**1998-075A**	**Intelsat 6B (PAS 6B)**					**PL**
TLEs	EGO (-)	2015-12-31	21:36:22.120	-4.03	317.018	236.545	397.490
25585	TEME	42480.447	0.0015284	6.4183	55.4696	87.5479	358.1795
D.274	**1998-002A**	**Skynet 4D**					**PL**
TLEs	EGO (-)	2015-12-31	08:13:48.349	-4.03	316.964	290.360	343.569
25134	TEME	42480.313	0.0003702	9.9368	35.8225	121.6784	177.3919
D.275	**1970-003A**	**Intelsat III F-6**					**PL**
TLEs	EGO (-)	2015-12-31	22:48:42.933	-4.02	316.062	271.304	360.820
4297	TEME	42480.494	0.0012220	7.8753	308.2130	331.2441	39.9567
D.276	**1983-047A**	**Intelsat V F-6**					**PL**
TLEs	EGO (0.20)	2015-12-29	15:49:33.917	-4.00	314.074	224.817	403.332
14077	TEME	42479.437	0.0038410	15.2934	7.0289	231.7482	59.8374
D.277	**1991-067A**	**Anik E1**					**PL**
TLEs	EGO (-)	2015-12-31	06:14:21.146	-3.97	312.209	288.779	335.638
21726	TEME	42476.167	0.0014209	10.5905	42.4185	219.9864	232.0317
D.278	**1968-081S**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.09)	2015-12-31	01:21:39.444	-3.95	310.593	-1071.681	1692.867
38692	TEME	42474.040	0.0332785	7.6068	321.9463	291.9874	202.4654
D.279	**2001-011B**	**BSAT 2a**					**PL**
TLEs	EGO (-)	2015-12-31	17:25:10.600	-3.95	310.213	285.784	334.643
26720	TEME	42474.054	0.0006495	2.9413	71.1192	154.8511	203.3206
D.280	**1998-044A**	**PSN 5 (Chinasat 5B, Zhongxing 5B, ZX 5B, Intelsat APR-1)**					**PL**
TLEs	EGO (-)	2015-12-31	14:36:25.403	-3.94	309.718	272.903	346.533
25404	TEME	42472.831	0.0011128	3.3934	68.7622	149.1682	162.6377
D.281	**1996-035A**	**Intelsat VII F-6**					**PL**
TLEs	EGO (-)	2015-12-31	15:53:54.305	-3.94	309.314	267.401	351.227
23915	TEME	42472.684	0.0014508	2.9234	71.5636	168.9085	183.1768
D.282	**1995-001A**	**Intelsat VII F-4**					**PL**
TLEs	EGO (-)	2015-12-31	02:26:05.080	-3.93	309.101	288.425	329.776
23461	TEME	42472.928	0.0003348	5.3585	59.4035	144.0251	317.7591
D.283	**1989-027A**	**Tele-X**					**PL**
TLEs	EGO (-)	2015-12-31	17:20:41.248	-3.93	308.676	281.195	336.157
19919	TEME	42472.951	0.0005647	14.4822	26.1092	182.8971	200.2676

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.284	**1993-078B**	**Thaicom 1**					**PL**
TLEs	EGO (-)	2015-12-31	05:28:58.079	-3.93	308.572	285.997	331.148
22931	TEME	42473.576	0.0006399	5.5278	58.4770	147.0450	252.0472
D.285	**1990-100A**	**Satcom C-1**					**PL**
TLEs	EGO (-)	2015-12-31	11:57:39.570	-3.92	308.361	283.921	332.801
20945	TEME	42471.699	0.0009631	9.6450	42.8639	276.5600	141.4411
D.286	**1989-067A**	**Sirius 1 (Marcopolo 1)**					**PL**
TLEs	EGO (-)	2015-12-29	20:55:03.506	-3.91	307.526	276.347	338.705
20193	TEME	42470.941	0.0006742	13.1356	32.9101	266.7361	343.3250
D.287	**1996-039A**	**Chinasat 5D (Zhongxing 5D, ZX 5D, APStar 1A)**					**PL**
TLEs	EGO (-)	2015-12-31	09:08:34.551	-3.90	306.248	217.615	394.882
23943	TEME	42470.867	0.0023720	8.3330	44.3297	247.2322	227.5242
D.288	**1994-040A**	**Intelsat 2 (PAS 2)**					**PL**
TLEs	EGO (-)	2015-12-31	04:12:03.481	-3.89	305.453	277.914	332.992
23175	TEME	42468.988	0.0003749	5.7713	60.3492	235.8749	1.6113
D.289	**1988-098A**	**TDF 1**					**PL**
TLEs	EGO (-)	2015-12-31	17:35:51.819	-3.88	305.111	272.378	337.843
19621	TEME	42470.143	0.0012517	14.6671	24.1277	181.6942	85.4507
D.290	**1978-068A**	**Comstar 1C (D-3)**					**PL**
TLEs	EGO (0.03)	2015-12-30	12:43:02.091	-3.87	304.457	220.421	388.493
10975	TEME	42467.513	0.0024468	14.9894	349.9389	220.5072	165.5376
D.291	**2004-043A**	**Ekspress-AM 1**					**PL**
TLEs	EGO (-)	2015-12-31	02:46:31.894	-3.87	304.263	268.833	339.694
28463	TEME	42469.032	0.0013426	4.4634	63.2513	163.6593	288.3109
D.292	**2003-028A**	**BSAT 2c**					**PL**
TLEs	EGO (-)	2015-12-31	06:39:14.171	-3.86	303.528	280.533	326.522
27830	TEME	42468.194	0.0008217	1.9874	75.7580	197.0687	284.1069
D.293	**1992-054A**	**Optus B1**					**PL**
TLEs	EGO (-)	2015-12-31	09:10:11.369	-3.85	302.102	259.257	344.947
22087	TEME	42467.204	0.0004423	7.8745	50.3657	51.6373	271.1106
D.294	**1976-017A**	**Marisat 1**					**PL**
TLEs	EGO (-)	2015-12-31	09:10:13.345	-3.84	301.886	256.447	347.326
8697	TEME	42466.699	0.0008143	13.3368	332.6884	123.8238	272.0156
D.295	**1990-074A**	**Thor I(Marcopolo 2)**					**PL**
TLEs	EGO (-)	2015-12-31	05:00:16.947	-3.83	300.895	286.699	315.091
20762	TEME	42465.729	0.0006249	11.9038	38.0321	187.9817	232.8006
D.296	**1997-062A**	**Apstar 2R (Telstar 10)**					**PL**
TLEs	EGO (-)	2015-12-31	00:10:46.963	-3.83	300.890	259.100	342.680
25010	TEME	42464.260	0.0015239	2.8983	71.7651	195.7893	338.0103
D.297	**1982-058A**	**Westar V**					**PL**
TLEs	EGO (-)	2015-12-31	19:19:15.381	-3.81	299.347	233.867	364.828
13269	TEME	42463.192	0.0019265	15.3403	10.9053	182.8415	127.0145
D.298	**1994-013A**	**Galaxy IR-A**					**PL**
TLEs	EGO (-)	2015-12-27	23:34:37.745	-3.79	297.450	285.148	309.753
23016	TEME	42460.782	0.0005398	8.1210	48.3877	196.2292	0.1614

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.299	**1988-086A**	**Sakura 3B (CS 3B)**					**PL**
TLEs	EGO (-)	2015-12-31	01:46:37.474	-3.78	296.768	275.404	318.133
19508	TEME	42461.531	0.0007861	14.2643	27.3228	226.5444	279.8159
D.300	**1982-017A**	**Intelsat V F-4**					**PL**
TLEs	EGO (0.23)	2015-12-31	20:44:37.326	-3.76	295.445	157.820	433.069
13083	TEME	42459.619	0.0029763	15.1714	0.9102	153.4737	132.7133
D.301	**1996-040A**	**Arabsat 2A**					**PL**
TLEs	EGO (-)	2015-12-29	19:17:14.387	-3.76	295.316	257.274	333.359
23948	TEME	42458.803	0.0004129	11.2679	39.4338	245.1664	0.3475
D.302	**1980-074A**	**GOES 4**					**PL**
TLEs	EGO (0.24)	2015-12-31	14:26:52.406	-3.76	295.190	154.106	436.275
11964	TEME	42459.183	0.0030574	14.7056	340.7436	354.9694	206.2771
D.303	**2006-022A**	**KAZSAT**					**PL**
TLEs	EGO (-)	2015-12-31	21:12:33.471	-3.74	294.066	275.008	313.123
29230	TEME	42457.752	0.0005162	5.3169	60.0341	140.6190	12.2354
D.304	**2004-015A**	**Ekspress-AM 11**					**PL**
TLEs	EGO (-)	2015-12-31	12:34:44.444	-3.73	293.178	271.734	314.622
28234	TEME	42456.449	0.0009108	8.0366	49.7173	196.4083	168.0981
D.305	**1968-063A**	**OPS 2222 (CANYON 1)**					**PL**
KIAM	EGO (0.03)	2016-01-01	00:00:00.000	-3.73	292.621	-3690.043	4275.285
UI102	J2000	42456.794	0.0938051	14.1579	328.9487	121.6152	247.8830
D.306	**1992-043A**	**Gorizont 26**					**PL**
TLEs	EGO (0.29)	2015-12-31	14:13:45.846	-3.71	291.524	160.241	422.807
22041	TEME	42456.436	0.0035361	14.7991	17.8935	174.7473	242.0140
D.307	**1990-030A**	**AsiaSat 1**					**PL**
TLEs	EGO (-)	2015-12-26	07:36:40.913	-3.71	291.372	277.245	305.500
20558	TEME	42454.827	0.0005808	13.4200	32.0776	216.1374	5.0359
D.308	**1994-049A**	**Brazilsat B1**					**PL**
TLEs	EGO (-)	2015-12-31	03:13:11.796	-3.69	289.700	263.485	315.916
23199	TEME	42454.121	0.0004797	7.3070	52.3709	143.3902	295.6663
D.309	**1977-065A**	**Himawari 1 (GMS 1)**					**PL**
TLEs	EGO (-)	2015-12-30	18:51:15.168	-3.69	289.673	216.370	362.975
10143	TEME	42453.002	0.0016942	14.0671	333.2237	151.7958	140.4259
D.310	**1993-015A**	**USA 98 (UFO F1)**					**PL**
TLEs	EGO (-)	2015-12-31	19:15:17.121	-3.68	288.832	261.753	315.910
22563	TEME	42451.971	0.0009529	17.8481	141.1445	138.3467	165.2551
D.311	**2000-082A**	**Beidou 1B**					**PL**
TLEs	EGO (0.41)	2015-12-31	22:30:40.163	-3.68	288.729	-49.546	627.004
26643	TEME	42452.269	0.0079839	7.1275	52.5735	354.7580	334.8315
D.312	**1993-074B**	**IABS**					**RB**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-3.66	287.207	263.158	311.256
UI084	J2000	42451.380	0.0005665	15.2453	16.1159	276.4276	153.4730
D.313	**1975-042A**	**Intelsat IV F-1**					**PL**
TLEs	EGO (-)	2015-12-31	12:36:23.442	-3.65	286.454	235.603	337.305
7815	TEME	42451.452	0.0013796	14.6972	342.8162	179.9047	254.4720

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.314	**1996-007A**	**N-Star 2**					**PL**
TLEs	EGO (-)	2015-12-31	08:16:36.436	-3.65	286.380	261.605	311.155
23781	TEME	42451.229	0.0013166	7.4909	51.7392	201.5379	226.3947
D.315	**1998-056A**	**Eutelsat W2**					**PL**
TLEs	EGO (-)	2015-12-31	06:52:10.602	-3.64	285.899	264.195	307.603
25491	TEME	42450.388	0.0004901	4.8392	62.2019	136.1845	219.6432
D.316	**2004-036A**	**GSAT 3 (EDUSAT)**					**PL**
TLEs	EGO (-)	2015-12-30	02:28:56.586	-3.62	284.603	268.272	300.934
28417	TEME	42447.965	0.0002893	4.1949	65.1202	132.0679	335.6427
D.317	**2002-029D**	**Proton-K/DM-2M fourth stage (Blok DM-2M)**					**RB**
TLEs	EGO (-)	2015-12-31	10:14:18.558	-3.62	284.186	230.376	337.996
27444	TEME	42447.616	0.0010843	11.0448	40.2441	272.0294	199.0729
D.318	**1992-013A**	**Galaxy V**					**PL**
TLEs	EGO (-)	2015-12-31	22:18:07.343	-3.55	278.538	216.122	340.953
21906	TEME	42442.416	0.0010768	9.1763	46.3071	353.3569	125.4371
D.319	**1986-016A**	**Yuri 2B (BS 2B)**					**PL**
TLEs	EGO (-)	2015-12-31	12:47:40.767	-3.54	277.848	200.243	355.453
16597	TEME	42442.613	0.0014451	15.2994	5.8766	142.1617	226.8628
D.320	**1991-083A**	**Eutelsat II F-3**					**PL**
TLEs	EGO (-)	2015-12-31	11:15:15.632	-3.52	276.168	262.163	290.174
21803	TEME	42440.409	0.0005124	12.8918	34.0984	206.6122	298.2870
D.321	**1994-064A**	**Intelsat VII F-3 (NSS 703)**					**PL**
TLEs	EGO (-)	2015-12-31	13:15:15.821	-3.49	273.915	253.112	294.719
23305	TEME	42437.333	0.0006850	5.0923	60.4570	185.0700	190.4275
D.322	**1995-064A**	**AsiaSat 2**					**PL**
TLEs	EGO (-)	2015-12-31	06:14:35.134	-3.49	273.668	241.352	305.984
23723	TEME	42437.000	0.0012686	4.1113	65.1334	215.3384	347.2282
D.323	**—**	**Himawari 2 AKM (Star 27)**					**RB**
KIAM	EGO (0.43)	2016-02-10	00:00:00.000	-3.46	271.573	-78.034	621.180
UU020	J2000	42435.746	0.0082385	14.4231	338.9446	10.7801	109.0770
D.324	**1995-016B**	**Hot Bird 1**					**PL**
TLEs	EGO (-)	2015-12-31	02:24:47.361	-3.45	270.778	254.856	286.700
23537	TEME	42435.549	0.0002253	8.1995	49.6084	123.1511	281.9773
D.325	**1992-060A**	**Hispasat 1A**					**PL**
TLEs	EGO (-)	2015-12-31	15:12:10.471	-3.45	270.414	248.376	292.452
22116	TEME	42433.589	0.0009625	11.0158	40.5521	204.2096	177.8962
D.326	**1991-055A**	**Intelsat VI F-5**					**PL**
TLEs	EGO (-)	2015-12-31	12:34:37.856	-3.41	267.989	256.125	279.852
21653	TEME	42430.980	0.0004887	9.3717	45.8685	188.0601	165.2482
D.327	**1985-092C**	**USA 12 (DSCS III F3, DSCS 3-3, DSCS III B-5)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-3.41	267.888	256.983	278.793
UI077	J2000	42432.061	0.0002570	14.8667	21.3223	182.0891	195.0880
D.328	**1968-081Q**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.11)	2015-12-31	22:14:01.000	-3.40	266.693	-870.956	1404.342
38690	TEME	42431.927	0.0278162	7.6007	321.5785	322.3303	248.1413

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.329	**1998-063B**	**GE 5**					**PL**
TLEs	EGO (-)	2015-12-31	19:37:53.860	-3.39	265.837	251.228	280.445
25516	TEME	42430.689	0.0004022	4.4112	63.8177	212.2636	47.5033
D.330	**1987-070A**	**Kiku 5 (ETS V)**					**PL**
TLEs	EGO (-)	2015-12-31	05:13:09.814	-3.38	265.542	235.467	295.616
18316	TEME	42430.571	0.0007413	15.3141	9.0148	279.3389	240.5291
D.331	**1968-081V**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.06)	2015-12-26	08:38:10.544	-3.36	263.587	-1692.888	2220.062
38695	TEME	42426.426	0.0466280	7.2315	321.2387	278.9212	140.9588
D.332	**1990-079B**	**Eutelsat II F-1**					**PL**
TLEs	EGO (-)	2015-12-31	14:00:06.351	-3.34	261.945	241.818	282.073
20777	TEME	42427.312	0.0008519	13.5673	31.1295	192.6238	81.7127
D.333	**2006-053C**	**Fengyun 2D AKM (FG-36)**					**PM**
TLEs	EGO (0.45)	2015-12-30	02:29:37.421	-3.30	259.300	-172.711	691.310
29642	TEME	42422.536	0.0099329	5.0014	62.9011	314.7977	354.7386
D.334	**1981-057F**	**Meteosat 2 AKM (MAGE 1)**					**PM**
TLEs	EGO (0.44)	2015-12-29	18:34:17.629	-3.25	254.962	-62.354	572.277
20837	TEME	42418.933	0.0071549	14.6447	337.9907	108.8624	141.7357
D.335	**1994-043A**	**Chinasat 5E (Zhongxing 5E, ZX 5E, APStar 1)**					**PL**
TLEs	EGO (-)	2015-12-30	04:21:16.924	-3.23	253.236	239.569	266.902
23185	TEME	42417.072	0.0004469	9.1298	45.3622	250.9070	20.3552
D.336	**1978-071A**	**ESA GEOS 2**					**PL**
TLEs	EGO (-)	2015-12-31	14:06:03.760	-3.23	253.124	235.353	270.895
10981	TEME	42418.209	0.0006766	13.4810	329.1351	255.8765	247.0124
D.337	**1982-106D**	**IUS second stage**					**RB**
TLEs	EGO (0.35)	2015-12-29	05:32:42.631	-3.21	251.859	57.651	446.067
13643	TEME	42415.020	0.0043942	15.3024	347.2257	320.2451	345.3628
D.338	**1997-002B**	**Nahuel 1A**					**PL**
TLEs	EGO (-)	2015-12-31	21:16:54.602	-3.20	250.645	224.645	276.645
24714	TEME	42414.062	0.0006223	6.8799	53.7134	141.6787	7.7886
D.339	**1988-051C**	**PAS 1 (PanAmSat 1)**					**PL**
TLEs	EGO (-)	2015-12-31	10:21:09.326	-3.18	249.080	230.537	267.623
19217	TEME	42412.755	0.0006701	12.2139	36.4006	224.8819	129.3515
D.340	**2012-002C**	**Fengyun 2F AKM (FG-36)**					**PM**
TLEs	EGO (0.44)	2015-12-31	14:26:52.406	-3.17	248.688	10.396	486.979
38072	TEME	42412.649	0.0058317	0.6298	68.2551	132.4213	207.1889
D.341	**1977-048A**	**GOES 2**					**PL**
TLEs	EGO (0.26)	2015-12-27	08:22:34.058	-3.16	247.482	183.542	311.423
10061	TEME	42411.400	0.0016305	13.9192	333.5690	295.3713	307.9819
D.342	**2007-058A**	**Cosmos-2434 (Raduga-1M1)**					**PL**
TLEs	EGO (-)	2015-12-31	19:54:41.067	-3.15	247.402	237.720	257.084
32373	TEME	42412.835	0.0003160	2.0167	75.5281	192.8726	62.4536
D.343	**1989-052A**	**Gorizont 18**					**PL**
TLEs	EGO (0.37)	2015-12-31	11:00:29.727	-3.15	246.706	95.647	397.766
20107	TEME	42411.723	0.0038661	15.0967	7.6673	247.2780	243.3269

D.nn	COSPAR	Name					Type
Source	Orbit (f^{GEO}_{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.344	**1985-016F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (0.37)	2015-12-31	15:45:52.134	-3.13	245.839	137.097	354.581
15581	TEME	42409.067	0.0026977	14.9631	350.9936	156.3654	185.9566
D.345	**1997-071A**	**Astra 5A (Sirius 2, GE 1E)**					**PL**
TLEs	EGO (-)	2015-12-31	08:21:37.522	-3.13	245.276	226.592	263.961
25049	TEME	42410.590	0.0003775	5.7113	58.3321	203.5037	269.5396
D.346	**1995-011B**	**Himawari 5 (GMS 5)**					**PL**
TLEs	EGO (-)	2015-12-31	22:43:32.676	-3.13	245.227	211.837	278.617
23522	TEME	42410.629	0.0004573	12.0401	35.4313	76.5416	85.0234
D.347	**1983-006A**	**Sakura 2A (CS 2A)**					**PL**
TLEs	EGO (0.21)	2015-12-30	04:05:56.160	-3.12	245.074	204.890	285.259
13782	TEME	42408.586	0.0013817	15.0697	354.6592	228.9471	15.1452
D.348	**1996-063A**	**Arabsat 2B**					**PL**
TLEs	EGO (-)	2015-12-30	22:37:54.991	-3.10	243.271	226.682	259.861
24652	TEME	42407.242	0.0006554	2.6699	73.3689	189.2608	24.1781
D.349	**1983-094A**	**RCA Satcom IIR**					**PL**
TLEs	EGO (0.24)	2015-12-31	08:31:14.177	-3.10	243.105	177.889	308.320
14328	TEME	42406.179	0.0013553	15.0007	20.0198	315.3962	164.0790
D.350	**1989-035C**	**Titan 34D stage 3 (Transtage D-16)**					**RB**
KIAM	EGO (0.03)	2016-01-01	00:00:00.000	-3.06	240.262	-3972.754	4453.278
UI020	J2000	42404.435	0.0993532	8.1489	9.2553	337.8744	103.1670
D.351	**1984-031F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (0.31)	2015-12-28	06:39:53.692	-3.06	240.088	175.428	304.748
14951	TEME	42402.989	0.0016121	14.8326	347.9235	159.3085	352.0623
D.352	**1994-038D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (0.37)	2015-12-31	18:28:23.649	-3.03	237.998	129.983	346.014
23171	TEME	42401.036	0.0021721	13.6647	26.1647	51.5495	348.2338
D.353	**1979-053C**	**Titan IIIC stage 3 (Transtage 31)**					**RB**
KIAM	EGO (0.45)	2016-01-01	00:00:00.000	-3.01	236.393	-25.087	497.873
UI051	J2000	42400.566	0.0061669	14.2177	335.0703	194.5532	55.6350
D.354	**1984-009C**	**Titan 34D stage 3 (Transtage D-10)**					**RB**
KIAM	EGO (0.03)	2016-01-01	00:00:00.000	-3.01	235.851	-3961.709	4433.411
UI025	J2000	42400.024	0.0989990	8.1335	353.5046	42.4892	48.4020
D.355	**2000-031D**	**Proton-K/DM-2M fourth stage (Blok DM-2M)**					**RB**
TLEs	EGO (0.10)	2015-12-31	04:08:47.193	-3.00	235.554	179.384	291.724
26381	TEME	42399.153	0.0008725	12.4577	35.3950	11.6287	20.1376
D.356	**1977-041A**	**Intelsat IVA F-4**					**PL**
TLEs	EGO (0.31)	2015-12-29	04:24:09.468	-2.99	234.701	182.610	286.791
10024	TEME	42397.661	0.0014317	14.8134	346.8028	178.2576	350.8371
D.357	**2004-011A**	**Superbird A2 (Superbird 6)**					**PL**
TLEs	EGO (0.41)	2015-12-31	15:53:09.898	-2.92	229.134	161.492	296.775
28218	TEME	42394.443	0.0026575	9.2639	45.6928	296.7448	239.3430
D.358	**1985-048B**	**Morelos 1**					**PL**
TLEs	EGO (-)	2015-12-30	04:16:02.562	-2.90	227.296	208.889	245.704
15824	TEME	42392.080	0.0000787	15.1414	17.0745	155.2768	228.1764

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.359	**1994-002D**	**Proton-K/DM-2M fourth stage (Blok DM-2M)**					**RB**
TLEs	EGO (0.45)	2015-12-29	08:37:20.801	-2.90	227.188	45.958	408.417
22966	TEME	42390.490	0.0038972	14.9637	17.8948	47.4810	324.2606
D.360	**1981-119A**	**Intelsat V F-3**					**PL**
TLEs	EGO (0.38)	2015-12-31	06:19:52.144	-2.89	226.813	124.575	329.051
12994	TEME	42390.721	0.0023870	15.1080	0.6448	146.5116	320.4661
D.361	**1978-062D**	**GOES 3 AKM (SVM-5)**					**PM**
TLEs	EGO (0.33)	2015-12-31	02:28:02.974	-2.87	225.053	-254.530	704.636
20801	TEME	42388.654	0.0112811	14.3503	330.0746	337.0608	14.7551
D.362	**1976-059A**	**OPS 2112 (DSP F6, DSP 7, DSP Block 2(PHASE II) F6)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-2.87	224.659	207.988	241.331
UI056	J2000	42388.832	0.0003933	11.8732	319.6314	153.8836	162.9350
D.363	**1990-021A**	**Intelsat VI F-3**					**PL**
TLEs	EGO (-)	2015-12-30	19:35:04.775	-2.86	223.864	210.240	237.487
20523	TEME	42387.142	0.0004545	11.0204	39.3028	277.5569	2.4925
D.364	**1969-069A**	**ATS 5**					**PL**
TLEs	EGO (0.23)	2015-12-31	19:05:28.323	-2.82	220.757	201.691	239.822
4068	TEME	42386.246	0.0006945	8.7932	310.4211	257.0101	67.1145
D.365	**1968-081W**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.14)	2015-11-22	13:23:59.695	-2.81	219.994	-691.594	1131.582
38696	TEME	42386.934	0.0228345	7.2102	321.0215	277.6135	58.7255
D.366	**1997-008D**	**IUS second stage**					**RB**
KIAM	EGO (0.44)	2016-01-01	00:00:00.000	-2.80	219.608	120.964	318.252
UI071	J2000	42383.781	0.0023274	12.4356	36.2109	96.7909	214.7560
D.367	**1975-011A**	**SMS 2**					**PL**
TLEs	EGO (0.40)	2015-12-31	09:10:00.831	-2.75	215.451	163.820	267.083
7648	TEME	42380.621	0.0012974	13.5014	327.8583	174.9687	266.0109
D.368	**1989-090D**	**IUS second stage**					**RB**
KIAM	EGO (-)	2016-01-01	00:00:00.000	-2.74	214.449	-1169.823	1598.721
UI090	J2000	42378.622	0.0326644	18.0208	22.8927	355.9165	229.5860
D.369	**1983-077A**	**Arabsat 1D-R**					**PL**
TLEs	EGO (0.42)	2015-12-30	12:39:06.103	-2.70	211.460	99.738	323.181
14234	TEME	42374.360	0.0022419	15.1514	16.0575	74.6017	179.4259
D.370	**1990-034A**	**Palapa B-2R**					**PL**
TLEs	EGO (0.39)	2015-12-31	14:59:52.732	-2.68	210.222	165.376	255.068
20570	TEME	42373.378	0.0006421	12.6302	35.4537	53.9104	186.7680
D.371	**1992-021A**	**Telecom 2B**					**PL**
TLEs	EGO (0.38)	2015-12-31	06:00:29.448	-2.68	209.839	164.172	255.506
21939	TEME	42374.463	0.0006916	12.3397	35.6566	5.2127	320.4100
D.372	**1989-020A**	**JCSAT 1**					**PL**
TLEs	EGO (0.19)	2015-12-31	13:55:09.869	-2.66	208.299	191.405	225.193
19874	TEME	42371.136	0.0002034	14.2795	27.0928	178.0996	160.6691
D.373	**—**	**Meteosat 3 AKM (MAGE 1)**					**RB**
KIAM	EGO (0.43)	2016-02-10	00:00:00.000	-2.64	206.952	-27.475	441.379
UU041	J2000	42371.125	0.0055327	15.3060	3.8025	75.9511	97.5760

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.374	**1996-033A**	**Galaxy IX**					**PL**
TLEs	EGO (0.44)	2015-12-31	09:16:59.611	-2.64	206.829	162.538	251.120
23877	TEME	42370.589	0.0007811	5.9762	56.9228	95.5503	313.8511
D.375	**1997-008E**	**USA 130 debris (DSP F18 IR Sensor telescope sunshade cover)**					**PM**
KIAM	EGO (0.49)	2016-01-01	00:00:00.000	-2.61	204.817	-144.392	554.027
UI164	J2000	42368.990	0.0082421	12.5671	35.9889	160.3273	157.2780
D.376	**1990-063B**	**DFS-Kopernikus 2**					**PL**
TLEs	EGO (0.45)	2015-12-31	19:11:13.999	-2.61	204.707	190.056	219.357
20706	TEME	42368.551	0.0006515	12.3707	35.6806	208.5916	124.5820
D.377	**1985-015B**	**Brazilsat 1**					**PL**
TLEs	EGO (0.44)	2015-12-28	03:25:53.973	-2.61	204.412	185.553	223.271
15561	TEME	42369.676	0.0007202	14.9761	18.9957	230.4879	52.6562
D.378	**1973-040B**	**Titan IIIC stage 3 (Transtage 24)**					**RB**
KIAM	EGO (0.49)	2016-01-01	00:00:00.000	-2.60	203.735	65.972	341.499
UI049	J2000	42367.908	0.0032516	9.7432	311.0267	309.8067	238.4630
D.379	**1981-076A**	**Himawari 2 (GMS 2)**					**PL**
TLEs	EGO (0.49)	2015-12-31	18:56:01.195	-2.60	203.514	161.439	245.590
12677	TEME	42366.464	0.0013341	14.5786	341.5674	222.8696	140.6877
D.380	**1986-003B**	**Satcom Ku-1**					**PL**
TLEs	EGO (0.43)	2015-12-31	14:00:16.889	-2.59	202.978	184.287	221.670
16482	TEME	42368.392	0.0004826	14.4791	25.1005	197.2740	87.0469
D.381	**1996-026B**	**Titan IVA third stage (Centaur)**					**RB**
KIAM	EGO (0.07)	2016-01-01	00:00:00.000	-2.59	202.899	-1734.153	2139.951
UI075	J2000	42367.072	0.0457207	9.4598	356.4751	317.0525	90.1620
D.382	**2000-019D**	**Proton-K/DM-2M fourth stage (Blok DM-2M)**					**RB**
TLEs	EGO (0.49)	2015-12-31	12:32:15.595	-2.58	202.004	141.326	262.683
26246	TEME	42366.933	0.0017880	12.7783	34.5210	217.1468	101.6526
D.383	**1985-109B**	**Morelos 2**					**PL**
TLEs	EGO (0.46)	2015-12-31	12:30:26.070	-2.56	200.165	175.281	225.050
16274	TEME	42364.936	0.0001741	13.6435	29.9974	99.0133	287.1321
D.384	**1991-028A**	**Spacenet 4**					**PL**
TLEs	EGO (0.53)	2015-12-31	14:18:20.138	-2.54	198.675	186.225	211.126
21227	TEME	42361.350	0.0006918	10.0858	43.0576	219.6675	172.2775
D.385	**2014-090C**	**Fengyun 2G AKM (FG-36)**					**PM**
TLEs	EGO (0.51)	2015-12-31	16:41:28.221	-2.48	193.984	4.244	383.724
40369	TEME	42358.869	0.0043733	1.5946	275.0854	258.0627	285.6675
D.386	**1994-054B**	**Titan IVA third stage (Centaur)**					**RB**
KIAM	EGO (0.28)	2016-01-01	00:00:00.000	-2.47	193.793	-322.673	710.260
UI017	J2000	42357.966	0.0121929	12.1276	21.3512	256.7958	187.7720
D.387	**2001-014A**	**Ekran-M 21**					**PL**
TLEs	EGO (0.52)	2015-12-31	12:34:18.757	-2.47	193.378	68.065	318.691
26736	TEME	42355.925	0.0026121	10.8704	45.3360	329.9899	157.1048
D.388	**1982-004A**	**RCA Satcom IV**					**PL**
TLEs	EGO (0.49)	2015-12-30	12:26:02.133	-2.47	193.052	170.888	215.216
13035	TEME	42358.217	0.0009746	15.2435	9.4907	102.6420	266.5948

