

RESOLUTION 8 (WRC-23)

**Tolerances for certain orbital characteristics of space stations
deployed as part of non-geostationary-satellite orbit systems in the fixed-
satellite, broadcasting-satellite or mobile-satellite service**

The World Radiocommunication Conference (Dubai, 2023),

considering

- a)* that WRC-19 invited the ITU Radiocommunication Sector (ITU-R) to study, as a matter of urgency, tolerances for certain orbital characteristics of non-geostationary-satellite orbit (non-GSO) space stations of the fixed-satellite service (FSS), the broadcasting-satellite service (BSS) and the mobile-satellite service (MSS) to account for the potential differences between the notified and deployed orbital characteristics for the inclination of the orbital plane, the altitude of the apogee of the space station, the altitude of the perigee of the space station and the argument of the perigee of the orbital plane;
- b)* that satellites on highly-elliptical orbits and highly-inclined orbits having an apogee altitude greater than 15 000 km and an orbital inclination between 35° and 145° have significant orbital precession rates and, consequently, restrictive orbital-keeping requirements and correction of orbital parameters may lead to a reduction of such satellites' lifetime and to frequent replacement;
- c)* that design considerations (including the impact of atmospheric drag¹ characteristics of the altitude chosen and solar cycle effects for systems at altitudes lower than 600 km); maintaining separation between satellites in the same and other systems to ensure safe flight operations and minimize the risk of collisions; and other operational considerations can lead to notifying administrations needing to operate some space stations in orbital planes with some deviation from the notified orbital planes for their non-GSO systems;
- d)* that significant deviations between the operational orbital plane(s) of a non-GSO system and the notified orbital plane(s) for those systems as recorded in the Master International Frequency Register (MIFR) could negatively impact the efficient use of orbit and spectrum resources;

¹ Atmospheric drag is the atmospheric force acting opposite to the relative motion of an object. Atmospheric drag is important for a space station as it hinders the space station exiting the atmosphere, and also pulls orbital satellites back towards Earth over time.

e) that it is important, for consideration of instances where a non-GSO system operates with orbital planes that deviate from the system's notified orbital planes, that there is a mechanism developed for determining that such operation does not now and will not in the future result in the space stations of the non-GSO system causing more interference or claiming a higher need for protection than would have been the case if the operational orbital planes exactly matched the notified orbital planes for the system;

f) that adherence to a transparent approach to the question of orbital tolerances is desirable, as it reduces uncertainty with respect to the deployment of non-GSO systems,

recognizing

a) that Nos. **11.44C** and **11.49.2** require the deployment of satellites on notified orbital planes;

b) that No. **13.6** is applicable to non-GSO systems with frequency assignments in the frequency bands and services to which this Resolution applies;

c) that orbital tolerances should ensure an adequate level of operational flexibility for non-GSO system operations, while ensuring that the interference environment into other systems and services is not degraded;

d) that orbit and spectrum resources are a shared resource, and this Resolution does not preclude coordination requests or notification filings under Articles **9** and **11** for other non-GSO systems at the same altitude and tolerance,

noting

that for the purpose of this Resolution:

- the term “frequency assignments” is understood to refer to frequency assignments to a space station of a non-GSO system;
- the term “notified orbital plane” means an orbital plane of the non-GSO system, as provided to the Bureau in the most recent notification information for the system's frequency assignments, that possesses the general characteristics of items:
 - A.4.b.4.a, the angle of inclination of the orbital plane of the space station;
 - A.4.b.4.d, the altitude of the apogee of the space station;
 - A.4.b.4.e, the altitude of the perigee of the space station;
 - A.4.b.4.i, the argument of the perigee of the orbit of the space station (only for orbits whose altitudes of the apogee and perigee are different);
 - A.4.b.4.r, the distance to the apogee of the space station; and
 - A.4.b.4.s, the distance to the perigee of the space station;

in Table A of Annex 2 to Appendix 4;

- the term “observed distance to the apogee” refers to the distance in kilometres from the centre of the Earth to the deployed space station at its apogee;

