Submission of NGSO satellite systems and networks subject to coordination

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#ITUWRS
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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.
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, OneWeb, 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 9.11A-1

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

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency band (GHz)</td>
<td>Footnotes No. in Article 5</td>
<td>Space services mentioned in a footnote referring to Nos. 9.11A, 9.11B, 9.12A, 9.13 or 9.14, as appropriate</td>
<td>Other space services or systems to which Nos. 9.12 to 9.14 provisions(s) apply equally, as appropriate</td>
<td>Applicability Nos. 9.12 to 9.14 provisions(s), as appropriate</td>
<td>Interferential services in respect of which Nos. 9.14 apply equally</td>
<td>Notes</td>
</tr>
<tr>
<td>18.2-10.6</td>
<td>5.533M</td>
<td>FIXED-SATELLITE (limited to non-GSO MOBILE-SATELLITE SERVICE feeder links)</td>
<td>( \uparrow )</td>
<td>9.12, 9.12B, 9.13</td>
<td>( \uparrow )</td>
<td>9.12, 9.12A, 9.13</td>
</tr>
<tr>
<td></td>
<td>5.533M</td>
<td>FIXED-SATELLITE (GSO with coordination information recorded as of 16.11.1999 and non-GSO MOBILE-SATELLITE SERVICE feeder links)</td>
<td>( \uparrow )</td>
<td>9.12, 9.12B, 9.13</td>
<td>( \uparrow )</td>
<td>9.12, 9.12A, 9.13</td>
</tr>
<tr>
<td>19.6-10.7</td>
<td>5.623M</td>
<td>FIXED-SATELLITE (GSO with coordination information recorded as of 22.11.1997 and non-GSO MOBILE-SATELLITE SERVICE feeder links)</td>
<td>( \uparrow )</td>
<td>FIXED-SATELLITE (GSO with coordination information recorded as of 23.11.1997 and non-GSO) (see also No. 6.232E)</td>
<td>( \uparrow )</td>
<td>9.12, 9.12A, 9.13</td>
</tr>
<tr>
<td>19.7-20.1</td>
<td>5.484A</td>
<td>FIXED-SATELLITE (non-GSO)</td>
<td>( \uparrow )</td>
<td>MOBILE-SATELLITE (Non-GSO)</td>
<td>( \uparrow )</td>
<td>9.12</td>
</tr>
<tr>
<td>20.1-20.2</td>
<td>5.484A</td>
<td>FIXED-SATELLITE (non-GSO)</td>
<td>( \uparrow )</td>
<td>MOBILE-SATELLITE (Non-GSO)</td>
<td>( \uparrow )</td>
<td>9.12</td>
</tr>
<tr>
<td>21.5-21.6</td>
<td>5.464A</td>
<td>FIXED-SATELLITE (non-GSO)</td>
<td>( \uparrow )</td>
<td>FIXED-SATELLITE (New-GSO) in the band 21.5-21.6GHz (5.534)</td>
<td>( \uparrow )</td>
<td>9.12</td>
</tr>
<tr>
<td>22.6-29.1</td>
<td>5.533A</td>
<td>FIXED-SATELLITE</td>
<td>( \uparrow )</td>
<td>---</td>
<td>( \uparrow )</td>
<td>9.12, 9.12A, 9.13</td>
</tr>
<tr>
<td>23.1-29.5</td>
<td>5.653A</td>
<td>FIXED-SATELLITE (GSO) (see also Nos. 5.533M and 5.533N and non-GSO MOBILE-SATELLITE SERVICE feeder links)</td>
<td>( \uparrow )</td>
<td>---</td>
<td>( \uparrow )</td>
<td>9.12, 9.12A, 9.13</td>
</tr>
<tr>
<td>28.5-29.5</td>
<td>5.484A</td>
<td>FIXED-SATELLITE (non-GSO)</td>
<td>( \uparrow )</td>
<td>MOBILE-SATELLITE (Non-GSO)</td>
<td>( \uparrow )</td>
<td>9.12</td>
</tr>
<tr>
<td>29.0-20</td>
<td>5.484A</td>
<td>FIXED-SATELLITE (non-GSO)</td>
<td>( \uparrow )</td>
<td>MOBILE-SATELLITE (New-GSO) in the band 29.0-20.0GHz (5.528)</td>
<td>( \uparrow )</td>
<td>9.12</td>
</tr>
</tbody>
</table>
Satellite networks subject to EPFD limits (1 of 2)

For NGSO in fixed-satellite service only:

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

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:

<table>
<thead>
<tr>
<th>Frequency ranges subject to EPFD limits (MHz)</th>
<th>Direction</th>
<th>Limits Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>17300 - 18100</td>
<td>R</td>
<td>Article 22, Table 22-2↑, BW: 40 kHz</td>
</tr>
</tbody>
</table>
| 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

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)

