

CLASSIFICATION OF GEOSYNCHRONOUS OBJECTS

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Abstract

This is a status report on geosynchronous objects as of 1 January 2017.

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 From 1482 objects for which orbital data are available (of which 2 are outdated, i.e. the last available state dates back to 180 or more days before the reference date), 502 are actively controlled, 773 are drifting above, below or through GEO, 190 are in a libration orbit and 17 are in a highly inclined orbit. For 0 objects the status could not be determined.

Furthermore, there are 51 uncontrolled objects without orbital data (of which 45 have not been catalogued). Thus the total number of known objects in the geostationary region is 1533.

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

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1 Introduction

All objects that are catalogued in ESA's DISCOS Database (Database and Information System Characterising Objects in Space) and residing at the reference date within one of the orbital classes GEO, IGO and EGO (see table 1 for the class definitions) are listed in this document. The main purpose is to classify all the objects residing in the first two orbital classes according to different categories (top level: controlled, drifting and librating).

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

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

2 Sources

Subsequently, each source contributing to this report is presented. From these sources, the report exhibits the categorisation of objects based on observed orbital patterns. Nine different classifications are distinguished:

- C1** objects under longitude and inclination control (E-W as well as N-S control) – the longitude is nearly constant and the inclination is 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,
- C4** objects maintaining a drift orbit near or inside GEO_{IADC},
- D** objects in a drift orbit,
- L1** objects in a libration orbit around the Eastern stable point (longitude 75 degrees East),
- L2** objects in a libration orbit around the Western stable point (longitude 105 degrees West),
- L3** objects in a libration orbit around both stable points,
- I** objects in highly inclined orbits with inclination larger than 25.0 degrees,
- Ind** objects of indeterminate status.

2.1 USSTRATCOM Two-Line Elements (TLEs)

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

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

2.2 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 2016 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 facility, 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),
 - Derenivka 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, Altaysky Krai),
 - Observation facility of El Centro de Investigaciones de Ciencias Físico Matemáticas de la Universidad Autónoma de Nuevo León (UANL).
- 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,

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

S-ID	COSPAR	Name	Page
UI089	1968-081R	Titan IIIC fragmentation debris	p. 117
UI094	1997-040A	PAS 6	p. 77
UI099	1977-092K	Ekran 2 fragmentation debris	p. 112
UI153	2008-006C	Proton-M/Briz-M fourth stage (Briz-M)	p. 78
UI163	2010-006B	Proton-M/Briz-M fourth stage (Briz-M)	p. 77
UU065	2002-040E	Meteosat 8 (MSG 1) operational debris (SEVIRI Cooler Cover)	p. 119
UU066	2002-040F	Meteosat 8 (MSG 1) operational debris (SEVIRI Ent. Ba. Cov.)	p. 122
UU068	2004-042D	Fengyun 2C operational debris (S-VISSR radiometer cover?)	p. 133
UU070	2008-066D	Fengyun 2E operational debris (S-VISSR radiometre cover)	p. 135
UU072	2012-035E	Meteosat 10 (MSG 3) operational debris (SEVIRI Cooler Cover)	p. 121
UU073	2012-035F	Meteosat 10 (MSG 3) operational debris (SEVIRI Ent. Ba. Cov)	p. 123

- Telescope Fabra ROA Montsec (TFRM) operated by the Reial Acadèmia de Ciències i Arts de Barcelona - Observatori Fabra, the Real Instituto y Observatorio de la Armada (ROA) and the Departament d'Astronomia i Meteorologia, Universitat de Barcelona, Spain.

The objects for which 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 2017 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. 149
1964-047A	Syncom 3	D	554.	p. 114
1965-028A	Intelsat I F-1 (Early Bird)	L2	28.	p. 140
1966-053A	GGTS 1	D	757.	p. 127
1966-053B	OPS 9311 (IDSCS 1)	D	755.	p. 127
1966-053C	OPS 9312 (IDSCS 2)	D	753.	p. 127
1966-053D	OPS 9313 (IDSCS 3)	D	750.	p. 127
1966-053E	OPS 9314 (IDSCS 4)	D	747.	p. 126
1966-053F	OPS 9315 (IDSCS 5)	D	744.	p. 126
1966-053G	OPS 9316 (IDSCS 6)	D	741.	p. 126
1966-053H	OPS 9317 (IDSCS 7)	D	739.	p. 126
1966-053J	Titan IIIC third stage (Transtage 11)	D	737.	p. 126
1966-110A	ATS 1	D	561.	p. 114
1967-001A	Intelsat II F-2	D	556.	p. 114
1967-003A	OPS 9321 (IDSCS 8)	D	761.	p. 127
1967-003B	OPS 9322 (IDSCS 9)	D	760.	p. 127
1967-003C	OPS 9323 (IDSCS 10)	D	759.	p. 127
1967-003D	OPS 9324 (IDSCS 11)	D	758.	p. 127
1967-003E	OPS 9325 (IDSCS 12)	D	756.	p. 127
1967-003F	OPS 9326 (IDSCS 13)	D	749.	p. 127
1967-003G	OPS 9327 (IDSCS 14)	D	746.	p. 126
1967-003H	OPS 9328 (IDSCS 15)	D	742.	p. 126
1967-026A	Intelsat II F-3	L1	123.	p. 137
1967-066A	OPS 9331 (IDSCS 16)	D	768.	p. 128
1967-066B	OPS 9332 (IDSCS 17)	D	767.	p. 128
1967-066C	OPS 9333 (IDSCS 18)	D	766.	p. 128
1967-066D	OPS 9334 (IDSCS 19, DATS)	D	765.	p. 128
1967-066E	LES 5	D	764.	p. 128
1967-066F	DODGE 1	D	763.	p. 127
1967-066G	Titan IIIC third stage (Transtage 14)	D	762.	p. 127
1967-094A	Intelsat II F-4	L2	32.	p. 140
1967-111A	ATS 3	L2	17.	p. 139
1968-050A	OPS 9341 (IDSCS 20)	D	754.	p. 127
1968-050B	OPS 9342 (IDSCS 21)	D	752.	p. 127
1968-050C	OPS 9343 (IDSCS 22)	D	751.	p. 127
1968-050D	OPS 9344 (IDSCS 23)	D	748.	p. 126
1968-050E	OPS 9345 (IDSCS 24)	D	745.	p. 126
1968-050F	OPS 9346 (IDSCS 25)	D	743.	p. 126
1968-050G	OPS 9347 (IDSCS 26)	D	740.	p. 126
1968-050H	OPS 9348 (IDSCS 27)	D	738.	p. 126
1968-050J	Titan IIIC third stage (Transtage 16)	D	734.	p. 126
1968-063A	OPS 2222 (CANYON 1)	D	322.	p. 98
1968-063B	Atlas SLV-3A stage 2 (Agena D)	D	681.	p. 122
1968-081A	OV2-5 (DG7-2)	D	675.	p. 122
1968-081D	LES 6	L2	26.	p. 139
1968-081E	Titan IIIC third stage (Transtage 5)	D	671.	p. 121
1968-081G	Titan IIIC fragmentation debris	D	625.	p. 118
1968-081H	Titan IIIC fragmentation debris	D	680.	p. 122

COSPAR	Name	Status	nn	Page
1968-081J	Titan IIIC fragmentation debris	D	617.	p. 118
1968-081K	Titan IIIC fragmentation debris	D	688.	p. 122
1968-081L	Titan IIIC fragmentation debris	D	682.	p. 122
1968-081M	Titan IIIC fragmentation debris	D	606.	p. 117
1968-081N	Titan IIIC fragmentation debris	D	618.	p. 118
1968-081P	Titan IIIC fragmentation debris	D	665.	p. 121
1968-081Q	Titan IIIC fragmentation debris	D	344.	p. 100
1968-081R	Titan IIIC fragmentation debris	D	601.	p. 117
1968-081S	Titan IIIC fragmentation debris	D	295.	p. 96
1968-081T	Titan IIIC fragmentation debris	D	704.	p. 124
1968-081U	Titan IIIC fragmentation debris	D	716.	p. 124
1968-081V	Titan IIIC fragmentation debris	D	347.	p. 100
1968-081W	Titan IIIC fragmentation debris	D	382.	p. 102
1968-081X	Titan IIIC fragmentation debris	D	668.	p. 121
1968-081Y	Titan IIIC fragmentation debris	D	727.	p. 125
1968-081Z	Titan IIIC fragmentation debris	D	615.	p. 118
1968-081AA	Titan IIIC fragmentation debris	D	701.	p. 123
1968-081AB	Titan IIIC fragmentation debris	D	634.	p. 119
1968-081AC	Titan IIIC fragmentation debris	D	694.	p. 123
1968-081AD	Titan IIIC fragmentation debris	D	733.	p. 125
1968-081AE	Titan IIIC fragmentation debris	D	693.	p. 123
1968-081AF	Titan IIIC fragmentation debris	D	687.	p. 122
1968-081AG	Titan IIIC fragmentation debris	D	592.	p. 116
1968-081AH	Titan IIIC fragmentation debris	D	541.	p. 113
1968-081AJ	Titan IIIC fragmentation debris	D	539.	p. 113
1968-081AK	Titan IIIC fragmentation debris	D	570.	p. 115
1968-116A	Intelsat III F-2	D	6.	p. 77
1969-013A	TACSAT 1	D	569.	p. 115
1969-013B	Titan IIIC third stage (Transtage 17)	D	67.	p. 81
1969-036A	OPS 3148 (CANYON 2)	D	565.	p. 114
1969-036B	Atlas SLV-3A stage 2 (Agena D)	D	719.	p. 125
1969-045A	Intelsat III F-4	D	5.	p. 77
1969-069A	ATS 5	D	381.	p. 102
1969-069C	ATS 5 AKM (JPL SR-28-3)	D	120.	p. 85
1969-101A	Skynet 1A	L2	8.	p. 138
1970-003A	Intelsat III F-6	D	289.	p. 96
1970-021A	NATO I	L2	6.	p. 138
1970-032A	Intelsat III F-7	L1	119.	p. 137
1970-046A	OPS 5346 (Rhyolite 1)	L1	24.	p. 130
1970-055A	Intelsat III F-8	D	696.	p. 123
1970-069A	OPS 7329 (CANYON 3)	L2	45.	p. 141
1970-069B	Atlas SLV-3A stage 2 (Agena D)	D	679.	p. 122
1971-006A	Intelsat IV F-2	D	209.	p. 91
1971-009A	NATO IIB	L2	4.	p. 138
1971-039A	OPS 3811 (DSP F2, DSP 3, DSP Block 1(PHASE I) F2)	D	115.	p. 84
1971-039B	Titan IIIC third stage (Transtage 20)	D	566.	p. 114
1971-095A	OPS 9431 (DSCS II F-1, DSCS 2-1, DSCS II A-1)	L2	7.	p. 138
1971-095B	OPS 9432 (DSCS II F-2, DSCS 2-2, DSCS II A-2)	L3	2.	p. 142

COSPAR	Name	Status	nn	Page
1971-095C	Titan IIIC third stage (Transtage 21)	D	54.	p. 80
1971-116A	Intelsat IV F-3	D	414.	p. 104
1972-003A	Intelsat IV F-4	D	462.	p. 107
1972-010A	OPS 1570 (DSP F3, DSP 4, DSP Block 1(PHASE I) F3)	D	441.	p. 106
1972-010B	Titan IIIC third stage (Transtage 22)	D	600.	p. 117
1972-041A	Intelsat IV F-5	D	523.	p. 111
1972-090A	Anik A1	D	206.	p. 90
1972-101A	OPS 9390 (CANYON 5)	L1	116.	p. 136
1972-101B	Atlas SLV-3A stage 2 (Agena D)	D	697.	p. 123
1973-013A	OPS 6063 (Rhyolite 2)	L1	1.	p. 129
1973-023A	Anik A2	D	452.	p. 107
1973-040A	OPS 6157 (DSP F4, DSP 2, DSP Block 1(PHASE I) F4)	D	454.	p. 107
1973-040B	Titan IIIC third stage (Transtage 24)	D	397.	p. 103
1973-058A	Intelsat IV F-7	D	283.	p. 95
1973-100A	OPS 9433 (DSCS II F-3, DSCS 2-3, DSCS II B-3)	D	72.	p. 81
1973-100B	OPS 9434 (DSCS II F-4, DSCS 2-4, DSCS II B-4)	D	61.	p. 81
1973-100D	Titan IIIC third stage (Transtage 26)	D	19.	p. 78
1974-017A	Cosmos-637	D	607.	p. 117
1974-017F	Proton-K/DM fourth stage (Blok-DM)	D	622.	p. 118
1974-022A	Westar I	D	480.	p. 109
1974-033A	SMS 1	D	166.	p. 88
1974-033F	SMS 1 AKM (SVM-5)	D	773.	p. 128
1974-039A	ATS 6	D	686.	p. 122
1974-039C	Titan IIIC third stage (Transtage 27)	D	599.	p. 117
1974-060A	Molniya 1-S	L1	70.	p. 133
1974-060F	Proton-K/DM fourth stage (Blok-DM)	L1	90.	p. 135
1974-075A	Westar II	D	470.	p. 108
1974-093A	Intelsat IV F-8	D	446.	p. 106
1974-094A	Skynet 2B	L1	117.	p. 136
1974-101A	Symphonie A	D	493.	p. 109
1975-011A	SMS 2	D	385.	p. 102
1975-011F	SMS 2 AKM (SVM-5)	D	162.	p. 87
1975-038A	Anik A3	D	515.	p. 111
1975-042A	Intelsat IV F-1	D	328.	p. 98
1975-055A	OPS 4966 (CANYON 6)	L1	92.	p. 135
1975-055B	Atlas SLV-3A stage 2 (Agena D)	D	689.	p. 123
1975-077A	Symphonie B	D	496.	p. 110
1975-091A	Intelsat IVA F-1	D	486.	p. 109
1975-097A	Cosmos-775	L1	77.	p. 134
1975-097F	Proton-K/DM fourth stage (Blok-DM)	D	524.	p. 112
1975-100A	GOES 1	L2	15.	p. 139
1975-100F	GOES 1 AKM (SVM-5)	D	684.	p. 122
1975-117A	RCA Satcom I	D	412.	p. 104
1975-118A	OPS 3165 (DSP F5, DSP 8, DSP Block 2(PHASE II) F5)	D	578.	p. 115
1975-118C	Titan IIIC third stage (Transtage 29)	D	582.	p. 115
1975-118D	OPS 3165 debris (DSP F5 IR Sensor telescope sunshade cover)	U	1.	p. 151
1975-123A	Raduga 1	L1	21.	p. 130
1975-123F	Proton-K/DM fourth stage (Blok-DM)	D	579.	p. 115

COSPAR	Name	Status	nn	Page
1976-004A	Hermes (CTS)	L2	23.	p. 139
1976-004E	Hermes (CTS) operational debris (solar array cover)	L2	16.	p. 139
1976-004F	Hermes (CTS) operational debris (solar array cover)	L2	14.	p. 139
1976-010A	Intelsat IVA F-2	D	427.	p. 105
1976-017A	Marisat 1	D	309.	p. 97
1976-023A	LES 8	L2	10.	p. 138
1976-023B	LES 9	L2	11.	p. 138
1976-023F	Titan IIIC third stage (Transtage 30)	D	128.	p. 85
1976-023J	LES 8, LES 9 operational debris	D	127.	p. 85
1976-023K	LES 8, LES 9 operational debris	D	661.	p. 121
1976-029A	RCA Satcom II	D	169.	p. 88
1976-035A	NATO IIIA	D	466.	p. 108
1976-042A	Comstar 1A (D-1)	D	459.	p. 107
1976-053A	Marisat 2	D	34.	p. 79
1976-059A	OPS 2112 (DSP F6, DSP 7, DSP Block 2(PHASE II) F6)	D	377.	p. 102
1976-059C	Titan IIIC third stage (Transtage 28)	D	585.	p. 116
1976-059D	OPS 2112 debris (DSP F6 IR Sensor telescope sunshade cover)	U	2.	p. 151
1976-066A	Palapa 1	D	520.	p. 111
1976-073A	Comstar 1B (D-2)	D	499.	p. 110
1976-092A	Raduga 2	L1	23.	p. 130
1976-092F	Proton-K/DM fourth stage (Blok-DM)	L1	39.	p. 131
1976-101A	Marisat 3	D	65.	p. 81
1976-107A	Ekran 1	L1	40.	p. 131
1976-107F	Proton-K/DM fourth stage (Blok-DM)	D	667.	p. 121
1977-005A	NATO IIIB	D	26.	p. 78
1977-007A	OPS 3151 (DSP F7, DSP 9, DSP Block 2(PHASE II) F7)	D	62.	p. 81
1977-007C	Titan IIIC third stage (Transtage 23)	L2	24.	p. 139
1977-007D	OPS 3151 debris (DSP F7 IR Sensor telescope sunshade cover)	D	586.	p. 116
1977-014A	Kiku 2 (ETS II)	D	505.	p. 110
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2016-027A	IRNSS-R1G	C2	69.	p. 70

COSPAR	Name	Status	nn	Page
2016-028A	JCSAT 2B	C1	186.	p. 54
2016-031A	Thaicom 8	C1	100.	p. 48
2016-035A	Intelsat 31 (DLA 2, ISDLA 2)	C1	265.	p. 59
2016-036A	USA 268 (NROL 37, ORION)	C2	63.	p. 70
2016-036B	Delta 4 second stage	D	724.	p. 125
2016-037A	Beidou DW 23	C2	73.	p. 70
2016-038A	ABS 2A	C1	80.	p. 47
2016-038B	EUTELSAT 117 West B	C1	226.	p. 57
2016-039A	BRISat	C1	184.	p. 54
2016-039B	EchoStar 18	C1	304.	p. 62
2016-041A	MUOS 5	C2	102.	p. 72
2016-047A	USA 269 (Quasar 20, SDS-4 1)	C2	49.	p. 69
2016-048A	Tiantong-1 01 xing	C2	57.	p. 69
2016-050A	JCSAT 16	C1	193.	p. 54
2016-052A	USA 270	C4	9.	p. 76
2016-052B	USA 271	C4	7.	p. 76
2016-052C	Delta 4 second stage	D	239.	p. 93
2016-053A	Intelsat IS-36	C1	85.	p. 47
2016-053B	Intelsat IS-33e	C1	72.	p. 46
2016-054A	Insat 3DR	C1	94.	p. 48
2016-060A	GSAT-18	C1	90.	p. 48
2016-060B	Sky Muster 2	C1	182.	p. 54
2016-064A	Himawari-9	C1	178.	p. 53
2016-065A	Shi Jian 17	C2	81.	p. 71
2016-065C	YZ-2 third stage	D	11.	p. 77
2016-071A	GOES 16	C1	270.	p. 60
2016-072A	Tian Lian 1-04	C2	40.	p. 68
2016-075A	USA 272 (WGS SV-8)	C4	6.	p. 76
2016-077A	Fengyun 4A	C2	55.	p. 69
2016-079A	Echostar 19	C1	261.	p. 59
2016-082A	JCSAT 15	C1	170.	p. 53
2016-082B	Star One D1	C1	279.	p. 60

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 2017) 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),

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

Date/Time epoch of the last available orbital data,

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

$\bar{\dot{\lambda}}$ 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,

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

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

The following list contains 353 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_{IADC}^{GEO})	Date	Time
S-ID	Frame	a	e
		i	Ω
		ω	λ
C1.1	2010-037B	RASCOM-QAF 1R	PL
TLEs	GEO (1.00)	2016-12-25	17:29:29.515
36831	TEME	42164.523	0.0006845 0.0220 62.3751 210.6699
			3.00 2.9748
C1.2	2014-030A	Eutelsat 3B	PL
TLEs	GEO (1.00)	2016-12-25	21:44:42.622
39773	TEME	42164.804	0.0002858 0.0651 29.6689 259.2420
			3.05 3.1150
C1.3	2007-057A	Sirius 4 (Astra 4A)	PL
TLEs	GEO (1.00)	2016-12-25	21:44:42.622
32299	TEME	42164.718	0.0002668 0.0143 355.0824 285.7913
			4.82 4.8153
C1.4	2012-036A	SES-5	PL
TLEs	GEO (1.00)	2016-12-25	02:08:42.557
38652	TEME	42164.806	0.0001969 0.0437 272.9401 7.8494
			4.98 4.9706
C1.5	2004-008A	Eutelsat 7A (Eutelsat W3A)	PL
TLEs	GEO (1.00)	2016-12-25	23:53:26.630
28187	TEME	42164.796	0.0004738 0.0615 357.0533 262.5642
			6.99 6.9783
C1.6	2013-022A	Eutelsat 3D	PL
TLEs	GEO (1.00)	2016-12-25	17:13:22.083
39163	TEME	42164.794	0.0004626 0.0374 8.8574 319.6901
			7.00 7.0154
C1.7	2010-069A	Eutelsat KA-SAT 9A (KA-SAT)	PL
TLEs	GEO (1.00)	2016-12-25	17:05:26.619
37258	TEME	42165.116	0.0003097 0.0508 292.8641 335.5516
			9.00 9.0040
C1.8	2016-005A	EUTELSAT 9B	PL
TLEs	GEO (1.00)	2016-12-25	17:05:17.461
41310	TEME	42164.893	0.0004696 0.0524 138.1552 159.0610
			9.01 9.0414
C1.9	2009-016A	Eutelsat 10A (Eutelsat W2A)	PL
TLEs	GEO (1.00)	2016-12-25	21:44:42.622
34710	TEME	42164.292	0.0005591 0.0640 19.3671 259.0489
			9.99 10.0316
C1.10	2012-040A	Tian Lian 1-03	PL
TLEs	GEO (1.00)	2016-12-31	16:35:10.067
38730	TEME	42165.782	0.0001942 0.0920 264.7225 342.9043
			10.65 10.6763
C1.11	2009-020A	SICRAL 1B	PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000
UI179	J2000	42165.591	0.0004119 0.2128 88.5747 236.6220
			11.81 11.8070
C1.12	2008-065A	Eutelsat Hot Bird 13C (Hot Bird 9)	PL
TLEs	GEO (1.00)	2016-12-25	16:49:23.517
33459	TEME	42165.118	0.0001885 0.0611 56.0853 213.1186
			12.99 13.0275
C1.13	2006-007B	Eutelsat 9A (Eutelsat 9A, Eurobird 9A, Hot Bird 7A)	PL
TLEs	GEO (1.00)	2016-12-25	16:49:22.295
28946	TEME	42164.730	0.0004980 0.0497 114.3582 137.0129
			13.00 13.0314

C1.nn	COSPAR	Name	Type
Source	Orbit (f_{IADC}^{GEO})	Date	λ
S-ID	Frame	a	λ
		e	
		i	
		Ω	
		ω	
C1.14	2006-032A	Eutelsat Hot Bird 13B (Hot Bird 8)	PL
TLEs	GEO (1.00)	2016-12-25	13.00
29270	TEME	42164.779	13.0139
		0.0005012	
		0.0656	
		24.5764	
		273.0895	
C1.15	2010-021B	COMSATBw-2	PL
TLEs	GEO (1.00)	2016-12-25	13.20
36582	TEME	42165.467	13.2260
		0.0002429	
		0.0497	
		306.4318	
		349.5003	
C1.16	2011-057A	Eutelsat 16A (Eutelsat W3C)	PL
TLEs	GEO (1.00)	2016-12-25	15.94
37836	TEME	42165.236	16.0593
		0.0005074	
		0.0619	
		2.2799	
		273.2044	
C1.17	2008-057A	Astra 1M	PL
TLEs	GEO (1.00)	2016-12-25	19.19
33436	TEME	42165.011	19.1767
		0.0001511	
		0.0289	
		77.0616	
		133.1948	
C1.18	2007-016A	Astra 1L	PL
TLEs	GEO (1.00)	2016-12-25	19.20
31306	TEME	42164.491	19.2460
		0.0004760	
		0.0394	
		346.2626	
		303.2214	
C1.19	2011-041A	Astra 1N	PL
TLEs	GEO (1.00)	2016-12-25	19.20
37775	TEME	42164.986	19.2048
		0.0002438	
		0.0535	
		25.7815	
		320.1218	
C1.20^m	2006-012A	Astra 1KR	PL
TLEs	GEO (1.00)	2016-12-25	19.23
29055	TEME	42164.523	19.2325
		0.0004750	
		0.0104	
		338.9579	
		281.3546	
C1.21	2011-049B	Arabsat 5C	PL
TLEs	GEO (1.00)	2016-12-25	19.98
37810	TEME	42165.184	20.0284
		0.0003048	
		0.0610	
		5.4485	
		268.6913	
C1.22	2012-062B	Eutelsat 21B	PL
TLEs	GEO (1.00)	2016-12-25	21.59
38992	TEME	42165.311	21.6302
		0.0002802	
		0.0619	
		2.7560	
		271.5603	
C1.23	2010-021A	Astra 3B	PL
TLEs	GEO (1.00)	2016-12-25	23.49
36581	TEME	42165.320	23.4819
		0.0002614	
		0.0362	
		352.9816	
		274.3440	
C1.24	2007-056B	Skynet 5B	PL
TLEs	GEO (1.00)	2016-12-25	24.62
32294	TEME	42164.202	25.0734
		0.0004023	
		0.0658	
		9.4145	
		263.8234	
C1.25	2013-044A	Eutelsat 25B / Es'hail 1	PL
TLEs	GEO (1.00)	2016-12-24	25.49
39233	TEME	42163.819	25.5230
		0.0001651	
		0.0473	
		24.0612	
		267.2955	
C1.26	2010-025A	Badr 5	PL
TLEs	GEO (1.00)	2016-12-25	26.00
36592	TEME	42165.894	26.0122
		0.0003207	
		0.0152	
		7.2237	
		234.4125	
C1.27	2008-034B	Badr 6	PL
TLEs	GEO (1.00)	2016-12-25	26.00
33154	TEME	42164.867	26.0030
		0.0002780	
		0.0573	
		32.8644	
		290.0855	
C1.28	2006-051A	Badr 4	PL
TLEs	GEO (1.00)	2016-12-25	26.00
29526	TEME	42163.917	26.0262
		0.0005751	
		0.0448	
		345.4227	
		311.3956	

C1.nn	COSPAR	Name						Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time					λ
S-ID	Frame	a	e	i	Ω	ω		λ
C1.29	2015-065B	Badr 7						PL
TLEs	GEO (1.00)	2016-12-25	20:59:55.699					26.03
41029	TEME	42163.892	0.0004734	0.0399	251.7184	5.2391		26.0049
C1.30	2014-089A	Astra 2G (Eutelsat 28G)						PL
TLEs	GEO (1.00)	2016-12-25	15:48:50.502					28.18
40364	TEME	42163.955	0.0002072	0.0339	29.8071	341.2575		28.2066
C1.31	2012-051A	Astra 2F (Eutelsat 28F)						PL
TLEs	GEO (1.00)	2016-12-25	15:48:43.099					28.21
38778	TEME	42165.173	0.0003768	0.0870	246.9224	358.6660		28.2357
C1.32	2013-056A	Astra 2E (Eutelsat 28E)						PL
TLEs	GEO (1.00)	2016-12-25	15:47:30.017					28.42
39285	TEME	42164.031	0.0002907	0.0593	30.7414	238.8492		28.5406
C1.33	2005-005A	XTAR-EUR						PL
TLEs	GEO (1.00)	2016-12-25	15:45:34.502					29.01
28542	TEME	42164.670	0.0002762	0.0336	285.0831	359.4677		29.0254
C1.34	2010-032B	Arabsat 5A						PL
TLEs	GEO (1.00)	2016-12-25	22:18:36.779					30.50
36745	TEME	42164.437	0.0003198	0.0520	15.9337	263.0726		30.4870
C1.35	2012-043B	HYLAS 2						PL
TLEs	GEO (1.00)	2016-12-25	15:37:31.116					31.01
38741	TEME	42165.551	0.0001673	0.0227	354.3644	278.6465		31.0408
C1.36	2014-011B	Astra 5B (HYLAS 2B)						PL
TLEs	GEO (1.00)	2016-12-25	22:18:36.779					31.52
39617	TEME	42164.163	0.0002218	0.0328	353.4397	271.3513		31.4980
C1.37	2011-016A	Intelsat 28 (New Dawn)						PL
TLEs	GEO (1.00)	2016-12-31	23:50:30.240					32.82
37392	TEME	42164.262	0.0000577	0.0465	242.3460	313.1293		32.7925
C1.38	2001-011A	Eutelsat 33C (Eutelsat 28A, Europesat 1, Eurobird 1)						PL
TLEs	GEO (1.00)	2016-12-31	23:21:02.233					33.10
26719	TEME	42165.009	0.0005641	0.0627	358.2635	292.6154		33.0638
C1.39	2009-008B	Eutelsat Hot Bird 13D (Eutelsat 3C, Atlantic Bird 4A)						PL
TLEs	GEO (1.00)	2016-12-31	23:50:29.930					33.11
33750	TEME	42165.155	0.0005041	0.0335	327.8594	283.4739		33.0418
C1.40^m	2009-065A	Eutelsat 36B (Eutelsat W7)						PL
TLEs	GEO (1.00)	2016-12-25	22:16:09.200					35.91
36101	TEME	42164.020	0.0004614	0.0634	16.9906	265.6517		35.9094
C1.41	2015-082A	Ekspress-AMU 1						PL
TLEs	GEO (1.00)	2016-12-25	22:16:09.200					36.10
41191	TEME	42164.119	0.0001691	0.0045	23.4640	232.6303		36.0791
C1.42	2015-022B	SICRAL 2						PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000					36.98
UI190	J2000	42166.324	0.0000527	0.1243	76.4903	126.8304		36.9770
C1.43	2014-006B	ATHENA-FIDUS						PL
TLEs	GEO (1.00)	2016-12-25	15:10:33.953					37.81
39509	TEME	42164.533	0.0001014	0.0088	331.5531	318.4014		37.8037

C1.nn	COSPAR	Name						Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time					λ
S-ID	Frame	a	e	i	Ω	ω		λ
C1.44	2011-042A	Paksat 1R						PL
TLEs	GEO (1.00)	2016-12-25	22:06:30.691					37.99
37779	TEME	42163.949	0.0003441	0.0179	134.6599	159.2770		38.0204
C1.45	2003-020A	Hellas Sat 2						PL
TLEs	GEO (1.00)	2016-12-25	22:15:29.677					39.00
27811	TEME	42164.066	0.0003832	0.0225	75.8428	202.6482		38.9900
C1.46	2015-012A	Ekspress-AM 7						PL
TLEs	GEO (1.00)	2016-12-23	03:28:24.835					40.00
40505	TEME	42164.235	0.0002340	0.0055	299.6101	332.9423		39.9966
C1.47	2008-030B	Turksat 3A						PL
TLEs	GEO (1.00)	2016-12-25	17:29:43.166					42.00
33056	TEME	42165.272	0.0003334	0.0622	168.7295	93.2147		42.0298
C1.48	2014-007A	Turksat 4A						PL
TLEs	GEO (1.00)	2016-12-25	14:53:36.365					42.01
39522	TEME	42164.184	0.0004987	0.0373	279.7397	352.7664		42.0525
C1.49	2011-077A	NigComSat 1R						PL
TLEs	GEO (1.00)	2016-12-25	23:14:04.504					42.50
38014	TEME	42164.767	0.0001612	0.0464	172.0344	81.9038		42.4559
C1.50	1996-021A	Astra 1F						PL
TLEs	GEO (1.00)	2016-12-25	23:44:42.586					44.87
23842	TEME	42163.682	0.0003463	0.0540	319.4142	314.2122		44.2962
C1.51^m	1999-071A	Galaxy 11						PL
TLEs	GEO (1.00)	2016-12-25	22:53:26.054					44.98
26038	TEME	42164.510	0.0001157	0.0132	42.1962	274.9180		44.9805
C1.52	2000-068A	Intelsat 12 (PAS 12, Europe*Star 1)						PL
TLEs	GEO (1.00)	2016-12-25	19:10:55.512					45.01
26590	TEME	42164.383	0.0002831	0.1216	96.4342	200.7623		45.0184
C1.53	2013-006B	Azerspace / Africasat-1a						PL
TLEs	GEO (1.00)	2016-12-25	14:37:46.564					46.01
39079	TEME	42165.648	0.0002189	0.0228	354.8041	309.8134		46.0191
C1.54	2005-041B	Syracuse 3A						PL
TLEs	GEO (1.00)	2016-12-25	22:28:08.701					47.00
28885	TEME	42164.493	0.0003160	0.0166	52.6851	218.6882		46.9761
C1.55	2012-016A	Yahsat 1B						PL
TLEs	GEO (1.00)	2016-12-25	14:31:24.744					47.61
38245	TEME	42164.423	0.0002479	0.0179	328.7535	337.5895		47.6178
C1.56	2009-047A	USA 207 (PAN)						PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000					47.67
UI158	J2000	42166.031	0.0009249	0.0807	40.7121	234.5558		47.6740
C1.57	2008-065B	Eutelsat 48D / Afghansat 1 (Eutelsat 28B, Eutelsat W2M)						PL
TLEs	GEO (1.00)	2016-12-25	22:10:55.423					48.10
33460	TEME	42164.736	0.0002852	0.0443	9.4726	263.8589		48.0719
C1.58	2003-053A	Yamal 200 N2 (Yamal 202)						PL
TLEs	GEO (1.00)	2016-12-25	22:10:55.423					48.99
28089	TEME	42163.854	0.0004106	0.0654	86.2184	204.7190		48.9962

C1.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time				λ
S-ID	Frame	a	e	i	Ω	ω	λ
C1.59	2015-060A	Turksat 4B					PL
TLEs	GEO (1.00)	2016-12-25	14:21:53.690				50.01
40984	TEME	42164.280	0.0001886	0.0183	62.2064	212.1828	50.0034
C1.60	2016-001A	BelinterSat-1					PL
TLEs	GEO (1.00)	2016-12-25	15:06:41.306				51.49
41238	TEME	42164.463	0.0001544	0.0165	300.9364	313.2531	51.4612
C1.61	2015-023A	TurkmenAlem52E/MonacoSAT					PL
TLEs	GEO (1.00)	2016-12-25	14:13:45.354				51.81
40617	TEME	42165.066	0.0002257	0.0107	16.5212	270.7751	52.0424
C1.62	2011-016B	Yahsat 1A					PL
TLEs	GEO (1.00)	2016-12-25	20:46:25.798				52.50
37393	TEME	42164.299	0.0002286	0.0146	298.1080	359.3875	52.5141
C1.63	2012-075A	Skynet 5D					PL
TLEs	GEO (1.00)	2016-12-25	20:46:25.798				52.74
39034	TEME	42165.212	0.0003853	0.0695	351.5009	281.0213	52.7560
C1.64	2014-064A	Ekspress-AM 6					PL
TLEs	GEO (1.00)	2016-12-25	20:46:38.798				52.91
40277	TEME	42164.720	0.0000227	0.0474	191.8248	124.5812	53.0001
C1.65	2012-070A	Yamal 402					PL
TLEs	GEO (1.00)	2016-12-23	03:16:57.920				54.88
39022	TEME	42164.340	0.0002268	0.0015	13.3540	300.7471	54.8743
C1.66	2014-078A	GSAT 16					PL
TLEs	GEO (1.00)	2016-12-25	14:01:58.138				55.02
40332	TEME	42164.684	0.0002516	0.0296	87.9503	11.8148	54.9965
C1.67	2011-022A	GSAT 8					PL
TLEs	GEO (1.00)	2016-12-25	20:45:45.955				55.05
37605	TEME	42164.309	0.0008279	0.0675	101.2339	171.1704	55.0835
C1.68	2014-010A	Ekspress-AT1					PL
TLEs	GEO (1.00)	2016-12-24	21:43:46.819				56.01
39612	TEME	42164.108	0.0000119	0.0430	189.6216	341.0763	56.0286
C1.69	2009-058A	NSS 12					PL
TLEs	GEO (1.00)	2016-12-25	13:53:49.567				57.00
36032	TEME	42165.263	0.0002822	0.0219	330.8304	308.2528	57.0394
C1.70	2014-023B	Kazsat-3					PL
TLEs	GEO (1.00)	2016-12-25	14:27:46.626				58.51
39728	TEME	42164.125	0.0000578	0.0167	39.0580	280.9492	58.5185
C1.71^m	2012-008A	Beidou DW 11					PL
TLEs	GEO (1.00)	2016-12-25	23:24:57.975				58.67
38091	TEME	42163.982	0.0004624	1.9328	52.8735	209.6006	58.6657
C1.72^m	2016-053B	Intelsat IS-33e					PL
TLEs	GEO (1.00)	2016-12-25	13:43:41.845				59.58
41748	TEME	42164.592	0.0002049	0.0281	121.2276	193.9694	59.5796
C1.73	2002-007A	Intelsat 904					PL
TLEs	GEO (1.00)	2016-12-25	22:42:12.811				60.00
27380	TEME	42164.539	0.0002827	0.0102	30.7465	249.9659	59.9821

C1.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time				λ
S-ID	Frame	a	e	i	Ω	ω	λ
C1.74	2009-017A	USA 204 (WGS SV-2)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				60.18
UI156	J2000	42166.121	0.0000459	0.1098	76.0400	2.5658	60.1840
C1.75	2001-025A	Astra 2C					PL
TLEs	GEO (1.00)	2016-12-25	22:26:24.228				60.30
26853	TEME	42164.846	0.0003563	0.0391	69.0150	212.3670	60.2846
C1.76^m	2004-007A	ABS 4 (Mobisat, ABS 2i, MBSat 1)					PL
TLEs	GEO (1.00)	2016-12-25	20:53:19.745				60.98
28184	TEME	42164.947	0.0001905	0.0016	2.8997	282.5804	60.9764
C1.77	2001-039A	Intelsat 902					PL
TLEs	GEO (1.00)	2016-12-25	21:09:44.572				62.00
26900	TEME	42164.542	0.0002961	0.0067	316.6138	322.6726	61.9872
C1.78	2013-073A	Inmarsat-5 F1					PL
TLEs	GEO (1.00)	2016-12-22	22:10:57.863				62.61
39476	TEME	42164.378	0.0000604	0.0027	4.3271	284.1041	62.6170
C1.79	2009-054B	COMSATBw-1					PL
TLEs	GEO (1.00)	2016-12-25	21:41:22.937				63.00
35943	TEME	42164.657	0.0002812	0.0544	69.4600	214.1423	62.9772
C1.80^m	2016-038A	ABS 2A					PL
TLEs	EGO (0.06)	2016-12-29	13:11:51.927				63.64
41588	TEME	42133.867	0.0510872	0.1756	294.2543	199.4510	63.6425
C1.81	2002-041A	Intelsat 906					PL
TLEs	GEO (1.00)	2016-12-25	19:34:44.064				64.15
27513	TEME	42164.822	0.0002677	0.0111	305.5906	333.7123	64.1519
C1.82	2013-045A	AMOS 4					PL
TLEs	GEO (1.00)	2016-12-31	20:53:39.011				65.01
39237	TEME	42164.493	0.0002556	0.0249	340.1486	323.8059	65.0141
C1.83	2010-065B	Intelsat 17 (IS 17)					PL
TLEs	GEO (1.00)	2016-12-25	22:42:50.745				65.97
37238	TEME	42164.704	0.0002598	0.0266	276.0960	0.0404	65.9780
C1.84	2012-043A	Intelsat 20 (IS 20)					PL
TLEs	GEO (1.00)	2016-12-25	13:07:58.287				68.51
38740	TEME	42165.207	0.0001800	0.0161	47.7304	143.1398	68.5306
C1.85	2016-053A	Intelsat IS-36					PL
TLEs	GEO (1.00)	2016-12-31	12:44:28.231				68.54
41747	TEME	42164.570	0.0002515	0.0115	23.9012	318.1130	68.5093
C1.86	2013-062A	Raduga 1M					PL
TLEs	GEO (1.00)	2016-12-25	20:57:11.819				70.01
39375	TEME	42164.418	0.0003302	0.0176	45.4880	239.6448	70.0105
C1.87	2012-069A	Eutelsat 70B					PL
TLEs	GEO (1.00)	2016-12-25	13:00:02.059				70.50
39020	TEME	42164.817	0.0003665	0.0572	3.4426	261.6511	70.5219
C1.88^m	2012-011A	Intelsat 22 (IS 22)					PL
TLEs	GEO (1.00)	2016-12-25	12:53:37.589				72.13
38098	TEME	42164.716	0.0002041	0.0199	14.9209	259.6894	72.1305

C1.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time				λ
S-ID	Frame	a	e	i	Ω	ω	λ
C1.89	2002-002A	INSAT 3C					PL
TLEs	GEO (1.00)	2016-12-25	22:48:54.716				73.98
27298	TEME	42164.659	0.0004367	0.2611	92.5026	205.6724	73.9471
C1.90	2016-060A	GSAT-18					PL
TLEs	GEO (1.00)	2016-12-25	12:46:16.354				73.99
41793	TEME	42164.641	0.0003526	0.0428	82.1486	14.7200	73.9733
C1.91	2007-037A	INSAT 4CR					PL
TLEs	GEO (1.00)	2016-12-25	22:48:52.392				73.99
32050	TEME	42164.496	0.0009632	0.0453	274.0189	2.2629	73.8961
C1.92	2014-001A	GSAT 14					PL
TLEs	GEO (1.00)	2016-12-27	12:38:04.366				74.00
39498	TEME	42164.889	0.0006420	0.0686	274.5336	7.2023	74.0580
C1.93	2013-044B	GSAT 7					PL
TLEs	GEO (1.00)	2016-12-25	12:45:35.034				74.03
39234	TEME	42164.491	0.0012920	0.0693	97.7610	177.8889	74.1436
C1.94	2016-054A	Insat 3DR					PL
TLEs	GEO (1.00)	2016-12-25	12:45:29.119				74.15
41752	TEME	42163.664	0.0015193	0.1064	275.7732	356.5795	74.1688
C1.95	2014-006A	ABS 2 (ST 3, Koreasat 8)					PL
TLEs	GEO (1.00)	2016-12-25	12:42:19.979				74.92
39508	TEME	42164.700	0.0002899	0.0194	352.5462	303.6079	74.9632
C1.96^m	2015-074A	Elektro-L No. 2					PL
TLEs	GEO (1.00)	2016-12-25	23:28:50.479				76.00
41105	TEME	42165.247	0.0000216	0.0332	262.8101	205.4913	76.0011
C1.97	2012-013A	Apstar 7					PL
TLEs	GEO (1.00)	2016-12-23	16:46:38.319				76.50
38107	TEME	42164.856	0.0002899	0.0198	18.7828	254.0574	76.5144
C1.98^m	2006-020B	Thaicom 5					PL
TLEs	GEO (1.00)	2016-12-25	23:52:22.871				78.45
29163	TEME	42164.590	0.0006010	0.0457	279.7869	9.8733	78.4459
C1.99	2014-002A	Thaicom 6					PL
TLEs	GEO (1.00)	2016-12-25	23:52:22.903				78.50
39500	TEME	42164.839	0.0001504	0.0861	118.7962	106.7081	78.4812
C1.100	2016-031A	Thaicom 8					PL
TLEs	GEO (1.00)	2016-12-25	12:27:54.297				78.50
41552	TEME	42164.798	0.0003588	0.0610	40.6817	279.5277	78.5773
C1.101	2003-060A	Ekspress-AM 22 (SESAT 2)					PL
TLEs	GEO (1.00)	2016-12-25	19:11:46.227				80.13
28134	TEME	42164.807	0.0000883	0.0869	82.8370	265.8830	80.1131
C1.102^m	2015-075A	Cosmos-2513					PL
TLEs	GEO (1.00)	2016-12-25	18:08:02.848				80.25
41121	TEME	42164.995	0.0003555	0.0840	80.9793	202.7202	80.2500
C1.103	2015-073A	Chinasat 1C (Zhongxing 1C, ZX 1C, Feng Huo 2-2)					PL
TLEs	GEO (1.00)	2016-12-25	23:52:39.268				81.51
41103	TEME	42164.370	0.0004380	0.0465	221.7195	60.2814	81.5231

C1.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time				λ
S-ID	Frame	a	e	i	Ω	ω	λ
C1.104	2013-038B	INSAT 3D					PL
TLEs	GEO (1.00)	2016-12-25	12:13:51.423				82.08
39216	TEME	42165.027	0.0001929	0.0260	301.6118	351.3083	82.0995
C1.105	2012-051B	GSAT 10					PL
TLEs	GEO (1.00)	2016-12-25	12:10:15.474				82.99
38779	TEME	42165.030	0.0001670	0.0416	107.5335	175.9060	83.0019
C1.106	2011-034A	GSAT 12					PL
TLEs	GEO (1.00)	2016-12-25	22:31:24.463				83.00
37746	TEME	42164.218	0.0003207	0.0175	17.0731	105.1164	83.0123
C1.107	2005-049A	INSAT 4A					PL
TLEs	GEO (1.00)	2016-12-25	12:09:57.511				83.01
28911	TEME	42164.348	0.0006826	0.0564	97.4516	175.6462	83.0768
C1.108^m	2015-041A	GSAT 6					PL
TLEs	GEO (1.00)	2016-12-25	12:09:44.099				83.13
40880	TEME	42164.688	0.0010974	0.1899	262.0893	10.7401	83.1312
C1.109^m	2012-059A	Beidou DW 16					PL
TLEs	GEO (1.00)	2016-12-25	23:18:26.637				83.97
38953	TEME	42163.852	0.0006725	1.3035	79.7324	173.4792	83.9651
C1.110	2007-063B	Horizons 2					PL
TLEs	GEO (1.00)	2016-12-25	17:19:09.372				84.85
32388	TEME	42164.426	0.0002785	0.0152	39.6020	247.6628	84.8711
C1.111	2010-002A	Raduga 1M					PL
TLEs	GEO (1.00)	2016-12-25	17:19:09.390				85.00
36358	TEME	42164.467	0.0002896	0.0013	0.5433	303.4212	85.0341
C1.112	2009-067A	Intelsat 15 (IS 15)					PL
TLEs	GEO (1.00)	2016-12-25	17:53:12.548				85.15
36106	TEME	42164.569	0.0002098	0.0156	42.7664	234.4984	85.1722
C1.113	2011-035B	Kazsat-2					PL
TLEs	GEO (1.00)	2016-12-31	00:49:18.990				86.50
37749	TEME	42164.335	0.0002778	0.0496	214.9645	77.6308	86.4725
C1.114	2012-067A	Chinasat 15A (Zhongxing 15A, Chinasat 12, Zhongxing 12)					PL
TLEs	GEO (1.00)	2016-12-25	17:53:12.548				87.50
39017	TEME	42164.345	0.0002470	0.0104	16.9969	264.8306	87.5144
C1.115	2011-022B	ST-2					PL
TLEs	GEO (1.00)	2016-12-25	19:30:48.319				87.97
37606	TEME	42165.029	0.0001568	0.0230	8.9818	289.1649	88.0202
C1.116^m	2012-003A	USA 233 (WGS SV-4)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				88.39
UI169	J2000	42165.225	0.0000357	0.1056	75.2845	72.3646	88.3910
C1.117^m	2000-028A	Eutelsat 36A (Eutelsat W4)					PL
TLEs	GEO (1.00)	2016-12-25	18:29:15.349				88.54
26369	TEME	42164.787	0.0004149	0.6560	84.0758	204.0368	88.5367
C1.118	2014-082A	Yamal 401					PL
TLEs	GEO (1.00)	2016-12-31	18:09:17.044				89.94
40345	TEME	42165.083	0.0000467	0.0562	128.3565	264.7963	89.9436

C1.nn	COSPAR	Name						Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time					λ
S-ID	Frame	a	e	i	Ω	ω		λ
C1.119	2006-056A	Measat 3						PL
TLEs	GEO (1.00)	2016-12-25	21:38:25.322					91.50
29648	TEME	42164.973	0.0000997	0.0617	128.5721	90.2199		91.4929
C1.120	2014-054B	Measat 3B						PL
TLEs	GEO (1.00)	2016-12-25	11:36:17.100					91.50
40147	TEME	42164.387	0.0002128	0.0239	351.3807	315.2899		91.5169
C1.121	2009-032A	Measat 3A						PL
TLEs	GEO (1.00)	2016-12-25	11:36:12.544					91.50
35362	TEME	42164.294	0.0002623	0.0520	195.9319	54.6186		91.5376
C1.122	2008-028A	Chinasat 9 (Zhongxing 9, ZX 9)						PL
TLEs	GEO (1.00)	2016-12-31	20:45:23.193					92.18
33051	TEME	42165.499	0.0004210	0.0099	325.6796	323.5168		92.1311
C1.123^m	2007-007A	INSAT 4B						PL
TLEs	GEO (1.00)	2016-12-25	22:02:59.047					93.48
30793	TEME	42164.904	0.0001064	0.0697	97.8832	11.7203		93.4758
C1.124	2015-065A	GSAT 15						PL
TLEs	GEO (1.00)	2016-12-25	11:28:13.156					93.51
41028	TEME	42164.623	0.0001937	0.0382	86.1319	186.1255		93.5388
C1.125	2002-057A	NSS 6						PL
TLEs	GEO (1.00)	2016-12-25	22:56:39.391					94.99
27603	TEME	42163.781	0.0002747	0.0297	76.0585	199.6634		94.9667
C1.126	2013-071A	SES-8						PL
TLEs	GEO (1.00)	2016-12-25	11:22:19.845					95.00
39460	TEME	42164.161	0.0000620	0.0231	295.7144	354.6389		95.0180
C1.127	2007-007B	Skynet 5A						PL
TLEs	GEO (1.00)	2016-12-25	22:56:39.270					95.17
30794	TEME	42165.159	0.0003998	0.0677	15.7232	257.8945		95.1326
C1.128	2008-003A	Ekspress-AM 33						PL
TLEs	GEO (1.00)	2016-12-25	21:55:34.392					96.50
32478	TEME	42165.001	0.0001552	0.0166	218.8315	209.2588		96.5127
C1.129	2013-020A	Chinasat 11 (Zhongxing 11, ZX 11, SupremeSat 2)						PL
TLEs	GEO (1.00)	2016-12-25	21:56:28.640					98.01
39157	TEME	42165.000	0.0002809	0.0010	7.5904	278.8160		97.9918
C1.130	2012-028A	Chinasat 2A (Zhongxing 2A, ZX 2A, Shentong 2-1)						PL
TLEs	GEO (1.00)	2016-12-25	23:53:47.387					98.27
38352	TEME	42165.319	0.0005299	0.0343	179.5899	141.0292		98.1905
C1.131	2009-042A	Asiasat 5						PL
TLEs	GEO (1.00)	2016-12-24	15:30:14.315					100.50
35696	TEME	42165.292	0.0001654	0.0064	254.8910	6.3642		100.5036
C1.132	2005-023A	Ekspress-AM 3						PL
TLEs	GEO (1.00)	2016-12-25	21:38:00.905					103.00
28707	TEME	42165.071	0.0000791	0.0290	132.4605	221.8552		103.0067
C1.133^m	2015-063A	Chinasat 2C (Zhongxing 2C, ZX 2C, Shentong 2-2)						PL
TLEs	GEO (1.00)	2016-12-25	21:38:00.961					103.44
41021	TEME	42164.271	0.0003126	0.0489	160.1841	185.4360		103.4445

C1.nn	COSPAR	Name						Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time					λ
S-ID	Frame	a	e	i	Ω	ω		λ
C1.134	2014-046A	Asiasat 8						PL
TLEs	GEO (1.00)	2016-12-25	10:41:12.019					105.31
40107	TEME	42164.038	0.0001221	0.0280	304.3243	313.7715		105.3254
C1.135	2011-069A	Asiasat 7						PL
TLEs	GEO (1.00)	2016-12-25	23:07:46.316					105.48
37933	TEME	42164.063	0.0001112	0.0338	286.9886	349.7904		105.4888
C1.136	2015-083A	Gao Fen 4						PL
TLEs	GEO (1.00)	2016-12-25	23:51:48.472					105.84
41194	TEME	42164.579	0.0002365	0.0376	249.2505	23.1983		105.7035
C1.137	1999-042A	Telkom 1						PL
TLEs	GEO (1.00)	2016-12-25	22:30:20.137					108.00
25880	TEME	42164.847	0.0002117	0.0322	129.1895	185.1761		108.0042
C1.138	2009-027A	Indostar II/Protostar II						PL
TLEs	GEO (1.00)	2016-12-25	22:30:19.917					108.06
34941	TEME	42164.672	0.0002723	0.0314	57.4945	226.9094		108.2290
C1.139	2000-059A	GE 1A						PL
TLEs	GEO (1.00)	2016-12-25	22:30:20.037					108.20
26554	TEME	42164.749	0.0001172	0.0181	327.9215	344.7863		108.1816
C1.140	2016-013A	SES-9						PL
TLEs	GEO (1.00)	2016-12-31	10:05:39.084					108.32
41380	TEME	42164.761	0.0000613	0.0336	307.6005	261.8307		108.3224
C1.141	2010-056B	BSAT 3B						PL
TLEs	GEO (1.00)	2016-12-25	21:47:59.249					109.85
37207	TEME	42164.475	0.0004944	0.0716	309.1167	352.2866		109.8238
C1.142	2007-036B	BSAT 3A						PL
TLEs	GEO (1.00)	2016-12-25	10:22:55.966					109.86
32019	TEME	42164.366	0.0004293	0.0702	240.3642	11.0490		109.9086
C1.143	2011-041B	BSAT 3c						PL
TLEs	GEO (1.00)	2016-12-25	19:36:07.621					109.97
37776	TEME	42164.457	0.0000148	0.0185	302.8373	132.9246		109.9795
C1.144	2000-060A	N-SAT-110						PL
TLEs	GEO (1.00)	2016-12-25	21:49:38.309					110.07
26559	TEME	42164.879	0.0000391	0.0186	358.1482	145.3005		110.0897
C1.145	2011-026A	Chinasat 10 (Zhongxing 10, ZX 10, Sinosat 5, Xinnuo 5)						PL
TLEs	GEO (1.00)	2016-12-25	23:49:40.353					110.51
37677	TEME	42163.666	0.0004877	0.0190	290.6912	332.5107		110.4337
C1.146^m	2010-024A	Beidou DW 4						PL
TLEs	GEO (1.00)	2016-12-25	09:32:46.793					110.63
36590	TEME	42164.211	0.0006382	1.4290	29.7550	299.3213		110.6275
C1.147^m	2012-002A	Fengyun 2F						PL
TLEs	GEO (1.00)	2016-12-25	23:19:30.936					111.96
38049	TEME	42166.773	0.0001865	1.3636	77.3481	235.5165		111.9612
C1.148	2009-046A	Palapa D						PL
TLEs	GEO (1.00)	2016-12-25	10:10:38.773					112.96
35812	TEME	42164.662	0.0002138	0.0168	45.1642	266.9771		112.9878