- the term “observed distance to the perigee” refers to the distance in kilometres from the centre of the Earth to the deployed space station at its perigee;
- the term “tolerances” refers to deviations between the value notified and/or recorded for the orbital characteristics as referred to in this *noting* and those observed for the actual deployment of satellites of the non-GSO FSS, BSS or MSS system under consideration,

resolves

1 that this Resolution applies to frequency assignments to non-GSO systems, for orbital planes having an orbital eccentricity² less than 0.5 and an apogee altitude less than 15 000 km notified as part of a non-GSO FSS, BSS or MSS system subject to Resolution **35 (Rev.WRC-23)**;

2 that, for frequency assignments to which *resolves* 1 applies, and for which information concerning the bringing into use or bringing back into use, or the deployment information under Resolution **35 (Rev.WRC-23)**, has been provided to the Bureau prior to 1 January 2025, the notifying administration shall communicate to the Bureau the required information regarding the system’s deployed space stations in accordance with Annex 1 to this Resolution no later than 1 April 2025 and include in that submission, for each orbital plane and without submitting a modification to the notification information, the information under Appendix 4 data items A.4.b.4.r and A.4.b.4.s (distances to the apogee and perigee of the space station);

3 that, for frequency assignments to which *resolves* 1 applies, and for which information concerning the bringing into use or bringing back into use of the frequency assignments is provided to the Bureau on or after 1 January 2025, the notifying administration shall communicate to the Bureau the required information regarding the system’s deployed space station(s) in accordance with Annex 1 to this Resolution at the same time as the notifying administration informs the Bureau of the bringing into use of applicable frequency assignments under No. **11.44C** or the bringing back into use of applicable frequency assignments under No. **11.49.2**, and, for each orbital plane, include in that submission, if not already provided, and without submitting a modification to the notification information, the information under Appendix 4 data items A.4.b.4.r and A.4.b.4.s (distances to the apogee and perigee of the space station);

4 that, for frequency assignments to which *resolves* 1 applies, and which retain the remark in the MIFR entry that was added under *resolves* 5b) of Resolution **35 (Rev.WRC-23)**, and for which deployment information under Resolution **35 (Rev.WRC-23)** is provided to the Bureau on or after 1 January 2025, the notifying administration shall communicate to the Bureau the required information regarding the system’s deployed space stations in accordance with Annex 1 to this Resolution at the same time as the notifying administration communicates to the Bureau the required information under *resolves* 7 or 8, as applicable, from Resolution **35 (Rev.WRC-23)**;

² The eccentricity e is equal to: $e = (R_a - R_p) / (R_a + R_p)$

where:

R_a : distance between the centre of the Earth and the space station at apogee
 R_p : distance between the centre of the Earth and the space station at perigee.

5 that, for frequency assignments to which *resolves* 1 applies, and for which a modification to the characteristics of the notified or recorded frequency assignments has been submitted pursuant to *resolves* 11c) of Resolution **35 (Rev.WRC-23)**, the notifying administration shall communicate to the Bureau the required information regarding the system's deployed space stations in accordance with Annex 1 to this Resolution within 30 days after notification information reflecting the modified characteristics is published in the Radiocommunication Bureau International Frequency Information Circular (BR IFIC) (Part II-S);

6 that, based on the latest notification information published in the BR IFIC (Part II-S, if available, or Part I-S if Part II-S is not available), and for each space station reported to have been deployed and operated, when:

- a) the magnitude of the difference between the observed and the notified distances to the apogee of the space station and between the observed and the notified distances to the perigee of the space station is 70 km or less (for a notified altitude of the apogee/notified altitude of the perigee of 2 000 km or less) or of 5% in km or less (for a notified altitude of the apogee/notified altitude of the perigee greater than 2 000 km); and
- b) the magnitude of the difference between the observed and the notified angle of inclination of the orbital plane of the space station is 2° or less (for a notified altitude of the apogee/notified altitude of the perigee of 2 000 km or less), or 3° or less (for a notified altitude of the apogee/notified altitude of the perigee greater than 2 000 km),

the notifying administration shall provide as part of its report under Annex 1 to this Resolution in accordance with *resolves* 2, 3, 4 or 5, as appropriate, an explanation of why there is a difference between the observed and the notified values for the orbital characteristics of the space station;

