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Submission of NGSO satellite systems and networks subject to coordination

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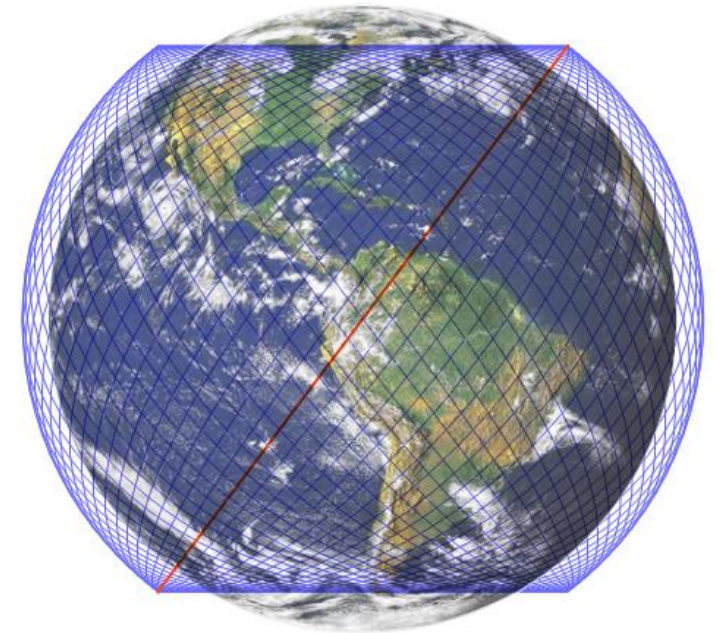
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Section 1 – NGSO networks

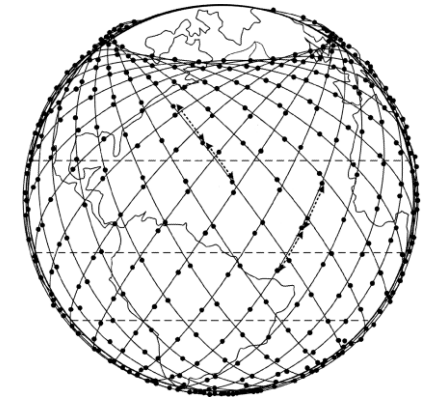
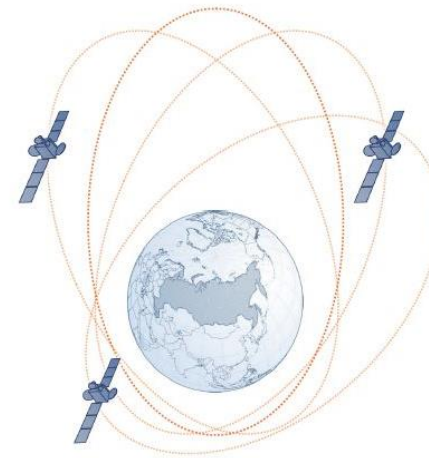
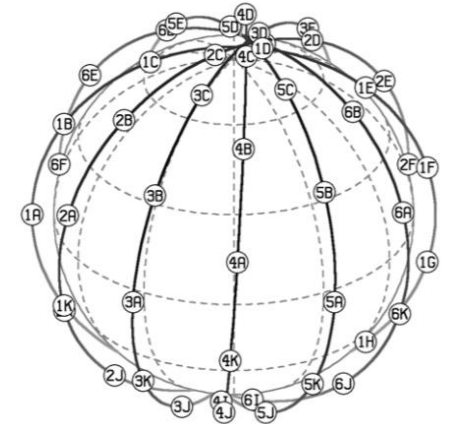
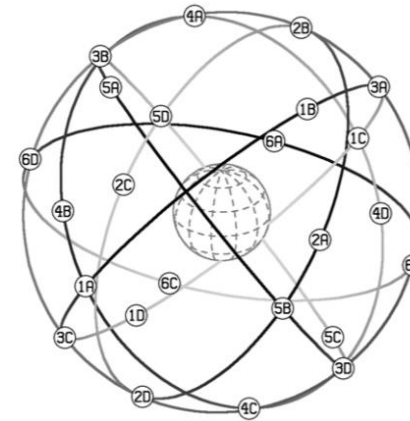
- The rapidly increase of non-geostationary satellite projects, especially satellite mega-constellations in the low Earth orbits (LEO), represents an important innovation in satellite technology and leads to an increase in the number and complexity of NGSO satellite networks submitted to the Radiocommunication Bureau

Starlink Initial Phase
1,584 satellites into 72 orbital planes
of 22 satellites each



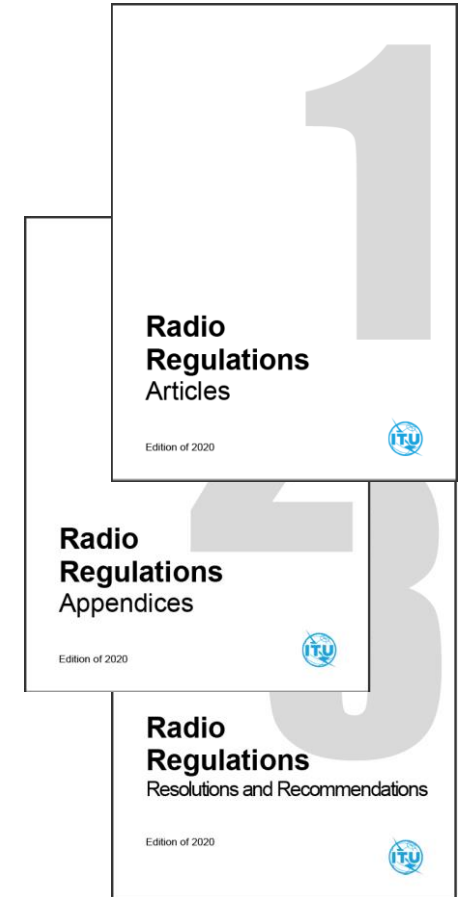
Examples of NGSO systems today

- ❑ Space science missions, navigation and mobile-satellite systems (Iridium, Globalstar, GPS, Glonass, etc.)
- ❑ Communication satellites in the elliptical orbits (Express-RB, etc.)
- ❑ Satellite constellations (or mega-constellations) providing broadband Internet access (O3B, Starlink, One-Web, Amazon, etc.)



Section 2 – Regulations of the CRC NGSO networks

- ❑ Coordination procedure:
 - ✓ *No. 9.21 of the Radio Regulations (RR)*
 - ✓ *No. 9.11A RR (Nos. 9.12, 9.12A and 9.14 RR)*
- ❑ NGSO satellite systems shall not cause unacceptable interference to and shall not claim protection from GSO networks in the FSS and BSS (*No. 22.2 RR*), or
- ❑ Article 22 EPFD limits to protect GSO from NGSO:
 - ✓ *Nos. 22.5C, 22.5D, 22.5F or 22.5L RR*



No. 9.21 and No. 9.11A of the Radio Regulations

9.21 *p)* for any station of a service for which the requirement to seek the agreement of other administrations is included in a footnote to the Table of Frequency Allocations referring to this provision. (WRC-2000)



5.461 *Additional allocation:* the bands 7 250-7 375 MHz (space-to-Earth) and 7 900-8 025 MHz (Earth-to-space) are also allocated to the mobile-satellite service on a primary basis, subject to agreement obtained under **No. 9.21**.

9.11A *e)* for a station for which the requirement to coordinate is included in a footnote to the Table of Frequency Allocations referring to this provision, the provisions of Nos. **9.12** to **9.16** are applicable; (WRC-2000)



5.523B The use of the band 19.3-19.6 GHz (Earth-to-space) by the fixed-satellite service is limited to feeder links for non-geostationary-satellite systems in the mobile-satellite service. Such use is subject to the application of the provisions of **No. 9.11A** and No. 22.2 does not apply.