C1.nn	COSPAR	Name	Type
Source	Orbit (f_{IADC}^{GEO})	Date	λ
S-ID	Frame	a	λ
		e	
		i	
		Ω	
		ω	
C1.149	2006-034A	Mugunghwa 5 (Koreasat 5)	PL
TLEs	GEO (1.00)	2016-12-25	113.05
29349	TEME	42164.675	113.0542
		0.0000762	
		0.0267	
		74.9359	
		192.7160	
C1.150	1998-050A	Astra 2A	PL
TLEs	GEO (1.00)	2016-12-25	113.49
25462	TEME	42164.136	113.4873
		0.0001939	
		0.0797	
		254.9487	
		8.1598	
C1.151	2007-031A	Chinasat 6B (Zhongxing 6B, ZX 6B)	PL
TLEs	GEO (1.00)	2016-12-25	115.53
31800	TEME	42163.926	115.4966
		0.0003476	
		0.0110	
		0.8740	
		257.6350	
C1.152	2010-070B	Olleh 1 (Koreasat 6)	PL
TLEs	GEO (1.00)	2016-12-25	116.00
37265	TEME	42164.502	115.9909
		0.0001323	
		0.0110	
		6.9706	
		272.6323	
C1.153	1999-046A	ABS 7 (Mugunghwa 3, Koreasat 3)	PL
TLEs	GEO (1.00)	2016-12-25	116.05
25894	TEME	42165.157	116.1503
		0.0002873	
		0.0202	
		59.6628	
		292.1106	
C1.154	2005-046A	Telkom 2	PL
TLEs	GEO (1.00)	2016-12-25	118.00
28902	TEME	42165.216	118.0006
		0.0001250	
		0.0190	
		288.2443	
		338.3798	
C1.155	2005-028A	Thaicom 4 (IPStar 1)	PL
TLEs	GEO (1.00)	2016-12-25	119.49
28786	TEME	42164.523	119.4785
		0.0002029	
		0.0179	
		12.7477	
		264.0350	
C1.156	2014-052A	Asiasat 6	PL
TLEs	GEO (1.00)	2016-12-25	119.91
40141	TEME	42165.243	119.9115
		0.0000288	
		0.0260	
		286.2133	
		72.8963	
C1.157	2003-014A	Asiasat 4	PL
TLEs	GEO (1.00)	2016-12-23	122.15
27718	TEME	42165.364	122.0781
		0.0000975	
		0.0227	
		74.3652	
		184.8505	
C1.158	2012-023A	JCSAT 13	PL
TLEs	GEO (1.00)	2016-12-25	124.07
38331	TEME	42164.655	124.0262
		0.0001855	
		0.0104	
		7.0739	
		290.7994	
C1.159	2010-042A	Chinasat 6A (Zhongxing 6A, ZX 6A, Sinosat 6, Xinnuo 6)	PL
TLEs	GEO (1.00)	2016-12-23	125.04
37150	TEME	42166.788	125.0260
		0.0001145	
		0.0492	
		254.7365	
		189.8189	
C1.160	2006-033A	JCSAT 3A	PL
TLEs	GEO (1.00)	2016-12-25	127.88
29272	TEME	42164.726	127.9953
		0.0001439	
		0.0094	
		340.9061	
		277.7804	
C1.161	2009-044A	JCSAT 12 (JCSAT-RA)	PL
TLEs	GEO (1.00)	2016-12-25	127.93
35755	TEME	42164.611	127.9369
		0.0000609	
		0.0497	
		46.5536	
		198.0803	
C1.162	2010-032A	COMS 1 (Chollian)	PL
TLEs	GEO (1.00)	2016-12-25	128.21
36744	TEME	42165.136	128.2131
		0.0001042	
		0.0174	
		34.4453	
		292.7343	
C1.163	2015-067A	LaoSat 1	PL
TLEs	GEO (1.00)	2016-12-25	128.51
41034	TEME	42165.062	128.5277
		0.0001694	
		0.0054	
		260.9174	
		333.8642	

C1.nn	COSPAR	Name	Type
Source	Orbit (f_{IADC}^{GEO})	Date	λ
S-ID	Frame	a	λ
		e	
		i	
		Ω	
		ω	
C1.164	2011-047A	Chinasat 1A (Zhongxing 1A, ZX 1A, Feng Huo 2-1)	PL
TLEs	GEO (1.00)	2016-12-31	129.86
37804	TEME	42164.242	129.8745
C1.165	2010-064A	Chinasat 20A (Zhongxing 20A, ZX 20A, Shentong 1-2)	PL
TLEs	GEO (1.00)	2016-12-31	130.03
37234	TEME	42164.762	130.1330
C1.166	2012-023B	VINASAT-2	PL
TLEs	GEO (1.00)	2016-12-25	131.84
38332	TEME	42164.703	131.8355
C1.167	2008-018A	VINASAT-1	PL
TLEs	GEO (1.00)	2016-12-25	131.94
32767	TEME	42164.751	131.9604
C1.168	2006-010A	JCSAT 9	PL
TLEs	GEO (1.00)	2016-12-25	132.04
29045	TEME	42164.636	132.0419
C1.169	2005-012A	Apstar 6	PL
TLEs	GEO (1.00)	2016-12-25	134.00
28638	TEME	42165.091	133.9788
C1.170^m	2016-082A	JCSAT 15	PL
TLEs	GEO (1.00)	2016-12-31	135.85
41903	TEME	42145.666	135.8550
C1.171^m	2002-015A	JCSAT 8	PL
TLEs	GEO (1.00)	2016-12-25	135.96
27399	TEME	42164.078	135.9572
C1.172	2004-024A	Telstar 18 (APStar 5)	PL
TLEs	GEO (1.00)	2016-12-25	137.99
28364	TEME	42164.871	138.0068
C1.173	2014-010B	Ekspress-AT2	PL
TLEs	GEO (1.00)	2016-12-31	139.85
39613	TEME	42165.070	139.8383
C1.174	2013-077A	Ekspress-AM 5	PL
TLEs	GEO (1.00)	2016-12-31	140.04
39487	TEME	42165.004	140.0288
C1.175^m	2010-001A	Beidou DW 3	PL
TLEs	GEO (1.00)	2016-12-25	140.08
36287	TEME	42164.806	140.0782
C1.176	2015-054A	Sky Muster	PL
TLEs	GEO (1.00)	2016-12-25	140.25
40940	TEME	42164.507	140.2749
C1.177	2014-060A	Himawari 8	PL
TLEs	GEO (1.00)	2016-12-25	140.67
40267	TEME	42164.139	140.6676
C1.178	2016-064A	Himawari-9	PL
TLEs	GEO (1.00)	2016-12-25	140.82
41836	TEME	42164.992	140.7803

C1.nn	COSPAR	Name	Type
Source	Orbit (f_{IADC}^{GEO})	Date	λ
S-ID	Frame	a	λ
		Time	
		e	
		i	
		Ω	
		ω	
C1.179	2015-059A	Apstar 9	PL
TLEs	GEO (1.00)	2016-12-25 08:14:48.640	142.03
40982	TEME	42164.101 0.0001874 0.0366 257.4541 356.7891	142.0255
C1.180^m	2008-007A	Kizuna (WINDS)	PL
TLEs	GEO (1.00)	2016-12-25 21:45:20.808	142.98
32500	TEME	42164.817 0.0002263 0.4695 91.3603 194.9475	142.9827
C1.181	2008-038A	Superbird C2	PL
TLEs	GEO (1.00)	2016-12-25 21:36:09.626	143.93
33274	TEME	42164.313 0.0001008 0.0130 310.6858 319.7108	143.9502
C1.182	2016-060B	Sky Muster 2	PL
TLEs	GEO (1.00)	2016-12-25 08:03:55.336	144.77
41794	TEME	42165.047 0.0001784 0.0192 352.0559 280.2835	144.7512
C1.183	2006-004A	Himawari 7 (MTSAT 2)	PL
TLEs	GEO (1.00)	2016-12-25 20:48:10.901	145.01
28937	TEME	42165.446 0.0003883 0.0294 101.1252 181.2945	144.9431
C1.184	2016-039A	BRISat	PL
TLEs	GEO (1.00)	2016-12-25 07:41:01.770	150.52
41591	TEME	42165.686 0.0002209 0.0228 338.6879 294.6304	150.4919
C1.185	2007-044A	Optus D2	PL
TLEs	GEO (1.00)	2016-12-25 21:34:00.818	152.01
32252	TEME	42164.933 0.0003718 0.0045 47.5476 230.9809	151.9846
C1.186	2016-028A	JCSAT 2B	PL
TLEs	GEO (1.00)	2016-12-25 07:26:58.795	154.04
41471	TEME	42164.292 0.0002839 0.0350 86.0777 239.2172	154.0164
C1.187	2015-046A	TJS	PL
TLEs	GEO (1.00)	2016-12-25 20:26:42.576	155.01
40892	TEME	42165.010 0.0002646 0.0540 74.6906 238.2944	155.0438
C1.188	2009-044B	Optus D3	PL
TLEs	GEO (1.00)	2016-12-25 20:26:42.576	156.01
35756	TEME	42164.527 0.0003450 0.0263 352.6215 300.6804	155.9853
C1.189	2003-028B	Optus C1 (Defense C1)	PL
TLEs	GEO (1.00)	2016-12-25 20:26:42.576	156.01
27831	TEME	42164.912 0.0003158 0.0252 117.5186 140.2435	155.9661
C1.190	1999-053A	LMI 1	PL
TLEs	GEO (1.00)	2016-12-25 07:06:57.049	159.03
25924	TEME	42164.821 0.0000959 0.0110 2.4324 266.8712	159.0343
C1.191^m	2010-057A	Beidou DW 6	PL
TLEs	GEO (1.00)	2016-12-25 18:43:50.638	159.97
37210	TEME	42164.350 0.0007419 0.7807 44.6235 187.1148	159.9715
C1.192	2006-043B	Optus D1	PL
TLEs	GEO (1.00)	2016-12-25 20:26:42.576	160.00
29495	TEME	42164.553 0.0003211 0.0153 80.0542 193.5230	159.9743
C1.193^m	2016-050A	JCSAT 16	PL
TLEs	GEO (1.00)	2016-12-23 07:03:04.462	161.98
41729	TEME	42164.213 0.0002066 0.0173 314.1261 115.8618	161.9773

C1.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time				λ
S-ID	Frame	a	e	i	Ω	ω	λ
C1.194	2000-012A	Superbird 4					PL
TLEs	GEO (1.00)	2016-12-25	18:36:19.718				162.00
26095	TEME	42164.755	0.0002301	0.0365	97.3299	180.4648	161.9885
C1.195^m	1998-033A	APStar 9A (Chinasat 5A, Zhongxing 5A, ZX 5A, Zhongwei 1)					PL
TLEs	GEO (1.00)	2016-12-25	20:03:12.504				163.01
25354	TEME	42164.695	0.0005424	0.8812	88.0833	190.3738	163.0082
C1.196	2014-054A	Optus 10					PL
TLEs	GEO (1.00)	2016-12-25	06:47:01.496				164.00
40146	TEME	42164.474	0.0001430	0.0410	293.4438	346.5948	164.0314
C1.197	2012-030A	Intelsat 19 (IS 19)					PL
TLEs	GEO (1.00)	2016-12-25	06:38:59.230				166.00
38356	TEME	42164.884	0.0003309	0.0163	6.0690	273.9762	166.0450
C1.198^m	2011-074B	Luch 5A					PL
TLEs	GEO (1.00)	2016-12-25	11:51:42.563				167.06
37951	TEME	42164.129	0.0004558	1.5787	197.7859	78.2576	167.0568
C1.199	1998-037A	Intelsat 805					PL
TLEs	GEO (1.00)	2016-12-25	18:45:11.974				168.99
25371	TEME	42164.355	0.0003247	0.0096	5.1642	294.6881	168.9820
C1.200	2005-052A	Eutelsat 172A (GE 23, AMC 23)					PL
TLEs	GEO (1.00)	2016-12-25	14:04:36.361				172.00
28924	TEME	42164.354	0.0006721	0.0659	23.3484	254.4173	171.9691
C1.201^m	2015-036A	USA 263 (WGS SV-7)					PL
KIAM	GEO (1.00)	2017-01-02	00:00:00.000				175.06
UI191	J2000	42165.999	0.0000375	0.1101	78.0633	250.4906	175.0590
C1.202	2015-042A	Inmarsat-5 F3					PL
TLEs	GEO (1.00)	2016-12-25	05:44:59.674				179.57
40882	TEME	42165.588	0.0000665	0.0230	2.0906	76.8966	179.5796
C1.203	2007-046A	USA 195 (WGS SV-1)					PL
KIAM	GEO (1.00)	2017-01-02	00:00:00.000				179.82
UI152	J2000	42166.402	0.0000479	0.1115	78.7030	250.2543	179.8170
C1.204	2011-056A	Intelsat 18 (IS 18)					PL
TLEs	GEO (1.00)	2016-12-25	12:31:14.172				180.00
37834	TEME	42164.541	0.0002168	0.0154	55.5004	236.2595	180.0034
C1.205	2012-061B	Yamal 300K					PL
TLEs	GEO (1.00)	2016-12-25	19:20:21.944				182.96
38978	TEME	42164.958	0.0000200	0.0452	162.7301	44.6989	182.9355
C1.206	2009-008A	NSS 9					PL
TLEs	GEO (1.00)	2016-12-25	16:03:19.183				183.02
33749	TEME	42164.936	0.0001929	0.0220	335.3068	300.5615	183.0421
C1.207^m	2013-004A	TDRS 11					PL
TLEs	GEO (1.00)	2016-12-25	03:03:50.305				188.91
39070	TEME	42164.794	0.0012165	5.6161	328.8558	291.3042	188.9106
C1.208	2000-081B	GE 8 (Aurora 3)					PL
TLEs	GEO (1.00)	2016-12-25	16:05:19.477				220.99
26639	TEME	42164.346	0.0002610	0.0164	347.1540	296.9078	220.9905

C1.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time				λ
S-ID	Frame	a	e	i	Ω	ω	λ
C1.209	2013-041A	USA 244 (WGS SV-6)					PL
KIAM	GEO (1.00)	2017-01-08	00:00:00.000				224.81
UI180	J2000	42164.844	0.0000249	0.1063	77.4155	164.1385	224.8150
C1.210	2010-008A	GOES 15					PL
TLEs	GEO (1.00)	2016-12-25	02:43:40.915				224.88
36411	TEME	42161.981	0.0001034	0.1511	264.1679	333.6766	225.0354
C1.211	2004-003A	AMC 10 (GE 10)					PL
TLEs	GEO (1.00)	2016-12-25	15:19:46.049				225.00
28154	TEME	42164.434	0.0000149	0.0148	34.8928	291.6513	224.9772
C1.212^m	2000-054B	GE 7					PL
TLEs	GEO (1.00)	2016-12-25	02:43:39.847				225.04
26495	TEME	42165.313	0.0002799	0.0552	77.0473	190.3868	225.0392
C1.213	2005-041A	Galaxy 15					PL
TLEs	GEO (1.00)	2016-12-25	14:38:17.666				226.99
28884	TEME	42164.160	0.0002366	0.0343	300.6084	356.7080	226.9884
C1.214	2004-017A	AMC 11 (GE 11)					PL
TLEs	GEO (1.00)	2016-12-25	12:02:43.681				228.99
28252	TEME	42163.987	0.0002743	0.0266	329.8833	327.2707	228.9948
C1.215^m	2003-013B	Galaxy XII					PL
TLEs	GEO (1.00)	2016-12-25	12:38:04.594				230.98
27715	TEME	42164.133	0.0002300	0.0263	251.9294	15.8500	230.9818
C1.216	2008-063A	Ciel 2					PL
TLEs	GEO (1.00)	2016-12-25	09:17:22.249				231.14
33453	TEME	42165.022	0.0002858	0.0187	322.8750	310.8913	231.1462
C1.217	2003-044A	Galaxy 13 / Horizons 1					PL
TLEs	GEO (1.00)	2016-12-25	15:06:48.182				232.99
27954	TEME	42164.750	0.0002486	0.0116	87.2843	198.5475	232.9470
C1.218	2005-030A	Galaxy 14					PL
TLEs	GEO (1.00)	2016-12-25	13:42:19.800				235.00
28790	TEME	42165.092	0.0002437	0.0096	5.1976	272.3580	234.9827
C1.219	2008-038B	AMC 21					PL
TLEs	GEO (1.00)	2016-12-25	13:42:19.800				235.10
33275	TEME	42164.798	0.0002414	0.0190	341.9893	304.6830	235.0712
C1.220	2008-024A	Galaxy 18					PL
TLEs	GEO (1.00)	2016-12-25	01:55:35.753				236.99
32951	TEME	42165.214	0.0003015	0.0232	40.9618	232.8990	237.0867
C1.221	2003-034A	EchoStar 9 (Galaxy 23, Intelsat Americas 13, Telstar 13)					PL
TLEs	GEO (1.00)	2016-12-25	15:13:30.522				239.00
27854	TEME	42164.383	0.0003043	0.0277	46.0553	240.8275	238.9646
C1.222	2004-016A	DirecTV 7S					PL
TLEs	GEO (1.00)	2016-12-25	14:17:50.599				240.93
28238	TEME	42164.538	0.0002757	0.0174	349.7666	295.9810	240.9002
C1.223	2010-010A	EchoStar 14					PL
TLEs	GEO (1.00)	2016-12-25	15:07:14.784				241.10
36499	TEME	42165.559	0.0002772	0.0176	339.5452	286.3627	241.0759

C1.nn	COSPAR	Name						Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time					λ
S-ID	Frame	a	e	i	Ω	ω		λ
C1.224	2002-006A	EchoStar 7						PL
TLEs	GEO (1.00)	2016-12-25	15:07:14.784					241.17
27378	TEME	42164.982	0.0001267	0.0256	314.6439	356.9986		241.1845
C1.225	2007-009A	Anik F3						PL
TLEs	GEO (1.00)	2016-12-25	13:01:58.764					241.29
31102	TEME	42164.956	0.0001673	0.0012	32.5007	260.9186		241.2814
C1.226^m	2016-038B	EUTELSAT 117 West B						PL
TLEs	GEO (1.00)	2016-12-25	01:32:05.746					242.98
41589	TEME	42164.695	0.0001243	0.0111	1.3335	98.7874		242.9801
C1.227	2013-012A	Eutelsat 117 West A (SATMEX 8)						PL
TLEs	GEO (1.00)	2016-12-25	01:30:55.536					243.23
39122	TEME	42164.958	0.0002701	0.0246	329.7610	303.6697		243.2702
C1.228	2013-058A	Sirius FM-6 (Radiosat 6)						PL
TLEs	GEO (1.00)	2016-12-25	01:28:26.238					243.87
39360	TEME	42165.191	0.0000413	0.0270	23.6088	122.9795		243.8928
C1.229	2006-049A	XM Radio 4 (Blues)						PL
TLEs	GEO (1.00)	2016-12-25	15:12:50.440					244.86
29520	TEME	42164.330	0.0000100	0.0128	185.2626	202.1981		244.7770
C1.230	2011-059A	ViaSat-1						PL
TLEs	GEO (1.00)	2016-12-25	15:12:50.440					244.89
37843	TEME	42165.196	0.0002297	0.0238	3.4109	270.0336		244.8758
C1.231	2015-010B	Eutelsat 115 West B						PL
TLEs	GEO (1.00)	2016-12-31	01:00:03.327					245.11
40425	TEME	42164.613	0.0000206	0.0105	161.3011	180.7228		245.0960
C1.232	2012-075B	Mexsat Bicentenario						PL
TLEs	GEO (1.00)	2016-12-25	01:23:10.971					245.20
39035	TEME	42164.551	0.0002216	0.0488	228.1774	21.9774		245.2152
C1.233	2006-020A	Eutelsat 113 West A (SATMEX 6, Morelos 4, Solidaridad 1R)						PL
TLEs	GEO (1.00)	2016-12-25	01:15:56.804					246.99
29162	TEME	42164.831	0.0002701	0.0216	242.4072	36.9263		247.0285
C1.234	2006-054A	WildBlue 1						PL
TLEs	GEO (1.00)	2016-12-25	15:07:27.774					248.86
29643	TEME	42164.528	0.0001819	0.0177	310.0965	339.1009		248.8072
C1.235	2004-027A	Anik F2						PL
TLEs	GEO (1.00)	2016-12-25	07:44:17.852					248.92
28378	TEME	42165.588	0.0000332	0.0230	30.7001	358.2743		248.9316
C1.236	2006-003A	EchoStar 10						PL
TLEs	GEO (1.00)	2016-12-25	12:07:30.550					249.80
28935	TEME	42164.349	0.0001521	0.0246	315.4779	327.8721		249.7889
C1.237	2002-023A	DirecTV 5						PL
TLEs	GEO (1.00)	2016-12-25	01:04:22.877					249.88
27426	TEME	42164.931	0.0003197	0.0215	13.1105	268.8112		249.9259
C1.238	2008-035A	EchoStar 11						PL
TLEs	GEO (1.00)	2016-12-25	01:03:56.376					250.00
33207	TEME	42164.551	0.0003166	0.0177	349.8141	304.3406		250.0368

C1.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time				λ
S-ID	Frame	a	e	i	Ω	ω	λ
C1.239^m	1999-059A	Telstar 12 (Orion 2)					PL
TLEs	GEO (1.00)	2016-12-25	10:52:46.963				250.78
25949	TEME	42164.588	0.0002915	0.5715	89.2387	198.3033	250.7755
C1.240	2005-036A	Anik F1R					PL
TLEs	GEO (1.00)	2016-12-25	07:43:38.161				252.69
28868	TEME	42164.997	0.0001729	0.0138	15.8574	316.5896	252.7010
C1.241	2000-076A	Anik F1					PL
TLEs	GEO (1.00)	2016-12-30	00:33:39.564				252.69
26624	TEME	42165.387	0.0000907	0.0149	52.7190	179.3669	252.6978
C1.242	2013-014A	Anik G1					PL
TLEs	GEO (1.00)	2016-12-31	00:29:36.344				252.70
39127	TEME	42164.823	0.0002739	0.0205	303.2015	329.7196	252.7293
C1.243	2012-035A	EchoStar 17					PL
TLEs	GEO (1.00)	2016-12-25	00:52:25.131				252.89
38551	TEME	42165.084	0.0002004	0.0228	2.8008	263.5537	252.9216
C1.244	2004-041A	AMC 15					PL
TLEs	GEO (1.00)	2016-12-25	12:02:48.073				254.94
28446	TEME	42164.928	0.0002092	0.0209	339.4897	309.0037	254.9309
C1.245	2006-054B	AMC 18					PL
TLEs	GEO (1.00)	2016-12-25	12:02:48.073				255.04
29644	TEME	42164.673	0.0002354	0.0116	15.5610	254.5235	255.0214
C1.246^m	2009-033A	GOES 14					PL
TLEs	GEO (1.00)	2016-12-25	00:41:29.687				255.66
35491	TEME	42164.318	0.0008270	0.1108	268.9634	325.9690	255.6643
C1.247^m	2011-035A	SES-3					PL
TLEs	GEO (1.00)	2016-12-25	07:40:31.337				257.00
37748	TEME	42164.679	0.0002488	0.0252	317.6908	315.9925	257.0041
C1.248	2005-015A	Spaceway 1					PL
TLEs	GEO (1.00)	2016-12-25	07:40:31.337				257.10
28644	TEME	42164.393	0.0000248	0.0392	200.2232	186.6602	257.0843
C1.249	2007-032A	DirecTV 10					PL
TLEs	GEO (1.00)	2016-12-25	00:35:35.749				257.16
31862	TEME	42164.544	0.0000194	0.0109	255.9857	258.2832	257.1437
C1.250	2009-075A	DirecTV 12					PL
TLEs	GEO (1.00)	2016-12-25	07:40:31.337				257.21
36131	TEME	42164.558	0.0000188	0.0321	192.6198	30.8615	257.2065
C1.251	2015-026A	DirecTV 15					PL
TLEs	GEO (1.00)	2016-12-25	00:35:09.007				257.26
40663	TEME	42166.503	0.0000864	0.0257	56.7151	301.6799	257.2524
C1.252^m	2010-061A	SkyTerra 1					PL
TLEs	GEO (1.00)	2016-12-25	22:21:14.056				258.72
37218	TEME	42164.738	0.0001844	3.4374	328.7269	231.6351	258.7206
C1.253	2001-052A	DirecTV 4S					PL
TLEs	GEO (1.00)	2016-12-25	15:06:30.567				258.84
26985	TEME	42164.531	0.0002057	0.0191	21.7357	274.3149	258.7789

C1.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time				λ
S-ID	Frame	a	e	i	Ω	ω	λ
C1.254	2006-043A	DirecTV 9S					PL
TLEs	GEO (1.00)	2016-12-25	15:06:30.538				258.88
29494	TEME	42164.683	0.0003064	0.0136	74.9472	202.5448	258.8701
C1.255	2010-016A	SES-1					PL
TLEs	GEO (1.00)	2016-12-25	15:06:30.571				258.99
36516	TEME	42164.379	0.0001900	0.0176	339.8222	311.9080	258.9769
C1.256	2005-019A	DirecTV 8					PL
TLEs	GEO (1.00)	2016-12-25	00:27:27.748				259.14
28659	TEME	42164.564	0.0002957	0.0139	331.1727	304.9644	259.1826
C1.257	2008-013A	DirecTV 11					PL
TLEs	GEO (1.00)	2016-12-25	13:33:47.767				260.77
32729	TEME	42163.662	0.0000121	0.0223	181.0634	172.0112	260.8353
C1.258	2014-078B	DirecTV 14					PL
TLEs	GEO (1.00)	2016-12-25	04:31:42.714				260.77
40333	TEME	42171.225	0.0003999	0.0189	17.6394	339.7734	260.7872
C1.259	2005-046B	Spaceway 2					PL
TLEs	GEO (1.00)	2016-12-25	13:33:47.767				260.88
28903	TEME	42164.553	0.0000380	0.0485	177.1713	195.1038	260.9431
C1.260	2006-023A	Galaxy 16					PL
TLEs	GEO (1.00)	2016-12-25	13:33:47.767				260.98
29236	TEME	42164.517	0.0002347	0.0412	250.8831	31.9151	260.9791
C1.261^m	2016-079A	Echostar 19					PL
TLEs	GEO (1.00)	2016-12-30	15:23:17.250				261.48
41893	TEME	42155.507	0.0006249	0.0643	243.6572	358.1526	261.4827
C1.262	2008-045A	Galaxy 19					PL
TLEs	GEO (1.00)	2016-12-25	00:12:03.797				262.95
33376	TEME	42165.123	0.0002978	0.0208	355.9336	282.2511	263.0409
C1.263	2014-062A	Intelsat 30 (DLA 1, ISDLA 1)					PL
TLEs	GEO (1.00)	2016-12-25	10:27:45.946				264.95
40271	TEME	42164.498	0.0002025	0.0148	34.0124	66.7803	264.9672
C1.264	2002-030A	Galaxy 3C					PL
TLEs	GEO (1.00)	2016-12-25	00:04:24.547				264.95
27445	TEME	42165.295	0.0001775	0.0190	319.7209	16.5539	264.9609
C1.265	2016-035A	Intelsat 31 (DLA 2, ISDLA 2)					PL
TLEs	GEO (1.00)	2016-12-25	00:04:25.853				264.97
41581	TEME	42165.279	0.0001473	0.0197	275.0935	304.7017	264.9567
C1.266	2007-036A	Spaceway 3					PL
TLEs	GEO (1.00)	2016-12-25	07:36:36.138				265.05
32018	TEME	42165.147	0.0000505	0.0206	182.2042	188.8148	265.0563
C1.267	1997-026A	Galaxy 25 (Intelsat Americas 5, IA 5, Telstar 5)					PL
TLEs	GEO (1.00)	2016-12-25	23:52:40.722				266.89
24812	TEME	42164.962	0.0003468	0.0275	22.6302	248.2675	266.9143
C1.268	2012-026A	Nimiq 6					PL
TLEs	GEO (1.00)	2016-12-25	23:44:40.372				268.89
38342	TEME	42164.703	0.0002375	0.0204	314.0702	324.7961	268.9228

C1.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time				λ
S-ID	Frame	a	e	i	Ω	ω	λ
C1.269	2007-016B	Galaxy 17					PL
TLEs	GEO (1.00)	2016-12-25	07:36:10.137				268.99
31307	TEME	42164.510	0.0003148	0.0311	43.7830	239.9165	269.0107
C1.270^m	2016-071A	GOES 16					PL
TLEs	GEO (1.00)	2016-12-25	23:38:09.920				270.55
41866	TEME	42164.915	0.0000816	0.0118	85.9416	283.0602	270.5534
C1.271	2005-022A	Galaxy 28 (Intelsat Americas 8, IA 8, Telstar 8)					PL
TLEs	GEO (1.00)	2016-12-31	06:29:25.270				270.99
28702	TEME	42164.594	0.0000844	0.0121	40.0323	48.7538	271.0038
C1.272	2013-075A	Tupac Katari (TKSat 1)					PL
TLEs	GEO (1.00)	2016-12-25	10:31:51.601				272.79
39481	TEME	42164.878	0.0002985	0.0443	214.6532	77.8872	272.7831
C1.273^m	2011-049A	SES-2					PL
TLEs	GEO (1.00)	2016-12-25	10:31:51.601				272.98
37809	TEME	42164.529	0.0002176	0.0160	29.8104	238.1365	272.9827
C1.274	1999-027A	Nimiq					PL
TLEs	GEO (1.00)	2016-12-25	10:31:51.601				273.47
25740	TEME	42164.867	0.0005415	0.0283	300.1970	352.6485	273.4651
C1.275	2009-034A	Sirius FM-5 (Radiosat 5)					PL
TLEs	GEO (1.00)	2016-12-31	06:14:24.056				273.87
35493	TEME	42164.652	0.0000273	0.0038	20.9608	91.1482	273.8564
C1.276	2010-053A	Sirius XM-5					PL
TLEs	GEO (1.00)	2016-12-25	06:16:29.888				274.79
37185	TEME	42164.653	0.0001257	0.0111	23.0677	345.4946	274.8059
C1.277	2005-008A	XM Radio 3 (Rhythm)					PL
TLEs	GEO (1.00)	2016-12-31	08:30:03.865				274.91
28626	TEME	42165.046	0.0000201	0.0192	192.0682	256.6933	274.9086
C1.278	2004-048A	AMC 16					PL
TLEs	GEO (1.00)	2016-12-25	06:16:29.888				274.99
28472	TEME	42164.760	0.0002044	0.0193	338.7154	303.8540	275.0043
C1.279^m	2016-082B	Star One D1					PL
TLEs	GEO (1.00)	2016-12-31	09:07:18.619				275.96
41904	TEME	42145.231	0.0004835	0.0779	231.4103	4.3064	275.9557
C1.280	2000-007A	Hispasat 1C					PL
TLEs	GEO (1.00)	2016-12-25	06:13:51.338				276.15
26071	TEME	42164.339	0.0005568	0.2072	84.9684	229.7932	276.1806
C1.281	2003-024A	AMC 9 (GE 12)					PL
TLEs	GEO (1.00)	2016-12-31	07:48:06.078				276.98
27820	TEME	42165.044	0.0002453	0.0119	1.6163	284.3192	276.9801
C1.282	2008-044A	Nimiq 4					PL
TLEs	GEO (1.00)	2016-12-25	06:13:37.468				277.99
33373	TEME	42166.140	0.0002790	0.0325	51.5167	256.2696	278.0293
C1.283	2015-054B	ARSAT-2					PL
TLEs	GEO (1.00)	2016-12-25	23:04:21.639				278.94
40941	TEME	42164.282	0.0001966	0.0182	351.2781	292.7963	279.0296

C1.nn	COSPAR	Name	Type
Source	Orbit (f_{IADC}^{GEO})	Date	λ
S-ID	Frame	a	λ
		Time	
		e	
		i	
		Ω	
		ω	
C1.284	2015-026B	SKY Mexico-1	PL
TLEs	GEO (1.00)	2016-12-25 22:55:29.261	281.20
40664	TEME	42164.471 0.0001891 0.0174 335.8042 308.9044	281.2521
C1.285	2008-055A	Simon Bolivar	PL
TLEs	GEO (1.00)	2016-12-25 06:10:28.615	281.99
33414	TEME	42164.925 0.0002838 0.0211 134.1121 155.9376	282.0145
C1.286^m	1995-073A	EchoStar 1	PL
TLEs	GEO (1.00)	2016-12-25 06:10:28.615	282.76
23754	TEME	42164.800 0.0002544 0.4486 90.9869 189.7683	282.7556
C1.287	2011-054A	QuetzSat-1	PL
TLEs	GEO (1.00)	2016-12-25 06:09:49.533	282.98
37826	TEME	42161.807 0.0002796 0.0223 332.1237 301.0777	282.9981
C1.288^m	2002-039A	EchoStar 8	PL
TLEs	GEO (1.00)	2016-12-25 06:09:49.533	283.11
27501	TEME	42164.629 0.0002783 0.7288 89.2016 190.9578	283.1053
C1.289	2012-062A	Star One C3	PL
TLEs	GEO (1.00)	2016-12-25 22:37:10.152	284.99
38991	TEME	42164.935 0.0002726 0.0153 46.3994 235.5709	285.0287
C1.290	2006-018A	GOES N	PL
TLEs	GEO (1.00)	2016-12-25 22:39:27.888	285.15
29155	TEME	42166.777 0.0001629 0.2276 102.7597 279.6329	285.2712
C1.291	2009-050A	Nimiq 5	PL
TLEs	GEO (1.00)	2016-12-25 10:24:27.587	287.29
35873	TEME	42164.559 0.0002544 0.0331 285.5430 359.6988	287.2773
C1.292^m	1997-050A	GE 3	PL
TLEs	GEO (1.00)	2016-12-31 06:20:52.857	287.99
24936	TEME	42165.172 0.0002082 0.0295 65.4599 219.2674	287.9916
C1.293	2014-062B	ARSAT-1	PL
TLEs	GEO (1.00)	2016-12-31 06:20:52.857	288.19
40272	TEME	42165.686 0.0001574 0.0183 35.9014 235.0943	288.2071
C1.294	2015-034B	Star One C4	PL
TLEs	GEO (1.00)	2016-12-25 22:20:31.896	290.01
40733	TEME	42164.100 0.0002346 0.0227 17.4261 291.5221	290.0177
C1.295	2008-018B	Star One C2	PL
TLEs	GEO (1.00)	2016-12-25 22:20:31.504	290.01
32768	TEME	42164.125 0.0001416 0.0498 159.1043 134.3256	290.0177
C1.296	1999-060A	GE 4	PL
TLEs	GEO (1.00)	2016-12-25 22:08:36.695	293.00
25954	TEME	42164.848 0.0000315 0.0609 80.7543 34.4831	293.0050
C1.297^m	2000-067A	GE 6	PL
TLEs	GEO (1.00)	2016-12-25 22:38:11.957	293.03
26580	TEME	42164.200 0.0001965 0.0182 10.5924 257.1537	293.0299
C1.298	2016-014A	Eutelsat 65 West A	PL
TLEs	GEO (1.00)	2016-12-25 22:01:21.456	294.82
41382	TEME	42165.062 0.0001769 0.0486 25.7950 266.1341	294.8226

C1.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time				λ
S-ID	Frame	a	e	i	Ω	ω	λ
C1.299	2007-056A	Star One C1					PL
TLEs	GEO (1.00)	2016-12-25	22:00:31.977				295.00
32293	TEME	42165.038	0.0002923	0.0195	81.2510	213.3620	295.0314
C1.300	2011-021A	Telstar 14R (Estrela do Sul 2)					PL
TLEs	GEO (1.00)	2016-12-25	22:38:25.696				296.99
37602	TEME	42164.566	0.0001792	0.0228	328.8335	306.0871	297.0217
C1.301	2010-034A	EchoStar 15					PL
TLEs	GEO (1.00)	2016-12-25	22:38:25.696				298.35
36792	TEME	42164.344	0.0001879	0.0261	321.6231	323.6974	298.3938
C1.302	2012-065A	EchoStar 16					PL
TLEs	GEO (1.00)	2016-12-25	21:46:36.433				298.49
39008	TEME	42164.398	0.0002213	0.0243	12.7010	260.8834	298.5173
C1.303	2003-033A	EchoStar 12 (Rainbow 1, Cablevision 1)					PL
TLEs	GEO (1.00)	2016-12-25	22:38:25.696				298.56
27852	TEME	42164.758	0.0001084	0.0102	4.3745	237.4490	298.8485
C1.304	2016-039B	EchoStar 18					PL
TLEs	GEO (1.00)	2016-12-31	21:22:19.636				298.68
41592	TEME	42164.761	0.0001702	0.0137	61.1309	208.3150	298.6921
C1.305	2009-054A	Amazonas 2					PL
TLEs	GEO (1.00)	2016-12-25	22:38:25.696				298.99
35942	TEME	42164.779	0.0001982	0.0545	127.0799	86.5503	299.0358
C1.306	2013-006A	Amazonas 3					PL
TLEs	GEO (1.00)	2016-12-25	21:44:30.780				299.01
39078	TEME	42164.156	0.0004203	0.0500	213.4570	31.7578	299.0465
C1.307	2014-011A	Amazonas 4A					PL
TLEs	GEO (1.00)	2016-12-25	21:44:23.671				299.05
39616	TEME	42164.908	0.0002656	0.0664	69.7662	249.9333	299.0757
C1.308	2010-006A	Intelsat 16 (IS 16, PAS 11R)					PL
TLEs	GEO (1.00)	2016-12-25	07:17:24.703				301.90
36397	TEME	42164.647	0.0002447	0.0111	330.2003	337.0839	301.9005
C1.309^m	2012-045A	Intelsat 21 (IS 21)					PL
TLEs	GEO (1.00)	2016-12-25	21:32:36.715				302.03
38749	TEME	42164.604	0.0001660	0.0116	52.2299	226.8065	302.0297
C1.310	2015-039A	Intelsat 34 (Hispasat 55W-2)					PL
TLEs	GEO (1.00)	2016-12-25	21:22:43.848				304.51
40874	TEME	42165.211	0.0000662	0.0236	7.0088	157.4461	304.5045
C1.311	2015-005A	Inmarsat-5 F2					PL
TLEs	GEO (1.00)	2016-12-31	07:01:06.629				305.01
40384	TEME	42165.202	0.0000151	0.0232	17.3398	338.8034	304.9930
C1.312	2012-057A	Intelsat 23 (IS 23)					PL
TLEs	GEO (1.00)	2016-12-25	21:12:50.343				307.01
38867	TEME	42162.375	0.0001802	0.0378	278.5443	53.7268	306.9849
C1.313	2013-024A	USA 243 (WGS SV-5)					PL
KIAM	GEO (1.00)	2017-01-04	00:00:00.000				307.49
UI176	J2000	42164.805	0.0001390	0.1165	90.6562	113.6213	307.4870

C1.nn	COSPAR	Name						Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time					λ
S-ID	Frame	a	e	i	Ω	ω		λ
C1.314	2000-072A	Intelsat 1R (PAS 1R)						PL
TLEs	GEO (1.00)	2016-12-25	10:19:45.276					310.00
26608	TEME	42166.435	0.0000329	0.0451	200.0223	263.2628		309.9053
C1.315	2016-004A	Intelsat IS-29e						PL
TLEs	GEO (1.00)	2016-12-25	21:00:46.573					310.04
41308	TEME	42164.879	0.0001133	0.0216	294.5942	359.9001		310.0098
C1.316	1998-014A	NSS 806 (Intelsat 806)						PL
TLEs	GEO (1.00)	2016-12-25	04:22:43.685					312.49
25239	TEME	42164.278	0.0004394	0.0621	334.6719	302.1767		312.5069
C1.317	2009-064A	Intelsat 14 (IS 14)						PL
TLEs	GEO (1.00)	2016-12-24	20:44:39.997					315.00
36097	TEME	42165.038	0.0002784	0.0087	329.3054	323.2595		315.0350
C1.318	2007-044B	Intelsat 11 (IS 11, PAS 11)						PL
TLEs	GEO (1.00)	2016-12-31	22:12:42.441					316.97
32253	TEME	42164.722	0.0002595	0.0465	229.2750	60.0017		317.0357
C1.319	2013-026A	SES-6						PL
TLEs	GEO (1.00)	2016-12-31	22:12:42.441					319.49
39172	TEME	42164.676	0.0001832	0.0195	357.6742	272.2331		319.5263
C1.320	2009-009A	Telstar 11N						PL
TLEs	GEO (1.00)	2016-12-31	04:14:13.720					322.44
34111	TEME	42164.796	0.0002508	0.0184	21.8988	245.3924		322.4327
C1.321	2005-003A	AMC 12						PL
TLEs	GEO (1.00)	2016-12-25	02:55:33.581					322.59
28526	TEME	42164.978	0.0002742	0.0218	32.4141	257.4219		322.5503
C1.322^m	2002-040A	Eutelsat 12 West A (Atlantic Bird 1)						PL
TLEs	GEO (1.00)	2016-12-24	20:08:35.569					324.08
27508	TEME	42165.047	0.0005447	0.0618	8.5176	306.7979		324.0761
C1.323	2002-016A	Intelsat 903						PL
TLEs	GEO (1.00)	2016-12-25	08:53:45.279					325.50
27403	TEME	42164.775	0.0003318	0.0156	53.2525	219.3243		325.4731
C1.324	2010-065A	HYLAS 1						PL
TLEs	GEO (1.00)	2016-12-25	05:47:23.649					326.50
37237	TEME	42163.936	0.0001741	0.0286	21.8537	274.8628		326.5129
C1.325	2008-034A	Intelsat 25 (Protostar 1)						PL
TLEs	GEO (1.00)	2016-12-21	20:02:35.519					328.49
33153	TEME	42165.060	0.0002682	0.0210	9.3580	239.9787		328.5353
C1.326	2002-044A	Hispasat 1D						PL
TLEs	GEO (1.00)	2016-12-25	08:42:47.043					330.00
27528	TEME	42164.807	0.0005395	0.0226	344.4036	307.4798		329.9529
C1.327	2006-007A	Spainsat						PL
TLEs	GEO (1.00)	2016-12-25	19:40:45.360					330.00
28945	TEME	42164.796	0.0005140	0.0122	300.0564	322.5805		330.0686
C1.328	2010-070A	Hispasat 1E						PL
TLEs	GEO (1.00)	2016-12-25	08:42:47.043					330.00
37264	TEME	42164.331	0.0002627	0.0416	138.5518	113.2783		329.9726

C1.nn	COSPAR	Name	Type
Source	Orbit (f_{IADC}^{GEO})	Date	λ
S-ID	Frame	a	λ
		e	
		i	
		Ω	
		ω	
C1.329	2003-007A	Intelsat 907	PL
TLEs	GEO (1.00)	2016-12-25	19:30:57.119
27683	TEME	42164.752	0.0002614 0.0192 293.7935 352.3351
			332.50
			332.5255
C1.330	2002-027A	Intelsat 905	PL
TLEs	GEO (1.00)	2016-12-25	02:48:57.527
27438	TEME	42165.465	0.0002196 0.0212 10.0544 257.6342
			335.50
			335.4911
C1.331	2012-007A	SES-4	PL
TLEs	GEO (1.00)	2016-12-31	05:58:10.922
38087	TEME	42165.012	0.0002029 0.0170 5.8037 293.8057
			337.90
			337.9887
C1.332	2001-024A	Intelsat 901	PL
TLEs	GEO (1.00)	2016-12-25	05:34:56.061
26824	TEME	42164.850	0.0002516 0.0190 285.9124 342.3168
			342.00
			341.9774
C1.333	2008-030A	Skynet 5C	PL
TLEs	GEO (1.00)	2016-12-25	05:34:56.061
33055	TEME	42164.411	0.0003672 0.0596 2.4658 267.2208
			342.20
			342.1327
C1.334	2015-068A	Telstar 12 Vantage (Telstar 12V)	PL
TLEs	GEO (1.00)	2016-12-25	18:41:05.385
41036	TEME	42165.109	0.0002436 0.0208 357.1139 287.8457
			345.00
			345.0234
C1.335	2015-048A	Ekspress-AM 8	PL
TLEs	GEO (1.00)	2016-12-25	20:45:49.394
40895	TEME	42164.502	0.0000518 0.0406 206.8882 68.2358
			346.00
			346.0040
C1.336	2011-048A	Cosmos-2473	PL
TLEs	GEO (1.00)	2016-12-25	18:35:06.195
37806	TEME	42164.329	0.0002450 0.0694 105.6759 207.4056
			346.53
			346.5259
C1.337	2001-042A	Eutelsat 12 West B (Eutelsat 8 West A, Atlantic Bird 2)	PL
TLEs	GEO (1.00)	2016-12-25	20:05:42.522
26927	TEME	42164.646	0.0007077 0.0729 34.3231 250.0573
			347.48
			347.5760
C1.338	2009-068A	USA 211 (WGS SV-3)	PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000
UI159	J2000	42166.299	0.0000805 0.1067 76.6004 67.1987
			348.01
			348.0070
C1.339	2009-007A	Ekspress-AM 44	PL
TLEs	GEO (1.00)	2016-12-25	20:16:42.594
33595	TEME	42164.800	0.0000547 0.0074 230.9406 59.0448
			349.01
			348.9960
C1.340	2015-039B	Eutelsat 8 West B	PL
TLEs	GEO (1.00)	2016-12-25	18:13:05.589
40875	TEME	42164.884	0.0004287 0.0635 353.6234 290.6004
			352.01
			352.0455
C1.341	2011-051A	Eutelsat 7 West A (Nilesat 104, Atlantic Bird 7)	PL
TLEs	GEO (1.00)	2016-12-25	18:10:23.115
37816	TEME	42164.613	0.0004669 0.0585 352.5192 252.8206
			352.69
			352.7222
C1.342	2010-037A	Nilesat 201	PL
TLEs	GEO (1.00)	2016-12-25	20:05:42.522
36830	TEME	42164.826	0.0002859 0.0630 165.7854 109.8985
			352.98
			353.0251
C1.343	2006-033B	Syracuse 3B	PL
TLEs	GEO (1.00)	2016-12-25	20:16:42.594
29273	TEME	42164.860	0.0005509 0.0104 23.3973 257.4361
			354.80
			354.8659

C1.nn	COSPAR	Name						Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time					λ
S-ID	Frame	a	e	i	Ω	ω		λ
C1.344	2002-035A	Eutelsat 5 West A (Atlantic Bird 3, Steliat 5)						PL
TLEs	GEO (1.00)	2016-12-25	18:01:04.782					355.00
27460	TEME	42164.790	0.0006071	0.0387	12.4518	266.2430		355.0574
C1.345	2008-022A	AMOS 3						PL
TLEs	GEO (1.00)	2016-12-25	04:09:25.946					356.01
32794	TEME	42164.645	0.0000909	0.0429	257.5141	33.3584		355.9620
C1.346^m	2003-059A	AMOS 2						PL
TLEs	GEO (1.00)	2016-12-25	04:09:25.946					356.03
28132	TEME	42163.602	0.0003032	0.3627	90.4283	204.6539		356.0254
C1.347^m	2015-034A	Meteosat 11 (MSG 4)						PL
TLEs	GEO (1.00)	2016-12-25	10:38:25.238					356.30
40732	TEME	42165.417	0.0001855	2.1389	249.6308	27.8939		356.2961
C1.348^m	2015-010A	ABS 3A						PL
TLEs	GEO (1.00)	2016-12-25	17:52:59.175					357.08
40424	TEME	42165.149	0.0001330	0.0232	22.3023	160.6200		357.0814
C1.349	2004-022A	Intelsat 10-02 (Thor 10-02)						PL
TLEs	GEO (1.00)	2016-12-25	23:56:42.685					359.03
28358	TEME	42164.839	0.0000574	0.0188	27.7331	158.9567		359.0137
C1.350	2009-058B	Thor 6 (Intelsat 1W)						PL
TLEs	GEO (1.00)	2016-12-25	19:54:42.669					359.18
36033	TEME	42164.841	0.0001593	0.0072	306.0969	342.2270		359.1790
C1.351	2008-006A	Thor 2R						PL
TLEs	GEO (1.00)	2016-12-25	18:53:22.804					359.25
32487	TEME	42164.768	0.0002418	0.0217	263.7584	21.2814		359.2772
C1.352	2015-022A	Thor 7						PL
TLEs	GEO (1.00)	2016-12-25	17:43:51.948					359.35
40613	TEME	42164.444	0.0002464	0.0424	151.8279	124.2260		359.3736
C1.353^m	2012-035B	Meteosat 10 (MSG 3)						PL
TLEs	GEO (1.00)	2016-12-25	17:41:41.763					359.92
38552	TEME	42163.103	0.0001531	0.6296	38.5029	238.6868		359.9166

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

The following list contains 140 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_{IADC}^{GEO})	Date	$\bar{\lambda}$
S-ID	Frame	a	λ
C2.1	2002-001A	USA 164 (Milstar-2 F3)	PL
KIAM	GEO (1.00)	2017-01-01 00:00:01.000	4.08
UI063	J2000	42165.893 0.0002319 7.5086 38.2119 256.4582	4.0770
C2.2	1999-009B	Skynet 4E	PL
TLEs	GEO (1.00)	2016-12-24 06:42:39.464	6.01
25639	TEME	42163.371 0.0003126 9.9736 29.9758 242.5813	6.0193
C2.3	1997-008A	USA 130 (DSP F18, DSP 20, DSP Block 5(DSP-1) F18)	PL
KIAM	GEO (1.00)	2017-01-01 00:00:01.000	7.54
UI125	J2000	42166.204 0.0001228 12.7207 31.8111 85.0880	7.5450
C2.4^m	2005-049B	Meteosat 9 (MSG 2)	PL
TLEs	GEO (1.00)	2016-12-25 17:16:41.293	9.26
28912	TEME	42165.595 0.0000345 1.8682 70.1346 337.0654	9.2568
C2.5	2000-019A	Eutelsat 16C (SESAT 1)	PL
TLEs	GEO (1.00)	2016-12-25 21:12:30.873	14.94
26243	TEME	42165.009 0.0003767 3.9442 67.2013 213.8706	14.4998
C2.6	2001-005A	SICRAL	PL
KIAM	GEO (1.00)	2017-01-01 00:00:01.000	16.20
UI178	J2000	42166.209 0.0003646 7.1508 51.8710 248.1053	16.2000
C2.7^m	2008-011A	AMC 14	PL
TLEs	GEO (1.00)	2016-12-25 23:55:21.980	18.22
32708	TEME	42165.112 0.0032015 18.7991 65.4928 354.3379	18.2211
C2.8	2012-019A	USA 235 (AEHF 2)	PL
KIAM	GEO (1.00)	2017-01-01 00:00:01.000	19.02
UI171	J2000	42166.176 0.0006886 1.8017 338.8948 288.3801	19.0150
C2.9^m	2000-054A	Astra 2B	PL
TLEs	GEO (1.00)	2016-12-25 15:32:52.427	19.47
26494	TEME	42165.607 0.0003812 1.8584 79.6071 196.4703	19.4676
C2.10	2013-011A	USA 241 (SBIRS GEO-2)	PL
KIAM	GEO (1.00)	2017-01-01 00:00:01.000	20.63
UI175	J2000	42166.670 0.0001409 3.8389 323.2257 302.0193	20.6260
C2.11	1998-063A	AfriStar 1	PL
TLEs	GEO (1.00)	2016-12-25 15:38:55.964	21.00
25515	TEME	42164.294 0.0004436 2.9651 70.1836 208.3556	21.0300
C2.12	2013-038A	Alphasat	PL
TLEs	GEO (1.00)	2016-12-25 18:03:30.786	24.85
39215	TEME	42164.929 0.0001989 1.5447 30.8430 228.7756	24.8656
C2.13	1993-056A	USA 95 (UFO F2)	PL
KIAM	GEO (1.00)	2017-01-01 00:00:01.000	28.86
UI069	J2000	42165.881 0.0004658 10.7125 24.7554 283.5857	28.8580

C2.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time				λ
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)	2016-12-25	22:18:36.779				30.83
27948	TEME	42164.073	0.0002105	2.0235	79.1237	228.5750	30.8697
C2.15^m	2016-015A	IRNSS-R1F					PL
TLEs	GEO (1.00)	2016-12-25	09:30:24.250				32.45
41384	TEME	42165.790	0.0016766	4.5173	269.0784	179.1086	32.4537
C2.16	1990-079A	Skynet 4C					PL
TLEs	GEO (1.00)	2016-12-30	16:18:50.410				33.66
20776	TEME	42164.703	0.0003367	13.7474	17.8159	257.4094	33.5982
C2.17	2002-040B	Meteosat 8 (MSG 1)					PL
TLEs	GEO (1.00)	2016-12-25	21:11:26.755				41.45
27509	TEME	42166.090	0.0000474	4.5415	59.0009	331.5052	41.3876
C2.18	2003-026A	Thuraya 2					PL
TLEs	GEO (1.00)	2016-12-25	22:36:31.818				44.04
27825	TEME	42164.116	0.0005063	4.7690	28.4667	244.9534	43.9722
C2.19	2009-001A	USA 202 (NROL-26, ORION)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				44.08
UI155	J2000	42166.346	0.0008632	4.7787	29.5345	331.4773	44.0750
C2.20	1994-054A	USA 105 (MERCURY 1)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				44.86
UI008	J2000	42169.285	0.0032221	10.8524	36.0510	147.8516	44.8620
C2.21	2001-019A	Intelsat 10 (PAS 10)					PL
TLEs	GEO (1.00)	2016-12-25	21:27:13.411				47.51
26766	TEME	42164.583	0.0005182	1.1568	85.9785	183.7714	47.4689
C2.22	1996-067A	Eutelsat 48A (Eutelsat W48, Eurobird 9, Hot Bird 2)					PL
TLEs	GEO (1.00)	2016-12-25	18:08:22.745				48.24
24665	TEME	42164.762	0.0006156	6.0713	56.2738	221.6653	48.2377
C2.23	1996-026A	USA 118 (MERCURY 2)					PL
KIAM	EGO (0.07)	2017-01-01	00:00:01.000				48.35
UI073	J2000	42166.662	0.0410224	9.5558	2.1266	238.1212	48.3530
C2.24^m	1999-033A	Astra 1H					PL
TLEs	GEO (1.00)	2016-12-25	23:44:42.586				49.27
25785	TEME	42205.778	0.0000169	3.4902	70.3342	32.1478	49.2750
C2.25	1997-053A	NSS 5 (NSS 803, Intelsat 803)					PL
TLEs	GEO (1.00)	2016-12-25	22:10:42.424				50.49
24957	TEME	42164.701	0.0003456	3.5059	70.1749	211.6386	50.4668
C2.26	2012-034A	USA 237 (NROL-15, ORION)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				52.52
UI173	J2000	42165.983	0.0043428	1.0147	347.8038	355.8339	52.5220
C2.27	2000-065A	USA 153 (DSCS III F12, DSCS 3-12, DSCS III B-11)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				56.69
UI105	J2000	42165.134	0.0001492	5.9317	57.4752	246.9816	56.6880
C2.28^m	2000-081A	Astra 2D					PL
TLEs	GEO (1.00)	2016-12-25	18:34:17.267				57.22
26638	TEME	42165.287	0.0002073	3.3150	70.8555	194.2396	57.2228

C2.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time				λ
S-ID	Frame	a	e	i	Ω	ω	λ
C2.29	1997-049B	Meteosat 7 (MTP)					PL
TLEs	GEO (1.00)	2016-12-25	16:25:55.524				57.55
24932	TEME	42165.111	0.0001522	10.4479	38.8299	264.1840	57.7122
C2.30	1997-076A	Astra 1G					PL
TLEs	GEO (1.00)	2016-12-25	20:43:07.205				62.80
25071	TEME	42164.553	0.0003468	1.9717	78.9947	201.6656	62.7878
C2.31^m	2005-044A	Inmarsat-4 F2					PL
TLEs	GEO (1.00)	2016-12-25	14:03:39.418				63.93
28899	TEME	42164.861	0.0003250	2.5416	9.4480	269.8205	63.9325
C2.32	1997-007A	Intelsat 26 (JCSAT R, JCSAT 4)					PL
TLEs	GEO (1.00)	2016-12-25	19:33:55.736				64.26
24732	TEME	42164.624	0.0003988	7.1922	51.3105	204.4021	64.2255
C2.33	1996-020A	Inmarsat-3 F1					PL
TLEs	GEO (1.00)	2016-12-25	20:42:14.841				64.49
23839	TEME	42164.317	0.0006532	3.6564	68.3108	208.8770	64.4670
C2.34	2004-004A	USA 176 (DSP F22, DSP Block 5(DSP-1) F22)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				65.70
UI108	J2000	42166.681	0.0000434	7.5741	47.2874	299.3473	65.7010
C2.35	2003-041A	USA 171 (Advanced ORION 3)					PL
KIAM	EGO (0.67)	2017-01-01	00:00:01.000				67.92
UI118	J2000	42166.115	0.0054813	9.1151	68.3471	204.4397	67.9150
C2.36	1999-063A	USA 146 (UFO F10)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				71.60
UI065	J2000	42166.087	0.0003784	6.4898	39.9835	240.1265	71.6010
C2.37	2002-043A	KALPANA-1 (METSAT-1)					PL
TLEs	GEO (1.00)	2016-12-25	16:33:05.073				73.97
27525	TEME	42164.579	0.0016509	6.0609	56.3822	224.6188	73.3535
C2.38	2015-044A	MUOS 4					PL
KIAM	EGO (0.61)	2017-01-01	00:00:01.000				75.08
UI192	J2000	42165.329	0.0057960	4.4867	330.8672	358.5221	75.0830
C2.39	2003-057A	USA 174 (UFO F11)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				75.51
UI117	J2000	42165.442	0.0006623	4.8754	35.6499	234.8173	75.5110
C2.40^m	2016-072A	Tian Lian 1-04					PL
TLEs	GEO (1.00)	2016-12-25	23:28:20.777				76.99
41869	TEME	42164.606	0.0001161	3.0121	291.2348	161.2029	76.9876
C2.41^m	2008-019A	Tian Lian 1-01					PL
TLEs	GEO (1.00)	2016-12-25	23:20:43.637				79.60
32779	TEME	42165.893	0.0038798	2.4499	76.8308	221.6420	79.6015
C2.42	1999-006A	JCSAT 6					PL
TLEs	GEO (1.00)	2016-12-25	19:11:32.385				81.95
25630	TEME	42164.714	0.0001777	1.9410	80.8719	207.3969	81.9317
C2.43	2014-061A	IRNSS-R1C					PL
TLEs	GEO (1.00)	2016-12-25	05:14:10.064				83.03
40269	TEME	42164.556	0.0022818	3.3569	255.3574	1.2873	83.0826