7 that, based on the latest notification information published in the BR IFIC (Part II-S, if available, or Part I-S if Part II-S is not available), and for each space station reported to have been deployed and operated, when one or both of the following conditions apply:

- a) the magnitude of the difference between the observed and the notified distances to the apogee of the space station or between the observed and the notified distances to the perigee of the space station is between 70 km and 100 km (for a notified altitude of the apogee/notified altitude of the perigee of 2 000 km or less)³ or between 5% and 10% in km (for a notified altitude of the apogee/notified altitude of the perigee greater than 2 000 km)⁴;

³ This *resolves* applies if the magnitude of the difference between the observed and notified distances to the apogee is between 70 km and 100 km while the magnitude of the difference between the observed and notified distances to the perigee is less than 70 km, as well as if the magnitude of the difference between the observed and notified deviation of the distance to the apogee is less than 70 km and the magnitude of the difference between the observed and notified distances to the perigee is between 70 km and 100 km.

⁴ This *resolves* applies if the magnitude of the difference between the observed and notified distances to the apogee is between 5% and 10% in km while the magnitude of the difference between the observed and notified distances to the perigee is below 5% in km, as well as if the magnitude of the difference between the observed and notified distances to the apogee is below 5% in km and the magnitude of the difference between the observed and notified distances to the perigee is between 5% and 10% in km.

- b) the magnitude of the difference between the observed and the notified angle of inclination of the orbital plane of the space station is between 2° and 3° (for a notified altitude of the apogee/notified altitude of the perigee of 2 000 km or less), or between 3° and 4° (for a notified altitude of the apogee/notified altitude of the perigee greater than 2 000 km),

the notifying administration shall provide as part of its report under Annex 1 to this Resolution in accordance with *resolves* 2, 3, 4 or 5, as appropriate, an explanation of why there is a difference between the observed and the notified values for the orbital characteristics of the space station and a technical demonstration confirming that a difference between the observed and the notified distances to the apogee of the space station or a difference between the observed and the notified distances to the perigee of the space station greater than 70 km but less than or equal to 100 km (for a notified altitude of the apogee/notified altitude of the perigee of 2 000 km or less) or greater than 5% but less than or equal to 10% in km (for a notified altitude of the apogee/notified altitude of the perigee greater than 2 000 km), as applicable, does not result in any increased interference protection requirements as compared to those requirements for operation in accordance with the notified orbital characteristics for the space station under consideration;

8 that, upon receipt of the required information submitted in accordance with *resolves* 2, 3, 4 or 5 above, the Bureau shall promptly make that information available “as received” on the ITU website;

9 that, if the information to be provided in any Annex 1 submission in accordance with *resolves* 2, 3, 4 or 5 above shows a difference between the observed and notified/recorded distances to the apogee or perigee of the space station, or a difference between the observed and notified/recorded angles of inclination of the orbital plane of the space station, that is greater than the values specified in *resolves* 7 above, the notifying administration shall also submit to the Bureau, no later than the deadline for the Annex 1 submissions in accordance with *resolves* 2, 3, 4 or 5 above, modifications to the characteristics of the notified or recorded frequency assignments reflecting the revised orbital parameters; a failure to provide such a modification will result in the frequency assignments subject to this *resolves* 9 not being considered as brought into use under No. **11.44C** or brought back into use under No. **11.49.2**, or counted towards a milestone under the procedures in Resolution **35 (Rev.WRC-23)**;

10 that, where a notifying administration has communicated to the Bureau the required information regarding the system’s deployed space stations in accordance with Annex 1 to this Resolution under *resolves* 4 or 5 (in reference to *resolves* 11c) of Resolution **35 (Rev.WRC-23)**, and where *resolves* 9 of this Resolution does not apply), the notifying administration shall ensure that its notification information aligns with the fully-deployed system, and that any such modification be considered under *resolves* 16 below;