Table for No. 9.11A in the Rules of Procedure

TABLE 9.11A-1

Applicability of the provisions of Nos. 9.11A-9.15 to stations of space services

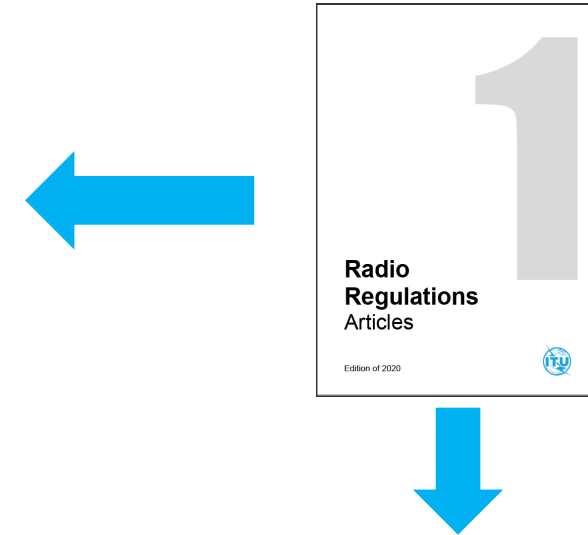
1	2	3	4	5	6	7
Frequency band (GHz)	Footnote No. in Article 5	Space services mentioned in a footnote referring to Nos. 9.11A, 9.12, 9.12A, 9.13 or 9.14, as appropriate	Other space services or systems to which Nos. 9.12 to 9.14 provision(s) apply equally, as appropriate	Applicable Nos. 9.12 to 9.14 provision(s), as appropriate	Terrestrial services in respect of which No. 9.14 apply equally	Notes
19.3-19.6	5.523B	FIXED-SATELLITE (limited to non-GSO MOBILE-SATELLITE SERVICE feeder links)		9.12, 9.12A, 9.13	---	
	5.523D	FIXED-SATELLITE (GSO with coordination information received as of 18.11.1995 and non-GSO MOBILE-SATELLITE SERVICE feeder links) (see also No. 5.523C)				
19.6-19.7	5.523D	FIXED-SATELLITE (GSO with coordination information received as of 22.11.1997 and non-GSO MOBILE-SATELLITE SERVICE feeder links) (see also No. 5.523E)	FIXED-SATELLITE (GSO with coordination information received as of 22.11.1997 and non-GSO) (see also No. 5.523E)	9.12, 9.12A, 9.13	---	
19.7-20.1	5.484A	FIXED-SATELLITE (non-GSO)	MOBILE-SATELLITE (Non-GSO) (Region 2)	9.12	---	
20.1-20.2	5.484A	FIXED-SATELLITE (non-GSO)	MOBILE-SATELLITE (Non-GSO)	9.12	---	
27.5-28.6	5.484A	FIXED-SATELLITE (non-GSO)	FIXED-SATELLITE (Non-GSO) in the band 27.5-27.501 GHz (5.538)	9.12	---	
28.6-29.1	5.523A	FIXED-SATELLITE	---	9.12, 9.12A, 9.13	---	
29.1-29.5	5.535A	FIXED-SATELLITE (GSO) (see also Nos. 5.523C and 5.523E) and non-GSO MOBILE-SATELLITE SERVICE feeder links)	---	9.12, 9.12A, 9.13	---	
29.5-29.9	5.484A	FIXED-SATELLITE (non-GSO)	MOBILE-SATELLITE (Non-GSO) (Region 2)	9.12	---	
29.9-30	5.484A	FIXED-SATELLITE (non-GSO)	MOBILE-SATELLITE (Non-GSO) FIXED-SATELLITE (Non-GSO) in the band 29.999-30 GHz (5.538)	9.12	---	



Satellite networks subject to EPFD limits (1 of 2)

For NGSO in fixed-satellite service only:

Frequency ranges subject to EPFD limits (MHz)	Direction	Limits Information
3700 -4200	E	Article 22, Table 22-1E↓, BW: 4 kHz
5925-6725	R	Article 22, Table 22-2↑, BW: 4 kHz
10700 - 11700	E	Appendix 5, Table 5-1, No. 9.7B↓, BW: 40 kHz
		Article 22, No. 22.5C4↓, BW: 40 kHz
		Article 22, Table 22-1A↓, BW: 40 kHz
		Article 22, Table 22-3↔, BW: 40 kHz
11700 - 12200	E	Appendix 5, Table 5-1, No. 9.7B↓, BW: 40 kHz
		Article 22, No. 22.5C4↓, BW: 40 kHz
		Article 22, No. 22.5C8↓, BW: 40 kHz
		Article 22, Table 22-1A↓, BW: 40 kHz
		Article 22, Table 22-1D↓, BW: 40 kHz
12200 - 12750	E	Article 22, No. 22.5C8↓, BW: 40 kHz
		Article 22, Table 22-1D↓, BW: 40 kHz
		Article 22, RR 22.5C4↓, BW: 40 kHz
		Article 22, Table 22-1A↓, BW: 40 kHz
		Appendix 5, Table 5-1, No. 9.7B↓, BW: 40 kHz
Article 22, Table 22-3↔, BW: 40 kHz		
12500 - 13250	R	Article 22, Table 22-2↑, BW: 40 kHz
13750 - 14500	R	Article 22, Table 22-2↑, BW: 40 kHz

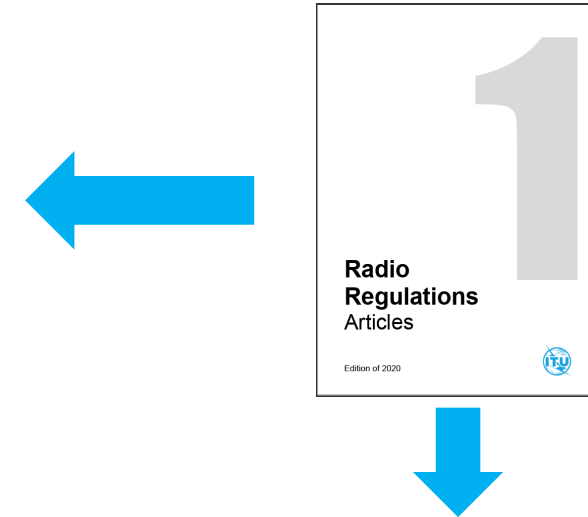


- Limit indicates ↑ – Earth Station EIRP mask is required (item A.14.b of Appendix 4)
- Limit indicates ↓ – Space Station PFD mask is required (item A.14.c of Appendix 4)
- Limit indicates ↔ – Space Station EIRP mask is required (item A.14.a of Appendix 4)

Satellite networks subject to EPFD limits (2 of 2)

For NGSO in fixed-satellite service only:

