



ECC Decision (21)01

The use of the bands 47.2-50.2 GHz and 50.4-52.4 GHz
by the fixed-satellite service (Earth-to-space)

approved 5 November 2021

EXPLANATORY MEMORANDUM

1 INTRODUCTION

This ECC Decision addresses the use of the bands 47.2-50.2 GHz and 50.4-52.4 GHz by the fixed-satellite service (FSS) (Earth-to-space), to establish and harmonise conditions for use of these bands in the CEPT.

2 BACKGROUND

Satellite systems are a key medium for delivery of telecommunication services, enabling broadband communication to rapidly be established over wide areas.

Current usage in C-band, Ku-band and Ka-band will remain essential for satellite operators, however the Q/V band¹ is the new frontier for satellite communications, with next-generation High Throughput Satellites (HTS) and Very High Throughput Satellite (VHTS) systems planning to operate not just in the Ku-band and Ka-band, but also in parts of the Q/V band.

Many satellite operators which currently use the lower frequency bands (C-band, Ku-band and Ka-band) have already launched or are developing systems that will use the Q/V band allocations in the near future. The satellite industry will need access to spectrum for gateway stations and for terminals. A clear and stable regulatory environment is important to give confidence to the industry in investing in these new systems and technologies. This demand for access to Q/V band is driven by a number of factors:

- the lower Ka-band frequencies are becoming congested, with around 138 GSO satellites operating in Ka-band and numerous non-GSO systems, some with thousands of satellites, in various stages of development and deployment;
- Q/V band spacecraft and terminal technology is becoming more mature and cost-effective;
- the development of satellite communication terminals using a new reconfigurable antenna technology, known as Metamaterials Surface Antenna, offering electronic beam-steering performance of a typical phased array antenna. Such technology is ideally suited to Q/V band, allowing small, low profile user terminals.

Proposals for systems in the fixed-satellite service (FSS) indicate that large numbers of user terminals are intended to be deployed for direct customer access in some frequency bands. Within the ITU, this concept has been named “high-density fixed satellite service” (HDFSS). It is expected to provide access to a wide range of broadband telecommunication applications supported by fixed telecommunication networks (including Internet connectivity), and thus will complement other telecommunication systems, helping to reduce the digital divide.

Satellite systems are also key to providing connectivity to mobile users, on ships, aircraft and in land vehicles. For such applications, there is typically no terrestrial alternative to provide connectivity. The desire for broadband internet connectivity for passengers on ships and aircraft is driving the demand for very high data throughput on satellite systems to provide the necessary backhaul capabilities.

Gateway earth stations are expected to require access to very wide bandwidths, but such stations are expected to be relatively few in number and hence can be coordinated with terrestrial services. These earth stations are expected to operate in the Earth-to-space direction in all parts of the bands 47.2-50.2 GHz and 50.4-52.4 GHz.

WRC-03 identified a number of frequency bands for high-density applications in the fixed satellite service (HDFSS) through RR No. 5.516B and also adopted Resolution 143 (WRC-03) providing “Guidelines for the implementation of high-density applications in the fixed-satellite service in frequency bands identified for these applications” [1]. CEPT has previously established an ECC Decision related to the availability of certain bands for HDFSS in ECC Decision (05)08 [2], which includes the bands 47.5-47.9 GHz, 48.2-48.54

¹ “Q/V band” is used to refer to the allocations in the range 37-52.4 GHz

GHz and 49.44 - 50.2 GHz for use in the space-to-Earth direction. These bands and other bands in the ranges 47.2 - 50.2 GHz and 50.4-52.4 GHz are now envisaged to be used primarily in the Earth-to-space direction, for gateway earth stations and ubiquitous user terminals.

Ubiquitous user terminals are expected to operate in the Earth-to-space direction in the band 48.2-50.2 GHz, which is identified for HDFSS in Region 2. The harmonisation of this band for HDFSS applications in the CEPT will align Europe with Region 2 countries, providing improved international harmonisation, assisting operators and manufacturers in providing equipment for all markets.