C2.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time				λ
S-ID	Frame	a	e	i	Ω	ω	λ
C2.44	1995-035B	TDRS 7					PL
TLEs	GEO (1.00)	2016-12-25	18:35:28.089				84.80
23613	TEME	42164.994	0.0019276	14.9063	16.9860	15.0490	85.0757
C2.45	1997-042A	ABS 3 (Agila 2/ABS 5, Agila 2, Mabuhay 1)					PL
TLEs	GEO (1.00)	2016-12-25	21:08:29.532				85.44
24901	TEME	42163.739	0.0007796	4.5726	64.2655	233.8906	85.2388
C2.46	2008-066A	Fengyun 2E					PL
TLEs	GEO (1.00)	2016-12-25	22:01:09.717				86.47
33463	TEME	42163.721	0.0004555	1.8560	65.3296	218.2440	86.7582
C2.47	2000-034A	TDRS 8					PL
TLEs	GEO (1.00)	2016-12-25	15:34:37.468				89.06
26388	TEME	42162.556	0.0010619	7.2005	57.3480	204.2279	89.0042
C2.48	2002-042B	Kodama (DRTS)					PL
TLEs	GEO (1.00)	2016-12-25	20:05:12.645				90.74
27516	TEME	42165.142	0.0002948	4.7299	63.0671	224.7511	90.7226
C2.49	2016-047A	USA 269 (Quasar 20, SDS-4 1)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				92.02
	J2000	42164.453	0.0001977	4.7865	328.7182	301.8256	92.0170
C2.50	2011-019A	USA 230 (SBIRS GEO-1)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				94.01
UI166	J2000	42164.748	0.0001615	3.7974	322.7428	318.9237	94.0140
C2.51	2014-023A	Luch 5V					PL
TLEs	GEO (1.00)	2016-12-25	23:28:36.042				94.81
39727	TEME	42165.100	0.0004063	3.0436	299.4817	352.2963	94.7026
C2.52	2010-063A	USA 223 (NROL-32, ORION)					PL
KIAM	EGO (0.72)	2017-01-01	00:00:01.000				95.43
UI160	J2000	42165.170	0.0052483	2.9804	195.9196	81.4012	95.4340
C2.53	2008-001A	Thuraya 3					PL
TLEs	GEO (1.00)	2016-12-25	11:19:24.739				98.61
32404	TEME	42164.637	0.0004610	4.1336	351.9732	279.9688	98.5715
C2.54	1989-035A	USA 37 (VORTEX 6)					PL
KIAM	EGO (0.03)	2017-01-01	00:00:01.000				98.61
UI018	J2000	42168.392	0.0987864	8.0150	9.4184	274.2610	98.6140
C2.55^m	2016-077A	Fengyun 4A					PL
TLEs	GEO (1.00)	2016-12-25	23:18:58.806				99.53
41882	TEME	42164.776	0.0002486	0.3655	273.4208	231.4649	99.5279
C2.56	1986-096A	USA 20 (FLTSATCOM F7)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				99.96
UI134	J2000	42168.334	0.0019616	14.7588	8.3107	171.8850	99.9570
C2.57^m	2016-048A	Tiantong-1 01 xing					PL
TLEs	GEO (1.00)	2016-12-25	23:52:43.694				101.36
41725	TEME	42163.914	0.0006267	4.8239	325.1665	348.9296	101.3631
C2.58^m	2006-038A	Chinasat 22A (Zhongxing 22A, ZX 22A, Feng Huo 1-2)					PL
TLEs	GEO (1.00)	2016-12-25	21:54:30.545				101.65
29398	TEME	42164.073	0.0008521	5.4874	58.8353	210.4486	101.6534

C2.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time				λ
S-ID	Frame	a	e	i	Ω	ω	λ
C2.59^m	2003-052A	Chinasat 20 (Zhongxing 20, ZX 20, Shentong 1-1)					PL
TLEs	GEO (1.00)	2016-12-25	21:51:27.516				103.19
28082	TEME	42164.772	0.0006580	3.1705	72.1440	222.4828	103.1936
C2.60	1995-038A	USA 113 (DSCS III F9, DSCS 3-9, DSCS III B-7)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				103.73
UI115	J2000	42162.744	0.0001713	10.1759	40.5508	223.2790	103.7260
C2.61	2014-090A	Fengyun 2G					PL
TLEs	GEO (1.00)	2016-12-25	21:51:40.814				104.48
40367	TEME	42166.974	0.0001250	0.7924	266.9521	341.6851	104.4391
C2.62	2000-016A	Asiastar					PL
TLEs	GEO (1.00)	2016-12-25	21:40:38.404				104.99
26107	TEME	42164.197	0.0004048	1.3198	82.0857	193.5779	104.9770
C2.63	2016-036A	USA 268 (NROL 37, ORION)					PL
KIAM	EGO (0.69)	2017-01-01	00:00:01.000				109.96
	J2000	42163.909	0.0053846	7.4222	353.7309	40.4279	109.9610
C2.64	2000-080A	USA 155 (SDS 3 F2)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				110.11
UI007	J2000	42164.952	0.0007098	7.8596	37.4213	196.9201	110.1090
C2.65	2001-009A	USA 157 (Milstar-2 F2)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				111.07
UI112	J2000	42164.391	0.0001744	8.1403	37.6937	221.3394	111.0710
C2.66	2001-029A	Artemis					PL
TLEs	GEO (1.00)	2016-12-24	15:23:38.312				123.01
26863	TEME	42165.868	0.0002873	12.5433	34.8954	264.6283	122.9323
C2.67	2006-053A	Fengyun 2D					PL
TLEs	GEO (1.00)	2016-12-25	20:05:03.840				123.51
29640	TEME	42163.658	0.0003388	4.1344	65.2514	303.9876	123.7330
C2.68	1995-022A	USA 110 (Advanced ORION 1)					PL
KIAM	EGO (0.67)	2017-01-01	00:00:01.000				126.93
UI128	J2000	42163.528	0.0054461	13.6920	41.2975	87.2232	126.9270
C2.69^m	2016-027A	IRNSS-R1G					PL
TLEs	GEO (1.00)	2016-12-25	03:07:46.289				129.61
41469	TEME	42163.955	0.0002779	4.5935	270.3282	325.9712	129.6115
C2.70	2001-033A	USA 159 (DSP F21, DSP Block 5(DSP-1) F21)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				131.00
UI001	J2000	42164.184	0.0000450	9.5132	40.0537	57.6071	130.9970
C2.71	2002-035B	N-Star 3 (N-Star c)					PL
TLEs	GEO (1.00)	2016-12-24	21:21:36.192				136.00
27461	TEME	42164.455	0.0001530	4.3086	65.8014	197.8936	136.0057
C2.72	2005-009A	Inmarsat-4 F1					PL
TLEs	GEO (1.00)	2016-12-25	08:46:21.502				143.50
28628	TEME	42165.029	0.0003548	2.8524	9.5099	273.0918	143.5453
C2.73^m	2016-037A	Beidou DW 23					PL
TLEs	GEO (1.00)	2016-12-25	04:53:08.525				144.60
41586	TEME	42163.893	0.0003847	1.5235	311.4633	303.2913	144.5999

C2.nn	COSPAR	Name	Type
Source	Orbit (f_{IADC}^{GEO})	Date	λ
S-ID	Frame	a	λ
		e	
		i	
		Ω	
		ω	
C2.74^m	2002-029A	Ekspress A1R (Express 4A)	PL
TLEs	GEO (1.00)	2016-12-25	13:10:31.820
27441	TEME	42164.080	0.0002875 5.7683 57.6483 183.9936
			145.48
			145.4785
C2.75	2006-059A	Kiku 8 (ETS VIII)	PL
TLEs	GEO (1.00)	2016-12-19	21:28:23.298
29656	TEME	42165.089	0.0005334 5.2328 60.1586 226.0323
			145.83
			145.6114
C2.76^m	1999-013A	Asiasat 3S	PL
TLEs	GEO (1.00)	2016-12-25	09:43:15.682
25657	TEME	42165.055	0.0003076 2.1573 79.0707 197.4038
			146.07
			146.0732
C2.77	1996-063B	MEASAT 2	PL
TLEs	GEO (1.00)	2016-12-25	14:16:08.504
24653	TEME	42164.819	0.0011668 7.2176 51.0000 189.2770
			148.01
			147.9248
C2.78^m	1997-075A	JCSAT 5	PL
TLEs	GEO (1.00)	2016-12-25	07:01:42.786
25067	TEME	42165.128	0.0008663 5.2593 59.9743 213.5022
			150.08
			150.0805
C2.79	2013-050A	USA 246 (AEHF SV-3)	PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000
UI181	J2000	42165.791	0.0005457 2.8127 304.0543 349.1089
			152.13
			152.1330
C2.80	1997-046A	Badr C (Intelsat 5, Arabsat 2C, PAS 5)	PL
TLEs	GEO (1.00)	2016-12-25	12:00:32.850
24916	TEME	42164.721	0.0005218 3.2089 71.9594 205.5946
			157.01
			157.0186
C2.81^m	2016-065A	Shi Jian 17	PL
TLEs	GEO (1.00)	2016-12-25	20:03:12.504
41838	TEME	42164.740	0.0006805 0.8657 86.7675 338.2623
			163.13
			163.1319
C2.82	2014-027A	USA 252 (NROL-33)	PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000
UI183	J2000	42166.035	0.0002807 3.0309 233.6043 71.9303
			169.92
			169.9210
C2.83	1998-016A	USA 138 (UFO F8)	PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000
UI111	J2000	42167.293	0.0004544 7.3794 38.9465 250.5653
			171.59
			171.5850
C2.84	2011-032A	Tian Lian 1-02	PL
TLEs	GEO (1.00)	2016-12-25	16:58:34.061
37737	TEME	42163.790	0.0009952 2.2372 78.2081 179.2628
			176.75
			176.6518
C2.85	1996-070A	Inmarsat-3 F3	PL
TLEs	GEO (1.00)	2016-12-25	12:31:53.176
24674	TEME	42165.158	0.0005764 3.0929 72.6082 203.9573
			178.10
			178.0820
C2.86	2000-001A	USA 148 (DSCS III F11, DSCS 3-11, DSCS III B-8)	PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000
UI104	J2000	42165.774	0.0001725 6.5490 54.6959 272.5233
			180.23
			180.2290
C2.87	2012-009A	MUOS 1	PL
KIAM	EGO (0.72)	2017-01-01	00:00:01.000
UI170	J2000	42165.933	0.0052404 3.3750 338.5006 181.9073
			183.04
			183.0420
C2.88	2002-055A	TDRS 10	PL
TLEs	GEO (1.00)	2016-12-25	09:15:47.304
27566	TEME	42163.323	0.0012781 4.7339 59.1883 211.8112
			185.67
			185.7201

C2.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time				λ
S-ID	Frame	a	e	i	Ω	ω	λ
C2.89^m	1991-054B	TDRS 5					PL
TLEs	GEO (1.00)	2016-12-25	20:38:45.401				192.08
21639	TEME	42165.119	0.0023392	14.2584	23.2738	330.4639	192.0821
C2.90	2000-024A	USA 149 (DSP F20, DSP Block 5(DSP-1) F20)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				194.81
UI004	J2000	42170.359	0.0001147	10.4263	36.8027	182.0627	194.8130
C2.91	2014-020A	USA 250 (NROL-67)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				197.02
UI182	J2000	42166.615	0.0002672	2.9715	319.5535	343.2045	197.0230
C2.92	2011-011A	USA 227 (NROL-27, SDS-3, QUASAR)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				215.97
UI165	J2000	42166.516	0.0013202	4.6683	0.3058	206.9918	215.9700
C2.93	2003-008A	USA 167 (DSCS III F13, DSCS 3-13, DSCS III A-3)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				229.96
UI106	J2000	42165.541	0.0002538	4.4243	65.6652	199.7572	229.9620
C2.94	1996-054A	GE 1					PL
TLEs	GEO (1.00)	2016-12-25	07:58:43.120				230.84
24315	TEME	42164.701	0.0002886	1.2088	85.9063	196.3101	230.8531
C2.95	2001-046A	USA 162 (SDS 3 F3)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				232.96
UI151	J2000	42166.408	0.0008501	9.0217	56.4761	201.0468	232.9560
C2.96	2003-012A	USA 169 (Milstar-2 F4)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				240.03
UI109	J2000	42166.214	0.0002455	7.2367	53.9409	229.1262	240.0280
C2.97	2015-056A	Morelos 3					PL
TLEs	GEO (1.00)	2016-12-25	23:13:51.820				246.90
40946	TEME	42164.432	0.0003320	6.6384	330.2045	0.6759	246.9179
C2.98	1997-065A	USA 134 (DSCS III F10, DSCS 3-10, DSCS III B-13)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				247.87
UI110	J2000	42164.957	0.0010007	8.7247	45.5620	194.1525	247.8720
C2.99	2009-035A	Terrestar 1					PL
TLEs	GEO (1.00)	2016-12-25	23:48:57.680				248.99
35496	TEME	42164.672	0.0003277	3.0341	341.0828	297.4152	249.0409
C2.100	1996-022A	MSAT					PL
TLEs	GEO (1.00)	2016-12-31	03:49:57.560				253.34
23846	TEME	42164.651	0.0005948	7.4969	50.0829	230.3857	252.5530
C2.101	1995-057A	USA 114 (UFO F6)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				254.88
UI119	J2000	42165.211	0.0007738	8.9580	31.0038	205.6574	254.8800
C2.102	2016-041A	MUOS 5					PL
KIAM	EGO (0.15)	2017-01-01	00:00:01.000				255.26
	J2000	42165.100	0.0207736	9.5305	320.3604	186.6912	255.2570
C2.103^m	1995-019A	AMSC 1 (M-Sat 2)					PL
TLEs	GEO (1.00)	2016-12-24	03:26:19.716				256.74
23553	TEME	42164.655	0.0005295	9.8591	41.4527	209.5770	256.7399

C2.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time				λ
S-ID	Frame	a	e	i	Ω	ω	λ
C2.104	2013-036A	MUOS 2					PL
KIAM	EGO (0.63)	2017-01-01	00:00:01.000				260.10
UI177	J2000	42165.156	0.0056780	3.8063	334.5004	355.0327	260.1000
C2.105	1995-003A	USA 108 (UFO F4)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				260.19
UI121	J2000	42164.302	0.0005791	9.5476	29.0784	254.3531	260.1890
C2.106	2008-039A	Inmarsat-4 F3					PL
TLEs	GEO (1.00)	2016-12-25	13:03:40.510				262.25
33278	TEME	42165.024	0.0003201	3.0211	359.7152	278.0674	261.9933
C2.107	2000-038A	Bermudasat 1 (EchoStar 6)					PL
TLEs	GEO (1.00)	2016-12-31	07:56:27.321				263.79
26402	TEME	42164.675	0.0003910	3.8683	67.9866	212.5229	263.7748
C2.108	2008-016A	EchoStar G1 (DBSD G1, ICO G1)					PL
TLEs	GEO (1.00)	2016-12-25	13:29:04.519				267.14
32763	TEME	42164.598	0.0003395	3.9093	352.9036	285.8979	267.1291
C2.109	2000-046A	Brasilsat B4					PL
TLEs	GEO (1.00)	2016-12-25	05:30:53.784				268.10
26469	TEME	42164.793	0.0002442	1.3002	85.9484	210.9641	268.0372
C2.110	1995-060A	USA 115 (Milstar DFS-2)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				270.05
UI124	J2000	42164.787	0.0002347	12.3762	31.6063	237.5816	270.0480
C2.111	1997-002A	GE 2					PL
TLEs	GEO (1.00)	2016-12-31	09:13:48.319				278.54
24713	TEME	42164.480	0.0004690	4.0255	66.8326	208.9907	275.1207
C2.112^m	2002-015B	Astra 3A					PL
TLEs	GEO (1.00)	2016-12-31	02:45:39.716				287.95
27400	TEME	42118.811	0.0000944	3.4931	69.5879	115.8746	287.9473
C2.113^m	1998-006A	Brazilsat B3					PL
TLEs	GEO (1.00)	2016-12-25	02:56:30.088				290.75
25152	TEME	42126.817	0.0001078	3.7005	69.2435	302.4219	290.7500
C2.114	1995-016A	Brazilsat B2					PL
TLEs	GEO (1.00)	2016-12-25	03:08:19.474				292.01
23536	TEME	42164.023	0.0002491	6.9218	52.4240	242.3072	292.0016
C2.115	2010-039A	USA 214 (AEHF 1)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				292.27
UI167	J2000	42163.830	0.0006164	0.5142	199.6889	97.5679	292.2740
C2.116	1988-091B	TDRS 3					PL
TLEs	GEO (1.00)	2016-12-25	22:38:25.696				297.65
19548	TEME	42165.911	0.0039086	14.8663	9.9590	305.4911	298.0517
C2.117	1997-059A	EchoStar 3					PL
TLEs	GEO (1.00)	2016-12-25	03:11:47.127				298.37
25004	TEME	42164.909	0.0000815	1.7987	80.9608	221.2279	298.2219
C2.118^m	1998-006B	Inmarsat-3 F5					PL
TLEs	GEO (1.00)	2016-12-25	07:11:28.573				305.96
25153	TEME	42163.748	0.0004998	2.2317	74.4458	200.8922	305.9599

C2.nn	COSPAR	Name	Type
Source	Orbit (f_{IADC}^{GEO})	Date	λ
S-ID	Frame	a	λ
		e	
		i	
		Ω	
		ω	
C2.119	1994-084A	USA 107 (DSP F17, DSP 17, DSP Block 5(DSP-1) F17)	PL
KIAM	GEO (1.00)	2017-01-01 00:00:01.000	310.81
UI131	J2000	42162.839 0.0000733 14.0880 24.4804 139.6940	310.8150
C2.120	1994-070A	Astra 1D	PL
TLEs	GEO (1.00)	2016-12-25 07:11:54.541	312.67
23331	TEME	42164.981 0.0003662 7.2977 50.5762 227.2145	312.6522
C2.121	1993-003B	TDRS 6	PL
TLEs	GEO (1.00)	2016-12-25 10:16:11.042	314.10
22314	TEME	42162.653 0.0008168 13.7713 26.1764 272.0082	313.9075
C2.122	2000-043A	Intelsat 9 (PAS 9)	PL
TLEs	GEO (1.00)	2016-12-25 22:37:24.705	316.89
26451	TEME	42165.144 0.0003890 3.1958 72.1821 214.2150	316.9400
C2.123	2003-040A	USA 170 (DSCS III F14, DSCS 3-14, DSCS III B-6)	PL
KIAM	GEO (1.00)	2017-01-01 00:00:01.000	317.50
UI107	J2000	42166.804 0.0002226 3.5324 70.8281 192.7036	317.5020
C2.124	2014-004A	TDRS 12	PL
TLEs	GEO (1.00)	2016-12-25 18:50:55.466	319.00
39504	TEME	42162.594 0.0004573 6.1595 336.3223 302.7302	318.9395
C2.125	1994-009A	USA 99 (Milstar DFS-1)	PL
KIAM	GEO (1.00)	2017-01-01 00:00:01.000	321.17
UI142	J2000	42164.372 0.0003991 12.0236 66.9300 288.2808	321.1650
C2.126	2004-031A	Amazonas	PL
TLEs	GEO (1.00)	2016-12-25 02:55:20.590	323.81
28393	TEME	42164.768 0.0005629 1.3916 84.5249 201.3457	323.8145
C2.127	2001-005B	Skynet 4F	PL
TLEs	GEO (1.00)	2016-12-30 10:12:04.575	326.01
26695	TEME	42164.906 0.0002578 8.7014 37.8501 250.3770	326.0054
C2.128	1993-066A	Intelsat VII F-1	PL
TLEs	GEO (1.00)	2016-12-25 08:39:55.577	330.49
22871	TEME	42164.671 0.0005305 3.8686 67.9408 212.4132	330.4451
C2.129	1998-029A	USA 139 (Advanced ORION 2)	PL
KIAM	GEO (1.00)	2017-01-01 00:00:01.000	333.63
UI074	J2000	42165.075 0.0044165 9.1230 358.8400 247.1991	333.6270
C2.130	1996-042A	USA 127 (UFO F7)	PL
KIAM	GEO (1.00)	2017-01-01 00:00:01.000	337.22
UI116	J2000	42165.469 0.0004563 8.2136 33.2269 248.7451	337.2200
C2.131^m	2002-019A	NSS 7	PL
TLEs	GEO (1.00)	2016-12-25 00:36:35.011	340.02
27414	TEME	42164.735 0.0002668 1.5350 83.9801 193.2921	340.0155
C2.132	2011-001A	Elektro-L No. 1	PL
TLEs	GEO (1.00)	2016-12-25 02:46:47.426	343.51
37344	TEME	42171.764 0.0003622 2.0844 78.5000 255.5084	339.5148
C2.133	2012-061A	Luch 5B	PL
TLEs	GEO (1.00)	2016-12-25 20:43:09.735	343.76
38977	TEME	42165.348 0.0003345 3.1967 75.7455 181.4092	343.7161

C2.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time				λ
S-ID	Frame	a	e	i	Ω	ω	λ
C2.134	1996-053A	Inmarsat-3 F2					PL
TLEs	GEO (1.00)	2016-12-24	22:28:42.658				344.50
24307	TEME	42164.752	0.0008020	2.2747	78.5746	198.5438	344.5646
C2.135	1989-077A	USA 46 (FLTSATCOM F8)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				344.51
UI130	J2000	42165.336	0.0006619	12.9102	16.8029	246.2990	344.5120
C2.136	2015-002A	MUOS 3					PL
KIAM	EGO (0.70)	2017-01-01	00:00:01.000				344.58
UI189	J2000	42166.131	0.0053264	4.2665	331.6816	182.3795	344.5840
C2.137	2002-011A	TDRS 9					PL
TLEs	GEO (1.00)	2016-12-25	05:41:43.303				348.04
27389	TEME	42164.726	0.0022318	4.8936	81.3472	227.1696	347.8461
C2.138	2012-033A	USA 236 (NROL-38, SDS-3, QUASAR)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000				349.94
UI172	J2000	42166.350	0.0007875	1.5845	225.7687	33.5444	349.9430
C2.139	2000-046B	Nilesat 102					PL
TLEs	GEO (1.00)	2016-12-25	20:16:42.594				353.00
26470	TEME	42164.483	0.0005888	1.3210	84.3529	192.8448	353.0469
C2.140^m	1998-035A	Thor III					PL
TLEs	GEO (1.00)	2016-12-30	21:38:10.506				355.74
25358	TEME	42164.435	0.0002805	5.1350	60.1627	229.7418	355.7411

4.3 Satellites in a Controlled Drift Orbit

The following list contains 9 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 ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
C4.1	2014-043C	USA 255 (ANGELS)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-4.92	387.324	346.977	427.671
UI186	J2000	42551.497	0.0009482	1.5331	72.7215	239.3089	256.4670
C4.2^m	2002-062A	Nimiq 2					PL
TLEs	GEO (1.00)	2016-12-24	17:08:12.932	-2.70	214.800	188.300	241.200
27632	TEME	42164.897	0.0002616	1.6270	83.0253	35.4869	91.5252
C4.3	2014-043B	USA 254 (GSSAP 2, AFSPC-4 F2)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	-0.12	9.373	6.547	12.199
UI185	J2000	42173.546	0.0000670	0.1752	83.0871	292.9546	161.6130
C4.4	2014-055A	USA 257 (CLIO)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	-0.09	6.636	-61.398	74.670
UI188	J2000	42170.809	0.0016133	0.1589	52.7098	308.3119	67.8500
C4.5^m	2014-058A	Luch					PL
TLEs	GEO (1.00)	2016-12-25	21:44:42.622	-0.01	0.300	-4.600	5.200
40258	TEME	42164.765	0.0000893	0.0010	8.8007	234.8577	9.8888
C4.6	2016-075A	USA 272 (WGS SV-8)					PL
KIAM	EGO (0.02)	2017-01-03	00:00:00.000	0.03	-2.624	-8065.228	8059.980
	J2000	42161.549	0.1912312	0.1099	311.2943	129.8620	219.8830
C4.7	2016-052B	USA 271					PL
KIAM	GEO (1.00)	2017-01-10	12:00:00.000	0.45	-35.029	-62.072	-7.986
	J2000	42129.144	0.0006419	0.1579	76.9745	334.8550	219.5360
C4.8	2014-043A	USA 253 (GSSAP 1, AFSPC-4 F1)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	1.14	-88.228	-110.545	-65.911
UI184	J2000	42075.945	0.0005304	0.1978	84.1850	212.4945	244.5120
C4.9	2016-052A	USA 270					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	4.32	-333.209	-335.744	-330.674
	J2000	41830.964	0.0000606	0.1496	75.9971	131.7969	273.4570

4.4 Objects in a Drift Orbit

The following list contains 773 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 ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.1	2010-006B	Proton-M/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (-)	2016-12-31	22:23:42.750	-47.99	4206.323	2057.152	6355.495
36398	TEME	46370.550	0.0471644	5.9003	65.0070	357.1724	353.6819
D.2	2012-057B	Proton-M/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (-)	2016-12-25	22:37:24.705	-42.80	3700.824	1361.587	6040.061
38868	TEME	45864.749	0.0520416	3.3758	76.1931	338.5629	317.8110
D.3	2013-077B	Proton-M/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (-)	2016-12-24	22:36:04.667	-38.55	3296.931	1023.642	5570.220
39488	TEME	45461.054	0.0500666	1.9314	69.8187	118.3097	356.1895
D.4	2011-074C	Proton-M/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (0.11)	2016-12-25	20:46:12.796	-38.33	3276.374	-58.047	6610.794
37952	TEME	45440.748	0.0724615	3.6087	57.7712	115.6455	52.6001
D.5	1969-045A	Intelsat III F-4					PL
TLEs	EGO (-)	2016-12-30	02:51:59.311	-36.83	3135.821	3021.165	3250.477
3947	TEME	45299.902	0.0028009	12.3313	316.0404	351.0481	336.8279
D.6	1968-116A	Intelsat III F-2					PL
TLEs	EGO (-)	2016-12-29	18:59:12.670	-36.29	3085.654	2636.635	3534.673
3623	TEME	45249.934	0.0099615	12.2584	319.2911	6.6845	80.6155
D.7	2014-010C	Proton-M/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (0.14)	2016-12-25	03:30:50.468	-34.90	2956.882	-120.387	6034.152
39614	TEME	45121.141	0.0689568	2.1795	78.8797	343.6006	291.4652
D.8	2014-058B	Proton-M/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (0.12)	2016-12-25	02:54:27.920	-30.91	2592.949	16.608	5169.290
40259	TEME	44757.058	0.0581867	1.8107	79.5865	127.0727	301.0988
D.9	2014-023C	Proton-M/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (0.11)	2016-12-25	20:44:25.117	-27.82	2316.056	-272.354	4904.467
39729	TEME	44480.239	0.0586762	2.4255	53.2401	146.1547	6.8681
D.10	2006-048A	Xinnuo 2					PL
TLEs	EGO (-)	2016-12-25	00:18:33.164	-26.61	2208.531	2028.400	2388.662
29516	TEME	44372.362	0.0043075	5.9901	94.2043	186.9704	355.3650
D.11	2016-065C	YZ-2 third stage					RB
TLEs	EGO (0.17)	2016-12-24	08:23:28.076	-24.48	2020.808	-140.301	4181.917
41840	TEME	44185.057	0.0489536	0.4959	125.6294	122.7965	140.8115
D.12	1997-040A	PAS 6					PL
TLEs	EGO (0.05)	2016-12-31	05:55:16.743	-23.67	1950.042	-1114.490	5014.574
24891	TEME	44114.396	0.0687637	13.6254	347.0607	173.7597	291.1596
D.13	1978-113D	Titan IIIC third stage (Transtage 36)					RB
TLEs	EGO (-)	2016-12-31	06:11:49.501	-23.46	1931.771	734.535	3129.007
11147	TEME	44096.237	0.0272528	17.3308	338.3634	339.1618	269.0381

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.14	1978-113A	OPS 9441 (DSCS II F-11, DSCS 2-11, DSCS II C-11)					PL
TLEs	EGO (-)	2016-12-24	03:40:50.526	-22.47	1845.587	1725.382	1965.793
11144	TEME	44009.773	0.0022401	16.5090	343.9425	123.9004	18.1809
D.15	2014-085A	GVM/Briz-M					PL
TLEs	EGO (-)	2016-12-25	11:09:07.989	-22.37	1836.747	375.067	3298.427
40355	TEME	44000.825	0.0331939	1.8001	90.3691	264.3923	187.9034
D.16	—	—					—
KIAM	EGO (-)	2017-01-01	00:00:01.000	-21.40	1753.259	1604.713	1901.805
UI058	J2000	43917.432	0.0033824	16.4948	336.0313	332.5016	272.6650
D.17	1985-024A	Ekran 14					PL
TLEs	EGO (-)	2016-12-29	12:35:04.711	-19.72	1608.656	1530.677	1686.636
15626	TEME	43772.986	0.0024256	16.8194	350.1844	277.5538	62.4787
D.18	1984-115A	NATO IIID					PL
TLEs	EGO (-)	2016-12-31	05:51:34.651	-19.15	1560.223	1120.567	1999.880
15391	TEME	43724.367	0.0095941	14.1945	18.6317	48.4635	19.4811
D.19	1973-100D	Titan IIIC third stage (Transtage 26)					RB
TLEs	EGO (-)	2016-12-26	18:59:12.595	-18.99	1547.152	380.857	2713.446
6976	TEME	43711.691	0.0260997	14.4566	322.4893	33.5986	88.6996
D.20	1983-016A	Ekran 10					PL
TLEs	EGO (-)	2016-12-24	08:21:34.586	-18.88	1537.129	1396.491	1677.768
13878	TEME	43701.112	0.0036646	16.4650	341.5889	297.7268	341.2799
D.21	1981-122A	MARECS A					PL
TLEs	EGO (-)	2016-12-30	05:34:14.371	-18.84	1534.138	1025.296	2042.980
13010	TEME	43698.268	0.0117835	15.6042	354.8164	182.7736	346.5644
D.22	1982-106A	OPS 9445 (DSCS II F-16, DSCS 2-16)					PL
TLEs	EGO (-)	2016-12-30	13:26:36.663	-18.66	1518.677	1498.641	1538.712
13636	TEME	43683.063	0.0003732	16.2748	354.3390	227.9611	252.6596
D.23	2008-006C	Proton-M/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (-)	2016-12-31	21:06:42.778	-18.55	1509.103	363.169	2655.037
37381	TEME	43673.075	0.0266226	7.4240	40.7749	230.2852	343.4006
D.24	1988-036A	Ekran-M 18					PL
TLEs	EGO (-)	2016-12-25	03:48:12.676	-18.34	1491.628	1448.328	1534.928
19090	TEME	43655.597	0.0010616	16.6734	0.4202	335.8845	313.3658
D.25	2014-064B	Proton-M/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (0.06)	2016-12-25	18:07:21.926	-18.18	1478.082	-963.609	3919.772
40278	TEME	43642.130	0.0569168	0.7401	83.2905	145.0162	353.4580
D.26	1977-005A	NATO IIIB					PL
TLEs	EGO (-)	2016-12-25	17:07:57.572	-18.02	1463.951	1271.773	1656.129
9785	TEME	43628.109	0.0047304	14.4595	337.9705	320.7467	21.2183
D.27	1979-098C	Titan IIIC third stage (Transtage 37)					RB
TLEs	EGO (0.13)	2016-12-25	09:19:30.665	-17.84	1448.857	79.350	2818.364
11623	TEME	43612.900	0.0313508	16.6300	338.8843	344.6420	144.5596
D.28	1977-034B	OPS 9438 (DSCS II F-8, DSCS 2-8, DSCS II C-8)					PL
TLEs	EGO (-)	2016-12-31	20:44:46.917	-17.45	1415.887	1265.527	1566.247
10001	TEME	43580.268	0.0029655	15.7319	333.4154	61.1308	100.3993

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.29	2008-022B	Zenit-3SLB third stage (Blok-DM-SL-B)					RB
TLEs	EGO (0.07)	2016-12-24	16:58:12.611	-17.06	1383.296	-839.378	3605.971
33059	TEME	43547.388	0.0526608	7.8561	55.4264	336.7950	143.9373
D.30	1977-034C	Titan IIIC third stage (Transtage 32)					RB
TLEs	EGO (0.13)	2016-12-31	17:42:42.620	-16.98	1376.368	69.105	2683.630
10002	TEME	43540.769	0.0298028	15.9457	331.0025	10.6000	158.7663
D.31	1979-098A	OPS 9443 (DSCS II F-13, DSCS 2-13, DSCS II D-13)					PL
TLEs	EGO (-)	2016-12-31	20:24:42.353	-16.83	1363.621	1322.062	1405.179
11621	TEME	43527.744	0.0006194	16.0282	343.1556	9.2257	129.7280
D.32	2007-054B	Delta 4 second stage (Delta 329, DCSS-5 F02)					RB
KIAM	EGO (-)	2017-01-01	00:00:01.000	-15.85	1281.222	207.334	2355.110
UI147	J2000	43445.395	0.0247181	3.8652	77.8374	50.3179	288.2290
D.33	1987-109A	Ekran-M 17					PL
TLEs	EGO (-)	2016-12-24	10:49:18.409	-15.81	1277.695	1094.618	1460.772
18715	TEME	43442.206	0.0041710	16.3774	2.8651	159.1496	104.9772
D.34	1976-053A	Marisat 2					PL
TLEs	EGO (-)	2016-12-31	07:28:03.055	-15.75	1272.557	734.591	1810.524
8882	TEME	43436.790	0.0127994	14.6544	332.6812	244.9860	298.2182
D.35	1984-114B	MARECS B2					PL
TLEs	EGO (-)	2016-12-25	14:32:28.262	-15.64	1264.018	765.237	1762.800
15386	TEME	43428.364	0.0116396	16.6450	1.5207	323.7464	58.6273
D.36	1987-028A	Raduga 20					PL
TLEs	EGO (-)	2016-12-25	12:15:32.745	-15.52	1253.698	1133.520	1373.875
17611	TEME	43418.043	0.0021994	17.0478	358.1372	88.1554	266.5405
D.37	1984-090A	Ekran 13					PL
TLEs	EGO (-)	2016-12-25	08:50:47.103	-15.30	1235.228	1160.742	1309.713
15219	TEME	43399.189	0.0013835	16.1685	346.8027	129.3264	308.6328
D.38	1997-029A	Fengyun 2A (Fengyun 2-1R)					PL
TLEs	EGO (-)	2016-12-31	19:25:33.151	-15.20	1226.842	803.176	1650.509
24834	TEME	43390.947	0.0100899	13.5251	32.4910	154.7257	11.4387
D.39	2009-001B	Delta 4 second stage (Delta 337, DCSS-5 F03)					RB
KIAM	EGO (0.12)	2017-01-01	00:00:01.000	-15.18	1224.792	124.917	2324.668
UI154	J2000	43388.965	0.0253492	4.9648	32.5055	10.9329	325.4240
D.40	1984-028A	Ekran 12					PL
TLEs	EGO (-)	2016-12-30	02:58:12.709	-15.17	1223.867	1188.109	1259.626
14821	TEME	43387.844	0.0002844	16.0488	343.4630	32.8347	317.4627
D.41	1991-084B	Inmarsat-2 F3					PL
TLEs	EGO (-)	2016-12-19	21:54:25.322	-15.16	1223.339	1172.791	1273.886
21814	TEME	43387.735	0.0008344	11.1312	35.6879	345.1824	44.8357
D.42	1987-073A	Ekran 16					PL
TLEs	EGO (-)	2016-12-31	18:16:12.664	-13.64	1096.888	1075.029	1118.747
18328	TEME	43260.934	0.0004299	16.1416	356.3963	219.0856	140.5466
D.43	1986-038A	Ekran 15					PL
TLEs	EGO (-)	2016-12-25	18:36:19.718	-13.42	1078.316	1035.333	1121.298
16729	TEME	43242.239	0.0014692	16.0686	351.5770	278.3713	161.5731

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.44	1988-108A	Ekran-M 19					PL
TLEs	EGO (-)	2016-12-25	08:39:41.645	-13.04	1046.880	921.595	1172.165
19683	TEME	43210.883	0.0025815	16.1692	4.8848	135.9773	316.0327
D.45	1977-034A	OPS 9437 (DSCS II F-7, DSCS 2-7, DSCS II C-7)					PL
TLEs	EGO (-)	2016-12-30	07:03:52.011	-12.96	1040.394	968.187	1112.601
10000	TEME	43204.486	0.0021943	15.3588	329.7365	273.4194	328.0708
D.46	1986-090A	Gorizont 13					PL
TLEs	EGO (-)	2016-12-31	14:50:55.418	-12.77	1024.982	957.957	1092.006
17083	TEME	43189.172	0.0019992	16.0047	357.2095	274.8135	38.8777
D.47	1988-051A	Meteosat 3					PL
TLEs	EGO (-)	2016-12-31	05:56:36.256	-11.97	958.966	936.195	981.737
19215	TEME	43122.900	0.0008278	16.0542	10.4760	269.5060	164.4576
D.48	1985-028C	LEASAT 3 (Syncom-4 3)					PL
TLEs	EGO (-)	2016-12-30	05:27:01.594	-11.92	954.462	627.322	1281.603
15643	TEME	43118.461	0.0078836	17.2841	342.3386	213.5567	338.8370
D.49	1992-060B	Satcom C-3					PL
TLEs	EGO (-)	2016-12-30	07:23:14.377	-11.75	940.193	841.397	1038.989
22117	TEME	43104.381	0.0025503	9.9422	43.3667	284.0920	211.7977
D.50	1989-020B	Meteosat 4 (MOP 1)					PL
TLEs	EGO (-)	2016-12-25	05:41:58.729	-11.39	910.999	826.848	995.150
19876	TEME	43075.121	0.0015987	15.8523	15.0821	128.5755	320.2388
D.51	1996-030B	Intelsat 24 (AMOS 1)					PL
TLEs	EGO (-)	2016-12-31	15:10:05.512	-11.36	908.666	861.973	955.359
23865	TEME	43073.161	0.0009428	6.7806	55.2390	148.5750	74.4680
D.52	1995-040A	Intelsat 4 (PAS 4)					PL
TLEs	EGO (-)	2016-12-24	13:38:39.481	-11.33	905.869	799.093	1012.644
23636	TEME	43070.134	0.0030723	5.4646	61.1520	165.2548	244.5106
D.53	1992-032A	NSS K (Intelsat K)					PL
TLEs	EGO (-)	2016-12-23	20:18:21.750	-11.14	890.100	510.776	1269.423
21989	TEME	43053.788	0.0088010	11.9029	38.4849	270.8526	346.5825
D.54	1971-095C	Titan IIIC third stage (Transtage 21)					RB
TLEs	EGO (-)	2016-12-24	00:36:52.603	-11.11	887.718	224.300	1551.136
5589	TEME	43051.882	0.0149595	11.4674	315.1532	87.9585	28.8329
D.55	1984-023A	Intelsat V F-8					PL
TLEs	EGO (-)	2016-12-25	13:09:33.824	-10.74	857.371	769.274	945.469
14786	TEME	43021.488	0.0016126	15.9764	6.4967	153.3783	232.0330
D.56	2000-003A	Chinasat 22 (Zhongxing 22, ZX 22, Feng Huo 1-1)					PL
TLEs	EGO (-)	2016-12-30	18:24:24.384	-10.62	848.125	829.357	866.894
26058	TEME	43012.658	0.0009575	6.9502	52.3565	222.5373	78.3162
D.57	1998-024A	Nilesat 101					PL
TLEs	EGO (-)	2016-12-25	17:19:09.276	-10.37	827.201	720.109	934.294
25311	TEME	42991.732	0.0031752	3.1586	73.3328	202.9266	84.8642
D.58	1989-070A	Himawari 4 (GMS 4)					PL
TLEs	EGO (-)	2016-12-25	17:42:12.705	-10.30	821.878	620.910	1022.846
20217	TEME	42985.805	0.0041421	15.6761	15.6149	58.2787	148.1016

D.nn	COSPAR	Name						Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$	
S-ID	Frame	a	e	i	Ω	ω	λ	
D.59	1984-093C	LEASAT 2 (Syncom-4 2)						PL
TLEs	EGO (-)	2016-12-30	23:34:38.474	-10.14	808.858	677.039	940.677	
15236	TEME	42973.470	0.0031817	16.3753	345.1343	196.5026	75.9507	
D.60	1985-107F	Proton-K/DM fourth stage (Blok-DM)						RB
TLEs	EGO (-)	2016-12-25	13:08:05.347	-10.00	797.119	720.097	874.141	
16339	TEME	42961.725	0.0014109	15.5775	352.0718	24.3300	265.9131	
D.61	1973-100B	OPS 9434 (DSCS II F-4, DSCS 2-4, DSCS II B-4)						PL
TLEs	EGO (-)	2016-12-23	23:57:12.686	-9.92	790.395	486.652	1094.137	
6974	TEME	42954.947	0.0073894	12.5552	320.4260	343.9155	253.6225	
D.62	1977-007A	OPS 3151 (DSP F7, DSP 9, DSP Block 2(PHASE II) F7)						PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-9.88	787.052	425.287	1148.817	
UI057	J2000	42951.225	0.0084227	12.4683	321.5032	306.1033	318.0300	
D.63	1978-073F	Proton-K/DM fourth stage (Blok-DM)						RB
TLEs	EGO (-)	2016-12-24	04:27:48.717	-9.74	775.813	710.715	840.911	
11941	TEME	42940.058	0.0010450	13.9937	325.6277	75.1186	274.0449	
D.64	1982-113F	Proton-K/DM fourth stage (Blok-DM)						RB
TLEs	EGO (-)	2016-12-31	08:52:43.037	-9.73	774.887	679.160	870.615	
13954	TEME	42938.956	0.0024356	15.1178	341.7760	204.7488	337.0895	
D.65	1976-101A	Marisat 3						PL
TLEs	EGO (-)	2016-12-29	06:50:34.332	-9.66	769.258	342.056	1196.461	
9478	TEME	42933.146	0.0106084	12.2635	333.5143	270.7745	335.0276	
D.66	1986-082F	Proton-K/DM fourth stage (Blok-DM)						RB
TLEs	EGO (-)	2016-12-25	21:26:12.550	-9.63	766.979	647.344	886.613	
17065	TEME	42931.675	0.0022896	15.6520	355.2653	84.0522	250.2153	
D.67	1969-013B	Titan IIIC third stage (Transtage 17)						RB
TLEs	EGO (0.18)	2016-12-14	12:02:54.023	-9.59	763.559	129.072	1398.046	
3692	TEME	42928.459	0.0156835	7.1466	305.2574	117.1773	41.0463	
D.68	1983-088F	Proton-K/DM fourth stage (Blok-DM)						RB
TLEs	EGO (-)	2016-12-24	05:30:40.853	-9.57	762.129	694.732	829.526	
14333	TEME	42926.588	0.0010958	15.3964	344.3897	45.9621	289.3636	
D.69	1983-066F	Proton-K/DM fourth stage (Blok-DM)						RB
TLEs	EGO (-)	2016-12-24	06:49:53.085	-9.56	761.478	714.922	808.034	
15141	TEME	42925.925	0.0006127	15.3263	344.1364	114.0961	220.6355	
D.70	1980-016D	Proton-K/DM fourth stage (Blok-DM)						RB
TLEs	EGO (-)	2016-12-31	14:44:32.006	-9.55	760.116	696.330	823.901	
11728	TEME	42923.756	0.0016373	14.4742	329.9255	215.3359	180.4545	
D.71	2009-007D	Proton-M/Briz-M fourth stage (Briz-M)						RB
TLEs	EGO (0.27)	2016-12-24	23:21:14.889	-9.51	757.471	-71.947	1586.888	
33598	TEME	42922.016	0.0197300	6.3376	58.6554	341.3123	82.4159	
D.72	1973-100A	OPS 9433 (DSCS II F-3, DSCS 2-3, DSCS II B-3)						PL
TLEs	EGO (-)	2016-12-29	09:54:23.702	-9.43	750.394	618.779	882.008	
6973	TEME	42914.676	0.0027538	13.0745	318.9324	143.6051	292.3014	
D.73	1987-040A	Gorizont 14						PL
TLEs	EGO (-)	2016-12-31	02:41:29.306	-9.42	749.579	620.417	878.742	
17969	TEME	42913.733	0.0026407	15.5823	349.6073	129.8368	37.4555	

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.74	1981-027F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-25	20:04:08.588	-9.40	748.189	672.047	824.331
14194	TEME	42912.180	0.0014094	14.9838	332.7438	133.4640	121.5922
D.75	1979-062D	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-25	05:23:26.506	-9.38	746.369	725.438	767.299
14005	TEME	42910.027	0.0005058	14.4915	329.4982	221.8472	0.0662
D.76	1986-044F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-31	12:18:02.682	-9.38	746.202	701.938	790.465
16797	TEME	42910.708	0.0006893	15.5705	354.1612	138.4218	288.4111
D.77	1996-005D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (-)	2016-12-25	04:04:26.937	-9.36	744.789	685.828	803.749
23778	TEME	42909.338	0.0010829	14.5013	25.7497	117.4213	290.4373
D.78	1986-027F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-25	09:57:28.836	-9.31	740.563	588.586	892.539
16676	TEME	42904.373	0.0030967	16.1441	353.2989	53.8757	157.5666
D.79	1981-069F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-25	16:46:01.846	-9.27	737.570	644.684	830.456
12850	TEME	42901.500	0.0017006	14.9053	334.2840	100.0982	189.3853
D.80	1982-113A	Raduga 11					PL
TLEs	EGO (-)	2016-12-31	18:37:50.314	-9.24	734.908	560.732	909.083
13669	TEME	42899.405	0.0042342	15.0093	342.0706	204.7272	76.2340
D.81	1977-071F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-25	16:47:42.567	-9.13	726.182	678.707	773.657
11570	TEME	42890.096	0.0008004	13.4142	322.5404	29.7560	155.4614
D.82	2001-045A	Raduga 1-6					PL
TLEs	EGO (-)	2016-12-25	04:11:10.670	-9.10	724.216	650.599	797.833
26936	TEME	42888.334	0.0016532	11.2132	40.5161	135.0923	312.9778
D.83	1988-028D	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-29	07:00:02.821	-8.96	712.507	624.024	800.989
19020	TEME	42876.255	0.0016197	16.0491	0.3930	32.9410	341.8394
D.84	1986-007F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-25	10:15:00.177	-8.91	708.495	571.363	845.628
16870	TEME	42872.892	0.0027575	15.5610	352.1274	89.4513	299.6637
D.85	1985-076D	LEASAT 4 (Syncom-4 3)					PL
TLEs	EGO (-)	2016-12-25	23:33:50.620	-8.91	708.294	679.963	736.626
15995	TEME	42872.883	0.0011160	13.8696	354.6395	267.3171	91.3294
D.86	1977-108D	Meteosat 1 AKM (MAGE 1)					PM
TLEs	EGO (-)	2016-12-31	14:19:05.358	-8.89	706.954	334.298	1079.609
13907	TEME	42872.100	0.0082559	14.0684	322.8025	47.1415	85.0526
D.87	1985-070F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-25	07:47:27.176	-8.89	706.596	655.961	757.232
15963	TEME	42870.530	0.0006917	15.4806	350.7476	104.6281	160.0196
D.88	1982-106B	DSCS III F1 (DSCS 3-1, DSCS III A-1)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-8.82	700.950	640.197	761.703
UI135	J2000	42865.123	0.0014173	15.4212	1.9910	116.6592	255.1940

D.nn	COSPAR	Name						Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$	
S-ID	Frame	<i>a</i>	<i>e</i>	<i>i</i>	Ω	ω	λ	
D.89	1988-028A	Gorizont 15						PL
TLEs	EGO (-)	2016-12-31	07:18:22.567	-8.81	699.912	544.430	855.393	
19017	TEME	42863.608	0.0031262	16.0062	0.5906	108.7612	347.5202	
D.90	1992-043D	Proton-K/DM-2 fourth stage (Blok DM-2)						RB
TLEs	EGO (-)	2016-12-25	20:04:36.618	-8.79	698.531	589.229	807.834	
22044	TEME	42862.546	0.0021634	15.5337	15.5057	113.7893	146.0936	
D.91	1989-101G	Proton-K/DM-2 fragmentation debris						RD
TLEs	EGO (-)	2016-12-25	10:40:24.385	-8.72	693.311	574.955	811.667	
21648	TEME	42857.123	0.0035025	15.7240	6.7113	239.4292	157.2902	
D.92	1989-098D	Proton-K/DM-2 fourth stage (Blok DM-2)						RB
TLEs	EGO (-)	2016-12-25	02:26:14.987	-8.71	692.436	611.382	773.491	
20370	TEME	42856.882	0.0014790	15.9785	6.7600	110.1579	211.6107	
D.93	1990-102D	Proton-K/DM-2 fourth stage (Blok DM-2)						RB
TLEs	EGO (-)	2016-12-31	21:17:59.051	-8.66	688.192	605.642	770.741	
21046	TEME	42852.271	0.0016273	15.7085	9.7257	131.9542	6.9231	
D.94	1989-048D	Proton-K/DM-2 fourth stage (Blok DM-2)						RB
TLEs	EGO (-)	2016-12-27	06:11:43.861	-8.58	681.254	586.473	776.035	
20086	TEME	42845.329	0.0016825	15.7164	4.8909	54.8678	2.8785	
D.95	1989-030D	Proton-K/DM-2 fourth stage (Blok DM-2)						RB
TLEs	EGO (-)	2016-12-25	12:15:59.351	-8.46	672.075	594.832	749.317	
19931	TEME	42836.902	0.0014798	15.6335	4.1296	126.5577	257.4724	
D.96	1980-049F	Proton-K/DM fourth stage (Blok-DM)						RB
TLEs	EGO (-)	2016-12-31	12:35:27.506	-8.41	667.918	540.295	795.541	
11862	TEME	42832.135	0.0026352	14.6396	331.8039	127.9398	226.7398	
D.97	1988-095F	Proton-K/DM-2 fourth stage (Blok DM-2)						RB
TLEs	EGO (-)	2016-12-25	17:24:51.310	-8.40	667.255	607.027	727.483	
19777	TEME	42831.730	0.0016236	15.6690	2.5755	188.6385	42.0169	
D.98	1995-067A	Telecom 2C						PL
TLEs	EGO (-)	2016-12-28	23:34:16.749	-8.40	666.882	600.886	732.877	
23730	TEME	42831.107	0.0021932	10.6066	40.7399	218.6042	309.3035	
D.99	1990-116D	Proton-K/DM-2 fourth stage (Blok DM-2)						RB
TLEs	EGO (-)	2016-12-25	21:39:12.267	-8.39	666.098	525.135	807.061	
21041	TEME	42831.020	0.0029865	15.6937	10.1622	2.3957	92.6760	
D.100	1992-021B	Inmarsat-2 F4						PL
TLEs	EGO (-)	2016-12-29	10:12:49.039	-8.39	665.936	642.268	689.605	
21940	TEME	42830.597	0.0002103	9.2188	33.0870	211.5581	267.1354	
D.101	1996-034D	Proton-K/DM-2 fourth stage (Blok DM-2)						RB
TLEs	EGO (-)	2016-12-25	20:16:22.365	-8.38	665.080	533.749	796.411	
23883	TEME	42829.020	0.0026928	14.3632	26.4703	6.7796	155.4678	
D.102	1988-018B	Telecom 1C						PL
TLEs	EGO (-)	2016-12-24	23:13:23.391	-8.34	662.291	231.104	1093.477	
18952	TEME	42826.957	0.0094161	15.5037	18.7447	65.4788	89.1438	
D.103	2001-014C	Proton-M/Briz-M fourth stage (Briz-M)						RB
TLEs	EGO (0.28)	2016-12-25	01:19:01.123	-8.31	659.578	-57.765	1376.921	
26738	TEME	42823.818	0.0172092	11.7946	42.2482	148.2218	312.2876	

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.104	1994-008D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (-)	2016-12-25	15:14:21.986	-8.30	659.225	570.942	747.509
22984	TEME	42823.980	0.0019915	15.2369	20.3453	325.5677	227.7360
D.105	1989-004F	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (-)	2016-12-27	18:21:01.032	-8.21	651.267	552.276	750.258
19776	TEME	42815.716	0.0018701	15.6276	3.3665	35.6899	27.4137
D.106	1993-013D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (-)	2016-12-25	21:38:43.774	-8.14	645.679	574.486	716.873
22624	TEME	42810.017	0.0011840	15.4457	17.5540	30.1563	94.7369
D.107	1991-087D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (-)	2016-12-25	08:13:58.104	-8.12	644.132	570.613	717.650
21824	TEME	42808.010	0.0015964	15.6351	13.4083	330.3273	164.2623
D.108	1992-082D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (-)	2016-12-25	08:44:43.828	-8.10	642.564	601.800	683.327
22248	TEME	42806.938	0.0005906	15.4816	16.3189	349.7627	213.4373
D.109	1999-010D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (-)	2016-12-24	14:44:03.177	-8.02	636.432	547.262	725.603
25645	TEME	42800.841	0.0024248	14.3066	34.9954	246.4718	116.6124
D.110	2004-042A	Fengyun 2C					PL
TLEs	EGO (-)	2016-12-27	07:41:00.331	-7.89	625.461	608.366	642.557
28451	TEME	42789.273	0.0006546	7.0780	51.9104	246.8317	357.3625
D.111	1996-053D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (-)	2016-12-25	04:03:24.680	-7.85	622.484	396.918	848.051
25339	TEME	42786.889	0.0057700	13.4320	31.1116	227.5963	237.6340
D.112	1997-031A	Intelsat 802					PL
TLEs	EGO (-)	2016-12-25	12:29:37.330	-7.79	617.940	507.439	728.441
24846	TEME	42782.588	0.0032418	4.6994	63.5194	208.1518	246.8082
D.113	1994-012D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (-)	2016-12-30	15:09:36.772	-7.79	617.893	472.346	763.441
23013	TEME	42782.311	0.0029708	15.1711	20.1408	31.2921	219.8042
D.114	1988-012A	Sakura 3A (CS 3A)					PL
TLEs	EGO (-)	2016-12-25	02:34:02.176	-7.69	610.004	574.442	645.566
18877	TEME	42774.581	0.0013147	15.2460	21.1881	244.6450	279.2138
D.115	1971-039A	OPS 3811 (DSP F2, DSP 3, DSP Block 1(PHASE I) F2)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-7.64	605.545	505.545	705.545
UI042	J2000	42769.718	0.0023381	7.9171	309.0161	287.7581	37.0600
D.116	1988-063B	Eutelsat I F-5 (ECS 5)					PL
TLEs	EGO (-)	2016-12-28	22:44:00.040	-7.59	601.608	550.403	652.813
19331	TEME	42766.202	0.0005368	15.5296	15.2255	65.4112	82.2548
D.117	1998-058A	USA 140 (UFO F9)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-7.57	599.829	543.740	655.918
UI113	J2000	42764.002	0.0013116	7.8533	34.9567	289.5064	58.7610
D.118	1983-088A	Raduga 13					PL
TLEs	EGO (-)	2016-12-23	03:26:31.026	-7.56	599.136	528.745	669.527
14307	TEME	42763.149	0.0016697	15.1379	343.8799	331.6014	21.1764