Frequency ranges subject to EPFD limits (MHz)	Direction	Limits Information
17300 - 18100	R	Article 22, Table 22-2↑, BW: 40 kHz
17800 - 18600	E	Article 22, Table 22-3↔, BW: 40 kHz
		Article 22, Table 22-1B↓, BW: 40 kHz
		Appendix 5, Table 5-1, No. 9.7B↓, BW: 1000 kHz
		Article 22, Table 22-1B↓, BW: 1000 kHz
19700 - 20200	E	Article 22, Table 22-1C↓, BW: 40 kHz
		Appendix 5, Table 5-1, No. 9.7B↓, BW: 1000 kHz
		Article 22, Table 22-1C↓, BW: 1000 kHz
27500 - 28600	R	Article 22, Table 22-2↑, BW: 40 kHz
29500 - 30000	R	Article 22, Table 22-2↑, BW: 40 kHz
37500 - 42500	E	Article 22, No. 22.5L↓, BW: 40 kHz
		Article 22, No. 22.5L↓, BW: 1000 kHz
47200 - 50200	R	Article 22, No. 22.5L↑, BW: 40 kHz
		Article 22, No. 22.5L↑, BW: 1000 kHz
50400 - 51400	R	Article 22, No. 22.5L↑, BW: 40 kHz
		Article 22, No. 22.5L↑, BW: 1000 kHz



- Limit indicates ↑ – Earth Station EIRP mask is required (item A.14.b of Appendix 4)
- Limit indicates ↓ – Space Station PFD mask is required (item A.14.c of Appendix 4)
- Limit indicates ↔ – Space Station EIRP mask is required (item A.14.a of Appendix 4)

Section 3 – Receivability

- ❑ Submit SNS and GIMS (if required) databases with correct structure (**Important** to use SpaceCap to capture filings and GIMS to create database with graphical data)
- ❑ Capture in SNS format database all mandatory data items in accordance with Appendix 4 RR
- ❑ Submit EPFD information (limited or extended set), including EIRP, PFD masks and links between these masks and beams (if applicable)
- ❑ Submit notes which cannot be captured in databases
- ❑ Submit all databases, notes and EPFD information (if applicable) with e-Submission system at the same time

§ 3.5 - 3.8 of the Rules of Procedure concerning Receivability

- If the information or clarification is provided within that period of 30 days, the date of receipt established by the Bureau will be considered as the formal date of the notice
- If the information or clarification is not provided within the above period of 30 days, the submission shall be considered incomplete and the Bureau will establish new formal date of receipt when the complete information is received

Appendix 4 of the Radio Regulations

Table of characteristics to be submitted for space and radio astronomy services
(Rev.WRC-12)

TABLE A
GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK OR SYSTEM,
EARTH STATION OR RADIO ASTRONOMY STATION (Rev.WRC-19)

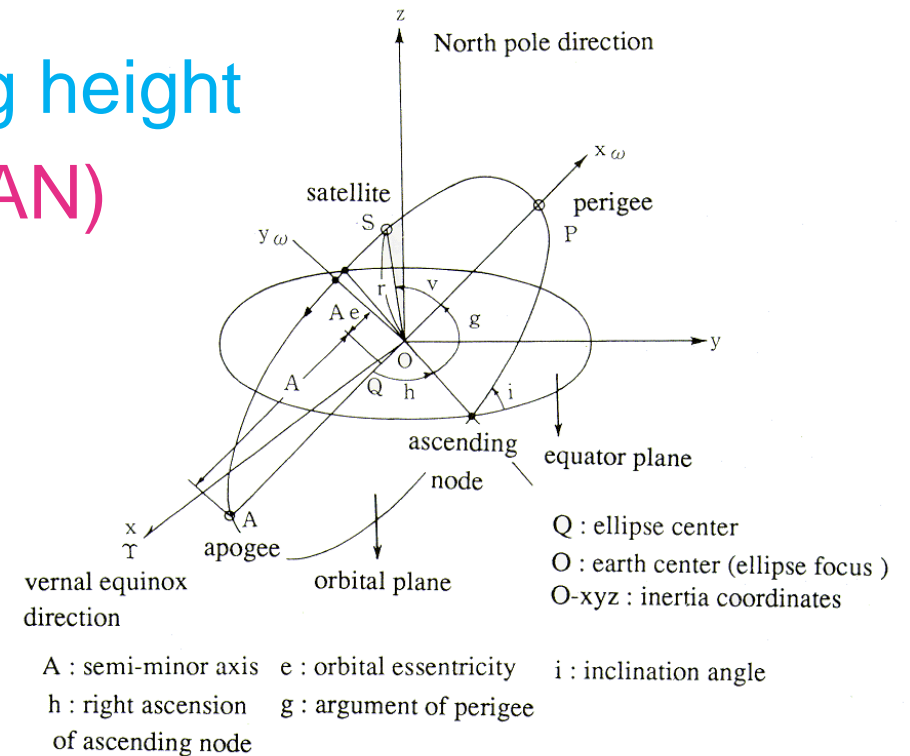
Items in Appendix	A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK OR SYSTEM, EARTH STATION OR RADIO ASTRONOMY STATION	Notification or coordination of a non-geostationary-satellite network or system								Items in Appendix	Radio astronomy		
		Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network or system subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network or system not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network or system subject to coordination under Article 2A of Appendix 30 or 30A	Notification or coordination of a non-geostationary-satellite network or system	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)			Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	
A.1	IDENTITY OF THE SATELLITE NETWORK OR SYSTEM, EARTH STATION OR RADIOASTRONOMY STATION										A.1		
A.1.a	the identity of the satellite network or system	X	X	X	X	X		X	X	X	A.1.a		
A.1.b	the beam identification In the case of Appendix 30 or 30A, required only for modification, suppression or notification of Plan assignments In the case of Appendix 30B, required only for a network derived from the Allotment Plan								+	+	+	A.1.b	
A.1.e	Identity of the earth station or radio astronomy station:											A.1.e	
A.1.e.1	the type of earth station (specific or typical)							X			A.1.e.1		
A.1.e.2	the name of the station							X			A.1.e.2	X	
A.1.e.3	For a specific earth station or radio astronomy station:										A.1.e.3		
A.1.e.3.a	the country or geographical area in which the station is located, using the symbols from the Preface							X			A.1.e.3.a	X	
A.1.e.3.b	the geographical coordinates of each transmitting or receiving antenna site constituting the station (latitude and longitude in degrees and minutes) For a specific earth station, seconds are to be provided if the coordination area of the earth station overlaps the territory of another administration							X			A.1.e.3.b	X	
A.1.f	Administration and intergovernmental organization symbol:										A.1.f		
A.1.f.1	the symbol of the notifying administration (see the Preface)	X	X	X	X	X	X	X	X	X	A.1.f.1	X	
A.1.f.2	if the notice is submitted by the notifying administration in association with other administrations, the symbols of each of the administrations (see the Preface)	+	+	+	+	+	+	+	+	+	A.1.f.2		
A.1.f.3	if the notice is submitted on behalf of an intergovernmental satellite organization, the symbol of that organization (see the Preface)	+	+	+	+	+	+	+	+	+	A.1.f.3		
A.1.g	indicator showing that the non-GSO satellite system is planned to be operated in accordance with Resolution 32 (WRC-19) Required for advance publication and notification			X		+					A.1.g		
A.1.g.1	Not used										A.1.g.1		
A.1.g.2	Not used										A.1.g.2		

Notification or coordination of a non-geostationary-satellite network or system

- X - Mandatory information
- + - Mandatory under the conditions
- O - Optional information
- C - Mandatory if used as a basis to effect coordination with another administration
- - The data item is not applicable to the corresponding notice

Mandatory data items of Appendix 4 for Keplerian elements

- Inclination of orbit
- Apogee and perigee, minimum operating height
- Right ascension of ascending node (RAAN)
- Longitude of ascending node (LAN)
- Phase angle of the satellite within its orbital plane
- Argument of perigee



