



Report ITU-R S.2261
(09/2012)

**Technical and operational requirements
for earth stations on mobile platforms
operating in non-GSO FSS systems
in the frequency bands from
17.3 to 19.3, 19.7 to 20.2,
27 to 29.1 and from
29.5 to 30.0 GHz**

S Series
Fixed satellite service



Foreword

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Note: This ITU-R Report was approved in English by the Study Group under the procedure detailed in Resolution ITU-R 1.

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27 to 29.1 and from 29.5 to 30.0 GHz**

(Question ITU-R 70-1/4)

(2012)

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1 Introduction

It has been reported within ITU-R that some networks with different technical characteristics and/or operational environments are being implemented using earth stations on mobile platforms in GSO FSS networks in bands from 17.3 to 30.0 GHz. It is envisioned that these planned networks may provide access to a variety of broadband communication applications (Internet, e-mail, VoIP, and access to internal corporate networks) to and from mobile platforms such as ships, aircraft, and land-based vehicles.

The same demand for increased broadband, speed, capacity and efficiency for applications involving earth stations on mobile platforms is driving non-GSO service providers to contemplate the use of the frequency bands from 17.3 to 19.3, 19.7 to 20.2, 27 to 29.1 and from 29.5 to 30.0 GHz for such applications, and non-GSO FSS systems are indeed planned for provision of such services in these bands.

This Report presents technical and operational requirements for earth stations on mobile platforms operating in non-GSO FSS systems in the frequency bands from 17.3 to 19.3, 19.7 to 20.2, 27 to 29.1 and from 29.5 to 30.0 GHz. The Report describes how such earth stations operating in these frequency bands must be designed and operated to meet the existing technical and/or operational requirements applicable to FSS earth stations. If these stations are designed and operated in this way they shall not cause harmful interference to, nor claim protection from, other GSO FSS networks

and/or non-GSO FSS systems operating in the same bands or sub-bands than FSS earth stations not on mobile platforms. Therefore, an important consideration in any deployment of such terminals on mobile platforms is that administrations authorizing such stations ensure that operators have in place methodologies that ensure that the implementation of these stations meet the existing technical and/or operational requirements of FSS terminals.

Even when earth stations on mobile platforms are deployed in accordance with the previous paragraph, it must be recognized that operation of these stations is not consistent with the current definition of the FSS contained in Article 1 of the Radio Regulations. As such, these stations must operate under No. 4.4 of the Radio Regulations.

2 Essential requirements

2.1 Circulation of station requirements

Earth stations on mobile platforms operating in non-GSO FSS systems would not be considered consistent with the definition of the FSS contained in Article 1 of the Radio Regulations. As such, these stations cannot be notified as FSS earth stations under the present regulatory provisions. This complicates the issue of circulation of these terminals.

The circulation of earth stations on mobile platforms requires appropriate administrative and procedural arrangements to ensure that the sovereignty of the countries in which these stations are intended to operate is preserved. This issue should be discussed and agreed between the earth stations on mobile platforms operator and the licensing authority of each administration in the countries where the earth stations on mobile platforms will operate. This discussion and agreement should be conducted at the time the earth stations on mobile platforms operator seeks the necessary authorization to operate.

2.2 Technical and operational requirements in frequency bands not shared with terrestrial services

In order to ensure that earth stations on mobile platforms operating in non-GSO FSS systems do not create potential interference issue for co-frequency GSO FSS networks and other non-GSO FSS systems, administrations must ensure that:

- in the bands 17.3-19.3 GHz, 19.7-20.2 GHz, 27-29.1 GHz and 29.5-30 GHz, these stations are operated in such a manner as to comply with the limitations described in RR Article 5 concerning the use of the FSS spectrum by non-GSO satellite systems;
- these stations meet the Earth-to-space efd limits specified in RR No. 22.5D;
- these stations meet any other limits and operational restrictions contained in coordination agreements for FSS earth stations reached as a result of coordination with non-GSO satellite systems and GSO satellite networks pursuant to Nos. 9.11A, 9.12, 9.12A or 9.13 of the Radio Regulations;
- the operation of these earth stations must comply/be consistent with the Radio Regulations (see § 2.1 above).