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.119	2000-052A	Eutelsat 4A (Eurobird 4A, Eutelsat W1)					PL
TLEs	EGO (-)	2016-12-31	06:25:53.749	-7.54	597.280	555.404	639.155
26487	TEME	42761.787	0.0017206	4.2827	69.2883	203.9054	277.6390
D.120	1969-069C	ATS 5 AKM (JPL SR-28-3)					PM
TLEs	EGO (0.24)	2016-12-30	23:50:07.033	-7.53	597.103	33.163	1161.043
21052	TEME	42760.948	0.0128152	8.8437	309.4451	208.4626	15.9291
D.121	1982-019A	OPS 8701 (DSP F10, DSP 13, DSP Block 3(MOS/PIM) F10)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-7.53	596.476	568.784	624.168
UI046	J2000	42760.649	0.0006476	15.1843	341.6411	232.5681	17.0180
D.122	2000-049D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (-)	2016-12-30	05:34:00.276	-7.50	594.225	526.609	661.840
26480	TEME	42757.779	0.0016411	11.8969	36.5381	281.6530	5.2320
D.123	2001-002A	Turksat 2A (Eurasiasat 1)					PL
TLEs	EGO (-)	2016-12-25	08:40:57.215	-7.43	589.067	544.230	633.903
26666	TEME	42752.770	0.0012261	0.7885	85.6943	213.7123	135.4683
D.124	1998-052A	Intelsat 7 (PAS 7)					PL
TLEs	EGO (-)	2016-12-25	07:15:17.117	-7.42	588.080	554.409	621.751
25473	TEME	42752.379	0.0008358	2.8864	74.9446	140.7338	231.4481
D.125	1989-101D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (-)	2016-12-25	01:49:54.125	-7.29	577.291	533.295	621.288
20394	TEME	42741.841	0.0009951	15.5949	6.4910	166.7110	302.8499
D.126	2000-013A	Ekspress 2A (Ekspress 6A)					PL
TLEs	EGO (-)	2016-12-25	18:26:54.339	-7.26	575.054	546.415	603.693
26098	TEME	42739.352	0.0008108	8.7242	45.6426	279.5773	35.1205
D.127	1976-023J	LES 8, LES 9 operational debris					PM
TLEs	EGO (0.29)	2016-12-25	22:27:26.424	-7.25	573.887	-76.628	1224.402
8832	TEME	42738.103	0.0146562	14.4144	91.1551	353.7839	27.2531
D.128	1976-023F	Titan IIIC third stage (Transtage 30)					RB
TLEs	EGO (0.29)	2016-12-31	22:45:54.187	-7.24	573.275	-63.723	1210.273
8751	TEME	42738.066	0.0144515	14.4282	91.0332	354.8190	68.2687
D.129	1983-118A	Gorizont 8					PL
TLEs	EGO (-)	2016-12-31	10:34:19.295	-7.22	571.410	455.989	686.832
14532	TEME	42735.691	0.0022850	15.0076	345.0598	99.2859	290.4640
D.130	1998-013A	Eutelsat 16B (Eurobird 16, Nilesat 103, Hot Bird 4)					PL
TLEs	EGO (-)	2016-12-25	21:44:42.622	-7.19	569.309	551.548	587.070
25237	TEME	42733.143	0.0006278	4.0348	67.6119	198.9936	6.5018
D.131	1991-001A	NATO IVA					PL
TLEs	EGO (-)	2016-12-30	05:40:26.020	-7.16	567.204	540.847	593.561
21047	TEME	42731.024	0.0006060	12.9916	18.7555	203.1459	359.9918
D.132	1985-025A	Intelsat VA F-10					PL
TLEs	EGO (-)	2016-12-25	09:40:12.610	-7.15	566.515	430.739	702.290
15629	TEME	42731.307	0.0036546	15.6183	9.6639	283.0031	221.3285
D.133	2007-021A	Eutelsat 8 West D (Eutelsat 3A, Chinasat 5C, Zhongxing 5C)					PL
TLEs	EGO (-)	2016-12-25	01:27:52.103	-6.98	552.174	537.007	567.340
31577	TEME	42716.570	0.0000416	2.8122	52.4610	346.2205	296.1512

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.134	1988-109B	Astra 1A					PL
TLEs	EGO (-)	2016-12-25	02:51:58.179	-6.97	551.797	484.232	619.362
19688	TEME	42716.110	0.0008797	12.6740	33.1608	25.3365	288.2471
D.135	1983-066A	Gorizont 7					PL
TLEs	EGO (-)	2016-12-25	15:59:48.566	-6.93	548.807	500.926	596.689
14160	TEME	42713.144	0.0015657	14.9559	343.5478	260.7374	225.4980
D.136	1979-098B	OPS 9444 (DSCS II F-14, DSCS 2-14, DSCS II D-14)					PL
TLEs	EGO (-)	2016-12-25	16:03:06.364	-6.92	547.765	527.143	568.387
11622	TEME	42711.614	0.0005107	14.7505	338.3842	312.1483	140.1724
D.137	1987-097A	USA 28 (DSP F13, DSP 5R, DSP Block 4(PHASE II UG) F13)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-6.82	539.347	425.367	653.327
UI030	J2000	42703.520	0.0026691	14.5038	4.8065	199.2500	205.8450
D.138	1990-095A	USA 65 (DSP F15, DSP 15, DSP Block 5(DSP-1) F15)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-6.78	536.520	513.423	559.617
UI083	J2000	42700.693	0.0005409	15.3541	13.0090	302.8418	228.7450
D.139	1984-081B	Telecom 1A					PL
TLEs	EGO (-)	2016-12-30	07:11:03.577	-6.74	533.214	383.424	683.003
15159	TEME	42697.649	0.0038070	15.6252	3.1972	310.7706	330.1789
D.140	1982-097A	Intelsat V F-5					PL
TLEs	EGO (-)	2016-12-23	09:52:39.139	-6.71	531.093	433.322	628.864
13595	TEME	42695.654	0.0025021	15.4237	0.3163	305.5103	306.3273
D.141	1999-018A	Eutelsat 21A (Eutelsat W6, Eutelsat W3)					PL
TLEs	EGO (-)	2016-12-25	07:36:49.137	-6.64	525.005	511.140	538.871
25673	TEME	42689.591	0.0006356	3.1277	73.1300	205.9486	265.6650
D.142	1990-056A	Intelsat VI F-4					PL
TLEs	EGO (-)	2016-12-25	21:34:00.818	-6.62	523.646	496.386	550.906
20667	TEME	42687.359	0.0011051	11.9205	36.6839	233.4870	151.6685
D.143	1978-113B	OPS 9442 (DSCS II F-12, DSCS 2-12, DSCS II C-12)					PL
TLEs	EGO (-)	2016-12-31	06:33:12.663	-6.60	521.546	492.164	550.929
11145	TEME	42686.276	0.0001177	14.6958	336.6611	73.8631	261.3722
D.144	1991-074A	Gorizont 24					PL
TLEs	EGO (-)	2016-12-29	19:06:14.017	-6.59	521.162	440.839	601.484
21759	TEME	42684.869	0.0021556	15.4034	12.5972	186.6015	342.6207
D.145	1996-044B	Telecom 2D					PL
TLEs	EGO (-)	2016-12-25	12:57:04.684	-6.57	519.704	457.514	581.893
24209	TEME	42683.501	0.0018760	8.5044	47.1389	272.1695	182.3686
D.146	1991-015B	Meteosat 5 (MOP 2)					PL
TLEs	EGO (-)	2016-12-25	22:30:02.818	-6.56	518.687	489.648	547.726
21140	TEME	42683.427	0.0012188	14.9974	18.9805	210.0181	252.2734
D.147	1998-057A	Eutelsat 4B (Eutelsat 25A, Badr 2, Arabsat 2D, Hot Bird 5)					PL
TLEs	EGO (-)	2016-12-25	17:37:20.826	-6.54	517.230	485.443	549.017
25495	TEME	42681.383	0.0006124	3.1037	72.9061	281.3355	119.0048
D.148	1986-082A	Raduga 19					PL
TLEs	EGO (-)	2016-12-24	05:10:11.659	-6.53	516.185	466.886	565.485
17046	TEME	42679.918	0.0006867	15.2717	354.6341	120.4325	3.9646

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.149	1996-015A	Intelsat VIIA F-2					PL
TLEs	EGO (-)	2016-12-25	20:16:42.594	-6.45	509.992	231.228	788.756
23816	TEME	42673.667	0.0068064	3.2050	72.4665	267.9054	357.5696
D.150	1989-021B	TDRS 4					PL
TLEs	EGO (-)	2016-12-31	09:18:12.856	-6.45	509.503	444.284	574.722
19883	TEME	42674.042	0.0023775	12.7712	18.5814	244.6892	225.4601
D.151	1978-106A	NATO IIIC					PL
TLEs	EGO (-)	2016-12-22	19:18:18.908	-6.44	509.113	488.146	530.080
11115	TEME	42673.238	0.0009374	14.5279	344.8416	259.5578	136.1823
D.152	1991-015A	Astra 1B					PL
TLEs	EGO (-)	2016-12-31	10:55:14.221	-6.35	501.708	475.463	527.952
21139	TEME	42665.956	0.0012616	9.0801	45.7250	248.5310	211.9816
D.153	1993-076A	NATO IVB					PL
TLEs	EGO (-)	2016-12-24	17:02:32.447	-6.32	499.767	473.024	526.509
22921	TEME	42664.300	0.0006184	11.9626	23.9465	254.3564	72.5296
D.154	1982-020A	Gorizont 5					PL
TLEs	EGO (-)	2016-12-30	02:58:12.709	-6.27	495.598	351.362	639.835
13092	TEME	42659.573	0.0032390	14.9032	335.9311	164.4789	309.9303
D.155	1993-074A	USA 97 (DSCS III F8, DSCS 3-8, DSCS III B-10)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-6.26	494.778	458.130	531.426
UI066	J2000	42658.951	0.0008591	10.5044	40.0482	261.6270	288.0640
D.156	1990-001B	JCSAT 2					PL
TLEs	EGO (-)	2016-12-31	10:57:12.500	-6.25	493.757	232.010	755.505
20402	TEME	42657.456	0.0065999	12.8520	41.2678	233.6211	182.7661
D.157	1979-038A	OPS 6392 (FLTSATCOM F2)					PL
TLEs	EGO (-)	2016-12-31	05:58:41.350	-6.23	492.176	423.412	560.939
11353	TEME	42655.690	0.0018327	14.2498	335.4693	335.5502	347.6719
D.158	1984-113C	LEASAT 1 (Syncom-4 1)					PL
TLEs	EGO (-)	2016-12-31	10:41:38.494	-6.23	491.885	368.981	614.789
15384	TEME	42656.388	0.0033339	13.9719	3.1042	218.2630	282.6192
D.159	1988-040A	Intelsat VA F-13 (NSS 513)					PL
TLEs	EGO (-)	2016-12-25	17:38:51.993	-6.11	482.771	425.236	540.306
19121	TEME	42647.558	0.0008674	15.1760	18.1983	352.9679	48.1664
D.160	1990-097B	USA 67 (SDS 2 F2)(QUASAR 2)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-6.10	481.849	404.050	559.648
UI092	J2000	42646.022	0.0018243	16.6607	6.0766	202.3842	253.2320
D.161	1994-079A	Telstar 11 (Orion 1)					PL
TLEs	EGO (-)	2016-12-25	12:17:43.521	-6.09	481.090	403.152	559.028
23413	TEME	42645.291	0.0021407	10.2495	41.4918	277.2978	204.2283
D.162	1975-011F	SMS 2 AKM (SVM-5)					PM
TLEs	EGO (0.25)	2016-12-24	03:29:14.776	-6.07	479.596	61.064	898.127
20835	TEME	42643.272	0.0094563	11.7783	316.9063	33.2729	2.8268
D.163	2006-024A	USA 187 (MITEx OSC satellite)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-6.01	474.398	401.533	547.263
UI149	J2000	42638.571	0.0017089	0.4869	54.5744	200.8850	245.5980

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.164	1981-073A	FLTSATCOM F5					PL
TLEs	EGO (-)	2016-12-31	20:30:39.517	-6.00	474.056	430.283	517.830
12635	TEME	42638.416	0.0004594	19.4714	347.3137	64.7999	120.2802
D.165	1989-069A	USA 43 (DSCS II F-15, DSCS 2-15, DSCS II E-15)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-6.00	473.586	393.879	553.293
UI087	J2000	42637.759	0.0018694	15.4203	5.5763	187.2691	352.9870
D.166	1974-033A	SMS 1					PL
TLEs	EGO (-)	2016-12-31	05:52:56.004	-5.98	472.223	401.902	542.543
7298	TEME	42636.509	0.0020634	12.3466	308.4989	326.2726	294.4211
D.167	1990-063A	TDF 2					PL
TLEs	EGO (-)	2016-12-23	10:22:44.422	-5.98	471.993	269.448	674.538
20705	TEME	42635.982	0.0053307	14.1713	27.4504	232.8194	140.3898
D.168	1991-079D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (-)	2016-12-31	12:30:48.009	-5.95	470.078	447.846	492.310
21792	TEME	42634.946	0.0002270	15.4787	12.3187	344.7775	263.5307
D.169	1976-029A	RCA Satcom II					PL
TLEs	EGO (-)	2016-12-25	13:24:15.906	-5.94	468.891	222.508	715.275
8774	TEME	42633.563	0.0055909	14.8527	341.0990	152.5840	230.7954
D.170	1984-041D	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-27	07:57:48.639	-5.93	468.325	401.625	535.025
14943	TEME	42632.467	0.0012594	14.9323	345.6505	143.3935	297.2564
D.171	1980-049A	Gorizont 4					PL
TLEs	EGO (-)	2016-12-25	12:07:11.563	-5.92	467.468	449.904	485.032
11841	TEME	42631.984	0.0007018	14.1906	331.2090	272.6103	276.8367
D.172	1994-047A	DirecTV-2					PL
TLEs	EGO (-)	2016-12-25	23:57:32.859	-5.90	465.685	423.767	507.602
23192	TEME	42630.393	0.0014090	8.0957	49.1140	238.4743	51.4668
D.173	1982-020F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-25	13:53:12.544	-5.89	465.369	347.729	583.008
13899	TEME	42629.075	0.0023262	14.9334	335.4322	118.3695	145.2752
D.174	2015-048B	Proton-M/DM-3 fourth stage (Blok DM-3)					RB
TLEs	EGO (0.28)	2016-12-25	01:00:47.417	-5.83	460.053	42.348	877.758
40896	TEME	42624.736	0.0095484	0.9951	86.2473	56.6055	250.8278
D.175	1988-066D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (-)	2016-12-25	08:38:43.180	-5.81	458.560	317.631	599.489
19347	TEME	42622.307	0.0028053	15.3703	0.9761	51.9245	335.9405
D.176	1984-037A	OPS 7641 (DSP F11, DSP 12, DSP Block 3(MOS/PIM) F11)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-5.76	454.333	411.433	497.233
UI037	J2000	42618.506	0.0010066	15.3603	347.4241	202.5828	17.8650
D.177	1979-105E	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-31	12:40:54.516	-5.73	451.782	381.370	522.194
11684	TEME	42615.725	0.0018184	14.0343	329.1591	217.7832	205.3312
D.178	1992-010B	INSAT 2DT (Arabsat 1C)					PL
TLEs	EGO (-)	2016-12-31	05:14:42.681	-5.72	451.325	342.578	560.072
21894	TEME	42615.601	0.0033844	11.4401	37.9115	200.6416	208.1212

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.179	1987-078B	Eutelsat I F-4 (ECS 4)					PL
TLEs	EGO (-)	2016-12-31	06:50:27.412	-5.71	450.204	415.373	485.036
18351	TEME	42614.513	0.0012919	15.4148	11.3986	291.7836	212.8665
D.180	1989-048A	Raduga 1-1					PL
TLEs	EGO (-)	2016-12-25	10:23:12.827	-5.64	444.655	361.773	527.538
20083	TEME	42608.578	0.0014820	15.4048	4.3509	61.0891	198.6580
D.181^m	1998-070A	Eutelsat 115 West A (SATMEX 5)					PL
TLEs	EGO (-)	2016-12-25	02:43:12.493	-5.59	441.096	424.480	457.712
25558	TEME	42605.269	0.0003900	2.8289	74.7557	226.3931	299.4630
D.182	1991-018A	Inmarsat-2 F2					PL
TLEs	EGO (-)	2016-12-30	02:14:55.699	-5.58	440.301	423.835	456.767
21149	TEME	42604.416	0.0007703	10.6064	30.6930	231.8984	28.9502
D.183	1981-057A	Meteosat 2					PL
TLEs	EGO (-)	2016-12-31	21:12:29.977	-5.58	440.012	310.360	569.663
12544	TEME	42604.751	0.0035278	15.1026	349.4578	288.4592	55.4741
D.184	1997-009A	Intelsat 801					PL
TLEs	EGO (-)	2016-12-24	15:46:58.994	-5.54	436.824	398.854	474.793
24742	TEME	42601.625	0.0012602	6.6222	54.7477	257.9001	65.4195
D.185	1979-053A	OPS 7484 (DSP F8, DSP 11, DSP Block 3(MOS/PIM) F8)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-5.53	435.840	389.845	481.835
UI053	J2000	42600.013	0.0010797	14.0849	332.1496	217.0486	46.3070
D.186	1995-027A	USA 111 (UFO F5)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-5.51	434.638	402.186	467.090
UI122	J2000	42598.811	0.0007618	9.9465	28.9670	248.8314	209.0110
D.187	1983-026B	TDRS 1					PL
TLEs	EGO (-)	2016-12-24	17:48:32.890	-5.51	434.268	338.546	529.990
13969	TEME	42598.320	0.0021226	13.6649	346.5580	190.7000	128.6554
D.188	1999-050A	Ciel 1 (EchoStar 5)					PL
TLEs	EGO (-)	2016-12-25	13:15:05.118	-5.50	433.655	413.394	453.915
25913	TEME	42597.398	0.0010126	6.0198	57.4151	205.5181	143.2743
D.189	1998-049A	ST-1					PL
TLEs	EGO (-)	2016-12-31	17:23:44.638	-5.49	433.361	411.377	455.345
25460	TEME	42598.195	0.0012181	4.1634	66.7802	214.9819	59.8910
D.190^m	1994-055A	Optus B3					PL
TLEs	EGO (-)	2016-12-29	22:59:59.999	-5.49	432.782	415.466	450.098
23227	TEME	42596.955	0.0004065	7.1287	51.5194	257.0157	139.2680
D.191	1997-016A	Thaicom 3					PL
TLEs	EGO (0.27)	2016-12-25	17:36:44.386	-5.48	432.377	74.768	789.987
24768	TEME	42596.421	0.0083248	8.3556	48.1904	322.2713	45.7078
D.192	1984-093B	SBS IV					PL
TLEs	EGO (-)	2016-12-25	09:45:46.307	-5.44	428.927	389.312	468.543
15235	TEME	42593.641	0.0005623	15.2260	10.7636	343.3866	237.1681
D.193	1989-070C	Himawari 4 (GMS 4) AKM (Star 27)					PM
TLEs	EGO (0.11)	2016-12-25	20:18:36.254	-5.43	428.501	-613.184	1470.185
20317	TEME	42592.806	0.0243049	15.0356	5.5241	330.2880	23.3047

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.194	2000-031A	Ekspress 3A					PL
TLEs	EGO (-)	2016-12-25	02:06:37.878	-5.43	427.847	407.530	448.163
26378	TEME	42592.037	0.0009110	6.8042	53.8432	177.6161	267.5185
D.195	1987-022F	GOES 7 AKM (Star 27)					PM
TLEs	EGO (0.01)	2016-12-26	04:51:08.827	-5.41	426.851	-4125.416	4979.118
28520	TEME	42591.330	0.1060071	15.1240	350.0158	354.3359	311.9219
D.196	1991-060A	Yuri 3B (BS 3B)					PL
TLEs	EGO (-)	2016-12-23	18:15:12.494	-5.34	421.128	396.055	446.202
21668	TEME	42584.676	0.0003018	12.8978	22.1948	182.4814	140.5778
D.197	1995-055A	Astra 1E					PL
TLEs	EGO (-)	2016-12-31	08:18:03.847	-5.33	420.447	393.010	447.884
23686	TEME	42584.674	0.0009792	5.1286	61.4154	260.2274	210.4470
D.198	1984-081A	Eutelsat I F-2 (ECS 2)					PL
TLEs	EGO (-)	2016-12-30	23:26:22.170	-5.32	419.080	380.575	457.584
15158	TEME	42583.950	0.0007063	15.4865	2.3720	164.6321	96.2313
D.199	1995-025A	GOES 9					PL
TLEs	EGO (-)	2016-12-30	16:06:26.336	-5.30	418.200	396.506	439.895
23581	TEME	42582.622	0.0002789	10.6807	39.8574	191.4180	40.8651
D.200	1990-077A	Yuri 3A (BS 3A)					PL
TLEs	EGO (-)	2016-12-31	20:40:16.249	-5.27	415.269	370.916	459.622
20771	TEME	42579.049	0.0015635	14.6558	27.5968	204.2621	132.5907
D.201	1983-081A	Sakura 2B (CS 2B)					PL
TLEs	EGO (-)	2016-12-24	10:19:23.948	-5.26	414.753	394.693	434.813
14248	TEME	42579.292	0.0006960	15.2736	354.2781	284.0637	285.8696
D.202	1986-007A	Raduga 18					PL
TLEs	EGO (0.20)	2016-12-24	08:42:46.799	-5.26	414.631	100.250	729.012
16497	TEME	42578.919	0.0069725	15.1268	351.1793	113.2990	301.0272
D.203	1992-037A	USA 82 (DSCS III F6, DSCS 3-6, DSCS III B-12)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-5.26	414.483	373.390	455.576
UI123	J2000	42578.656	0.0009651	11.7030	35.8733	284.0796	126.8700
D.204	1989-046A	USA 39 (DSP F14, DSP 14, DSP Block 5(DSP-1) F14)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-5.24	412.841	394.767	430.915
UI150	J2000	42577.014	0.0004245	14.7289	9.4144	229.1077	103.3890
D.205	1981-025A	OPS 7350 (DSP F9, DSP 10, DSP Block 3(MOS/PIM) F9)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-5.22	411.205	329.350	493.061
UI045	J2000	42575.378	0.0019226	14.3659	337.7526	205.1090	182.5400
D.206	1972-090A	Anik A1					PL
TLEs	EGO (-)	2016-12-31	05:57:57.921	-5.20	410.146	350.037	470.256
6278	TEME	42573.872	0.0008936	13.3897	328.3881	108.8348	332.9167
D.207	2004-001A	Estrela do Sul 1 (Telstar 14)					PL
TLEs	EGO (-)	2016-12-25	03:15:10.409	-5.19	409.138	391.333	426.942
28137	TEME	42573.507	0.0009043	4.2592	65.6278	215.1859	295.2280
D.208	2001-020A	USA 158 (GeoLITE)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-5.19	408.911	347.742	470.080
UI114	J2000	42573.084	0.0014368	6.1602	48.0819	35.4118	212.1780

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.209	1971-006A	Intelsat IV F-2					PL
TLEs	EGO (-)	2016-12-31	12:07:20.767	-5.17	407.533	350.142	464.923
4881	TEME	42572.267	0.0015493	12.2303	318.7944	342.8179	268.6030
D.210	1993-031A	Astra 1C					PL
TLEs	EGO (-)	2016-12-24	14:12:05.972	-5.16	406.608	390.227	422.989
22653	TEME	42571.017	0.0007025	8.1681	48.1190	230.9305	110.9937
D.211	1981-050A	Intelsat V F-1					PL
TLEs	EGO (-)	2016-12-23	08:58:34.249	-5.11	402.336	378.364	426.309
12474	TEME	42566.837	0.0008758	15.1479	354.2013	233.6076	127.4970
D.212	1984-129A	USA 7 (DSP F12, DSP 6R, DSP Block 4(PHASE II UG) F12)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-5.11	402.275	382.758	421.792
UI034	J2000	42566.448	0.0004585	15.9857	352.9315	231.9206	335.5770
D.213	2006-024B	USA 188 (MITEx Lockheed satellite)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-5.10	401.679	371.142	432.216
UI148	J2000	42565.852	0.0007174	5.7283	59.1621	97.4723	64.7020
D.214	1994-065A	Solidaridad 2					PL
TLEs	EGO (-)	2016-12-25	17:08:24.463	-5.07	399.621	383.051	416.191
23313	TEME	42563.332	0.0008480	6.9733	52.9395	222.5825	8.5731
D.215	1983-058A	Eutelsat I F-1 (ECS 1)					PL
TLEs	EGO (-)	2016-12-31	15:41:29.063	-5.05	398.129	351.907	444.351
14128	TEME	42561.747	0.0004864	15.3039	359.0450	128.3501	148.6741
D.216	1990-093A	Inmarsat-2 F1					PL
TLEs	EGO (-)	2016-12-31	18:26:12.816	-5.03	396.304	373.235	419.374
20918	TEME	42559.731	0.0012307	11.2111	29.1081	262.0953	154.4748
D.217	1980-098A	Intelsat V F-2					PL
TLEs	EGO (-)	2016-12-31	20:55:20.320	-4.99	393.034	342.645	443.423
12089	TEME	42557.170	0.0018242	15.1590	356.2074	243.1737	49.0964
D.218	1994-022A	GOES 8					PL
TLEs	EGO (-)	2016-12-31	17:10:37.151	-4.93	387.993	362.581	413.405
23051	TEME	42552.829	0.0010694	11.1790	40.5039	230.7246	96.4558
D.219	1987-078A	Optus A3					PL
TLEs	EGO (-)	2016-12-31	18:26:12.816	-4.92	387.699	361.706	413.692
18350	TEME	42551.158	0.0009632	14.5541	19.8774	270.0905	154.3297
D.220	1984-113B	Arabsat 1D					PL
TLEs	EGO (-)	2016-12-29	05:09:36.585	-4.92	387.571	272.632	502.509
15383	TEME	42551.228	0.0030177	15.2530	10.8316	290.5974	4.7546
D.221	1991-046A	Gorizont 23					PL
TLEs	EGO (-)	2016-12-31	18:44:23.038	-4.92	387.269	361.673	412.865
21533	TEME	42551.436	0.0010699	15.4056	10.9728	246.0329	31.6580
D.222	2014-043D	Delta 4M+(4,2) second stage (DCSS 4)					RB
KIAM	EGO (-)	2017-01-01	00:00:01.000	-4.92	387.208	324.947	449.469
UI187	J2000	42551.381	0.0014632	1.5321	72.8915	224.9954	256.4960
D.223	2000-069A	Beidou					PL
TLEs	EGO (-)	2016-12-31	05:17:29.419	-4.91	386.878	328.103	445.652
26599	TEME	42551.822	0.0011188	6.8392	54.3633	267.0487	264.1199

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.224^m	2005-006A	Himawari 6 (MTSAT 1R)					PL
TLEs	EGO (-)	2016-12-25	19:48:25.823	-4.90	386.282	298.513	474.051
28622	TEME	42550.455	0.0020627	1.4281	83.5266	209.0928	68.4845
D.225	1977-118A	Sakura 1 (CS 1)					PL
TLEs	EGO (-)	2016-12-31	02:35:08.196	-4.89	385.467	368.273	402.661
10516	TEME	42549.355	0.0005017	14.2310	332.5308	292.8354	19.0458
D.226	1987-095A	TV-Sat 1					PL
TLEs	EGO (0.21)	2016-12-30	05:33:32.192	-4.88	384.346	130.846	637.847
18570	TEME	42547.838	0.0054422	15.0088	356.7961	38.9711	1.5393
D.227	1994-034A	Intelsat VII F-2					PL
TLEs	EGO (-)	2016-12-25	04:26:04.282	-4.81	378.378	360.443	396.313
23124	TEME	42543.056	0.0005633	4.2084	66.0947	233.6986	265.1957
D.228	1991-003B	Eutelsat II F-2					PL
TLEs	EGO (-)	2016-12-28	22:35:04.644	-4.80	378.046	353.180	402.911
21056	TEME	42541.809	0.0002828	13.3981	30.0294	184.5563	132.0772
D.229	1998-028A	EchoStar 4					PL
TLEs	EGO (-)	2016-12-31	09:46:03.969	-4.76	374.949	325.110	424.787
25331	TEME	42538.369	0.0020203	6.5490	49.4622	214.6086	156.6713
D.230	1980-087A	OPS 6394 (FLTSATCOM F4)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-4.76	374.850	357.103	392.597
UI096	J2000	42539.023	0.0004172	14.2915	337.3789	280.5198	105.5760
D.231	1991-084A	Telecom 2A					PL
TLEs	EGO (-)	2016-12-25	23:18:30.802	-4.76	374.843	357.381	392.305
21813	TEME	42538.848	0.0008046	12.4176	33.8943	218.2062	17.6141
D.232	1999-056A	DirecTV 1R					PL
TLEs	EGO (-)	2016-12-25	12:57:42.790	-4.73	372.209	349.730	394.688
25937	TEME	42535.517	0.0008303	3.4715	70.3777	183.5828	164.6422
D.233	1997-025A	Thor II					PL
TLEs	EGO (-)	2016-12-25	21:11:12.475	-4.69	368.875	352.750	384.999
24808	TEME	42533.924	0.0008556	6.5384	53.2821	223.5320	84.2142
D.234	1995-013A	Intelsat VII F-5					PL
TLEs	EGO (-)	2016-12-29	03:10:49.346	-4.68	368.402	289.992	446.812
23528	TEME	42532.830	0.0011725	5.6130	58.8370	17.1940	294.0767
D.235	1993-073B	Meteosat 6 (MOP 3)					PL
TLEs	EGO (-)	2016-12-25	12:46:37.600	-4.64	365.441	340.145	390.737
22912	TEME	42529.607	0.0007924	13.1056	28.8454	193.9202	121.2725
D.236	1993-078A	DirecTV 1					PL
TLEs	EGO (-)	2016-12-25	03:17:46.341	-4.64	364.883	321.128	408.638
22930	TEME	42529.316	0.0009755	6.4276	55.5789	144.2126	297.2156
D.237	1985-092B	USA 11 (DSCS III F2, DSCS 3-2, DSCS III B-4)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-4.63	364.781	349.743	379.819
UI079	J2000	42528.954	0.0003536	15.2217	15.9555	278.9300	260.9280
D.238	2000-066A	Thuraya 1					PL
TLEs	EGO (-)	2016-12-25	03:54:39.917	-4.63	364.736	336.613	392.859
26578	TEME	42529.022	0.0011684	6.7246	27.6055	258.2206	28.5102

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.239	2016-052C	Delta 4 second stage					RB
KIAM	EGO (-)	2017-01-01	00:00:01.000	-4.63	364.272	332.856	395.688
	J2000	42528.445	0.0007387	1.1728	58.8474	255.3261	6.8090
D.240	1990-091A	SBS VI					PL
TLEs	EGO (-)	2016-12-24	20:42:02.661	-4.61	363.057	328.948	397.166
20872	TEME	42527.478	0.0002420	7.5362	51.3917	101.6696	36.6542
D.241	1978-016A	OPS 6391 (FLTSATCOM F1)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-4.60	361.889	331.674	392.104
UI101	J2000	42526.062	0.0007105	14.2378	329.6492	212.7685	50.6260
D.242	1990-001A	Skynet 4A					PL
TLEs	EGO (-)	2016-12-31	02:47:02.718	-4.60	361.675	308.000	415.350
20401	TEME	42526.291	0.0018324	13.2540	14.2754	234.8685	47.6031
D.243	1999-005A	Galaxy 26 (Intelsat Americas 6, IA 6, Telstar 6)					PL
TLEs	EGO (-)	2016-12-25	08:39:55.577	-4.59	361.615	341.495	381.736
25626	TEME	42525.205	0.0005023	4.4259	75.4688	167.4747	330.8676
D.244	1995-029A	DirecTV 3					PL
TLEs	EGO (-)	2016-12-24	04:50:51.342	-4.58	360.433	341.474	379.392
23598	TEME	42525.096	0.0005732	6.1634	56.7690	263.8864	250.7662
D.245	1996-030A	Palapa C2					PL
TLEs	EGO (-)	2016-12-31	06:30:16.043	-4.58	360.405	345.046	375.764
23864	TEME	42524.725	0.0002552	5.4744	59.7951	99.9199	227.3575
D.246	1989-087A	Intelsat VI F-2					PL
TLEs	EGO (-)	2016-12-24	21:21:54.748	-4.56	359.029	334.758	383.301
20315	TEME	42523.342	0.0005530	12.0153	34.2512	184.4332	34.1534
D.247^m	2001-018A	XM Radio 1 (Roll)					PL
TLEs	EGO (-)	2016-12-25	22:19:56.515	-4.56	358.615	314.604	402.626
26761	TEME	42522.788	0.0010350	0.7097	89.2572	166.8456	24.6482
D.248	1991-037A	Aurora II					PL
TLEs	EGO (-)	2016-12-29	23:52:29.809	-4.53	356.783	335.862	377.704
21392	TEME	42520.072	0.0009470	12.6763	33.0378	215.6715	335.8511
D.249	1992-057A	Satcom C-4					PL
TLEs	EGO (-)	2016-12-30	08:24:16.237	-4.52	356.026	342.396	369.656
22096	TEME	42520.095	0.0007890	10.2509	41.2172	217.7673	205.0864
D.250	1999-052A	Galaxy 27 (Intelsat Americas 7, IA 7, Telstar 7)					PL
TLEs	EGO (-)	2016-12-24	16:06:56.401	-4.52	355.485	332.951	378.019
25922	TEME	42520.325	0.0008833	2.8370	72.9485	207.4830	97.1732
D.251	1997-011A	Tempo 2					PL
TLEs	EGO (-)	2016-12-25	10:22:00.816	-4.47	351.756	230.538	472.973
24748	TEME	42516.804	0.0035196	8.7884	46.2201	228.4283	268.5763
D.252	1992-006A	USA 78 (DSCS III F5, DSCS 3-5, DSCS III B-14)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-4.46	351.041	309.419	392.663
UI127	J2000	42515.214	0.0009790	13.2363	31.0934	241.7416	249.3520
D.253	1998-056B	Sirius 3					PL
TLEs	EGO (-)	2016-12-23	20:08:31.123	-4.46	350.880	342.122	359.638
25492	TEME	42514.753	0.0003908	6.1211	54.2820	229.9585	19.2264

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.254	1998-068A	Bonum 1					PL
TLEs	EGO (-)	2016-12-25	01:04:24.301	-4.45	349.957	337.022	362.892
25546	TEME	42513.826	0.0005798	3.8893	68.1583	228.0783	317.7832
D.255	2000-022A	GOES 11					PL
TLEs	EGO (-)	2016-12-25	15:27:57.231	-4.43	348.661	327.593	369.729
26352	TEME	42512.529	0.0006605	4.6055	75.7056	166.0539	17.7013
D.256^m	2005-010A	Ekspress-AM 2					PL
TLEs	EGO (-)	2016-12-25	20:16:42.594	-4.43	348.455	315.380	381.530
28629	TEME	42512.628	0.0007780	2.0025	76.9802	42.1065	352.5608
D.257	1993-046A	USA 93 (DSCS III F7, DSCS 3-7, DSCS III B-9)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-4.42	347.812	337.014	358.610
UI120	J2000	42511.985	0.0002540	10.7607	39.7881	229.1371	253.5590
D.258	1994-049B	Turksat 1B					PL
TLEs	EGO (-)	2016-12-31	12:24:12.575	-4.42	347.389	278.471	416.306
23200	TEME	42510.707	0.0010820	10.1673	41.4264	12.3630	160.3996
D.259	1995-023A	Intelsat VIIA F-1					PL
TLEs	EGO (-)	2016-12-31	18:34:28.502	-4.40	346.037	332.469	359.606
23571	TEME	42510.477	0.0003488	4.1482	65.5665	188.1606	37.8634
D.260	1984-005A	Yuri 2A (BS 2A)					PL
TLEs	EGO (-)	2016-12-31	10:30:05.184	-4.40	345.903	292.306	399.499
14659	TEME	42510.472	0.0011052	15.1954	354.4621	187.3523	297.6358
D.261	1992-010A	Superbird B1					PL
TLEs	EGO (-)	2016-12-29	11:05:16.229	-4.39	345.255	282.583	407.926
21893	TEME	42509.478	0.0007433	12.4080	33.7682	39.9911	297.3157
D.262	1996-002B	MEASAT 1					PL
TLEs	EGO (-)	2016-12-24	22:28:42.658	-4.36	342.935	326.491	359.379
23765	TEME	42506.411	0.0008426	7.3068	51.1249	227.3139	351.8755
D.263	1989-004A	Gorizont 17					PL
TLEs	EGO (-)	2016-12-31	19:18:24.706	-4.35	342.057	253.389	430.726
19765	TEME	42506.239	0.0015676	15.2166	2.4372	81.3551	117.7227
D.264	2007-063A	Rascom-QAF 1					PL
TLEs	EGO (-)	2016-12-25	17:02:58.742	-4.35	341.932	299.765	384.099
32387	TEME	42505.492	0.0003836	4.8614	63.2704	333.7596	184.7938
D.265^m	1997-036A	Superbird C					PL
TLEs	EGO (-)	2016-12-25	06:02:01.734	-4.33	340.813	290.517	391.109
24880	TEME	42504.986	0.0011833	6.4018	55.3408	244.5281	230.5221
D.266	1992-041B	Eutelsat II F-4					PL
TLEs	EGO (-)	2016-12-25	15:02:11.753	-4.30	338.415	310.903	365.927
22028	TEME	42503.046	0.0010580	12.6730	33.4148	203.7359	221.9059
D.267	2001-012A	XM Radio 2 (Rock)					PL
TLEs	EGO (-)	2016-12-25	12:29:02.987	-4.29	337.413	313.712	361.113
26724	TEME	42500.569	0.0003566	1.7826	79.6235	285.8128	157.1701
D.268	1996-002A	Intelsat 3R (PAS 3R)					PL
TLEs	EGO (-)	2016-12-25	18:08:22.556	-4.27	335.898	284.347	387.449
23764	TEME	42500.592	0.0021083	5.7626	57.8101	198.0643	47.2683

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.269	1989-006A	Intelsat VA F-15					PL
TLEs	EGO (-)	2016-12-25	15:13:30.522	-4.20	330.619	238.084	423.155
19772	TEME	42495.678	0.0015754	14.5184	23.7141	21.6376	239.5434
D.270	2009-007B	Ekspress MD-1					PL
TLEs	EGO (-)	2016-12-25	15:38:55.975	-4.18	328.984	298.504	359.464
33596	TEME	42492.870	0.0010948	2.6354	76.1435	239.5036	21.2243
D.271	1985-087A	Intelsat VA F-12					PL
TLEs	EGO (-)	2016-12-25	15:19:46.049	-4.17	328.040	302.169	353.911
16101	TEME	42493.046	0.0013163	15.3697	13.6615	237.8461	225.1569
D.272	1992-084A	Superbird A1					PL
TLEs	EGO (-)	2016-12-25	05:17:09.003	-4.16	326.891	260.880	392.901
22253	TEME	42491.374	0.0011199	8.4204	43.6541	101.7831	227.9879
D.273	1998-024B	BSAT 1b					PL
TLEs	EGO (-)	2016-12-25	01:58:43.891	-4.16	326.707	307.950	345.465
25312	TEME	42490.855	0.0008364	4.5656	69.7015	184.7735	305.7535
D.274	1989-069B	USA 44 (DSCS III F4, DSCS 3-4, DSCS III A-2)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-4.15	326.644	278.430	374.858
UI126	J2000	42490.817	0.0011347	12.9344	32.2134	278.1473	286.6800
D.275	1997-016B	BSAT 1a					PL
TLEs	EGO (-)	2016-12-25	18:12:20.263	-4.15	326.359	311.379	341.339
24769	TEME	42490.314	0.0008331	4.7787	60.2026	201.7771	125.8088
D.276	1997-019A	GOES 10					PL
TLEs	EGO (0.07)	2016-12-31	02:26:11.345	-4.14	325.791	207.867	443.715
24786	TEME	42490.502	0.0030621	9.0363	44.4110	162.0922	267.9071
D.277	1983-059B	Anik C2					PL
TLEs	EGO (0.14)	2016-12-28	17:27:24.446	-4.14	325.686	170.437	480.935
14133	TEME	42489.298	0.0032583	15.3829	5.8007	24.0179	6.3579
D.278	1995-044A	N-Star 1					PL
TLEs	EGO (-)	2016-12-25	19:13:19.617	-4.12	324.195	279.547	368.843
23651	TEME	42489.183	0.0017940	9.0549	45.0536	265.5057	55.8172
D.279	1991-026A	Anik E2					PL
TLEs	EGO (-)	2016-12-25	21:34:00.818	-4.12	324.090	295.434	352.746
21222	TEME	42487.283	0.0010173	11.0736	38.4762	266.0692	151.7071
D.280	2001-031A	GOES 12					PL
TLEs	EGO (-)	2016-12-24	19:03:37.557	-4.09	321.479	289.998	352.960
26871	TEME	42485.025	0.0012051	6.0223	61.3353	219.0732	330.7546
D.281	1978-044A	OTS 2					PL
TLEs	EGO (-)	2016-12-25	07:10:09.852	-4.08	320.834	290.426	351.241
10855	TEME	42485.034	0.0012921	14.3500	337.2481	269.4678	205.3085
D.282	1990-100B	GStar 4					PL
TLEs	EGO (-)	2016-12-25	15:58:46.924	-4.07	319.835	285.920	353.750
20946	TEME	42483.288	0.0012984	11.5818	36.7914	241.4131	142.4218
D.283	1973-058A	Intelsat IV F-7					PL
TLEs	EGO (-)	2016-12-31	09:29:12.689	-4.06	319.275	293.855	344.695
6796	TEME	42484.044	0.0001445	14.0877	332.3470	184.9438	235.5524

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.284	1995-043A	JCSAT 3					PL
TLEs	EGO (-)	2016-12-25	01:11:57.218	-4.05	318.398	255.897	380.899
23649	TEME	42482.012	0.0010893	9.4159	39.9119	330.3766	343.6375
D.285	1994-040B	BS-3N					PL
TLEs	EGO (-)	2016-12-25	11:08:12.742	-4.04	317.615	302.976	332.254
23176	TEME	42482.054	0.0006789	9.3867	44.1980	251.6491	219.0709
D.286	2007-003A	Beidou 2A					PL
TLEs	EGO (0.36)	2016-12-25	11:00:59.807	-4.04	317.389	64.088	570.690
30323	TEME	42480.552	0.0066282	1.9882	87.3485	181.7695	187.0252
D.287	1998-075A	Intelsat 6B (PAS 6B)					PL
TLEs	EGO (-)	2016-12-25	19:43:42.597	-4.03	317.001	237.855	396.147
25585	TEME	42480.419	0.0014044	7.0222	52.7391	102.5363	348.5715
D.288	1998-002A	Skynet 4D					PL
TLEs	EGO (-)	2016-12-25	13:19:44.741	-4.03	316.904	291.346	342.463
25134	TEME	42480.210	0.0002893	10.3514	32.7605	161.7801	166.3402
D.289	1970-003A	Intelsat III F-6					PL
TLEs	EGO (-)	2016-12-25	17:11:31.846	-4.02	315.979	271.403	360.555
4297	TEME	42480.361	0.0014295	7.2371	304.6720	342.7207	35.9809
D.290	1983-047A	Intelsat V F-6					PL
TLEs	EGO (0.21)	2016-12-25	14:29:23.821	-4.00	314.104	211.709	416.499
14077	TEME	42479.317	0.0041330	15.3303	3.1913	247.3039	53.1289
D.291	1991-067A	Anik E1					PL
TLEs	EGO (-)	2016-12-31	17:03:45.533	-3.97	312.009	284.713	339.305
21726	TEME	42475.677	0.0016382	11.0828	38.7985	232.2679	222.1902
D.292	2001-011B	BSAT 2a					PL
TLEs	EGO (-)	2016-12-25	08:29:36.216	-3.95	310.174	286.727	333.621
26720	TEME	42474.724	0.0007982	3.6441	69.3346	172.9745	226.5495
D.293	1998-044A	PSN 5 (Chinasat 5B, Zhongxing 5B, ZX 5B, Intelsat APR-1)					PL
TLEs	EGO (-)	2016-12-25	17:02:58.742	-3.94	309.673	269.985	349.361
25404	TEME	42473.212	0.0015288	4.0854	66.8352	172.6812	185.3887
D.294	1996-035A	Intelsat VII F-6					PL
TLEs	EGO (-)	2016-12-25	05:07:25.169	-3.94	309.300	264.267	354.333
23915	TEME	42473.525	0.0018618	3.6280	69.7165	175.9335	210.3856
D.295	1968-081S	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.09)	2016-12-31	01:09:15.053	-3.93	309.156	-1084.206	1702.518
38692	TEME	42472.644	0.0337413	7.0803	319.6020	300.9676	202.5258
D.296	1995-001A	Intelsat VII F-4					PL
TLEs	EGO (-)	2016-12-25	05:42:26.845	-3.93	309.082	288.863	329.301
23461	TEME	42472.501	0.0004088	5.9925	56.9581	149.6390	343.0920
D.297	1989-027A	Tele-X					PL
TLEs	EGO (-)	2016-12-25	04:19:42.848	-3.93	308.700	283.205	334.195
19919	TEME	42473.866	0.0006459	14.7762	22.2050	206.9850	227.5042
D.298	1993-078B	Thaicom 1					PL
TLEs	EGO (-)	2016-12-31	08:49:26.632	-3.93	308.530	285.260	331.801
22931	TEME	42473.584	0.0006876	6.1654	55.9738	171.9990	256.4162

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.299	1990-100A	Satcom C-1					PL
TLEs	EGO (-)	2016-12-31	20:25:22.830	-3.92	308.276	282.008	334.544
20945	TEME	42471.566	0.0011713	10.1423	39.5181	284.2131	145.8441
D.300	1989-067A	Sirius 1 (Marcopolo 1)					PL
TLEs	EGO (-)	2016-12-31	21:06:42.778	-3.91	307.489	278.217	336.762
20193	TEME	42470.948	0.0008874	13.5216	29.0065	278.5182	344.2836
D.301	1996-039A	Chinasat 5D (Zhongxing 5D, ZX 5D, APStar 1A)					PL
TLEs	EGO (0.03)	2016-12-24	02:15:39.502	-3.90	306.160	214.506	397.813
23943	TEME	42471.075	0.0025310	8.8361	41.4680	256.1021	271.9646
D.302	1994-040A	Intelsat 2 (PAS 2)					PL
TLEs	EGO (-)	2016-12-25	19:53:42.532	-3.89	305.475	281.561	329.390
23175	TEME	42470.125	0.0005439	6.4119	57.5239	240.8707	41.2017
D.303	1988-098A	TDF 1					PL
TLEs	EGO (-)	2016-12-31	21:41:16.807	-3.88	305.031	269.375	340.687
19621	TEME	42469.733	0.0012795	14.9398	20.1579	202.5684	105.1643
D.304	2004-043A	Ekspress-AM 1					PL
TLEs	EGO (-)	2016-12-31	04:58:03.694	-3.88	304.533	265.913	343.154
28463	TEME	42469.425	0.0014318	5.1344	61.0396	179.6533	308.0992
D.305	1978-068A	Comstar 1C (D-3)					PL
TLEs	EGO (0.05)	2016-12-22	14:24:20.585	-3.87	304.367	218.885	389.850
10975	TEME	42468.812	0.0024966	14.7909	346.1213	235.2666	219.7714
D.306	2003-028A	BSAT 2c					PL
TLEs	EGO (-)	2016-12-25	09:00:53.074	-3.86	303.486	278.565	328.406
27830	TEME	42466.930	0.0009964	2.7111	74.4848	205.5853	335.2238
D.307	1992-054A	Optus B1					PL
TLEs	EGO (-)	2016-12-29	10:04:17.601	-3.84	302.033	261.587	342.479
22087	TEME	42466.212	0.0002623	8.4413	47.2716	54.1224	312.4309
D.308	1991-080B	USA 75 (DSP F16, DSP 16, DSP Block 5(DSP-1) F16)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-3.84	302.004	290.283	313.725
UI133	J2000	42466.177	0.0002760	15.0727	14.9909	301.8121	139.4300
D.309	1976-017A	Marisat 1					PL
TLEs	EGO (-)	2016-12-31	02:53:12.623	-3.84	301.786	254.742	348.829
8697	TEME	42465.822	0.0006375	12.9133	328.7463	126.5099	308.4964
D.310	1997-062A	Apstar 2R (Telstar 10)					PL
TLEs	EGO (-)	2016-12-25	19:53:42.532	-3.83	300.875	258.072	343.677
25010	TEME	42465.356	0.0016355	3.6061	69.9013	205.5668	38.1842
D.311	1990-074A	Thor I(Marcopolo 2)					PL
TLEs	EGO (-)	2016-12-25	03:47:14.287	-3.83	300.829	285.453	316.206
20762	TEME	42465.347	0.0007478	12.3404	34.3098	209.3681	295.6067
D.312	1982-058A	Westar V					PL
TLEs	EGO (-)	2016-12-25	10:23:12.827	-3.81	299.289	232.173	366.405
13269	TEME	42463.167	0.0019178	15.4311	7.0568	199.2083	197.6429
D.313	1994-013A	Galaxy IR-A					PL
TLEs	EGO (-)	2016-12-25	19:34:08.164	-3.79	297.383	284.228	310.538
23016	TEME	42462.617	0.0006838	8.6696	45.3161	218.0982	64.6300

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.314	1988-086A	Sakura 3B (CS 3B)					PL
TLEs	EGO (-)	2016-12-26	02:48:31.386	-3.78	296.699	275.125	318.274
19508	TEME	42460.155	0.0009456	14.5749	23.4098	245.2932	356.9017
D.315	1982-017A	Intelsat V F-4					PL
TLEs	EGO (0.17)	2016-12-25	09:18:12.686	-3.76	295.483	153.674	437.292
13083	TEME	42460.525	0.0026494	15.1226	357.1179	172.0076	218.4817
D.316	1996-040A	Arabsat 2A					PL
TLEs	EGO (-)	2016-12-25	19:10:12.457	-3.76	295.280	261.325	329.235
23948	TEME	42460.686	0.0004203	11.7226	35.7929	244.5330	80.6447
D.317	1980-074A	GOES 4					PL
TLEs	EGO (0.25)	2016-12-31	06:37:46.855	-3.76	295.091	154.532	435.650
11964	TEME	42459.966	0.0032313	14.3794	336.7393	3.2166	274.2369
D.318	2006-022A	KAZSAT					PL
TLEs	EGO (-)	2016-12-25	23:35:28.790	-3.74	294.068	274.466	313.670
29230	TEME	42458.799	0.0005744	5.9548	57.5440	166.8755	106.0914
D.319	2004-015A	Ekspress-AM 11					PL
TLEs	EGO (-)	2016-12-25	02:06:37.827	-3.73	293.197	270.322	316.072
28234	TEME	42458.293	0.0010929	8.5907	46.6295	213.7652	267.4591
D.320	1992-043A	Gorizont 26					PL
TLEs	EGO (0.29)	2016-12-25	17:44:31.210	-3.71	291.442	157.617	425.267
22041	TEME	42454.763	0.0035086	14.9859	14.0607	188.3880	347.0780
D.321	1990-030A	AsiaSat 1					PL
TLEs	EGO (-)	2016-12-20	14:03:41.601	-3.71	291.301	276.662	305.941
20558	TEME	42455.891	0.0007281	13.7888	28.2101	235.9415	110.1710
D.322	1968-063A	OPS 2222 (CANYON 1)					PL
KIAM	EGO (0.03)	2017-01-01	00:00:01.000	-3.70	290.851	-3709.240	4290.942
UI102	J2000	42455.024	0.0942195	13.6755	324.6862	132.4111	338.9060
D.323	1994-049A	Brazilsat B1					PL
TLEs	EGO (-)	2016-12-25	22:57:14.592	-3.69	289.681	264.330	315.032
23199	TEME	42454.520	0.0005428	7.8864	49.4139	172.3237	46.3635
D.324	1993-074B	IABS					RB
KIAM	EGO (-)	2017-01-01	00:00:01.000	-3.69	289.671	257.003	322.339
UI084	J2000	42453.844	0.0007695	15.4027	12.1798	288.9002	253.5600
D.325	1977-065A	Himawari 1 (GMS 1)					PL
TLEs	EGO (-)	2016-12-24	13:13:42.046	-3.69	289.583	214.589	364.577
10143	TEME	42454.641	0.0015078	13.6571	329.2130	163.6159	255.1944
D.326	1993-015A	USA 98 (UFO F1)					PL
TLEs	EGO (-)	2016-12-25	11:58:07.042	-3.68	288.781	260.998	316.564
22563	TEME	42453.515	0.0009714	18.3104	133.4650	145.3410	284.6158
D.327	2000-082A	Beidou 1B					PL
TLEs	EGO (0.41)	2016-12-25	14:45:12.310	-3.68	288.763	-51.812	629.337
26643	TEME	42453.916	0.0079158	7.7067	49.6931	2.6168	93.7709
D.328	1975-042A	Intelsat IV F-1					PL
TLEs	EGO (-)	2016-12-29	03:42:20.420	-3.65	286.366	234.027	338.704
7815	TEME	42449.923	0.0012349	14.3999	338.8744	197.3274	9.5665

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.329	1996-007A	N-Star 2					PL
TLEs	EGO (-)	2016-12-25	20:16:42.594	-3.65	286.344	259.179	313.509
23781	TEME	42449.860	0.0014819	8.0642	48.7411	219.2182	353.2349
D.330	1998-056A	Eutelsat W2					PL
TLEs	EGO (-)	2016-12-25	22:23:37.031	-3.64	285.882	265.446	306.317
25491	TEME	42449.172	0.0005425	5.4926	59.8133	164.4557	348.8791
D.331	2004-036A	GSAT 3 (EDUSAT)					PL
TLEs	EGO (-)	2016-12-25	15:51:45.875	-3.62	284.581	268.901	300.262
28417	TEME	42449.252	0.0003744	4.8684	62.8984	170.1869	107.5111
D.332	2002-029D	Proton-K/DM-2M fourth stage (Blok DM-2M)					RB
TLEs	EGO (-)	2016-12-24	03:49:47.136	-3.62	284.036	232.544	335.528
27444	TEME	42447.029	0.0012464	11.5040	36.6566	280.1406	344.3000
D.333	1992-013A	Galaxy V					PL
TLEs	EGO (-)	2016-12-29	04:45:42.064	-3.55	278.478	216.791	340.164
21906	TEME	42443.342	0.0010024	9.7031	42.9516	355.5483	278.6167
D.334	1986-016A	Yuri 2B (BS 2B)					PL
TLEs	EGO (-)	2016-12-30	03:52:30.213	-3.54	277.781	201.868	353.693
16597	TEME	42441.584	0.0012995	15.3195	1.9988	160.3344	17.5123
D.335	1991-083A	Eutelsat II F-3					PL
TLEs	EGO (-)	2016-12-25	15:47:36.970	-3.52	276.083	261.762	290.404
21803	TEME	42440.458	0.0006588	13.2837	30.2768	229.4926	113.2126
D.336	—	Himawari 2 AKM (Star 27)					RB
KIAM	EGO (0.43)	2017-01-01	00:00:01.000	-3.49	274.125	-72.176	620.426
UU020	J2000	42438.298	0.0081601	14.1187	335.3393	18.9215	59.7660
D.337	1994-064A	Intelsat VII F-3 (NSS 703)					PL
TLEs	EGO (-)	2016-12-31	21:17:42.467	-3.49	273.863	252.319	295.407
23305	TEME	42437.003	0.0008768	5.7434	58.0401	198.1488	354.9456
D.338	1995-064A	AsiaSat 2					PL
TLEs	EGO (-)	2016-12-25	15:09:54.675	-3.49	273.725	239.301	308.150
23723	TEME	42436.822	0.0014343	4.7825	62.9934	222.5626	172.7349
D.339	1995-016B	Hot Bird 1					PL
TLEs	EGO (-)	2016-12-31	20:31:30.723	-3.45	270.730	255.371	286.089
23537	TEME	42435.712	0.0001634	8.7629	46.3903	190.0460	98.8909
D.340	1992-060A	Hispasat 1A					PL
TLEs	EGO (-)	2016-12-25	17:47:43.128	-3.44	270.340	246.749	293.932
22116	TEME	42434.244	0.0011474	11.4797	36.9406	219.5175	19.0810
D.341	1985-092C	USA 12 (DSCS III F3, DSCS 3-3, DSCS III B-5)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-3.44	269.663	256.296	283.030
UI077	J2000	42433.836	0.0003150	15.0953	17.3747	203.2808	25.9510
D.342	1991-055A	Intelsat VI F-5					PL
TLEs	EGO (-)	2016-12-25	16:38:49.528	-3.41	267.985	255.490	280.479
21653	TEME	42431.697	0.0006084	9.8898	42.4944	209.5710	17.3461
D.343	2002-038A	Eutelsat 33D (Eutelsat 8 West C, Hot Bird 6)					PL
TLEs	EGO (-)	2016-12-25	20:47:03.289	-3.41	267.708	249.844	285.572
27499	TEME	42431.466	0.0005632	0.4249	87.4981	194.5200	313.4475