Mandatory data items for networks subject to coordination under *No. 9.11A*

- ❑ For the satellite transmitting and receiving antenna beams:
 - ✓ the orientation angle alpha, in degrees (item **B.4.a.3.a.1** of Appendix 4)
 - ✓ the orientation angle beta, in degrees (item **B.4.a.3.a.2** of Appendix 4)
- ❑ For transmitting beams, the satellite antenna gain as a function of elevation angle at a fixed point on the Earth (item **B.4.b.2** of Appendix 4)
- ❑ For each beam, the maximum and average beam peak EIRP (item **B.4.b.4** of Appendix 4)
- ❑ For each carrier, the type of modulation (item **C.9.a.1** of Appendix 4)
- ❑ For each group, the type of multiple access (item **C.9.c.1** of Appendix 4)
- ❑ For each group, the spectrum mask (item **C.9.c.2** of Appendix 4)
- ❑ the appropriate information required to calculate the affected region only for NGSO networks in frequency bands between 1 and 3 GHz for MSS (item **C.11.b** of Appendix 4)

Mandatory AP4 items for networks subject to Nos. 22.5C, 22.5D, 22.5F and 22.5L (limited set)

□ Capture in the SRS database:

- ✓ the maximum number of non-geostationary satellites receiving simultaneously with overlapping frequencies from the associated earth stations within a given cell (item **A.4.b.7.a** of Appendix 4)
- ✓ the average number of associated earth stations with overlapping frequencies per square kilometre within a cell (item **A.4.b.7.b** of Appendix 4)
- ✓ the average distance, in kilometres, between co-frequency cells (item **A.4.b.7.c** of Appendix 4)
- ✓ the minimum elevation angle at which any associated earth station can transmit to or receive from a non-geostationary satellite (item **A.4.b.7.cbis** of Appendix 4)
- ✓ the type of zone (based on topocentric angle or satellite-based angle for establishing the exclusion zone) and the width of the zone, in degrees (items **A.4.b.7.d.1** and **A.4.b.7.d.2** of Appendix 4)
- ✓ Maximum number of non-geostationary satellites transmitting with overlapping frequencies to a given location within the latitude range from -90 to 90 degrees (item **A.4.b.6.a.1** of Appendix 4)
- ✓ an indicator showing whether the space station uses station-keeping to maintain a repeating ground track (items **A.4.b.6.c** and **A.4.b.6.d** of Appendix 4)
- ✓ an indicator showing whether the space station should be modelled with a specific precession rate of the ascending node of the orbit instead of the J2 term (items **A.4.b.6.e** and **A.4.b.6.f** of Appendix 4)
- ✓ the longitudinal tolerance of the longitude of the ascending node (items **A.4.b.6.j** of Appendix 4)

□ EIRP, PFD masks and masks links (A.14)

Resolution 770 (WRC-19)

“Application of Article 22 of the Radio Regulations to the protection of geostationary fixed-satellite service and broadcasting-satellite service networks from non-geostationary fixed-satellite service systems in the frequency bands 37.5-39.5 GHz, 39.5-42.5 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz”

- ❑ The Bureau is currently unable to examine NGSO FSS systems subject to the single-entry provision given in *No. 22.5L RR* due to a lack of available software
- ❑ In accordance with resolves 3 of Resolution **770** (WRC-19) it is required to provide:
 - ✓ all necessary information sufficient to demonstrate compliance with *No. 22.5L*
 - ✓ a commitment that the NGSO FSS system complies with the limits given in *No. 22.5L*
- ❑ In accordance with the decision of 84th meeting of the Radio Regulations Board, such FSS frequency assignments may be given qualified favourable findings on condition that administration provide all the required Appendix 4 data items and a commitment that the NGSO satellite network complies with limits of *No. 22.5L RR*

AP4 information required for CRC NGSO networks after WRC-19 (1 of 2)

AP4 item	Description	No. 9.21	No. 9.11A	Nos. 22.5C, 22.5D, 22.5F or 22.5L	SpaceCap v. 9
A.4.b.1.a	indicator of whether the non-geostationary-satellite system represents a “constellation”, where the term “constellation” describes a satellite system, for which the relative distribution of the orbital planes and satellites is defined	Mandatory	Must be YES	Must be YES	Station Tab
A.4.b.1.b	indicator of whether all the orbital planes identified under A.4.b.1 describe a) a single configuration where all frequency assignments to the satellite system will be in use or b) multiple configurations that are mutually exclusive where a sub-set of the frequency assignments to the satellite system will be in use on one of the sub-sets of orbital parameters to be determined at the notification and recording stage of the satellite system	Mandatory, if item A.4.b.1.a - YES	Mandatory	Mandatory	Station Tab
A.4.b.1.c	if the orbital planes identified under A.4.b.1 describe multiple mutually exclusive configurations, identification of the number of sub-sets of orbital characteristics that are mutually exclusive	Mandatory if item A.4.b.1.b - MULTIPLE	Mandatory if item A.4.b.1.b - MULTIPLE	Mandatory if item A.4.b.1.b - MULTIPLE	Station Tab
A.4.b.1.d	if the orbital planes identified under A.4.b.1.b describe multiple mutually exclusive configurations, identification of the orbital planes’ id numbers that are associated with each of the mutually exclusive configurations	Mandatory if item A.4.b.1.b - MULTIPLE	Mandatory if item A.4.b.1.b - MULTIPLE	Mandatory if item A.4.b.1.b - MULTIPLE	Attachment
A.4.b.4.j	the longitude of the ascending node (θ_j) for the j-th orbital plane, measured counter-clockwise in the equatorial plane from the Greenwich meridian to the point where the satellite orbit makes its South-to-North crossing of the equatorial plane ($0^\circ \leq \theta_j < 360^\circ$) Note – All satellites in all orbital planes must use the same reference time. If no reference time is provided in A.4.b.4.k and A.4.b.4.l, it is assumed to be $t = 0$	-	Mandatory	Mandatory	Station Tab - Orbital information (3 of 3)
A.4.b.4.k	the date (day:month:year) at which the satellite is at the location defined by the longitude of the ascending node (θ_j) (see Note under A.4.b.4.j)	-	Optional	Optional	Station Tab - Orbital information (3 of 3)
A.4.b.4.l	the time (hours:minutes) at which the satellite is at the location defined by the longitude of the ascending node (θ_j) (see Note under A.4.b.4.j)	-	Optional	Optional	Station Tab - Orbital information (3 of 3)

AP4 information required for CRC NGSO networks after WRC-19 (2 of 2)

AP4 item	Description	No. 9.21	No. 9.11A	Nos. 22.5C, 22.5D, 22.5F or 22.5L	SpaceCap v. 9
A.4.b.4.m	indicator of whether the space station uses sun-synchronous orbit or not	Mandatory	-	-	Station Tab - Orbital information (1 of 3)
A.4.b.4.n	if the space station uses sun-synchronous orbit (A.4.b.4.m), indicator of whether the space station references the local time of the ascending node (solar local time when the space station is crossing the equatorial plane in the South-North direction in hours:minutes format) or the descending node (solar local time when the space station is crossing the equatorial plane in the North-South direction in hours:minutes format)	Optional	-	-	Station Tab - Orbital information (1 of 3)
A.4.b.4.o	if the space station uses sun-synchronous orbit (A.4.b.4.m), the local time of the ascending (or descending, per A.4.b.4.n) node (solar local time when the space station is crossing the equatorial plane in the South-North (or North-South) direction in hours : minutes format)	Optional	-	-	Station Tab - Orbital information (1 of 3)
A.17.abis	the equivalent power flux-density (epfd) produced at the site of a radio astronomy station in the frequency band 1 610.6-1 613.8 MHz, as defined in No. 5.372	-	Mandatory for NGSO operating in the MSS (space-to-Earth) in the 1613.8-1626.5 MHz	-	Notice Tab
A.4.b.6bis	an indicator showing whether the set of operating parameters is provided in A.14.d (extended set of operating parameters) or provided in A.4.b.6.a and A.4.b.7 (limited set of operating parameters)	-	-	Mandatory	Station Tab - Orbital information (3 of 3)
A.4.b.7.cbis	the minimum elevation angle at which any associated earth station can transmit to or receive from a non-geostationary satellite	-	-	Mandatory	Group Tab
A.4.b.7.d.3	Not used * (if an alternative method is used for establishing the exclusion zone, a detailed description of the avoidance mechanism)	-	-	-	-