11 that, for any space stations in non-GSO systems with frequency assignments subject to this Resolution that have either been brought into use under No. **11.44C** or brought back into use under No. **11.49.2**, or where the space stations themselves have been counted towards a milestone under the procedures in Resolution **35 (Rev.WRC-23)**:

- a) the maximum allowed difference between the observed distance to the apogee or perigee of the space station and the distances to the apogee or perigee of a space station previously declared under this Resolution is 30 km;
- b) the maximum allowed difference between the observed angle of inclination of the orbital plane of the space station and the angle of inclination of the orbital plane of a space station previously declared under this Resolution is 2° (for a notified altitude of the apogee/notified altitude of the perigee of 2 000 km or less), or 3° (for a notified altitude of the apogee/notified altitude of the perigee greater than 2 000 km);

for purposes of this *resolves* 11, the tolerance required can be maintained as against any notified orbital plane in the system or against any distance to the apogee and perigee previously declared under this Resolution if different than a notified orbital plane;

12 that any space station deployed as part of a non-GSO FSS, BSS or MSS system subject to this Resolution that has been counted towards a milestone under the procedures in Resolution **35 (Rev.WRC-23)** for systems that have not completed the milestone process shall be considered in the deployment information submitted under *resolves* 7 or 8 of Resolution **35 (Rev.WRC-23)**, as applicable, for any subsequent milestone submission if the tolerances referred to in *resolves* 11 above have not been exceeded for a maximum of 60 consecutive days;

13 that any space station deployed as part of a non-GSO FSS, BSS or MSS system subject to this Resolution that has completed the milestone process in *resolves* 6 or *resolves* 7 to 18 of Resolution **35 (Rev.WRC-23)** shall not exceed the tolerances referred to in *resolves* 11 above for a maximum of 60 consecutive days;

14 that, for any space stations under *resolves* 12 or 13 above that have exceeded the maximum allowed differences in *resolves* 11 above for more than 60 consecutive days, the notifying administration shall provide the Bureau with the information in Annex 1 to this Resolution for these space stations only within 30 days after the end of that 60-day period (unless *resolves* 15 below is applied) and, within 90 days after the end of that 60-day period, submit modifications to the characteristics of the notified or recorded frequency assignments reflecting the revised parameters;

15 that, instead of applying the procedure in *resolves* 14 of this Resolution, if the notifying administration has informed the Bureau before the end of the 60-day period that it is temporarily discontinuing use of the frequency assignments, it may, within 3 years after the initiation of the discontinued use, inform the Bureau of the resumption of use within the maximum allowed differences in *resolves* 11, subject to the condition that the space stations with those frequency assignments cannot be counted towards any milestone submission under Resolution **35 (Rev.WRC-23)** prior to such resumption;

16 that, upon receipt of the modifications to the characteristics of the notified or recorded frequency assignments as referred to in *resolves* 10, the Bureau shall:

- a) promptly make this information available “as received” on the ITU website;
- b) conduct an examination for compliance with Nos. **11.43A/11.43B**, as appropriate;
- c) for the purpose of No. **11.43B**, retain the original dates of entry of the frequency assignments in the MIFR, in the modifications submitted pursuant to *resolves* 10, if:
 - i) the Bureau reaches a favourable finding under No. **11.31**; and
 - ii) the modifications are limited to any Appendix 4 data item A.4.b.4 except Appendix 4 data item A.4.b.4.b (i.e. the number of satellites in the orbital plane) and any Appendix 4 data items A.14, A.4.b.6.a and A.4.b.7; and
 - iii) the notifying administration provides a commitment stating that the characteristics as modified will not cause more interference or require more protection than the characteristics provided in the latest notification information published in Part I-S of the BR IFIC for the frequency assignments (see Appendix 4 data item A.39.a);
- d) publish the information provided and its findings under No. **11.43B** in the BR IFIC;

17 that the Bureau shall, no later than 45 days before any deadline for submission by a notifying administration under *resolves* 2, 3, 4, 5 or 14, send a reminder to the notifying administration to provide the information required;