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.344	1968-081Q	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.11)	2016-12-25	07:46:43.336	-3.40	266.631	-877.713	1410.976
38690	TEME	42431.582	0.0281638	7.0803	319.2319	330.4177	108.3591
D.345	1998-063B	GE 5					PL
TLEs	EGO (-)	2016-12-25	10:23:07.972	-3.39	265.824	251.639	280.008
25516	TEME	42430.813	0.0005152	5.0728	61.5825	222.0554	271.7129
D.346	1987-070A	Kiku 5 (ETS V)					PL
TLEs	EGO (-)	2016-12-31	16:14:46.053	-3.38	265.455	236.358	294.551
18316	TEME	42430.913	0.0009347	15.3785	5.0970	290.7405	81.8361
D.347	1968-081V	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.06)	2016-12-18	15:50:33.496	-3.35	262.648	-1701.629	2226.926
38695	TEME	42425.212	0.0472778	6.7117	319.1270	286.5320	25.9844
D.348	1990-079B	Eutelsat II F-1					PL
TLEs	EGO (-)	2016-12-31	22:45:42.876	-3.34	261.864	240.979	282.750
20777	TEME	42426.232	0.0009183	13.9290	27.1869	214.4744	300.2948
D.349	2006-053C	Fengyun 2D AKM (FG-36)					PM
TLEs	EGO (0.45)	2016-12-31	03:12:36.620	-3.30	259.231	-171.455	689.917
29642	TEME	42423.976	0.0100333	5.6696	60.2503	323.5116	222.4378
D.350	1978-062A	GOES 3					PL
TLEs	EGO (-)	2016-12-31	05:58:41.350	-3.29	257.994	240.018	275.970
10953	TEME	42420.933	0.0004684	13.6270	332.9963	282.2803	345.9290
D.351	1981-057F	Meteosat 2 AKM (MAGE 1)					PM
TLEs	EGO (0.44)	2016-12-31	21:14:19.027	-3.25	255.027	-64.166	574.221
20837	TEME	42419.740	0.0069983	14.2814	333.8913	118.6264	21.8592
D.352	1994-043A	Chinasat 5E (Zhongxing 5E, ZX 5E, APStar 1)					PL
TLEs	EGO (-)	2016-12-31	04:20:04.117	-3.23	253.267	239.419	267.114
23185	TEME	42418.216	0.0006529	9.6524	42.0347	261.7673	277.6610
D.353	1978-071A	ESA GEOS 2					PL
TLEs	EGO (-)	2016-12-31	15:59:44.856	-3.23	253.029	235.188	270.869
10981	TEME	42416.124	0.0007734	13.0168	325.0217	282.0973	147.8398
D.354	1982-106D	IUS second stage					RB
TLEs	EGO (0.38)	2016-12-31	12:22:13.221	-3.21	251.775	59.969	443.580
13643	TEME	42416.963	0.0046111	15.0590	343.1846	330.3477	244.3207
D.355	1997-002B	Nahuel 1A					PL
TLEs	EGO (-)	2016-12-25	04:01:40.727	-3.19	250.635	224.974	276.295
24714	TEME	42414.878	0.0006829	7.4671	50.8565	164.7209	301.9162
D.356	1988-051C	PAS 1 (PanAmSat 1)					PL
TLEs	EGO (-)	2016-12-20	02:10:26.697	-3.17	249.026	230.469	267.582
19217	TEME	42414.436	0.0008191	12.6260	32.6975	237.6612	84.6850
D.357	2012-002C	Fengyun 2F AKM (FG-36)					PM
TLEs	EGO (0.44)	2016-12-25	18:45:27.493	-3.17	248.610	8.424	488.797
38072	TEME	42411.521	0.0059150	1.3448	76.5481	132.9384	148.5087
D.358	2007-058A	Cosmos-2434 (Raduga-1M1)					PL
TLEs	EGO (-)	2016-12-25	23:53:39.634	-3.15	247.409	237.858	256.960
32373	TEME	42410.852	0.0004772	2.7382	74.2348	201.8625	8.5430

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.359	1977-048A	GOES 2					PL
TLEs	EGO (0.28)	2016-12-31	16:58:27.112	-3.15	247.386	183.732	311.039
10061	TEME	42412.004	0.0018048	13.5003	329.4612	309.5961	221.0746
D.360	1989-052A	Gorizont 18					PL
TLEs	EGO (0.37)	2016-12-25	12:36:12.692	-3.14	246.609	95.165	398.052
20107	TEME	42410.110	0.0040281	15.1427	3.8553	259.3889	192.8082
D.361	1985-016F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (0.36)	2016-12-25	12:43:45.238	-3.13	245.754	135.956	355.552
15581	TEME	42408.978	0.0025222	14.7778	347.1505	169.2788	139.6248
D.362	1997-071A	Astra 5A (Sirius 2, GE 1E)					PL
TLEs	EGO (-)	2016-12-31	11:44:15.979	-3.13	245.339	227.943	262.735
25049	TEME	42409.473	0.0005409	6.3462	55.6903	214.3322	205.6474
D.363	1995-011B	Himawari 5 (GMS 5)					PL
TLEs	EGO (-)	2016-12-25	16:11:19.951	-3.13	245.145	212.070	278.221
23522	TEME	42409.903	0.0002664	12.4467	31.7502	87.6640	41.7134
D.364	1983-006A	Sakura 2A (CS 2A)					PL
TLEs	EGO (0.25)	2016-12-27	09:15:59.536	-3.12	244.951	204.186	285.716
13782	TEME	42408.536	0.0014739	14.9328	350.7960	247.2215	322.1037
D.365	1996-063A	Arabsat 2B					PL
TLEs	EGO (-)	2016-12-30	02:53:17.517	-3.10	243.256	226.716	259.797
24652	TEME	42406.587	0.0007629	3.3918	71.4539	201.8945	333.7265
D.366	1983-094A	RCA Satcom IIR					PL
TLEs	EGO (0.24)	2016-12-24	10:52:38.277	-3.10	243.048	179.455	306.641
14328	TEME	42407.359	0.0014864	15.2146	16.1119	320.6537	130.8547
D.367	1989-035C	Titan 34D third stage (Transtage D-16)					RB
KIAM	EGO (0.03)	2017-01-01	00:00:01.000	-3.06	240.019	-3965.468	4445.506
UI020	J2000	42404.192	0.0991762	8.2222	7.7631	346.5689	72.4380
D.368	1984-031F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (0.26)	2016-12-30	02:58:12.709	-3.06	239.987	174.390	305.584
14951	TEME	42403.784	0.0013950	14.6002	343.9784	174.1531	308.3074
D.369	1994-038D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (0.35)	2016-12-31	22:57:12.722	-3.03	237.907	130.310	345.504
23171	TEME	42401.544	0.0020194	13.9638	22.3180	57.9490	318.8538
D.370	1979-053C	Titan IIIC third stage (Transtage 31)					RB
KIAM	EGO (0.45)	2017-01-01	00:00:01.000	-3.01	236.217	-20.695	493.130
UI051	J2000	42400.390	0.0060592	13.8151	330.9930	205.9426	45.6320
D.371	2000-031D	Proton-K/DM-2M fourth stage (Blok DM-2M)					RB
TLEs	EGO (-)	2016-12-24	20:40:22.082	-3.00	235.442	180.477	290.407
26381	TEME	42399.220	0.0007995	12.8635	31.6150	9.2492	21.9149
D.372	1984-009C	Titan 34D third stage (Transtage D-10)					RB
KIAM	EGO (0.03)	2017-01-01	00:00:01.000	-3.00	235.272	-3979.597	4450.142
UI025	J2000	42399.445	0.0994086	8.0002	352.0842	51.0536	40.5500
D.373	1977-041A	Intelsat IVA F-4					PL
TLEs	EGO (0.29)	2016-12-26	05:50:43.005	-2.99	234.587	181.041	288.133
10024	TEME	42397.654	0.0013175	14.5695	342.8935	195.9884	346.0766

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.374	2004-011A	Superbird A2 (Superbird 6)					PL
TLEs	EGO (0.42)	2016-12-31	13:48:03.025	-2.92	229.086	151.049	307.123
28218	TEME	42394.587	0.0027762	9.7874	42.2983	304.2801	251.1738
D.375	1985-048B	Morelos 1					PL
TLEs	EGO (-)	2016-12-25	09:10:12.424	-2.90	227.176	208.736	245.617
15824	TEME	42392.457	0.0001735	15.3168	13.1543	266.7253	262.7320
D.376	1994-002D	Proton-K/DM-2M fourth stage (Blok DM-2M)					RB
TLEs	EGO (0.40)	2016-12-31	19:44:13.488	-2.90	227.067	45.965	408.170
22966	TEME	42390.181	0.0037692	15.1532	13.9180	55.3632	337.6227
D.377	1976-059A	OPS 2112 (DSP F6, DSP 7, DSP Block 2(PHASE II) F6)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	-2.90	226.974	219.416	234.532
UI056	J2000	42391.147	0.0001783	11.3069	315.4699	168.8277	190.9620
D.378	1981-119A	Intelsat V F-3					PL
TLEs	EGO (0.39)	2016-12-25	05:44:42.444	-2.89	226.805	124.661	328.949
12994	TEME	42390.454	0.0021205	15.0558	356.8307	163.8213	358.1239
D.379	1978-062D	GOES 3 AKM (SVM-5)					PM
TLEs	EGO (0.32)	2016-12-31	23:13:16.279	-2.87	224.984	-252.753	702.722
20801	TEME	42389.873	0.0114954	13.8946	325.8086	347.5492	43.2963
D.380	1990-021A	Intelsat VI F-3					PL
TLEs	EGO (0.13)	2016-12-30	00:06:03.319	-2.86	223.927	207.568	240.286
20523	TEME	42388.648	0.0006320	11.4763	35.6742	280.8046	40.6215
D.381	1969-069A	ATS 5					PL
TLEs	EGO (0.26)	2016-12-31	19:20:25.337	-2.81	220.622	201.374	239.870
4068	TEME	42384.771	0.0007152	8.1598	306.5825	285.1014	119.1401
D.382	1968-081W	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.13)	2016-12-31	14:09:20.740	-2.80	219.362	-759.271	1197.995
38696	TEME	42381.463	0.0229470	6.6190	318.6526	289.9143	6.0427
D.383	1997-008D	IUS second stage					RB
KIAM	EGO (0.43)	2017-01-01	00:00:01.000	-2.80	219.098	124.397	313.799
UI071	J2000	42383.271	0.0022344	12.8533	32.3767	109.5487	277.4220
D.384	1997-027A	Inmarsat-3 F4					PL
TLEs	EGO (0.28)	2016-12-25	22:37:24.705	-2.79	218.624	192.610	244.638
24819	TEME	42382.241	0.0006799	5.4637	58.5129	292.9691	317.1285
D.385	1975-011A	SMS 2					PL
TLEs	EGO (0.40)	2016-12-29	06:38:05.694	-2.75	215.350	161.656	269.045
7648	TEME	42378.313	0.0011279	13.0268	323.7061	190.5040	347.6729
D.386	1989-090D	IUS second stage					RB
KIAM	EGO (-)	2017-01-01	00:00:01.000	-2.71	212.279	-1169.439	1593.997
UI090	J2000	42376.452	0.0326058	18.2677	18.4340	6.4205	315.0920
D.387	1983-077A	Arabsat 1D-R					PL
TLEs	EGO (0.39)	2016-12-31	00:02:27.919	-2.70	211.367	99.248	323.487
14234	TEME	42376.630	0.0020438	15.3142	12.0865	81.9333	271.6485
D.388	1990-034A	Palapa B-2R					PL
TLEs	EGO (0.32)	2016-12-29	04:07:00.960	-2.68	210.152	165.135	255.168
20570	TEME	42374.775	0.0004710	13.0398	31.5837	53.8358	293.2102

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.389	1992-021A	Telecom 2B					PL
TLEs	EGO (0.33)	2016-12-25	14:24:46.224	-2.68	209.960	160.411	259.510
21939	TEME	42376.920	0.0006128	12.7485	31.8776	357.1664	70.8500
D.390	1989-020A	JCSAT 1					PL
TLEs	EGO (0.25)	2016-12-26	05:39:34.963	-2.66	208.365	195.050	221.681
19874	TEME	42373.370	0.0003088	14.5853	23.1518	226.2562	282.6292
D.391	1997-008E	USA 130 debris (DSP F18 IR Sensor telescope sunshade cover)					PM
KIAM	EGO (0.49)	2017-01-01	00:00:01.000	-2.65	207.488	-167.145	582.121
UI164	J2000	42371.661	0.0088416	12.9859	32.1345	171.2375	273.0100
D.392	1996-033A	Galaxy IX					PL
TLEs	EGO (0.40)	2016-12-31	23:12:47.374	-2.64	206.816	164.015	249.617
23877	TEME	42372.577	0.0006418	6.6002	54.2299	116.0004	67.8923
D.393	—	Meteosat 3 AKM (MAGE 1)					RB
KIAM	EGO (0.43)	2017-01-01	00:00:01.000	-2.63	206.259	-18.313	430.831
UU041	J2000	42370.432	0.0053002	15.3014	0.3009	85.2575	317.3830
D.394	1990-063B	DFS-Kopernikus 2					PL
TLEs	EGO (0.45)	2016-12-25	02:06:17.695	-2.61	204.635	189.522	219.748
20706	TEME	42370.002	0.0008405	12.7786	31.9027	230.3279	267.3007
D.395	1985-015B	Brazilsat 1					PL
TLEs	EGO (0.42)	2016-12-25	17:02:58.742	-2.61	204.332	185.424	223.240
15561	TEME	42367.492	0.0008846	15.1788	15.0435	250.8334	185.3705
D.396	1981-076A	Himawari 2 (GMS 2)					PL
TLEs	EGO (0.47)	2016-12-29	06:30:07.343	-2.60	203.408	160.942	245.874
12677	TEME	42368.480	0.0013373	14.2661	337.5905	242.7680	278.1450
D.397	1973-040B	Titan IIIC third stage (Transtage 24)					RB
KIAM	EGO (0.49)	2017-01-01	00:00:01.000	-2.59	202.849	60.911	344.787
UI049	J2000	42367.022	0.0033502	9.1053	306.9130	319.8778	21.0880
D.398	1986-003B	Satcom Ku-1					PL
TLEs	EGO (0.46)	2016-12-31	14:06:53.179	-2.59	202.846	183.705	221.988
16482	TEME	42367.408	0.0005826	14.7632	21.1069	227.1292	220.8444
D.399	1996-026B	Titan IVA third stage (Centaur)					RB
KIAM	EGO (0.07)	2017-01-01	00:00:01.000	-2.58	202.385	-1735.995	2140.765
UI075	J2000	42366.558	0.0457526	9.3504	354.3312	325.8965	238.5660
D.400	2000-019D	Proton-K/DM-2M fourth stage (Blok DM-2M)					RB
TLEs	EGO (0.49)	2016-12-25	12:07:17.279	-2.58	201.860	139.557	264.163
26246	TEME	42367.248	0.0019299	13.1736	30.6836	231.0734	255.1968
D.401	1985-109B	Morelos 2					PL
TLEs	EGO (0.24)	2016-12-25	19:36:41.555	-2.55	200.090	175.794	224.386
16274	TEME	42365.784	0.0000571	13.9855	26.1071	207.2148	87.9180
D.402	1991-028A	Spacenet 4					PL
TLEs	EGO (0.52)	2016-12-24	03:49:47.136	-2.54	198.602	184.715	212.488
21227	TEME	42361.645	0.0008589	10.5725	39.5829	234.6954	344.4078
D.403	1994-054B	Titan IVA third stage (Centaur)					RB
KIAM	EGO (0.28)	2017-01-01	00:00:01.000	-2.49	194.802	-323.701	713.306
UI017	J2000	42358.975	0.0122407	12.3594	17.9930	266.6419	0.0690

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.404	2014-090C	Fengyun 2G AKM (FG-36)					PM
TLEs	EGO (0.51)	2016-12-25	09:54:38.208	-2.48	193.926	6.672	381.180
40369	TEME	42358.191	0.0042996	0.8445	267.5254	275.1796	116.9998
D.405	2001-014A	Ekran-M 21					PL
TLEs	EGO (0.52)	2016-12-24	21:55:42.538	-2.47	193.364	70.437	316.290
26736	TEME	42356.222	0.0026597	11.3798	41.5277	336.0793	351.2087
D.406	1982-004A	RCA Satcom IV					PL
TLEs	EGO (0.47)	2016-12-25	12:55:30.175	-2.46	192.901	166.162	219.640
13035	TEME	42358.024	0.0011582	15.3144	5.6101	115.4302	99.1389
D.407	1994-065B	Thaicom 2					PL
TLEs	EGO (0.60)	2016-12-26	03:50:24.287	-2.46	192.583	175.295	209.871
23314	TEME	42356.771	0.0005307	5.3126	59.7244	180.2855	302.8879
D.408	1991-075A	Intelsat VI F-1					PL
TLEs	EGO (0.56)	2016-12-25	14:42:43.299	-2.46	192.549	179.387	205.711
21765	TEME	42358.365	0.0007390	9.8253	41.5821	228.6396	86.3239
D.409	1996-006A	Palapa C1					PL
TLEs	EGO (0.57)	2016-12-31	09:07:18.619	-2.45	191.878	157.256	226.500
23779	TEME	42357.087	0.0007352	3.9481	68.0369	144.8327	277.1060
D.410	1990-002B	LEASAT 5 (Syncom-4 5)					PL
TLEs	EGO (0.63)	2016-12-31	19:34:18.061	-2.44	191.275	177.699	204.852
20410	TEME	42354.286	0.0005819	11.6895	13.0691	290.5512	1.3437
D.411	1981-107C	Titan IIIC third stage (Transtage 39)					RB
KIAM	EGO (0.03)	2017-01-01	00:00:01.000	-2.43	190.498	-4039.878	4420.874
UI076	J2000	42354.671	0.0998798	7.2942	347.3727	74.6696	11.0550
D.412	1975-117A	RCA Satcom I					PL
TLEs	EGO (0.54)	2016-12-31	14:11:46.519	-2.42	189.400	105.256	273.545
8476	TEME	42353.325	0.0018370	14.2350	337.8403	195.3146	206.3254
D.413	1985-109D	Satcom Ku-2					PL
TLEs	EGO (0.56)	2016-12-25	02:06:04.565	-2.40	188.016	150.212	225.819
16276	TEME	42353.320	0.0014468	14.5861	22.3754	208.3547	267.3182
D.414	1971-116A	Intelsat IV F-3					PL
TLEs	EGO (0.61)	2016-12-31	07:28:03.055	-2.35	183.724	134.218	233.230
5709	TEME	42348.131	0.0011150	13.5723	328.5027	358.9409	297.8812
D.415	1978-058B	Titan IIIC third stage (Transtage 33)					RB
KIAM	EGO (0.02)	2017-01-01	00:00:01.000	-2.33	182.181	-6217.094	6581.456
UI010	J2000	42346.354	0.1511175	7.3372	29.0087	57.5344	330.3130
D.416	1997-070D	Proton-K/DM-2M fourth stage (Blok DM-2M)					RB
TLEs	EGO (0.63)	2016-12-25	21:26:12.550	-2.30	179.984	112.868	247.100
25048	TEME	42345.329	0.0010895	14.3261	24.0223	74.3536	253.5405
D.417	1986-026B	Brazilsat 2					PL
TLEs	EGO (0.72)	2016-12-25	23:49:57.855	-2.28	178.269	162.028	194.510
16650	TEME	42343.044	0.0007903	14.7247	20.3883	247.3188	109.7897
D.418	2000-002A	Galaxy 10R					PL
TLEs	GEO (1.00)	2016-12-25	19:54:42.669	-2.28	178.182	159.881	196.484
26056	TEME	42341.096	0.0004546	6.8318	53.2759	178.4397	359.5385

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.419	1993-069A	Gorizont 28					PL
TLEs	EGO (0.57)	2016-12-25	11:43:49.885	-2.24	175.018	33.031	317.006
22880	TEME	42337.415	0.0027881	14.7241	17.6283	82.8152	165.1710
D.420	1999-016A	INSAT 2E (Intelsat APR-2)					PL
TLEs	EGO (0.69)	2016-12-25	12:38:13.640	-2.22	173.913	145.057	202.768
25666	TEME	42337.466	0.0011018	4.9930	61.8185	199.7189	128.9874
D.421	2000-016B	INSAT 3B					PL
TLEs	EGO (0.73)	2016-12-25	03:55:32.056	-2.21	173.189	152.947	193.430
26108	TEME	42338.460	0.0009046	3.9754	67.4807	182.1537	274.2152
D.422	1988-018A	Spacenet 3R					PL
TLEs	EGO (0.87)	2016-12-31	17:06:43.365	-2.20	172.268	155.507	189.029
18951	TEME	42336.005	0.0007226	13.4802	28.6615	218.4421	201.0669
D.423	1985-028B	Anik C1					PL
TLEs	EGO (0.77)	2016-12-31	08:21:39.003	-2.20	171.833	107.552	236.114
15642	TEME	42334.251	0.0009337	14.6674	22.2576	54.0360	161.9039
D.424	1995-041A	Europe*Star B (Mugunghwa 1, Koreasat 1)					PL
TLEs	GEO (1.00)	2016-12-29	02:45:26.344	-2.18	170.525	153.741	187.309
23639	TEME	42335.734	0.0003800	13.6550	27.7852	236.6443	285.1027
D.425	1979-086C	Titan IIIC third stage (Transtage 34)					RB
KIAM	EGO (0.02)	2017-01-01	00:00:01.000	-2.16	168.731	-5542.786	5880.248
UI024	J2000	42332.904	0.1349191	6.9111	352.4290	84.0566	181.7420
D.426	1988-109A	Skynet 4B					PL
TLEs	EGO (0.68)	2016-12-24	13:07:41.449	-2.13	166.772	146.198	187.346
19687	TEME	42333.817	0.0009926	15.4012	7.2612	236.2173	76.8555
D.427	1976-010A	Intelsat IVA F-2					PL
TLEs	EGO (0.90)	2016-12-25	06:33:12.576	-2.11	165.084	141.212	188.956
8620	TEME	42330.804	0.0008270	14.1990	337.4496	235.1579	254.3490
D.428	1983-105A	Intelsat V F-7					PL
TLEs	GEO (1.00)	2016-12-25	17:11:32.013	-2.08	162.852	138.096	187.608
14421	TEME	42327.546	0.0005757	15.1641	1.0791	294.6752	36.1707
D.429	1992-072A	Galaxy VII					PL
TLEs	GEO (1.00)	2016-12-25	04:04:29.953	-2.07	161.965	127.489	196.441
22205	TEME	42326.203	0.0008838	12.7738	31.6102	277.6687	30.6110
D.430	1997-078A	Galaxy VIII-i					PL
TLEs	GEO (1.00)	2016-12-25	20:18:41.164	-2.06	161.509	133.218	189.801
25086	TEME	42323.737	0.0008027	11.3971	36.6656	276.1555	156.5331
D.431	1991-074D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-24	01:53:20.764	-2.04	159.865	145.181	174.549
21762	TEME	42326.153	0.0003698	15.0967	11.2195	221.6406	74.0307
D.432	2000-024E	USA 149 debris (DSP F20 IR Sensor telescope sunshade cover)					PM
KIAM	EGO (0.13)	2017-01-01	00:00:01.000	-2.03	158.724	-862.227	1179.675
UI005	J2000	42322.897	0.0241229	10.8990	36.7858	243.4540	237.6590
D.433	2000-024D	IUS second stage					RB
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	-2.02	158.276	136.802	179.750
UI067	J2000	42322.449	0.0005074	10.5056	37.1927	114.1373	158.3960

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\overline{\Delta a}$	$\overline{\Delta r_p}$	$\overline{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.434	1993-048A	Hispasat 1B					PL
TLEs	EGO (0.83)	2016-12-29	02:52:03.838	-1.98	154.798	124.872	184.724
22723	TEME	42319.873	0.0012000	10.6593	38.8774	220.1025	286.8476
D.435	1992-066A	DFS-Kopernikus 3					PL
TLEs	GEO (1.00)	2016-12-31	15:28:16.564	-1.95	152.829	135.144	170.514
22175	TEME	42318.661	0.0004713	11.9860	34.4399	246.7573	244.8097
D.436	1984-080E	Himawari 3 (GMS 3) AKM (Star 27)					PM
TLEs	EGO (0.24)	2016-12-25	06:33:12.576	-1.90	148.865	-421.743	719.473
22266	TEME	42314.842	0.0131866	14.6393	347.1144	14.4693	254.8874
D.437	1989-041A	Superbird A					PL
TLEs	GEO (1.00)	2016-12-31	12:22:07.695	-1.90	148.323	119.327	177.319
20040	TEME	42314.894	0.0010712	15.1921	2.2622	285.8381	251.9113
D.438	1984-114A	Chinasat 5R (Zhongxing 5R, ZX 5R, Spacenet 2)					PL
TLEs	GEO (1.00)	2016-12-24	21:21:36.192	-1.86	145.453	110.009	180.898
15385	TEME	42308.241	0.0007302	14.5884	22.1345	311.3661	136.7292
D.439	1990-091B	Galaxy VI					PL
TLEs	GEO (1.00)	2016-12-29	05:33:09.280	-1.84	143.998	125.898	162.097
20873	TEME	42309.378	0.0006793	11.3614	36.7550	194.4019	281.5457
D.440	1985-076B	Optus A1					PL
TLEs	GEO (1.00)	2016-12-31	02:43:40.594	-1.84	143.850	126.178	161.522
15993	TEME	42306.538	0.0007273	15.2987	9.0538	266.6456	2.1314
D.441	1972-010A	OPS 1570 (DSP F3, DSP 4, DSP Block 1(PHASE I) F3)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	-1.83	143.068	91.178	194.958
UI144	J2000	42307.241	0.0012265	7.7455	307.1755	293.0484	217.5020
D.442	1982-014A	Westar IV					PL
TLEs	GEO (1.00)	2016-12-25	02:07:48.709	-1.81	141.425	124.218	158.633
13069	TEME	42307.271	0.0008012	15.2489	5.0796	234.7715	268.7826
D.443	2003-021A	Beidou 3					PL
TLEs	EGO (0.94)	2016-12-27	07:57:11.123	-1.80	140.434	105.793	175.076
27813	TEME	42303.055	0.0014631	4.8986	63.8720	178.4208	337.5699
D.444	1984-093D	Telstar 3C (Telstar 302)					PL
TLEs	GEO (1.00)	2016-12-30	05:27:15.474	-1.78	139.046	119.011	159.080
15237	TEME	42301.549	0.0002060	15.1088	15.6463	237.7829	355.7009
D.445	1995-067B	INSAT 2C					PL
TLEs	GEO (1.00)	2016-12-24	02:12:25.475	-1.77	138.395	119.493	157.297
23731	TEME	42300.955	0.0006976	11.8417	35.9171	242.7768	6.3757
D.446	1974-093A	Intelsat IV F-8					PL
TLEs	GEO (1.00)	2016-12-25	07:51:23.301	-1.75	136.998	114.005	159.991
7544	TEME	42298.884	0.0001365	14.2053	337.9940	259.5123	161.0884
D.447	1988-081B	SBS V					PL
TLEs	GEO (1.00)	2016-12-25	14:32:55.127	-1.74	135.721	109.676	161.765
19484	TEME	42302.315	0.0011368	13.1997	29.7827	234.1203	73.7969
D.448	1996-003A	ABS 1A (Mugungwha 2, Koreasat 2)					PL
TLEs	GEO (1.00)	2016-12-25	08:23:01.589	-1.72	134.719	120.796	148.642
23768	TEME	42296.593	0.0004062	7.9520	48.4791	214.9401	166.1880

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.449	1986-026A	GStar 2					PL
TLEs	GEO (1.00)	2016-12-25	05:45:26.347	-1.72	134.389	117.493	151.284
16649	TEME	42296.489	0.0005938	15.0921	16.2371	278.0801	345.4297
D.450	1992-059D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-31	19:44:13.488	-1.71	134.041	86.648	181.435
22115	TEME	42296.813	0.0015562	15.1119	13.5686	243.8857	337.4694
D.451	—	USA 197 debris (DSP F23 IR Sensor telescope sunshade cover)					PM
KIAM	EGO (0.26)	2017-01-01	00:00:01.000	-1.71	133.962	-394.160	662.084
UU069	J2000	42298.135	0.0124857	3.8849	73.8379	16.8016	339.2620
D.452	1973-023A	Anik A2					PL
TLEs	GEO (1.00)	2016-12-25	16:55:35.314	-1.71	133.783	84.283	183.283
6437	TEME	42295.622	0.0014307	13.8005	331.9118	320.2084	158.7467
D.453	2003-013A	INSAT 3A					PL
TLEs	GEO (1.00)	2016-12-25	17:49:44.535	-1.70	132.816	66.305	199.328
27714	TEME	42294.789	0.0016073	0.7913	88.8378	222.1577	16.4745
D.454	1973-040A	OPS 6157 (DSP F4, DSP 2, DSP Block 1(PHASE I) F4)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	-1.66	129.916	87.009	172.823
UI048	J2000	42294.089	0.0010145	8.9035	306.3949	298.8086	213.3220
D.455	1978-116A	Anik B1					PL
TLEs	EGO (0.72)	2016-12-24	06:22:05.597	-1.65	129.171	54.910	203.432
11153	TEME	42293.558	0.0025746	14.6306	347.1125	234.0065	209.4049
D.456	2004-004D	IUS second stage (IUS-10 SRM-2, Orbus 6E)					RB
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	-1.65	128.928	108.479	149.377
UI062	J2000	42293.101	0.0004835	7.6297	47.5073	272.5636	203.0360
D.457	1985-010B	USA 8 (MAGNUM 1)					PL
KIAM	EGO (0.18)	2017-01-01	00:00:01.000	-1.63	127.641	-450.699	705.982
UI097	J2000	42291.814	0.0136750	17.6541	350.8963	313.7865	159.5680
D.458	1980-091A	SBS I					PL
TLEs	GEO (1.00)	2016-12-31	16:48:33.537	-1.63	127.014	92.076	161.952
12065	TEME	42292.358	0.0001330	14.8900	349.0009	109.3140	43.6566
D.459	1976-042A	Comstar 1A (D-1)					PL
TLEs	GEO (1.00)	2016-12-27	04:39:51.384	-1.62	126.848	108.770	144.927
8838	TEME	42289.061	0.0007973	14.1935	338.0497	270.0444	356.3915
D.460	2009-010A	Raduga 1					PL
TLEs	GEO (1.00)	2016-12-25	20:05:12.645	-1.62	126.498	90.325	162.672
34264	TEME	42292.951	0.0009387	5.4065	69.9668	287.7246	91.7858
D.461	1994-067A	Ekspress 1 (Ekspress 11L)					PL
TLEs	GEO (1.00)	2016-12-25	00:32:27.130	-1.61	125.944	105.758	146.131
23319	TEME	42291.072	0.0007283	12.9623	30.6094	198.9042	109.0977
D.462	1972-003A	Intelsat IV F-4					PL
TLEs	GEO (1.00)	2016-12-31	03:12:32.812	-1.60	124.811	106.228	143.394
5775	TEME	42291.015	0.0003545	13.6997	330.8535	312.1787	251.0702
D.463	1984-080A	Himawari 3 (GMS 3)					PL
TLEs	GEO (1.00)	2016-12-28	08:09:21.641	-1.59	124.054	94.107	154.002
15152	TEME	42289.500	0.0002787	14.8495	353.7620	5.0184	283.3702

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.464	2000-020A	Galaxy IVR					PL
TLEs	GEO (1.00)	2016-12-25	16:20:54.492	-1.58	123.189	103.699	142.679
26298	TEME	42285.044	0.0007446	8.2705	47.3830	190.7019	174.1884
D.465	1984-101A	Galaxy III					PL
TLEs	GEO (1.00)	2016-12-31	22:40:41.934	-1.57	122.408	95.296	149.520
15308	TEME	42287.238	0.0009348	15.1122	15.4243	278.9571	37.3729
D.466	1976-035A	NATO IIIA					PL
TLEs	EGO (0.75)	2016-12-29	23:20:41.253	-1.55	120.905	20.517	221.293
8808	TEME	42283.667	0.0026858	11.9488	328.4814	240.1860	10.5192
D.467	1989-062A	TV-SAT 2					PL
TLEs	GEO (1.00)	2016-12-25	16:57:22.468	-1.53	119.400	93.126	145.674
20168	TEME	42285.774	0.0007752	14.0426	25.4956	199.6136	97.8704
D.468	2003-018A	GSAT 2					PL
TLEs	GEO (1.00)	2016-12-25	11:56:12.114	-1.53	119.178	103.663	134.694
27807	TEME	42280.728	0.0008272	4.6844	63.3256	223.3949	154.3149
D.469	1992-017A	Gorizont 25					PL
TLEs	EGO (0.81)	2016-12-25	11:53:06.574	-1.52	119.065	8.714	229.416
21922	TEME	42284.689	0.0022494	14.9767	12.4360	15.6802	280.5833
D.470	1974-075A	Westar II					PL
TLEs	GEO (1.00)	2016-12-30	05:35:33.813	-1.51	117.989	97.292	138.687
7466	TEME	42280.066	0.0002927	13.8693	334.2867	236.4543	355.0269
D.471	1983-030A	RCA Satcom IR					PL
TLEs	GEO (1.00)	2016-12-20	21:42:41.653	-1.50	117.546	78.967	156.125
13984	TEME	42280.809	0.0002318	15.2601	8.8476	348.5166	129.4448
D.472	1999-047A	Yamal 100 No. 1					PL
TLEs	EGO (0.41)	2016-12-25	10:08:29.791	-1.47	114.860	-249.803	479.523
25896	TEME	42278.599	0.0085049	13.4176	28.6154	328.9337	205.4546
D.473	1984-022F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	GEO (1.00)	2016-12-29	09:56:24.800	-1.46	113.715	17.202	210.228
14948	TEME	42276.319	0.0018671	15.4999	340.9292	46.8523	324.1459
D.474	1987-028D	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (0.67)	2016-12-24	15:27:41.675	-1.45	113.283	0.876	225.690
17705	TEME	42276.934	0.0023408	15.5796	353.0988	13.1283	202.0535
D.475	1985-048D	Telstar 3D (Telstar 303)					PL
TLEs	GEO (1.00)	2016-12-27	23:05:30.973	-1.43	111.665	96.321	127.008
15826	TEME	42276.630	0.0005843	15.0252	16.6297	220.4250	293.4155
D.476	1995-063A	Gals 2					PL
TLEs	GEO (1.00)	2016-12-24	21:03:41.736	-1.39	108.746	80.693	136.799
23717	TEME	42270.815	0.0011178	12.8398	31.1327	240.5934	141.9489
D.477	2001-033D	IUS second stage					RB
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	-1.39	108.673	74.419	142.927
UI061	J2000	42272.846	0.0008103	9.5742	40.2320	266.7710	211.5200
D.478	1996-005A	Gorizont 31					PL
TLEs	GEO (1.00)	2016-12-25	09:44:03.577	-1.38	107.575	18.896	196.255
23775	TEME	42271.587	0.0021537	13.9796	23.8946	161.3934	206.9918

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.479	1991-064B	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-25	19:47:12.118	-1.37	106.691	89.503	123.878
21703	TEME	42273.698	0.0006082	15.1666	10.1035	267.2021	59.2947
D.480	1974-022A	Westar I					PL
TLEs	GEO (1.00)	2016-12-31	08:56:57.624	-1.35	105.332	80.883	129.782
7250	TEME	42269.045	0.0009572	13.8264	333.2177	292.1211	309.4746
D.481	1987-022A	GOES 7					PL
TLEs	GEO (1.00)	2016-12-25	14:29:23.821	-1.35	105.166	93.010	117.322
17561	TEME	42271.486	0.0006157	15.1351	7.6557	276.4238	52.1380
D.482	1982-110C	Anik C3					PL
TLEs	GEO (1.00)	2016-12-25	09:14:07.168	-1.32	103.350	87.786	118.915
13652	TEME	42267.307	0.0005063	15.1968	4.3641	261.4484	206.5695
D.483	1978-002A	Intelsat IVA F-3					PL
TLEs	GEO (1.00)	2016-12-25	23:15:35.316	-1.31	102.405	84.425	120.386
10557	TEME	42268.951	0.0006211	14.4721	344.3015	239.8005	95.4485
D.484	2000-011A	Garuda 1					PL
TLEs	GEO (1.00)	2016-12-25	22:37:10.152	-1.30	101.787	83.761	119.813
26089	TEME	42267.391	0.0007134	1.4925	125.7528	136.0539	284.6380
D.485	1987-029A	Agila 1					PL
TLEs	GEO (1.00)	2016-12-31	08:04:25.167	-1.30	101.783	83.743	119.823
17706	TEME	42262.950	0.0005976	14.8945	18.4898	272.2172	157.2313
D.486	1975-091A	Intelsat IVA F-1					PL
TLEs	GEO (1.00)	2016-12-31	10:48:47.468	-1.24	96.849	72.025	121.674
8330	TEME	42262.827	0.0004740	14.1122	337.7234	211.1363	280.1304
D.487	1982-110B	SBS III					PL
TLEs	GEO (1.00)	2016-12-25	17:25:01.069	-1.23	96.198	62.357	130.038
13651	TEME	42262.450	0.0005261	15.1924	4.5604	322.5965	42.6284
D.488	1990-095D	IUS second stage					RB
KIAM	EGO (0.49)	2017-01-01	00:00:01.000	-1.21	94.370	-196.280	385.020
UI081	J2000	42258.543	0.0068779	15.2981	12.7296	3.8427	210.4930
D.489	1982-009A	Ekran 8					PL
TLEs	EGO (0.80)	2016-12-25	20:15:20.470	-1.20	93.757	-19.612	207.126
13056	TEME	42257.910	0.0031157	13.8754	332.5026	252.0869	122.5793
D.490	1992-027A	Palapa B4					PL
TLEs	GEO (1.00)	2016-12-30	05:10:07.530	-1.20	93.739	77.284	110.195
21964	TEME	42257.466	0.0006207	9.6440	41.8940	244.2928	204.8743
D.491	1985-109C	Optus A2					PL
TLEs	GEO (1.00)	2016-12-29	15:05:42.398	-1.19	92.556	75.460	109.652
16275	TEME	42256.758	0.0008559	15.1672	10.3341	243.6626	208.8590
D.492	1979-072A	Westar III					PL
TLEs	GEO (1.00)	2016-12-31	12:14:27.479	-1.17	91.706	75.549	107.862
11484	TEME	42257.777	0.0007382	14.7781	351.5858	259.7701	280.9813
D.493	1974-101A	Symphonie A					PL
TLEs	GEO (1.00)	2016-12-31	07:49:11.427	-1.15	89.757	71.047	108.467
7578	TEME	42255.676	0.0006238	12.3194	320.1558	288.4890	288.3361

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.494	1991-003A	Italsat 1					PL
TLEs	GEO (1.00)	2016-12-24	23:14:31.946	-1.11	86.807	30.456	143.158
21055	TEME	42254.415	0.0015009	14.5510	21.7027	298.4072	86.1119
D.495	1980-081F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	GEO (1.00)	2016-12-24	03:31:05.655	-1.11	86.521	64.675	108.367
12447	TEME	42252.991	0.0007893	13.3654	328.1907	299.2342	279.3535
D.496	1975-077A	Symphonie B					PL
TLEs	GEO (1.00)	2016-12-25	15:21:02.183	-1.09	84.899	63.621	106.178
8132	TEME	42251.894	0.0009333	11.8741	318.5206	297.6575	248.0098
D.497	1993-048B	INSAT 2B					PL
TLEs	GEO (1.00)	2016-12-25	17:46:57.622	-1.09	84.777	19.124	150.431
22724	TEME	42248.582	0.0015042	12.8080	31.1548	152.4865	28.7439
D.498	1988-071A	Gorizont 16					PL
TLEs	GEO (1.00)	2016-12-25	07:18:05.569	-1.07	83.679	25.914	141.444
19397	TEME	42245.471	0.0012907	14.9209	359.6068	333.3436	328.6748
D.499	1976-073A	Comstar 1B (D-2)					PL
TLEs	GEO (1.00)	2016-12-31	00:10:07.353	-1.06	82.952	67.101	98.804
9047	TEME	42245.775	0.0003864	14.0950	338.2829	277.1342	18.4143
D.500	1984-049A	Chinasat 5 (Zhongxing 5, ZX 5, Spacenet 1)					PL
TLEs	GEO (1.00)	2016-12-31	20:22:55.746	-1.04	80.999	63.004	98.994
14985	TEME	42241.777	0.0008402	14.8536	18.6397	228.4959	149.5958
D.501	1993-073E	Meteosat 6 AKM (MAGE 1)					PM
TLEs	EGO (0.65)	2016-12-31	07:35:24.484	-1.03	80.454	-194.606	355.514
23118	TEME	42243.357	0.0062061	14.9032	17.3810	14.1485	311.9160
D.502	1999-047B	Yamal 100 No. 2					PL
TLEs	GEO (1.00)	2016-12-31	09:38:18.318	-1.03	80.387	67.182	93.592
25897	TEME	42243.910	0.0009070	10.6810	38.7140	237.3242	203.0545
D.503	1997-041D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (0.08)	2016-12-23	17:07:12.822	-0.97	75.670	-1402.982	1554.322
24897	TEME	42239.311	0.0363570	13.5225	27.3825	211.7566	28.7222
D.504	2009-010B	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-31	06:44:12.736	-0.96	74.646	63.582	85.710
34265	TEME	42242.430	0.0005435	5.4192	70.1397	194.7755	252.5779
D.505	1977-014A	Kiku 2 (ETS II)					PL
TLEs	GEO (1.00)	2016-12-24	15:39:56.322	-0.95	74.275	57.028	91.523
9852	TEME	42237.129	0.0005740	12.8015	323.7435	279.4127	127.4261
D.506	1990-016D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (0.72)	2016-12-31	15:04:43.704	-0.89	69.584	-101.716	240.885
20502	TEME	42238.701	0.0039852	15.0462	5.0751	155.9971	74.1747
D.507	1990-112D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-25	16:56:41.250	-0.89	69.266	-46.264	184.797
21019	TEME	42231.474	0.0022726	15.0404	8.0384	94.8536	12.0318
D.508	1981-057B	APPLE					PL
TLEs	GEO (1.00)	2016-12-31	09:29:12.689	-0.86	66.725	-39.288	172.738
12545	TEME	42233.821	0.0021748	13.8082	332.6611	138.1867	235.8264

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.509	1977-092J	Ekran 2 fragmentation debris					PD
TLEs	GEO (1.00)	2016-12-30	07:34:09.752	-0.83	65.120	-1.286	131.525
12996	TEME	42232.788	0.0011475	12.1058	319.0486	214.0725	271.6814
D.510	1977-018A	Palapa 2					PL
TLEs	GEO (1.00)	2016-12-20	04:03:43.922	-0.83	65.004	43.938	86.071
9862	TEME	42225.240	0.0004486	14.3682	342.5649	304.4020	353.2831
D.511	2003-053E	Proton-K/DM-2M fourth stage (Blok DM-2M)					RB
TLEs	EGO (0.13)	2016-12-24	23:45:13.709	-0.83	64.754	-875.032	1004.539
28119	TEME	42231.302	0.0231948	10.5590	39.4755	215.6898	102.8873
D.512	1987-084D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-31	01:12:11.426	-0.82	63.933	-59.619	187.484
18387	TEME	42232.443	0.0028561	14.7766	356.4351	163.7035	57.9228
D.513	1983-028F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	GEO (1.00)	2016-12-31	12:35:42.506	-0.82	63.661	-45.395	172.717
13983	TEME	42230.109	0.0022472	14.2694	339.5616	134.4014	227.8642
D.514	1998-025D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-24	20:40:22.082	-0.81	62.970	-72.578	198.519
25318	TEME	42225.826	0.0027384	12.2338	31.2386	42.2210	21.9333
D.515	1975-038A	Anik A3					PL
TLEs	GEO (1.00)	2016-12-25	16:07:16.111	-0.81	62.899	46.475	79.323
7790	TEME	42230.397	0.0005598	14.0539	336.8082	277.9560	235.6208
D.516	1992-088D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-25	18:20:36.531	-0.76	58.898	15.269	102.527
22272	TEME	42221.227	0.0005166	14.3208	17.5962	75.9069	14.8665
D.517	1994-060D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-24	20:02:16.015	-0.71	55.702	19.024	92.379
23270	TEME	42224.003	0.0003828	14.5045	20.0462	55.3897	100.0241
D.518	1994-087D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-25	13:29:17.520	-0.70	54.806	9.823	99.789
23451	TEME	42223.864	0.0005594	14.4327	20.9417	36.6311	262.2846
D.519	2000-032A	Fengyun 2B					PL
TLEs	GEO (1.00)	2016-12-24	16:31:51.088	-0.67	52.081	38.151	66.012
26382	TEME	42217.200	0.0006766	9.7105	41.8554	222.9445	116.6634
D.520	1976-066A	Palapa 1					PL
TLEs	GEO (1.00)	2016-12-25	16:03:06.270	-0.65	51.024	29.927	72.120
9009	TEME	42211.181	0.0004036	14.0700	338.3252	223.2342	139.6381
D.521	1985-055A	Intelsat VA F-11					PL
TLEs	GEO (1.00)	2016-12-25	18:45:11.974	-0.63	49.178	-4.146	102.502
15873	TEME	42207.539	0.0010699	15.1971	9.2039	333.8350	168.1890
D.522	1988-034D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-25	17:09:12.683	-0.62	47.970	-56.418	152.358
19076	TEME	42206.388	0.0020141	14.9416	357.7632	103.7097	154.5124
D.523	1972-041A	Intelsat IV F-5					PL
TLEs	GEO (1.00)	2016-12-24	14:49:02.417	-0.59	45.643	26.654	64.632
6052	TEME	42206.134	0.0004940	13.0865	326.0589	240.9012	10.2486

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.524	1975-097F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	GEO (1.00)	2016-12-29	04:59:35.822	-0.58	45.495	-49.966	140.955
11676	TEME	42204.805	0.0018919	10.4171	312.4166	120.0834	1.0007
D.525	1981-114A	RCA Satcom IIIR					PL
TLEs	GEO (1.00)	2016-12-24	05:18:29.808	-0.57	44.345	25.944	62.746
12967	TEME	42204.943	0.0009137	15.1290	2.2683	243.3517	9.8033
D.526	1982-082A	Anik D1					PL
TLEs	GEO (1.00)	2016-12-31	17:04:26.412	-0.57	44.055	20.285	67.824
13431	TEME	42209.362	0.0010675	15.1039	3.1238	257.1118	212.2250
D.527	2004-010F	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-31	21:22:20.286	-0.56	43.933	-75.141	163.007
28256	TEME	42205.233	0.0028533	9.4702	47.9988	273.9365	13.1632
D.528	1993-003D	IUS second stage					RB
TLEs	EGO (0.56)	2016-12-30	22:44:59.161	-0.56	43.412	-239.775	326.600
22316	TEME	42214.905	0.0064289	13.3386	10.1941	35.3998	67.5858
D.529	1994-069D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-25	07:06:41.304	-0.55	43.101	-56.361	142.562
23330	TEME	42201.943	0.0018078	14.7933	19.9507	59.6235	347.2865
D.530	1978-058A	OPS 9454 (VORTEX 1) (CHALET 1)					PL
KIAM	EGO (0.02)	2017-01-01	00:00:01.000	-0.53	41.617	-5963.807	6047.041
UI009	J2000	42205.790	0.1422891	7.5386	29.5279	348.9538	343.8920
D.531	1991-010F	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-25	17:07:41.900	-0.53	41.249	-32.214	114.712
21129	TEME	42201.639	0.0016695	14.6725	11.7824	151.3532	190.1816
D.532	1983-065A	Galaxy I					PL
TLEs	GEO (1.00)	2016-12-25	12:07:04.203	-0.52	40.756	26.550	54.962
14158	TEME	42211.447	0.0006592	15.1369	12.2038	239.6958	259.7541
D.533	1977-092K	Ekran 2 fragmentation debris					PD
TLEs	GEO (1.00)	2016-12-28	20:56:09.527	-0.51	40.122	-34.574	114.818
29014	TEME	42200.923	0.0020131	11.9491	318.6512	246.1245	133.4243
D.534	2004-043D	Proton-K/DM-2M fourth stage (Blok DM-2M)					RB
TLEs	GEO (1.00)	2016-12-31	20:56:16.558	-0.51	39.391	7.213	71.569
28466	TEME	42203.691	0.0003903	9.7392	41.2098	92.0856	26.6164
D.535	1999-047E	Proton-K/DM-2M fourth stage (Blok DM-2M)					RB
TLEs	EGO (0.32)	2016-12-25	15:07:14.784	-0.50	38.597	-388.390	465.585
25900	TEME	42209.653	0.0099653	13.3620	28.4560	328.3179	242.3138
D.536	1981-096A	SBS II					PL
TLEs	GEO (1.00)	2016-12-31	06:41:43.198	-0.49	37.955	10.710	65.200
12855	TEME	42202.151	0.0005317	14.7288	351.9666	204.5950	308.7825
D.537	1991-015E	Meteosat 5 AKM (MAGE 1)					PM
TLEs	EGO (0.20)	2016-12-31	20:55:20.485	-0.48	37.529	-638.965	714.022
21904	TEME	42207.129	0.0155628	14.4624	6.9644	145.4494	49.5101
D.538	1993-072A	Gorizont 29					PL
TLEs	GEO (1.00)	2016-12-31	12:09:42.680	-0.48	37.307	-11.552	86.165
22907	TEME	42208.530	0.0015305	14.6744	17.2978	266.1478	266.2025

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.539	1968-081AJ	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.17)	2016-12-23	00:53:28.458	-0.47	36.279	-702.653	775.211
39298	TEME	42202.303	0.0178987	6.9834	317.3148	325.9256	298.6594
D.540	1999-009A	Arabsat 3A					PL
TLEs	GEO (1.00)	2016-12-29	03:02:07.600	-0.45	34.727	14.463	54.991
25638	TEME	42203.801	0.0009163	6.4652	54.6252	231.7968	289.0768
D.541^m	1968-081AH	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.11)	2016-12-25	21:40:52.807	-0.42	33.055	-1150.105	1216.214
39297	TEME	42197.228	0.0280388	7.0163	317.3235	318.0025	257.3550
D.542	1985-107A	Raduga 17					PL
TLEs	GEO (1.00)	2016-12-31	16:14:22.854	-0.42	32.645	-19.213	84.503
16250	TEME	42204.187	0.0010839	14.4646	348.8494	161.1450	51.4739
D.543	1995-045D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-31	12:46:12.581	-0.41	31.912	-51.238	115.061
23656	TEME	42187.014	0.0019589	14.1974	22.8442	312.2102	166.2414
D.544	1979-035E	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	GEO (1.00)	2016-12-31	13:34:53.884	-0.39	30.330	-92.114	152.774
17873	TEME	42203.592	0.0026740	12.7631	323.2313	157.2059	245.1540
D.545	2000-032C	Fengyun 2B AKM (FG-36)					PM
TLEs	GEO (1.00)	2016-12-31	07:17:55.287	-0.39	30.158	-70.853	131.169
26460	TEME	42187.599	0.0024395	12.2282	34.7447	300.5809	0.5840
D.546	1996-034A	Gorizont 32					PL
TLEs	GEO (1.00)	2016-12-25	14:11:31.752	-0.34	26.666	-7.860	61.191
23880	TEME	42180.771	0.0012218	13.8792	24.5556	264.2505	175.4772
D.547	1983-059C	Palapa Pacific 1 (Palapa B1)					PL
TLEs	GEO (1.00)	2016-12-25	15:21:31.309	-0.33	26.000	6.612	45.388
14134	TEME	42200.404	0.0004136	14.9796	359.7324	289.9865	97.7895
D.548	2000-036D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-25	17:08:50.613	-0.32	24.940	-53.585	103.465
26397	TEME	42184.737	0.0016011	11.6731	34.6444	334.7310	7.8837
D.549	1992-082A	Gorizont 27					PL
TLEs	GEO (1.00)	2016-12-25	17:47:26.426	-0.32	24.694	-29.138	78.527
22245	TEME	42181.664	0.0015381	14.9103	14.2577	284.1787	356.3593
D.550	1983-098A	Galaxy II					PL
TLEs	GEO (1.00)	2016-12-19	09:20:52.411	-0.29	22.385	-3.198	47.967
14365	TEME	42182.182	0.0004551	15.0976	12.6080	298.0539	137.8654
D.551	1992-041A	INSAT 2A					PL
TLEs	GEO (1.00)	2016-12-31	17:15:52.844	-0.27	21.409	1.249	41.569
22027	TEME	42200.978	0.0010617	14.4346	22.0739	216.9339	83.1984
D.552	1981-102F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	GEO (1.00)	2016-12-27	04:31:26.585	-0.26	20.350	-27.691	68.392
14195	TEME	42178.984	0.0007011	13.5374	330.9689	142.6962	358.9223
D.553	1979-086A	OPS 1948 (VORTEX 2) (CHALET 2)					PL
KIAM	EGO (0.02)	2017-01-01	00:00:01.000	-0.26	20.320	-5133.064	5173.704
UI023	J2000	42184.493	0.1221630	6.7152	353.7609	31.0160	184.4550