* Exclusion zone can be described only by 2 methods
(items A.4.b.7.d.1 and A.4.b.7.d.2)

“Constellation”

- ❑ WRC-19 added mandatory data item **A.4.b.1.a** of Appendix 4 – an indicator of whether the NGSO satellite system represents a “constellation”
- ❑ NGSO systems in frequency bands subject to the provisions of Nos. **9.11A**, **22.5C**, **22.5D**, **22.5F** or **22.5L RR** are always considered as “constellations”
- ❑ Term “constellation” would apply to NGSO satellite systems having more than 1 orbital plane where mutual relative position of each orbital plane and mutual relative position of each satellite in its orbital plane is important

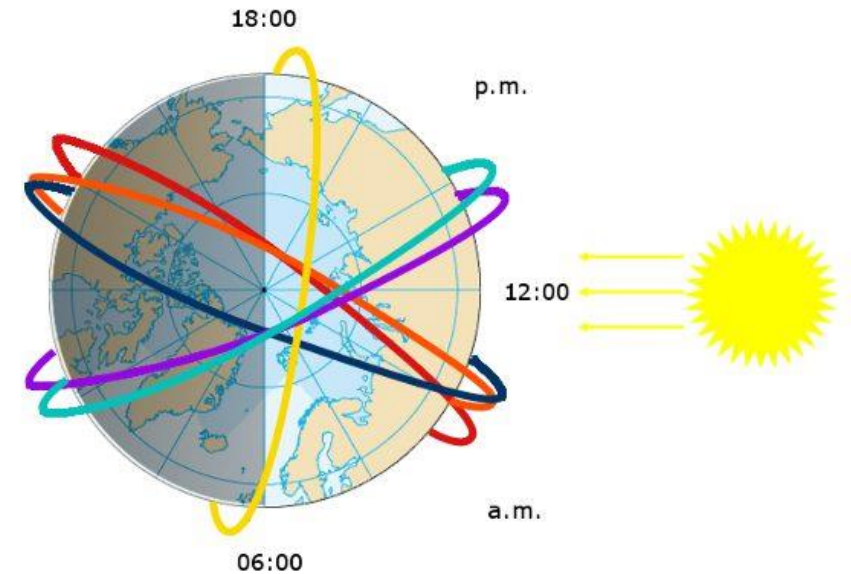
Multiple configurations

- ❑ WRC-19 added mandatory, for NGSO satellite system represents a “constellation”, data item **A.4.b.1.b** of Appendix 4 – indicator of whether all the orbital planes describe:
 - ✓ a single configuration where all frequency assignments to the satellite system will be in use or
 - ✓ multiple configurations that are mutually exclusive where a sub-set of the frequency assignments to the satellite system will be in use on one of the sub-sets of orbital parameters to be determined at the notification and recording stage of the satellite system

Note: In this case identification of the number of sub-sets (item **A.4.b.1.c** of Appendix 4) and the orbital planes’ id numbers that are associated with each of the mutually exclusive configurations (item **A.4.b.1.d** of Appendix 4) are required
- ❑ In accordance with Council Decision 482 (Modified 2020), for a coordination request of a NGSO satellite network containing different mutually exclusive sub-sets, cost recovery charges will be separately computed for each of the sub-sets

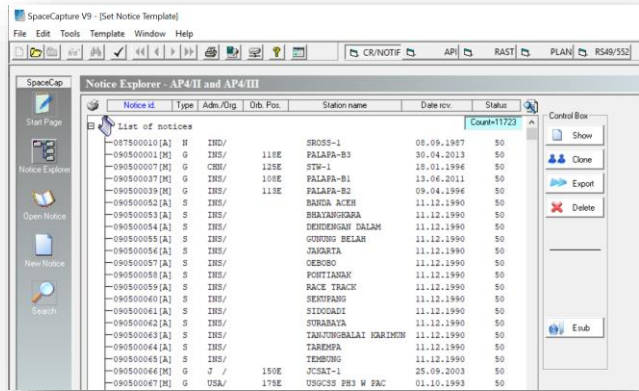
Sun-synchronous orbit

- ❑ WRC-19 added mandatory data item **A.4.b.4.m** of Appendix 4 – an indicator of whether the space station uses sun-synchronous orbit or not
- ❑ This data item is mandatory only in frequency bands not subject to the provisions of *Nos. 9.12 or 9.12A RR*, i.e. subject to *No. 9.21 RR* only
- ❑ A sun-synchronous orbit is a nearly polar orbit around the Earth, in which the satellite passes over any given point of the Earth surface at the same local time.
- ❑ More technically, an orbit will be sun-synchronous if the precession rate equals the angular rate of the motion of the Earth about the Sun, which is 360° per year, i.e. approximately 1.99×10^{-7} (rad/s)

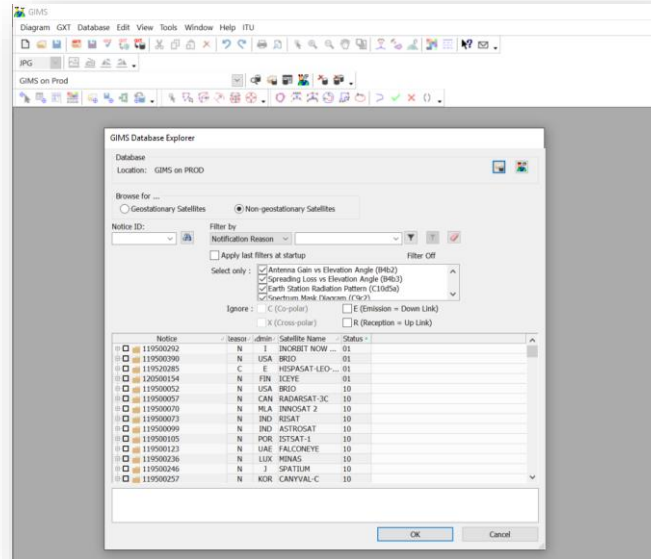


Section 4 – BR software

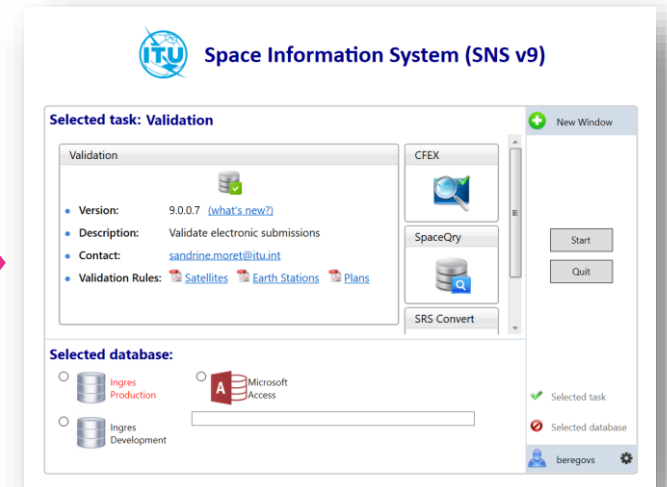
SpaceCap v. 9



GIMS v. 9



BRSIS Validation v.9



(No FATAL errors!)