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.389	**1994-065B**	**Thaicom 2**					**PL**
TLEs	EGO (0.62)	2015-12-31	14:50:11.687	-2.46	192.608	174.970	210.247
23314	TEME	42357.444	0.0004254	4.6627	61.9788	154.4475	107.4887
D.390	**1991-075A**	**Intelsat VI F-1**					**PL**
TLEs	EGO (0.58)	2015-12-30	03:33:11.938	-2.46	192.579	181.171	203.987
21765	TEME	42358.150	0.0005835	9.3157	44.9315	212.8160	253.3536
D.391	**1996-006A**	**Palapa C1**					**PL**
TLEs	EGO (0.58)	2015-12-31	14:00:26.768	-2.45	191.920	155.898	227.942
23779	TEME	42357.544	0.0006477	3.2417	70.0926	121.0143	91.3565
D.392	**1990-002B**	**LEASAT 5 (Syncom-4 5)**					**PL**
TLEs	EGO (0.73)	2015-12-31	08:17:18.672	-2.44	191.178	179.872	202.483
20410	TEME	42353.992	0.0003599	11.5204	16.1862	278.6071	175.0750
D.393	**1975-117A**	**RCA Satcom I**					**PL**
TLEs	EGO (0.54)	2015-12-31	04:12:21.263	-2.42	189.520	105.799	273.240
8476	TEME	42352.607	0.0020301	14.5466	341.8435	180.5966	11.0463
D.394	**1985-109D**	**Satcom Ku-2**					**PL**
TLEs	EGO (0.56)	2015-12-31	02:51:58.932	-2.40	188.158	152.565	223.751
16276	TEME	42353.151	0.0013458	14.2907	26.3020	191.4042	49.4221
D.395	**1981-107C**	**Titan IIIC stage 3 (Transtage 39)**					**RB**
KIAM	EGO (0.03)	2016-01-01	00:00:00.000	-2.40	187.862	-4019.355	4395.079
UI076	J2000	42352.035	0.0993392	7.4962	348.3657	66.6314	173.5130
D.396	**1971-116A**	**Intelsat IV F-3**					**PL**
TLEs	EGO (0.62)	2015-12-30	22:21:52.304	-2.35	183.860	132.331	235.388
5709	TEME	42349.671	0.0009223	13.9971	332.6359	352.5685	76.0101
D.397	**1978-058B**	**Titan IIIC stage 3 (Transtage 33)**					**RB**
KIAM	EGO (0.02)	2016-01-01	00:00:00.000	-2.33	182.685	-6217.022	6582.392
UI010	J2000	42346.858	0.1511259	6.9473	30.1200	49.6630	100.7840
D.398	**1997-070D**	**Proton-K/DM-2M fourth stage (Blok DM-2M)**					**RB**
TLEs	EGO (0.63)	2015-12-31	23:05:06.819	-2.30	180.164	113.041	247.287
25048	TEME	42342.645	0.0012778	14.0106	27.9365	67.1444	358.5716
D.399	**1986-026B**	**Brazilsat 2**					**PL**
TLEs	EGO (0.80)	2015-12-30	11:02:59.269	-2.28	178.351	162.591	194.111
16650	TEME	42342.586	0.0006236	14.4535	24.3265	227.5834	211.3839
D.400	**2000-002A**	**Galaxy 10R**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:58:45.176	-2.28	178.192	159.318	197.066
26056	TEME	42343.681	0.0003622	6.2262	56.0049	154.0053	97.9890
D.401	**1993-069A**	**Gorizont 28**					**PL**
TLEs	EGO (0.56)	2015-12-31	14:06:45.201	-2.24	175.133	31.048	319.217
22880	TEME	42340.634	0.0029825	14.4903	21.5050	73.5900	248.9812
D.402	**1999-016A**	**INSAT 2E (Intelsat APR-2)**					**PL**
TLEs	EGO (0.73)	2015-12-31	15:52:40.266	-2.22	174.029	147.319	200.740
25666	TEME	42337.970	0.0009376	4.3318	64.0576	180.9018	205.9880
D.403	**2000-016B**	**INSAT 3B**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:52:38.677	-2.21	173.230	154.588	191.872
26108	TEME	42335.700	0.0006301	3.2853	69.4539	157.8059	346.0087

D.nn	COSPAR	Name					Type
Source	Orbit (f^{GEO}_{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.404	**1988-018A**	**Spacenet 3R**					**PL**
TLEs	EGO (0.89)	2015-12-31	12:30:26.070	-2.20	172.327	156.877	187.777
18951	TEME	42337.255	0.0006682	13.1021	32.5851	193.6647	286.2154
D.405	**1985-028B**	**Anik C1**					**PL**
TLEs	EGO (0.69)	2015-12-31	05:37:46.955	-2.20	171.948	106.911	236.985
15642	TEME	42337.497	0.0010892	14.3683	26.2708	51.7495	244.5553
D.406	**1995-041A**	**Europe*Star B (Mugunghwa 1, Koreasat 1)**					**PL**
TLEs	GEO (1.00)	2015-12-29	19:17:13.728	-2.18	170.613	152.981	188.245
23639	TEME	42333.496	0.0002342	13.2882	31.7152	198.0811	0.1427
D.407	**1979-086C**	**Titan IIIC stage 3 (Transtage 34)**					**RB**
KIAM	EGO (0.02)	2016-01-01	00:00:00.000	-2.18	170.308	-5517.130	5857.747
UI024	J2000	42334.481	0.1343453	7.0469	352.8468	76.7472	243.4630
D.408	**1988-109A**	**Skynet 4B**					**PL**
TLEs	EGO (0.72)	2015-12-31	09:46:08.992	-2.13	166.667	147.717	185.617
19687	TEME	42331.200	0.0008691	15.3079	11.1530	216.6526	125.1264
D.409	**1976-010A**	**Intelsat IVA F-2**					**PL**
TLEs	EGO (0.92)	2015-12-25	10:41:59.411	-2.11	165.234	142.576	187.893
8620	TEME	42329.121	0.0008510	14.5140	341.4581	210.1603	305.0222
D.410	**1983-105A**	**Intelsat V F-7**					**PL**
TLEs	GEO (0.91)	2015-12-31	13:59:32.102	-2.08	162.944	136.837	189.052
14421	TEME	42328.966	0.0003799	15.1568	4.9282	287.6051	65.1310
D.411	**1992-072A**	**Galaxy VII**					**PL**
TLEs	EGO (0.86)	2015-12-30	16:10:43.671	-2.07	162.046	127.970	196.121
22205	TEME	42327.699	0.0009500	12.3682	35.4087	271.6598	55.4319
D.412	**1997-078A**	**Galaxy VIII-i**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:12:10.441	-2.07	161.630	132.973	190.287
25086	TEME	42324.011	0.0006407	10.9378	40.2912	272.4606	178.1961
D.413	**1991-074D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-30	14:05:42.225	-2.04	159.930	146.195	173.666
21762	TEME	42325.912	0.0003452	14.9491	15.0910	178.4824	87.8364
D.414	**2000-024E**	**USA 149 debris (DSP F20 IR Sensor telescope sunshade cover)**					**PM**
KIAM	EGO (0.13)	2016-01-01	00:00:00.000	-2.04	159.835	-856.466	1176.136
UI005	J2000	42324.008	0.0240124	10.4154	40.2053	239.0552	255.1220
D.415	**2000-024D**	**IUS second stage**					**RB**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	-2.03	158.425	133.379	183.472
UI067	J2000	42322.598	0.0005918	10.0379	40.5628	91.4444	182.1860
D.416	**1993-048A**	**Hispasat 1B**					**PL**
TLEs	EGO (0.90)	2015-12-31	12:01:58.607	-1.98	154.851	126.217	183.486
22723	TEME	42320.139	0.0010928	10.1735	42.4127	199.2706	285.0345
D.417	**1992-066A**	**DFS-Kopernikus 3**					**PL**
TLEs	GEO (1.00)	2015-12-30	04:16:31.543	-1.95	152.902	134.869	170.935
22175	TEME	42318.639	0.0004229	11.5412	38.2148	217.6647	241.4666
D.418	**1984-080E**	**Himawari 3 (GMS 3) AKM (Star 27)**					**PM**
TLEs	EGO (0.24)	2015-12-29	13:47:31.517	-1.90	148.820	-426.137	723.777
22266	TEME	42313.944	0.0131446	14.8251	350.9928	4.8335	221.1950

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.419	**1989-041A**	**Superbird A**					**PL**
TLEs	GEO (0.91)	2015-12-31	12:47:40.767	-1.90	148.379	118.165	178.594
20040	TEME	42314.138	0.0008994	15.1682	6.1845	268.5615	227.3556
D.420	**1984-114A**	**Chinasat 5R (Zhongxing 5R, ZX 5R, Spacenet 2)**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:00:08.986	-1.86	145.640	108.954	182.326
15385	TEME	42311.737	0.0005703	14.2969	26.0676	313.2737	83.3885
D.421	**1990-091B**	**Galaxy VI**					**PL**
TLEs	GEO (1.00)	2015-12-29	07:39:43.155	-1.84	144.138	127.236	161.041
20873	TEME	42309.575	0.0006382	10.8940	40.4377	167.2659	233.2342
D.422	**1985-076B**	**Optus A1**					**PL**
TLEs	GEO (0.90)	2015-12-31	09:18:55.608	-1.84	143.946	125.848	162.044
15993	TEME	42307.426	0.0005473	15.1787	13.0174	244.0872	314.4738
D.423	**1982-014A**	**Westar IV**					**PL**
TLEs	GEO (0.90)	2015-12-31	12:46:03.617	-1.81	141.546	125.859	157.233
13069	TEME	42304.828	0.0006985	15.1860	8.9516	211.5140	197.3842
D.424	**—**	**USA 197 debris (DSP F23 IR Sensor telescope sunshade cover)**					**PM**
KIAM	EGO (0.23)	2016-02-10	00:00:00.000	-1.80	140.693	-441.363	722.749
UU069	J2000	42304.866	0.0137586	3.2200	77.1219	265.3809	197.9430
D.425	**2003-021A**	**Beidou 3**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:10:00.831	-1.80	140.396	109.468	171.323
27813	TEME	42306.518	0.0012314	4.2213	66.3554	155.9538	266.0695
D.426	**1984-093D**	**Telstar 3C (Telstar 302)**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:20:39.076	-1.78	139.189	119.586	158.791
15237	TEME	42304.366	0.0001923	14.8979	19.6348	160.8531	284.2784
D.427	**1972-010A**	**OPS 1570 (DSP F3, DSP 4, DSP Block 1(PHASE I) F3)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	-1.77	138.577	92.450	184.704
UI144	J2000	42302.750	0.0010904	8.3818	310.8430	272.6281	154.8230
D.428	**1995-067B**	**INSAT 2C**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:27:54.758	-1.77	138.454	119.948	156.960
23731	TEME	42303.759	0.0005566	11.3913	39.6311	229.1472	280.1110
D.429	**1974-093A**	**Intelsat IV F-8**					**PL**
TLEs	GEO (1.00)	2015-12-30	23:53:12.208	-1.75	137.175	114.681	159.669
7544	TEME	42303.529	0.0001741	14.5085	341.9431	169.0859	71.0868
D.430	**1988-081B**	**SBS V**					**PL**
TLEs	GEO (1.00)	2015-12-27	05:08:57.505	-1.74	135.838	110.858	160.819
19484	TEME	42298.042	0.0009826	12.8105	33.6761	217.4297	344.7254
D.431	**1996-003A**	**ABS 1A (Mugungwha 2, Koreasat 2)**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:05:19.762	-1.72	134.762	117.622	151.903
23768	TEME	42301.288	0.0002509	7.3855	51.4650	196.9243	64.0844
D.432	**1986-026A**	**GStar 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:13:45.511	-1.72	134.588	117.709	151.466
16649	TEME	42300.150	0.0003704	14.8766	20.1753	267.3414	241.3318
D.433	**1992-059D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	11:00:29.727	-1.72	134.128	87.452	180.803
22115	TEME	42300.311	0.0014346	14.9288	17.5499	226.1406	245.1696

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.434	**1973-023A**	**Anik A2**					**PL**
TLEs	GEO (1.00)	2015-12-29	14:39:39.453	-1.71	133.970	82.476	185.463
6437	TEME	42299.888	0.0012374	14.1791	335.9588	308.8196	56.8735
D.435	**1985-010B**	**USA 8 (MAGNUM 1)**					**PL**
KIAM	EGO (0.21)	2016-01-01	00:00:00.000	-1.68	131.571	-439.075	702.217
UI097	J2000	42295.744	0.0134918	17.7945	355.2509	303.2811	43.3530
D.436	**2004-004D**	**IUS second stage (IUS-10 SRM-2, Orbus 6E)**					**RB**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	-1.68	131.433	120.275	142.591
UI062	J2000	42295.606	0.0002638	7.0628	50.1981	261.0969	76.4840
D.437	**1973-040A**	**OPS 6157 (DSP F4, DSP 2, DSP Block 1(PHASE I) F4)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	-1.68	131.155	93.195	169.115
UI048	J2000	42295.328	0.0008975	9.5434	310.5119	275.0471	90.1330
D.438	**1978-116A**	**Anik B1**					**PL**
TLEs	EGO (0.71)	2015-12-30	21:00:17.419	-1.65	129.221	63.572	194.870
11153	TEME	42295.830	0.0026694	14.8148	350.9691	222.5634	83.0688
D.439	**1980-091A**	**SBS I**					**PL**
TLEs	GEO (0.95)	2015-12-31	00:09:56.943	-1.63	127.205	93.052	161.358
12065	TEME	42292.659	0.0003315	15.0524	352.9616	112.8862	279.0932
D.440	**1976-042A**	**Comstar 1A (D-1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:59:24.858	-1.62	126.951	109.301	144.602
8838	TEME	42291.866	0.0006899	14.4972	342.0138	245.9416	221.3125
D.441	**2009-010A**	**Raduga 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:37:35.236	-1.62	126.362	91.480	161.245
34264	TEME	42290.084	0.0008595	4.6984	73.8038	287.7698	313.2314
D.442	**1994-067A**	**Ekspress 1 (Ekspress 11L)**					**PL**
TLEs	GEO (1.00)	2015-12-24	20:58:10.403	-1.61	126.161	107.485	144.837
23319	TEME	42288.283	0.0007526	12.5618	34.4989	170.1593	337.3498
D.443	**1972-003A**	**Intelsat IV F-4**					**PL**
TLEs	GEO (1.00)	2015-12-30	18:17:17.265	-1.60	124.957	105.698	144.216
5775	TEME	42289.288	0.0001766	14.0961	334.9615	273.1993	115.2833
D.444	**1984-080A**	**Himawari 3 (GMS 3)**					**PL**
TLEs	GEO (1.00)	2015-12-30	12:47:00.526	-1.59	124.214	93.858	154.570
15152	TEME	42286.476	0.0002389	14.9451	357.6381	44.5839	139.7905
D.445	**2000-020A**	**Galaxy IVR**					**PL**
TLEs	GEO (1.00)	2015-12-30	16:08:57.510	-1.58	123.227	104.701	141.753
26298	TEME	42286.769	0.0006519	7.7111	50.4652	169.9718	21.4115
D.446	**1984-101A**	**Galaxy III**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:42:02.060	-1.57	122.549	94.302	150.796
15308	TEME	42288.667	0.0007251	14.9038	19.4364	265.4189	250.7803
D.447	**1976-035A**	**NATO IIIA**					**PL**
TLEs	EGO (0.74)	2015-12-31	14:18:32.283	-1.55	121.122	21.673	220.571
8808	TEME	42285.400	0.0027179	12.3710	332.2769	225.1507	212.7118
D.448	**1989-062A**	**TV-SAT 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:24:37.746	-1.53	119.519	92.661	146.378
20168	TEME	42284.741	0.0006529	13.7089	29.4183	177.7029	288.2525

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.449	**2003-018A**	**GSAT 2**					**PL**
TLEs	GEO (1.00)	2015-12-29	08:33:24.128	-1.53	119.216	104.813	133.619
27807	TEME	42281.246	0.0007013	4.0116	65.5016	226.9473	344.1855
D.450	**1992-017A**	**Gorizont 25**					**PL**
TLEs	EGO (0.82)	2015-12-31	12:32:27.450	-1.52	119.157	7.107	231.207
21922	TEME	42284.273	0.0022453	14.8129	16.3170	10.4439	108.0519
D.451	**1974-075A**	**Westar II**					**PL**
TLEs	GEO (1.00)	2015-12-29	14:03:48.709	-1.51	118.230	98.963	137.497
7466	TEME	42280.439	0.0003727	14.2244	338.3396	192.0612	186.9624
D.452	**1983-030A**	**RCA Satcom IR**					**PL**
TLEs	GEO (0.91)	2015-12-30	10:32:40.413	-1.51	117.730	76.915	158.544
13984	TEME	42281.647	0.0002464	15.1459	12.7170	27.3645	304.6015
D.453	**1999-047A**	**Yamal 100 No. 1**					**PL**
TLEs	EGO (0.42)	2015-12-29	19:17:44.683	-1.47	114.939	-254.373	484.251
25896	TEME	42277.737	0.0083678	13.0456	32.5020	319.4524	15.2335
D.454	**1984-022F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	GEO (0.80)	2015-12-31	18:46:48.310	-1.46	113.914	16.338	211.490
14948	TEME	42276.496	0.0018499	15.7679	345.0852	42.5445	132.1606
D.455	**1987-028D**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (0.69)	2015-12-31	04:12:06.773	-1.45	113.424	-0.938	227.785
17705	TEME	42275.583	0.0022667	15.6821	357.0667	7.3274	2.7355
D.456	**1985-048D**	**Telstar 3D (Telstar 303)**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:00:22.817	-1.43	111.822	97.738	125.907
15826	TEME	42278.346	0.0005029	14.8029	20.5977	190.2418	90.2818
D.457	**1995-063A**	**Gals 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:31:05.462	-1.39	108.930	82.236	135.624
23717	TEME	42274.518	0.0009190	12.4413	34.9439	227.7471	280.7014
D.458	**1996-005A**	**Gorizont 31**					**PL**
TLEs	EGO (0.96)	2015-12-31	07:47:54.588	-1.38	107.644	19.178	196.109
23775	TEME	42269.434	0.0022570	13.6666	27.7683	146.2381	342.5699
D.459	**1991-064B**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (0.96)	2015-12-31	17:34:20.766	-1.37	106.778	88.877	124.679
21703	TEME	42269.453	0.0004314	15.0345	14.0076	246.4051	190.6328
D.460	**1974-022A**	**Westar I**					**PL**
TLEs	GEO (1.00)	2015-12-29	19:47:20.312	-1.35	105.591	79.996	131.185
7250	TEME	42272.493	0.0008109	14.1952	337.3044	271.6956	83.6811
D.461	**1987-022A**	**GOES 7**					**PL**
TLEs	GEO (0.96)	2015-12-31	18:58:53.151	-1.35	105.148	94.019	116.276
17561	TEME	42266.724	0.0004201	15.0369	11.5357	259.1497	175.5257
D.462	**2001-033D**	**IUS second stage**					**RB**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	-1.33	104.235	80.751	127.719
UI061	J2000	42268.408	0.0005556	9.0765	43.4231	261.7803	347.2000
D.463	**1982-110C**	**Anik C3**					**PL**
TLEs	GEO (0.91)	2015-12-16	07:55:58.832	-1.33	103.583	87.991	119.175
13652	TEME	42265.122	0.0003564	15.1393	8.4058	231.7421	342.4234

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.464	**1978-002A**	**Intelsat IVA F-3**					**PL**
TLEs	GEO (1.00)	2015-12-31	17:20:00.158	-1.31	102.661	85.955	119.366
10557	TEME	42266.224	0.0006118	14.6945	348.1955	209.8839	205.0517
D.465	**2000-011A**	**Garuda 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:46:27.139	-1.31	102.372	83.088	121.656
26089	TEME	42265.993	0.0005066	0.9995	159.0163	82.0684	30.1092
D.466	**1987-029A**	**Agila 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	00:39:32.021	-1.31	101.998	82.755	121.242
17706	TEME	42268.140	0.0005386	14.6448	22.5103	278.7916	273.5089
D.467	**1975-091A**	**Intelsat IVA F-1**					**PL**
TLEs	GEO (1.00)	2015-12-30	02:30:16.279	-1.24	97.053	73.869	120.237
8330	TEME	42259.413	0.0006158	14.4251	341.7556	181.3673	13.0314
D.468	**1990-095D**	**IUS second stage**					**RB**
KIAM	EGO (0.55)	2016-01-01	00:00:00.000	-1.23	96.289	-161.288	353.867
UI081	J2000	42260.462	0.0060950	15.1338	16.7325	353.8151	283.0410
D.469	**1982-110B**	**SBS III**					**PL**
TLEs	GEO (0.92)	2015-12-31	20:53:15.364	-1.23	96.190	60.730	131.650
13651	TEME	42259.708	0.0003943	15.1369	8.4396	328.4154	129.1249
D.470	**1992-027A**	**Palapa B4**					**PL**
TLEs	GEO (1.00)	2015-12-31	01:54:17.461	-1.20	93.933	76.955	110.911
21964	TEME	42259.649	0.0004341	9.1282	45.2674	221.2063	282.8338
D.471	**1982-009A**	**Ekran 8**					**PL**
TLEs	EGO (0.80)	2015-12-31	12:35:04.006	-1.20	93.870	-18.390	206.131
13056	TEME	42256.810	0.0031021	14.2451	336.5467	237.6414	193.7075
D.472	**1985-109C**	**Optus A2**					**PL**
TLEs	GEO (0.96)	2015-12-31	02:26:53.487	-1.19	92.743	77.051	108.434
16275	TEME	42258.587	0.0007105	15.0298	14.2910	221.2126	281.3877
D.473	**1979-072A**	**Westar III**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:10:01.360	-1.18	91.997	76.599	107.396
11484	TEME	42253.141	0.0006541	14.9047	355.5078	235.3044	349.2865
D.474	**1974-101A**	**Symphonie A**					**PL**
TLEs	GEO (1.00)	2015-12-31	04:11:37.795	-1.15	89.702	71.405	107.999
7578	TEME	42251.471	0.0004987	12.8314	324.3839	258.3985	348.5758
D.475	**1991-003A**	**Italsat 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:17:40.240	-1.11	86.983	29.135	144.832
21055	TEME	42250.306	0.0013588	14.2661	25.6419	294.6530	124.6659
D.476	**1980-081F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	GEO (1.00)	2015-12-31	00:41:43.291	-1.11	86.773	63.412	110.135
12447	TEME	42249.575	0.0006330	13.7831	332.2522	278.7106	316.7478
D.477	**1975-077A**	**Symphonie B**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:17:47.381	-1.09	85.218	63.956	106.480
8132	TEME	42251.139	0.0008004	12.3932	322.6610	278.2273	278.3717
D.478	**1993-048B**	**INSAT 2B**					**PL**
TLEs	GEO (1.00)	2015-12-30	16:12:19.267	-1.09	85.049	19.723	150.374
22724	TEME	42251.951	0.0015847	12.4077	34.9855	135.3845	58.4446

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.479	**1988-071A**	**Gorizont 16**					**PL**
TLEs	GEO (1.00)	2015-12-31	04:50:00.661	-1.08	83.952	23.945	143.959
19397	TEME	42244.794	0.0011233	14.9342	3.4466	328.7008	352.2748
D.480	**1976-073A**	**Comstar 1B (D-2)**					**PL**
TLEs	GEO (1.00)	2015-12-29	22:24:56.939	-1.07	83.195	68.104	98.286
9047	TEME	42249.238	0.0003032	14.3998	342.3000	230.8892	46.8810
D.481	**1984-049A**	**Chinasat 5 (Zhongxing 5, ZX 5, Spacenet 1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	08:24:55.187	-1.04	81.139	64.095	98.182
14985	TEME	42241.517	0.0007369	14.6025	22.6670	204.6452	168.2842
D.482	**1993-073E**	**Meteosat 6 AKM (MAGE 1)**					**PM**
TLEs	EGO (0.65)	2015-12-29	06:53:02.698	-1.03	80.747	-194.267	355.761
23118	TEME	42241.986	0.0062064	14.6677	21.4139	5.3768	327.5507
D.483	**1999-047B**	**Yamal 100 No. 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	17:20:26.806	-1.03	80.492	68.319	92.664
25897	TEME	42245.703	0.0006188	10.1951	42.3011	225.2279	218.0139
D.484	**1997-041D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (0.08)	2015-12-31	06:11:31.161	-0.97	75.963	-1382.383	1534.309
24897	TEME	42237.602	0.0362516	13.1664	31.2488	201.2406	9.6908
D.485	**2009-010B**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	09:09:02.872	-0.96	74.785	64.795	84.775
34265	TEME	42241.991	0.0004283	4.7006	74.0872	169.3928	239.7634
D.486	**1977-014A**	**Kiku 2 (ETS II)**					**PL**
TLEs	GEO (1.00)	2015-12-27	19:40:42.103	-0.95	74.473	57.023	91.923
9852	TEME	42239.678	0.0005080	13.2709	327.8947	251.4471	110.9538
D.487	**1990-016D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (0.76)	2015-12-31	15:11:34.046	-0.89	69.774	-101.164	240.712
20502	TEME	42235.584	0.0041726	14.9826	9.0099	143.6818	39.0929
D.488	**1990-112D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	06:20:19.432	-0.89	69.480	-45.864	184.824
21019	TEME	42230.511	0.0024674	14.9366	11.9236	85.9495	334.2179
D.489	**1981-057B**	**APPLE**					**PL**
TLEs	GEO (1.00)	2015-12-28	15:15:38.257	-0.86	66.984	-37.014	170.982
12545	TEME	42227.778	0.0023779	14.1848	336.7903	129.0007	188.3254
D.490	**1977-092J**	**Ekran 2 fragmentation debris**					**PD**
TLEs	GEO (1.00)	2015-12-31	14:18:32.283	-0.84	65.542	0.860	130.224
12996	TEME	42229.823	0.0012064	12.6261	323.2751	194.3683	211.7643
D.491	**1977-018A**	**Palapa 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	07:37:51.027	-0.84	65.228	41.911	88.545
9862	TEME	42230.973	0.0002756	14.6084	346.4233	291.0962	288.8914
D.492	**2003-053E**	**Proton-K/DM-2M fourth stage (Blok DM-2M)**					**RB**
TLEs	EGO (0.13)	2015-12-30	19:11:48.007	-0.83	65.084	-861.247	991.416
28119	TEME	42230.388	0.0230924	10.0717	43.0203	205.4787	38.0587
D.493	**1987-084D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-29	07:01:02.604	-0.82	64.199	-58.014	186.413
18387	TEME	42224.582	0.0030424	14.8356	0.3490	150.6845	358.8780

D.nn	COSPAR	Name					Type
Source	Orbit (f^{GEO}_{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.494	**1983-028F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	GEO (1.00)	2015-12-31	10:08:39.061	-0.82	63.860	-43.907	171.627
13983	TEME	42222.627	0.0024601	14.5578	343.5809	124.9829	164.9284
D.495	**1998-025D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	09:37:35.236	-0.81	63.212	-71.585	198.009
25318	TEME	42225.787	0.0028774	11.8361	34.9252	34.7459	313.1487
D.496	**1975-038A**	**Anik A3**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:24:55.003	-0.81	63.129	46.936	79.323
7790	TEME	42222.012	0.0004402	14.3719	340.7858	250.2554	165.6739
D.497	**1992-088D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-30	09:04:03.272	-0.76	59.109	14.760	103.457
22272	TEME	42225.156	0.0007029	14.0875	21.4571	72.6892	291.5261
D.498	**1994-060D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	06:01:19.894	-0.72	55.937	19.064	92.811
23270	TEME	42215.796	0.0005433	14.2411	23.9702	58.8705	353.7699
D.499	**1994-087D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	09:32:03.583	-0.70	54.980	9.562	100.399
23451	TEME	42213.571	0.0006708	14.1576	24.8678	41.3148	155.4491
D.500	**2000-032A**	**Fengyun 2B**					**PL**
TLEs	GEO (1.00)	2015-12-30	07:18:52.565	-0.67	52.465	38.826	66.104
26382	TEME	42211.658	0.0005346	9.2025	45.2372	203.1256	351.7563
D.501	**1976-066A**	**Palapa 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	04:27:24.422	-0.66	51.447	32.328	70.565
9009	TEME	42211.938	0.0004599	14.3687	342.2840	188.3032	9.2391
D.502	**1985-055A**	**Intelsat VA F-11**					**PL**
TLEs	GEO (0.94)	2015-12-31	04:26:56.795	-0.63	49.424	-5.457	104.306
15873	TEME	42214.651	0.0009651	15.0763	13.1370	332.8927	32.9627
D.503	**1988-034D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	04:12:25.215	-0.62	48.399	-55.637	152.435
19076	TEME	42209.542	0.0022128	14.9800	1.6347	95.0830	12.7187
D.504	**1972-041A**	**Intelsat IV F-5**					**PL**
TLEs	GEO (1.00)	2015-12-31	00:57:00.517	-0.59	45.991	28.652	63.330
6052	TEME	42211.682	0.0005353	13.5268	330.1629	209.1260	216.7923
D.505	**1975-097F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	GEO (1.00)	2015-12-31	15:48:41.985	-0.59	45.853	-49.090	140.796
11676	TEME	42209.876	0.0020066	10.9951	316.5826	113.6733	208.1684
D.506	**1981-114A**	**RCA Satcom IIIR**					**PL**
TLEs	GEO (0.93)	2015-12-31	03:47:03.130	-0.57	44.755	27.619	61.890
12967	TEME	42209.487	0.0007511	15.1046	6.1519	226.2221	211.1639
D.507	**2004-010F**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	10:24:30.460	-0.57	44.505	-76.490	165.500
28256	TEME	42210.464	0.0026906	8.8945	51.7092	264.2620	216.9136
D.508	**1982-082A**	**Anik D1**					**PL**
TLEs	GEO (0.94)	2015-12-29	15:56:11.660	-0.56	43.963	20.335	67.591
13431	TEME	42214.760	0.0009100	15.0664	7.0922	237.4551	61.6827