Realizing that earth stations on mobile platforms operate in a dynamic environment (i.e. the position and orientation of the platform can change with time), it is important to address this aspect in specifying an essential set of technical and operational requirements. The design, coordination and operation of earth stations on mobile platforms operating in non-GSO FSS systems in the frequency bands from 17.3 to 19.3, 19.7 to 20.2, 27 to 29.1 and from 29.5 to 30 GHz should be such that, in addition to the requirements discussed above, the interference levels generated by such earth stations shall observe/comply with the following factors:

- Mispointing of earth station antennas on mobile platforms. Where applicable, this includes, at least, motion-induced antenna pointing errors, effects caused by bias and latency of their pointing systems, tracking error of open or closed loop tracking systems, misalignment between transmit and receive apertures for systems that use separate apertures, and misalignment between transmit and receive feeds for systems that use combined apertures, as well as effects caused by the orbits of the non-GSO satellite.
- Variations in the antenna pattern of earth station antennas on mobile platforms. Where applicable, this includes, at least, effects caused by manufacturing tolerances, ageing of the antenna and environmental effects. Networks using certain types of antennas, such as phased arrays, should account for variation in antenna pattern with scan angles (elevation and azimuth). Networks using phased arrays should also account for element phase error, amplitude error and failure rate.
- Variations in the transmit e.i.r.p. from earth stations on mobile platforms. Where applicable, this includes, at least, effects caused by measurement error, control error and latency for closed loop power control systems, and motion-induced antenna pointing errors.

Earth stations on mobile platforms, operating in non-GSO FSS systems in the frequency bands from 17.3 to 19.3, 19.7 to 20.2, 27 to 29.1 and from 29.5 to 30 GHz, that use closed loop tracking of the satellite signal, need to employ an algorithm that is resistant to capturing and tracking adjacent satellite signals. Such earth stations must immediately inhibit transmission when they detect that unintended satellite tracking has happened or is about to happen.

They also must immediately inhibit transmission when their mispointing would cause the efd limits specified in RR No. 22.5D, or any other limits or operational restrictions contained in coordination agreements reached pursuant to Nos. 9.11A, 9.12, 9.12A or 9.13 of the Radio Regulations with FSS non-GSO satellite systems or GSO satellite networks, to be violated.

Earth stations on mobile platforms operating in non-GSO FSS systems in the frequency bands from 17.3 to 19.3, 19.7 to 20.2, 27 to 29.1 and from 29.5 to 30 GHz should be subject to the monitoring and control by a Network Control and Management Center (NCMC) or equivalent facility. Such earth stations should be able to receive at least “enable transmission” and “disable transmission” commands from the NCMC. In addition, it should be possible for the NCMC to monitor the operation of such an earth station on a mobile platform to determine if it is malfunctioning.

Finally, earth stations on mobile platforms operating in non-GSO FSS systems in the frequency bands from 17.3 to 19.3, 19.7 to 20.2, 27 to 29.1 and from 29.5 to 30 GHz must be capable of automatically ceasing transmissions immediately upon receiving any “parameter change” command which may cause harmful interference during the change, until it successfully implements the requested change. Such earth stations need also to be self-monitoring and, should a fault be detected which can cause harmful interference to the FSS or other satellite services in the bands, they must automatically cease their transmissions.

Given the requirements specified above, it is essential that administrations authorizing such stations ensure that operators:

- i) demonstrate that appropriate methodologies are in place, and
- ii) submit formal commitments to fulfil the above-mentioned requirements,

to ensure that the implementation of these stations meet these requirements.

2.3 Technical and operational requirements in frequency bands shared with terrestrial services

The technical and operational requirements in this section are in addition to those in § 2.2.

While the designation of frequency bands within the territory of each administration is their prerogative, the use of earth stations on mobile platforms within the territory of one administration must protect terrestrial services in the territories of other administrations which are within the coordination/agreement area established in application of the Radio Regulations or other bilateral procedure.

The compatibility of earth stations on mobile platforms with respect to terrestrial services in affected countries could thus be achieved through bilateral agreements. In this connection, it is worth mentioning that there are several ITU-R Recommendations addressing the protection of terrestrial services from interference caused by other services sharing the same band (for example, Recommendations ITU-R SF.1719, which addresses the deployment of FS receiver stations and large numbers of FSS transmitting earth stations in the same geographical area, ITU-R SM.1448 and ITU-R SF.1006).

Administrations may therefore use the information provided in these Recommendations, if so agreed, taking into account that the Recommendations cited above were developed for the case of coordinating co-primary services which have established regulatory status.

Given the mobile nature of the earth station (i.e. operations at unspecified locations), establishment of a geographical separation zone is complex and will require discussion and agreement of the administrations on whose territory this type of earth stations will be located to:

- a) allow earth stations to operate in its territory with respect to terrestrial services;
- b) carry out the task of reaching agreement with respect to terrestrial services of affected countries.

In certain cases, the task mentioned in b) could be difficult to implement.