= SUCCESS!

SpaceCap for CRC NGSO networks (1 of 4)

NonGeoStationary Notice:1

Notice | **Station** | Beam | Attachments

Notice Id: 1 Administration: D Status: 20 Date: 09.10.2020

A1a. Identity of the Satellite Network: TEST NGSO

A4b1. Number of Orbital Planes: 36 A4b2. Reference body: (T) Earth A4b1a. Constellation: (M) Multiple

A4b1c. No of sub-sets: 2 A4b1d. Attachment Number: 1

A4b. Orbital Information for each Orbital Plane, where the Earth is the reference body

Orbital Plane id	4a. Incl. Angle	4b. Satellites in the plane	4c. Period ddd	4c. Period hh	4c. Period mm	4d. Apogee	4d. apog exp	4e. Perigee	4e. perig exp	4f. Minimum Altitude	4f. Min Alt exp
1	55.0	40	0	1	48	1150.00	0	1150.00	0	1150.00	0
2	55.0	40	0	1	48	1150.00	0	1150.00	0	1150.00	0
3	55.0	40	0	1	48	1150.00	0	1150.00	0	1150.00	0
4	55.0	40	0	1	48	1150.00	0	1150.00	0	1150.00	0
5	55.0	40	0	1	48	1150.00	0	1150.00	0	1150.00	0

List of Available Beams:

- Beam KARX1
- Beam KARX2
- Beam KARX3
- Beam KARX4
- Beam KARX5
- Beam NUBX1
- Beam TC
- Beam VUR
- Beam TM
- Beam TXKA1
- Beam TXKA2
- Beam TXKA3
- Beam TXKA4
- Beam TXKU1
- Beam TXKU2
- Beam TXKU3
- Beam TXKU4
- Beam VDR

A15a. Commitment to meet epfd limits (applicable bands 10.7-12.75 GHz depending on region) Yes No

A17a. Commitment to meet power-flux density limits (applicable bands 1164-1215 MHz) Yes No

A18a. Commitment of aircraft earth station (applicable bands 14-14.5 GHz) Yes No

Commitment under resolves 3 of Res 770 (applicable bands 37.5-42.5 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz) Yes No Attachment No: 1

A17b,d,e Compliance with PFD limits Enter PFD values

Mandatory information!
If it's indicated that there are "Multiple configurations" please provide the number of sub-sets and indicate configuration for each orbital plane

Mandatory information!
Information concerning "sun-synchronous" orbits is mandatory only for satellite networks subject to coordination under **No. 9.21 RR**

Do not forget to provide commitments and PFD values for concerned frequency bands if any

SpaceCap for CRC NGSO networks (2 of 4)

NonGeoStationary Notice:1

Notice | **Station** | Beam | Attachments

Notice Id: 1 Administration: D Status: 20 Date: 09.10.2020

A1a. Identity of the Satellite Network: TEST NGSO

A4b1. Number of Orbital Planes: 36 A4b2. Reference body: (T) Earth A4b1a. Constellation: (M) Multiple

A4b3a. Nbr of Satellites to NH: A4b3b. Nbr of Satellites to SH: A4b1c. No of sub-sets: 2 A4b1d. Attachment Number: 1

Orbital Information (1 of 3) | **Orbital Information (2 of 3)** | Orbital Information (3 of 3)

A4b4. Orbital Parameters				
Orbital Plane id	4a. Inclination Angle	4b. Satellites in the plane	4g. Right Ascension (degrees)	4i. Argument of the Perigee (degrees)
1	55	40	0	0
2	55	40	5	0
3	55	40	10	0
4	55	40	15	0
5	55	40	20	0
6	55	40	25	0
7	55	40	30	0
8	55	40	35	0
9	55	40	40	0
10	55	40	45	0

A4b4h. Phase Data for Orbital Plane number 1	
Satellite Number	4h. Initial phase angle
1	0
2	9
3	18
4	27
5	36
6	45
7	54
8	63
9	72
10	81

In order to calculate automatically phase angles, please insert values below:

Initial phase angle:

Step:

Apply to current orbit

Apply to all orbits with same number of satellites

Mandatory information for networks subject to coordination under *No. 9.11A RR*

Convenient tool for capturing of the initial phase angle (item **A.4.b.4.h** of Appendix 4)

SpaceCap for CRC NGSO networks (3 of 4)

NonGeoStationary Notice:1

Notice **Station** Beam Attachments

Notice Id: 1 Administration: D Status: 20 Date: 09.10.2020

A1a. Identity of the Satellite Network: TEST NGSD

A4b1. Number of Orbital Planes: 36 A4b2. Reference body: (T) Earth

A4b3a. Nbr of Satellites to NH: A4b3b. Nbr of Satellites to SH:

Orbital Information (1 of 3) **Orbital Information (2 of 3)** **Orbital Information (3 of 3)**

A4b6bis. Operating parameters indicator: (L) Limited Set

A4b6a. Latitude Ranges

A4b6a2. Start of Latitude Range (degrees)	A4b6a3. End of Latitude Range (degrees)	A4b6a1. Max Number of Satellites
-90.0	90.0	1

A4b6. Orbital Operation

N. of sats	4a. Incl. Angl	6c. Stn Keeping	6d. R-prd ddd	6d. R-prd d hh	6d. R-prd mm	6d. R-prd ss	6e. Precession / J2 term	6f. Precession Rate * / day	4j. Longitude ascending node	6j. Longitudinal tolerance
40	5	<input checked="" type="radio"/> yes <input type="radio"/> no <input type="radio"/> n.v.					<input type="radio"/> Prec <input checked="" type="radio"/> J2 term <input type="radio"/> n.v.		0	0.1
40	5	<input checked="" type="radio"/> yes <input type="radio"/> no <input type="radio"/> n.v.					<input type="radio"/> Prec <input checked="" type="radio"/> J2 term <input type="radio"/> n.v.		5	0.1
40	5	<input checked="" type="radio"/> yes <input type="radio"/> no <input type="radio"/> n.v.					<input type="radio"/> Prec <input checked="" type="radio"/> J2 term <input type="radio"/> n.v.		10	0.1
40	5	<input checked="" type="radio"/> yes <input type="radio"/> no <input type="radio"/> n.v.					<input type="radio"/> Prec <input checked="" type="radio"/> J2 term <input type="radio"/> n.v.		15	0.1

A4b4k/l. Date/time of sat location for Orbital Plane 1

Satellite Number	4k. Reference Date DD.MM.YYYY	4l. Reference Time HH:mm:ss
1	01.01.2020	00:00:00
2	01.01.2020	00:00:00
3	01.01.2020	00:00:00
4	01.01.2020	00:00:00
5	01.01.2020	00:00:00
6	01.01.2020	00:00:00

Select Date and Time for all satellites on Selected Orbital Plane: 00:00:00 Set

A4b7. Performance of the non-geostationary system

7a. Number of Tracked Sats: 10

7b. Avg Number Assoc E-stn: 0.0000254

7c. Avg Distance: 500

7d. Exclusion Zone

7d1. Type of zone: Topocentric angle Satellite-based angle other method

7d2. Width of zone: 5 °

7d3. Avoidance mechanism. See Attachment No.:

Mandatory information for satellite networks subject to limits given in Nos. 22.5C, 22.5D, 22.5F or 22.5L RR

Note that LAN is mandatory for satellite networks subject to coordination under No. 9.11A RR also

SpaceCap for CRC NGSO networks (4 of 4)