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.554	1964-047A	Syncom 3					PL
TLEs	GEO (1.00)	2016-12-31	13:38:47.397	-0.24	18.547	5.570	31.525
858	TEME	42196.613	0.0005406	1.1690	306.3439	292.5044	230.5273
D.555	1987-091D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-25	12:36:12.692	-0.24	18.462	-69.113	106.037
18446	TEME	42180.548	0.0021901	14.7235	355.7812	181.0094	187.9095
D.556	1967-001A	Intelsat II F-2					PL
TLEs	GEO (1.00)	2016-12-25	11:09:31.078	-0.23	17.756	-38.586	74.098
2639	TEME	42195.950	0.0014566	4.9878	300.3731	287.2718	228.2821
D.557	2002-001B	Titan IVB third stage (Centaur TC-19)					RB
KIAM	EGO (0.81)	2017-01-01	00:00:01.000	-0.15	12.030	-201.512	225.572
UI013	J2000	42176.203	0.0050631	5.7693	39.6115	61.5363	153.9250
D.558^m	1985-102G	Cosmos-1700 debris					PD
TLEs	GEO (1.00)	2016-12-25	17:04:53.656	-0.15	11.310	-73.028	95.648
40924	TEME	42175.483	0.0019997	14.4992	349.2760	21.1393	95.1648
D.559^m	1998-065A	Intelsat 8 (PAS 8)					PL
TLEs	GEO (1.00)	2016-12-25	18:45:11.974	-0.01	0.536	-9.984	11.056
25522	TEME	42164.709	0.0002495	0.6584	89.0941	192.4616	168.8586
D.560	1980-060G	Ekran 5 debris					PD
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	0.14	-10.737	-89.180	67.706
UI137	J2000	42153.436	0.0018609	12.7731	324.4644	251.2770	155.9060
D.561	1966-110A	ATS 1					PL
TLEs	GEO (1.00)	2016-12-25	22:14:50.184	0.23	-17.733	-43.777	8.310
2608	TEME	42134.287	0.0007652	3.2078	299.7847	271.7817	41.8581
D.562	2000-029B	Proton-K/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (0.11)	2016-12-26	09:07:26.192	0.28	-21.929	-1169.818	1125.960
26373	TEME	42146.235	0.0272781	11.4159	33.2161	247.6018	325.3100
D.563	1982-103E	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	GEO (1.00)	2016-12-31	18:48:15.433	0.32	-24.667	-79.400	30.065
13630	TEME	42145.951	0.0008427	13.7212	335.7499	102.3908	139.8256
D.564	1981-027A	Raduga 8					PL
TLEs	EGO (0.38)	2016-12-30	22:53:47.014	0.38	-29.716	-395.064	335.632
12351	TEME	42140.106	0.0085036	13.4580	328.3046	172.7859	3.0467
D.565	1969-036A	OPS 3148 (CANYON 2)					PL
KIAM	EGO (0.03)	2017-01-01	00:00:01.000	0.39	-30.606	-3806.831	3745.619
UI070	J2000	42133.567	0.0896251	6.8472	74.3637	95.1715	309.9980
D.566	1971-039B	Titan IIIC third stage (Transtage 20)					RB
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	0.48	-37.448	-176.976	102.080
UI093	J2000	42126.725	0.0033121	6.4440	304.0841	15.1990	134.6090
D.567	1985-048C	Arabsat 1B					PL
TLEs	GEO (1.00)	2016-12-25	08:19:31.598	0.50	-38.738	-98.698	21.223
15825	TEME	42133.147	0.0020312	15.0683	4.6345	282.6098	166.4409
D.568	1985-015A	Arabsat 1A					PL
TLEs	GEO (1.00)	2016-12-31	07:22:41.316	0.54	-41.704	-59.012	-24.396
15560	TEME	42119.210	0.0006602	14.9724	1.4764	266.8849	222.6033

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.569	1969-013A	TACSAT 1					PL
TLEs	GEO (1.00)	2016-12-31	06:29:12.241	0.54	-42.064	-121.922	37.793
3691	TEME	42116.620	0.0020274	5.3135	303.3121	256.5336	270.8694
D.570	1968-081AK	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.26)	2016-12-27	06:02:21.694	0.56	-43.390	-538.847	452.068
39299	TEME	42119.877	0.0120670	6.9996	316.6273	14.1301	258.0841
D.571	1989-020E	Meteosat 4 AKM (MAGE 1)					PM
TLEs	EGO (0.24)	2016-12-24	02:08:05.031	0.63	-48.728	-600.087	502.631
20800	TEME	42109.958	0.0128915	14.2463	359.8641	164.3651	55.0362
D.572	2001-009B	Titan IVB third stage (Centaur TC-22)					RB
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	0.67	-51.781	-105.891	2.329
UI003	J2000	42112.392	0.0012849	9.9651	35.5714	60.3656	12.4110
D.573	1978-038A	OPS 8790 (AQUACADE 4)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	0.68	-52.688	-137.522	32.146
UI091	J2000	42111.485	0.0020145	9.5178	331.3328	231.1841	1.1500
D.574	2003-015A	Cosmos-2397					PL
TLEs	EGO (0.80)	2016-12-24	22:28:42.658	0.71	-55.407	-236.516	125.703
27775	TEME	42113.307	0.0043630	8.7913	43.6370	274.6364	348.9428
D.575	1988-091D	IUS second stage					RB
TLEs	GEO (1.00)	2016-12-31	14:13:24.230	0.71	-55.426	-126.503	15.650
19550	TEME	42105.384	0.0021262	15.3017	2.1845	220.5838	47.9977
D.576	1979-087C	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (0.77)	2016-12-25	03:37:12.603	0.73	-57.129	-220.727	106.469
17939	TEME	42108.963	0.0045956	12.8051	324.2525	259.2994	318.0247
D.577	1993-069D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-31	20:20:52.276	0.77	-59.633	-81.699	-37.567
22883	TEME	42108.096	0.0006377	14.6272	16.8915	280.8011	138.0775
D.578	1975-118A	OPS 3165 (DSP F5, DSP 8, DSP Block 2(PHASE II) F5)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	0.79	-61.612	-198.201	74.977
UI052	J2000	42102.561	0.0032442	10.2810	312.0070	276.8723	75.8820
D.579	1975-123F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	GEO (1.00)	2016-12-25	03:37:12.603	0.80	-62.116	-125.644	1.411
11568	TEME	42103.683	0.0011112	10.5481	313.5445	110.8609	318.3061
D.580	1995-035D	IUS second stage					RB
TLEs	GEO (1.00)	2016-12-25	05:44:55.677	0.80	-62.185	-108.868	-15.502
23615	TEME	42103.529	0.0006535	16.8691	16.2572	89.6370	19.9548
D.581	1990-054D	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	GEO (1.00)	2016-12-31	19:56:31.720	0.83	-64.860	-128.829	-0.891
20662	TEME	42102.239	0.0012582	15.0096	5.8824	354.7265	326.1079
D.582	1975-118C	Titan IIIC third stage (Transtage 29)					RB
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	0.96	-74.452	-114.601	-34.303
UI050	J2000	42089.721	0.0009539	10.2506	312.0945	110.2407	38.5910
D.583	1988-071D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-25	23:13:12.781	0.99	-76.802	-159.883	6.280
19400	TEME	42089.111	0.0018573	14.7140	359.0934	156.4364	316.3319

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.584	1995-022B	Titan IVA third stage (Centaur)					RB
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	1.01	-78.164	-125.591	-30.737
UI021	J2000	42086.009	0.0011269	15.6002	43.0657	245.8789	115.8890
D.585	1976-059C	Titan IIIC third stage (Transtage 28)					RB
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	1.05	-81.642	-123.724	-39.559
UI054	J2000	42082.531	0.0010000	10.6823	313.3002	162.8089	252.1640
D.586	1977-007D	OPS 3151 debris (DSP F7 IR Sensor telescope sunshade cover)					PM
KIAM	EGO (0.17)	2017-01-01	00:00:01.000	1.05	-81.868	-856.018	692.282
UI100	J2000	42082.305	0.0183961	10.9270	313.1491	10.7442	337.9290
D.587	1987-096D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-31	07:27:23.393	1.06	-82.521	-177.317	12.274
18578	TEME	42083.531	0.0021617	14.6616	356.3373	162.3725	318.8307
D.588	2003-012B	Titan IVB third stage (Centaur TC-23)					RB
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	1.07	-82.962	-193.766	27.842
UI064	J2000	42081.211	0.0026331	7.3239	39.9718	202.5673	10.9950
D.589	1977-048G	GOES 2 AKM (SVM-5)					PM
TLEs	EGO (0.14)	2016-12-25	13:24:40.387	1.08	-83.621	-1026.921	859.680
20799	TEME	42079.914	0.0225046	11.8597	319.3543	358.4663	215.8994
D.590	1995-060B	Titan IVA third stage (Centaur)					RB
KIAM	EGO (0.81)	2017-01-01	00:00:01.000	1.09	-84.863	-224.785	55.059
UI016	J2000	42079.310	0.0033252	13.3402	28.4717	137.0133	186.9010
D.591	1994-009B	Titan IVA third stage (Centaur)					RB
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	1.12	-86.797	-150.334	-23.260
UI014	J2000	42077.376	0.0015100	11.9386	59.4708	158.3290	206.8770
D.592	1968-081AG	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.16)	2016-12-02	17:25:17.377	1.14	-88.400	-799.121	622.320
39296	TEME	42073.218	0.0193779	6.8996	316.3503	319.6526	109.6730
D.593	1989-081D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-24	22:07:12.642	1.21	-94.134	-207.698	19.429
20266	TEME	42072.111	0.0022932	14.7826	2.9589	26.5750	323.6204
D.594	1989-021D	IUS second stage					RB
TLEs	GEO (1.00)	2016-12-29	08:16:56.245	1.21	-94.242	-200.616	12.132
19913	TEME	42071.797	0.0021001	13.4681	348.3486	110.3205	323.5463
D.595	1985-102D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-31	12:21:52.092	1.27	-98.600	-184.448	-12.751
16214	TEME	42063.436	0.0015769	14.3121	348.7230	62.4484	244.4938
D.596	1997-049E	Meteosat 7 AKM (MAGE 1)					PM
TLEs	EGO (0.43)	2016-12-24	22:58:01.127	1.34	-104.351	-429.404	220.703
25353	TEME	42061.232	0.0082350	13.0348	28.2965	243.1526	128.3874
D.597	1989-041B	DFS-Kopernikus 1					PL
TLEs	GEO (1.00)	2016-12-31	16:04:18.645	1.40	-108.645	-161.035	-56.254
20041	TEME	42055.150	0.0018659	14.7393	17.2439	227.1759	35.6856
D.598	1988-034A	Cosmos-1940					PL
TLEs	EGO (0.93)	2016-12-29	05:00:09.631	1.41	-109.200	-190.015	-28.385
19073	TEME	42055.247	0.0022264	14.7346	357.0177	208.7562	302.3547

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.599	1974-039C	Titan IIIC third stage (Transtage 27)					RB
TLEs	EGO (0.82)	2016-12-30	02:52:12.310	1.41	-109.409	-208.630	-10.188
7324	TEME	42056.992	0.0026228	10.7500	312.7743	257.0364	335.4747
D.600	1972-010B	Titan IIIC third stage (Transtage 22)					RB
KIAM	EGO (0.62)	2017-01-01	00:00:01.000	1.41	-109.799	-349.925	130.327
UI038	J2000	42054.374	0.0057099	7.1916	305.8276	56.0066	308.9970
D.601	1968-081R	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.15)	2016-12-25	13:44:58.920	1.57	-121.859	-933.730	690.013
38691	TEME	42043.610	0.0203244	5.8640	315.3791	296.7756	14.7423
D.602	2004-015D	Proton-K/DM-2M fourth stage (Blok DM-2M)					RB
TLEs	EGO (0.81)	2016-12-24	14:22:18.916	1.58	-122.756	-200.284	-45.228
28240	TEME	42039.751	0.0021979	10.0910	40.2679	239.1908	234.7845
D.603	2003-040C	IABS					PM
KIAM	EGO (0.92)	2017-01-01	00:00:01.000	1.67	-129.345	-202.565	-56.124
UI002	J2000	42034.828	0.0017419	10.5130	38.6965	229.6137	220.0180
D.604	1989-090B	USA 48 (MAGNUM 2)					PL
KIAM	EGO (0.00)	2017-01-01	00:00:01.000	1.68	-130.067	-1291.663	1031.529
UI136	J2000	42034.106	0.0276346	18.0967	17.5963	16.3554	55.4010
D.605	2000-013D	Proton-K/DM-2M fourth stage (Blok DM-2M)					RB
TLEs	GEO (1.00)	2016-12-25	22:44:30.739	1.75	-136.040	-167.665	-104.415
26101	TEME	42026.645	0.0006331	12.9214	30.1954	309.4661	94.7762
D.606	1968-081M	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.20)	2016-12-31	03:01:13.376	1.80	-139.565	-763.024	483.894
33511	TEME	42024.791	0.0161375	6.6238	315.6447	335.3352	303.9779
D.607	1974-017A	Cosmos-637					PL
TLEs	EGO (0.61)	2016-12-25	14:05:41.361	1.82	-141.158	-306.112	23.795
7229	TEME	42025.319	0.0043707	8.8962	309.6993	321.7987	168.0237
D.608	1996-044A	Italsat 2					PL
TLEs	EGO (0.75)	2016-12-24	18:04:13.910	1.84	-142.693	-251.890	-33.496
24208	TEME	42021.635	0.0019400	11.5881	34.3932	63.1950	29.6287
D.609	1994-082D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (0.68)	2016-12-24	09:26:38.406	1.89	-146.311	-267.989	-24.633
23429	TEME	42018.488	0.0024313	14.1194	24.8896	44.8903	203.1036
D.610	2003-043E	INSAT 3E					PL
TLEs	EGO (0.71)	2016-12-25	20:18:41.164	1.90	-147.182	-221.082	-73.282
27951	TEME	42019.160	0.0021911	2.1570	79.3139	172.7722	157.1836
D.611	2005-023H	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (0.75)	2016-12-31	21:06:42.778	1.94	-150.118	-208.497	-91.739
28704	TEME	42015.969	0.0017285	9.1162	43.5761	240.3393	347.9362
D.612	1985-010D	IUS second stage					RB
KIAM	EGO (0.37)	2017-01-01	00:00:01.000	1.96	-152.248	-278.985	-25.511
UI047	J2000	42011.925	0.0030167	17.7553	351.1285	207.1731	292.8000
D.613	1987-109D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (0.55)	2016-12-25	08:51:00.178	2.01	-156.086	-425.735	113.564
18718	TEME	42008.692	0.0066451	14.6398	357.0975	187.4681	307.2886

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.614	2003-041B	Titan IVB third stage (Centaur TC-20)					RB
KIAM	EGO (0.60)	2017-01-01	00:00:01.000	2.04	-158.382	-296.787	-19.977
UI072	J2000	42005.791	0.0032949	9.1071	77.6631	10.6198	179.0650
D.615	1968-081Z	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.31)	2016-12-25	22:22:05.821	2.10	-162.879	-615.549	289.791
38699	TEME	42001.478	0.0111404	6.3403	315.3206	307.2226	26.9496
D.616	1990-094D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (0.60)	2016-12-29	06:31:31.627	2.12	-163.930	-310.884	-16.977
20926	TEME	42000.771	0.0030007	14.8801	6.5936	61.7079	205.0182
D.617	1968-081J	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.23)	2016-12-27	18:09:41.155	2.27	-175.672	-725.991	374.648
30000	TEME	41986.795	0.0144419	6.3614	315.2173	335.2359	103.4124
D.618^m	1968-081N	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.10)	2016-12-29	01:03:32.755	2.33	-180.557	-1448.059	1086.945
33512	TEME	41983.616	0.0301904	6.2769	315.3461	329.2174	313.2077
D.619	1991-046D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (0.57)	2016-12-24	03:56:42.781	2.36	-183.158	-257.870	-108.446
21536	TEME	41980.881	0.0018147	14.8260	9.1832	168.0968	215.6753
D.620	1994-080A	DFH 3-1					PL
TLEs	EGO (0.39)	2016-12-30	14:31:34.231	2.49	-192.968	-603.518	217.582
23415	TEME	41970.090	0.0100398	14.7303	15.3888	287.3254	58.0551
D.621	1982-009F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (0.51)	2016-12-31	04:28:53.389	2.55	-197.509	-357.018	-38.000
14117	TEME	41966.214	0.0034161	13.3387	330.9481	103.8808	295.8179
D.622	1974-017F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (0.50)	2016-12-25	21:15:49.378	2.62	-202.985	-397.669	-8.301
11567	TEME	41959.789	0.0050703	8.7438	309.3843	330.7030	66.5445
D.623	2006-022D	Proton-K/DM-2M fourth stage (Blok DM-2M)					RB
TLEs	EGO (0.50)	2016-12-25	16:09:44.796	2.64	-204.169	-416.404	8.066
29233	TEME	41961.281	0.0048803	8.2684	46.3961	309.2511	175.6031
D.624	1981-061F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (0.42)	2016-12-31	10:01:30.263	2.64	-204.391	-220.915	-187.866
12851	TEME	41958.409	0.0005459	13.0668	328.7659	303.2682	257.6682
D.625	1968-081G	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.28)	2016-12-31	15:30:57.314	2.74	-211.667	-706.561	283.227
25000	TEME	41951.632	0.0125600	6.3299	314.9033	317.1856	238.0328
D.626	1983-100F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (0.42)	2016-12-29	06:50:34.332	2.80	-216.482	-298.332	-134.632
14394	TEME	41948.858	0.0015175	13.5511	336.5647	58.7818	334.0673
D.627	1997-065C	IABS					RB
TLEs	EGO (0.44)	2016-12-29	08:24:43.656	2.83	-219.135	-367.244	-71.025
25021	TEME	41945.992	0.0022663	14.0560	22.6196	71.6793	312.0565
D.628	1985-092E	IUS second stage					RB
KIAM	EGO (0.43)	2017-01-01	00:00:01.000	2.93	-226.664	-452.502	-0.826
UI033	J2000	41937.509	0.0053851	15.0725	348.6388	89.6737	254.7540

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.629	1992-017D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (0.41)	2016-12-25	05:32:03.314	2.93	-226.760	-318.638	-134.882
21925	TEME	41938.151	0.0021750	14.7433	11.3064	324.7547	16.9134
D.630	1983-016F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (0.36)	2016-12-25	20:05:12.645	2.97	-229.756	-288.615	-170.897
14086	TEME	41933.026	0.0017280	13.3101	332.6777	235.7713	83.1404
D.631	2003-008C	IABS					PM
KIAM	EGO (0.34)	2017-01-01	00:00:01.000	3.03	-234.056	-303.811	-164.301
UI006	J2000	41930.117	0.0016636	10.8713	37.3836	169.2090	150.6860
D.632	1988-036E	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (0.35)	2016-12-30	05:27:16.862	3.03	-234.525	-330.456	-138.595
19094	TEME	41929.007	0.0018452	14.4127	353.3648	95.7092	268.1995
D.633	—	Himawari 1 AKM (Star 27)					RB
KIAM	EGO (0.11)	2017-01-01	00:00:01.000	3.04	-235.141	-1446.974	976.692
UU010	J2000	41929.032	0.0289020	11.8908	319.3350	8.7314	237.9010
D.634_o	1968-081AB	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.08)	2016-03-24	16:35:44.579	3.10	-239.857	-1586.755	1107.041
38701	TEME	41924.726	0.0394878	6.0589	315.0034	316.1645	243.3425
D.635	1992-074D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (0.29)	2016-12-25	02:08:10.752	3.13	-242.235	-334.403	-150.066
22213	TEME	41920.881	0.0016954	14.6048	13.4383	54.4566	73.4282
D.636	1984-129B	Titan 34D third stage (Transtage D-13)					RB
KIAM	EGO (-)	2017-01-01	00:00:01.000	3.14	-242.948	-265.694	-220.201
UI032	J2000	41921.225	0.0005426	15.1815	349.8310	184.3406	182.3790
D.637	1984-037B	Titan 34D third stage (Transtage D-11)					RB
KIAM	EGO (0.40)	2017-01-01	00:00:01.000	3.17	-244.912	-385.652	-104.172
UI095	J2000	41919.261	0.0033574	14.2671	344.1853	233.2435	161.8820
D.638	2005-049E	Meteosat 9 (MSG 2) operational debris (SEVIRI Cooler Cover)					PM
TLEs	EGO (0.32)	2016-12-19	01:17:16.828	3.23	-249.478	-296.237	-202.718
29106	TEME	41915.478	0.0021283	7.6097	56.2364	182.0964	316.4252
D.639	1994-084D	IUS second stage					RB
KIAM	EGO (-)	2017-01-01	00:00:01.000	3.24	-250.201	-255.704	-244.698
UI019	J2000	41913.972	0.0001313	13.9210	23.7860	191.9065	349.8760
D.640	2000-065C	IABS					RB
KIAM	EGO (0.44)	2017-01-01	00:00:01.000	3.24	-250.339	-507.388	6.710
UI011	J2000	41913.834	0.0061328	12.5390	30.6215	193.4314	164.1450
D.641	2000-001C	IABS					RB
KIAM	EGO (0.27)	2017-01-01	00:00:01.000	3.24	-250.470	-325.579	-175.361
UI015	J2000	41913.703	0.0017920	12.9615	29.1517	253.4896	339.6320
D.642	2002-040E	Meteosat 8 (MSG 1) operational debris (SEVIRI Cooler Cover)					PM
TLEs	EGO (0.17)	2016-09-02	01:22:23.193	3.27	-252.659	-287.481	-217.837
39998	TEME	41911.392	0.0014631	9.1480	39.2205	164.6220	37.1055
D.643	—	USA 107 debris (DSP F17 IR Sensor telescope sunshade cover)					PM
KIAM	EGO (0.44)	2017-01-01	00:00:01.000	3.29	-254.144	-549.027	40.739
UU058	J2000	41910.029	0.0070361	13.9280	23.7358	297.2231	69.5850

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.644	1985-024D	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-25	22:14:17.920	3.44	-265.541	-327.462	-203.621
15630	TEME	41897.366	0.0013361	13.9125	341.7050	169.5008	61.9417
D.645	1987-097B	Titan 34D third stage (Transtage D-14)					RB
KIAM	EGO (-)	2017-01-01	00:00:01.000	3.44	-265.720	-302.754	-228.686
UI029	J2000	41898.453	0.0008839	13.7481	1.7559	199.1135	173.9580
D.646	1989-069D	Titan 34D third stage (Transtage D-2)					RB
KIAM	EGO (0.43)	2017-01-01	00:00:01.000	3.50	-270.227	-575.395	34.941
UI088	J2000	41893.946	0.0072843	14.6393	358.5287	255.1961	65.8170
D.647	1982-093F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-25	20:05:12.645	3.53	-272.527	-298.627	-246.428
14115	TEME	41890.693	0.0008806	13.1652	332.5033	232.0019	82.4282
D.648	1995-011D	Himawari 5 (GMS 5) AKM (Star 27)					PM
TLEs	EGO (0.14)	2016-12-31	07:24:19.598	3.54	-273.292	-1233.969	687.386
23524	TEME	41890.801	0.0229593	14.1330	18.4514	279.7897	204.0983
D.649	1982-019B	Titan IIIC third stage (Transtage 38)					RB
KIAM	EGO (-)	2017-01-01	00:00:01.000	3.54	-273.567	-312.144	-234.990
UI039	J2000	41890.606	0.0009209	13.8060	336.9440	38.6600	249.3860
D.650	1984-090F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-25	13:31:12.581	3.56	-275.273	-345.314	-205.233
17875	TEME	41890.292	0.0011912	13.7199	339.7156	69.8420	154.3802
D.651	1995-038C	IABS					RB
KIAM	EGO (0.22)	2017-01-01	00:00:01.000	3.58	-276.614	-375.519	-177.709
UI022	J2000	41887.559	0.0023612	14.6730	16.4991	222.9865	258.1460
D.652	1991-080D	IUS second stage					RB
KIAM	EGO (0.22)	2017-01-01	00:00:01.000	3.61	-279.049	-382.313	-175.785
UI078	J2000	41885.124	0.0024654	14.8240	14.0196	257.0348	316.9570
D.653	1977-092G	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-28	12:12:16.481	3.63	-280.540	-325.246	-235.833
11571	TEME	41883.852	0.0006930	11.3517	316.8718	65.1553	127.4409
D.654	1989-046D	IUS second stage					RB
KIAM	EGO (0.36)	2017-01-01	00:00:01.000	3.67	-283.387	-479.515	-87.259
UI080	J2000	41880.786	0.0046830	14.3017	8.0590	278.0334	354.3260
D.655	1989-046E	USA 39 debris (DSP F14 IR Sensor telescope sunshade cover)					PM
KIAM	EGO (0.16)	2017-01-01	00:00:01.000	3.70	-285.557	-1148.499	577.385
	J2000	41878.616	0.0206058	14.3426	7.9068	78.7175	5.9390
D.656	—	USA 75 debris (DSP F16 IR Sensor telescope sunshade cover)					PM
KIAM	EGO (0.41)	2017-01-01	00:00:01.000	3.82	-295.181	-632.431	42.070
UU052	J2000	41868.992	0.0080549	14.8750	13.8824	228.3851	199.5830
D.657	1981-025C	Titan IIIC third stage (Transtage 40)					RB
KIAM	EGO (0.36)	2017-01-01	00:00:01.000	3.83	-295.936	-525.847	-66.025
UI040	J2000	41868.237	0.0054913	13.2032	333.9702	228.4167	89.3470
D.658	1980-104E	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (0.18)	2016-12-25	08:50:47.103	3.84	-296.493	-428.229	-164.757
12471	TEME	41867.914	0.0027407	12.7332	326.6172	100.2733	308.2956

D.nn	COSPAR	Name						Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$	
S-ID	Frame	a	e	i	Ω	ω	λ	
D.659	1979-015D	Proton-K/DM fourth stage (Blok-DM)						RB
TLEs	EGO (-)	2016-12-22	04:20:17.719	3.84	-296.493	-335.559	-257.428	
13900	TEME	41868.285	0.0011211	12.0067	320.8743	236.0460	329.5622	
D.660	2004-042C	Fengyun 2C AKM (FG-36)						PM
TLEs	EGO (0.17)	2016-12-24	22:20:17.225	3.85	-296.798	-392.798	-200.798	
28491	TEME	41868.377	0.0026379	8.7839	42.7919	243.9755	327.1226	
D.661	1976-023K	LES 8, LES 9 operational debris						PM
TLEs	EGO (-)	2016-12-25	06:57:41.335	3.85	-297.140	-313.035	-281.245	
13753	TEME	41868.085	0.0006182	12.3218	322.9105	294.0938	353.0183	
D.662	1989-053A	Olympus 1						PL
TLEs	EGO (-)	2016-12-31	01:49:40.082	3.95	-304.710	-364.332	-245.089	
20122	TEME	41858.701	0.0020202	14.8762	5.1418	252.7479	245.2720	
D.663	1986-038D	Proton-K/DM fourth stage (Blok-DM)						RB
TLEs	EGO (-)	2016-12-31	22:53:20.403	3.95	-304.927	-393.797	-216.057	
16732	TEME	41859.142	0.0016723	13.9932	345.5055	88.8870	110.9542	
D.664	1987-073D	Proton-K/DM fourth stage (Blok-DM)						RB
TLEs	EGO (-)	2016-12-25	19:10:12.457	3.99	-308.029	-380.131	-235.927	
18331	TEME	41855.426	0.0012394	14.1908	350.6956	60.4460	86.3965	
D.665	1968-081P	Titan IIIC fragmentation debris						RD
TLEs	EGO (0.41)	2016-12-31	06:15:55.713	4.04	-311.533	-686.851	63.786	
33513	TEME	41853.248	0.0096730	6.0864	313.8178	321.1749	200.1985	
D.666	1984-028F	Proton-K/DM fourth stage (Blok-DM)						RB
TLEs	EGO (-)	2016-12-25	15:40:49.653	4.16	-320.539	-403.457	-237.620	
15139	TEME	41843.524	0.0022661	13.3803	335.6950	311.4142	213.2844	
D.667	1976-107F	Proton-K/DM fourth stage (Blok-DM)						RB
TLEs	EGO (-)	2016-12-31	11:10:59.415	4.26	-328.821	-375.448	-282.194	
11569	TEME	41835.324	0.0007130	10.6750	313.7198	86.7702	213.4144	
D.668	1968-081X	Titan IIIC fragmentation debris						RD
TLEs	EGO (0.11)	2016-12-25	15:00:00.075	4.32	-333.212	-1121.176	454.753	
38697	TEME	41831.187	0.0302967	4.7074	331.4229	2.1445	9.8845	
D.669	1988-108D	Proton-K/DM-2 fourth stage (Blok DM-2)						RB
TLEs	EGO (-)	2016-12-31	14:17:46.281	4.47	-344.252	-409.413	-279.091	
19686	TEME	41819.238	0.0011749	14.6626	359.0548	120.4424	249.5639	
D.670	2012-035E	Meteosat 10 (MSG 3) operational debris (SEVIRI Cooler Cover)						PM
TLEs	EGO (0.13)	2016-12-20	21:59:46.466	4.47	-344.732	-485.665	-203.798	
40871	TEME	41819.131	0.0037797	1.8684	97.6761	188.3238	42.6167	
D.671	1968-081E	Titan IIIC third stage (Transtage 5)						RB
TLEs	EGO (0.39)	2016-12-25	10:59:24.706	4.48	-345.230	-747.399	56.940	
3432	TEME	41818.591	0.0103381	6.1569	313.5917	313.4122	229.0583	
D.672	2015-034E	Meteosat 11 (MSG 4) operational debris (SEVIRI Cooler Cover)						PM
TLEs	EGO (0.11)	2016-12-25	23:28:35.674	4.50	-346.572	-489.507	-203.637	
40989	TEME	41818.042	0.0037172	2.1471	248.5895	42.4706	162.1870	
D.673	1979-007A	SCATHA (P78-2)						PL
TLEs	EGO (0.01)	2016-12-31	10:29:24.057	4.52	-348.133	-7874.628	7178.363	
11256	TEME	41816.627	0.1790765	17.2118	329.6639	20.2362	314.3817	

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.674	—	OPS 7641 debris (DSP F11 IR Sensor telescope sunshade cover)					PM
KIAM	EGO (-)	2017-01-01	00:00:01.000	4.55	-350.673	-410.475	-290.871
UU028	J2000	41813.500	0.0014302	14.2562	343.2734	326.4769	221.3310
D.675	1968-081A	OV2-5 (DG7-2)					PL
TLEs	EGO (0.37)	2016-12-25	15:35:48.400	4.62	-356.219	-703.594	-8.844
3428	TEME	41808.747	0.0089584	6.1138	313.7186	318.8915	144.9069
D.676	1979-007C	SCATHA AKM (FW-5)					PM
TLEs	EGO (0.01)	2016-12-25	18:24:57.761	4.74	-364.734	-7804.990	7075.522
29000	TEME	41799.429	0.1770544	17.1597	329.8161	19.8121	56.2114
D.677	1980-060F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-30	05:33:16.606	4.80	-369.296	-445.465	-293.127
14193	TEME	41795.414	0.0018106	12.4716	324.5894	199.3462	340.0063
D.678	1992-037C	IABS					RB
KIAM	EGO (-)	2017-01-01	00:00:01.000	4.95	-380.829	-466.372	-295.286
UI085	J2000	41783.344	0.0020473	14.6981	5.2205	341.2230	241.7540
D.679	1970-069B	Atlas SLV-3A stage 2 (Agena D)					RB
KIAM	EGO (0.02)	2017-01-01	00:00:01.000	5.14	-395.703	-6281.874	5490.469
UI145	J2000	41768.470	0.1409238	11.4602	238.5786	37.6437	321.4340
D.680	1968-081H	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.28)	2016-12-25	10:17:43.399	5.14	-395.840	-691.484	-100.196
25001	TEME	41769.545	0.0071896	6.0421	313.0518	10.3455	301.9809
D.681	1968-063B	Atlas SLV-3A stage 2 (Agena D)					RB
KIAM	EGO (0.03)	2017-01-01	00:00:01.000	5.39	-414.470	-5053.576	4224.636
UI055	J2000	41749.703	0.1111171	12.3567	318.5055	152.1396	320.0380
D.682	1968-081L	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.28)	2016-12-31	01:47:58.609	5.63	-433.003	-711.542	-154.464
33510	TEME	41730.150	0.0087941	6.0071	312.7344	337.2277	251.8108
D.683	—	—					—
KIAM	EGO (0.15)	2017-01-01	00:00:01.000	5.86	-450.103	-1419.621	519.415
UI031	J2000	41714.070	0.0232420	4.1926	311.7248	273.8349	264.0070
D.684	1975-100F	GOES 1 AKM (SVM-5)					PM
TLEs	EGO (0.11)	2016-12-25	15:59:13.832	5.97	-458.557	-1658.978	741.864
20962	TEME	41706.024	0.0297946	10.2665	311.5040	333.3601	337.1536
D.685^{tr}	2002-040F	Meteosat 8 (MSG 1) operational debris (SEVIRI Ent. Ba. Cov.)					PM
TLEs	EGO (0.21)	2016-12-21	18:38:12.458	6.02	-462.470	-796.559	-128.380
39999	TEME	41701.703	0.0080114	9.1786	37.7023	40.0907	161.8229
D.686	1974-039A	ATS 6					PL
TLEs	EGO (-)	2016-12-25	23:47:59.374	6.14	-471.671	-599.590	-343.752
7318	TEME	41692.902	0.0030711	9.8926	310.2985	225.3067	23.1383
D.687	1968-081AF	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.14)	2016-12-31	10:44:09.535	6.39	-490.289	-1511.271	530.692
38705	TEME	41672.492	0.0254598	4.8054	311.0692	69.9659	49.9701
D.688	1968-081K	Titan IIIC fragmentation debris					RD
TLEs	EGO (-)	2016-12-28	21:58:00.418	6.45	-494.599	-706.737	-282.462
33509	TEME	41668.059	0.0060486	6.1471	312.2489	28.1710	332.5425

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.689	1975-055B	Atlas SLV-3A stage 2 (Agena D)					RB
KIAM	EGO (-)	2017-01-01	00:00:01.000	6.51	-499.539	-6095.108	5096.030
UI103	J2000	41664.634	0.1343002	17.2693	304.5296	11.9462	344.0270
D.690	2008-066C	Fengyun 2E AKM (FG-36)					PM
TLEs	EGO (-)	2016-12-25	07:31:27.544	6.55	-502.720	-652.082	-353.358
33465	TEME	41661.373	0.0039042	3.4090	59.9477	235.7280	212.5396
D.691	1993-046C	IABS					RB
KIAM	EGO (0.12)	2017-01-01	00:00:01.000	6.68	-511.907	-847.957	-175.856
UI028	J2000	41652.266	0.0080680	14.6417	8.5994	45.1116	41.8250
D.692	2015-075J	Briz-M fragmentation debris					RD
TLEs	EGO (0.08)	2016-12-25	16:17:34.634	6.91	-529.813	-2160.362	1100.736
41548	TEME	41633.897	0.0387500	1.2541	67.6538	55.1702	87.6888
D.693	1968-081AE	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.22)	2016-12-25	23:47:42.876	6.96	-533.104	-1307.358	241.151
38704	TEME	41631.402	0.0199552	3.8509	309.3639	280.3609	217.7445
D.694	1968-081AC	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.22)	2016-12-25	03:33:02.621	6.96	-533.465	-1312.480	245.549
38702	TEME	41631.302	0.0197865	6.9000	312.3315	56.4478	165.0787
D.695	2005-049F	Meteosat 9 (MSG 2) operational debris (SEVIRI Ent. Ba. Cov.)					PM
TLEs	EGO (-)	2016-12-31	08:45:12.572	7.05	-539.970	-768.562	-311.378
29676	TEME	41623.706	0.0041899	7.5521	55.7555	304.8152	240.7852
D.696	1970-055A	Intelsat III F-8					PL
TLEs	EGO (0.10)	2016-12-25	05:37:33.772	7.17	-548.863	-1984.580	886.855
4478	TEME	41615.731	0.0343218	2.5858	296.9381	181.0881	0.9121
D.697	1972-101B	Atlas SLV-3A stage 2 (Agena D)					RB
KIAM	EGO (0.02)	2017-01-01	00:00:01.000	7.36	-563.622	-5796.185	4668.941
UI059	J2000	41600.551	0.1257811	15.9352	298.4253	45.6823	77.6720
D.698	1977-038B	Atlas SLV-3A stage 2 (Agena D)					RB
KIAM	EGO (0.02)	2017-01-01	00:00:01.000	7.42	-567.936	-6834.821	5698.949
	J2000	41596.237	0.1506599	10.9396	348.0297	97.8071	111.8530
D.699	1997-049A	Eutelsat W75 (ABS 1B, Eurobird 10, Eurobird 4, Hot Bird 3)					PL
TLEs	EGO (-)	2016-12-31	12:34:03.380	7.94	-607.359	-704.230	-510.489
24931	TEME	41557.007	0.0023215	6.0268	54.9999	302.5056	207.5307
D.700	2015-034F	Meteosat 11 (MSG 4) operational debris (SEVIRI Ent. Ba. Cov)					PM
TLEs	EGO (-)	2016-12-29	23:14:34.802	8.57	-654.153	-968.079	-340.228
40990	TEME	41510.516	0.0077334	2.1432	248.8759	331.7536	162.0315
D.701	1968-081AA	Titan IIIC fragmentation debris					RD
TLEs	EGO (0.08)	2016-12-25	03:55:48.358	8.84	-674.549	-1148.036	-201.062
38700	TEME	41490.206	0.0118008	5.6622	310.1008	264.6353	157.1787
D.702^m	2012-035F	Meteosat 10 (MSG 3) operational debris (SEVIRI Ent. Ba. Cov)					PM
TLEs	EGO (-)	2016-12-24	21:03:15.347	8.88	-677.831	-1073.673	-281.989
40872	TEME	41486.342	0.0095415	1.8355	97.5621	132.7307	47.2227
D.703	2011-001B	Zenit-3SLBF third stage (Fregat-SB)					RB
TLEs	EGO (0.21)	2016-12-25	02:45:47.727	9.09	-693.372	-1314.004	-72.740
37345	TEME	41470.614	0.0151246	3.8808	62.9731	348.5740	315.2858

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.704	1968-081T	Titan IIIC fragmentation debris					RD
TLEs	EGO (-)	2016-12-31	10:46:46.645	9.18	-699.771	-1145.219	-254.323
38693	TEME	41464.251	0.0108174	4.8762	309.0754	259.8549	47.3351
D.705	1997-029C	Fengyun 2A AKM (FG-36)					PM
TLEs	EGO (0.31)	2016-12-25	23:18:43.627	9.37	-714.559	-1613.876	184.757
25611	TEME	41449.568	0.0216887	13.4538	25.0975	342.2585	116.4226
D.706	2015-074B	Zenit-3SLBF third stage (Fregat-SB)					RB
TLEs	EGO (0.26)	2016-12-25	14:51:24.837	9.44	-719.488	-1473.435	34.459
41106	TEME	41444.545	0.0181877	0.2582	93.8724	258.4805	42.6032
D.707	1987-040D	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-31	06:37:28.611	9.88	-752.168	-814.348	-689.987
17972	TEME	41412.439	0.0018599	13.3336	341.9304	231.7052	202.0400
D.708	1985-007D	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-25	18:45:48.345	9.90	-753.450	-819.898	-687.001
15487	TEME	41410.643	0.0018522	13.1878	343.3614	212.9518	108.9798
D.709	1989-052D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (-)	2016-12-31	20:13:56.784	10.03	-763.730	-892.289	-635.170
20110	TEME	41401.215	0.0032605	13.9936	359.8898	184.8621	153.4075
D.710	2012-034B	Delta 4 second stage (Delta 360, DCSS-5 F09)					RB
KIAM	EGO (0.21)	2017-01-01	00:00:01.000	10.34	-786.733	-1519.639	-53.827
UI174	J2000	41377.440	0.0177127	0.9922	337.2351	194.8762	243.1260
D.711	1993-072D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (-)	2016-12-31	17:06:03.189	10.41	-791.613	-872.079	-711.146
22910	TEME	41372.670	0.0014505	13.9465	14.6522	78.7042	216.7913
D.712	2015-075H	Briz-M fragmentation debris					RD
TLEs	EGO (0.17)	2016-12-22	04:04:26.518	10.50	-798.383	-1935.497	338.730
41547	TEME	41365.733	0.0272522	0.7712	119.7161	11.2486	207.7484
D.713	1984-063F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (-)	2016-12-25	13:06:52.831	10.86	-824.739	-898.322	-751.156
15693	TEME	41339.308	0.0016938	12.9400	339.7422	173.3900	251.3858
D.714	1987-100D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (-)	2016-12-31	18:56:20.366	11.25	-854.069	-920.999	-787.140
18634	TEME	41310.601	0.0016499	14.0920	352.8703	181.9613	144.5347
D.715	1991-014D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (-)	2016-12-31	06:37:45.156	11.37	-862.655	-966.847	-758.464
21135	TEME	41301.800	0.0021027	14.6441	4.8069	46.5038	219.5526
D.716	1968-081U	Titan IIIC fragmentation debris					RD
TLEs	EGO (-)	2016-12-16	11:30:50.079	11.64	-882.885	-1252.843	-512.927
38694	TEME	41280.393	0.0081410	6.0331	308.4117	137.5328	50.2833
D.717	2001-015A	GSAT 1					PL
TLEs	EGO (0.22)	2016-12-25	01:25:12.765	12.78	-966.447	-1907.264	-25.630
26745	TEME	41197.970	0.0240896	11.0235	32.6355	202.3154	320.3452
D.718	1994-030D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	EGO (-)	2016-12-25	03:48:12.676	12.84	-971.138	-1165.157	-777.119
23111	TEME	41193.447	0.0042815	13.7533	15.1848	97.0358	317.0732

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.719	1969-036B	Atlas SLV-3A stage 2 (Agena D)					RB
KIAM	EGO (0.03)	2017-01-01	00:00:01.000	12.87	-973.032	-5256.581	3310.517
UI012	J2000	41191.141	0.1039920	9.0180	63.6717	149.2358	168.7750
D.720	2008-003B	Proton-M/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (-)	2016-12-25	05:07:25.098	13.43	-1014.148	-1771.124	-257.171
32479	TEME	41150.030	0.0189337	6.6159	50.8651	152.1139	210.1517
D.721	2006-024C	USA 189 (NRL POTV)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	13.50	-1019.504	-1047.886	-991.122
UI140	J2000	41144.669	0.0006898	7.7971	45.6201	158.3080	153.8370
D.722	2010-063B	Delta 4 second stage (Delta 351, DCSS-5 F05)					RB
KIAM	EGO (0.18)	2017-01-01	00:00:01.000	13.55	-1023.542	-1987.401	-59.683
UI161	J2000	41140.631	0.0234284	3.2175	194.8998	252.0618	124.8390
D.723	2010-002B	Proton-M/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (0.12)	2016-12-25	22:16:58.266	13.57	-1024.453	-1860.432	-188.475
36359	TEME	41139.743	0.0214572	5.0636	61.3912	168.1575	109.9745
D.724	2016-036B	Delta 4 second stage					RB
KIAM	EGO (0.11)	2017-01-01	00:00:01.000	13.67	-1032.101	-1918.020	-146.182
	J2000	41132.072	0.0215384	7.4783	353.3838	190.0822	3.3020
D.725	2013-062B	Proton-M/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (0.18)	2016-12-25	22:43:09.823	14.16	-1068.088	-2112.780	-23.397
39376	TEME	41096.288	0.0250105	2.2104	79.5141	20.4084	3.2796
D.726	2011-048B	Proton-M/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (0.14)	2016-12-25	02:45:47.588	14.36	-1082.686	-2045.134	-120.238
37807	TEME	41081.647	0.0236177	3.6645	65.7291	358.3627	314.9990
D.727	1968-081Y	Titan IIIC fragmentation debris					RD
TLEs	EGO (-)	2016-12-25	06:07:36.668	14.82	-1116.103	-1740.835	-491.370
38698	TEME	41047.080	0.0169331	4.3014	303.8345	269.8519	117.9450
D.728	2007-058C	Proton-M/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (0.09)	2016-12-30	01:29:35.007	14.96	-1126.061	-2108.252	-143.870
32375	TEME	41037.886	0.0234750	6.8254	49.4754	126.9595	255.1775
D.729	2015-075G	Briz-M fragmentation debris					RD
TLEs	EGO (0.06)	2016-12-25	02:16:21.214	15.71	-1180.878	-2189.824	-171.931
41546	TEME	40983.122	0.0243311	0.7668	117.7649	35.4280	231.8857
D.730	2015-075B	Proton-M/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (0.24)	2016-12-25	02:10:16.636	15.72	-1181.435	-2500.395	137.525
41122	TEME	40982.808	0.0322464	0.8397	95.0230	55.0636	233.4129
D.731	1997-027B	INSAT 2D					PL
TLEs	EGO (0.23)	2016-12-31	22:57:12.722	16.27	-1220.865	-2537.585	95.855
24820	TEME	40942.859	0.0323156	13.4246	18.3258	30.7197	307.4907
D.732	2015-075D	Briz-M fragmentation debris					RD
TLEs	EGO (-)	2016-12-08	15:55:19.228	18.12	-1354.821	-2391.581	-318.060
41543	TEME	40809.252	0.0251616	0.7786	99.2182	63.8771	43.3493
D.733	1968-081AD	Titan IIIC fragmentation debris					RD
TLEs	EGO (-)	2016-12-25	16:56:36.715	18.54	-1384.270	-2441.362	-327.179
38703	TEME	40780.040	0.0257899	4.9773	301.7708	143.9722	34.2187

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.734	1968-050J	Titan IIIC third stage (Transtage 16)					RB
TLEs	EGO (-)	2016-12-25	14:32:55.127	19.16	-1428.876	-2125.342	-732.409
3292	TEME	40735.242	0.0162693	1.1847	31.8592	316.2308	73.5164
D.735	2015-075F	Briz-M fragmentation debris					RD
TLEs	EGO (-)	2016-11-09	05:56:28.704	19.30	-1439.118	-2489.221	-389.016
41545	TEME	40725.444	0.0238989	0.6779	113.6041	63.9611	222.0632
D.736	2015-075E	Briz-M fragmentation debris					RD
TLEs	EGO (-)	2016-12-25	11:41:31.504	19.46	-1450.695	-2663.732	-237.658
41544	TEME	40713.322	0.0296157	0.7707	108.2691	55.6887	90.2062
D.737	1966-053J	Titan IIIC third stage (Transtage 11)					RB
TLEs	EGO (-)	2016-12-25	16:35:42.612	23.21	-1715.616	-2394.226	-1037.007
2222	TEME	40448.368	0.0159073	1.9848	57.2465	88.1183	96.1834
D.738	1968-050H	OPS 9348 (IDSCS 27)					PL
TLEs	EGO (-)	2016-12-31	09:43:42.633	23.38	-1727.403	-2051.941	-1402.865
3291	TEME	40436.870	0.0076906	1.0528	358.2650	119.7964	201.2452
D.739	1966-053H	OPS 9317 (IDSCS 7)					PL
TLEs	EGO (-)	2016-12-31	02:16:21.508	23.75	-1753.275	-2084.977	-1421.573
2221	TEME	40410.826	0.0076850	2.1187	56.5218	94.3404	273.9401
D.740	1968-050G	OPS 9347 (IDSCS 26)					PL
TLEs	EGO (-)	2016-12-25	12:40:22.485	24.34	-1795.004	-2053.932	-1536.077
3290	TEME	40369.094	0.0060879	1.0739	3.1660	117.0021	267.0058
D.741	1966-053G	OPS 9316 (IDSCS 6)					PL
TLEs	EGO (-)	2016-12-31	05:17:45.277	24.78	-1825.419	-2088.718	-1562.120
2220	TEME	40338.648	0.0061081	2.2328	56.6408	101.5405	259.1599
D.742	1967-003H	OPS 9328 (IDSCS 15)					PL
TLEs	EGO (-)	2016-12-25	01:49:13.072	25.04	-1843.794	-2123.570	-1564.017
2655	TEME	40320.324	0.0066340	1.8255	49.5375	326.3711	281.8392
D.743	1968-050F	OPS 9346 (IDSCS 25)					PL
TLEs	EGO (-)	2016-12-31	01:59:29.311	25.25	-1858.256	-2053.099	-1663.414
3289	TEME	40305.916	0.0044874	1.0850	11.7106	111.1437	294.7421
D.744	1966-053F	OPS 9315 (IDSCS 5)					PL
TLEs	EGO (-)	2016-12-21	04:48:28.364	25.65	-1886.063	-2094.045	-1678.080
2219	TEME	40278.002	0.0049223	2.3560	57.6263	109.9230	254.9458
D.745	1968-050E	OPS 9345 (IDSCS 24)					PL
TLEs	EGO (-)	2016-12-31	13:42:12.591	25.94	-1905.960	-2055.507	-1756.413
3288	TEME	40258.127	0.0033612	1.1192	14.4974	110.9700	242.2258
D.746	1967-003G	OPS 9327 (IDSCS 14)					PL
TLEs	EGO (-)	2016-12-31	09:34:38.858	26.05	-1914.167	-2134.728	-1693.606
2654	TEME	40250.128	0.0052449	1.9559	52.1863	334.9033	196.9295
D.747	1966-053E	OPS 9314 (IDSCS 4)					PL
TLEs	EGO (-)	2016-12-29	10:51:06.977	26.32	-1932.595	-2100.007	-1765.183
2218	TEME	40231.501	0.0040194	2.4327	57.4335	120.1979	248.5607
D.748	1968-050D	OPS 9344 (IDSCS 23)					PL
TLEs	EGO (-)	2016-12-30	14:22:00.122	26.52	-1946.344	-2054.187	-1838.500
3287	TEME	40217.834	0.0023627	1.1441	19.8099	110.8346	112.9414

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.749	1967-003F	OPS 9326 (IDSCS 13)					PL
TLEs	EGO (-)	2016-12-22	22:40:23.504	26.91	-1973.403	-2150.041	-1796.766
2653	TEME	40190.800	0.0041452	2.0527	52.0662	349.3289	114.8304
D.750	1966-053D	OPS 9313 (IDSCS 3)					PL
TLEs	EGO (-)	2016-12-25	04:55:21.015	26.93	-1974.800	-2110.202	-1839.399
2217	TEME	40189.298	0.0034098	2.5326	58.1609	132.6633	244.5072
D.751	1968-050C	OPS 9343 (IDSCS 22)					PL
TLEs	EGO (-)	2016-12-31	16:47:36.043	26.94	-1975.529	-2054.699	-1896.358
3286	TEME	40188.496	0.0016719	1.1702	22.3991	113.6594	72.6129
D.752	1968-050B	OPS 9342 (IDSCS 21)					PL
TLEs	EGO (-)	2016-12-25	11:41:12.741	27.16	-1990.821	-2055.744	-1925.897
3285	TEME	40173.300	0.0013464	1.1810	23.1858	118.7156	233.3648
D.753	1966-053C	OPS 9312 (IDSCS 2)					PL
TLEs	EGO (-)	2016-12-28	07:18:36.193	27.28	-1998.688	-2118.831	-1878.545
2216	TEME	40165.437	0.0031180	2.5838	58.2761	142.0259	237.9624
D.754	1968-050A	OPS 9341 (IDSCS 20)					PL
TLEs	EGO (-)	2016-12-30	20:23:49.129	27.29	-1999.553	-2057.486	-1941.620
3284	TEME	40164.539	0.0011540	1.1917	22.5175	119.9895	97.8304
D.755	1966-053B	OPS 9311 (IDSCS 1)					PL
TLEs	EGO (-)	2016-12-31	08:48:38.743	27.49	-2013.234	-2130.746	-1895.722
2215	TEME	40150.850	0.0030040	2.6174	58.3485	148.4421	259.5417
D.756	1967-003E	OPS 9325 (IDSCS 12)					PL
TLEs	EGO (-)	2016-12-30	21:01:55.534	27.61	-2021.609	-2175.563	-1867.655
2652	TEME	40142.638	0.0035881	2.1520	53.8759	3.3980	123.2892
D.757	1966-053A	GGTS 1					PL
TLEs	EGO (-)	2016-12-31	05:39:28.734	27.73	-2030.141	-2135.946	-1924.336
2207	TEME	40132.874	0.0029868	2.6286	57.8692	162.0931	194.2969
D.758	1967-003D	OPS 9324 (IDSCS 11)					PL
TLEs	EGO (-)	2016-12-29	04:30:28.315	28.19	-2061.770	-2204.587	-1918.952
2651	TEME	40102.381	0.0032874	2.2230	53.3951	20.8179	283.2878
D.759	1967-003C	OPS 9323 (IDSCS 10)					PL
TLEs	EGO (-)	2016-12-31	21:27:26.461	28.61	-2090.604	-2233.267	-1947.941
2650	TEME	40073.578	0.0032642	2.2799	53.7522	33.6961	112.8396
D.760	1967-003B	OPS 9322 (IDSCS 9)					PL
TLEs	EGO (-)	2016-12-25	05:44:11.519	28.83	-2105.388	-2250.263	-1960.513
2649	TEME	40058.704	0.0033143	2.2970	53.8248	40.4989	252.6786
D.761	1967-003A	OPS 9321 (IDSCS 8)					PL
TLEs	EGO (-)	2016-12-31	07:27:20.073	28.96	-2114.026	-2262.881	-1965.171
2645	TEME	40050.179	0.0033828	2.3242	54.9153	42.4822	209.6541
D.762	1967-066G	Titan IIIC third stage (Transtage 14)					RB
TLEs	EGO (-)	2016-12-25	05:24:08.868	31.08	-2258.760	-2564.288	-1953.232
2868	TEME	39905.468	0.0077776	5.6406	298.3307	267.5806	14.6182
D.763	1967-066F	DODGE 1					PL
TLEs	EGO (-)	2016-12-25	07:37:15.139	32.02	-2322.461	-2520.956	-2123.965
2867	TEME	39841.694	0.0053679	5.5343	297.2310	289.0006	262.3699

D.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	$\bar{\lambda}$	$\bar{\Delta a}$	$\bar{\Delta r_p}$	$\bar{\Delta r_a}$
S-ID	Frame	a	e	i	Ω	ω	λ
D.764	1967-066E	LES 5					PL
TLEs	EGO (-)	2016-12-24	21:24:59.819	32.92	-2383.520	-2587.140	-2179.899
2866	TEME	39779.186	0.0058038	5.3935	296.5810	308.1127	51.9500
D.765	1967-066D	OPS 9334 (IDSCS 19, DATS)					PL
TLEs	EGO (-)	2016-12-29	05:41:34.293	33.66	-2433.042	-2648.597	-2217.487
2865	TEME	39731.142	0.0059993	5.2867	295.9161	319.3207	218.3949
D.766	1967-066C	OPS 9333 (IDSCS 18)					PL
TLEs	EGO (-)	2016-12-25	06:21:25.829	34.24	-2472.049	-2706.595	-2237.503
2864	TEME	39692.317	0.0065359	5.2477	295.4036	328.2205	158.1953
D.767	1967-066B	OPS 9332 (IDSCS 17)					PL
TLEs	EGO (-)	2016-12-25	15:23:52.960	34.64	-2498.799	-2750.338	-2247.261
2863	TEME	39665.465	0.0069446	5.1539	295.1794	333.5478	196.9346
D.768	1967-066A	OPS 9331 (IDSCS 16)					PL
TLEs	EGO (-)	2016-12-25	22:15:03.187	34.85	-2512.836	-2770.703	-2254.968
2862	TEME	39651.320	0.0071147	5.1618	294.8868	336.2044	39.8064
D.769	1992-006C	IABS					RB
KIAM	EGO (-)	2017-01-01	00:00:01.000	37.83	-2710.525	-5216.388	-204.662
UI132	J2000	39453.648	0.0635141	11.2957	356.0080	352.5455	306.9220
D.770	2014-082B	Proton-M/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (-)	2016-12-25	20:12:32.159	39.82	-2841.164	-5283.901	-398.427
40346	TEME	39322.906	0.0615468	1.6730	96.1290	68.1911	57.4336
D.771	2012-061D	Proton-M/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (0.12)	2016-12-25	21:43:14.869	43.96	-3109.763	-6221.309	1.784
38980	TEME	39054.494	0.0792003	3.2492	66.5507	29.8966	5.6083
D.772	2011-035D	Proton-M/Briz-M fourth stage (Briz-M)					RB
TLEs	EGO (-)	2016-12-25	15:15:19.431	44.78	-3162.282	-6006.105	-318.460
37751	TEME	39001.861	0.0739126	3.9404	64.5009	321.2548	226.5866
D.773	1974-033F	SMS 1 AKM (SVM-5)					PM
TLEs	EGO (-)	2016-12-25	20:45:24.084	57.28	-3943.451	-4941.332	-2945.569
9998	TEME	38221.079	0.0252422	1.8657	218.7951	158.6091	173.1212