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.509	**1993-003D**	**IUS second stage**					**RB**
TLEs	EGO (0.55)	2015-12-31	11:41:53.760	-0.56	43.827	-238.917	326.570
22316	TEME	42213.167	0.0064585	13.2063	13.8025	27.2035	270.7237
D.510	**1994-069D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	08:12:57.331	-0.56	43.556	-56.700	143.811
23330	TEME	42202.320	0.0019724	14.5300	23.9341	52.9365	182.3834
D.511	**1991-010F**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	16:47:08.040	-0.54	41.787	-30.334	113.908
21129	TEME	42203.591	0.0018262	14.5178	15.6341	136.6186	19.3065
D.512	**1983-065A**	**Galaxy I**					**PL**
TLEs	GEO (1.00)	2015-12-30	14:05:47.493	-0.53	41.085	28.210	53.960
14158	TEME	42211.884	0.0005325	14.9756	16.1518	214.2374	90.2699
D.513	**1977-092K**	**Ekran 2 fragmentation debris**					**PD**
TLEs	GEO (1.00)	2015-12-29	10:12:41.313	-0.52	40.694	-33.020	114.408
29014	TEME	42202.073	0.0020626	12.4734	322.8836	228.9997	318.1579
D.514	**1978-058A**	**OPS 9454 (VORTEX 1) (CHALET 1)**					**PL**
KIAM	EGO (0.02)	2016-01-01	00:00:00.000	-0.52	40.430	-5944.917	6025.777
UI009	J2000	42204.603	0.1418174	7.1532	31.3649	339.7567	190.2710
D.515	**2004-043D**	**Proton-K/DM-2M fourth stage (Blok DM-2M)**					**RB**
TLEs	GEO (1.00)	2015-12-31	12:56:54.195	-0.51	39.424	6.603	72.245
28466	TEME	42204.160	0.0005709	9.2295	44.6228	78.2754	208.1020
D.516	**1999-047E**	**Proton-K/DM-2M fourth stage (Blok DM-2M)**					**RB**
TLEs	EGO (0.32)	2015-12-30	16:07:33.237	-0.50	38.824	-392.934	470.583
25900	TEME	42210.846	0.0098355	12.9935	32.3495	318.6474	63.6491
D.517	**1991-015E**	**Meteosat 5 AKM (MAGE 1)**					**PM**
TLEs	EGO (0.19)	2015-12-31	04:29:27.900	-0.49	38.468	-642.708	719.644
21904	TEME	42204.067	0.0157557	14.3731	10.8209	134.3983	216.6060
D.518	**1981-096A**	**SBS II**					**PL**
TLEs	GEO (1.00)	2015-12-30	08:23:31.578	-0.49	38.178	12.593	63.762
12855	TEME	42200.070	0.0006287	14.8498	355.9019	174.6287	129.8521
D.519	**1993-072A**	**Gorizont 29**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:00:07.668	-0.48	37.565	-11.912	87.042
22907	TEME	42210.186	0.0013374	14.4421	21.2770	251.9948	82.8305
D.520	**2002-001B**	**Titan IVB third stage (Centaur TC-19)**					**RB**
KIAM	EGO (0.76)	2016-01-01	00:00:00.000	-0.47	36.332	-184.330	256.994
UI013	J2000	42200.505	0.0052289	5.2964	40.1443	54.2981	237.7740
D.521	**1968-081AJ**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.17)	2015-12-29	10:44:11.574	-0.45	35.372	-702.325	773.069
39298	TEME	42206.286	0.0178024	7.5153	319.8472	317.2210	101.8926
D.522	**1999-009A**	**Arabsat 3A**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:00:28.085	-0.45	35.128	15.874	54.382
25638	TEME	42207.666	0.0007474	5.8473	57.3275	222.5846	92.0081
D.523	**1985-107A**	**Raduga 17**					**PL**
TLEs	GEO (1.00)	2015-12-31	17:29:08.611	-0.42	32.799	-17.944	83.542
16250	TEME	42194.697	0.0011493	14.6293	352.7706	145.5488	197.3064

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.524	**1995-045D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-20	19:48:16.726	-0.41	32.298	-53.220	117.815
23656	TEME	42192.153	0.0017677	13.8822	26.9556	304.1497	326.0729
D.525	**1979-035E**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	GEO (1.00)	2015-12-30	16:48:57.298	-0.40	30.976	-90.578	152.530
17873	TEME	42194.891	0.0028752	13.2438	327.4593	147.3101	23.9485
D.526	**2000-032C**	**Fengyun 2B AKM (FG-36)**					**PM**
TLEs	GEO (1.00)	2015-12-31	13:46:01.528	-0.40	30.882	-72.779	134.543
26460	TEME	42185.074	0.0022680	11.7837	38.6261	292.2219	149.5469
D.527	**1983-059C**	**Palapa Pacific 1 (Palapa B1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:37:10.113	-0.35	27.667	6.943	48.391
14134	TEME	42188.230	0.0002172	14.9918	3.6246	275.0785	194.3157
D.528	**1996-034A**	**Gorizont 32**					**PL**
TLEs	GEO (1.00)	2015-12-31	04:44:20.668	-0.33	26.061	-6.204	58.326
23880	TEME	42190.698	0.0010347	13.5574	28.4611	250.9996	310.9700
D.529	**—**	**—**					**—**
KIAM	EGO (0.12)	2015-10-05	00:00:00.000	-0.32	25.188	-1035.782	1086.158
UI168	J2000	42189.361	0.0251478	14.4696	4.8157	74.5836	9.6750
D.530	**1992-082A**	**Gorizont 27**					**PL**
TLEs	GEO (1.00)	2015-12-29	15:38:06.485	-0.31	24.305	-30.152	78.762
22245	TEME	42187.085	0.0013312	14.7204	18.2017	273.5651	130.7663
D.531	**2000-036D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	15:49:10.979	-0.31	23.961	-56.268	104.189
26397	TEME	42181.609	0.0015490	11.2378	38.3189	330.7775	143.3824
D.532	**1983-098A**	**Galaxy II**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:28:26.787	-0.30	23.132	-4.335	50.600
14365	TEME	42187.447	0.0002896	14.9336	16.5128	301.3964	199.2948
D.533[m]	**1968-081AH**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.16)	2015-12-14	03:08:37.219	-0.29	22.289	-761.873	806.451
39297	TEME	42186.462	0.0185880	7.5330	319.3615	300.1849	348.9479
D.534	**1992-041A**	**INSAT 2A**					**PL**
TLEs	GEO (1.00)	2015-12-31	08:24:55.187	-0.28	22.128	3.841	40.414
22027	TEME	42174.393	0.0009751	14.1419	26.1193	195.5446	168.1959
D.535	**1981-102F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	GEO (1.00)	2015-12-31	20:25:18.156	-0.26	20.602	-26.869	68.073
14195	TEME	42187.028	0.0009058	13.9243	335.0212	132.9715	126.1893
D.536	**1979-086A**	**OPS 1948 (VORTEX 2) (CHALET 2)**					**PL**
KIAM	EGO (0.02)	2016-01-01	00:00:00.000	-0.26	20.542	-5124.407	5165.491
UI023	J2000	42184.715	0.1219624	6.8297	354.3168	23.0477	317.4380
D.537	**1964-047A**	**Syncom 3**					**PL**
TLEs	GEO (1.00)	2015-07-29	01:25:41.596	-0.23	18.002	6.213	29.792
858	TEME	42182.403	0.0024272	2.1204	297.4120	157.8560	11.6263
D.538	**1987-091D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	04:51:32.846	-0.23	17.959	-67.673	103.590
18446	TEME	42185.187	0.0023174	14.7893	359.6216	166.3182	315.8587

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.539	**1967-001A**	**Intelsat II F-2**					**PL**
TLEs	GEO (1.00)	2015-12-22	01:31:12.269	-0.23	17.639	-39.451	74.729
2639	TEME	42176.363	0.0014550	5.6656	303.3462	270.3618	343.6311
D.540	**1997-041A**	**Cosmos-2345**					**PL**
TLEs	EGO (0.18)	2015-12-31	12:32:16.253	-0.16	12.651	-673.372	698.674
24894	TEME	42196.323	0.0168287	13.1099	30.9991	200.9872	101.9558
D.541^{m}	**1985-102G**	**Cosmos-1700 debris**					**PD**
TLEs	GEO (1.00)	2015-12-31	02:49:04.092	0.18	-13.879	-98.217	70.460
40924	TEME	42150.294	0.0020009	14.6565	353.1369	16.1038	61.1006
D.542	**1966-110A**	**ATS 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	07:32:54.333	0.24	-18.783	-44.212	6.646
2608	TEME	42147.162	0.0007752	3.8747	300.9979	249.4207	325.0579
D.543	**2000-029B**	**Proton-K/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (0.11)	2015-12-31	10:47:45.883	0.27	-21.302	-1165.802	1123.197
26373	TEME	42143.457	0.0272216	10.9962	36.8010	237.2130	195.0869
D.544	**1969-036A**	**OPS 3148 (CANYON 2)**					**PL**
KIAM	EGO (0.03)	2016-01-01	00:00:00.000	0.31	-23.959	-3801.901	3753.983
UI070	J2000	42140.214	0.0896517	6.1079	79.5543	82.3860	148.2690
D.545	**1982-103E**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	GEO (1.00)	2015-12-31	02:27:40.580	0.31	-24.217	-78.631	30.198
13630	TEME	42145.997	0.0009918	14.0565	339.7934	101.1404	2.9031
D.546	**1980-060G**	**Ekran 5 debris**					**PD**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	0.33	-26.030	-105.098	53.038
UI137	J2000	42138.143	0.0018764	13.2463	328.6611	233.6616	29.8990
D.547	**1981-027A**	**Raduga 8**					**PL**
TLEs	EGO (0.37)	2015-12-31	16:01:40.982	0.38	-29.864	-393.624	333.896
12351	TEME	42130.082	0.0087214	13.8806	332.4976	161.8686	218.9770
D.548	**1985-048C**	**Arabsat 1B**					**PL**
TLEs	GEO (0.98)	2015-12-28	06:52:32.728	0.51	-39.382	-99.449	20.685
15825	TEME	42131.416	0.0018228	15.0108	8.5857	272.3787	344.7510
D.549$_{o}$	**1968-081AK**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.25)	2015-07-01	03:04:30.420	0.51	-39.434	-521.522	442.654
39299	TEME	42132.878	0.0123116	7.7840	320.5649	354.9844	355.6792
D.550	**1985-015A**	**Arabsat 1A**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:28:26.683	0.54	-42.001	-60.995	-23.006
15560	TEME	42122.842	0.0005874	14.9590	5.4427	239.3013	25.9253
D.551	**1969-013A**	**TACSAT 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:05:37.544	0.54	-42.336	-120.894	36.223
3691	TEME	42114.499	0.0020633	5.9642	306.1798	240.9105	71.1142
D.552	**1971-039B**	**Titan IIIC stage 3 (Transtage 20)**					**RB**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	0.55	-42.723	-179.268	93.822
UI093	J2000	42121.450	0.0032417	7.0988	307.5311	7.0580	295.7930
D.553	**1989-020E**	**Meteosat 4 AKM (MAGE 1)**					**PM**
TLEs	EGO (0.24)	2015-12-31	10:20:42.955	0.63	-48.794	-602.310	504.721
20800	TEME	42119.219	0.0130224	14.2558	3.6123	153.2353	183.8218

D.nn	COSPAR	Name					Type
Source	Orbit (f^{GEO}_{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.554	**1975-118A**	**OPS 3165 (DSP F5, DSP 8, DSP Block 2(PHASE II) F5)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	0.65	-50.424	-184.346	83.498
UI052	J2000	42113.749	0.0031800	10.8718	316.2231	264.6199	167.5500
D.555	**2003-015A**	**Cosmos-2397**					**PL**
TLEs	EGO (0.79)	2015-12-31	14:00:30.720	0.72	-55.706	-238.902	127.491
27775	TEME	42103.992	0.0042349	8.2720	46.7873	265.5686	93.3065
D.556	**1988-091D**	**IUS second stage**					**RB**
TLEs	GEO (0.88)	2015-12-31	11:08:18.805	0.72	-55.797	-124.774	13.180
19550	TEME	42113.780	0.0020979	15.2774	6.2152	203.9328	149.1200
D.557	**1979-087C**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (0.77)	2015-12-30	23:57:36.040	0.74	-57.256	-219.723	105.210
17939	TEME	42103.535	0.0044319	13.2641	328.4100	246.3708	47.8783
D.558	**2001-009B**	**Titan IVB third stage (Centaur TC-22)**					**RB**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	0.74	-57.405	-114.775	-0.034
UI003	J2000	42106.768	0.0013625	9.5209	38.7720	51.1037	109.4730
D.559	**1993-069D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	08:37:04.551	0.77	-59.620	-83.120	-36.120
22883	TEME	42104.146	0.0004340	14.4010	20.9033	266.1167	211.9457
D.560	**1978-038A**	**OPS 8790 (AQUACADE 4)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	0.80	-62.101	-147.332	23.131
UI091	J2000	42102.072	0.0020244	9.9171	334.3544	218.9695	86.4040
D.561	**1975-123F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	GEO (1.00)	2015-12-30	16:48:57.411	0.80	-62.124	-125.487	1.238
11568	TEME	42102.654	0.0012155	11.1090	317.6859	108.0930	23.6989
D.562	**1995-035D**	**IUS second stage**					**RB**
TLEs	GEO (0.72)	2015-12-30	17:24:20.304	0.80	-62.524	-109.129	-15.919
23615	TEME	42098.063	0.0008521	16.6522	20.5656	82.5537	94.1256
D.563	**1990-054D**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	GEO (1.00)	2015-12-30	16:57:05.767	0.84	-65.184	-131.170	0.802
20662	TEME	42101.354	0.0011457	14.9343	9.8796	352.8452	16.8051
D.564	**1975-118C**	**Titan IIIC stage 3 (Transtage 29)**					**RB**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	0.97	-75.616	-117.317	-33.915
UI050	J2000	42088.557	0.0009908	10.8410	316.3092	104.4122	44.0110
D.565	**1988-071D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	09:17:12.613	0.99	-77.144	-159.121	4.833
19400	TEME	42089.388	0.0020368	14.7342	2.9669	142.8228	320.1549
D.566	**1995-022B**	**Titan IVA third stage (Centaur)**					**RB**
KIAM	GEO (0.94)	2016-01-01	00:00:00.000	1.00	-77.868	-123.494	-32.242
UI021	J2000	42086.305	0.0010841	15.0684	47.8579	236.5848	109.3170
D.567	**1976-059C**	**Titan IIIC stage 3 (Transtage 28)**					**RB**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	1.03	-80.371	-128.793	-31.949
UI054	J2000	42083.802	0.0011506	11.2621	317.5554	149.3012	237.6510
D.568	**1987-096D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-25	12:19:28.179	1.07	-82.763	-177.215	11.689
18578	TEME	42080.157	0.0023577	14.7214	0.3334	148.5805	284.1841

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.569	**1977-048G**	**GOES 2 AKM (SVM-5)**					**PM**
TLEs	EGO (0.14)	2015-12-31	15:02:27.210	1.08	-83.920	-1029.584	861.743
20799	TEME	42083.054	0.0223690	12.3676	323.5232	348.1573	187.4863
D.570	**2003-012B**	**Titan IVB third stage (Centaur TC-23)**					**RB**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	1.09	-84.734	-191.224	21.757
UI064	J2000	42079.439	0.0025307	6.8401	42.0243	193.7779	320.6980
D.571	**1994-009B**	**Titan IVA third stage (Centaur)**					**RB**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	1.10	-85.781	-147.392	-24.170
UI014	J2000	42078.392	0.0014642	11.2730	64.4733	139.7453	146.1950
D.572	**1995-060B**	**Titan IVA third stage (Centaur)**					**RB**
KIAM	EGO (0.78)	2016-01-01	00:00:00.000	1.12	-87.262	-233.336	58.812
UI016	J2000	42076.911	0.0034716	12.9735	32.4384	123.6996	127.3760
D.573	**1977-007D**	**OPS 3151 debris (DSP F7 IR Sensor telescope sunshade cover)**					**PM**
KIAM	EGO (0.16)	2016-01-01	00:00:00.000	1.15	-88.925	-916.490	738.641
UI100	J2000	42075.248	0.0196687	11.5279	317.4526	4.3290	278.7620
D.574	**1968-081AG**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.16)	2015-11-30	15:51:02.538	1.15	-88.990	-783.106	605.126
39296	TEME	42074.033	0.0198787	7.4468	319.0321	313.1590	50.9661
D.575	**1989-081D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-29	15:05:54.233	1.21	-94.235	-208.681	20.212
20266	TEME	42067.767	0.0022968	14.7492	6.8566	21.0972	244.6936
D.576	**1989-021D**	**IUS second stage**					**RB**
TLEs	GEO (1.00)	2015-12-31	04:47:56.930	1.22	-94.385	-199.772	11.002
19913	TEME	42067.725	0.0022885	13.6381	352.0955	101.7445	239.2668
D.577	**1985-102D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	06:59:59.704	1.27	-98.804	-184.903	-12.705
16214	TEME	42068.111	0.0016417	14.4765	352.6685	59.1837	140.0494
D.578	**1997-049E**	**Meteosat 7 AKM (MAGE 1)**					**PM**
TLEs	EGO (0.44)	2015-12-30	19:33:06.537	1.35	-104.499	-426.914	217.916
25353	TEME	42062.114	0.0080847	12.6712	32.1665	232.2600	3.9231
D.579	**1972-010B**	**Titan IIIC stage 3 (Transtage 22)**					**RB**
KIAM	EGO (0.63)	2016-01-01	00:00:00.000	1.39	-107.509	-348.283	133.265
UI038	J2000	42056.664	0.0057250	7.8318	309.4961	46.2732	145.2510
D.580	**1989-041B**	**DFS-Kopernikus 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:24:32.152	1.40	-108.788	-159.254	-58.322
20041	TEME	42053.539	0.0017619	14.5084	21.3033	210.8305	242.3300
D.581	**1988-034A**	**Cosmos-1940**					**PL**
TLEs	EGO (0.94)	2015-12-31	09:21:09.369	1.41	-109.441	-188.427	-30.455
19073	TEME	42057.899	0.0022744	14.7837	0.9511	192.5260	150.4794
D.582	**1974-039C**	**Titan IIIC stage 3 (Transtage 27)**					**RB**
TLEs	EGO (0.81)	2015-12-31	15:49:57.521	1.41	-109.536	-208.521	-10.551
7324	TEME	42057.264	0.0026641	11.3231	317.0688	241.3610	179.7808
D.583	**1968-081R**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.15)	2015-12-31	03:27:21.843	1.57	-121.893	-931.655	687.869
38691	TEME	42044.976	0.0200030	6.4128	317.4182	287.7088	166.4594

D.nn	COSPAR	Name					Type
Source	Orbit (f^{GEO}_{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.584	**2004-015D**	**Proton-K/DM-2M fourth stage (Blok DM-2M)**					**RB**
TLEs	EGO (0.86)	2015-12-29	19:59:54.889	1.58	-122.798	-199.767	-45.828
28240	TEME	42042.055	0.0020389	9.6000	43.7817	227.7603	22.1305
D.585	**1989-090B**	**USA 48 (MAGNUM 2)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	1.64	-126.878	-1291.668	1037.912
UI136	J2000	42037.295	0.0277085	17.8637	22.1597	5.4640	164.1470
D.586	**2003-040C**	**IABS**					**PM**
KIAM	EGO (0.89)	2016-01-01	00:00:00.000	1.66	-128.737	-204.998	-52.476
UI002	J2000	42035.436	0.0018142	10.0332	42.2710	210.6469	323.7590
D.587	**2000-013D**	**Proton-K/DM-2M fourth stage (Blok DM-2M)**					**RB**
TLEs	GEO (1.00)	2015-12-31	15:26:30.673	1.76	-136.162	-169.161	-103.163
26101	TEME	42030.182	0.0004879	12.5358	34.1091	311.5881	181.6526
D.588	**1968-081M**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.19)	2015-12-29	22:34:57.989	1.80	-139.586	-761.222	482.050
33511	TEME	42026.364	0.0164336	7.1782	318.2429	327.6775	1.4503
D.589	**1974-017A**	**Cosmos-637**					**PL**
TLEs	EGO (0.61)	2015-12-31	10:19:56.570	1.82	-141.237	-306.037	23.564
7229	TEME	42021.864	0.0041693	9.4870	313.6461	309.6817	230.1090
D.590	**1996-044A**	**Italsat 2**					**PL**
TLEs	EGO (0.72)	2015-12-30	19:57:47.007	1.84	-142.872	-252.705	-33.040
24208	TEME	42019.571	0.0020692	11.1578	38.1161	52.9770	87.0233
D.591	**1994-082D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (0.66)	2015-12-31	11:00:29.727	1.89	-146.454	-267.945	-24.964
23429	TEME	42016.375	0.0025567	13.7971	28.9091	37.6421	245.4300
D.592	**2003-043E**	**INSAT 3E**					**PL**
TLEs	EGO (0.72)	2015-12-31	16:03:56.611	1.90	-147.203	-217.976	-76.430
27951	TEME	42018.245	0.0020338	1.4292	81.2068	161.3208	190.3900
D.593	**2005-023H**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (0.79)	2015-12-29	23:14:19.170	1.94	-150.244	-208.169	-92.319
28704	TEME	42015.905	0.0015633	8.5850	46.9771	227.6725	354.0033
D.594	**1985-010D**	**IUS second stage**					**RB**
KIAM	EGO (0.33)	2016-01-01	00:00:00.000	1.95	-150.844	-275.590	-26.098
UI047	J2000	42013.329	0.0029692	17.8905	355.6032	193.3854	297.2820
D.595	**1987-109D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (0.55)	2015-12-31	00:52:44.101	2.02	-156.233	-424.761	112.294
18718	TEME	42008.364	0.0067387	14.6872	0.9951	175.3218	301.2794
D.596	**2003-041B**	**Titan IVB third stage (Centaur TC-20)**					**RB**
KIAM	EGO (0.59)	2016-01-01	00:00:00.000	2.07	-160.158	-307.479	-12.837
UI072	J2000	42004.015	0.0035073	8.3607	83.5787	0.1744	133.5180
D.597	**1968-081Z**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.31)	2015-10-15	12:58:54.712	2.11	-163.247	-611.248	284.754
38699	TEME	42004.933	0.0109807	7.0001	318.2020	292.1670	186.1020
D.598	**1990-094D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (0.60)	2015-12-31	09:05:49.238	2.12	-164.058	-311.257	-16.858
20926	TEME	42002.327	0.0031234	14.7956	10.5783	54.3239	155.2265

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.599	**1968-081J**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.23)	2015-12-31	02:07:11.926	2.27	-175.653	-724.816	373.510
30000	TEME	41989.513	0.0143306	6.9130	317.6599	326.3495	355.5824
D.600^{m}	**1968-081N**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.10)	2015-12-31	15:38:39.936	2.32	-179.743	-1446.556	1087.070
33512	TEME	41984.430	0.0301734	6.8321	317.7160	322.8756	177.8226
D.601	**1991-046D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (0.56)	2015-12-31	14:00:16.229	2.37	-183.241	-256.720	-109.763
21536	TEME	41979.606	0.0019493	14.7077	13.1231	153.1764	87.2227
D.602	**1994-080A**	**DFH 3-1**					**PL**
TLEs	EGO (0.41)	2015-12-28	14:19:26.656	2.49	-193.041	-605.372	219.290
23415	TEME	41970.931	0.0098136	14.5232	19.4783	276.3494	218.0469
D.603	**1982-009F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (0.50)	2015-12-30	13:08:19.640	2.55	-197.478	-355.789	-39.168
14117	TEME	41964.917	0.0035423	13.7289	335.1231	95.4941	77.2859
D.604	**1974-017F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (0.50)	2015-12-31	12:37:36.061	2.62	-203.032	-397.522	-8.542
11567	TEME	41961.794	0.0048728	9.3358	313.3323	319.6081	199.4914
D.605	**2006-022D**	**Proton-K/DM-2M fourth stage (Blok DM-2M)**					**RB**
TLEs	EGO (0.49)	2015-12-31	03:45:33.138	2.64	-204.144	-419.088	10.799
29233	TEME	41959.866	0.0047890	7.7249	49.5616	300.6676	302.3000
D.606	**1981-061F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (0.43)	2015-12-31	04:12:15.336	2.64	-204.420	-222.192	-186.648
12851	TEME	41960.640	0.0003938	13.4815	332.9525	273.1684	8.0523
D.607	**1968-081G**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.29)	2015-12-31	10:50:03.976	2.74	-211.711	-703.112	279.691
25000	TEME	41953.188	0.0123246	6.8893	317.3975	307.5671	315.1472
D.608	**1983-100F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (0.42)	2015-12-31	02:28:40.514	2.80	-216.575	-298.903	-134.247
14394	TEME	41947.673	0.0015277	13.8714	340.6104	55.7056	33.8797
D.609	**1997-065C**	**IABS**					**RB**
TLEs	EGO (0.46)	2015-12-29	22:35:21.043	2.83	-219.293	-366.845	-71.740
25021	TEME	41946.647	0.0029332	13.7571	26.6808	57.2687	357.2582
D.610	**1985-092E**	**IUS second stage**					**RB**
KIAM	EGO (0.41)	2016-01-01	00:00:00.000	2.92	-225.882	-458.325	6.561
UI033	J2000	41938.291	0.0055425	15.2435	352.7728	79.4949	263.3640
D.611	**1992-017D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (0.40)	2015-12-31	02:28:54.346	2.93	-226.854	-321.098	-132.611
21925	TEME	41937.113	0.0020099	14.5960	15.2823	317.4735	40.4662
D.612	**1983-016F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (0.36)	2015-12-30	22:06:14.427	2.97	-229.717	-287.116	-172.318
14086	TEME	41933.159	0.0017553	13.6733	336.7459	218.4664	89.0410
D.613	**—**	**Himawari 1 AKM (Star 27)**					**RB**
KIAM	EGO (0.11)	2016-02-10	00:00:00.000	3.02	-233.778	-1449.952	982.396
UU010	J2000	41930.395	0.0290046	12.3414	323.2242	359.8538	323.3120

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.614	**1988-036E**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (0.37)	2015-12-31	06:41:35.942	3.03	-234.648	-329.865	-139.431
19094	TEME	41929.004	0.0020201	14.5124	357.3243	88.6364	241.2255
D.615	**2003-008C**	**IABS**					**PM**
KIAM	EGO (0.37)	2016-01-01	00:00:00.000	3.04	-235.257	-320.368	-150.145
UI006	J2000	41928.916	0.0020299	10.4069	41.0633	153.7043	112.1130
D.616	**1992-074D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (0.32)	2015-12-31	04:26:43.795	3.13	-242.322	-334.755	-149.889
22213	TEME	41922.348	0.0018231	14.4292	17.4128	48.7493	25.0431
D.617	**1984-129B**	**Titan 34D stage 3 (Transtage D-13)**					**RB**
KIAM	EGO (-)	2016-01-01	00:00:00.000	3.18	-245.462	-275.295	-215.628
UI032	J2000	41918.711	0.0007117	15.3363	353.9814	159.5255	97.8740
D.618	**1968-081AB**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.12)	2015-12-17	19:33:46.046	3.19	-246.744	-1103.753	610.264
38701	TEME	41918.381	0.0262121	6.3971	316.6853	297.2104	297.2069
D.619	**1984-037B**	**Titan 34D stage 3 (Transtage D-11)**					**RB**
KIAM	EGO (0.39)	2016-01-01	00:00:00.000	3.20	-247.039	-389.377	-104.701
UI095	J2000	41917.134	0.0033957	14.4986	348.2459	218.4660	69.8340
D.620	**2005-049E**	**Meteosat 9 (MSG 2) operational debris (SEVIRI Cooler Cover)**					**PM**
TLEs	EGO (0.30)	2015-12-31	04:29:19.743	3.23	-249.545	-289.179	-209.911
29106	TEME	41913.923	0.0020487	6.9972	59.8188	162.6963	253.1328
D.621	**2000-001C**	**IABS**					**RB**
KIAM	EGO (0.30)	2016-01-01	00:00:00.000	3.26	-251.778	-340.653	-162.903
UI015	J2000	41912.395	0.0021205	12.5885	33.1172	244.4283	219.6830
D.622	**1994-084D**	**IUS second stage**					**RB**
KIAM	EGO (-)	2016-01-01	00:00:00.000	3.26	-252.096	-253.135	-251.057
UI019	J2000	41912.077	0.0000248	13.6135	27.8329	98.9224	229.4700
D.623	**2000-065C**	**IABS**					**RB**
KIAM	EGO (0.44)	2016-01-01	00:00:00.000	3.26	-252.148	-508.205	3.909
UI011	J2000	41912.025	0.0061094	12.1490	34.5297	180.8193	45.9170
D.624	**—**	**USA 107 debris (DSP F17 IR Sensor telescope sunshade cover)**					**PM**
KIAM	EGO (0.44)	2016-01-17	00:00:00.000	3.26	-252.169	-525.993	21.655
UU058	J2000	41912.004	0.0065333	13.6262	27.8306	293.5414	359.4080
D.625	**2002-040E**	**Meteosat 8 (MSG 1) operational debris (SEVIRI Cooler Cover)**					**PM**
TLEs	EGO (0.21)	2015-12-15	03:47:21.403	3.26	-252.330	-459.179	-45.481
39998	TEME	41911.169	0.0016111	8.8037	41.5637	184.2267	261.1860
D.626	**—**	**OPS 8701 debris (DSP F10 IR Sensor telescope sunshade cover)**					**PM**
KIAM	EGO (0.07)	2015-11-10	00:00:00.000	3.35	-258.545	-2176.285	1659.195
UU023	J2000	41905.628	0.0457633	14.1140	340.2241	16.5266	168.3280
D.627	**1985-024D**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	10:07:00.142	3.44	-265.498	-326.090	-204.905
15630	TEME	41897.540	0.0015185	14.1647	345.6908	154.9469	260.3997
D.628	**1987-097B**	**Titan 34D stage 3 (Transtage D-14)**					**RB**
KIAM	EGO (-)	2016-01-01	00:00:00.000	3.46	-267.092	-306.408	-227.776
UI029	J2000	41897.081	0.0009384	13.7397	5.5521	174.9120	342.5230