NonGeoStationary Notice:1

Coordination Notice	Special Section Station	Assoc Earth Station Beam	Assoc Space Station Group	Attachments Emissions	Frequencies
1			120658893		

Notice: 1 Satellite Network: TEST NGSO Beam Id: KARX1 R Group Id: 120658893 Split Grip Id:

3. Observed Frequencies and Related Characteristics

BR Identification of the Group to be modified/suppressed Page No. 1 BR Data

Characteristics Common to a Group of Frequencies General Characteristics

C3a. Assigned Frequency Bandwidth: 1100000 (kHz)

C4a. Cls Stn: EC C4b. Nat Srv: CP

C6. Polarization Type: M Mixed Polarization

C5a. Receiving System Noise Temperature: 500 Kelvins

C11a. Service Area as List of Countries or Geographic designations: XAA

Diagram Type	Attachment no	Diagram no. in Gims
C11a Service area diagram		
C11b Affected Region		
C9c1 Type of multiple access	1	
C9c2 Spectrum mask diagram	1	

A4b7cbis. Min. elev. angle: 25

Mandatory information for satellite networks subject to coordination under **No. 9.11A RR**

Diagram number for service area shall be provided if it is captured in GIMS
Affected region is mandatory only for satellite networks in the MSS in frequency bands between 1 and 3 GHz

Mandatory information for frequency assignments subject to limits given in **Nos. 22.5C, 22.5D, 22.5F or 22.5L RR**

MOD for CRC NGSO networks

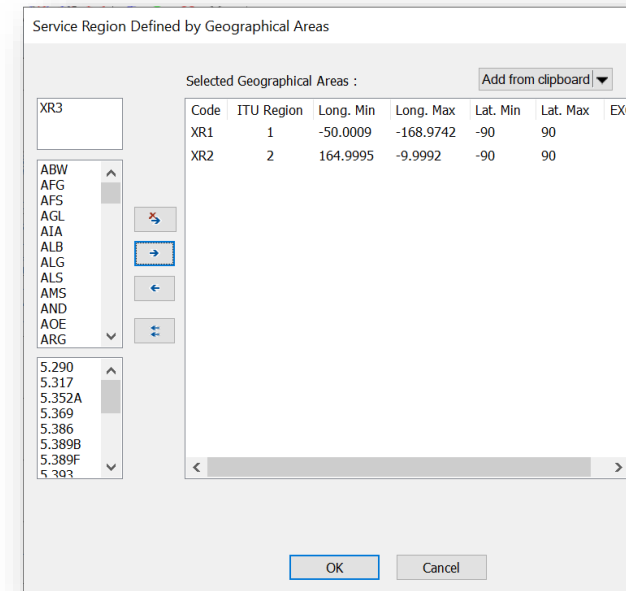
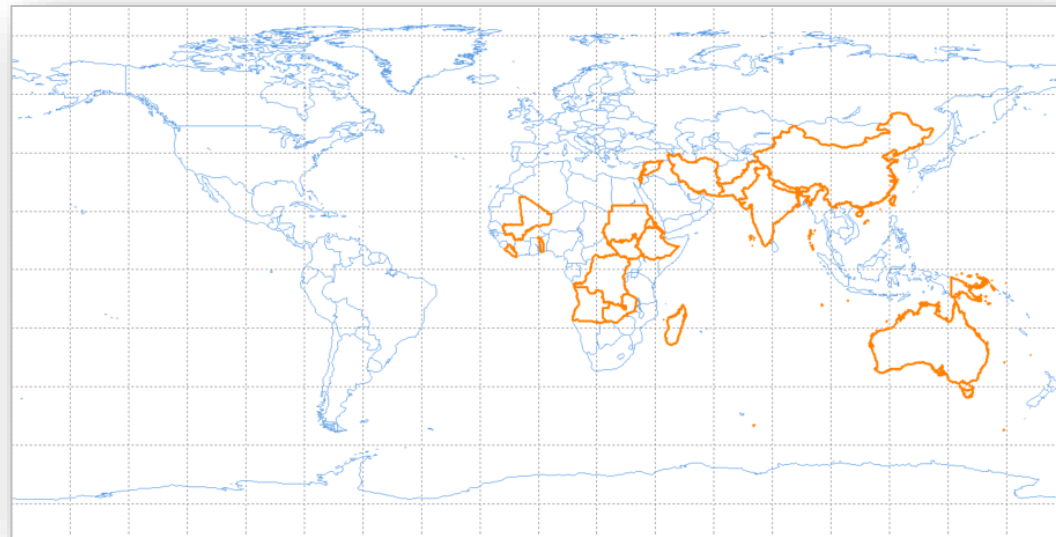
- ❑ To create MOD use “Clone” function in SpaceCap software
- ❑ Keep all orbital planes which were submitted initially and set appropriate action codes for additional (action code “A”), modified (action code “M”) or suppressed (action code “S”) orbital planes (will be available soon)
- ❑ Properly indicate action codes (“A”, “M” or “S”) for beams, groups and/or associated Earth station to help the Bureau to understand what you are modifying and how (delete unchanged “existing” beams and/or groups)
- ❑ Clearly indicate in notes if you would like to keep or modify graphical data or/and EPFD information for MOD (if you would like to modify such information kindly provide it within your submission)
- ❑ Note that any changes in the orbital information will lead to re-examination of all beams associated with modified orbital planes

Graphical interference management system (GIMS)

- ❑ Capture all graphical data with GIMS, such as:
 - ✓ Space station radiation pattern (item **B.3.c.1** of Appendix 4)
 - ✓ Earth station radiation pattern (item **C.10.d.5.a** of Appendix 4)
 - ✓ Antenna gain vs Elevation angle (item **B.4.b.2** of Appendix 4)
 - ✓ Service area (item **C.11.a** of Appendix 4)
 - ✓ Affected region (item **C.11.b** of Appendix 4)
 - ✓ Spectrum mask diagram (item **C.9.c.2** of Appendix 4)
- ❑ Cross-validation option with BRSIS Validation is now available for validating the SNS format database against the GIMS format database for NGSO satellite systems

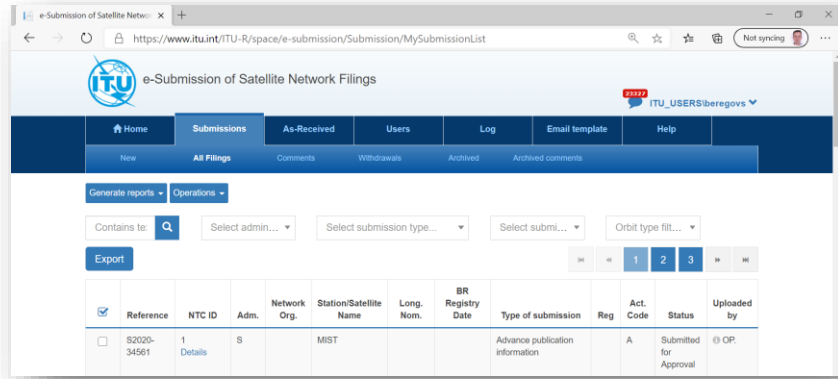
Service area diagrams in GIMS

- ❑ Visualization service area in the map
- ❑ Possibility to include and exclude countries from service area
- ❑ Possibility to form service area which will complies with restrictions described in the different footnotes of RR (such as *No. 5.369*, *No. 5.386* RR, etc.)