4.5 Objects in a Libration Orbit around the Eastern Stable Point

The following list contains 123 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 ($f_{\text{IADC}}^{\text{GEO}}$)	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)	2017-01-01	00:00:01.000	738.60	6.35	71.81	78.16	
UI043	J2000	42166.233	0.0021290	8.4003	308.5622	181.7472	74.3380	
L1.2	1993-039A	Galaxy IV						PL
TLEs	GEO (1.00)	2016-12-31	15:05:33.058	738.65	6.89	71.54	78.43	
22694	TEME	42162.692	0.0016446	14.0201	24.8997	229.2246	74.1097	
L1.3	2000-036A	Cosmos-2371						PL
TLEs	GEO (1.00)	2016-12-31	21:22:12.560	739.52	9.86	70.05	79.91	
26394	TEME	42162.481	0.0003066	11.6966	34.6574	196.0053	78.8056	
L1.4	1990-061A	Cosmos-2085						PL
TLEs	GEO (1.00)	2016-12-31	15:15:04.722	739.60	10.06	69.95	80.00	
20693	TEME	42161.546	0.0005785	15.0447	6.4696	206.4262	77.9904	
L1.5	1988-066A	Cosmos-1961						PL
TLEs	GEO (1.00)	2016-12-31	22:40:14.311	739.69	10.35	69.80	80.15	
19344	TEME	42164.371	0.0002128	14.8553	359.4514	298.8148	69.8774	
L1.6	1994-087A	Raduga 32						PL
TLEs	GEO (1.00)	2016-12-23	03:05:46.760	739.70	10.38	69.79	80.17	
23448	TEME	42165.173	0.0010438	14.4127	20.9312	201.5651	70.0765	
L1.7	1991-010A	Cosmos-2133						PL
TLEs	GEO (1.00)	2016-12-30	23:12:41.563	739.84	10.73	69.61	80.34	
21111	TEME	42164.486	0.0002133	14.6960	12.1761	151.5440	69.6955	
L1.8	1984-022A	Cosmos-1540						PL
TLEs	GEO (1.00)	2016-12-25	23:28:20.779	739.92	10.85	69.55	80.40	
14783	TEME	42167.696	0.0007925	15.3677	340.6767	199.2779	77.3007	
L1.9^m	1995-054A	Luch 1-1						PL
TLEs	GEO (1.00)	2016-12-25	15:12:41.819	740.00	5.00	72.50	77.50	
23680	TEME	42162.871	0.0001645	13.7879	29.6197	64.3154	74.8290	
L1.10	1981-018A	Comstar 1D (D-4)						PL
TLEs	GEO (1.00)	2016-12-23	22:59:25.042	740.05	11.27	69.34	80.61	
12309	TEME	42161.973	0.0005332	14.3104	343.1068	292.4517	79.2158	
L1.11	2008-033A	Cosmos-2440						PL
TLEs	GEO (1.00)	2016-12-25	19:51:21.977	740.06	11.25	69.35	80.60	
33108	TEME	42166.410	0.0007739	4.3500	57.6746	187.3255	70.3671	
L1.12	1998-025A	Cosmos-2350						PL
TLEs	GEO (1.00)	2016-12-24	17:13:01.655	740.24	11.74	69.10	80.84	
25315	TEME	42168.294	0.0002762	12.2181	31.2099	130.1904	76.9906	

L1.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	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)	2016-12-30	02:08:46.510	740.42	12.17	68.89	81.06
22836	TEME	42164.514	0.0007389	14.7263	17.1579	238.5459	69.0388
L1.14	1990-051A	INSAT 1D					PL
TLEs	GEO (1.00)	2016-12-25	16:03:00.355	740.47	12.28	68.83	81.11
20643	TEME	42166.088	0.0012198	14.2251	24.0465	123.0942	68.9642
L1.15	1984-031A	Cosmos-1546					PL
TLEs	GEO (1.00)	2016-12-31	15:47:51.071	740.95	13.35	68.29	81.64
14867	TEME	42160.398	0.0026343	14.2630	343.1060	283.0858	75.0887
L1.16	1994-069A	Elektro 1					PL
TLEs	GEO (1.00)	2016-12-31	19:32:44.542	741.39	14.27	67.83	82.10
23327	TEME	42168.946	0.0009389	14.8042	19.8143	195.5196	73.1927
L1.17	1982-044A	Cosmos-1366					PL
TLEs	GEO (1.00)	2016-12-29	23:03:54.785	741.45	14.40	67.76	82.17
13177	TEME	42168.935	0.0005112	14.9149	335.1782	343.9225	72.5413
L1.18	1983-028A	Raduga 12					PL
TLEs	GEO (1.00)	2016-12-24	17:53:12.558	744.81	19.92	64.98	84.90
13974	TEME	42158.806	0.0004345	14.2394	339.5716	273.9946	80.0257
L1.19	1981-102A	Raduga 10					PL
TLEs	GEO (1.00)	2016-12-25	20:05:12.645	745.39	20.75	64.56	85.31
12897	TEME	42169.891	0.0003627	13.6081	331.2503	192.9417	81.5109
L1.20	1979-035A	Raduga 5					PL
TLEs	GEO (1.00)	2016-12-23	22:50:18.591	745.81	21.29	64.29	85.58
11343	TEME	42171.272	0.0001315	12.8241	323.5202	230.6716	72.6084
L1.21	1975-123A	Raduga 1					PL
TLEs	GEO (1.00)	2016-12-31	19:18:16.816	746.00	21.52	64.17	85.69
8513	TEME	42157.756	0.0006272	10.7844	314.1938	193.3081	72.7285
L1.22	1984-016A	Raduga 14					PL
TLEs	GEO (1.00)	2016-12-25	23:30:37.137	747.26	23.14	63.36	86.49
14725	TEME	42172.051	0.0002016	14.2247	342.6116	247.2160	74.4174
L1.23	1976-092A	Raduga 2					PL
TLEs	GEO (1.00)	2016-12-25	20:05:12.645	747.64	23.52	63.16	86.68
9416	TEME	42164.825	0.0030663	11.4022	316.1353	293.5537	86.3565
L1.24	1970-046A	OPS 5346 (Rhyolite 1)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	748.42	24.10	62.87	86.97
UI035	J2000	42171.651	0.0002985	5.9270	301.8257	173.2091	71.0640
L1.25	2006-053D	Fengyun 2D operational debris (S-VISSR radiometer cover?)					PD
TLEs	EGO (0.39)	2016-12-22	17:04:04.318	748.56	24.62	62.61	87.23
33458	TEME	42160.505	0.0081608	5.6292	59.9142	290.8144	85.6182
L1.26^m	1977-080A	SIRIO 1					PL
TLEs	GEO (1.00)	2016-12-31	20:09:37.937	750.00	1.50	74.40	75.90
10294	TEME	42164.301	0.0003350	13.8293	334.1223	45.7092	74.4710
L1.27	1988-014A	DFH-2A 2 (Chinasat 1, Zhongxing 1, ZX 1, STTW 2)					PL
TLEs	GEO (1.00)	2016-12-30	13:20:30.942	751.67	27.95	60.92	88.87
18922	TEME	42173.053	0.0001769	15.1230	9.9699	123.9586	70.4556

L1.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	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)	2016-12-31	21:17:52.358	754.24	30.37	59.69	90.07
11440	TEME	42155.678	0.0007433	13.1056	325.5834	265.4687	81.5687
L1.29	2008-033D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-25	20:05:12.645	755.25	31.27	59.24	90.51
33111	TEME	42169.595	0.0033876	4.3184	57.7286	249.8300	88.6133
L1.30	2003-053B	Yamal 200 N1 (Yamal 201)					PL
TLEs	GEO (1.00)	2016-12-25	21:54:14.704	755.52	31.49	59.13	90.61
28094	TEME	42176.013	0.0007341	1.9333	80.7010	201.3263	74.7197
L1.31	1983-118F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	EGO (0.89)	2016-12-25	21:11:12.475	759.03	34.44	57.63	92.06
14548	TEME	42155.780	0.0048492	14.1847	342.6540	252.8021	84.5540
L1.32	1997-070A	Kupon 1					PL
TLEs	GEO (1.00)	2016-12-30	14:55:26.260	759.57	34.86	57.41	92.27
25045	TEME	42157.909	0.0008261	14.0817	24.4536	229.9744	61.1432
L1.33	1988-063A	INSAT 1C					PL
TLEs	GEO (1.00)	2016-12-25	20:55:32.370	763.76	37.98	55.82	93.81
19330	TEME	42152.954	0.0000558	14.9578	358.0132	285.3319	81.3186
L1.34	1985-102A	Cosmos-1700					PL
TLEs	GEO (1.00)	2016-12-24	14:19:29.409	765.41	39.14	55.23	94.38
16199	TEME	42174.073	0.0005134	14.5104	349.3564	192.2033	62.5137
L1.35	1977-038A	OPS 9751 (CANYON 7)					PL
KIAM	EGO (0.02)	2017-01-01	00:00:01.000	769.10	41.94	53.81	95.74
UI086	J2000	42153.490	0.1239047	11.5382	349.7389	50.2106	62.2740
L1.36	1990-112A	Raduga 26					PL
TLEs	GEO (1.00)	2016-12-25	11:19:37.758	772.48	43.74	52.88	96.63
21016	TEME	42168.161	0.0002524	14.9985	7.8890	314.2403	96.2547
L1.37	1990-054A	Gorizont 20					PL
TLEs	GEO (1.00)	2016-12-31	18:33:23.781	772.76	43.90	52.81	96.70
20659	TEME	42173.721	0.0006403	15.1043	6.2155	174.9679	58.6011
L1.38	1984-041A	Gorizont 9					PL
TLEs	GEO (1.00)	2016-12-31	02:44:37.118	773.29	44.19	52.66	96.85
14940	TEME	42161.695	0.0007143	14.2518	343.7397	216.2820	53.2386
L1.39	1976-092F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	GEO (1.00)	2016-12-25	17:53:12.548	773.44	44.30	52.60	96.90
17872	TEME	42154.047	0.0012132	11.3802	316.2894	91.7975	89.8944
L1.40	1976-107A	Ekran 1					PL
TLEs	EGO (0.59)	2016-12-25	19:12:08.549	773.45	44.30	52.60	96.90
9503	TEME	42150.963	0.0059379	11.4817	316.4604	79.3647	82.8975
L1.41	1979-087A	Ekran 4					PL
TLEs	GEO (1.00)	2016-12-25	15:05:13.803	774.02	44.58	52.46	97.04
11561	TEME	42157.491	0.0002720	13.0223	324.9702	354.8826	55.6590
L1.42	1987-096A	Cosmos-1897					PL
TLEs	GEO (1.00)	2016-12-30	17:55:25.357	774.67	45.02	52.23	97.25
18575	TEME	42167.430	0.0002196	14.7997	356.8018	304.9142	52.7280

L1.nn	COSPAR	Name						Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}	
S-ID	Frame	a	e	i	Ω	ω	λ	
L1.43	1990-011A	DFH-2A 4 (Chinasat 3, Zhongxing 3, ZX 3, STTW 4)						PL
TLEs	GEO (1.00)	2016-12-24	14:13:55.817	776.33	45.97	51.75	97.72	
20473	TEME	42157.137	0.0000993	14.9434	16.9625	187.0594	55.1269	
L1.44	1980-104A	Ekran 6						PL
TLEs	GEO (1.00)	2016-12-25	21:51:14.516	776.37	46.04	51.71	97.75	
12120	TEME	42175.204	0.0008899	13.3846	328.5647	313.0026	90.5672	
L1.45	2003-060D	Proton-K/DM-2M fourth stage (Blok DM-2M)						RB
TLEs	GEO (1.00)	2016-12-25	20:55:32.489	779.83	47.97	50.72	98.69	
28139	TEME	42179.034	0.0017828	10.4103	39.6094	157.5607	82.5162	
L1.46	1992-074A	Ekran-M 20						PL
TLEs	GEO (1.00)	2016-12-31	23:13:56.076	781.54	48.88	50.26	99.14	
22210	TEME	42179.071	0.0004433	14.8498	14.2825	181.8241	67.3219	
L1.47	1984-016F	Proton-K/DM fourth stage (Blok-DM)						RB
TLEs	GEO (1.00)	2016-12-25	22:14:18.106	781.85	49.04	50.18	99.21	
17874	TEME	42177.691	0.0035664	14.2195	342.6842	139.1374	62.3958	
L1.48	1977-092A	Ekran 2						PL
TLEs	GEO (1.00)	2016-12-25	19:47:08.470	782.68	49.48	49.95	99.43	
10365	TEME	42149.469	0.0042047	12.0341	318.9600	275.3872	68.9619	
L1.49	1979-015A	Ekran 3						PL
TLEs	GEO (1.00)	2016-12-24	23:55:42.623	784.56	50.44	49.46	99.90	
11273	TEME	42170.665	0.0042077	12.6853	322.9298	271.9881	51.2833	
L1.50	1981-061A	Ekran 7						PL
TLEs	GEO (1.00)	2016-12-31	18:58:42.667	785.33	50.85	49.24	100.10	
12564	TEME	42148.651	0.0006207	13.5265	330.0788	303.5609	78.9876	
L1.51	1990-116A	Raduga 1-2						PL
TLEs	GEO (1.00)	2016-12-31	16:05:16.518	786.65	51.54	48.89	100.43	
21038	TEME	42156.110	0.0002132	15.0311	7.9406	7.6060	97.0499	
L1.52	1994-008A	Raduga 1-3						PL
TLEs	GEO (1.00)	2016-12-25	00:16:52.685	787.33	51.84	48.74	100.58	
22981	TEME	42165.061	0.0004004	14.6965	18.4195	228.0045	48.6668	
L1.53	—	Fengyun 2G debris (VISSR cover?)						PM
KIAM	EGO (0.40)	2017-01-01	00:00:01.000	790.45	53.52	47.87	101.40	
UU074	J2000	42158.667	0.0080626	0.6804	267.5187	351.0726	99.8580	
L1.54	1983-100A	Ekran 11						PL
TLEs	GEO (1.00)	2016-12-25	22:10:41.602	792.17	54.20	47.53	101.72	
14377	TEME	42149.096	0.0006422	13.9843	337.8595	257.1023	63.9690	
L1.55	—	—						—
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	796.15	55.81	46.70	102.51	
UI044	J2000	42175.194	0.0040878	13.7018	334.1486	1.9504	96.0880	
L1.56	1986-010A	DFH-2A 1 (STTW 1)						PL
TLEs	GEO (1.00)	2016-12-24	21:47:09.466	796.59	56.27	46.46	102.73	
16526	TEME	42157.184	0.0005396	14.8082	353.9734	230.4276	100.4117	
L1.57	1996-058A	Ekspress 2 (Ekspress 12L)						PL
TLEs	GEO (1.00)	2016-12-25	19:56:36.115	797.48	56.62	46.28	102.90	
24435	TEME	42152.077	0.0010704	14.1306	24.3318	251.4370	55.5724	

L1.nn	COSPAR	Name						Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}	
S-ID	Frame	a	e	i	Ω	ω	λ	
L1.58	2001-045D	Proton-K/DM-2 fourth stage (Blok DM-2)						RB
TLEs	GEO (1.00)	2016-12-24	20:02:16.015	799.90	57.73	45.71	103.44	
26939	TEME	42172.866	0.0026856	10.9125	38.9922	290.3932	100.2584	
L1.59	2005-010F	Proton-K/DM-2M fourth stage (Blok DM-2M)						RB
TLEs	GEO (1.00)	2016-12-31	15:40:56.890	802.17	58.70	45.21	103.91	
28634	TEME	42181.225	0.0025383	9.3846	42.9695	190.4035	86.9198	
L1.60	1982-093A	Ekran 9						PL
TLEs	GEO (1.00)	2016-12-31	20:44:46.917	805.96	60.30	44.38	104.68	
13554	TEME	42155.639	0.0028997	13.6770	334.1277	276.2421	100.7580	
L1.61	1989-098A	Raduga 24						PL
TLEs	GEO (1.00)	2016-12-25	12:57:10.630	806.50	60.51	44.28	104.78	
20367	TEME	42146.165	0.0005364	15.2412	4.3820	230.4767	81.3142	
L1.62	1994-012A	Raduga 31						PL
TLEs	GEO (1.00)	2016-12-31	22:45:52.228	808.08	61.15	43.94	105.09	
23010	TEME	42180.124	0.0001915	14.6684	18.3016	254.2427	91.7013	
L1.63	2000-049A	Raduga 1-5						PL
TLEs	GEO (1.00)	2016-12-25	23:35:28.790	808.46	61.31	43.86	105.17	
26477	TEME	42163.652	0.0003303	11.5828	35.2395	232.3976	105.5935	
L1.64	—	Fengyun 2A debris (VISSR cover?)						PM
KIAM	EGO (0.24)	2017-01-01	00:00:01.000	811.30	62.81	43.08	105.90	
UU061	J2000	42144.667	0.0130086	14.0380	27.3120	320.2908	77.5080	
L1.65^m	2004-042D	Fengyun 2C operational debris (S-VISSR radiometer cover?)						PM
TLEs	EGO (0.50)	2016-12-24	17:41:54.002	816.00	62.80	43.40	106.20	
40000	TEME	42166.950	0.0067515	8.9272	43.0776	332.6826	43.8748	
L1.66^m	2001-037D	Proton-K/DM-2 fourth stage (Blok DM-2)						RB
TLEs	GEO (1.00)	2016-12-31	05:39:37.300	820.00	87.00	30.70	117.70	
26895	TEME	42169.687	0.0018205	10.0644	39.4159	345.0919	31.6106	
L1.67	1980-016A	Raduga 6						PL
TLEs	GEO (1.00)	2016-12-24	19:54:12.810	820.53	65.93	41.47	107.40	
11708	TEME	42183.331	0.0005072	13.0661	325.9569	243.6908	86.6613	
L1.68	—	Fengyun 2B debris (VISSR cover?)						PM
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	821.48	66.00	41.44	107.44	
UU064	J2000	42179.554	0.0008697	12.3214	34.7809	349.0642	53.9650	
L1.69	2007-018A	NigComSat 1						PL
TLEs	GEO (1.00)	2016-12-31	19:17:15.654	822.46	66.65	41.10	107.75	
31395	TEME	42170.845	0.0002529	6.3733	54.7561	141.6998	106.3467	
L1.70	1974-060A	Molniya 1-S						PL
TLEs	GEO (1.00)	2016-12-31	15:25:53.693	822.57	66.68	41.08	107.76	
7392	TEME	42144.530	0.0007528	9.4754	309.4975	176.7325	81.1200	
L1.71	1978-039A	Yuri 1 (BSE)						PL
TLEs	GEO (1.00)	2016-12-31	15:47:47.665	825.30	67.63	40.59	108.22	
10792	TEME	42185.197	0.0019100	12.9265	324.3829	233.1248	75.6429	
L1.72	1986-044A	Gorizont 12						PL
TLEs	GEO (1.00)	2016-12-31	22:50:12.720	831.11	69.67	39.53	109.20	
16769	TEME	42146.527	0.0007049	14.5732	351.3303	245.3407	92.5538	

L1.nn	COSPAR	Name						Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}	
S-ID	Frame	a	e	i	Ω	ω	λ	
L1.73	1979-105A	Gorizont 3						PL
TLEs	GEO (1.00)	2016-12-25	20:05:12.645	832.30	70.04	39.34	109.38	
11648	TEME	42185.351	0.0012047	13.2139	326.8204	180.2440	81.8483	
L1.74	1978-073A	Raduga 4						PL
TLEs	GEO (1.00)	2016-12-25	21:53:59.536	843.13	73.57	37.50	111.07	
10987	TEME	42176.600	0.0013623	12.4568	321.2525	289.2255	104.7836	
L1.75	1988-111A	DFH-2A 3 (Chinasat 2, Zhongxing 2, ZX 2, STTW 3)						PL
TLEs	GEO (1.00)	2016-12-31	14:51:31.299	844.97	74.12	37.21	111.33	
19710	TEME	42177.606	0.0001963	14.9754	16.0477	131.9899	45.5071	
L1.76	—	—						—
KIAM	EGO (0.66)	2017-01-01	00:00:01.000	853.79	76.53	35.95	112.48	
UI041	J2000	42182.065	0.0055658	13.4447	334.6969	284.8833	51.9220	
L1.77	1975-097A	Cosmos-775						PL
TLEs	GEO (1.00)	2016-12-25	17:17:51.616	859.10	78.32	35.02	113.34	
8357	TEME	42173.344	0.0007782	10.4138	312.3898	55.2273	38.5259	
L1.78	1989-081A	Gorizont 19						PL
TLEs	GEO (1.00)	2016-12-31	02:46:47.498	860.03	78.58	34.88	113.46	
20263	TEME	42185.203	0.0008013	14.9140	3.2770	231.5177	58.0456	
L1.79	1999-010A	Raduga 1-4						PL
TLEs	GEO (1.00)	2016-12-25	16:33:32.551	860.74	78.79	34.77	113.56	
25642	TEME	42186.945	0.0007243	13.9237	33.2189	205.8000	85.2217	
L1.80	1977-071A	Raduga 3						PL
TLEs	GEO (1.00)	2016-12-25	19:50:43.904	862.97	79.43	34.43	113.87	
10159	TEME	42141.181	0.0009514	11.9444	318.4048	209.4803	69.5820	
L1.81	1981-069A	Raduga 9						PL
TLEs	GEO (1.00)	2016-12-25	15:06:56.990	863.23	79.49	34.41	113.89	
12618	TEME	42186.303	0.0002620	13.5639	330.5177	279.3532	60.7871	
L1.82	1996-058D	Proton-K/DM-2M fourth stage (Blok DM-2M)						RB
TLEs	GEO (1.00)	2016-12-25	21:45:38.545	867.78	80.75	33.74	114.49	
24438	TEME	42148.899	0.0005025	14.4529	21.1950	15.2554	45.3547	
L1.83	1994-002A	Gals 1						PL
TLEs	GEO (1.00)	2016-12-25	19:10:12.457	869.57	81.24	33.49	114.73	
22963	TEME	42141.023	0.0009340	14.1711	23.8603	155.4840	83.2806	
L1.84	1984-078F	Proton-K/DM fourth stage (Blok-DM)						RB
TLEs	GEO (1.00)	2016-12-24	21:43:27.715	880.28	84.19	31.93	116.12	
15181	TEME	42174.943	0.0020211	14.3281	345.0644	127.0284	112.3968	
L1.85	—	Fengyun 2F debris (VISSR cover?)						PM
KIAM	EGO (0.23)	2017-01-01	00:00:01.000	882.70	84.63	31.70	116.33	
UU071	J2000	42165.478	0.0133326	1.4823	77.4464	204.8199	116.2620	
L1.86	1997-071B	Cakrawatra 1						PL
TLEs	GEO (1.00)	2016-12-25	16:23:56.548	886.34	85.69	31.14	116.83	
25050	TEME	42139.304	0.0006362	9.0053	44.2106	221.7104	77.1843	
L1.87^m	1991-087A	Raduga 28						PL
TLEs	GEO (1.00)	2016-12-23	16:33:48.355	905.00	87.90	30.10	118.00	
21821	TEME	42148.613	0.0001330	15.0185	11.3301	152.8732	107.1675	

L1.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L1.88	1989-030A	Raduga 23					PL
TLEs	GEO (1.00)	2016-12-25	17:14:56.652	907.35	90.42	28.64	119.06
19928	TEME	42178.467	0.0016887	14.8669	1.7905	121.8014	37.5843
L1.89	1982-031A	INSAT 1A					PL
TLEs	GEO (1.00)	2016-12-31	23:08:26.383	919.99	93.29	27.11	120.40
13129	TEME	42189.055	0.0022297	13.7832	333.6822	314.2573	91.1216
L1.90	1974-060F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	GEO (1.00)	2016-12-25	22:26:23.992	926.24	94.55	26.44	120.99
20836	TEME	42190.003	0.0014330	9.4666	309.3353	114.6299	60.3959
L1.91	1990-061D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-30	04:05:17.044	936.51	96.62	25.33	121.95
20696	TEME	42176.393	0.0031110	15.0215	6.4392	130.2595	32.0963
L1.92	1975-055A	OPS 4966 (CANYON 6)					PL
KIAM	EGO (0.02)	2017-01-01	00:00:01.000	939.62	97.53	24.84	122.37
UI060	J2000	42137.336	0.1316135	18.4876	309.7211	312.8155	63.7740
L1.93^m	2008-066D	Fengyun 2E operational debris (S-VISSR radiometre cover)					PD
TLEs	EGO (0.27)	2016-12-25	13:23:09.865	954.80	100.40	23.30	123.70
40987	TEME	42169.065	0.0113708	3.5885	59.9099	252.4949	124.3490
L1.94	1997-021A	DFH 3-2 (Chinasat 6, Zhongxing 6, ZX 6)					PL
TLEs	GEO (1.00)	2016-12-25	17:19:37.591	989.49	106.07	20.22	126.29
24798	TEME	42145.073	0.0002272	10.3508	39.6271	23.1767	38.4623
L1.95	1986-090D	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	GEO (1.00)	2016-12-25	14:51:00.102	1003.17	108.24	19.04	127.27
17125	TEME	42145.939	0.0005261	14.6608	353.0085	102.3711	35.7157
L1.96	2002-051A	Eutelsat 33B (Eutelsat 25C, Eutelsat 70A, Eutelsat W5)					PL
TLEs	GEO (1.00)	2016-12-25	21:47:04.854	1007.79	109.11	18.56	127.67
27554	TEME	42174.114	0.0014794	1.0248	88.5409	214.7082	124.2698
L1.97	1991-014A	Raduga 27					PL
TLEs	GEO (1.00)	2016-12-25	05:44:55.677	1018.75	110.57	17.75	128.33
21132	TEME	42160.194	0.0003420	15.5494	8.2560	253.4966	18.4556
L1.98	1984-063A	Raduga 15					PL
TLEs	GEO (1.00)	2016-12-20	20:13:19.919	1025.50	111.59	17.19	128.78
15057	TEME	42156.569	0.0002324	14.2858	343.6350	202.8575	126.8748
L1.99	2004-010A	Raduga 1					PL
TLEs	GEO (1.00)	2016-12-25	12:42:38.982	1029.67	112.16	16.87	129.04
28194	TEME	42176.553	0.0005250	9.4539	47.8248	187.9863	123.2487
L1.100	2009-018A	Beidou DW 2					PL
TLEs	EGO (0.29)	2016-12-31	12:47:01.290	1032.52	112.62	16.62	129.24
34779	TEME	42166.493	0.0107661	5.0416	60.2842	196.1429	128.0308
L1.101	1996-040B	Turksat 1C					PL
TLEs	GEO (1.00)	2016-12-25	17:47:43.128	1036.38	113.10	16.35	129.45
23949	TEME	42157.926	0.0006489	6.8727	52.3316	158.0733	18.8143
L1.102	1977-092H	Ekran 2 fragmentation debris					PD
TLEs	GEO (1.00)	2016-12-25	18:09:45.993	1041.66	113.80	15.96	129.76
11581	TEME	42174.690	0.0004660	11.9506	318.6837	184.3284	21.5233

L1.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	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)	2016-12-25	23:18:43.627	1062.00	116.00	17.00	133.00
37950	TEME	42146.952	0.0001883	0.8244	89.8843	199.6019	115.8196
L1.104	2003-015F	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-24	15:05:06.326	1064.21	116.79	14.29	131.08
27780	TEME	42144.115	0.0010630	8.7931	43.8620	292.0022	113.3566
L1.105	1983-089B	INSAT 1B					PL
TLEs	GEO (1.00)	2016-12-25	21:38:42.072	1066.96	117.13	14.09	131.23
14318	TEME	42171.164	0.0010586	14.9008	357.3336	186.7622	130.0422
L1.106	2001-037A	Cosmos-2379					PL
TLEs	GEO (1.00)	2016-12-25	12:46:37.600	1093.64	120.34	12.27	132.62
26892	TEME	42148.238	0.0007101	10.0897	39.3038	184.0218	120.9745
L1.107	1995-054D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-25	21:44:05.648	1103.11	121.40	11.67	133.07
23683	TEME	42190.588	0.0016578	13.7697	29.5466	0.5627	103.2657
L1.108	1993-013A	Raduga 29					PL
TLEs	GEO (1.00)	2016-12-22	21:03:24.280	1114.56	122.67	10.94	133.61
22557	TEME	42144.130	0.0001416	14.8505	15.4486	233.4503	115.9752
L1.109	1977-108A	Meteosat 1					PL
TLEs	GEO (1.00)	2016-12-22	20:46:57.304	1117.55	122.98	10.76	133.74
10489	TEME	42155.681	0.0014030	12.6584	322.8099	340.1499	15.6412
L1.110	1988-095A	Raduga 22					PL
TLEs	GEO (1.00)	2016-12-25	17:18:10.645	1136.19	124.91	9.64	134.55
19596	TEME	42188.295	0.0002511	14.8667	0.1258	164.6886	39.6649
L1.111	1984-035A	DFH-2 2 (STTW T2)					PL
TLEs	GEO (1.00)	2016-12-31	20:30:39.517	1136.81	124.98	9.60	134.58
14899	TEME	42182.660	0.0005223	14.3673	348.3361	119.1848	120.1822
L1.112	1995-063D	Proton-K/DM-2 fourth stage (Blok DM-2)					RB
TLEs	GEO (1.00)	2016-12-30	21:34:36.377	1161.99	127.44	8.15	135.59
23720	TEME	42132.934	0.0039090	14.6854	18.4212	102.6237	65.2090
L1.113	2007-054A	USA 197 (DSP F23, DSP Block 5(DSP-1) F23)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	1189.68	129.83	6.72	136.56
UI141	J2000	42180.830	0.0004796	3.8138	74.0937	176.7591	123.5760
L1.114	1990-102A	Gorizont 22					PL
TLEs	GEO (1.00)	2016-12-25	17:23:41.316	1302.21	138.17	1.52	139.69
20953	TEME	42167.604	0.0007247	14.9792	7.3614	257.4009	2.0031
L1.115	1998-029B	Titan IVB third stage (Centaur TC-18)					RB
KIAM	EGO (0.83)	2017-01-01	00:00:01.000	1332.08	139.78	0.46	140.24
UI027	J2000	42197.316	0.0045920	10.5658	355.1994	103.1081	84.8240
L1.116	1972-101A	OPS 9390 (CANYON 5)					PL
KIAM	EGO (-)	2017-01-01	00:00:01.000	1350.56	140.89	359.71	140.60
UI138	J2000	42172.276	0.1368247	17.1685	304.5210	349.6121	136.7860
L1.117	1974-094A	Skynet 2B					PL
TLEs	GEO (1.00)	2016-12-20	00:56:37.527	1356.56	141.23	359.48	140.71
7547	TEME	42186.034	0.0002530	11.2759	319.8095	297.7899	28.9742

L1.nn	COSPAR	Name						Type
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}	
S-ID	Frame	a	e	i	Ω	ω	λ	
L1.118	1978-035A	Intelsat IVA F-6						PL
TLEs	GEO (1.00)	2016-12-29	03:40:03.171	1407.29	143.63	357.82	141.45	
10778	TEME	42154.738	0.0009965	14.3180	343.6272	239.6191	7.4380	
L1.119	1970-032A	Intelsat III F-7						PL
TLEs	GEO (1.00)	2016-12-24	13:55:24.779	1462.22	145.79	356.25	142.04	
4376	TEME	42162.986	0.0006517	5.9397	299.3829	305.1112	357.1541	
L1.120	1993-062D	Proton-K/DM-2 fourth stage (Blok DM-2)						RB
TLEs	GEO (1.00)	2016-12-25	05:39:59.323	1532.02	147.99	354.59	142.57	
22839	TEME	42162.612	0.0008420	14.6941	17.0759	332.7140	353.8840	
L1.121	1992-088A	Cosmos-2224						PL
TLEs	GEO (1.00)	2016-12-31	20:13:01.179	1643.08	150.46	352.59	143.05	
22269	TEME	42152.903	0.0008022	14.2858	17.1972	215.5714	135.7769	
L1.122	1985-035B	Telecom 1B						PL
TLEs	GEO (1.00)	2016-12-30	05:34:14.371	1677.99	151.04	352.10	143.14	
15678	TEME	42165.864	0.0005849	14.6599	351.5478	272.1990	346.1857	
L1.123^m	1967-026A	Intelsat II F-3						PL
TLEs	GEO (1.00)	2016-12-19	21:27:57.824	1743.00	151.80	351.40	143.30	
2717	TEME	42155.001	0.0024903	4.0840	304.9970	285.7073	5.4292	

4.6 Objects in a Libration Orbit around the Western Stable Point

The following list contains 49 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 ($f_{\text{IADC}}^{\text{GEO}}$)	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)	2016-12-31	12:32:29.565	800.00	0.30	254.50	254.80	
15677	TEME	42164.431	0.0005562	14.7510	19.1218	290.3165	254.7201	
L2.2^m	1988-081A	GStar 3						PL
TLEs	GEO (1.00)	2016-12-31	10:23:02.692	850.00	0.30	254.50	254.80	
19483	TEME	42164.385	0.0001937	15.7433	351.7326	140.1962	254.6791	
L2.3^m	1993-058B	ACTS						PL
TLEs	GEO (1.00)	2016-12-25	13:13:06.783	890.00	1.20	254.10	255.30	
22796	TEME	42164.178	0.0022162	13.9505	25.4460	350.3101	254.5127	
L2.4^m	1971-009A	NATO IIB						PL
TLEs	GEO (1.00)	2016-12-25	13:29:19.129	900.00	0.90	254.20	255.10	
4902	TEME	42164.828	0.0000531	9.2602	308.9103	292.6910	255.0448	
L2.5	1993-073A	Solidaridad 1						PL
TLEs	GEO (1.00)	2016-12-31	12:26:23.071	908.18	8.06	250.80	258.86	
22911	TEME	42165.088	0.0008242	12.7749	30.9814	197.0132	258.4000	
L2.6	1970-021A	NATO I						PL
TLEs	GEO (1.00)	2016-12-25	05:17:12.865	908.70	10.16	249.76	259.92	
4353	TEME	42164.111	0.0003988	8.3296	311.5948	265.5568	259.6895	
L2.7	1971-095A	OPS 9431 (DSCS II F-1, DSCS 2-1, DSCS II A-1)						PL
TLEs	GEO (1.00)	2016-12-25	14:38:40.295	909.66	13.22	248.24	261.46	
5587	TEME	42168.079	0.0006391	9.6881	310.2742	270.0644	253.5428	
L2.8^m	1969-101A	Skynet 1A						PL
TLEs	GEO (1.00)	2016-12-31	08:01:15.001	910.00	4.10	252.60	256.70	
4250	TEME	42165.760	0.0023852	7.6880	307.8114	234.2387	253.9143	
L2.9	1993-077A	Telstar 401						PL
TLEs	GEO (1.00)	2016-12-31	01:15:14.323	910.83	16.12	246.81	262.93	
22927	TEME	42163.119	0.0002977	14.5482	21.1498	50.4997	262.4675	
L2.10^m	1976-023A	LES 8						PL
TLEs	GEO (1.00)	2016-12-31	13:30:28.511	912.00	5.70	252.00	257.70	
8746	TEME	42164.584	0.0015934	15.4978	85.5626	37.3231	252.1019	
L2.11^m	1976-023B	LES 9						PL
TLEs	GEO (1.00)	2016-12-29	07:35:49.425	920.00	5.00	252.50	257.50	
8747	TEME	42165.954	0.0021743	15.4536	85.5943	85.3477	254.0053	
L2.12	1995-049A	Telstar 4 (Telstar 402R)						PL
TLEs	GEO (1.00)	2016-12-25	12:07:17.279	921.37	32.00	239.00	271.00	
23670	TEME	42173.069	0.0007373	10.5815	38.6966	232.2340	255.7136	

L2.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L2.13	1985-076C	ASC 1					PL
TLEs	GEO (1.00)	2016-12-25	10:22:26.818	936.54	45.74	232.32	278.06
15994	TEME	42173.356	0.0007451	15.0708	13.9223	283.6540	270.1082
L2.14	1976-004F	Hermes (CTS) operational debris (solar array cover)					PM
TLEs	EGO (0.18)	2016-12-25	23:02:31.286	938.25	46.59	231.91	278.50
39689	TEME	42170.429	0.0169968	11.2417	315.1646	321.0628	234.6970
L2.15	1975-100A	GOES 1					PL
TLEs	GEO (1.00)	2016-12-22	12:05:30.501	940.25	48.43	231.02	279.45
8366	TEME	42153.044	0.0006920	12.3237	320.6206	276.2703	264.6787
L2.16	1976-004E	Hermes (CTS) operational debris (solar array cover)					PM
TLEs	GEO (1.00)	2016-12-31	01:45:36.296	940.57	48.68	230.90	279.58
39688	TEME	42169.495	0.0016332	11.2045	314.7896	87.8117	277.3957
L2.17^m	1967-111A	ATS 3					PL
TLEs	GEO (1.00)	2016-12-25	12:46:16.515	950.00	0.30	254.60	254.90
3029	TEME	42164.672	0.0012513	5.0815	299.9285	116.2439	255.0387
L2.18^m	1982-105A	Aurora I					PL
TLEs	GEO (1.00)	2016-12-25	06:44:12.668	950.00	0.80	254.30	255.10
13631	TEME	42164.425	0.0007471	15.0546	2.7227	279.1018	255.0773
L2.19	1983-041A	GOES 6					PL
TLEs	GEO (1.00)	2016-12-25	03:15:49.864	958.07	59.51	225.69	285.19
14050	TEME	42150.714	0.0004361	14.6864	351.7995	231.7288	267.6721
L2.20	1995-069A	Galaxy IIIR					PL
TLEs	GEO (1.00)	2016-12-29	13:06:50.136	961.29	61.28	224.84	286.12
23741	TEME	42177.396	0.0005621	9.8243	41.3424	221.6555	272.9653
L2.21	—	—					—
KIAM	EGO (0.78)	2017-01-01	00:00:01.000	974.43	67.57	221.83	289.40
UI139	J2000	42173.311	0.0048714	15.1797	7.7950	201.0329	227.0350
L2.22	1981-049A	GOES 5					PL
TLEs	GEO (1.00)	2016-12-31	09:07:18.619	991.55	75.22	218.20	293.41
12472	TEME	42149.732	0.0006705	14.4920	346.8834	250.7871	277.9809
L2.23	1976-004A	Hermes (CTS)					PL
TLEs	GEO (1.00)	2016-12-31	07:49:11.571	1002.02	79.29	216.27	295.56
8585	TEME	42154.062	0.0013527	11.7841	317.6073	191.8103	288.6477
L2.24	1977-007C	Titan IIIC third stage (Transtage 23)					RB
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	1005.20	80.03	215.92	295.94
UI162	J2000	42184.087	0.0018638	11.2813	315.7428	301.9738	261.1790
L2.25	1996-055A	EchoStar 2					PL
TLEs	GEO (1.00)	2016-12-25	08:30:38.291	1030.20	88.78	211.80	300.58
24313	TEME	42164.050	0.0001759	6.6092	53.6892	48.3178	211.8749
L2.26	1968-081D	LES 6					PL
TLEs	GEO (1.00)	2016-12-31	12:28:53.820	1044.32	92.77	209.93	302.70
3431	TEME	42186.575	0.0012574	6.7768	314.0377	318.6784	245.1269
L2.27	1987-100A	Raduga 21					PL
TLEs	GEO (1.00)	2016-12-25	15:59:42.113	1094.07	105.71	203.93	309.65
18631	TEME	42142.601	0.0003573	15.2094	356.5356	234.7687	231.1104

L2.nn	COSPAR	Name					Type
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L2.28	1965-028A	Intelsat I F-1 (Early Bird)					PL
TLEs	GEO (1.00)	2016-12-24	13:18:36.499	1119.51	111.12	201.46	312.58
1317	TEME	42189.878	0.0004437	0.9950	311.3667	237.6975	269.3827
L2.29	1981-107A	OPS 4029 (VORTEX 3)					PL
KIAM	EGO (0.03)	2017-01-01	00:00:01.000	1122.74	112.11	201.01	313.12
UI129	J2000	42137.879	0.0903558	7.6535	354.4523	324.4177	261.0890
L2.30	1997-086A	HGS-1					PL
TLEs	EGO (0.88)	2016-12-25	12:04:35.418	1274.87	134.82	191.00	325.82
25126	TEME	42193.263	0.0043302	7.4965	60.1605	311.9706	239.6457
L2.31	1984-078A	Gorizont 10					PL
TLEs	GEO (1.00)	2016-12-23	09:54:21.187	1300.66	137.65	189.82	327.48
15144	TEME	42142.210	0.0006106	14.2867	344.8050	259.3623	295.7626
L2.32	1967-094A	Intelsat II F-4					PL
TLEs	GEO (1.00)	2016-12-31	04:43:31.513	1312.44	138.90	189.31	328.21
2969	TEME	42184.155	0.0015326	4.1454	298.8779	240.2446	303.6960
L2.33	1990-016A	Raduga 25					PL
TLEs	GEO (1.00)	2016-12-25	15:28:34.841	1322.84	139.90	188.90	328.81
20499	TEME	42139.910	0.0004468	14.9666	4.7765	231.9594	220.8720
L2.34	1982-103A	Gorizont 6					PL
TLEs	GEO (1.00)	2016-12-31	01:32:43.338	1329.06	140.54	188.64	329.19
13624	TEME	42163.641	0.0003872	13.7616	335.7988	247.6015	329.5777
L2.35	1985-070A	Raduga 16					PL
TLEs	GEO (1.00)	2016-12-31	04:46:03.165	1339.98	141.58	188.23	329.81
15946	TEME	42166.237	0.0005021	14.4319	347.6827	247.6627	330.0591
L2.36	1980-081A	Raduga 7					PL
TLEs	GEO (1.00)	2016-12-25	14:26:12.541	1436.53	149.28	185.29	334.58
12003	TEME	42161.877	0.0013656	13.1707	327.5682	237.3969	184.1572
L2.37	1977-114A	OPS 4258 (AQUACADE 3)					PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	1447.07	149.86	185.09	334.94
UI146	J2000	42191.388	0.0024733	17.6235	325.0432	274.0099	285.6510
L2.38	1994-038A	Cosmos-2282					PL
TLEs	GEO (1.00)	2016-12-31	09:09:22.468	1473.47	151.67	184.45	336.13
23168	TEME	42186.107	0.0004608	13.7873	21.5164	3.6719	302.7595
L2.39	1992-059A	Cosmos-2209					PL
TLEs	GEO (1.00)	2016-12-22	04:46:56.133	1478.27	151.98	184.35	336.33
22112	TEME	42157.603	0.0011761	14.9784	13.1047	224.9378	331.4951
L2.40	1985-016A	Cosmos-1629					PL
TLEs	GEO (1.00)	2016-12-25	06:44:12.668	1489.13	152.58	184.15	336.73
15574	TEME	42195.815	0.0006074	14.3918	345.9100	200.0872	251.0689
L2.41	1980-004A	OPS 6393 (FLTSATCOM F3)					PL
TLEs	GEO (1.00)	2016-12-22	20:04:01.123	1512.91	153.90	183.72	337.62
11669	TEME	42166.347	0.0024751	12.4669	335.2522	165.0384	337.9186
L2.42	1987-091A	Cosmos-1894					PL
TLEs	GEO (1.00)	2016-12-31	05:58:54.426	1540.52	155.29	183.28	338.57
18443	TEME	42163.489	0.0006870	14.7054	355.5716	261.8321	340.8955

L2.nn	COSPAR	Name						Type
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}	
S-ID	Frame	a	e	i	Ω	ω	λ	
L2.43	1989-101A	Cosmos-2054						PL
TLEs	GEO (1.00)	2016-12-25	12:36:12.692	1606.93	158.09	182.47	340.56	
20391	TEME	42179.916	0.0004648	14.9491	4.3255	247.9082	196.1350	
L2.44	1994-035A	USA 104 (UFO F3)						PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	1615.74	169.43	179.05	348.48	
UI068	J2000	42176.483	0.0006004	10.7631	28.3685	214.4043	328.1680	
L2.45	1970-069A	OPS 7329 (CANYON 3)						PL
KIAM	EGO (0.04)	2017-01-01	00:00:01.000	1621.41	158.52	182.36	340.87	
UI157	J2000	42195.064	0.0837046	13.2536	253.9801	324.2273	239.1060	
L2.46	1994-082A	Luch 1						PL
TLEs	GEO (1.00)	2016-12-25	06:44:12.668	1816.22	163.43	181.31	344.74	
23426	TEME	42132.579	0.0004277	14.2323	25.1345	176.9054	251.5358	
L2.47^m	1994-060A	Cosmos-2291						PL
TLEs	GEO (1.00)	2016-12-31	19:34:18.061	1981.00	165.70	180.50	346.20	
23267	TEME	42157.286	0.0005438	14.4662	19.6296	178.3174	0.4478	
L2.48^m	1995-045A	Cosmos-2319						PL
TLEs	GEO (1.00)	2016-12-31	07:31:54.505	2032.00	166.30	180.10	346.40	
23653	TEME	42161.778	0.0007861	14.1806	22.6338	196.5200	343.5036	
L2.49^m	1987-084A	Cosmos-1888						PL
TLEs	GEO (1.00)	2016-12-24	06:45:42.475	2252.00	168.00	179.60	347.60	
18384	TEME	42162.776	0.0004986	14.6880	356.0764	227.5859	346.1738	

4.7 Objects in a Libration Orbit around both Stable Points

The following list contains 18 objects in libration orbit around both stable points, sorted according to the ascending order of the libration period (which is equivalent to the ascending order of the libration magnitude).

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

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

L3.nn	COSPAR	Name						Type
Source	Orbit ($f_{\text{IADC}}^{\text{GEO}}$)	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)	2016-12-25	09:23:08.225	2928.77	334.65	174.69	149.35	
25110	TEME	42161.624	0.0007914	9.5006	42.4539	239.1164	149.7507	
L3.2	1971-095B	OPS 9432 (DSCS II F-2, DSCS 2-2, DSCS II A-2)						PL
TLEs	GEO (1.00)	2016-12-22	22:54:26.501	2929.12	334.29	174.88	149.17	
5588	TEME	42131.955	0.0006477	9.6513	310.6144	322.9352	95.9236	
L3.3	1991-054D	IUS second stage						RB
TLEs	GEO (1.00)	2016-12-31	16:15:12.602	2930.67	333.98	175.04	149.02	
21641	TEME	42152.624	0.0039892	16.3978	6.2005	256.0913	184.1825	
L3.4	1991-064A	Cosmos-2155						PL
TLEs	GEO (1.00)	2016-12-25	08:50:31.492	2933.79	333.17	175.46	148.62	
21702	TEME	42177.504	0.0005572	15.0456	9.6441	247.7339	329.9633	
L3.5	1997-041A	Cosmos-2345						PL
TLEs	EGO (0.18)	2016-12-23	03:30:47.117	2960.73	339.72	172.11	151.83	
24894	TEME	42175.544	0.0168822	13.4613	27.1514	211.8312	349.4429	
L3.6	1977-092L	Ekran 2 fragmentation debris						PD
TLEs	EGO (0.28)	2016-12-31	02:19:07.586	2973.87	340.95	171.48	152.43	
33519	TEME	42151.487	0.0110723	11.9673	318.4698	318.3180	183.8030	
L3.7	2012-012A	Cosmos-2479						PL
TLEs	GEO (1.00)	2016-12-25	22:15:03.187	3114.95	347.19	168.31	155.50	
38101	TEME	42135.462	0.0006692	1.3088	65.0675	215.2355	38.9128	
L3.8	1990-094A	Gorizont 21						PL
TLEs	GEO (1.00)	2016-12-31	12:47:38.085	3125.40	325.69	179.31	144.99	
20923	TEME	42156.481	0.0007660	15.0485	7.0146	208.2087	142.2323	
L3.9	2000-029A	Gorizont 33						PL
TLEs	GEO (1.00)	2016-12-24	21:22:18.004	3132.38	325.60	179.35	144.95	
26372	TEME	42174.245	0.0003707	11.6871	33.9643	216.5476	139.1855	
L3.10	1980-060A	Ekran 5						PL
KIAM	GEO (1.00)	2017-01-01	00:00:01.000	3341.80	321.34	181.55	142.90	
UI098	J2000	42188.534	0.0007302	12.8606	324.6460	138.5736	298.0770	
L3.11	2012-012D	Proton-K/DM-2 fourth stage (Blok DM-2)						RB
TLEs	GEO (1.00)	2016-12-25	12:54:51.210	3367.75	323.67	180.35	144.02	
38104	TEME	42137.136	0.0015705	1.2799	64.9066	222.9324	222.0358	
L3.12	1984-009A	OPS 0441 (VORTEX 4)						PL
KIAM	EGO (0.03)	2017-01-01	00:00:01.000	3376.27	323.62	180.37	143.99	
UI026	J2000	42160.230	0.1021552	7.6023	350.7492	345.1824	353.3330	

L3.nn	COSPAR	Name					Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time	P_{lib}	$\Delta\lambda$	λ_{min}	λ_{max}
S-ID	Frame	a	e	i	Ω	ω	λ
L3.13	1986-027A	Cosmos-1738					PL
TLEs	GEO (1.00)	2016-12-31	01:04:01.819	3507.10	321.87	181.28	143.15
16667	TEME	42164.337	0.0009716	15.0677	349.9713	15.3953	350.8526
L3.14	1994-030A	Gorizont 30					PL
TLEs	GEO (1.00)	2016-12-25	15:14:07.617	3549.77	321.96	181.23	143.19
23108	TEME	42195.077	0.0007190	14.5960	18.3664	219.5002	236.3302
L3.15	1985-007A	Gorizont 11					PL
TLEs	GEO (1.00)	2016-12-25	05:35:22.063	3588.49	323.00	180.70	143.69
15484	TEME	42171.038	0.0003300	14.3279	346.5423	246.0780	337.9326
L3.16	1994-067D	Proton-K/DM-2M fourth stage (Blok DM-2M)					RB
TLEs	GEO (1.00)	2016-12-31	22:57:12.722	3598.52	322.98	180.71	143.68
23322	TEME	42180.684	0.0002777	14.9045	15.2898	40.0289	318.4458
L3.17	1982-044F	Proton-K/DM fourth stage (Blok-DM)					RB
TLEs	GEO (1.00)	2016-12-27	06:10:34.975	3875.31	322.34	181.04	143.38
14114	TEME	42164.552	0.0012006	14.8483	334.8377	105.8910	350.7377
L3.18	1991-079A	Cosmos-2172					PL
TLEs	GEO (1.00)	2016-12-31	22:57:12.722	4545.62	322.52	180.95	143.46
21789	TEME	42178.445	0.0008150	15.0062	10.6275	267.2604	322.9339

The longitude histories of TLE-based objects in this category are plotted in Fig. 4.1 to 4.16.