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.629	**1989-069D**	**Titan 34D stage 3 (Transtage D-2)**					**RB**
KIAM	EGO (0.43)	2016-01-01	00:00:00.000	3.49	-269.303	-570.380	31.775
UI088	J2000	41894.870	0.0071865	14.6744	2.5192	244.3556	222.9190
D.630	**1982-019B**	**Titan IIIC stage 3 (Transtage 38)**					**RB**
KIAM	EGO (-)	2016-01-01	00:00:00.000	3.53	-272.321	-310.137	-234.505
UI039	J2000	41891.852	0.0009027	14.1294	341.0714	41.1455	30.6780
D.631	**1982-093F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	01:54:06.550	3.53	-272.623	-297.118	-248.128
14115	TEME	41890.931	0.0009250	13.5299	336.5633	209.2503	248.6552
D.632	**1995-011D**	**Himawari 5 (GMS 5) AKM (Star 27)**					**PM**
TLEs	EGO (0.14)	2015-12-30	19:38:14.907	3.54	-273.169	-1238.820	692.483
23524	TEME	41891.459	0.0228056	13.8875	22.4889	268.8413	344.3058
D.633	**—**	**USA 75 debris (DSP F16 IR Sensor telescope sunshade cover)**					**PM**
KIAM	EGO (0.44)	2015-11-10	00:00:00.000	3.55	-274.396	-660.452	111.660
UU052	J2000	41889.777	0.0092160	14.4451	17.9259	296.8024	168.8350
D.634	**1995-038C**	**IABS**					**RB**
KIAM	EGO (0.20)	2016-01-01	00:00:00.000	3.56	-275.068	-367.567	-182.568
UI022	J2000	41889.105	0.0022082	14.4597	20.5847	208.9447	30.5780
D.635	**1984-090F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	06:01:58.486	3.57	-275.377	-345.534	-205.221
17875	TEME	41889.361	0.0012594	13.9969	343.7054	67.7453	309.8527
D.636	**1991-080D**	**IUS second stage**					**RB**
KIAM	EGO (0.20)	2016-01-01	00:00:00.000	3.61	-279.109	-376.131	-182.086
UI078	J2000	41885.064	0.0023164	14.6447	18.1045	245.0075	68.9730
D.637	**1977-092G**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	12:36:14.071	3.63	-280.542	-326.005	-235.080
11571	TEME	41882.657	0.0006775	11.8826	321.1542	70.2145	245.9090
D.638	**1989-046D**	**IUS second stage**					**RB**
KIAM	EGO (0.36)	2016-01-01	00:00:00.000	3.70	-285.351	-477.826	-92.876
UI080	J2000	41878.822	0.0045960	14.2053	11.9959	267.1158	77.0350
D.639	**1981-025C**	**Titan IIIC stage 3 (Transtage 40)**					**RB**
KIAM	EGO (0.37)	2016-01-01	00:00:00.000	3.81	-294.127	-525.836	-62.418
UI040	J2000	41870.046	0.0055340	13.5625	338.0627	215.9692	128.0800
D.640	**1979-015D**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-30	01:13:42.214	3.84	-296.455	-334.415	-258.496
13900	TEME	41867.577	0.0011806	12.4919	325.0740	216.2282	31.5367
D.641	**1980-104E**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (0.20)	2015-12-31	04:12:06.116	3.84	-296.553	-427.428	-165.678
12471	TEME	41868.536	0.0028413	13.1626	330.7771	92.4986	3.1796
D.642	**2004-042C**	**Fengyun 2C AKM (FG-36)**					**PM**
TLEs	EGO (0.12)	2015-12-31	04:31:13.387	3.85	-296.899	-392.380	-201.417
28491	TEME	41867.933	0.0024820	8.2760	46.0042	233.8024	22.4607
D.643	**1976-023K**	**LES 8, LES 9 operational debris**					**PM**
TLEs	EGO (-)	2015-12-30	23:58:05.730	3.85	-297.221	-313.875	-280.566
13753	TEME	41866.706	0.0004953	12.7900	327.1208	267.6319	44.9301

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.644	**1989-053A**	**Olympus 1**					**PL**
TLEs	EGO (-)	2015-12-31	05:49:47.280	3.95	-304.678	-364.376	-244.980
20122	TEME	41858.628	0.0018675	14.8115	9.2019	237.5579	238.7076
D.645	**1986-038D**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	21:03:41.857	3.95	-305.049	-393.370	-216.727
16732	TEME	41858.901	0.0018049	14.1994	349.5187	83.6266	103.7004
D.646	**1987-073D**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-30	22:06:27.404	3.99	-308.126	-380.329	-235.924
18331	TEME	41855.378	0.0013184	14.3248	354.6247	58.0470	85.1504
D.647	**1968-081P**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.41)	2015-12-31	15:43:25.841	4.04	-311.547	-684.178	61.085
33513	TEME	41853.949	0.0094571	6.6522	316.2860	311.5582	160.9854
D.648	**1984-028F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	07:48:10.627	4.16	-320.542	-404.917	-236.167
15139	TEME	41844.579	0.0020730	13.7060	339.7296	299.4588	154.6125
D.649	**1976-107F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-30	21:22:33.016	4.26	-328.866	-375.340	-282.392
11569	TEME	41834.558	0.0007378	11.2385	318.0656	91.4813	88.5088
D.650	**1968-081X**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.12)	2015-12-30	21:00:43.053	4.32	-333.213	-1451.020	784.594
38697	TEME	41830.606	0.0267869	5.1795	329.7753	352.4312	275.7175
D.651	**—**	**OPS 7641 debris (DSP F11 IR Sensor telescope sunshade cover)**					**PM**
KIAM	EGO (0.36)	2016-02-10	00:00:00.000	4.46	-343.938	-683.610	-4.266
UU028	J2000	41820.235	0.0081222	14.4658	346.9772	33.8707	183.1360
D.652	**1988-108D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	13:31:17.920	4.47	-344.303	-408.946	-279.660
19686	TEME	41819.353	0.0013945	14.6828	3.0921	110.7763	53.0766
D.653	**2012-035E**	**Meteosat 10 (MSG 3) operational debris (SEVIRI Cooler Cover)**					**PM**
TLEs	EGO (0.11)	2015-12-29	07:27:59.306	4.47	-344.543	-493.295	-195.790
40871	TEME	41818.978	0.0036822	1.1525	110.1217	175.1791	241.2867
D.654	**1968-081E**	**Titan IIIC stage 3 (Transtage 5)**					**RB**
TLEs	EGO (0.39)	2015-12-31	19:05:03.295	4.48	-345.257	-744.515	54.000
3432	TEME	41818.328	0.0101168	6.7138	316.0994	303.7277	56.9117
D.655	**2015-034E**	**Meteosat 11 (MSG 4) operational debris (SEVIRI Cooler Cover)**					**PM**
TLEs	EGO (0.08)	2015-12-28	13:20:15.364	4.49	-345.943	-491.616	-200.270
40989	TEME	41818.719	0.0035887	2.8519	260.8272	25.0514	324.5322
D.656	**1979-007A**	**SCATHA (P78-2)**					**PL**
TLEs	EGO (-)	2015-12-30	18:30:33.486	4.52	-348.127	-7892.996	7196.742
11256	TEME	41815.885	0.1792039	17.6639	334.8704	8.5249	121.8884
D.657	**1968-081A**	**OV2-5 (DG7-2)**					**PL**
TLEs	EGO (0.36)	2015-12-31	06:37:01.025	4.62	-356.212	-700.914	-11.510
3428	TEME	41807.462	0.0087440	6.6704	316.1978	309.3655	276.3169
D.658	**1979-007C**	**SCATHA AKM (FW-5)**					**PM**
TLEs	EGO (-)	2015-12-31	11:52:12.825	4.74	-364.833	-7821.024	7091.357
29000	TEME	41799.972	0.1772625	17.6003	334.9208	8.3174	150.6547

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.659	**1980-060F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-30	16:48:57.330	4.80	-369.325	-443.927	-294.723
14193	TEME	41794.956	0.0019959	12.9281	328.8605	184.9081	24.6668
D.660	**1992-037C**	**IABS**					**RB**
KIAM	EGO (-)	2016-01-01	00:00:00.000	4.94	-380.102	-465.032	-295.172
UI085	J2000	41784.071	0.0020326	14.6397	9.2680	333.4721	228.6970
D.661	**1968-081H**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.28)	2015-12-31	14:05:21.361	5.15	-396.216	-695.142	-97.290
25001	TEME	41768.704	0.0071864	6.6025	315.5560	2.2101	253.7009
D.662	**1970-069B**	**Atlas SLV-3A stage 2 (Agena D)**					**RB**
KIAM	EGO (0.02)	2016-01-01	00:00:00.000	5.15	-396.318	-6192.548	5399.912
UI145	J2000	41767.855	0.1387725	12.1524	247.5555	23.3627	234.6680
D.663	**1968-063B**	**Atlas SLV-3A stage 2 (Agena D)**					**RB**
KIAM	EGO (0.03)	2016-01-01	00:00:00.000	5.39	-414.706	-5036.501	4207.089
UI055	J2000	41749.467	0.1107031	12.9037	323.0643	140.9525	136.0780
D.664	**1968-081L**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.28)	2015-12-17	09:23:05.822	5.63	-432.604	-712.652	-152.557
33510	TEME	41732.591	0.0085183	6.6005	315.4047	328.0466	268.8932
D.665	**—**	**—**					**—**
KIAM	EGO (0.16)	2016-01-01	00:00:00.000	5.85	-449.367	-1403.305	504.571
UI031	J2000	41714.806	0.0228681	4.7878	312.7069	265.2280	278.1350
D.666	**1975-100F**	**GOES 1 AKM (SVM-5)**					**PM**
TLEs	EGO (0.11)	2015-12-31	02:26:51.841	5.97	-458.530	-1652.813	735.753
20962	TEME	41706.109	0.0294751	10.8376	315.8527	322.4207	339.5286
D.667^{m}	**2002-040F**	**Meteosat 8 (MSG 1) operational debris (SEVIRI Ent. Ba. Cov.)**					**PM**
TLEs	EGO (0.06)	2015-12-30	07:05:35.025	5.98	-459.361	-723.794	-194.927
39999	TEME	41704.812	0.0063406	8.7269	40.8984	46.0497	134.5270
D.668	**1974-039A**	**ATS 6**					**PL**
TLEs	EGO (-)	2015-12-31	02:26:21.547	6.14	-471.730	-598.742	-344.718
7318	TEME	41693.087	0.0031687	10.4715	314.6315	211.2491	324.9325
D.669	**1968-081AF**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.14)	2015-12-31	22:51:56.861	6.38	-489.748	-1495.616	516.119
38705	TEME	41673.505	0.0249458	5.3905	312.8611	64.3178	229.9847
D.670	**1968-081K**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (-)	2015-12-31	12:45:10.703	6.44	-494.127	-706.977	-281.277
33509	TEME	41669.113	0.0060315	6.7175	314.9681	21.9292	141.0727
D.671	**1975-055B**	**Atlas SLV-3A stage 2 (Agena D)**					**RB**
KIAM	EGO (-)	2016-01-01	00:00:00.000	6.53	-501.059	-6073.538	5071.420
UI103	J2000	41663.114	0.1337509	17.9478	310.3234	0.3605	108.5680
D.672	**2008-066C**	**Fengyun 2E AKM (FG-36)**					**PM**
TLEs	EGO (-)	2015-12-31	20:22:14.296	6.55	-502.711	-652.140	-353.283
33465	TEME	41661.763	0.0037791	2.7864	59.6373	229.7339	13.9049
D.673	**1993-046C**	**IABS**					**RB**
KIAM	EGO (0.13)	2016-01-01	00:00:00.000	6.68	-512.212	-850.038	-174.385
UI028	J2000	41651.961	0.0081107	14.5373	12.7114	34.3600	110.2220

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.674	**1968-081AC**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.21)	2015-12-31	02:33:47.325	6.95	-532.848	-1343.060	277.365
38702	TEME	41631.709	0.0203023	7.4622	315.4753	46.2160	177.9177
D.675	**1968-081AE**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.23)	2015-12-31	22:30:51.452	6.96	-533.177	-1305.190	238.835
38704	TEME	41631.070	0.0194413	4.4421	310.2340	272.3590	232.7011
D.676	**2005-049F**	**Meteosat 9 (MSG 2) operational debris (SEVIRI Ent. Ba. Cov.)**					**PM**
TLEs	EGO (-)	2015-12-29	14:08:35.911	7.05	-539.825	-709.585	-370.064
29676	TEME	41624.877	0.0045218	6.9267	59.5476	299.5560	167.0719
D.677	**1970-055A**	**Intelsat III F-8**					**PL**
TLEs	EGO (0.10)	2015-12-31	05:09:17.606	7.16	-548.835	-1976.740	879.070
4478	TEME	41615.168	0.0346835	3.2579	297.9443	173.6114	295.0623
D.678	**1972-101B**	**Atlas SLV-3A stage 2 (Agena D)**					**RB**
KIAM	EGO (0.01)	2016-01-01	00:00:00.000	7.34	-562.358	-5835.500	4710.784
UI059	J2000	41601.815	0.1267527	16.6342	304.4618	33.7310	270.7020
D.679	**1977-038C**	**Atlas SLV-3A stage 2 (Agena D)**					**RB**
KIAM	EGO (0.02)	2016-01-01	00:00:00.000	7.40	-566.736	-6817.828	5684.356
UI082	J2000	41597.437	0.1502759	11.1220	351.3577	87.3484	278.3480
D.680	**1997-049A**	**Eutelsat W75 (ABS 1B, Eurobird 10, Eurobird 4, Hot Bird 3)**					**PL**
TLEs	EGO (-)	2015-12-31	13:25:24.765	7.94	-607.297	-705.925	-508.669
24931	TEME	41557.400	0.0022394	5.4169	57.7705	298.0921	178.8992
D.681	**2015-034F**	**Meteosat 11 (MSG 4) operational debris (SEVIRI Ent. Ba. Cov)**					**PM**
TLEs	EGO (-)	2015-12-28	18:03:16.161	8.57	-654.210	-978.173	-330.247
40990	TEME	41509.690	0.0076391	2.8483	261.2120	309.8796	253.9633
D.682	**1968-081AA**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (0.06)	2015-12-31	05:10:49.706	8.84	-674.505	-1144.698	-204.313
38700	TEME	41489.663	0.0116176	6.2397	312.7496	253.9660	211.8375
D.683	**2011-001B**	**Zenit-3SLBF third stage (Fregat-SB)**					**RB**
TLEs	EGO (0.21)	2015-12-31	12:31:05.462	9.09	-693.234	-1310.745	-75.723
37345	TEME	41470.230	0.0150989	3.2372	64.4162	340.7575	282.0108
D.684	**1968-081T**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (-)	2015-12-24	00:05:01.386	9.18	-699.703	-1144.459	-254.947
38693	TEME	41464.416	0.0108181	5.4849	311.3054	248.6295	217.9808
D.685	**1997-029C**	**Fengyun 2A AKM (FG-36)**					**PM**
TLEs	EGO (0.31)	2015-12-27	11:15:12.653	9.37	-714.534	-1620.005	190.936
25611	TEME	41449.560	0.0215566	13.1297	29.3093	331.5270	296.9255
D.686	**2015-074B**	**Zenit-3SLBF third stage (Fregat-SB)**					**RB**
TLEs	EGO (0.26)	2015-12-31	01:38:30.246	9.44	-719.227	-1472.828	34.375
41106	TEME	41444.425	0.0181907	0.4736	273.5014	71.5707	236.1912
D.687	**1987-040D**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	15:58:23.295	9.88	-752.204	-812.925	-691.483
17972	TEME	41412.537	0.0018800	13.5813	346.0657	214.2235	189.4742
D.688	**1985-007D**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	16:13:35.806	9.90	-753.480	-818.636	-688.325
15487	TEME	41411.183	0.0019080	13.4137	347.3775	196.3664	143.6507

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.689	**1989-052D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	23:54:37.321	10.04	-763.806	-891.369	-636.242
20110	TEME	41400.350	0.0033789	14.0017	3.9782	170.7387	82.0487
D.690	**2012-034B**	**Delta 4 second stage (Delta 360, DCSS-5 F09)**					**RB**
KIAM	EGO (0.21)	2016-01-01	00:00:00.000	10.34	-786.348	-1529.725	-42.970
UI174	J2000	41377.825	0.0179656	1.4540	315.9190	207.9443	45.1190
D.691	**1993-072D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-23	12:11:13.570	10.41	-791.630	-872.219	-711.040
22910	TEME	41372.469	0.0016353	13.7495	18.9186	71.4420	280.2807
D.692	**1984-063F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (-)	2015-12-31	10:51:47.389	10.86	-824.776	-896.861	-752.691
15693	TEME	41339.615	0.0018665	13.2099	343.8094	159.5142	301.0684
D.693	**1987-100D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-30	07:37:21.072	11.25	-854.121	-919.825	-788.417
18634	TEME	41310.552	0.0018019	14.1951	357.0767	165.6745	328.7916
D.694	**1991-014D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	06:01:04.224	11.37	-862.741	-967.410	-758.073
21135	TEME	41302.013	0.0021606	14.5838	9.0757	40.6977	18.4649
D.695	**1968-081U**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (-)	2015-12-30	20:04:37.720	11.64	-882.839	-1247.276	-518.402
38694	TEME	41280.397	0.0082960	6.6039	311.4833	126.5848	271.5168
D.696	**2001-015A**	**GSAT 1**					**PL**
TLEs	EGO (0.22)	2015-12-31	16:43:03.035	12.78	-966.445	-1897.132	-35.758
26745	TEME	41197.612	0.0239453	10.6239	36.5161	191.1070	48.4018
D.697	**1994-030D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	EGO (-)	2015-12-31	16:47:08.040	12.84	-971.176	-1164.759	-777.593
23111	TEME	41193.372	0.0044735	13.5592	19.3342	86.3528	20.2128
D.698	**1969-036B**	**Atlas SLV-3A stage 2 (Agena D)**					**RB**
KIAM	EGO (0.03)	2016-01-01	00:00:00.000	12.89	-974.461	-5218.875	3269.954
UI012	J2000	41189.712	0.1030455	8.3270	68.9902	136.6909	124.6090
D.699	**2008-003B**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (-)	2015-12-31	19:05:08.564	13.43	-1014.119	-1767.470	-260.768
32479	TEME	41149.745	0.0187984	6.0547	53.8538	141.2796	59.5479
D.700	**2006-024C**	**USA 189 (NRL POTV)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	13.51	-1019.899	-1043.870	-995.928
UI140	J2000	41144.274	0.0005826	7.2700	48.8611	137.8343	238.0460
D.701	**2010-063B**	**Delta 4 second stage (Delta 351, DCSS-5 F05)**					**RB**
KIAM	EGO (0.18)	2016-01-01	00:00:00.000	13.54	-1022.567	-1983.602	-61.532
UI161	J2000	41141.606	0.0233592	3.4831	213.8130	226.8653	197.7600
D.702	**2010-002B**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (0.11)	2015-12-31	09:09:37.780	13.57	-1024.451	-1850.279	-198.623
36359	TEME	41139.536	0.0211916	4.4287	64.3208	157.8733	255.2998
D.703	**2013-062B**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (0.19)	2015-12-31	03:28:19.348	14.16	-1068.049	-2115.376	-20.722
39376	TEME	41096.009	0.0252571	1.5028	82.2983	11.1403	290.3137

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.704	**2011-048B**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (0.14)	2015-12-31	16:03:56.611	14.36	-1082.641	-2041.417	-123.866
37807	TEME	41081.771	0.0235415	3.0132	67.6087	349.9983	190.2415
D.705	**1968-081Y**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (-)	2015-12-30	03:16:44.234	14.82	-1115.935	-1731.546	-500.324
38698	TEME	41047.942	0.0161035	4.9151	306.2858	261.8458	159.0534
D.706	**2007-058C**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (0.09)	2015-12-31	09:07:20.127	14.96	-1126.031	-2111.470	-140.592
32375	TEME	41038.248	0.0235302	6.2696	52.5878	115.7455	195.2944
D.707	**2015-075B**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (0.16)	2015-12-31	18:34:47.248	15.76	-1184.470	-2285.234	-83.706
41122	TEME	40979.694	0.0273030	0.1494	139.6459	0.4781	341.4344
D.708	**1997-027B**	**INSAT 2D**					**PL**
TLEs	EGO (0.23)	2015-12-31	12:32:16.253	16.26	-1220.782	-2534.614	93.050
24820	TEME	40942.788	0.0323239	13.1869	22.6615	19.5595	102.7869
D.709	**1968-081AD**	**Titan IIIC stage 3 fragmentation debris**					**RD**
TLEs	EGO (-)	2015-12-31	04:49:49.466	18.54	-1384.263	-2440.708	-327.819
38703	TEME	40780.173	0.0257943	5.5956	305.1554	133.8636	189.4999
D.710	**1968-050J**	**Titan IIIC stage 3 (Transtage 16)**					**RB**
TLEs	EGO (-)	2015-12-31	04:12:08.749	19.16	-1428.889	-2132.574	-725.204
3292	TEME	40735.614	0.0162704	0.9953	2.3880	338.2969	4.3065
D.711	**1966-053J**	**Titan IIIC stage 3 (Transtage 11)**					**RB**
TLEs	EGO (-)	2015-12-31	22:53:02.932	23.21	-1715.585	-2397.272	-1033.897
2222	TEME	40448.567	0.0162060	1.4325	49.8760	87.5903	24.3799
D.712	**1968-050H**	**OPS 9348 (IDSCS 27)**					**PL**
TLEs	EGO (-)	2015-12-30	05:13:05.321	23.38	-1727.377	-2048.864	-1405.889
3291	TEME	40436.674	0.0079130	1.2797	331.7663	139.0992	254.4171
D.713	**1966-053H**	**OPS 9317 (IDSCS 7)**					**PL**
TLEs	EGO (-)	2015-12-31	10:09:38.206	23.75	-1753.257	-2086.575	-1419.939
2221	TEME	40410.862	0.0078899	1.5605	50.0425	92.2939	228.2277
D.714	**1968-050G**	**OPS 9347 (IDSCS 26)**					**PL**
TLEs	EGO (-)	2015-12-29	23:16:01.962	24.34	-1794.986	-2051.433	-1538.540
3290	TEME	40369.125	0.0062882	1.2385	336.1323	136.6841	102.7759
D.715	**1966-053G**	**OPS 9316 (IDSCS 6)**					**PL**
TLEs	EGO (-)	2015-12-31	08:47:43.204	24.78	-1825.389	-2090.245	-1560.533
2220	TEME	40338.913	0.0062809	1.6711	51.2278	97.9470	190.6990
D.716	**1967-003H**	**OPS 9328 (IDSCS 15)**					**PL**
TLEs	EGO (-)	2015-12-31	01:36:09.590	25.04	-1843.763	-2127.402	-1560.124
2655	TEME	40320.278	0.0065955	1.3560	38.0485	331.1176	263.1643
D.717	**1968-050F**	**OPS 9346 (IDSCS 25)**					**PL**
TLEs	EGO (-)	2015-12-30	16:56:16.662	25.25	-1858.232	-2051.287	-1665.178
3289	TEME	40305.897	0.0046934	1.1566	342.4765	132.9749	40.4337
D.718	**1966-053F**	**OPS 9315 (IDSCS 5)**					**PL**
TLEs	EGO (-)	2015-12-21	09:06:03.663	25.65	-1886.040	-2095.064	-1677.015
2219	TEME	40278.045	0.0050270	1.7834	53.4950	104.4544	228.5117

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.719	**1968-050E**	**OPS 9345 (IDSCS 24)**					**PL**
TLEs	EGO (-)	2015-12-31	11:48:18.578	25.94	-1905.918	-2054.147	-1757.690
3288	TEME	40258.177	0.0035546	1.1513	345.7142	131.9552	103.4442
D.720	**1967-003G**	**OPS 9327 (IDSCS 14)**					**PL**
TLEs	EGO (-)	2015-12-26	05:33:11.334	26.05	-1914.129	-2137.170	-1691.087
2654	TEME	40249.920	0.0052015	1.4403	42.7137	338.0638	242.8462
D.721	**1966-053E**	**OPS 9314 (IDSCS 4)**					**PL**
TLEs	EGO (-)	2015-12-26	09:01:07.364	26.32	-1932.565	-2100.055	-1765.074
2218	TEME	40231.489	0.0041117	1.8564	53.6968	113.5588	250.8387
D.722	**1968-050D**	**OPS 9344 (IDSCS 23)**					**PL**
TLEs	EGO (-)	2015-12-31	13:40:40.883	26.52	-1946.306	-2052.852	-1839.759
3287	TEME	40218.044	0.0025453	1.1076	350.9056	131.5234	149.3977
D.723	**1967-003F**	**OPS 9326 (IDSCS 13)**					**PL**
TLEs	EGO (-)	2015-12-31	10:35:20.665	26.91	-1973.367	-2150.614	-1796.119
2653	TEME	40190.832	0.0041813	1.5524	44.1942	350.9836	211.1655
D.724	**1966-053D**	**OPS 9313 (IDSCS 3)**					**PL**
TLEs	EGO (-)	2015-12-30	08:33:04.134	26.93	-1974.772	-2110.788	-1838.756
2217	TEME	40189.299	0.0034231	1.9620	55.3709	124.8354	243.1570
D.725	**1968-050C**	**OPS 9343 (IDSCS 22)**					**PL**
TLEs	EGO (-)	2015-12-31	02:00:18.949	26.94	-1975.502	-2053.505	-1897.499
3286	TEME	40188.570	0.0018476	1.0978	353.8092	133.1763	272.0165
D.726	**1968-050B**	**OPS 9342 (IDSCS 21)**					**PL**
TLEs	EGO (-)	2015-12-31	07:31:46.266	27.16	-1990.796	-2054.773	-1926.820
3285	TEME	40173.587	0.0014919	1.0944	355.3656	135.9246	166.5336
D.727	**1966-053C**	**OPS 9312 (IDSCS 2)**					**PL**
TLEs	EGO (-)	2015-12-24	05:03:09.940	27.28	-1998.659	-2118.807	-1878.511
2216	TEME	40165.497	0.0031210	1.9973	55.6873	133.3539	219.7506
D.728	**1968-050A**	**OPS 9341 (IDSCS 20)**					**PL**
TLEs	EGO (-)	2015-12-31	12:05:12.653	27.29	-1999.519	-2056.639	-1942.400
3284	TEME	40164.706	0.0013117	1.1132	354.7061	136.9108	204.3171
D.729	**1966-053B**	**OPS 9311 (IDSCS 1)**					**PL**
TLEs	EGO (-)	2015-12-30	06:54:44.380	27.49	-2013.128	-2132.013	-1894.243
2215	TEME	40150.863	0.0029781	2.0346	55.9833	139.6380	245.9414
D.730	**1967-003E**	**OPS 9325 (IDSCS 12)**					**PL**
TLEs	EGO (-)	2015-12-23	11:14:16.323	27.61	-2021.571	-2175.342	-1867.800
2652	TEME	40142.460	0.0036394	1.6106	47.0002	4.8732	250.2601
D.731	**1966-053A**	**GGTS 1**					**PL**
TLEs	EGO (-)	2015-12-31	16:37:13.871	27.74	-2030.287	-2135.941	-1924.633
2207	TEME	40133.656	0.0029195	2.0526	55.4708	153.6349	128.3708
D.732	**1967-003D**	**OPS 9324 (IDSCS 11)**					**PL**
TLEs	EGO (-)	2015-12-23	09:32:10.766	28.19	-2061.738	-2204.331	-1919.146
2651	TEME	40102.338	0.0033947	1.6866	47.0951	21.4829	238.0353
D.733	**1967-003C**	**OPS 9323 (IDSCS 10)**					**PL**
TLEs	EGO (-)	2015-12-30	16:06:15.715	28.61	-2090.573	-2232.822	-1948.324
2650	TEME	40073.562	0.0034006	1.7452	48.1394	33.3886	41.1660

D.nn	COSPAR	Name					Type
Source	Orbit (f^{GEO}_{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.734	**1967-003B**	**OPS 9322 (IDSCS 9)**					**PL**
TLEs	EGO (-)	2015-12-30	04:17:54.528	28.83	-2105.361	-2247.845	-1962.877
2649	TEME	40058.745	0.0034647	1.7699	48.5352	39.3935	280.3154
D.735	**1967-003A**	**OPS 9321 (IDSCS 8)**					**PL**
TLEs	EGO (-)	2015-12-26	00:40:16.875	28.96	-2113.992	-2260.993	-1966.992
2645	TEME	40050.044	0.0035516	1.7724	49.8954	41.1693	255.3147
D.736	**1967-066G**	**Titan IIIC stage 3 (Transtage 14)**					**RB**
TLEs	EGO (-)	2015-12-30	10:33:19.658	31.08	-2258.725	-2565.992	-1951.459
2868	TEME	39905.474	0.0077846	6.2547	302.9323	253.6259	318.6927
D.737	**1967-066F**	**DODGE 1**					**PL**
TLEs	EGO (-)	2015-12-31	09:09:35.805	32.02	-2322.442	-2521.534	-2123.349
2867	TEME	39841.687	0.0052833	6.1510	301.9137	274.7897	254.1916
D.738	**1967-066E**	**LES 5**					**PL**
TLEs	EGO (-)	2015-12-29	22:14:29.717	32.92	-2383.495	-2587.276	-2179.714
2866	TEME	39780.635	0.0056030	6.0166	301.2921	294.4004	43.2392
D.739	**1967-066D**	**OPS 9334 (IDSCS 19, DATS)**					**PL**
TLEs	EGO (-)	2015-12-31	07:15:28.573	33.66	-2433.018	-2647.494	-2218.541
2865	TEME	39731.213	0.0058282	5.9142	300.7256	305.7730	204.1144
D.740	**1967-066C**	**OPS 9333 (IDSCS 18)**					**PL**
TLEs	EGO (-)	2015-12-26	03:15:06.608	34.24	-2472.021	-2705.322	-2238.720
2864	TEME	39692.048	0.0063462	5.8783	300.2787	315.0517	251.1318
D.741	**1967-066B**	**OPS 9332 (IDSCS 17)**					**PL**
TLEs	EGO (-)	2015-12-31	03:51:49.491	34.64	-2498.762	-2748.955	-2248.569
2863	TEME	39665.429	0.0067607	5.7770	299.9864	320.8321	305.6383
D.742	**1967-066A**	**OPS 9331 (IDSCS 16)**					**PL**
TLEs	EGO (-)	2015-12-31	21:02:50.087	34.85	-2512.806	-2769.213	-2256.400
2862	TEME	39651.241	0.0069292	5.7851	299.7312	323.5492	86.8217
D.743	**1992-006C**	**IABS**					**RB**
KIAM	EGO (0.01)	2016-01-01	00:00:00.000	37.83	-2710.333	-5221.380	-199.285
UI132	J2000	39453.840	0.0636452	11.3615	0.5050	340.2067	118.1520
D.744	**2014-082B**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (-)	2015-12-31	16:57:23.317	39.82	-2841.146	-5293.517	-388.775
40346	TEME	39323.041	0.0620667	1.0123	109.0260	46.7220	113.7753
D.745	**2012-061D**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (0.12)	2015-12-31	20:57:14.229	43.96	-3109.737	-6223.597	4.124
38980	TEME	39054.471	0.0795411	2.6263	69.1987	19.6776	14.6747
D.746	**2011-035D**	**Proton-M/Briz-M fourth stage (Briz-M)**					**RB**
TLEs	EGO (-)	2015-12-31	05:17:34.390	44.78	-3162.252	-6000.259	-324.245
37751	TEME	39001.852	0.0733310	3.3368	68.2102	309.1956	288.5247
D.747	**1974-033F**	**SMS 1 AKM (SVM-5)**					**PM**
TLEs	EGO (-)	2015-12-31	19:05:27.006	57.28	-3943.474	-4949.738	-2937.209
9998	TEME	38220.838	0.0251837	2.3295	239.3261	129.2812	67.1983