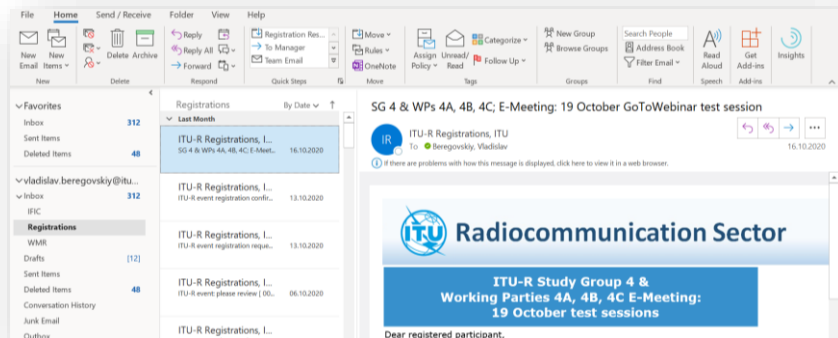


Section 5 – Submission of CRC NGSO networks

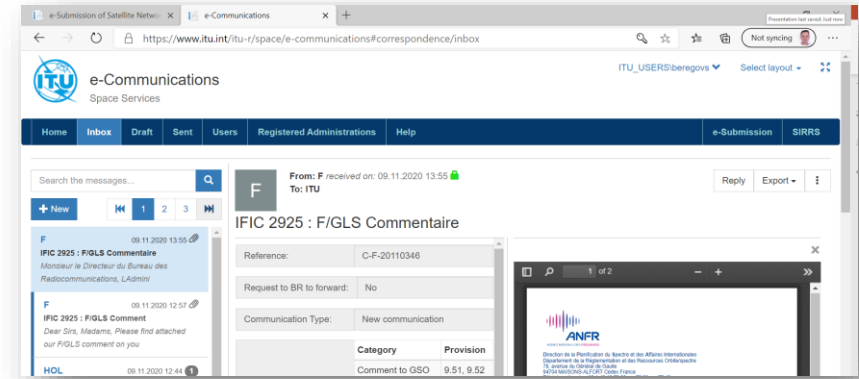
E-Submission of Satellite Network Filings



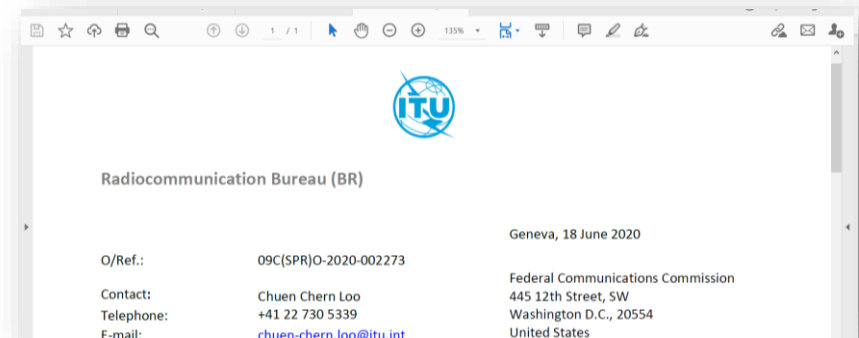
Telefax and E-mail (BRmail@itu.int)



E-Communications for administrative correspondence related to space services



Postal Mail (not recommended)



E-Submission for CRC NGSO networks

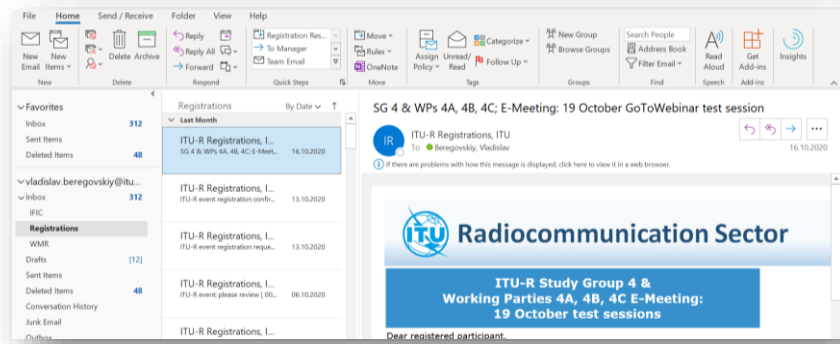
- ❑ All graphical data shall be submitted in graphics data format compatible with BR's data capture software **GIMS** in accordance with Resolution **55** (Rev.WRC-19)
- ❑ EPFD information (EIRP, PFD masks) shall be submitted **at the same time with other complete information**, including SNS format database, GIMS database and notes from administration

<input checked="" type="checkbox"/>	Reference	NTC ID	Adm. Org.	Network Org.	Station/Satellite Name	Long. Nom.	BR Registry Date	Type of submission	Reg	Act. Code	Status	Uploaded by
<input type="checkbox"/>	S2020-34561	1 Details	S		MIST			Advance publication information		A	Submitted for Approval	OP.
<input type="checkbox"/>	CHN2020-34558	120520210 Details	CHN		GALAXY-3B		06.11.2020	Coordination Request		A	Published As-Received	ADM.
<input type="checkbox"/>	CHN2020-34558	1	CHN		GALAXY-3B		06.11.2020	Advance publication information		A	Submitted for Approval	ADM.

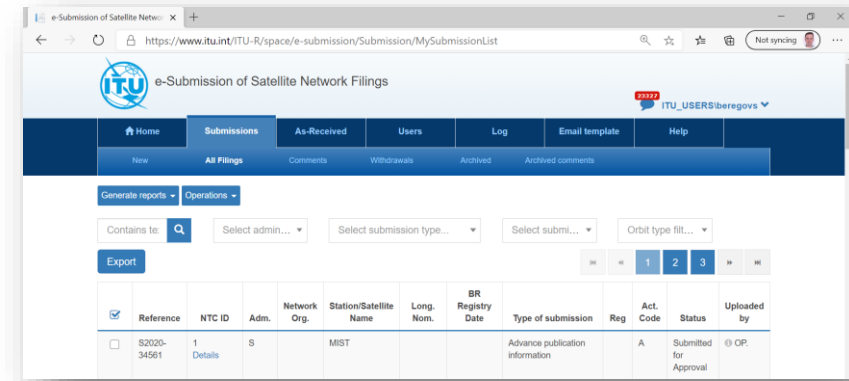
Submission for missing or corrected databases

- Note that missing or corrected databases should be submitted by e-Communication, e-mail to brmail@itu.int or through the “other” category via the e-Submission system

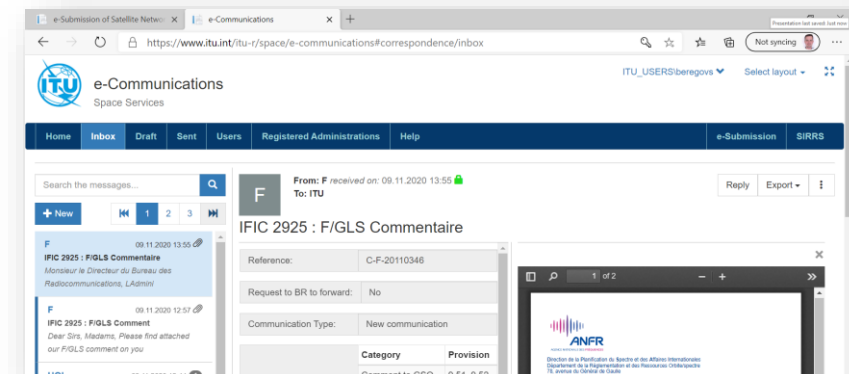
E-mail (BRmail@itu.int)



E-Submission of Satellite Network Filings



E-Communications for administrative correspondence related to space services



Thank you!

ITU – Radiocommunication Bureau

Questions to brmail@itu.int or vladislav.beregovskiy@itu.int