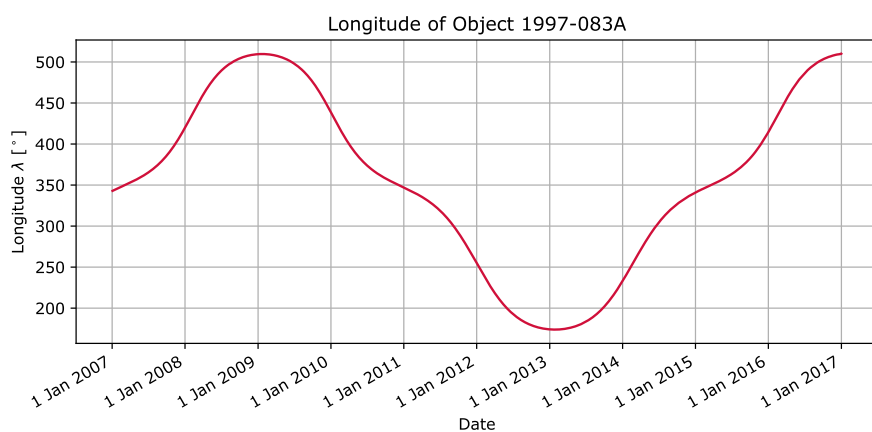


Figure 4.1: Longitude history of object 1997-083A

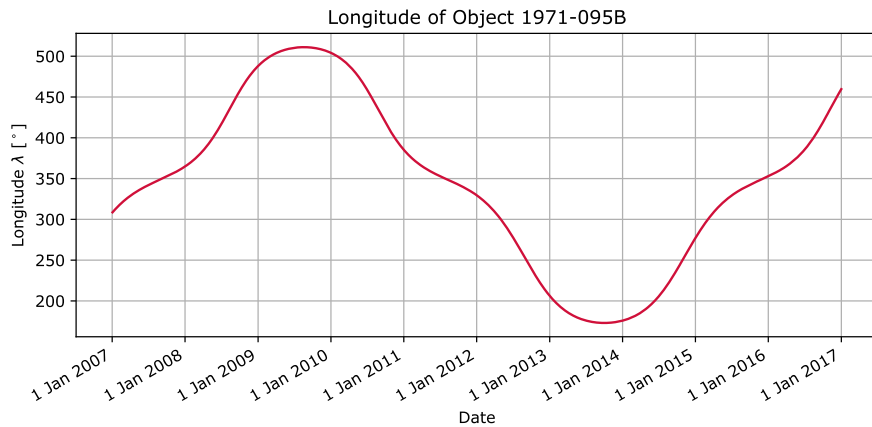


Figure 4.2: Longitude history of object 1971-095B

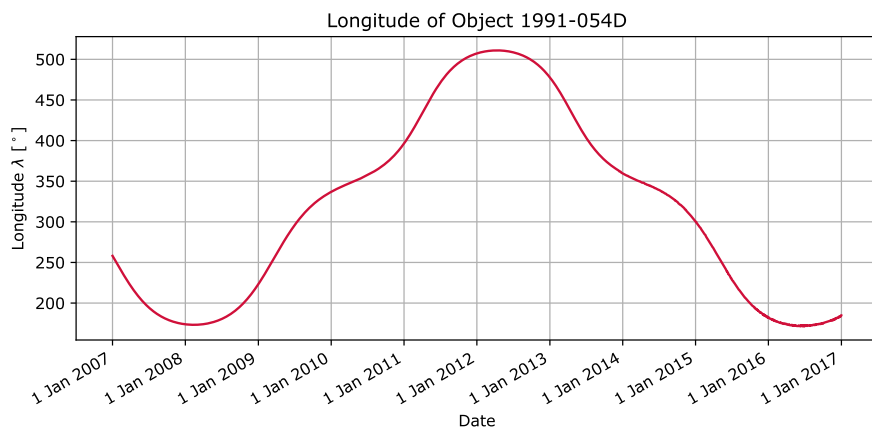


Figure 4.3: Longitude history of object 1991-054D

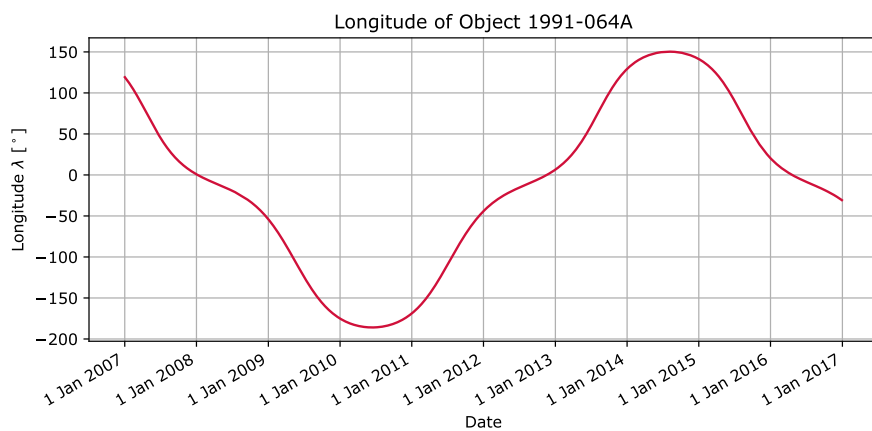


Figure 4.4: Longitude history of object 1991-064A

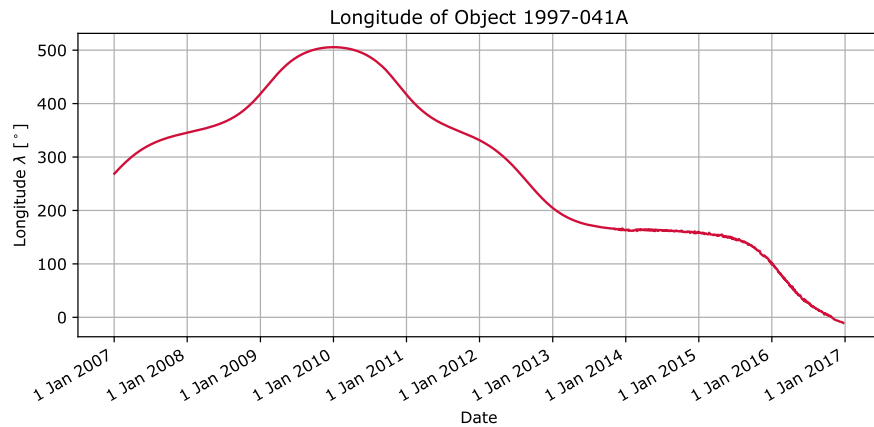


Figure 4.5: Longitude history of object 1997-041A

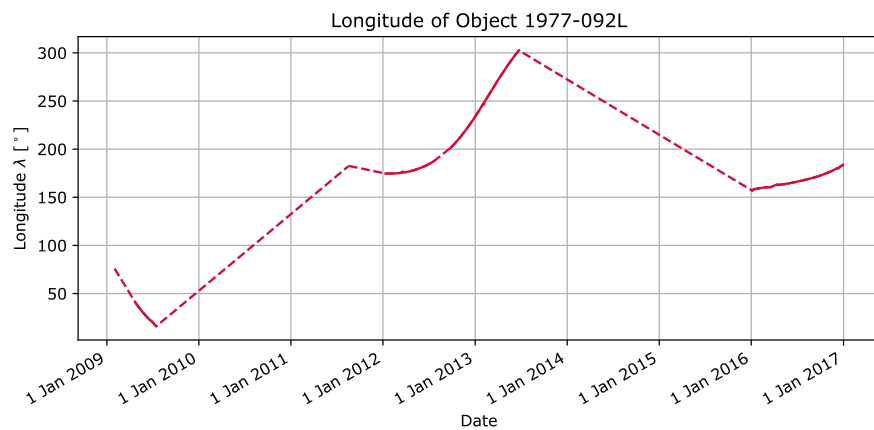


Figure 4.6: Longitude history of object 1977-092L

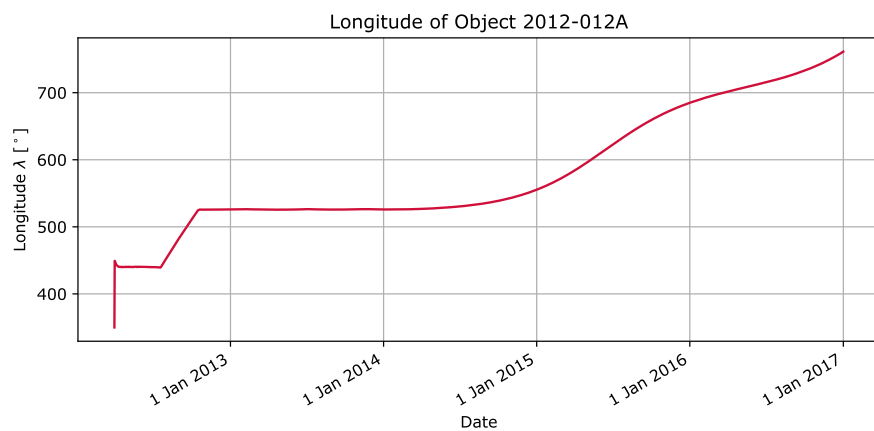


Figure 4.7: Longitude history of object 2012-012A

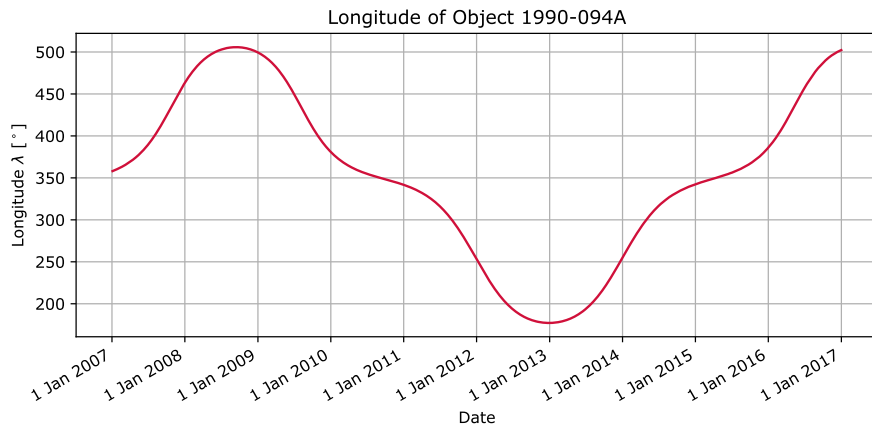


Figure 4.8: Longitude history of object 1990-094A

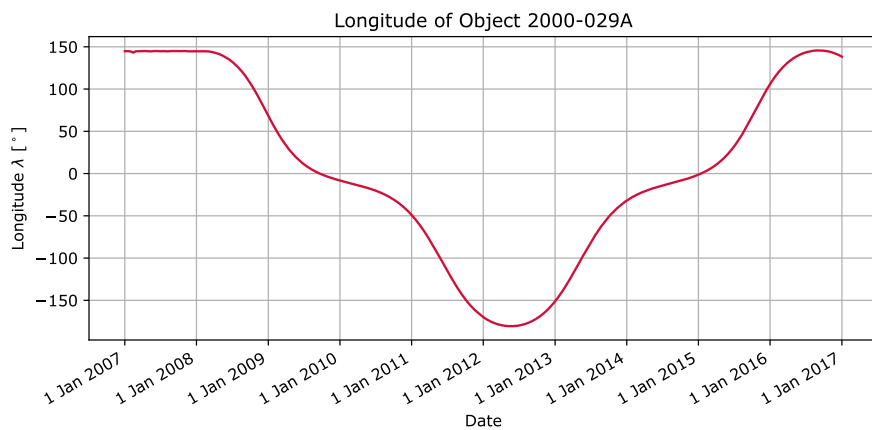


Figure 4.9: Longitude history of object 2000-029A

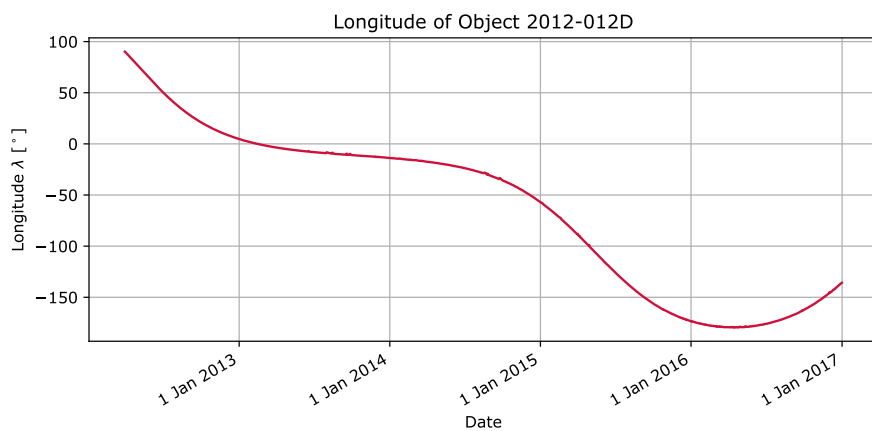


Figure 4.10: Longitude history of object 2012-012D

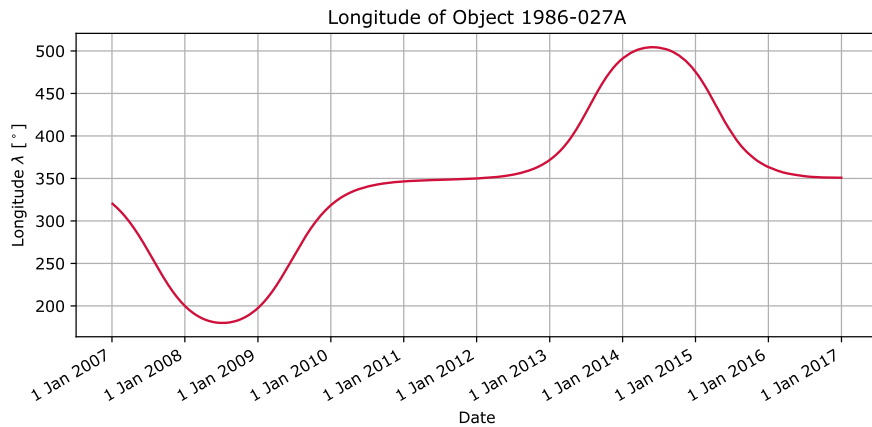


Figure 4.11: Longitude history of object 1986-027A

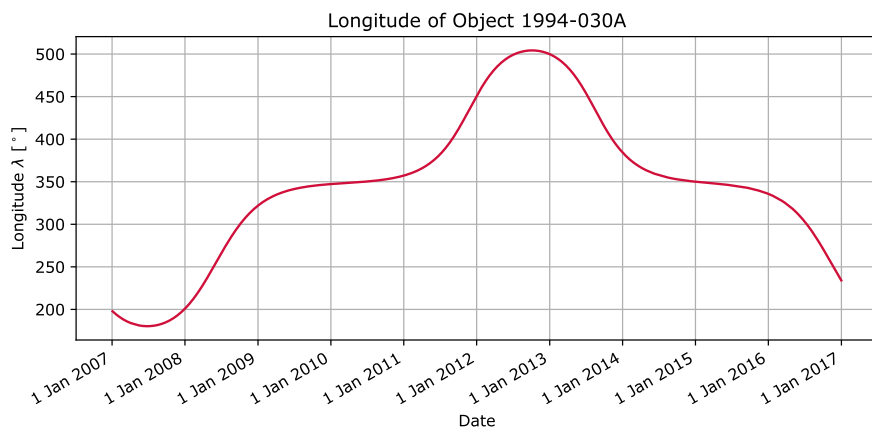


Figure 4.12: Longitude history of object 1994-030A

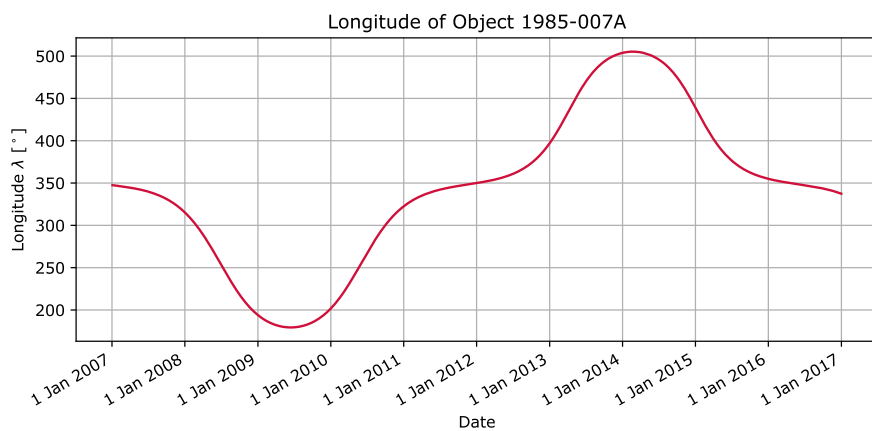


Figure 4.13: Longitude history of object 1985-007A

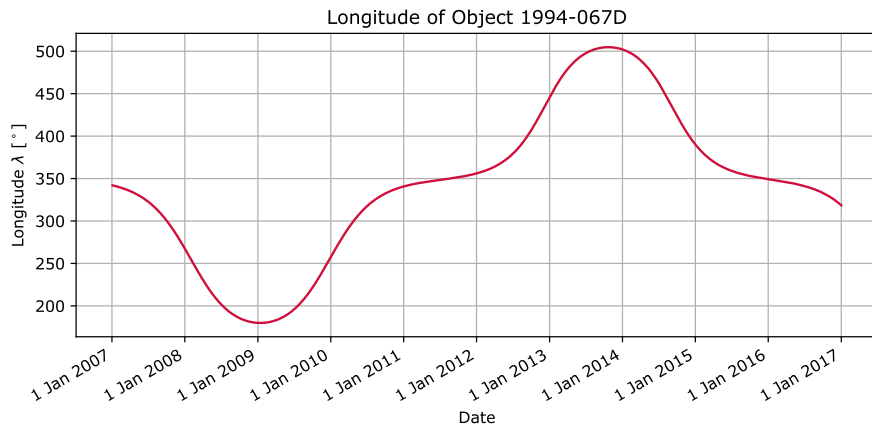


Figure 4.14: Longitude history of object 1994-067D

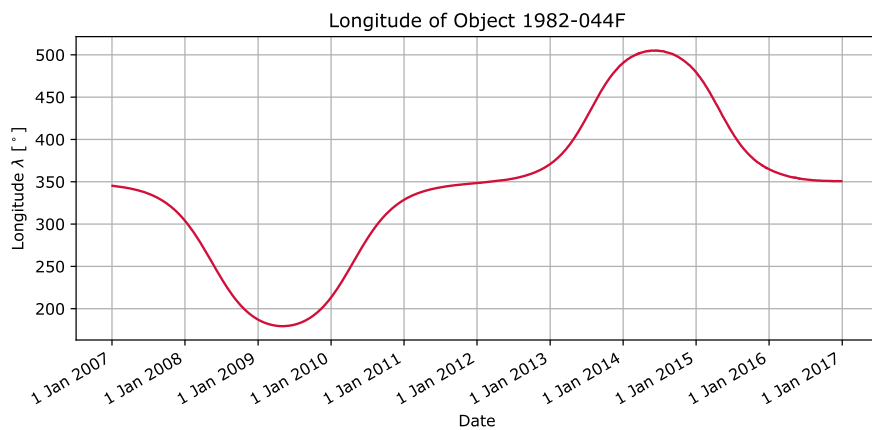


Figure 4.15: Longitude history of object 1982-044F

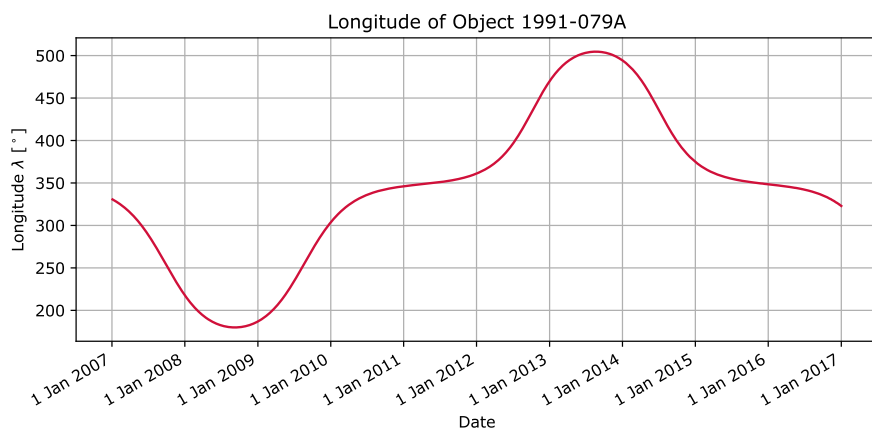


Figure 4.16: Longitude history of object 1991-079A

4.8 Objects in Highly Inclined Orbits

The following list contains 17 objects in highly inclined orbits (of which 1 is outdated), sorted according to the ascending order of the COSPAR designation.

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

I.nn	COSPAR	Name						Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time					
S-ID	Frame	a	e	i	Ω	ω	λ	
I.1	1963-031A	Syncom 2						PL
TLEs	IGO (1.00)	2016-12-31	22:37:01.741					
634	TEME	42169.877	0.0005113	35.5397	348.2251	162.4861	79.2713	
I.2	1978-012A	IUE						PL
TLEs	IGO (-)	2016-12-31	01:45:35.633					
10637	TEME	42220.045	0.1548593	43.3492	338.4416	208.4136	203.3709	
I.3_o	1978-012D	IUE dust cover						PM
TLEs	IGO (-)	2016-03-14	03:05:46.935					
33000	TEME	42124.911	0.2113741	43.5387	336.4624	220.4932	274.3570	
I.4	2010-005A	SDO						PL
TLEs	IGO (1.00)	2016-12-24	12:31:42.865					
36395	TEME	42164.986	0.0001920	28.5796	143.5716	147.5479	258.3221	
I.5	2010-036A	Beidou DW 5						PL
TLEs	IGO (0.21)	2016-12-25	23:45:12.290					
36828	TEME	42161.627	0.0050374	54.1964	195.1972	221.6644	119.6451	
I.6	2010-045A	Michibiki						PL
TLEs	IGO (0.04)	2016-12-29	06:56:23.551					
37158	TEME	42164.828	0.0746592	40.7737	161.7973	269.9542	130.0393	
I.7	2010-068A	Beidou DW 7						PL
TLEs	IGO (0.13)	2016-12-25	20:57:19.836					
37256	TEME	42160.029	0.0051981	53.3541	313.2809	209.1319	118.9068	
I.8	2011-013A	Beidou DW 8						PL
TLEs	IGO (1.00)	2016-12-25	20:24:35.519					
37384	TEME	42169.263	0.0026887	57.6082	74.7520	209.4286	118.2699	
I.9	2011-038A	Beidou DW 9						PL
TLEs	IGO (1.00)	2016-12-25	23:41:19.546					
37763	TEME	42163.751	0.0040996	54.5039	197.5353	208.3175	95.9932	
I.10	2011-073A	Beidou DW 10						PL
TLEs	IGO (1.00)	2016-12-25	23:06:19.541					
37948	TEME	42159.387	0.0044989	53.4386	312.7440	207.9471	93.8088	
I.11	2013-034A	IRNSS-R1A						PL
TLEs	IGO (1.00)	2016-12-31	21:28:38.141					
39199	TEME	42163.874	0.0021521	28.5537	117.9509	180.8363	54.9739	
I.12	2014-017A	IRNSS-R1B						PL
TLEs	IGO (1.00)	2016-12-21	23:51:06.892					
39635	TEME	42163.249	0.0018124	29.4132	297.6809	189.2593	55.1219	
I.13	2015-018A	IRNSS-R1D						PL
TLEs	IGO (1.00)	2016-12-25	06:06:55.979					
40547	TEME	42163.474	0.0018162	29.3995	297.7710	187.3680	111.8576	

I.nn	COSPAR	Name						Type
Source	Orbit (f_{IADC}^{GEO})	Date	Time					
S-ID	Frame	a	e	i	Ω	ω	λ	
I.14	2015-019A	Beidou DW 17						PL
TLEs	IGO (1.00)	2016-12-25	21:39:26.525					
40549	TEME	42163.325	0.0040433	54.5561	335.7495	185.1496	96.2703	
I.15	2015-053A	Beidou DW 20						PL
TLEs	IGO (1.00)	2016-12-25	00:24:45.190					
40938	TEME	42159.959	0.0046459	54.4456	298.6425	174.6678	95.1777	
I.16	2016-003A	IRNSS-R1E						PL
TLEs	IGO (1.00)	2016-12-25	18:05:05.303					
41241	TEME	42165.857	0.0019992	28.5140	117.7229	178.5474	111.6684	
I.17	2016-021A	Beidou DW 22						PL
TLEs	IGO (1.00)	2016-12-25	21:43:46.694					
41434	TEME	42166.016	0.0028902	55.3096	74.3140	180.7605	95.1527	

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 45 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 discovered 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	UU023	1982-019	OPS 8701 debris (DSP F10 IR Sensor telescope sunshade cover)	PM
KIAM	UU024	1982-105	Aurora I debris (Array restraint cable)	PM
KIAM	UU025	1983-030	Satcom IR debris (Array restraint cable)	PM
KIAM	UU026	1983-041	GOES 6 debris (VAS cover)	PM
KIAM	UU027	1983-094	Satcom IIR debris (Array restraint cable)	PM
KIAM	UU029	1984-049	Spacenet 1 debris (Array restraint cable)	PM
KIAM	UU030	1984-080	Himawari 3 debris (VISSR cover)	PM
KIAM	UU031	1984-114	Spacenet 2 debris (Array restraint cable)	PM
KIAM	UU032	1984-129	USA 7 debris (DSP F12 IR Sensor telescope sunshade cover)	PM
KIAM	UU033	1985-035	GStar 1 debris (Array restraint cable)	PM
KIAM	UU034	1985-076	ASC 1 debris (Array restraint cable)	PM
KIAM	UU035	1986-026	GStar 2 debris (Array restraint cable)	PM
KIAM	UU036	1987-022	GOES 7 debris (VAS cover)	PM
KIAM	UU037	1987-097	USA 28 debris (DSP F13 IR Sensor telescope sunshade cover)	PM
KIAM	UU038	1988-018	Spacenet 3R debris (Array restraint cable)	PM
KIAM	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 trend of adherence to the IADC re-orbiting guidelines,
- 6.6 distribution and altitude range of the objects in drift orbit,
- 6.7 zoom in the distribution and altitude range of the objects in drift orbit,
- 6.8 distribution of the perigee mean deviation from the geostationary altitude for the objects in drift orbit,
- 6.9 distribution of objects in libration orbit.

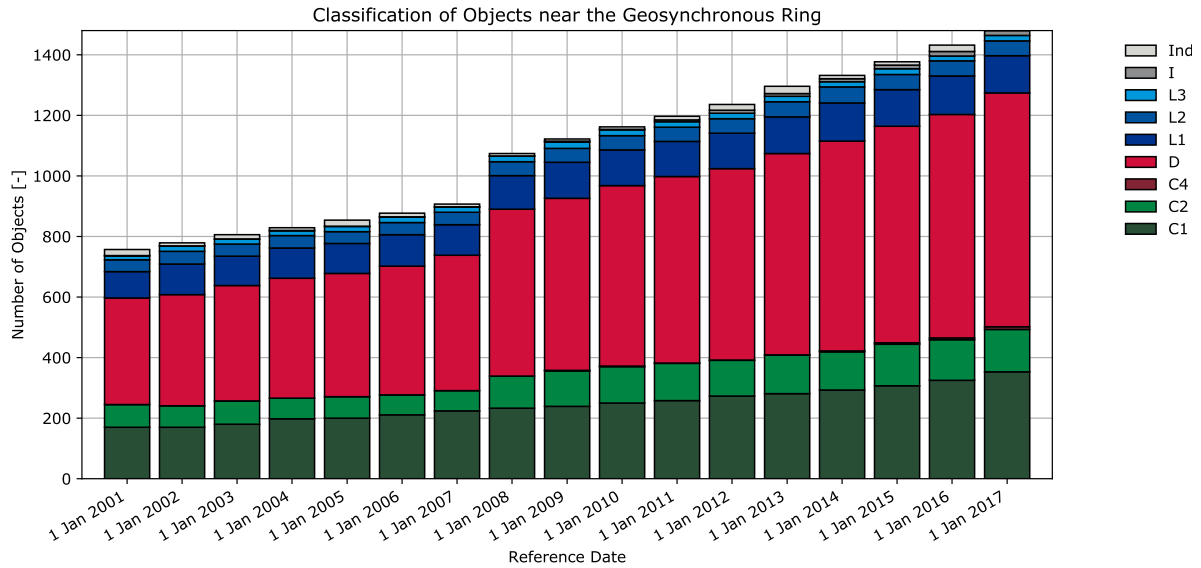


Figure 6.1: Absolute number of geosynchronous objects in their respective category bins. Please note that the apparent jump for reference date Jan 1 2008 is due to the addition of the KIAM catalogue.

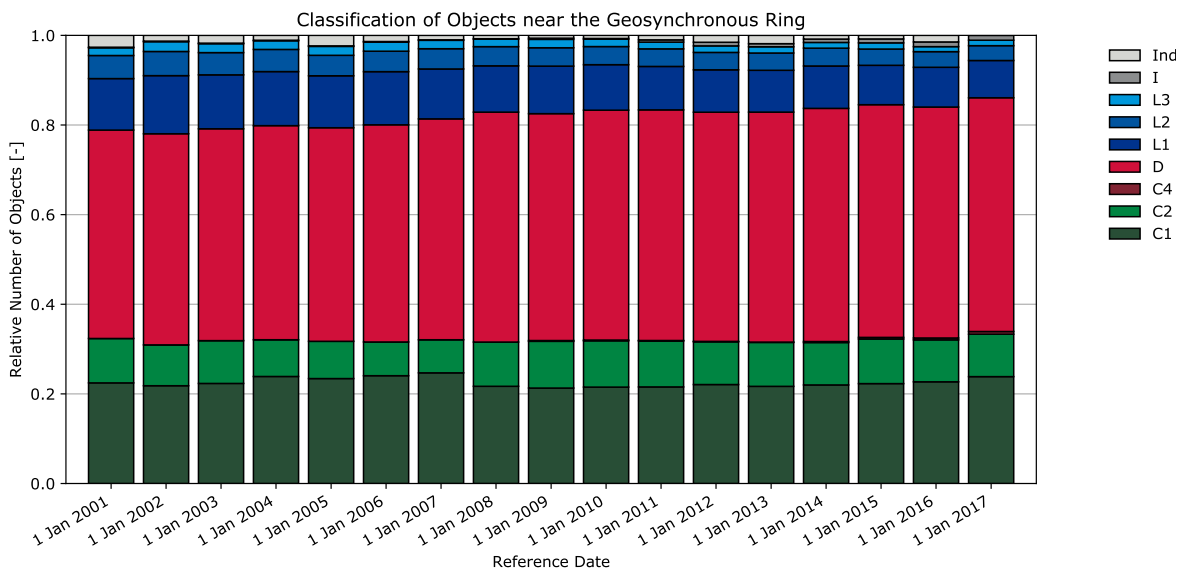


Figure 6.2: Relative number of geosynchronous objects in their respective category bins.

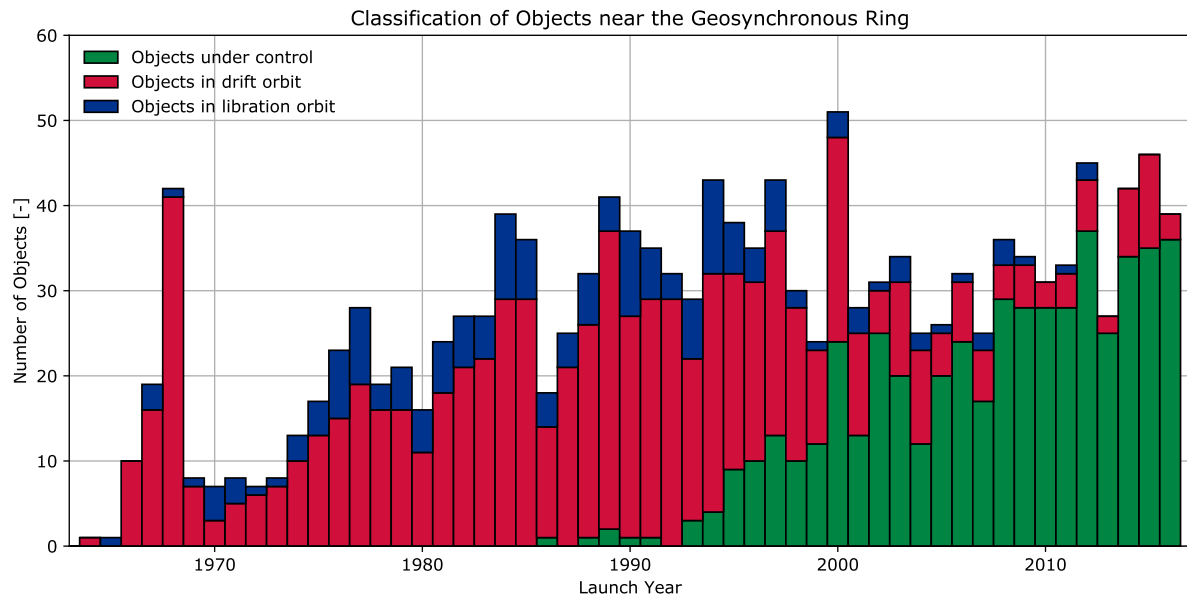


Figure 6.3: Number of objects in each category according to launch year.

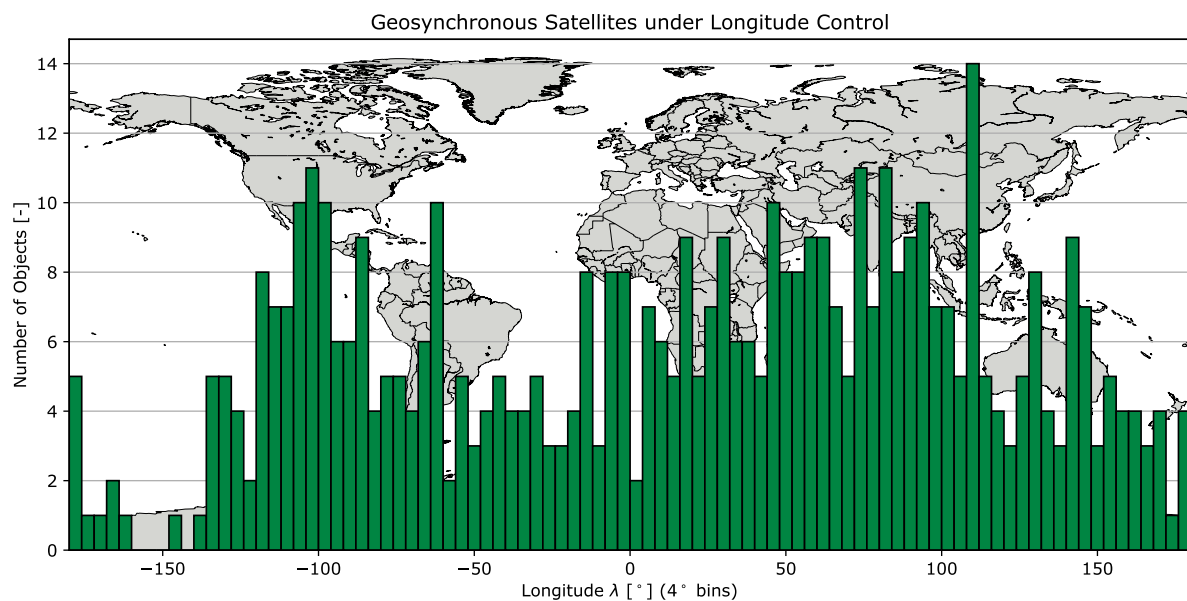
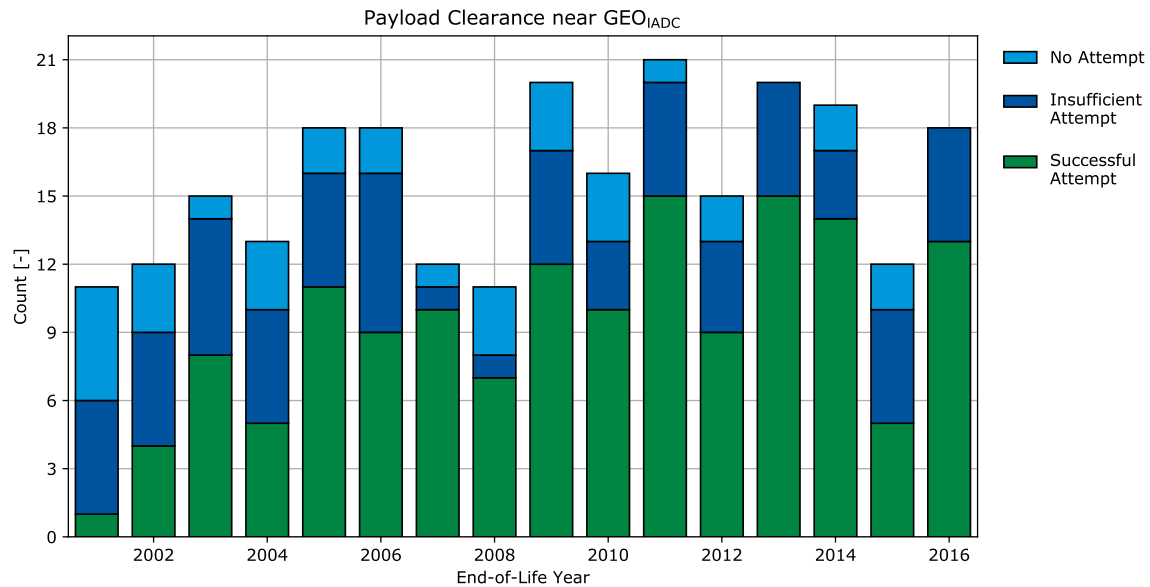
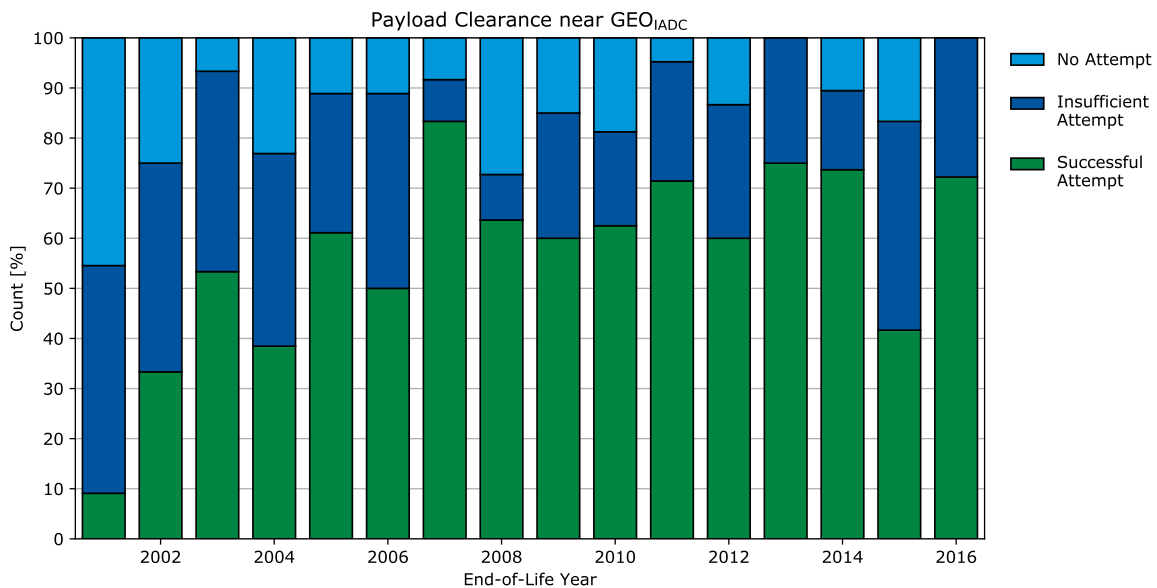


Figure 6.4: Distribution of the longitude of the satellites under control (without category C4).



(a) Absolute number of payloads



(b) Relative number of payloads

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

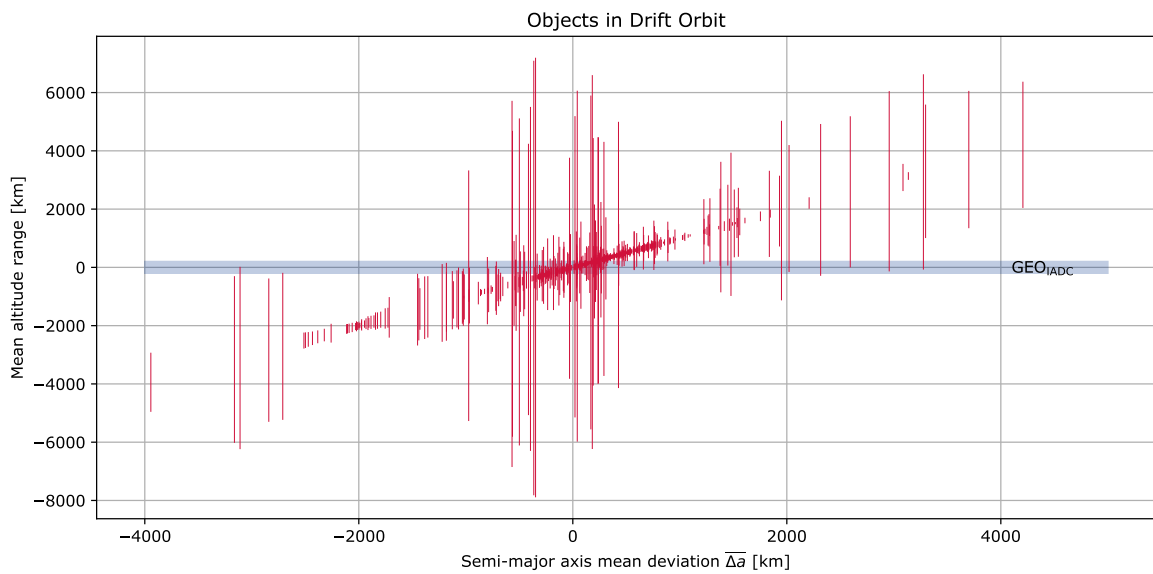


Figure 6.6: Distribution and altitude range of the objects in drift orbit.

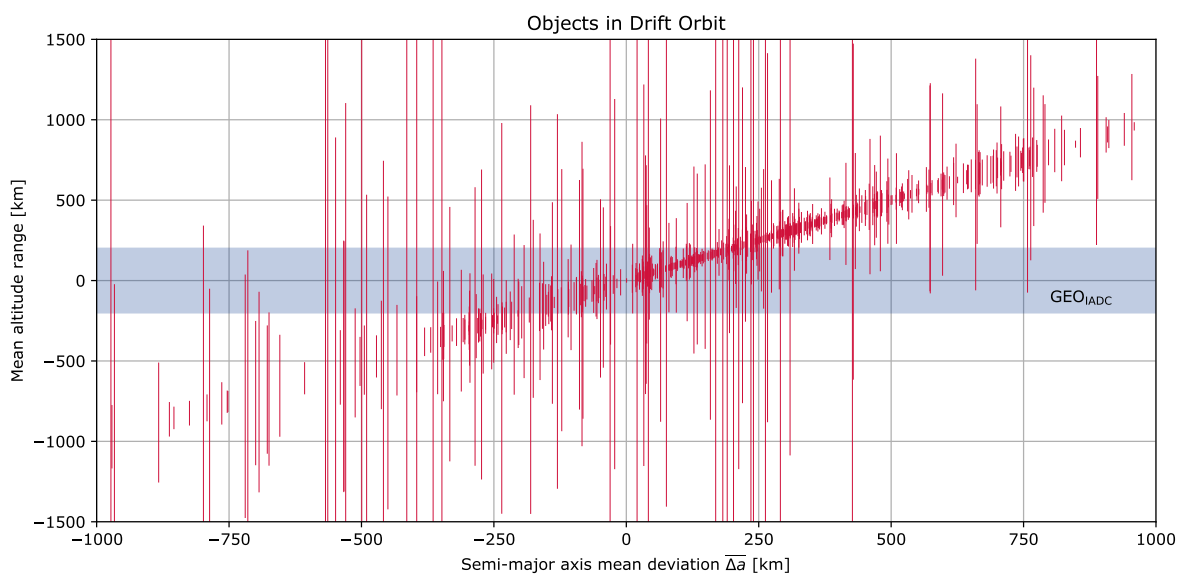


Figure 6.7: Zoom in the distribution and altitude range of the objects in drift orbit.

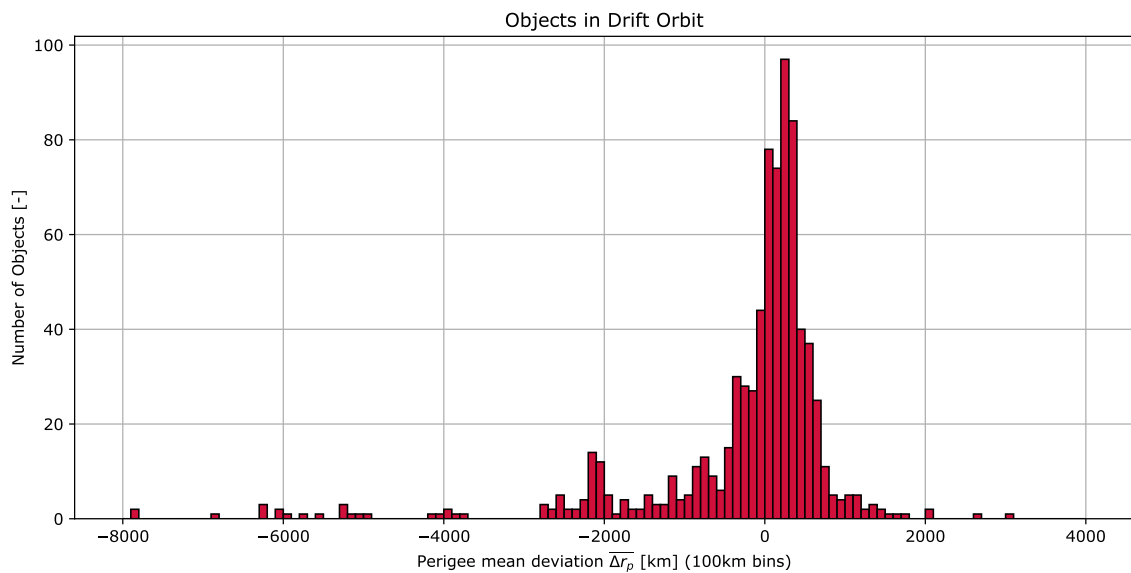


Figure 6.8: Distribution of the perigee mean deviation from the geostationary altitude.

Distribution of Librating Objects near the Geosynchronous Ring

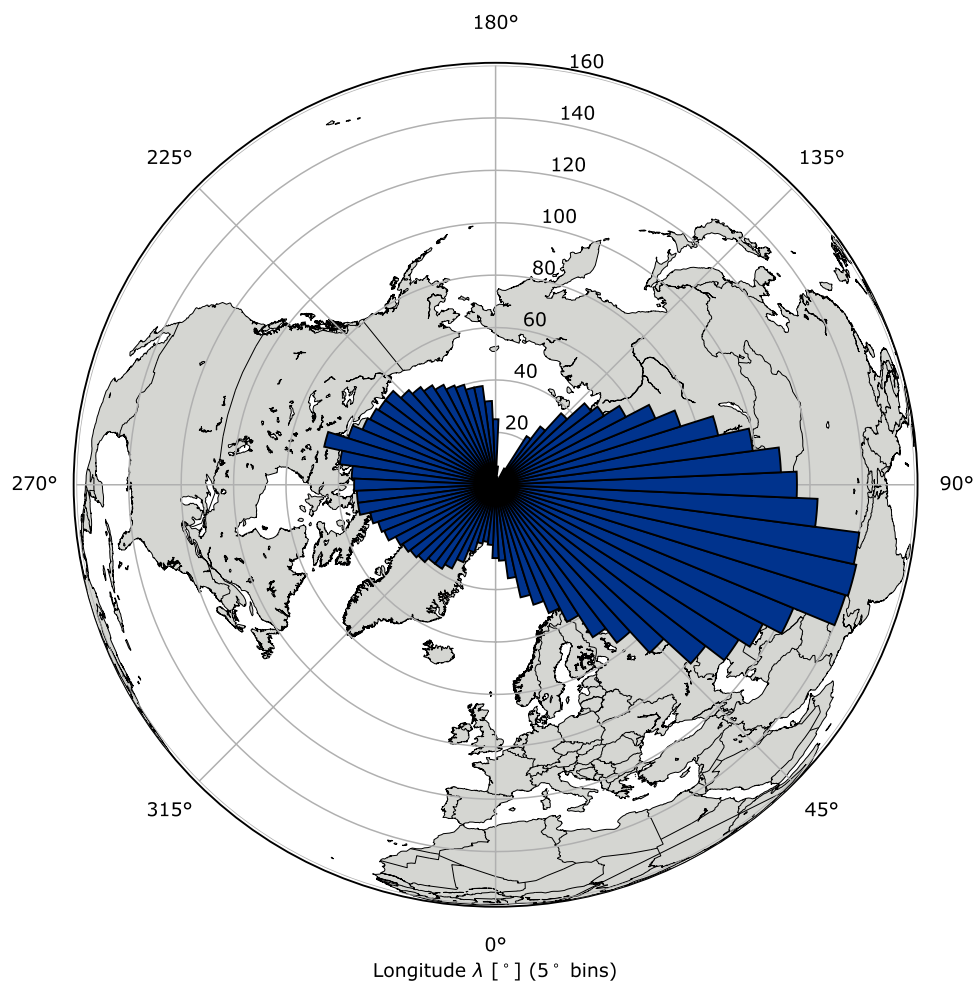


Figure 6.9: Distribution of objects in libration orbit. For every longitude interval, the number of objects librating through this interval is given, e.g. the interval encompassing the Eastern stable point (75°) contains the sum of the objects in classes L1 and L3.

7 Summary

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

1482 objects met these criteria as of 1 January 2017. A total of 2 objects have only old orbital data available (i.e. older than 180 days compared to the reference date). For 204 of the objects KIAM provided orbital elements. A total of 51 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. 45 objects are known to have been released from satellites in GEO, but they have been neither catalogued by USSTRATCOM nor identified yet by KIAM among objects discovered and tracked by ISON network. Thus, the total number of known objects in the geostationary region is 1533.

The 1482 objects with orbital data can be classified as follows:

- 502 are controlled,
- 773 are in a drift orbit (of which 1 is outdated),
- 190 are in a libration orbit,
- 17 are in a highly inclined orbit (of which 1 is outdated),

In 2016 at least 18 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]). Thirteen were reorbited sufficiently above GEO_{IADC} and complied with the IADC re-orbiting guidelines:

- USA 75 (DSP F16, DSP 16, DSP Block 5(DSP-1) F16) (1991-080B, 291.2×314.6 km, see p. 97),
- NATO IVB (1993-076A, 473×526 km, see p. 87),
- Intelsat VII F-2 (1994-034A, 357×399 km, see p. 92),
- Optus B3 (1994-055A, 415×480 km, see p. 89),
- Palapa C2 (1996-030A, 348×371 km, see p. 93),
- Superbird C (1997-036A, 307.4×373.5 km, see p. 94),
- Intelsat 7 (PAS 7) (1998-052A, 555×620 km, see p. 85),
- Eutelsat 115 West A (SATMEX 5) (1998-070A, 426.6×455.4 km, see p. 89),
- Galaxy 27 (Intelsat Americas 7, IA 7, Telstar 7) (1999-052A, 329×381 km, see p. 93),
- Turksat 2A (Eurasiasat 1) (2001-002A, 539×638 km, see p. 85),
- XM Radio 1 (Roll) (2001-018A, 358.9k×327.8 km, see p. 93),
- Himawari 6 (MTSAT 1R) (2005-006A, 385.6×310.0 km, see p. 92),
- Ekspres-AM 2 (2005-010A, 306×391 km, see p. 94).

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

- GOES 3 (1978-062A, 239×275 km, see p. 100),
- Inmarsat-3 F4 (1997-027A, 189×247 km, see p. 102),
- Eutelsat 33D (Eutelsat 8 West C, Hot Bird 6) (2002-038A, 247×288 km, see p. 99),
- INSAT 3A (2003-013A, 63×200 km, see p. 107),
- Intelsat 8 (PAS 8) (1998-065A, 160×2818 km, see p. 114).

In 2016 a total of 34 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}:

- Delta 4 second stage (2016-036B, see p. 125),
- Delta 4 second stage (2016-052C, see p. 93),
- YZ-2 third stage (2016-065C, see p. 77).

This analysis has shown that in 2016, nineteen years after the IADC guidelines were established and fifteen years after their adoption, there is in general a wide attempt to comply with the guidelines. This identifies the year 2015, with a higher number of satellites which were not or could not be properly reorbited, as an outlier to the general trend of increased compliances rates.

8 Acknowledgements

The authors, Jan Siminski and Stijn Lemmens, thank Vladimir Agapov (KIAM) and J.-C. Liou (NASA) for their suggestions and valuable contributions. They also thank Stefan Frey for improving the report's layout, and Tim Flohrer and Benjamin Bastida Virgili for providing technical support and further input.

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Glossary

ABS	Asia Broadcast Satellite. 47, 48, 52, 65, 69, 106, 123
ACTS	Advanced Communications Technology Satellite. 138
AEHF	Advanced Extremely High Frequency. 66, 71, 73
AKM	Apogee Kick Motor. 82, 85, 87, 89, 90, 99, 100, 102–104, 106, 110, 112, 113, 115, 116, 119–124, 128
AMC	Americom. 55, 56, 58, 60, 63, 66
AMOS	Affordable Modular Optimized Satellite. 47, 65, 80, 136
AMSC	American Mobile Satellite Corporation. 72
ANGELS	Automated Navigation and Guidance Experiment for Local Space. 76
APPLE	Ariane Passenger Payload Experiment. 110
Artemis	Advanced Relay and Technology Mission. 70
ASC	American Satellite Company. 139, 152
ATHENA-FIDUS	Access on theatres for European allied forces nations-French Italian dual use satellite. 44
ATS	Applications Technology Satellite. 85, 102, 114, 122, 139
BRISat	Bank Rakyat Indonesia Satellite. 54
BS	Broadcasting Satellite. 47, 73, 90, 94, 96, 99, 152
BSAT	Broadcasting Satellite. 51, 95–97
BSE	Broadcasting Satellite Experimental. 133
COMS	Communication, Ocean and Meteorological Satellite. 52

COMSATBw	Communication Satellite for Bundeswehr. 43, 47
CS	Communication Satellite. 84, 90, 92, 98, 101
CTS	Communications Technology Satellite. 139
DATS	Despun Antenna Test Satellite. 128
DCSS	Delta Cryogenic Second Stage. 79, 91, 124, 125
DFH	Dǒngfānghóng. 118, 130, 132, 134–136
DFS	Deutscher Fernmeldesatellit. 103, 106, 116
DLA	DIRECTV Latin America. 59
DODGE	Department of Defense Gravity Experiment. 127
DRTS	Data Relay & Tracking Satellite. 69
DSCS	Defense Satellite Communications System. 67, 70–72, 74, 78–82, 86–88, 90, 92–95, 99, 138, 142
DSP	Defense Support Program. 66, 68, 70, 72, 74, 81, 84–86, 88–91, 97, 102, 103, 105–107, 115, 116, 119, 120, 122, 136, 151, 152, 160
ECS	European Communications Satellite. 84, 89–91
EDUSAT	Education Satellite. 99
ETS	Engineering Test Satellite. 71, 100, 110
FLTSATCOM	Fleet Satellite Communications. 69, 75, 87, 88, 92, 93, 140
GeoLITE	Geosynchronous Lightweight Technology Experiment. 90
GEOS	Geostationary Scientific Satellite. 100
GGTS	Gravity Gradient Test Satellite. 127
GMS	Geostationary Meteorological Satellite. 80, 89, 98, 101, 103, 106, 107, 120
GOES	Geostationary Operational Environmental Satellite. 56, 58, 60, 61, 90, 91, 94, 95, 98, 100–102, 109, 116, 122, 139, 151, 152, 161
GSAT	Geosynchronous Satellite. 46, 48–50, 99, 108, 124
GSSAP	Geosynchronous Space Situational Awareness Program. 76
HGS	Hughes Global Services. 140
HYLAS	Highly Adaptable Satellite. 44, 63
IABS	Integrated Apogee Boost System. 98, 117–120, 122, 123, 128
IDSCS	Initial Defense Satellite Communications System. 126–128
INSAT	Indian National Satellite. 48–50, 88, 105–107, 110, 113, 117, 125, 130, 131, 135, 136, 161
Intelsat	International Telecommunications Satellite. 44–47, 49, 55, 56, 59, 60, 62–65, 67, 68, 71, 74, 77, 80, 84–87, 89, 91–99, 101, 102, 104–107, 109, 111, 114, 123, 137, 140, 142, 160, 161
IRNSS	Indian Regional Navigation Satellite System. 67, 68, 70, 149, 150
IUE	International Ultraviolet Explorer. 149
IUS	Inertial Upper Stage (originally - Interim Upper Stage). 100, 102, 105, 107–109, 112, 115–120, 142
JCSAT	Japan Communications Satellite. 52–54, 68, 71, 87, 96, 103
JPL	Jet Propulsion Laboratory. 85
KAZSAT	Kazakh Satellite. 98

LEASAT	Leased Satellite. 80–82, 87, 104
LES	Lincoln Experimental Satellite. 85, 121, 128, 138, 139
LMI	Lockheed Martin Intersputnik. 54
MAGE	Moteur d'Apogée Géostationnaire Européen. 82, 100, 103, 110, 112, 115, 116
MARECS	Maritime European Communications Satellite. 78, 79
MEASAT	Malaysia East Asia Satellite. 71, 94
METSAT	Meteorological Satellite. 68
Milstar DFS	Military Strategic and Tactical Relay Development Flight Satellite. 73, 74
MITEx	Micro-satellite Technology Experiment. 87, 91
MOP	Meteosat Operational Programme. 80, 86, 92
MOS/PIM	Multi-Orbit Satellite/Performance Improvement Modification. 85, 88–90
MSAT	Mobile Satellite. 72
MSG	Meteosat Second Generation. 6, 65–67, 119, 121–123
MTP	Meteosat Transition Programme. 68
MTSAT	Multi-Functional Transport Satellite. 54, 92, 160
MUOS	Mobile User Objective System. 68, 71–73, 75
MVIRI	Meteosat Visible and InfraRed Imager. 152
NATO	North Atlantic Treaty Organization. 78, 85, 87, 108, 138, 160
NigComSat	Nigerian Communication Satellite. 45, 133
NRL	Naval Research Laboratory. 125
NROL	NRO Launch. 67, 69–72, 75
NSS	New Skies Satellites. 46, 50, 55, 63, 67, 74, 80, 87, 99
OPS	Operations (?). 78–81, 84–90, 92, 93, 98, 102, 106, 107, 112–116, 122, 126–131, 135, 136, 138, 140–142, 151, 152
OSC	Orbital Sciences Corporation. 87
OTS	Orbital Test Satellite. 95
OV	Orbiting Vehicle. 122
PAS	PanAmSat. 6, 45, 62, 63, 67, 71, 74, 77, 80, 85, 94, 96, 97, 100, 114, 160, 161
POTV	Precision Orbital Transfer Vehicle. 125
PSN	Pasifik Satelit Nusantara. 96
RASCOM	Regional African Satellite Communication (Organization). 42
RCA	Radio Corporation of America. 88, 101, 104, 108, 112
S-VISSR	Stretched Visible and Infrared Spin Scan Radiometer. 6, 130, 133, 135
SBIRS	Space-Based Infrared System. 66, 69
SBS	Satellite Business Systems. 89, 93, 106, 107, 109, 112
SCATHA	Spacecraft Charging AT High Altitudes. 121, 122
SDO	Solar Dynamics Observatory. 149
SDS	Satellite Data System. 69, 70, 72, 75, 87
SES	Société Européenne des Satellites. 42, 50, 51, 58–60, 63, 64
SESAT	Siberian-European Satellite. 48, 66
SEVIRI	Spinning Enhanced Visible and Infrared Imager. 6, 119, 121–123
SICRAL	Sistema Italiano per Comunicazioni Riservate ed Allarmi. 42, 44, 66
SIRIO	Satellite Italiano di Ricerca Industriale Orientata. 130

SMS	Synchronous Meteorological Satellite. 87, 88, 102, 128, 151
ST	Singapore-Taiwan. 48, 49, 89
STTW	Shiyan Tongbu Tongxing Weixing. 130, 132, 134, 136
Syncom	Synchronous Communication. 80–82, 87, 104, 114, 149
Syracuse	Système de Radiocommunication utilisant un satellite. 45, 64
TACSAT	Tactical Communications. 115
TDF	TéléDiffusion de France. 88, 97
TDRS	Tracking and Data Relay Satellite. 55, 69, 71–75, 87, 89
TJS	Tōngxùn Jìshù Shìyàn. 54
UFO	UHF (Ultra High Frequency) Follow-On. 66, 68, 71–74, 84, 89, 98, 141
VAS	VISSR Atmospheric Sounder. 152
VINASAT	Vietnamese Satellite. 53
VISSR	Visible and Infrared Spin Scan Radiometer. 132–134, 151, 152
WGS	Wideband Global SATCOM (initially - Wideband Gapfiller Satellite). 47, 49, 55, 56, 62, 64, 76
WINDS	Wideband InterNetworking engineering test and Demonstration Satellite. 54
ZX	Zhongxing. 48, 50–53, 55, 69, 70, 80, 96, 97, 100, 106, 110, 130, 132, 134, 135

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