4.5 Objects in a Libration Orbit around the Eastern Stable Point

The following list contains 121 objects in libration orbit around the Eastern stable point at longitude 75E, 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 ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.1	**1973-013A**	**OPS 6063 (Rhyolite 2)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	738.09	3.71	73.13	76.84
UI043	J2000	42165.269	0.0022706	9.0223	312.4081	171.9001	75.8260
L1.2	**1993-039A**	**Galaxy IV**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:59:54.496	738.67	6.97	71.50	78.47
22694	TEME	42166.426	0.0015465	13.6897	28.8917	208.4348	76.0989
L1.3	**1990-061A**	**Cosmos-2085**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:59:45.275	739.56	9.98	69.99	79.97
20693	TEME	42167.260	0.0005697	14.9609	10.4154	197.2934	71.8629
L1.4	**2000-036A**	**Cosmos-2371**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:59:45.275	739.62	10.05	69.95	80.00
26394	TEME	42166.457	0.0002814	11.2534	38.3961	146.1267	71.0946
L1.5	**1988-066A**	**Cosmos-1961**					**PL**
TLEs	GEO (1.00)	2015-12-29	00:46:59.734	739.70	10.37	69.79	80.16
19344	TEME	42164.807	0.0000381	14.8710	3.3840	169.9528	80.3592
L1.6	**1994-087A**	**Raduga 32**					**PL**
TLEs	GEO (1.00)	2015-12-30	14:30:05.197	739.72	10.39	69.78	80.17
23448	TEME	42164.319	0.0010035	14.1388	24.8389	181.5105	80.2246
L1.7	**1991-010A**	**Cosmos-2133**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:28:29.704	739.85	10.76	69.60	80.35
21111	TEME	42164.846	0.0003581	14.5340	16.0879	131.2627	80.5748
L1.8	**1984-022A**	**Cosmos-1540**					**PL**
TLEs	GEO (0.82)	2015-12-20	13:03:48.269	739.91	10.95	69.50	80.45
14783	TEME	42161.224	0.0010514	15.6427	344.9312	177.4979	73.2144
L1.9^{m}	**1995-054A**	**Luch 1-1**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:59:52.520	740.00	5.00	72.50	77.50
23680	TEME	42166.189	0.0003386	13.4063	33.6188	67.6850	75.0024
L1.10	**1981-018A**	**Comstar 1D (D-4)**					**PL**
TLEs	GEO (1.00)	2015-12-29	23:28:39.134	740.07	11.32	69.32	80.63
12309	TEME	42166.611	0.0003557	14.5463	347.0062	269.2568	70.4744
L1.11	**2008-033A**	**Cosmos-2440**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:20:17.077	740.13	11.42	69.27	80.68
33108	TEME	42163.216	0.0005938	3.7255	58.4963	169.6115	79.6760
L1.12	**1998-025A**	**Cosmos-2350**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:59:50.544	740.25	11.75	69.10	80.85
25315	TEME	42160.707	0.0004052	11.8226	34.8953	99.7593	73.9167

L1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.13	**1993-062A**	**Raduga 30**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:28:29.704	740.39	12.14	68.90	81.04
22836	TEME	42164.874	0.0006381	14.4970	21.1270	213.3295	81.1796
L1.14	**1990-051A**	**INSAT 1D**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:28:29.704	740.43	12.20	68.87	81.07
20643	TEME	42163.497	0.0013418	13.9110	27.9967	109.3139	81.2832
L1.15	**1984-031A**	**Cosmos-1546**					**PL**
TLEs	GEO (1.00)	2015-12-31	23:44:29.383	741.05	13.58	68.17	81.76
14867	TEME	42168.584	0.0024531	14.5030	347.0565	269.2081	74.3980
L1.16	**1994-069A**	**Elektro 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:31:33.924	741.43	14.33	67.80	82.13
23327	TEME	42160.142	0.0009716	14.5392	23.8602	172.9086	77.5446
L1.17	**1982-044A**	**Cosmos-1366**					**PL**
TLEs	GEO (0.88)	2015-12-31	20:48:36.764	741.47	14.41	67.76	82.17
13177	TEME	42160.252	0.0003065	15.2552	339.3901	340.2043	78.5017
L1.18	**1970-046A**	**OPS 5346 (Rhyolite 1)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	741.55	14.95	67.49	82.44
UI035	J2000	42160.201	0.0004283	6.5985	305.1913	164.9954	79.4150
L1.19	**1983-028A**	**Raduga 12**					**PL**
TLEs	GEO (1.00)	2015-12-29	23:28:39.134	744.82	19.93	64.98	84.91
13974	TEME	42169.575	0.0003367	14.5208	343.5339	237.0591	68.8027
L1.20	**1981-102A**	**Raduga 10**					**PL**
TLEs	GEO (1.00)	2015-12-30	17:41:42.452	745.49	20.84	64.52	85.36
12897	TEME	42158.666	0.0005461	13.9925	335.3042	168.1177	69.7974
L1.21	**1979-035A**	**Raduga 5**					**PL**
TLEs	GEO (1.00)	2015-12-26	22:05:53.323	745.85	21.33	64.27	85.60
11343	TEME	42158.041	0.0002995	13.2959	327.6955	185.6813	78.8249
L1.22	**1975-123A**	**Raduga 1**					**PL**
TLEs	GEO (1.00)	2015-12-30	21:26:37.627	745.96	21.50	64.19	85.68
8513	TEME	42171.573	0.0008241	11.3509	318.3854	176.9702	76.3584
L1.23	**1984-016A**	**Raduga 14**					**PL**
TLEs	GEO (1.00)	2015-12-28	23:09:31.376	747.31	23.17	63.34	86.51
14725	TEME	42157.069	0.0002524	14.4709	346.5371	181.3283	77.2820
L1.24	**1976-092A**	**Raduga 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:44:54.076	747.83	23.78	63.03	86.81
9416	TEME	42163.316	0.0029495	11.9423	320.3027	279.5108	63.4466
L1.25	**2006-053D**	**Fengyun 2D operational debris (S-VISSR radiometer cover?)**					**PD**
TLEs	EGO (0.38)	2015-12-30	16:36:34.075	748.85	24.92	62.46	87.37
33458	TEME	42167.677	0.0084482	4.9854	62.5445	275.5051	64.9549
L1.26^{m}	**1977-080A**	**SIRIO 1**					**PL**
TLEs	GEO (1.00)	2015-12-30	16:12:31.349	750.00	1.50	74.40	75.90
10294	TEME	42164.761	0.0003307	14.1853	338.2045	74.4603	75.8382
L1.27	**1988-014A**	**DFH-2A 2 (Chinasat 1, Zhongxing 1, ZX 1, STTW 2)**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:51:34.549	751.68	27.94	60.92	88.87
18922	TEME	42156.374	0.0003914	14.9926	13.9409	110.6287	81.4302

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
L1.28	**1979-062A**	**Gorizont 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:45:07.439	754.27	30.40	59.68	90.08
11440	TEME	42172.586	0.0007091	13.5576	329.7743	241.1310	66.3308
L1.29	**2003-053B**	**Yamal 200 N1 (Yamal 201)**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:22:54.776	754.92	30.97	59.39	90.36
28094	TEME	42153.612	0.0006178	1.1987	82.3588	184.9556	77.5235
L1.30	**2008-033D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	18:15:29.346	755.38	31.36	59.19	90.55
33111	TEME	42158.646	0.0032564	3.6941	58.5150	243.0502	62.6658
L1.31	**1983-118F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	EGO (0.91)	2015-12-30	19:44:28.318	759.23	34.59	57.55	92.14
14548	TEME	42171.555	0.0047679	14.4265	346.5516	239.7231	61.8708
L1.32	**1997-070A**	**Kupon 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:27:58.839	760.43	35.53	57.07	92.60
25045	TEME	42172.697	0.0007201	13.7567	28.4362	205.4937	86.7992
L1.33	**1988-063A**	**INSAT 1C**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:59:30.126	763.79	38.00	55.81	93.82
19330	TEME	42174.514	0.0001475	14.9909	1.8818	109.5457	64.3484
L1.34	**1985-102A**	**Cosmos-1700**					**PL**
TLEs	GEO (1.00)	2015-12-29	20:03:45.934	765.26	39.06	55.28	94.33
16199	TEME	42156.808	0.0006251	14.6660	353.2111	165.8572	90.4660
L1.35	**1990-054A**	**Gorizont 20**					**PL**
TLEs	GEO (0.96)	2015-12-29	22:01:27.013	772.57	43.80	52.86	96.65
20659	TEME	42157.295	0.0008100	15.0253	10.1914	152.0924	93.8494
L1.36	**1990-112A**	**Raduga 26**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:56:19.941	773.03	44.03	52.74	96.77
21016	TEME	42157.666	0.0000844	14.8978	11.7799	349.4917	55.8538
L1.37	**1984-041A**	**Gorizont 9**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:23:56.245	773.19	44.18	52.66	96.84
14940	TEME	42170.371	0.0008160	14.4832	347.6703	190.2776	94.9835
L1.38	**1976-107A**	**Ekran 1**					**PL**
TLEs	EGO (0.59)	2015-12-30	21:20:39.317	773.36	44.24	52.63	96.87
9503	TEME	42176.250	0.0059706	12.0171	320.6327	69.9729	62.7277
L1.39	**1976-092F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	GEO (1.00)	2015-12-30	23:57:23.038	773.64	44.40	52.55	96.95
17872	TEME	42172.155	0.0012731	11.9174	320.4472	89.7082	56.3256
L1.40	**1979-087A**	**Ekran 4**					**PL**
TLEs	GEO (1.00)	2015-12-29	22:28:56.623	773.74	44.49	52.50	96.99
11561	TEME	42174.686	0.0002056	13.4751	329.1148	31.7815	90.5329
L1.41	**1987-096A**	**Cosmos-1897**					**PL**
TLEs	GEO (1.00)	2015-12-29	23:23:00.072	774.37	44.90	52.30	97.19
18575	TEME	42164.507	0.0000289	14.8529	0.7108	70.6771	97.6158
L1.42	**1990-011A**	**DFH-2A 4 (Chinasat 3, Zhongxing 3, ZX 3, STTW 4)**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:00:22.157	776.05	45.85	51.81	97.66
20473	TEME	42175.409	0.0002460	14.7185	20.9092	118.0363	90.0980

L1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.43	**1980-104A**	**Ekran 6**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:13:56.817	776.55	46.10	51.68	97.78
12120	TEME	42151.763	0.0007138	13.7996	332.6507	296.9104	64.0101
L1.44	**1977-038A**	**OPS 9751 (CANYON 7)**					**PL**
KIAM	EGO (0.02)	2016-01-01	00:00:00.000	778.94	47.16	51.14	98.30
UI086	J2000	42177.378	0.1237180	11.6911	353.0255	39.7221	63.8300
L1.45	**2003-060D**	**Proton-K/DM-2M fourth stage (Blok DM-2M)**					**RB**
TLEs	GEO (1.00)	2015-12-30	14:38:32.708	780.17	48.11	50.65	98.76
28139	TEME	42149.405	0.0018052	9.9249	43.1316	141.7166	72.3784
L1.46	**1992-074A**	**Ekran-M 20**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:00:16.889	781.39	48.81	50.29	99.10
22210	TEME	42151.341	0.0005553	14.6607	18.2617	154.8431	87.5787
L1.47	**1984-016F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	GEO (1.00)	2015-12-31	01:08:22.072	781.42	48.84	50.28	99.12
17874	TEME	42153.926	0.0037743	14.4644	346.5861	128.9496	93.3312
L1.48	**1977-092A**	**Ekran 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:43:47.709	783.26	49.75	49.81	99.56
10365	TEME	42180.044	0.0040221	12.5444	323.1238	262.7256	72.0667
L1.49	**—**	**Fengyun 2G debris (VISSR cover?)**					**PM**
KIAM	GEO (1.00)	2016-02-10	00:00:00.000	783.88	50.13	49.62	99.74
UU074	J2000	42163.750	0.0035202	1.3444	273.9599	315.9189	49.6260
L1.50	**1979-015A**	**Ekran 3**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:02:36.735	784.46	50.44	49.45	99.90
11273	TEME	42162.695	0.0041228	13.1582	327.0551	258.0123	99.3943
L1.51	**1981-061A**	**Ekran 7**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:13:53.717	785.50	50.93	49.20	100.14
12564	TEME	42178.746	0.0003279	13.9271	334.2078	271.9111	63.5262
L1.52	**1994-008A**	**Raduga 1-3**					**PL**
TLEs	GEO (1.00)	2015-12-31	23:52:08.531	786.91	51.68	48.82	100.50
22981	TEME	42169.044	0.0003256	14.4539	22.3425	188.5797	99.8560
L1.53	**1990-116A**	**Raduga 1-2**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:44:38.416	787.12	51.73	48.80	100.52
21038	TEME	42168.660	0.0002416	14.9261	11.9039	56.2210	49.7550
L1.54	**1983-100A**	**Ekran 11**					**PL**
TLEs	GEO (1.00)	2015-12-30	16:12:31.320	792.14	54.24	47.51	101.74
14377	TEME	42181.487	0.0005783	14.2860	341.8168	227.1862	75.9621
L1.55	**1986-010A**	**DFH-2A 1 (STTW 1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	01:26:14.197	797.16	56.46	46.36	102.82
16526	TEME	42165.868	0.0005326	14.8982	357.8379	196.2690	46.4201
L1.56	**1996-058A**	**Ekspress 2 (Ekspress 12L)**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:33:01.120	797.51	56.66	46.26	102.92
24435	TEME	42180.858	0.0009194	13.8103	28.2718	236.8250	85.1120
L1.57	**2001-045D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-30	16:16:01.365	800.61	57.99	45.58	103.56
26939	TEME	42151.966	0.0025386	10.4336	42.6368	281.7649	55.0722

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
L1.58	**2005-010F**	**Proton-K/DM-2M fourth stage (Blok DM-2M)**					**RB**
TLEs	GEO (1.00)	2015-12-31	13:59:43.298	802.52	58.83	45.14	103.97
28634	TEME	42146.584	0.0024703	8.8609	46.3429	176.7124	70.1268
L1.59	**1982-093A**	**Ekran 9**					**PL**
TLEs	GEO (1.00)	2015-12-31	01:19:47.280	806.61	60.51	44.28	104.78
13554	TEME	42167.633	0.0027753	14.0315	338.1862	261.2010	44.5476
L1.60	**1989-098A**	**Raduga 24**					**PL**
TLEs	GEO (0.90)	2015-12-31	02:57:49.946	806.97	60.66	44.20	104.86
20367	TEME	42178.997	0.0004945	15.1846	8.3027	194.9409	56.3674
L1.61	**1994-012A**	**Raduga 31**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:59:36.054	808.00	61.11	43.96	105.08
23010	TEME	42146.332	0.0001294	14.4256	22.3086	171.1695	66.8329
L1.62	**2000-049A**	**Raduga 1-5**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:50:06.874	808.05	61.13	43.95	105.09
26477	TEME	42159.097	0.0002129	11.1416	38.9211	192.9528	45.0336
L1.63	**—**	**Fengyun 2B debris (VISSR cover?)**					**PM**
KIAM	GEO (1.00)	2016-02-10	00:00:00.000	813.08	63.21	42.88	106.09
UU064	J2000	42160.128	0.0020283	11.9171	38.2790	13.9818	105.3450
L1.64^{m}	**2004-042D**	**Fengyun 2C operational debris (S-VISSR radiometer cover?)**					**PM**
TLEs	EGO (0.79)	2015-12-28	13:35:06.991	816.00	62.80	43.40	106.20
40000	TEME	42168.059	0.0050306	8.3991	46.2008	330.7449	105.6325
L1.65^{m}	**2001-037D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	12:32:45.232	820.00	87.00	30.70	117.70
26895	TEME	42171.832	0.0017939	9.5737	42.8424	340.7945	115.5141
L1.66	**1980-016A**	**Raduga 6**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:44:01.029	820.03	65.77	41.56	107.32
11708	TEME	42144.313	0.0005682	13.5093	330.0568	214.1782	76.0864
L1.67	**2007-018A**	**NigComSat 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:20:35.211	822.67	66.71	41.07	107.78
31395	TEME	42152.858	0.0003315	5.7522	57.4336	126.3890	47.7460
L1.68	**1974-060A**	**Molniya 1-S**					**PL**
TLEs	GEO (1.00)	2015-12-30	22:35:12.803	823.15	66.84	41.00	107.84
7392	TEME	42180.849	0.0009606	10.0796	313.6261	165.6123	55.3367
L1.69	**1978-039A**	**Yuri 1 (BSE)**					**PL**
TLEs	GEO (1.00)	2015-12-29	19:31:01.257	824.70	67.45	40.68	108.13
10792	TEME	42145.044	0.0019795	13.3984	328.6119	216.3529	85.3034
L1.70	**—**	**Fengyun 2A debris (VISSR cover?)**					**PM**
KIAM	EGO (0.38)	2016-02-10	00:00:00.000	829.13	68.72	40.03	108.74
UU061	J2000	42179.337	0.0084727	13.7101	30.9430	324.5865	51.7740
L1.71	**1979-105A**	**Gorizont 3**					**PL**
TLEs	GEO (1.00)	2015-12-29	19:40:49.932	831.58	69.84	39.44	109.28
11648	TEME	42143.792	0.0013955	13.6518	330.9552	167.4506	82.2617
L1.72	**1986-044A**	**Gorizont 12**					**PL**
TLEs	GEO (1.00)	2015-12-30	02:31:18.849	831.79	69.85	39.44	109.29
16769	TEME	42175.393	0.0006595	14.7007	355.2585	214.9270	45.2589

L1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.73	**—**	**Fengyun 2F debris (VISSR cover?)**					**PM**
KIAM	EGO (0.28)	2016-02-10	00:00:00.000	839.94	72.79	37.91	110.69
UU071	J2000	42150.399	0.0113245	0.8344	75.3265	200.3344	47.0800
L1.74	**1978-073A**	**Raduga 4**					**PL**
TLEs	GEO (1.00)	2015-12-30	23:57:23.038	842.90	73.51	37.53	111.04
10987	TEME	42145.705	0.0012694	12.9505	325.4321	270.7508	56.4776
L1.75	**1988-111A**	**DFH-2A 3 (Chinasat 2, Zhongxing 2, ZX 2, STTW 3)**					**PL**
TLEs	GEO (1.00)	2015-12-30	23:28:35.416	844.59	74.03	37.26	111.29
19710	TEME	42159.464	0.0004085	14.7609	20.0744	111.1452	110.8182
L1.76	**1975-097A**	**Cosmos-775**					**PL**
TLEs	GEO (1.00)	2015-12-31	20:50:33.148	859.28	78.38	34.99	113.36
8357	TEME	42166.316	0.0007373	10.9860	316.5085	57.8122	113.6485
L1.77	**1989-081A**	**Gorizont 19**					**PL**
TLEs	GEO (1.00)	2015-12-29	22:28:50.958	859.44	78.45	34.95	113.40
20263	TEME	42150.852	0.0007567	14.8784	7.2092	206.3432	105.6463
L1.78	**1999-010A**	**Raduga 1-4**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:00:12.279	859.88	78.57	34.88	113.46
25642	TEME	42141.973	0.0006570	13.5039	37.3630	187.0913	84.4651
L1.79	**1981-069A**	**Raduga 9**					**PL**
TLEs	GEO (1.00)	2015-12-29	12:33:46.039	862.86	79.41	34.44	113.86
12618	TEME	42150.077	0.0002201	13.9601	334.6019	223.2658	105.0985
L1.80	**1977-071A**	**Raduga 3**					**PL**
TLEs	GEO (1.00)	2015-12-30	22:20:42.260	863.13	79.45	34.42	113.88
10159	TEME	42184.421	0.0011028	12.4602	322.5925	190.7212	54.7311
L1.81	**1996-058D**	**Proton-K/DM-2M fourth stage (Blok DM-2M)**					**RB**
TLEs	GEO (1.00)	2015-12-31	14:00:02.399	868.21	80.85	33.69	114.54
24438	TEME	42188.261	0.0005677	14.1706	25.1396	27.3525	79.9419
L1.82	**1994-002A**	**Gals 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:45:09.336	870.18	81.38	33.41	114.79
22963	TEME	42178.785	0.0012402	13.8555	27.8146	142.5552	42.9588
L1.83	**1984-078F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	GEO (1.00)	2015-12-31	01:06:55.575	882.41	84.56	31.74	116.30
15181	TEME	42143.661	0.0022104	14.5416	348.9508	117.6603	53.9592
L1.84	**1997-071B**	**Cakrawatra 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:50:06.874	897.49	87.95	29.95	117.90
25050	TEME	42181.357	0.0004751	8.4755	47.4537	200.4512	43.8683
L1.85	**1989-030A**	**Raduga 23**					**PL**
TLEs	GEO (1.00)	2015-12-30	23:32:27.873	903.31	89.74	29.00	118.74
19928	TEME	42164.208	0.0018891	14.8511	5.6407	110.7777	119.7124
L1.86^{m}	**1991-087A**	**Raduga 28**					**PL**
TLEs	GEO (1.00)	2015-12-30	05:42:19.927	905.00	87.90	30.10	118.00
21821	TEME	42165.856	0.0003141	14.8685	15.2476	113.8941	30.1561
L1.87	**1982-031A**	**INSAT 1A**					**PL**
TLEs	GEO (1.00)	2015-12-30	16:23:31.364	918.57	92.97	27.28	120.25
13129	TEME	42139.134	0.0020750	14.1487	337.7879	303.1101	87.6539

L1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.88	**1974-060F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	GEO (1.00)	2015-12-31	20:50:33.148	925.04	94.34	26.55	120.89
20836	TEME	42150.821	0.0015095	10.0655	313.4004	110.5460	113.4840
L1.89	**1990-061D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	20:35:40.996	936.95	96.70	25.29	121.99
20696	TEME	42168.089	0.0033250	14.9398	10.3646	118.9836	122.4515
L1.90^{m}	**2008-066D**	**Fengyun 2E operational debris (S-VISSR radiometer cover?)**					**PM**
TLEs	EGO (0.29)	2015-12-21	19:13:40.636	954.80	100.40	23.30	123.70
40987	TEME	42134.332	0.0107773	2.9363	59.6933	240.4926	40.8494
L1.91	**1997-021A**	**DFH 3-2 (Chinasat 6, Zhongxing 6, ZX 6)**					**PL**
TLEs	GEO (1.00)	2015-12-30	16:15:21.934	987.37	105.76	20.39	126.15
24798	TEME	42191.210	0.0003965	9.8608	43.1360	36.8240	55.9874
L1.92	**2002-051A**	**Eutelsat 33B (Eutelsat 25C, Eutelsat 70A, Eutelsat W5)**					**PL**
TLEs	GEO (1.00)	2015-12-31	15:12:04.258	998.94	107.80	19.27	127.08
27554	TEME	42137.398	0.0013108	0.2782	94.3505	201.8247	55.2008
L1.93	**1986-090D**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	GEO (1.00)	2015-12-30	13:36:23.034	1001.80	108.04	19.14	127.19
17125	TEME	42190.824	0.0007406	14.7611	356.8713	98.0637	54.1072
L1.94	**1972-101A**	**OPS 9390 (CANYON 5)**					**PL**
KIAM	EGO (-)	2016-01-01	00:00:00.000	1009.43	109.49	18.35	127.84
UI138	J2000	42134.409	0.1354551	17.8556	310.0653	338.0963	80.8660
L1.95	**1991-014A**	**Raduga 27**					**PL**
TLEs	GEO (0.85)	2015-12-31	23:51:39.470	1017.32	110.40	17.85	128.25
21132	TEME	42192.128	0.0002180	15.4394	12.2322	201.6505	92.3770
L1.96	**1984-063A**	**Raduga 15**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:59:01.389	1028.59	111.99	16.97	128.96
15057	TEME	42151.300	0.0003733	14.5128	347.4958	162.2737	25.9995
L1.97	**1975-055A**	**OPS 4966 (CANYON 6)**					**PL**
KIAM	EGO (0.02)	2016-01-01	00:00:00.000	1029.28	112.07	16.92	128.99
UI060	J2000	42168.967	0.1307329	19.0898	315.1649	300.9777	18.2030
L1.98	**2004-010A**	**Raduga 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:05:17.784	1029.82	112.16	16.88	129.03
28194	TEME	42135.175	0.0004550	8.8940	51.4765	155.8835	63.5810
L1.99	**2007-054A**	**USA 197 (DSP F23, DSP Block 5(DSP-1) F23)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	1030.91	112.60	16.63	129.23
UI141	J2000	42134.331	0.0004090	3.0772	77.2731	149.5258	84.7120
L1.100	**1996-040B**	**Turksat 1C**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:00:12.937	1034.88	112.91	16.46	129.37
23949	TEME	42194.522	0.0005956	6.2767	55.0717	132.7474	84.7990
L1.101	**1977-092H**	**Ekran 2 fragmentation debris**					**PD**
TLEs	GEO (1.00)	2015-12-30	21:52:31.675	1038.83	113.46	16.15	129.61
11581	TEME	42175.468	0.0006519	12.4675	322.8539	167.7688	124.9174
L1.102	**2009-018A**	**Beidou DW 2**					**PL**
TLEs	EGO (0.34)	2015-12-30	19:09:01.436	1044.14	114.12	15.78	129.91
34779	TEME	42145.024	0.0092340	4.3830	62.4740	190.7927	36.1600

L1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.103^{m}	**2011-074A**	**AMOS 5**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:47:21.041	1062.00	116.00	17.00	133.00
37950	TEME	42160.531	0.0000189	0.0817	103.8098	220.5672	17.8898
L1.104	**1983-089B**	**INSAT 1B**					**PL**
TLEs	GEO (1.00)	2015-12-30	02:31:37.949	1066.93	117.12	14.10	131.22
14318	TEME	42136.361	0.0011702	14.9482	1.2353	165.8521	55.0709
L1.105	**2003-015F**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-29	23:34:24.628	1069.66	117.43	13.93	131.36
27780	TEME	42161.078	0.0009362	8.2677	47.0082	288.7683	14.9336
L1.106	**1995-054D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-30	12:38:24.078	1096.58	120.69	12.08	132.76
23683	TEME	42140.708	0.0016639	13.3915	33.5851	356.1300	108.4334
L1.107	**2001-037A**	**Cosmos-2379**					**PL**
TLEs	GEO (1.00)	2015-12-31	05:55:50.693	1097.10	120.73	12.06	132.78
26892	TEME	42157.137	0.0006710	9.6075	42.7082	160.5342	15.6012
L1.108	**1993-013A**	**Raduga 29**					**PL**
TLEs	GEO (1.00)	2015-12-31	05:54:33.058	1112.43	122.42	11.08	133.50
22557	TEME	42158.361	0.0001214	14.6468	19.3659	145.1057	12.6427
L1.109	**1977-108A**	**Meteosat 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	01:26:00.381	1116.84	122.89	10.81	133.70
10489	TEME	42194.490	0.0012310	13.1270	326.9339	332.8406	58.4704
L1.110	**1984-035A**	**DFH-2 2 (STTW T2)**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:24:22.468	1129.76	124.28	10.00	134.29
14899	TEME	42134.672	0.0007302	14.5421	352.2615	115.3206	92.8242
L1.111	**1988-095A**	**Raduga 22**					**PL**
TLEs	GEO (1.00)	2015-12-28	21:22:27.535	1137.11	125.02	9.57	134.60
19596	TEME	42164.850	0.0004514	14.8746	4.0052	130.8244	135.4988
L1.112	**1995-063D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-30	19:27:37.999	1163.33	127.56	8.08	135.64
23720	TEME	42169.845	0.0041435	14.4350	22.4442	92.0529	9.2472
L1.113	**1998-029B**	**Titan IVB third stage (Centaur TC-18)**					**RB**
KIAM	EGO (0.90)	2016-01-01	00:00:00.000	1204.57	131.26	5.86	137.12
UI027	J2000	42152.862	0.0046993	10.6588	357.9616	94.3357	130.6700
L1.114	**1990-102A**	**Gorizont 22**					**PL**
TLEs	GEO (1.00)	2015-12-31	11:58:12.940	1295.27	137.75	1.79	139.54
20953	TEME	42196.202	0.0005614	14.8821	11.2444	232.0020	90.8052
L1.115	**1974-094A**	**Skynet 2B**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:27:32.134	1346.83	140.74	359.81	140.55
7547	TEME	42171.326	0.0001445	11.7741	323.7167	253.5499	138.7995
L1.116	**1978-035A**	**Intelsat IVA F-6**					**PL**
TLEs	GEO (1.00)	2015-12-31	23:07:31.819	1414.22	143.92	357.61	141.53
10778	TEME	42172.240	0.0009631	14.5486	347.5812	216.8654	4.3349
L1.117	**1970-032A**	**Intelsat III F-7**					**PL**
TLEs	GEO (1.00)	2015-12-31	22:52:49.854	1456.41	145.58	356.41	141.99
4376	TEME	42187.043	0.0004648	6.6008	302.9482	287.3919	29.8310

L1.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.118	**1993-062D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-30	21:21:40.219	1566.92	148.88	353.89	142.76
22839	TEME	42172.963	0.0007335	14.4677	21.0221	334.8465	3.9048
L1.119	**1992-088A**	**Cosmos-2224**					**PL**
TLEs	GEO (1.00)	2015-12-30	04:05:27.306	1573.96	149.06	353.74	142.80
22269	TEME	42148.717	0.0007372	14.0552	21.1416	191.2761	16.3874
L1.120	**1985-035B**	**Telecom 1B**					**PL**
TLEs	GEO (1.00)	2015-12-30	05:55:18.962	1592.90	149.48	353.40	142.88
15678	TEME	42165.270	0.0004411	14.7861	355.4906	244.3330	349.5368
L1.121^{m}	**1967-026A**	**Intelsat II F-3**					**PL**
TLEs	GEO (1.00)	2015-12-26	02:08:43.262	1743.00	151.80	351.40	143.30
2717	TEME	42165.472	0.0024053	4.7155	306.5074	273.7693	351.7850