18 that, if a notifying administration fails to communicate the information required under *resolves* 2, 3, 4, 5 or 14, as appropriate, the Bureau shall promptly send the notifying administration a reminder asking the administration to provide the required information within 30 days from the date of that reminder from the Bureau;

19 that, if a notifying administration fails to provide information after the reminder sent under *resolves* 18, the Bureau shall send the notifying administration a second reminder asking it to provide the required information within 15 days from the date of the second reminder;

20 that, if a notifying administration fails to provide the required information under resolves 2, 3, 4, 5 or 14, as appropriate, following the reminders under resolves 18 and 19, the Bureau shall:

- a) continue to take the entry in the MIFR into account when conducting its examinations, until the Radio Regulations Board confirms that *resolves* 20 b) shall apply;
- b) no longer consider the frequency assignments in subsequent examinations under Nos. **9.36**, **11.32** or **11.32A** and inform administrations having frequency assignments subject to Sub-Section IA of Article **9** that those assignments shall not cause harmful interference to, or claim protection from, other frequency assignments recorded in the MIFR with a favourable finding under No. **11.31**;

21 that, if information provided by a notifying administration under *resolves* 4 or 5 of this Resolution results in frequency assignments not retaining their original dates of entry in the MIFR after application of *resolves* 9 or 14 of this Resolution, those space stations with altitude or inclination deviations that caused this result shall not be included in the total number of space stations deployed as part of the system for purposes of the milestone submission under Resolution **35 (Rev.WRC-23)** with which the information under *resolves* 4 or 5 of this Resolution is associated,

further resolves

to apply the provisions of this Resolution on a provisional basis as from 1 January 2025 pending review by a future competent conference,

instructs the Radiocommunication Bureau

1 to take the necessary actions to implement this Resolution and to report on any difficulties it or administrations encounter in the implementation or application of this Resolution to future world radiocommunication conferences;

2 not to revisit or review, in connection with submissions from administrations under this Resolution, any prior confirmations that frequency assignments subject to this Resolution have been brought into use or brought back into use or any prior milestone determinations under Resolution **35 (Rev.WRC-23)**;

3 to develop tools, including a naming convention applicable to large non-GSO systems complying with this Resolution, to help with implementation of this Resolution,

invites the ITU Radiocommunication Sector

to continue studies with a view to identifying a methodology or methodologies for determining whether specific changes to a notified orbital plane will cause more interference or require more protection than the characteristics provided in the latest notification information published in the BR IFIC (Part II-S, if available, or Part I-S if Part II-S is not available) for the frequency assignments.

ANNEX 1 TO RESOLUTION 8 (WRC-23)

Information to be submitted about the deployed space stations**A Satellite system information**

- 1) Name of the satellite system;
- 2) Name of the notifying administration;
- 3) Country symbol;
- 4) Reference to the advance publication information or the request for coordination, or the notification information, if available;
- 5) Total number of space stations deployed into each notified orbital plane of the satellite system with the capability of transmitting or receiving the frequency assignments;
- 6) Orbital plane number indicated in the latest notification information published in the Radiocommunication Bureau International Frequency Information Circular (BR IFIC) (Part II-S, if available, or Part I-S if Part II-S is not available) for the frequency assignments into which each space station is deployed.

B Space station characteristics for each space station deployed

- 1) Name of the space station;
- 2) Orbital plane number with which the space station is associated and, for information purposes, the initial phase angle of the space station in the orbital plane;
- 3) Observed distance to the apogee and observed distance to the perigee of the space station, and observed angle of inclination of the orbital plane of the space station.

C Commitment of non-interference/non-protection

By providing a submission under this Annex, the notifying administration commits that the operation of its notified frequency assignments using the orbital characteristics of the submission that are in deviation from the notified orbital plane(s) will not cause more interference or require more protection than would otherwise be the case for operation in accordance with the characteristics provided in the latest notification information published in the BR IFIC (Part II-S, if available, or Part I-S if Part II-S is not available) for the frequency assignments to the non-geostationary-satellite system.