<table>
<thead>
<tr>
<th>AP4 item</th>
<th>Description</th>
<th>No. 9.21</th>
<th>No. 9.11A</th>
<th>Nos. 22.5C, 22.5D, 22.5F or 22.5L</th>
<th>SpaceCap v. 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.4.b.1.a</td>
<td>indicator of whether the non-geostationary-satellite system represents a &quot;constellation&quot;, where the term &quot;constellation&quot; describes a satellite system, for which the relative distribution of the orbital planes and satellites is defined</td>
<td>Mandatory</td>
<td>Must be YES</td>
<td>Must be YES</td>
<td>Station Tab</td>
</tr>
<tr>
<td>A.4.b.1.b</td>
<td>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</td>
<td>Mandatory, if item A.4.b.1.a - YES</td>
<td>Mandatory</td>
<td>Mandatory</td>
<td>Station Tab</td>
</tr>
<tr>
<td>A.4.b.1.c</td>
<td>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</td>
<td>Mandatory if item A.4.b.1.b - MULTIPLE</td>
<td>Mandatory if item A.4.b.1.b - MULTIPLE</td>
<td>Mandatory if item A.4.b.1.b - MULTIPLE</td>
<td>Station Tab</td>
</tr>
<tr>
<td>A.4.b.1.d</td>
<td>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</td>
<td>Mandatory if item A.4.b.1.b - MULTIPLE</td>
<td>Mandatory if item A.4.b.1.b - MULTIPLE</td>
<td>Mandatory if item A.4.b.1.b - MULTIPLE</td>
<td>Attachment</td>
</tr>
<tr>
<td>A.4.b.4.j</td>
<td>the longitude of the ascending node (θj) 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° ≤ θj &lt; 360°) 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</td>
<td>-</td>
<td>Mandatory</td>
<td>Mandatory</td>
<td>Station Tab - Orbital information (3 of 3)</td>
</tr>
<tr>
<td>A.4.b.4.k</td>
<td>the date (day:month:year) at which the satellite is at the location defined by the longitude of the ascending node (θj) (see Note under A.4.b.4.j)</td>
<td>-</td>
<td>Optional</td>
<td>Optional</td>
<td>Station Tab - Orbital information (3 of 3)</td>
</tr>
<tr>
<td>A.4.b.4.l</td>
<td>the time (hours:minutes) at which the satellite is at the location defined by the longitude of the ascending node (θj) (see Note under A.4.b.4.j)</td>
<td>-</td>
<td>Optional</td>
<td>Optional</td>
<td>Station Tab - Orbital information (3 of 3)</td>
</tr>
</tbody>
</table>
## AP4 information required for CRC NGSO networks after WRC-19 (2 of 2)

<table>
<thead>
<tr>
<th>AP4 item</th>
<th>Description</th>
<th>No. 9.21</th>
<th>No. 9.11A</th>
<th>Nos. 22.5C, 22.5D, 22.5F or 22.5L</th>
<th>SpaceCap v. 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.4.b.4.m</td>
<td>indicator of whether the space station uses sun-synchronous orbit or not</td>
<td>Mandatory</td>
<td>-</td>
<td>-</td>
<td>Station Tab - Orbital information (1 of 3)</td>
</tr>
<tr>
<td>A.4.b.4.n</td>
<td>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)</td>
<td>Optional</td>
<td>-</td>
<td>-</td>
<td>Station Tab - Orbital information (1 of 3)</td>
</tr>
<tr>
<td>A.4.b.4.o</td>
<td>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)</td>
<td>Optional</td>
<td>-</td>
<td>-</td>
<td>Station Tab - Orbital information (1 of 3)</td>
</tr>
<tr>
<td>A.17.abis</td>
<td>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</td>
<td>-</td>
<td>Mandatory for NGSO operating in the MSS (space-to-Earth) in the 1613.8-1626.5 MHz</td>
<td>-</td>
<td>Notice Tab</td>
</tr>
<tr>
<td>A.4.b.6bis</td>
<td>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)</td>
<td>-</td>
<td>-</td>
<td>Mandatory</td>
<td>Station Tab - Orbital information (3 of 3)</td>
</tr>
<tr>
<td>A.4.b.7.cbis</td>
<td>the minimum elevation angle at which any associated earth station can transmit to or receive from a non-geostationary satellite</td>
<td>-</td>
<td>-</td>
<td>Mandatory</td>
<td>Group Tab</td>
</tr>
<tr>
<td>A.4.b.7.d.3</td>
<td>Not used * (if an alternative method is used for establishing the exclusion zone, a detailed description of the avoidance mechanism)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* 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 $1.99 \times 10^{-7}$ (rad/s)
Section 4 – BR software

SpaceCap v. 9 + GIMS v. 9 = SUCCESS!

BRSIS Validation v.9 (No FATAL errors!)
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)

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)

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

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

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
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
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