4.6 Objects in a Libration Orbit around the Western Stable Point

The following list contains 52 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^{m}	**1985-035A**	**GStar 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	03:47:03.935	800.00	0.30	254.50	254.80
15677	TEME	42164.524	0.0003675	14.4943	23.1574	283.1854	254.6049
L2.2^{m}	**1988-081A**	**GStar 3**					**PL**
TLEs	GEO (0.79)	2015-12-31	14:20:35.852	850.00	0.30	254.50	254.80
19483	TEME	42164.502	0.0003701	15.8659	355.8439	121.4934	254.7576
L2.3^{m}	**1993-058B**	**ACTS**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:44:47.334	890.00	1.20	254.10	255.30
22796	TEME	42164.781	0.0018916	13.6191	29.3830	348.9982	254.4101
L2.4^{m}	**1971-009A**	**NATO IIB**					**PL**
TLEs	GEO (1.00)	2015-12-30	14:36:41.284	900.00	0.90	254.20	255.10
4902	TEME	42164.408	0.0001730	9.8612	312.9533	175.0011	254.7982
L2.5	**1978-062A**	**GOES 3**					**PL**
TLEs	GEO (1.00)	2015-12-31	08:07:07.272	908.10	7.70	250.98	258.68
10953	TEME	42162.462	0.0003676	13.9963	337.0059	202.9115	255.2888
L2.6	**1993-073A**	**Solidaridad 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:09:41.634	908.17	8.00	250.83	258.83
22911	TEME	42162.906	0.0008126	12.3728	34.8750	172.2291	252.2957
L2.7	**1970-021A**	**NATO I**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:51:54.294	908.69	10.17	249.76	259.92
4353	TEME	42163.459	0.0004133	8.9087	315.1592	227.5516	250.2639
L2.8	**1971-095A**	**OPS 9431 (DSCS II F-1, DSCS 2-1, DSCS II A-1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:09:47.001	909.68	13.24	248.23	261.47
5587	TEME	42162.397	0.0006206	10.2775	314.3415	241.0257	259.7282
L2.9^{m}	**1969-101A**	**Skynet 1A**					**PL**
TLEs	GEO (1.00)	2015-12-29	06:20:53.124	910.00	4.10	252.60	256.70
4250	TEME	42163.951	0.0025204	8.3109	311.4855	219.2172	256.1915
L2.10	**1993-077A**	**Telstar 401**					**PL**
TLEs	GEO (1.00)	2015-12-30	02:40:33.060	910.75	15.95	246.89	262.84
22927	TEME	42163.115	0.0004012	14.2646	25.1898	64.9345	246.8364
L2.11^{m}	**1976-023A**	**LES 8**					**PL**
TLEs	GEO (1.00)	2015-12-31	07:07:21.984	912.00	5.70	252.00	257.70
8746	TEME	42165.532	0.0014450	14.7627	92.1474	28.8755	256.9596
L2.12^{m}	**1976-023B**	**LES 9**					**PL**
TLEs	GEO (1.00)	2015-12-31	07:45:25.712	920.00	5.00	252.50	257.50
8747	TEME	42163.877	0.0022063	14.7231	92.1397	69.9369	256.7574

L2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L2.13	**1995-049A**	**Telstar 4 (Telstar 402R)**					**PL**
TLEs	GEO (1.00)	2015-12-31	01:43:58.722	921.55	32.17	238.92	271.09
23670	TEME	42158.011	0.0005859	10.1054	42.2268	214.0101	264.9220
L2.14	**—**	**—**					**—**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	927.02	38.36	235.90	274.26
UI044	J2000	42152.133	0.0040282	14.0654	338.2004	352.0949	59.2440
L2.15	**1985-076C**	**ASC 1**					**PL**
TLEs	GEO (1.00)	2015-12-30	13:53:21.114	936.75	45.85	232.27	278.12
15994	TEME	42152.515	0.0005616	14.8884	17.8874	273.3102	256.5443
L2.16	**1976-004F**	**Hermes (CTS) operational debris (solar array cover)**					**PM**
TLEs	EGO (0.19)	2015-12-18	20:47:14.031	938.22	47.25	231.59	278.84
39689	TEME	42166.371	0.0165073	11.8093	319.5362	308.0975	280.5949
L2.17	**1975-100A**	**GOES 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	08:45:00.202	940.16	48.38	231.04	279.42
8366	TEME	42169.538	0.0006050	12.8145	324.7563	251.6621	232.7364
L2.18	**1976-004E**	**Hermes (CTS) operational debris (solar array cover)**					**PM**
TLEs	GEO (1.00)	2015-12-26	08:59:35.479	941.43	49.19	230.65	279.84
39688	TEME	42152.957	0.0004837	11.7721	319.1049	85.9869	245.2104
L2.19^{m}	**1967-111A**	**ATS 3**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:09:36.463	950.00	0.30	254.60	254.90
3029	TEME	42164.688	0.0013303	5.7435	302.9457	114.0026	254.8592
L2.20^{m}	**1982-105A**	**Aurora I**					**PL**
TLEs	GEO (0.96)	2015-12-30	03:26:05.841	950.00	0.80	254.30	255.10
13631	TEME	42164.430	0.0005652	15.0242	6.6189	264.3987	254.4021
L2.21	**1983-041A**	**GOES 6**					**PL**
TLEs	GEO (1.00)	2015-12-26	02:14:15.390	957.92	59.43	225.72	285.15
14050	TEME	42170.192	0.0004375	14.8065	355.7237	191.3383	227.5536
L2.22	**1995-069A**	**Galaxy IIIR**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:23:12.571	961.74	61.46	224.75	286.21
23741	TEME	42149.187	0.0004920	9.3182	44.7825	200.6866	262.2247
L2.23	**—**	**—**					**—**
KIAM	EGO (0.85)	2016-01-01	00:00:00.000	968.82	65.04	223.04	288.08
UI139	J2000	42170.380	0.0047424	15.0853	11.7659	187.5937	285.4800
L2.24	**—**	**—**					**—**
KIAM	EGO (0.68)	2016-01-01	00:00:00.000	985.09	72.73	219.38	292.10
UI041	J2000	42156.443	0.0054440	13.8016	338.6780	274.5901	108.0340
L2.25	**1977-007C**	**Titan IIIC stage 3 (Transtage 23)**					**RB**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	987.24	73.72	218.90	292.63
UI162	J2000	42152.505	0.0016839	11.8431	319.9705	289.8424	283.6400
L2.26	**1981-049A**	**GOES 5**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:36:35.752	991.87	75.31	218.15	293.46
12472	TEME	42166.571	0.0006214	14.6806	350.8399	220.1649	217.9269
L2.27	**1976-004A**	**Hermes (CTS)**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:36:32.457	1002.67	79.47	216.18	295.65
8585	TEME	42160.079	0.0015442	12.3176	321.8656	177.7144	217.1037

L2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L2.28	**1996-055A**	**EchoStar 2**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:31:05.462	1027.79	88.14	212.10	300.24
24313	TEME	42181.449	0.0001860	6.0044	56.3832	47.5055	282.4920
L2.29	**1968-081D**	**LES 6**					**PL**
TLEs	GEO (1.00)	2015-12-31	03:21:50.625	1033.22	89.98	211.24	301.22
3431	TEME	42157.839	0.0010941	7.3492	316.7706	303.3970	299.0775
L2.30	**1987-100A**	**Raduga 21**					**PL**
TLEs	GEO (0.88)	2015-12-31	12:47:40.767	1094.49	105.77	203.91	309.68
18631	TEME	42184.654	0.0003549	15.2607	0.4763	186.5167	225.9374
L2.31	**1981-107A**	**OPS 4029 (VORTEX 3)**					**PL**
KIAM	EGO (0.03)	2016-01-01	00:00:00.000	1102.46	107.39	203.16	310.56
UI129	J2000	42176.519	0.0907070	7.7740	355.6882	316.3072	210.8320
L2.32	**1965-028A**	**Intelsat I F-1 (Early Bird)**					**PL**
TLEs	GEO (1.00)	2015-12-30	10:32:40.413	1116.37	110.55	201.72	312.27
1317	TEME	42152.788	0.0005001	1.6299	300.2093	220.3768	304.1582
L2.33	**1997-086A**	**HGS-1**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:26:22.864	1275.94	134.94	190.95	325.90
25126	TEME	42166.826	0.0042919	6.8426	63.9790	302.9430	325.9737
L2.34	**1984-078A**	**Gorizont 10**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:32:45.604	1303.85	137.97	189.69	327.67
15144	TEME	42157.601	0.0005293	14.4984	348.6803	229.2041	191.7311
L2.35	**1967-094A**	**Intelsat II F-4**					**PL**
TLEs	GEO (1.00)	2015-12-31	03:37:48.838	1315.17	139.16	189.21	328.36
2969	TEME	42151.960	0.0016659	4.8270	301.3599	226.1055	316.5832
L2.36	**1990-016A**	**Raduga 25**					**PL**
TLEs	GEO (1.00)	2015-12-30	07:40:49.149	1318.90	139.52	189.06	328.58
20499	TEME	42180.496	0.0003695	14.9040	8.6866	191.1274	202.0901
L2.37	**1982-103A**	**Gorizont 6**					**PL**
TLEs	GEO (1.00)	2015-12-31	12:37:53.147	1330.82	140.70	188.58	329.28
13624	TEME	42134.267	0.0004529	14.0979	339.8346	203.1782	251.9541
L2.38	**1985-070A**	**Raduga 16**					**PL**
TLEs	GEO (1.00)	2015-12-31	08:27:39.242	1340.42	141.61	188.22	329.83
15946	TEME	42135.009	0.0004835	14.6137	351.6238	213.6103	268.6810
L2.39	**1980-081A**	**Raduga 7**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:09:41.073	1430.88	148.89	185.43	334.33
12003	TEME	42195.715	0.0013537	13.5925	331.6611	219.9929	256.3211
L2.40	**1994-038A**	**Cosmos-2282**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:20:19.432	1461.70	150.97	184.70	335.66
23168	TEME	42160.925	0.0004780	13.5033	25.4127	17.3445	334.9696
L2.41	**1985-016A**	**Cosmos-1629**					**PL**
TLEs	GEO (1.00)	2015-12-31	07:46:07.959	1479.61	152.04	184.33	336.37
15574	TEME	42168.532	0.0006869	14.5945	349.7913	174.8636	335.2985
L2.42	**1992-059A**	**Cosmos-2209**					**PL**
TLEs	GEO (1.00)	2015-12-31	14:14:07.346	1488.69	152.57	184.15	336.72
22112	TEME	42135.402	0.0009439	14.8095	17.0134	201.0651	232.4609

L2.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f^{\mathrm{GEO}}_{\mathrm{IADC}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L2.43	**1980-004A**	**OPS 6393 (FLTSATCOM F3)**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:52:42.998	1508.29	153.67	183.79	337.46
11669	TEME	42143.173	0.0026538	12.8022	338.9460	154.0123	303.9823
L2.44	**1987-091A**	**Cosmos-1894**					**PL**
TLEs	GEO (1.00)	2015-12-26	09:11:06.580	1511.11	153.82	183.74	337.56
18443	TEME	42137.684	0.0005649	14.7783	359.5439	230.1076	288.5868
L2.45	**1970-069A**	**OPS 7329 (CANYON 3)**					**PL**
KIAM	EGO (0.04)	2016-01-01	00:00:00.000	1544.61	171.70	176.78	348.48
UI157	J2000	42172.289	0.0833478	13.9620	261.5545	309.2588	341.5220
L2.46	**1977-114A**	**OPS 4258 (AQUACADE 3)**					**PL**
KIAM	GEO (0.63)	2016-01-01	00:00:00.000	1604.24	157.99	182.50	340.49
UI146	J2000	42165.781	0.0023518	18.0883	329.8830	261.6645	340.0040
L2.47	**1989-101A**	**Cosmos-2054**					**PL**
TLEs	GEO (1.00)	2015-12-31	10:50:03.976	1610.48	158.21	182.44	340.65
20391	TEME	42181.672	0.0003428	14.8967	8.1898	213.4777	314.6967
L2.48	**1994-082A**	**Luch 1**					**PL**
TLEs	GEO (1.00)	2015-12-31	08:12:53.565	1725.18	161.65	181.63	343.27
23426	TEME	42166.144	0.0004825	13.9016	29.1457	141.2660	180.2657
L2.49	**1994-035A**	**USA 104 (UFO F3)**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	1827.00	167.87	180.61	348.48
UI068	J2000	42166.310	0.0004595	10.4024	31.5661	201.9880	347.8920
L2.50^{m}	**1994-060A**	**Cosmos-2291**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:57:33.447	1981.00	165.70	180.50	346.20
23267	TEME	42161.718	0.0006287	14.2031	23.6353	148.2935	345.2501
L2.51^{m}	**1995-045A**	**Cosmos-2319**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:24:37.746	2032.00	166.30	180.10	346.40
23653	TEME	42136.951	0.0008564	13.8812	26.6395	170.8455	287.1419
L2.52^{m}	**1987-084A**	**Cosmos-1888**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:37:20.886	2252.00	168.00	179.60	347.60
18384	TEME	42146.344	0.0004850	14.7510	359.9169	194.8836	313.7071

4.7 Objects in a Libration Orbit around both Stable Points

The following list contains 17 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 ($f_{\mathrm{IADC}}^{\mathrm{GEO}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L3.1	**1997-083A**	**Intelsat 804**					**PL**
TLEs	GEO (1.00)	2015-12-31	19:04:56.709	2929.02	334.74	174.65	149.39
25110	TEME	42131.699	0.0007507	8.9910	45.8128	216.6793	54.5042
L3.2	**1971-095B**	**OPS 9432 (DSCS II F-2, DSCS 2-2, DSCS II A-2)**					**PL**
TLEs	GEO (1.00)	2015-12-31	01:46:54.049	2929.44	333.96	175.05	149.01
5588	TEME	42155.621	0.0004675	10.2320	314.6406	305.1342	352.7248
L3.3	**1991-054D**	**IUS second stage**					**RB**
TLEs	GEO (0.75)	2015-12-31	19:02:09.854	2930.88	333.97	175.05	149.02
21641	TEME	42174.733	0.0038345	16.3142	10.4141	243.2369	181.8580
L3.4	**1991-064A**	**Cosmos-2155**					**PL**
TLEs	GEO (1.00)	2015-12-31	16:46:55.040	2933.10	333.35	175.36	148.71
21702	TEME	42184.154	0.0004206	14.9194	13.5634	218.8004	20.5125
L3.5$_o$	**1977-092L**	**Ekran 2 fragmentation debris**					**PD**
TLEs	EGO (0.30)	2013-06-23	07:53:28.242	2942.25	331.63	176.25	147.87
33519	TEME	42139.297	0.0103838	13.4654	332.6054	291.6303	302.5828
L3.6	**2012-012D**	**Proton-K/DM-2 fourth stage (Blok DM-2)**					**RB**
TLEs	GEO (1.00)	2015-12-31	13:21:09.333	3096.26	326.23	179.02	145.26
38104	TEME	42174.128	0.0014225	0.6702	44.6234	235.9334	186.6848
L3.7	**1990-094A**	**Gorizont 21**					**PL**
TLEs	GEO (1.00)	2015-12-31	04:26:43.795	3098.27	326.13	179.08	145.21
20923	TEME	42143.160	0.0008684	14.9586	10.9947	186.8279	25.7858
L3.8	**2000-029A**	**Gorizont 33**					**PL**
TLEs	GEO (1.00)	2015-12-31	13:32:01.488	3105.58	326.01	179.14	145.15
26372	TEME	42135.890	0.0002785	11.2629	37.6466	178.1070	105.7433
L3.9	**2012-012A**	**Cosmos-2479**					**PL**
TLEs	GEO (1.00)	2015-12-31	02:26:20.228	3159.04	348.46	167.67	156.13
38101	TEME	42147.279	0.0004381	0.6938	45.9108	219.1634	324.7835
L3.10	**1984-009A**	**OPS 0441 (VORTEX 4)**					**PL**
KIAM	EGO (0.03)	2016-01-01	00:00:00.000	3237.72	324.42	179.96	144.38
UI026	J2000	42138.897	0.1027830	7.7770	352.0968	336.8164	296.7340
L3.11	**1980-060A**	**Ekran 5**					**PL**
KIAM	GEO (1.00)	2016-01-01	00:00:00.000	3432.67	323.40	180.49	143.89
UI098	J2000	42167.390	0.0008320	13.3329	328.8428	126.7334	344.9020
L3.12	**1985-007A**	**Gorizont 11**					**PL**
TLEs	GEO (1.00)	2015-12-31	04:11:51.626	3547.26	323.08	180.65	143.73
15484	TEME	42169.165	0.0003013	14.5196	350.4178	199.3950	355.0377

L3.nn	**COSPAR**	**Name**					**Type**
Source	Orbit (f^{GEO}_{IADC})	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L3.13	**1994-067D**	**Proton-K/DM-2M fourth stage (Blok DM-2M)**					**RB**
TLEs	GEO (1.00)	2015-12-31	07:47:22.985	3634.73	322.92	180.74	143.65
23322	TEME	42167.363	0.0003875	14.7000	19.3165	58.0261	349.3186
L3.14	**1986-027A**	**Cosmos-1738**					**PL**
TLEs	GEO (0.89)	2015-12-31	04:12:07.432	3683.80	322.17	181.13	143.29
16667	TEME	42172.964	0.0008875	15.2143	354.0032	17.1394	3.4866
L3.15	**1994-030A**	**Gorizont 30**					**PL**
TLEs	GEO (1.00)	2015-12-31	06:20:19.432	3815.17	322.30	181.06	143.36
23108	TEME	42171.822	0.0006382	14.3554	22.2955	192.1040	335.7629
L3.16	**1982-044F**	**Proton-K/DM fourth stage (Blok-DM)**					**RB**
TLEs	GEO (0.90)	2015-12-31	04:12:09.408	3890.05	322.35	181.03	143.38
14114	TEME	42173.769	0.0013609	15.1889	339.0503	100.6086	4.9264
L3.17	**1991-079A**	**Cosmos-2172**					**PL**
TLEs	GEO (1.00)	2015-12-30	07:31:18.738	4183.15	322.55	180.93	143.48
21789	TEME	42166.546	0.0006307	14.8650	14.6362	248.3492	348.4879

The longitude histories of TLE-based objects in this category are plotted in Fig. 4.1 to 4.15.

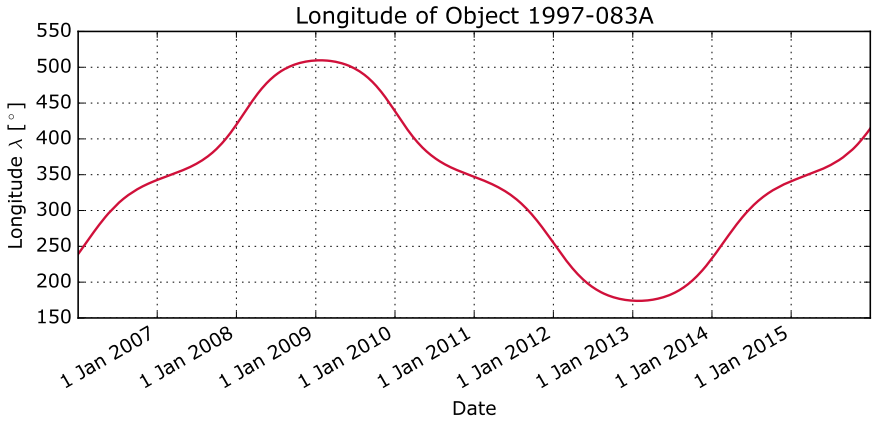

Figure 4.1: Longitude history of object 1997-083A

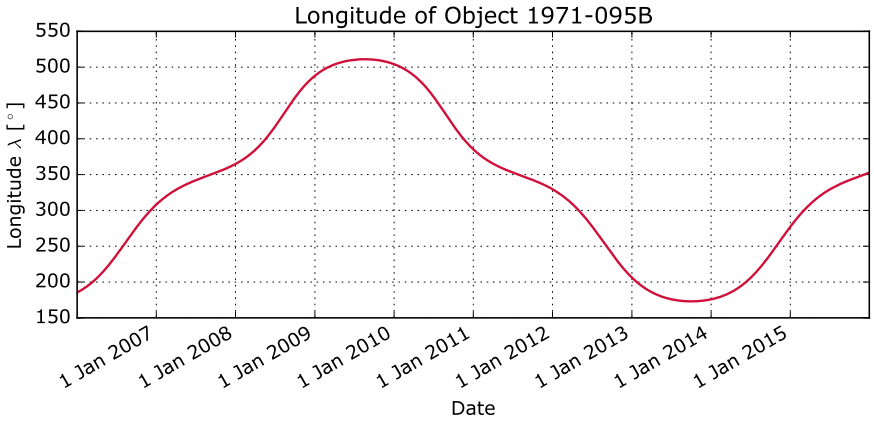

Figure 4.2: Longitude history of object 1971-095B

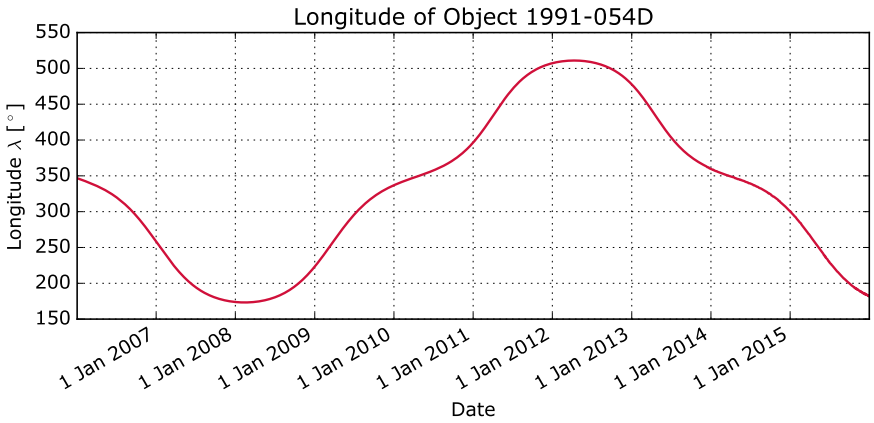

Figure 4.3: Longitude history of object 1991-054D

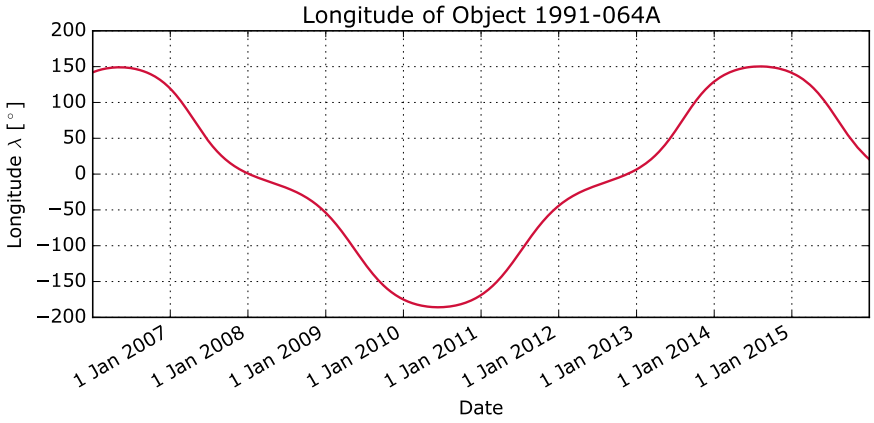

Figure 4.4: Longitude history of object 1991-064A

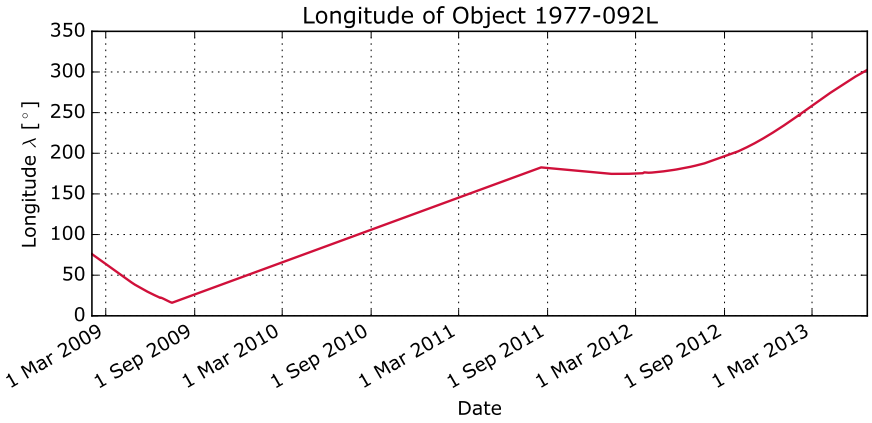

Figure 4.5: Longitude history of object 1977-092L

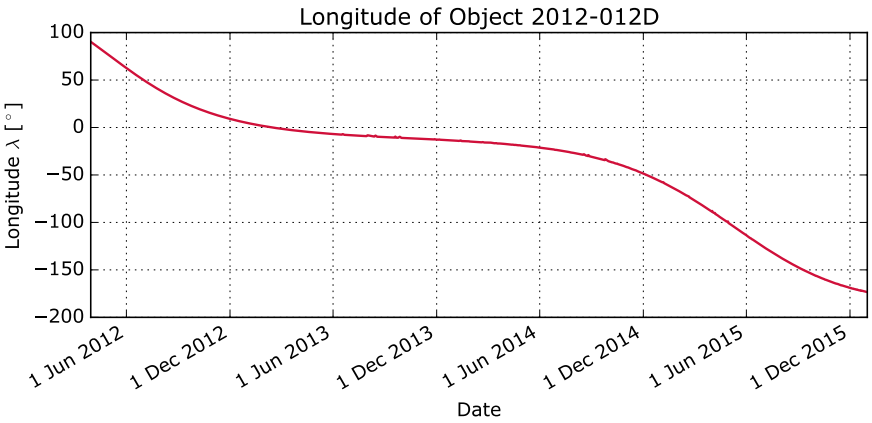

Figure 4.6: Longitude history of object 2012-012D

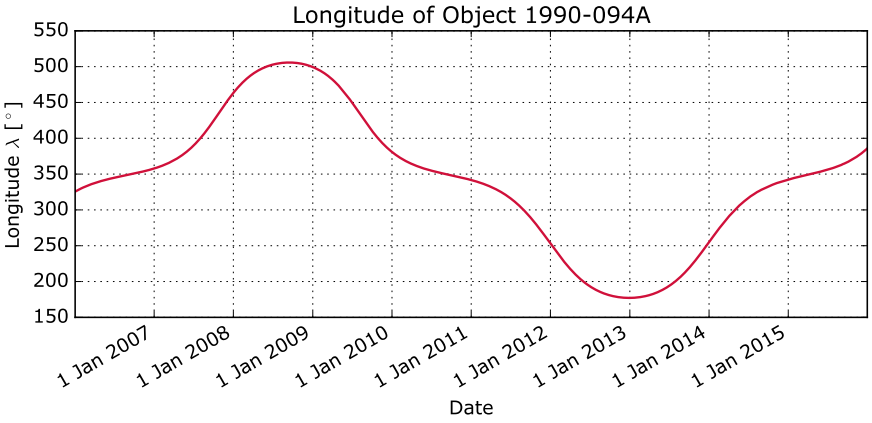

Figure 4.7: Longitude history of object 1990-094A

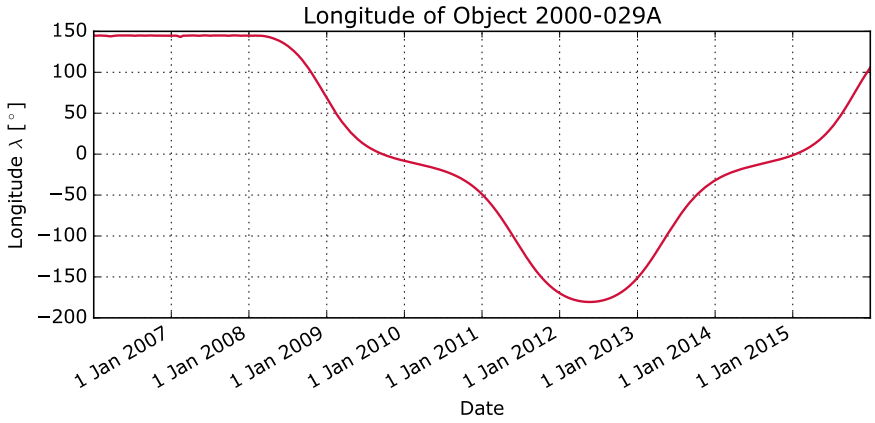

Figure 4.8: Longitude history of object 2000-029A

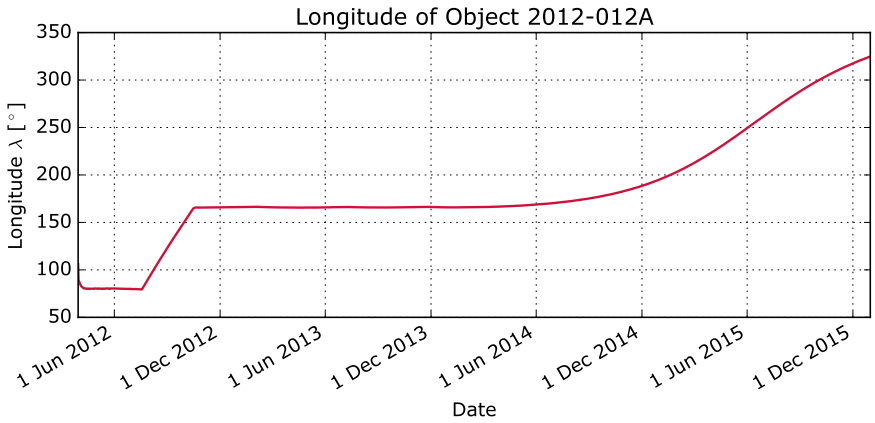

Figure 4.9: Longitude history of object 2012-012A

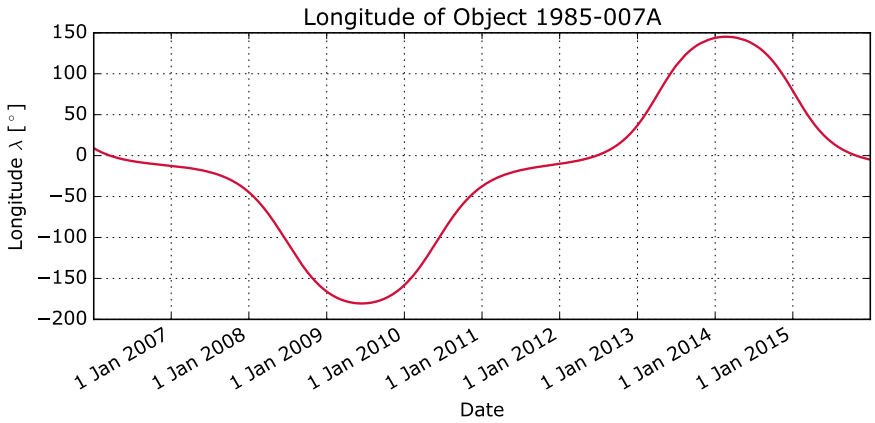

Figure 4.10: Longitude history of object 1985-007A

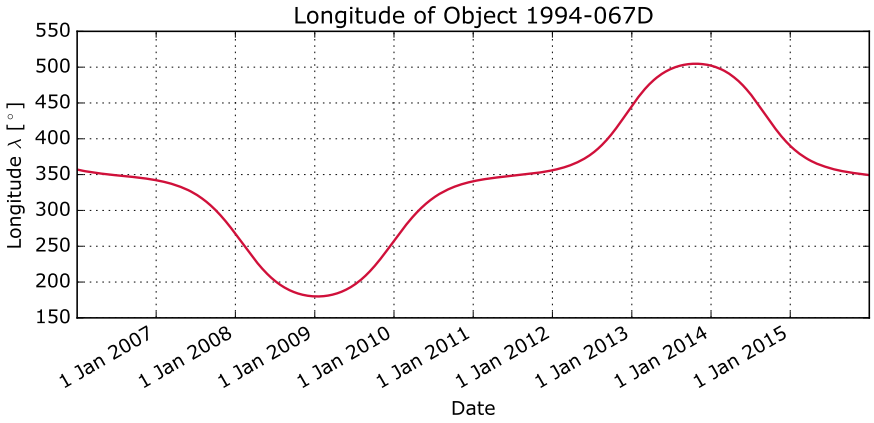

Figure 4.11: Longitude history of object 1994-067D

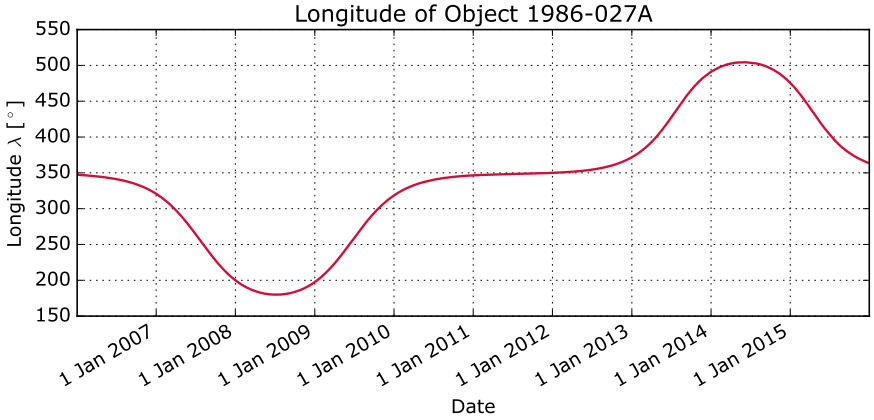

Figure 4.12: Longitude history of object 1986-027A

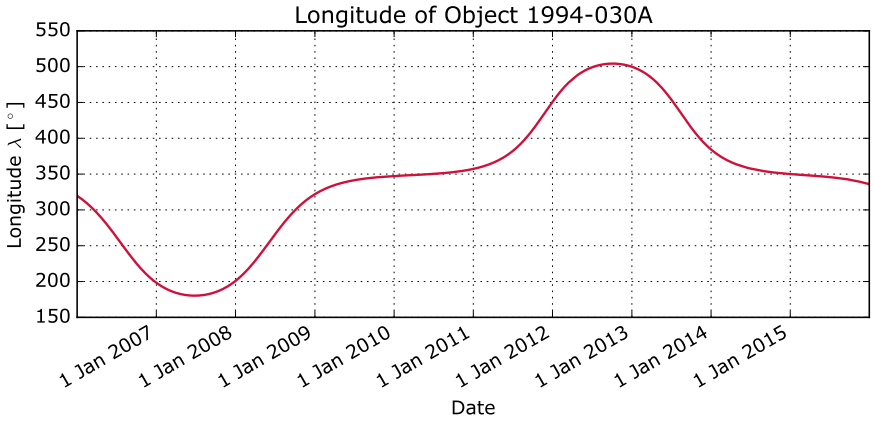

Figure 4.13: Longitude history of object 1994-030A

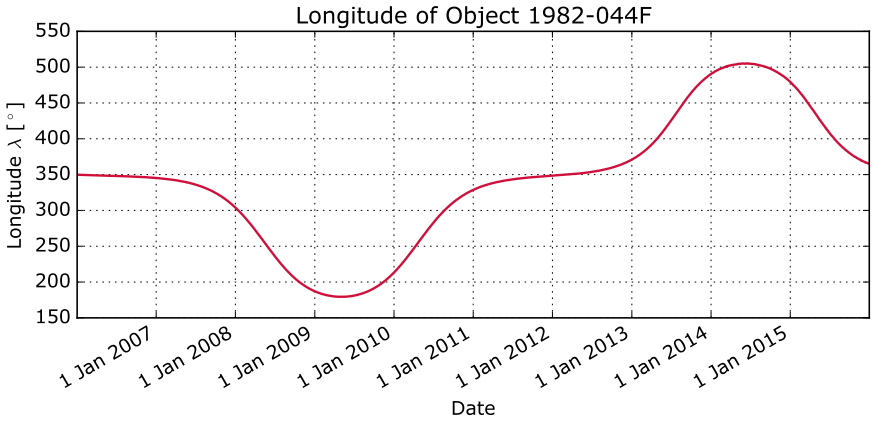

Figure 4.14: Longitude history of object 1982-044F

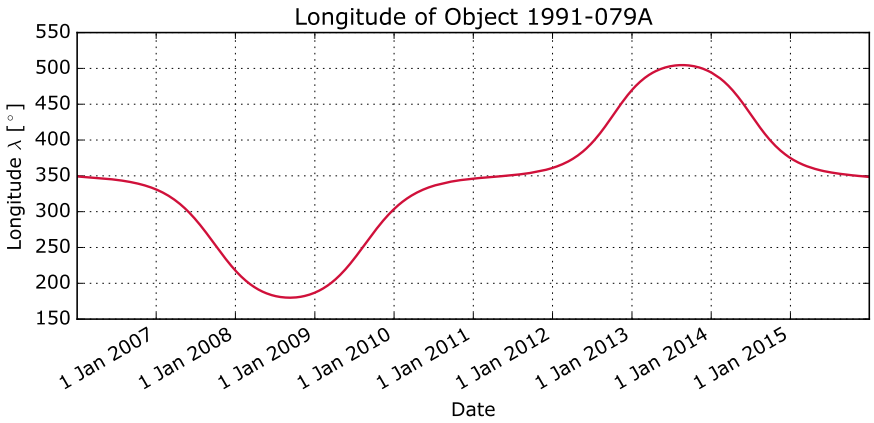

Figure 4.15: Longitude history of object 1991-079A

4.8 Objects in Highly Inclined Orbits

The following list contains 15 objects in highly inclined orbits, 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 (0.29)	2015-12-31	23:36:59.758				
634	TEME	42157.693	0.0006400	35.7002	353.2688	148.3821	76.2920
I.2	**1978-012A**	**IUE**					**PL**
TLEs	IGO (-)	2015-12-27	21:21:46.348				
10637	TEME	42223.533	0.1518195	43.6858	343.5178	201.3454	103.8218
I.3	**1978-012D**	**IUE dust cover**					**PM**
TLEs	IGO (-)	2015-12-29	13:24:33.127				
33000	TEME	42120.563	0.2148353	43.6404	337.5743	219.6984	251.4902
I.4	**2010-005A**	**SDO**					**PL**
TLEs	IGO (0.37)	2015-12-31	14:45:39.875				
36395	TEME	42165.181	0.0002392	28.2646	150.1024	164.2282	258.3200
I.5	**2010-036A**	**Beidou DW 5**					**PL**
TLEs	IGO (0.21)	2015-12-31	21:41:59.966				
36828	TEME	42160.648	0.0041661	54.2588	198.7808	213.4212	120.0670
I.6	**2010-045A**	**Michibiki**					**PL**
TLEs	IGO (0.04)	2015-12-31	15:18:38.219				
37158	TEME	42162.848	0.0746684	40.6581	167.0999	269.9353	142.7039
I.7	**2010-068A**	**Beidou DW 7**					**PL**
TLEs	IGO (0.21)	2015-12-31	22:07:25.485				
37256	TEME	42158.846	0.0042156	53.7819	317.4564	208.5415	118.5732
I.8	**2011-013A**	**Beidou DW 8**					**PL**
TLEs	IGO (0.20)	2015-12-31	22:44:23.083				
37384	TEME	42168.758	0.0025576	57.1727	78.5435	200.5200	118.7323
I.9	**2011-038A**	**Beidou DW 9**					**PL**
TLEs	IGO (0.21)	2015-12-31	23:09:13.161				
37763	TEME	42164.489	0.0034635	54.5699	201.0555	199.9563	96.3091
I.10	**2011-073A**	**Beidou DW 10**					**PL**
TLEs	IGO (0.21)	2015-12-31	21:00:56.056				
37948	TEME	42159.042	0.0038013	53.8727	316.9061	206.2841	92.7752
I.11	**2013-034A**	**IRNSS-R1A**					**PL**
TLEs	IGO (0.37)	2015-12-31	21:57:18.483				
39199	TEME	42163.547	0.0020939	28.0213	124.4420	182.3764	55.0232
I.12	**2014-017A**	**IRNSS-R1B**					**PL**
TLEs	IGO (0.35)	2015-12-29	10:02:18.216				
39635	TEME	42163.675	0.0019191	30.0317	303.2062	191.2723	55.1004
I.13	**2015-018A**	**IRNSS-R1D**					**PL**
TLEs	IGO (0.35)	2015-12-31	06:08:22.123				
40547	TEME	42164.382	0.0018518	30.0355	303.3283	185.7714	111.8977

I.nn	**COSPAR**	**Name**					**Type**
Source	Orbit ($f_{\mathrm{IADC}}^{\mathrm{GEO}}$)	Date	Time				
S-ID	Frame	a	e	i	Ω	ω	λ
I.14	**2015-019A**	**Beidou DW 17**					**PL**
TLEs	IGO (0.21)	2015-12-31	20:49:46.737				
40549	TEME	42157.728	0.0041316	54.8274	339.8484	181.4359	92.7590
I.15	**2015-053A**	**Beidou DW 20**					**PL**
TLEs	IGO (0.20)	2015-12-31	23:42:32.099				
40938	TEME	42162.568	0.0042668	54.9177	302.6872	167.1636	98.0496

4.9 Objects of Indeterminate Status

The following list contains 11 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 TLEs available or that the status has recently changed (satellite newly launched or recently manoeuvred). Indeed, at least about 5 TLEs within a few weeks with the same status are needed to determine the category in which the object falls. Some bad TLE sets 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 ($f_{\mathrm{IADC}}^{\mathrm{GEO}}$)	Date	Time				
S-ID	Frame	a	e	i	Ω	ω	λ
Ind.1^m	**1997-036A**	**Superbird C**					**PL**
TLEs	EGO (-)	2015-12-31	22:15:16.159				
24880	TEME	42504.002	0.0010316	5.7793	57.8944	233.7545	343.9714
Ind.2^m	**1998-006B**	**Inmarsat-3 F5**					**PL**
TLEs	GEO (1.00)	2015-12-31	21:21:53.602				
25153	TEME	42271.905	0.0004778	1.5191	74.2265	225.1996	2.1374
Ind.3^m	**1998-070A**	**Eutelsat 115 West A (SATMEX 5)**					**PL**
TLEs	GEO (1.00)	2015-12-31	04:45:02.733				
25558	TEME	42116.968	0.0002906	2.0964	76.5230	359.8358	265.5132
Ind.4^m	**1999-071A**	**Galaxy 11**					**PL**
TLEs	GEO (1.00)	2015-12-31	09:28:32.071				
26038	TEME	42104.849	0.0008339	0.0423	177.6372	207.4371	326.3406
Ind.5^m	**2000-081A**	**Astra 2D**					**PL**
TLEs	GEO (1.00)	2015-12-31	18:20:50.267				
26638	TEME	42164.123	0.0002179	2.6237	72.6750	212.5122	57.2789
Ind.6^m	**2001-018A**	**XM Radio 1 (Roll)**					**PL**
TLEs	GEO (1.00)	2015-12-28	02:41:35.176				
26761	TEME	42164.383	0.0000111	0.0294	71.5638	172.5937	320.9885
Ind.7^m	**2002-040A**	**Eutelsat 12 West A (Atlantic Bird 1)**					**PL**
TLEs	GEO (1.00)	2015-12-31	18:39:30.175				
27508	TEME	42210.946	0.0001382	0.0695	23.9166	192.0666	340.2461
Ind.8^m	**2005-006A**	**Himawari 6 (MTSAT 1R)**					**PL**
TLEs	EGO (-)	2015-12-31	16:46:27.139				
28622	TEME	42549.630	0.0019802	0.6783	84.0078	202.1566	29.5713
Ind.9^m	**2005-044A**	**Inmarsat-4 F2**					**PL**
TLEs	GEO (1.00)	2015-12-29	22:53:18.218				
28899	TEME	42164.034	0.0003276	2.4724	4.3486	263.6719	63.8967
Ind.10	**2012-035F**	**Meteosat 10 (MSG 3) operational debris (SEVIRI Ent. Ba. Cov)**					**PM**
TLEs	EGO (-)	2015-12-08	09:40:56.565				
40872	TEME	41486.302	0.0093295	1.0786	111.4427	110.9666	248.6435
Ind.11	**2014-058A**	**Luch**					**PL**
TLEs	GEO (1.00)	2015-12-31	04:11:50.309				
40258	TEME	42114.489	0.0009455	0.0148	6.1949	87.8933	354.9205

The longitude histories of TLE-based objects in this category are plotted in Fig. 4.16 to 4.26.

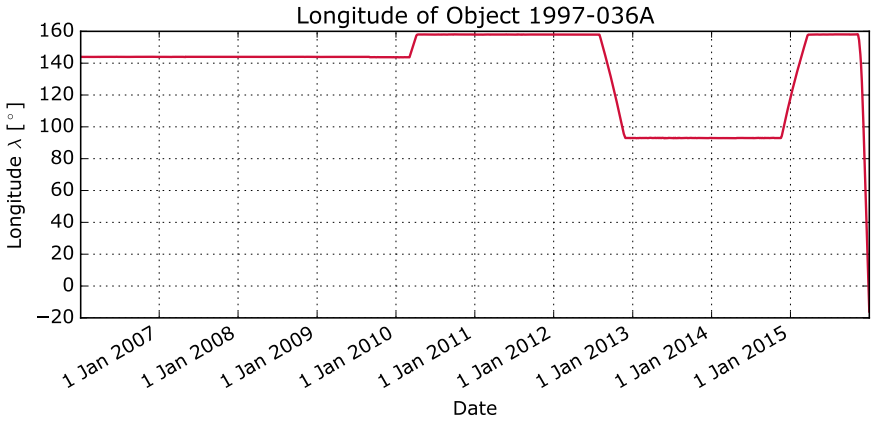

Figure 4.16: Longitude history of object 1997-036A

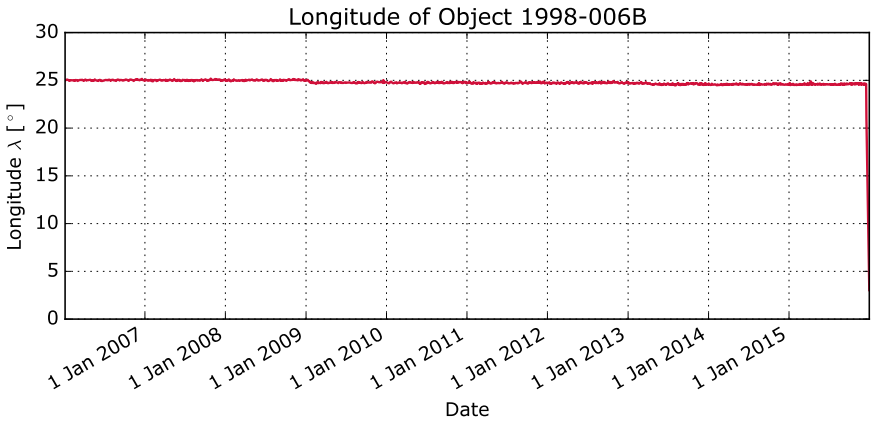

Figure 4.17: Longitude history of object 1998-006B

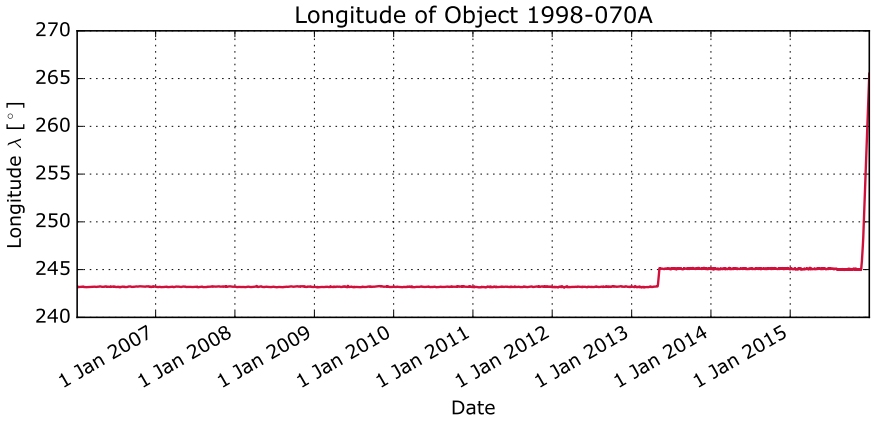

Figure 4.18: Longitude history of object 1998-070A

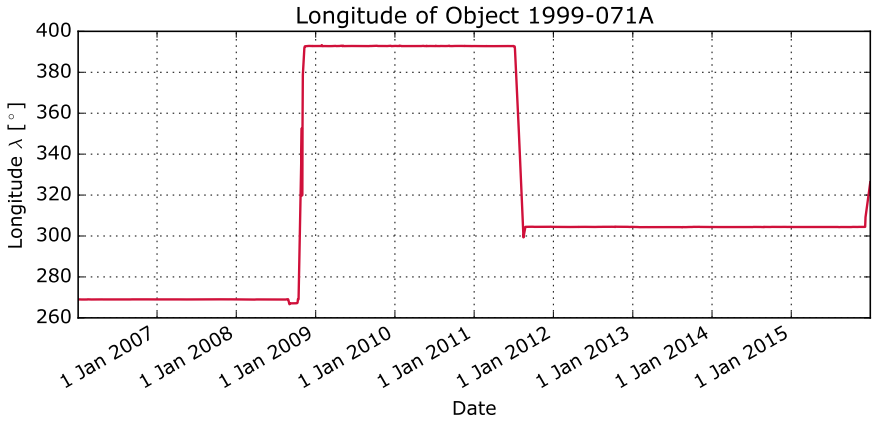

Figure 4.19: Longitude history of object 1999-071A

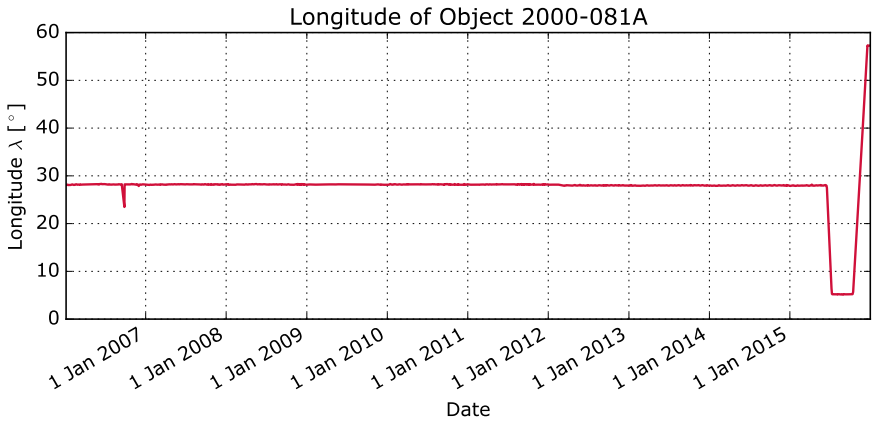

Figure 4.20: Longitude history of object 2000-081A

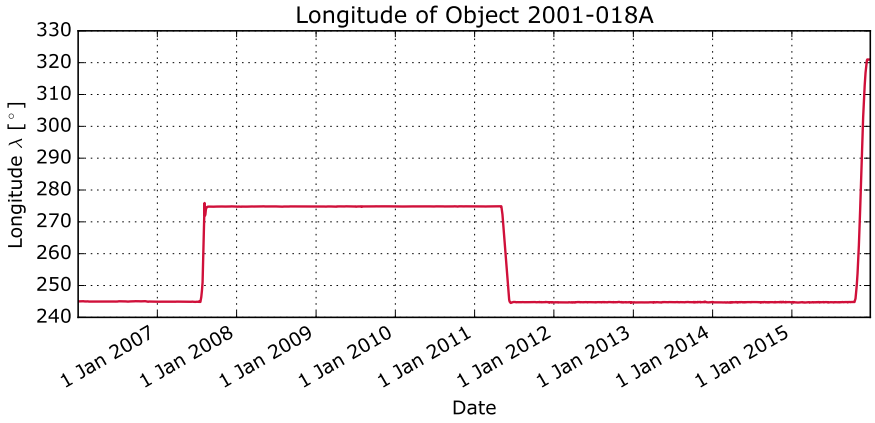

Figure 4.21: Longitude history of object 2001-018A

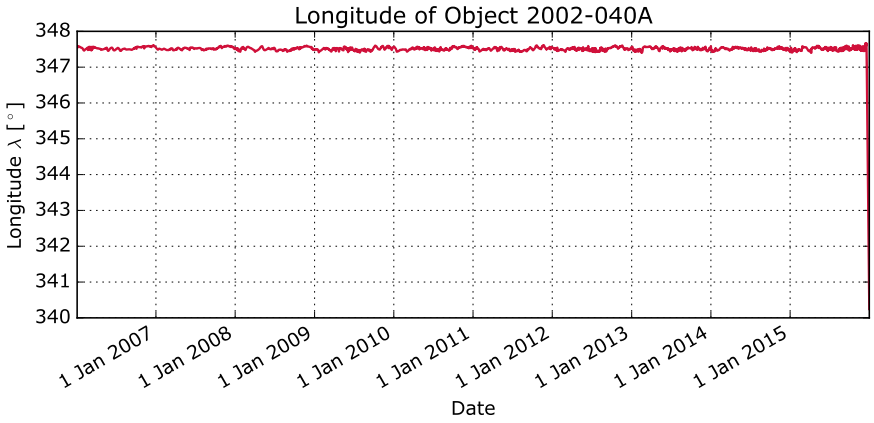

Figure 4.22: Longitude history of object 2002-040A

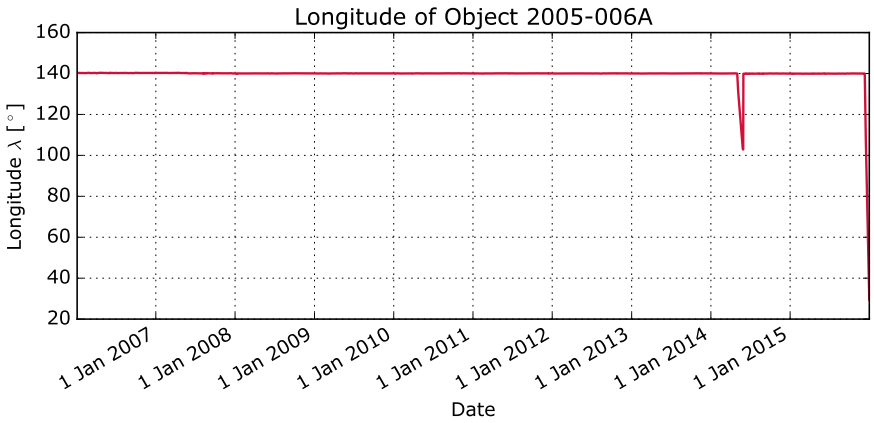

Figure 4.23: Longitude history of object 2005-006A

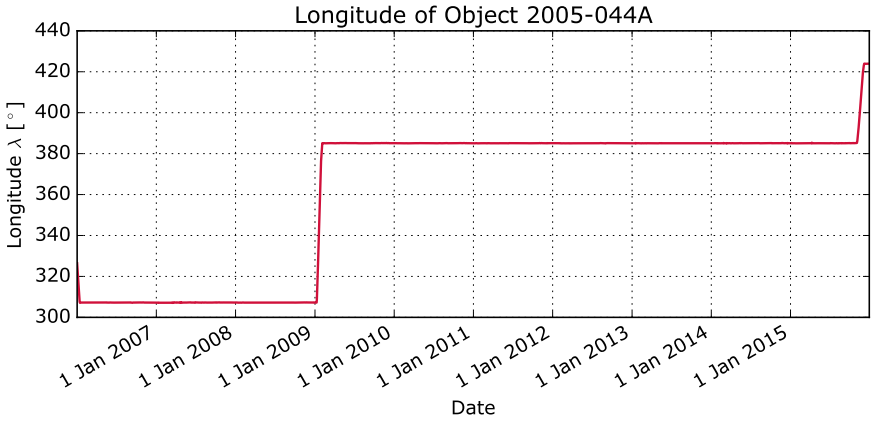

Figure 4.24: Longitude history of object 2005-044A

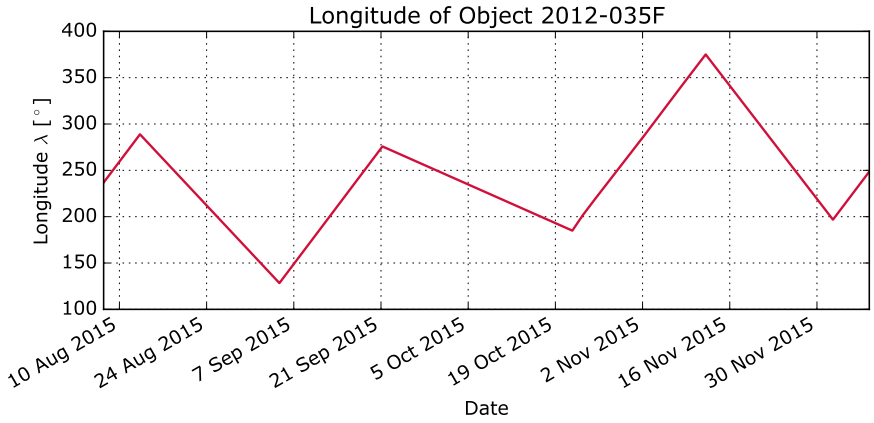

Figure 4.25: Longitude history of object 2012-035F

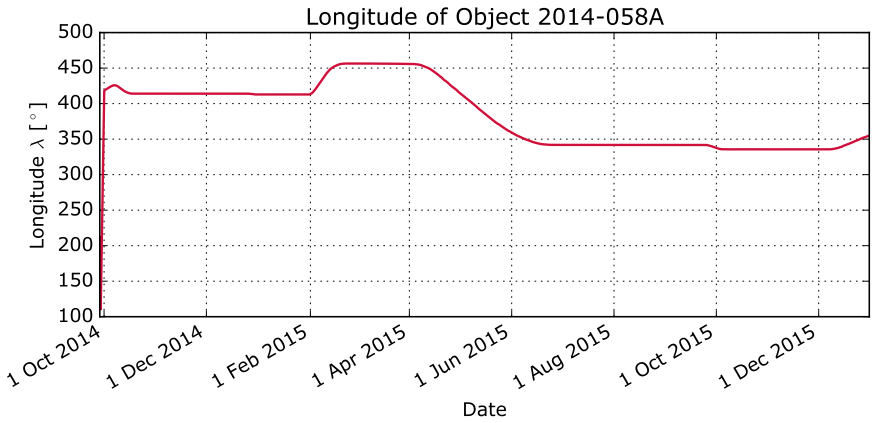

Figure 4.26: Longitude history of object 2014-058A

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 (PL: Payload, PM: Payload Mission Related Object, PD: Payload Debris, RB: Rocket Body, RD: Rocket Debris),

5.1 Catalogued Objects

The following list contains 6 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	1989-046E	USA 39 debris (DSP F14 IR Sensor telescope sunshade cover)	PM
KIAM	U005	1990-095E	USA 65 debris (DSP F15 IR Sensor telescope sunshade cover)	PM
KIAM	U006	2001-033E	USA 159 debris (DSP F21 IR Sensor telescope sunshade cover)	PM

5.2 Uncatalogued Objects

The following list contains 44 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

Source	S-ID	COSPAR	Name	Type
KIAM	UU009	1977-065	Himawari 1 debris (VISSR 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
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	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	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	UU040	1988-051	Meteosat 3 debris (MVIRI cooler cover)	PM
KIAM	UU043	1989-020	Meteosat 4 debris (MVIRI 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	UU048	1991-015	Meteosat 5 debris (MVIRI 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	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
KIAM	UU060	1996-003	Koreasat 2 debris (Array restraint cable)	PM
KIAM	UU062	1997-049	Meteosat 7 debris (MVIRI 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 distribution and altitude range of the objects in drift orbit,

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

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

6.8 distribution of objects in libration orbit.

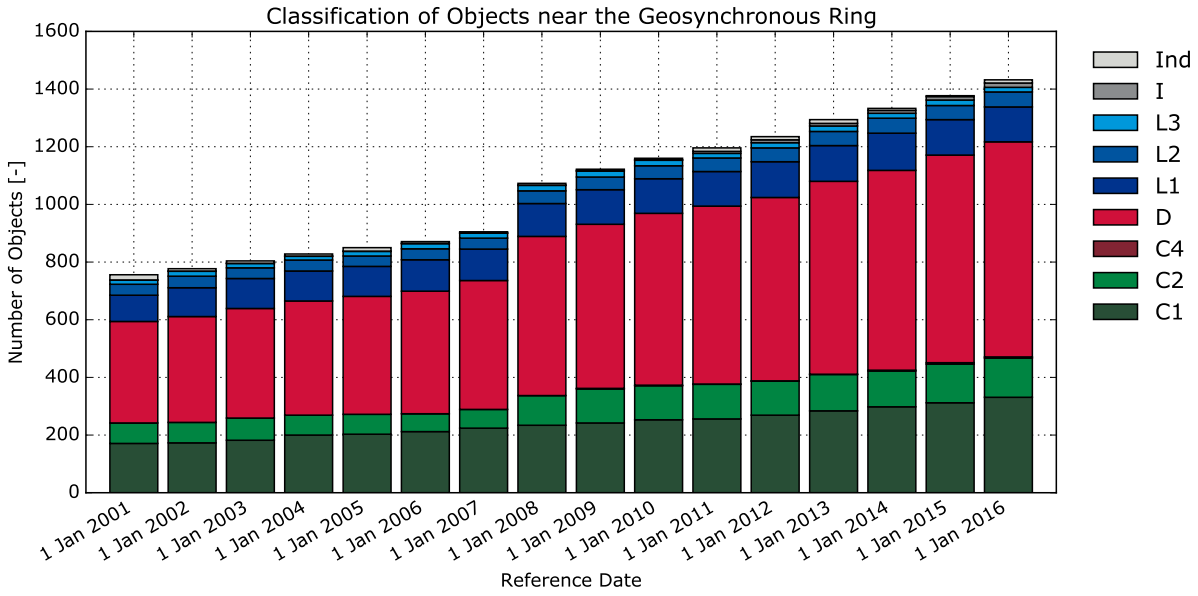

Figure 6.1: Absolute number of geosynchronous objects in their respective category bins. Please note that the apparent jump for reference date Jan 1 2008 is due to the addition of the KIAM catalogue.

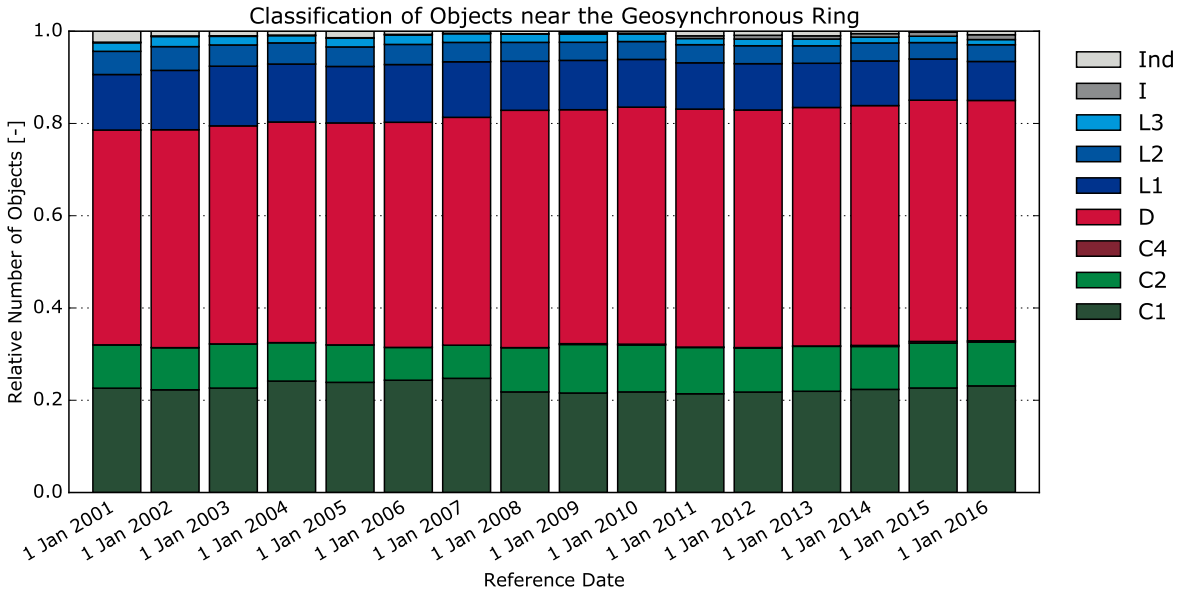

Figure 6.2: Relative number of geosynchronous objects in their respective category bins.

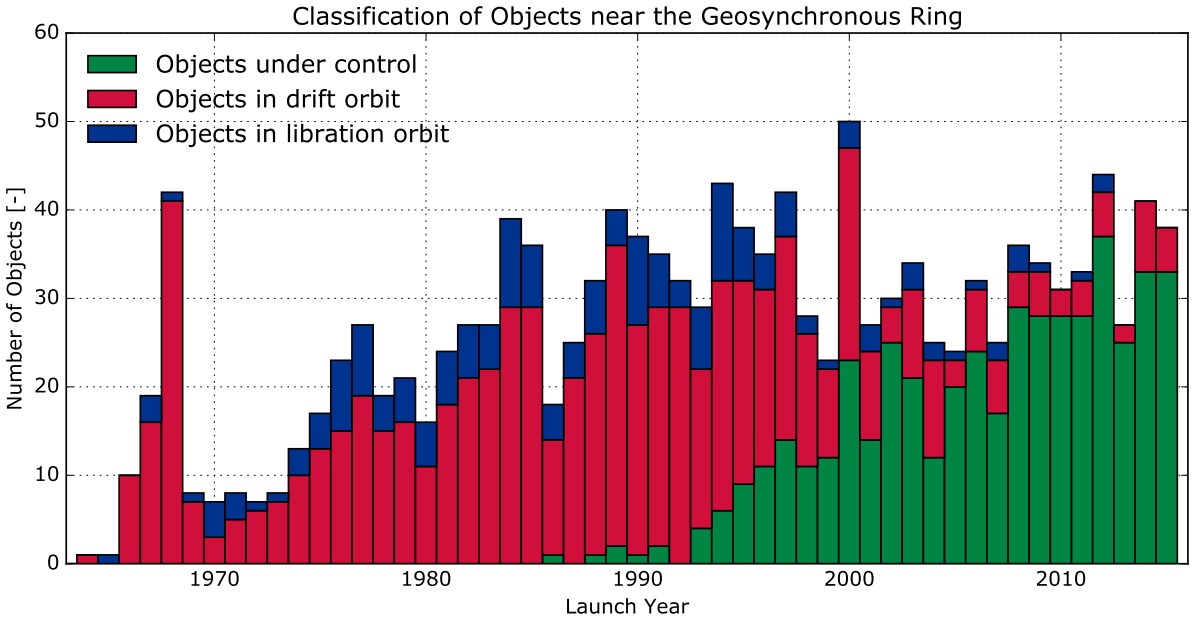

Figure 6.3: Number of objects in each category according to launch year.

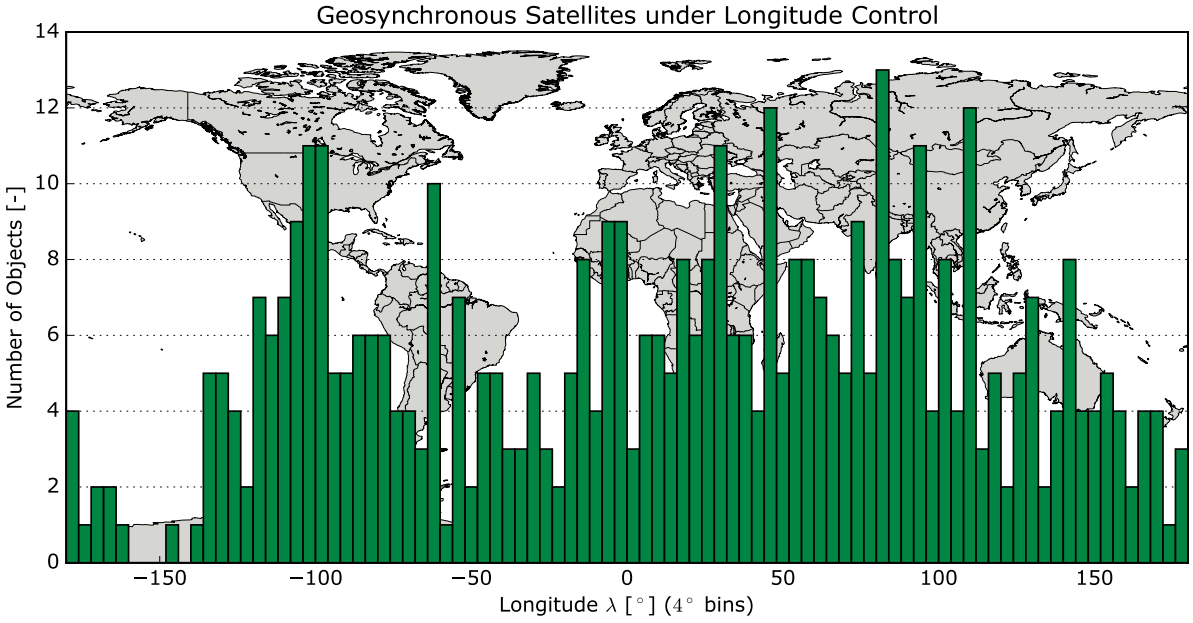

Figure 6.4: Distribution of the longitude of the satellites under control (without category C4).

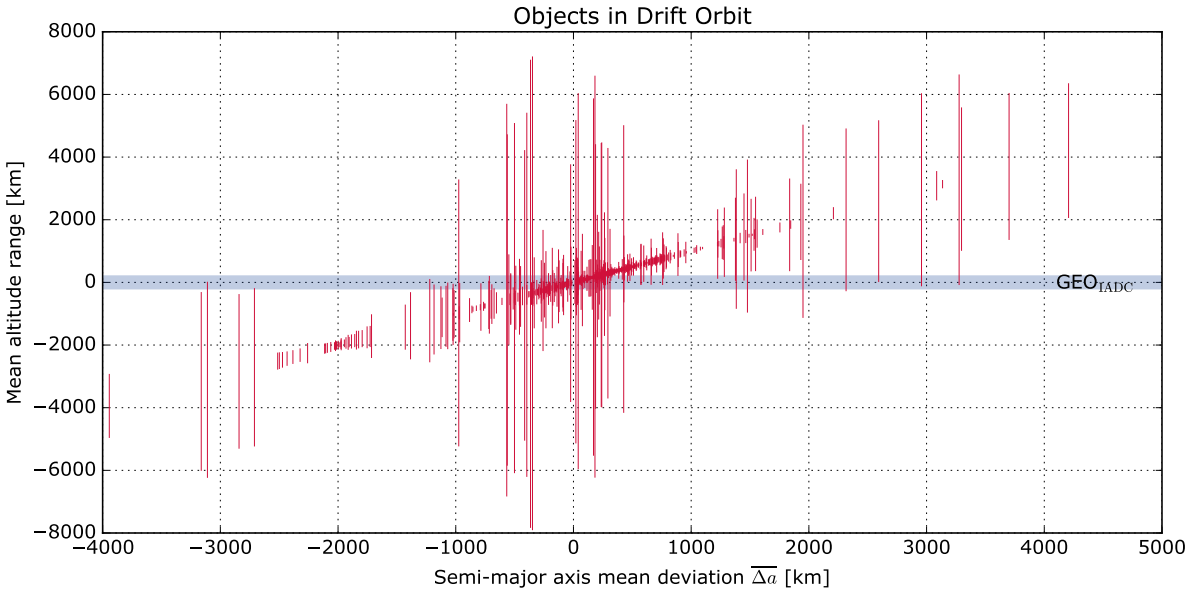

Figure 6.5: Distribution and altitude range of the objecs in drift orbit.

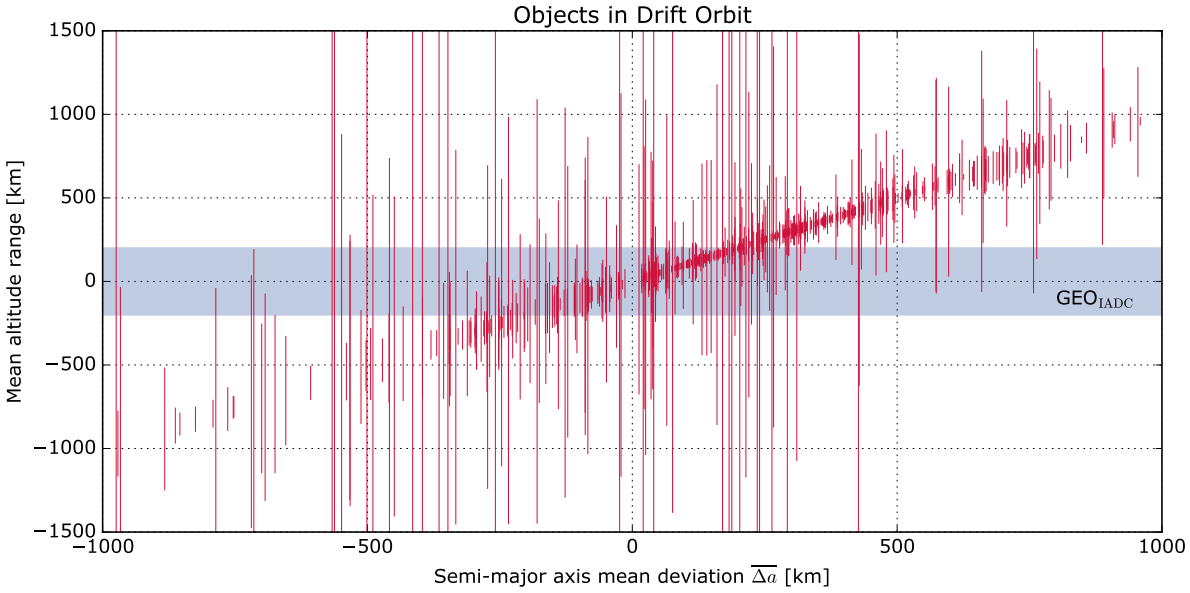

Figure 6.6: Zoom in the distribution and altitude range of the objecs in drift orbit.

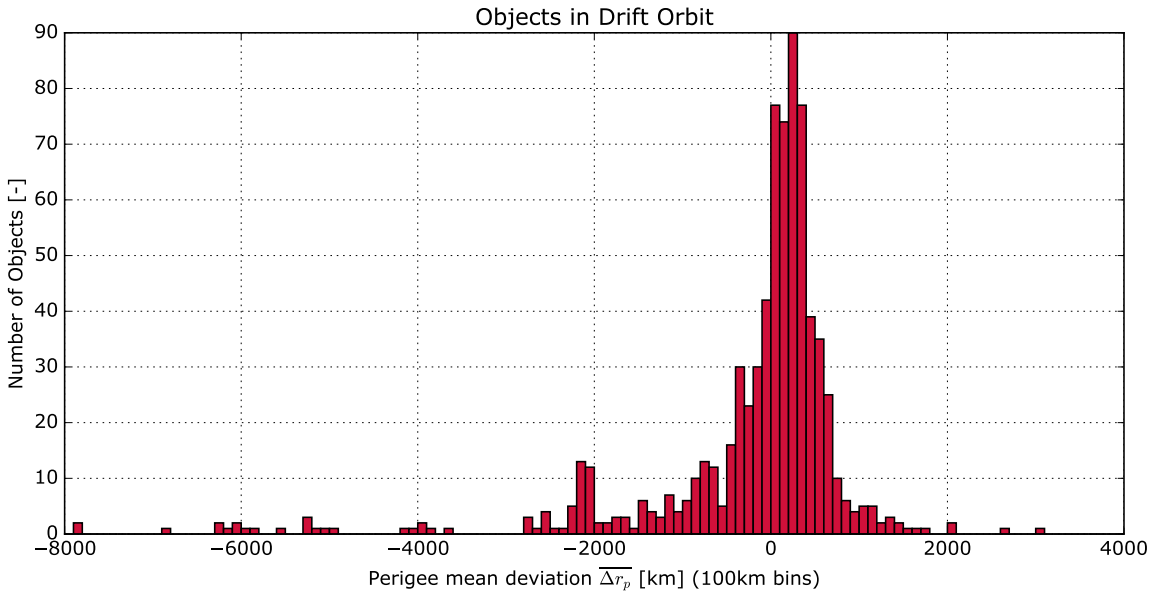

Figure 6.7: Distribution of the perigee mean deviation from the geostationary altitude.

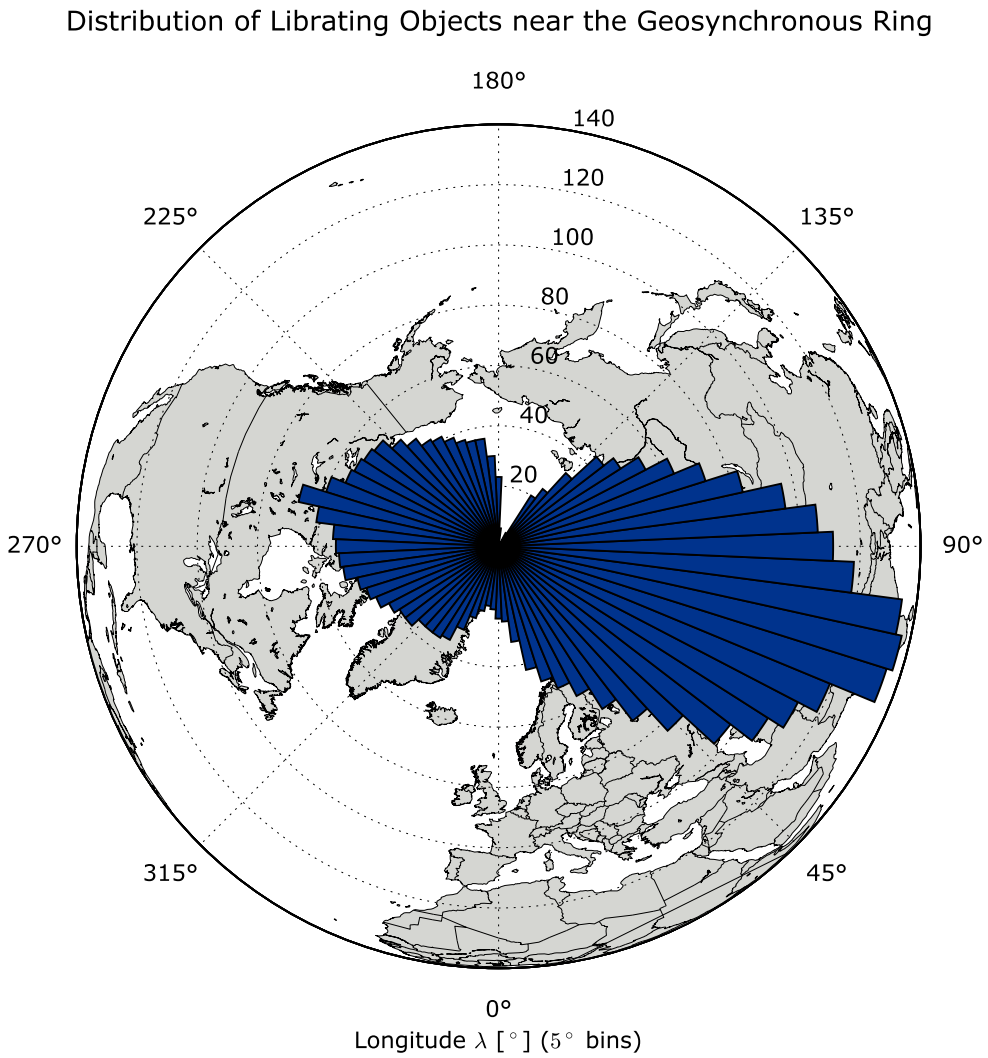

Figure 6.8: Distribution of objects in libration orbit. For every longitude interval, the number of objects librating through this interval is given, e.g. the interval encompassing the Eastern stable point (75°) contains the sum of the objects in classes L1 and L3.

7 Summary

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

1434 objects met these criteria as of 1 January 2016. A total of 2 objects have only old orbital data available (i.e. older than 180 days compared to the reference date). For 197 of the objects KIAM provided orbital elements. A total of 50 additional objects are also known to be present in this orbital region. Of these only 6 objects have been correlated by USSTRATCOM with a launch but orbital data for them are not available from whichever source. 44 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 dicovered and tracked by ISON network. Thus, the total number of known objects in the geostationary region is 1484.

The 1434 objects with orbital data can be classified as follows:

- 471 are controlled,
- 747 are in a drift orbit (of which 1 is outdated),
- 190 are in a libration orbit (of which 1 is outdated),
- 15 are in a highly inclined orbit,
- 11 could not be classified.

In 2015 at least 13 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]). Only six were reorbited more than 250 km above GEO_{IADC} and complied with the IADC re-orbiting guidelines:

- Astra 1E (1995-055A, 398×443 km, see p. 87),
- Eutelsat 16B (Eurobird 16, Nilesat 103, Hot Bird 4) (1998-013A, 548×590 km, see p. 83),
- Sirius 3 (1998-056B, 348×351 km, see p. 91),
- Bonum 1 (1998-068A, 339×361 km, see p. 91),
- Ekspress 2A (Ekspress 6A) (2000-013A, 547×604 km, see p. 83),
- USA 97 (DSCS III F8, DSCS 3-8, DSCS III B-10) (1993-074A, 460×520 km, see p. 85).

Five spacecraft were reorbited too low:

- LEASAT 5 (Syncom-4 5) (1990-002B, 180×203 km, see p. 101),
- Intelsat VI F-3 (1990-021A, 210×238 km, see p. 99),
- ABS 1A (Mugungwha 2, Koreasat 2) (1996-003A, 118×152 km, see p. 103),
- Garuda 1 (2000-011A, 83×102 km, see p. 106),
- Raduga 1 (2009-010A, 92×161 km, see p. 104).

Two spacecraft seem to be abandoned and have started librating around the libration point L1:

- AMOS 5 (2011-074A, see p. 132),
- Eutelsat 33B (Eutelsat 25C, Eutelsat 70A, Eutelsat W5) (2002-051A, see p. 131).

In 2015 a total of 19 new payloads have been launched into GEO_{IADC}.

Three rocket bodies have been left in a drift orbit close to or crossing the GEO_{IADC} (of these the object 2015-075B was reported to have fragmented in January 2016):

- Proton-M/DM-3 fourth stage (Block DM-3) (2015-048B, see p. 86),
- Zenit-3SLBF third stage (Fregat-SB) (2015-074B, see p. 120),
- Proton-M/Briz-M fourth stage (Briz-M) (2015-075B, see p. 122).

At least two new MROs have been catalogued in drift orbit close to or crossing the GEO_{IADC}:

- Meteosat 11 (MSG 4) operational debris (SEVIRI Cooler Cover) (2015-034E, see p. 118),
- Meteosat 11 (MSG 4) operational debris (SEVIRI Ent. Ba. Cov) (2015-034F, see p. 120).

The object Raduga 23 (1989-030A, see p. 130) has been skipped in last report due to editorial mishap.

The re-orbit of Eutelsat 8 West D (Eutelsat 3A, Chinasat 5C, Zhongxing 5C) (2007-021A, see p. 83) into a IADC-compliant 536×568 km orbit at the end of 2014 could be confirmed. The drift orbit of GVM/Briz-M (2014-085A, see p. 76) has been confirmed. Further to the reports last year, Fengyun 2G AKM (FG-36) (2014-090C, see p. 100) was left crossing the GEO_{IADC} in 2014.

The two objects 1990-095E as well as UU062 have been lost for a while.

This analysis has shown that in 2015, eighteen years after the IADC guidelines were established, there is in general a wide attempt to comply with the guidelines. Contrary to the previous year and the general trend, a higher number satellites were not or could not be properly reorbited.

8 Acknowledgements

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Glossary

ABS	Asia Broadcast Satellite. 46, 47, 50, 62, 72, 103, 120, 160
ACTS	Advanced Communications Technology Satellite. 134
AEHF	Advanced Extremely High Frequency. 64, 68, 71
AKM	Apogee Kick Motor. 80, 83, 85, 87, 96, 97, 99, 100, 102, 107, 109–111, 113, 115, 117–120, 124, 161
AMC	Americom. 53, 54, 56, 58, 61, 64
AMOS	Affordable Modular Optimized Satellite. 46, 62, 78, 132, 161
AMSC	American Mobile Satellite Corporation. 70
ANGELS	Automated Navigation and Guidance Experiment for Local Space. 74
APPLE	Ariane Passenger PayLoad Experiment. 107
Artemis	Advanced Relay and Technology Mission. 64
ASC	American Satellite Company. 135, 153
ATHENA-FIDUS	Access on theatres for European allied forces nations-French Italian dual use satellite. 44
ATS	Applications Technology Satellite. 83, 99, 111, 119, 135
BS	Broadcasting Satellite. 46, 70, 87, 88, 91, 93, 96, 153
BSAT	Broadcasting Satellite. 50, 92–94
BSE	Broadcasting Satellite Experimental. 129
COMS	Communication, Ocean and Meteorological Satellite. 51
COMSATBw	Communication Satellite for Bundeswehr. 42, 46

CS	Communication Satellite. 82, 88, 89, 95, 98
CTS	Communications Technology Satellite. 135
DATS	Despun Antenna Test Satellite. 124
DCSS	Delta Cryogenic Second Stage. 77, 89, 121
DFH	Dōngfānghóng. 115, 126–128, 130–132
DFS	Deutscher Fernmeldesatellit. 100, 102, 113
DLA	DIRECTV Latin America. 57
DODGE	Department of Defense Gravity Experiment. 124
DRTS	Data Relay & Tracking Satellite. 67
DSCS	Defense Satellite Communications System. 65, 67, 69–71, 75–80, 83–85, 88, 90–92, 96, 134, 138, 160
DSP	Defense Support Program. 64, 66, 68–71, 79, 82–84, 86–88, 99, 100, 102–104, 112, 113, 116–118, 131, 152, 153
ECS	European Communications Satellite. 82, 86, 87, 89
EDUSAT	Education Satellite. 96
ETS	Engineering Test Satellite. 68, 97, 107
FLTSATCOM	Fleet Satellite Communications. 67, 72, 85, 89, 90, 137
GeoLITE	Geosynchronous Lightweight Technology Experiment. 88
GEOS	Geostationary Scientific Satellite. 97
GGTS	Gravity Gradient Test Satellite. 123
GMS	Geostationary Meteorological Satellite. 78, 87, 95, 98, 100, 102, 104, 117
GOES	Geostationary Operational Environmental Satellite. 54, 56, 59, 87, 89, 91, 92, 95, 97, 99, 105, 113, 119, 134, 135, 152, 153
GSAT	Geosynchronous Satellite. 45, 47–49, 96, 105, 121
GSSAP	Geosynchronous Space Situational Awareness Program. 74
HGS	Hughes Global Services. 136
HYLAS	Highly Adaptable Satellite. 43, 61
IABS	Integrated Apogee Boost System. 95, 114–117, 119, 124
IDSCS	Initial Defense Satellite Communications System. 122–124
INSAT	Indian National Satellite. 46–49, 86, 101, 103, 106, 110, 114, 122, 126, 127, 130, 132
Intelsat	International Telecommunications Satellite. 43–46, 48, 53, 54, 57–62, 65, 66, 68, 71, 72, 75, 78, 82–85, 87–96, 98, 99, 101–104, 106, 108, 111, 120, 132, 133, 136, 138, 160
IRNSS	Indian Regional Navigation Satellite System. 66, 145
IUE	International Ultraviolet Explorer. 145
IUS	Inertial Upper Stage (originally - Interim Upper Stage). 97, 99, 102, 104–106, 109, 112–117, 138
JCSAT	Japan Communications Satellite. 51, 52, 66, 68, 85, 93, 99
JPL	Jet Propulsion Laboratory. 83
KAZSAT	Kazakh Satellite. 95
LEASAT	Leased Satellite. 78, 80, 85, 101, 160
LES	Lincoln Experimental Satellite. 83, 117, 124, 134, 136

LMI	Lockheed Martin Intersputnik. 53
MAGE	Moteur d'Apogée Géostationnaire Européen. 80, 97, 99, 107, 109, 111, 113
MARECS	Maritime European Communications Satellite. 76, 77
MEASAT	Malaysia East Asia Satellite. 68, 91
METSAT	Meteorological Satellite. 66
Milstar DFS	Military Strategic and Tactical Relay Development Flight Satellite. 70, 72
MITEx	Micro-satellite Technology Experiment. 85, 88
MOP	Meteosat Operational Programme. 78, 84, 90
MOS/PIM	Multi-Orbit Satellite/Performance Improvement Modification. 83, 86–88
MSAT	Mobile Satellite. 70
MSG	Meteosat Second Generation. 6, 41, 62–64, 116, 118–120, 147, 161
MTP	Meteosat Transition Programme. 65
MTSAT	Multi-Functional Transport Satellite. 52, 147
MUOS	Mobile User Objective System. 69, 70, 72
MVIRI	Meteosat Visible and InfraRed Imager. 153
NATO	North Atlantic Treaty Organization. 65, 76, 83, 84, 104, 134
NigComSat	Nigerian Communication Satellite. 44, 129
NRL	Naval Research Laboratory. 121
NROL	NRO Launch. 65, 67, 69, 72
NSS	New Skies Satellites. 45, 49, 53, 60, 65, 72, 78, 85, 96
OPS	Operations (?). 75–79, 82–90, 95, 99, 103, 104, 109–113, 116, 118, 122–126, 128, 131, 134, 136–138, 152, 153
OSC	Orbital Sciences Corporation. 85
OTS	Orbital Test Satellite. 92
OV	Orbiting Vehicle. 118
PAS	PanAmSat. 6, 44, 53, 59, 60, 65, 68, 71, 72, 75, 78, 92–94, 97
POTV	Precision Orbital Transfer Vehicle. 121
PSN	Pasifik Satelit Nusantara. 93
RASCOM	Regional African Satellite Communication (Organization). 41
RCA	Radio Corporation of America. 86, 98, 100, 101, 105, 108
S-VISSR	Stretched Visible and Infrared Spin Scan Radiometer. 6, 126, 129, 131
SBIRS	Space-Based Infrared System. 64, 67
SBS	Satellite Business Systems. 87, 90, 103, 104, 106, 109
SCATHA	Spacecraft Charging AT High Altitudes. 118
SDO	Solar Dynamics Observatory. 145
SDS	Satellite Data System. 67–69, 72, 85
SES	Société Européenne des Satellites. 41, 49, 56–58, 60, 61
SESAT	Siberian-European Satellite. 47, 64
SEVIRI	Spinning Enhanced Visible and Infrared Imager. 6, 116, 118–120, 147, 161
SICRAL	Sistema Italiano per Comunicazioni Riservate ed Allarmi. 41, 44, 64
SIRIO	Satellite Italiano di Ricerca Industriale Orientata. 126
SMS	Synchronous Meteorological Satellite. 85, 99, 124, 152
ST	Singapore-Taiwan. 47, 48, 87
STTW	Shiyan Tongbu Tongxing Weixing. 126–128, 130, 132

Syncom	Synchronous Communication. 78, 80, 85, 101, 110, 145, 160
Syracuse	Système de Radiocommunication utilisant un satellite. 44, 62
TACSAT	Tactical Communications. 111
TDF	TéléDiffusion de France. 85, 94
TDRS	Tracking and Data Relay Satellite. 54, 66, 67, 69, 71, 72, 84, 87
TJS	Tōngxùn Jishù Shiyàn. 52
UFO	UHF (Ultra High Frequency) Follow-On. 64, 66, 69, 70, 72, 82, 87, 95, 137
VAS	VISSR Atmospheric Sounder. 153
VINASAT	Vietnamese Satellite. 51
VISSR	Visible and Infrared Spin Scan Radiometer. 128–130, 152, 153
WGS	Wideband Global SATCOM (initially - Wideband Gapfiller Satellite). 46, 48, 52–54, 60, 62
WINDS	Wideband InterNetworking engineering test and Demonstration Satellite. 52
ZX	Zhongxing. 47–52, 67, 78, 93, 94, 97, 103, 107, 126, 127, 130, 131

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