WRC-19 made a new allocation to the FSS (Earth-to-space) in the band 51.4-52.4 GHz, limited to geostationary networks, and limiting earth stations to gateway stations with minimum antenna diameter of 2.4 m (see RR No. 5.555C).

3 REQUIREMENT FOR AN ECC DECISION

In order to provide a clear regulatory framework for investment and deployment of satellite systems using the bands 47.2-50.2 GHz and 50.4-52.4 GHz, a regulatory framework is necessary.

ECC DECISION OF 5 NOVEMBER 2021 ON THE USE OF THE BANDS 47.2-50.2 GHz AND 50.4-52.4 GHz BY THE FIXED SATELLITE SERVICE (EARTH-TO-SPACE) (ECC/DEC/(21)01)

“The European Conference of Postal and Telecommunications Administrations,

considering

- a) that the bands 47.2-50.2 GHz and 50.4-52.4 GHz are allocated on a primary basis to the fixed satellite service in the Earth-to-space direction and to the fixed and mobile services;
- b) that these bands are expected to be used by gateway earth stations operating with GSO and non-GSO FSS networks for provision of services in Europe, which may be coordinated with terrestrial services in the same bands;
- c) that the band 48.2-50.2 GHz is expected to be used by ubiquitous user terminals operating with GSO and non-GSO FSS networks for provision of services in Europe, which typically do not share with terrestrial services;
- d) that the band 51.4-52.4 GHz is allocated to the FSS (Earth-to-space), limited to geostationary satellite networks, and the earth stations are limited to gateway earth stations with a minimum antenna diameter of 2.4m (RR No. 5.555C [1]);
- e) that WRC-19 established provisions for compatibility of EESS (passive) sensor systems using the bands 49.7-50.2 GHz, 50.2-50.4 GHz and 52.6-54.25 GHz from the emissions of FSS earth stations using the bands 50.4-50.9 GHz and 51.4-52.4 GHz, through the provisions of Resolution 750 (Rev.WRC-19) [1];
- f) that the band 48.94-49.04 GHz is also allocated to the radio astronomy service on a primary basis (RR No. 5.555), and the band 51.4-54.25 GHz may be used for radio astronomy observations under national arrangements (RR No. 5.556 [1]);
- g) that ERC Decision (00)02 [3] harmonises the band 37.5-40.5 GHz inter alia for FSS operations in the space-to-Earth direction;
- h) that ECC Decision (02)04 [4] identifies that the band 40.5-42.5 GHz may be used by coordinated FSS earth stations in the space-to-Earth direction, and that uncoordinated Earth stations in the fixed satellite and broadcasting satellite services shall not claim protection from fixed and broadcasting stations;
- i) that CEPT administrations may need to develop national processes to allow for the coordination of terrestrial stations and coordinated FSS earth stations in the bands 47.2-50.2 GHz and 50.4-52.4 GHz (see Annex 1);
- j) that CEPT administrations may need to develop national processes to allow for the coordination of FSS earth stations with respect to radio astronomy stations in the bands 47.2-50.2 GHz and 50.4-52.4 GHz (see Annex 2);
- k) that the band 47.2-50.2 GHz is identified as a frequency range for cordless cameras in ERC Recommendation 25-10 [5] on the basis of shared use with other co-primary services;
- l) that Report ITU-R S.2463-0 [6] provides elements on FSS (Earth-to-space) sharing with incumbent services in the 51.4-52.4 GHz band and adjacent and nearby bands;

DECIDES

1. that the **purpose of this ECC Decision** is to:
 - harmonise the use of the frequency bands 47.2-50.2 GHz and 50.4-51.4 GHz for use by GSO and non-GSO systems in the fixed satellite service in the Earth-to-space direction,
 - harmonise the use of the frequency band 51.4-52.4 GHz for use by GSO networks in the fixed-satellite service in the Earth-to-space direction;

2. that CEPT **administrations shall**:
 - designate the frequency bands 47.2-48.2 GHz and 50.4-52.4 GHz for coordinated FSS gateway earth stations, operating in the Earth-to-space direction,
 - designate the frequency band 48.2-50.2 GHz for uncoordinated and coordinated FSS earth stations, operating in the Earth-to-space direction;
3. that FSS earth stations intending to use the band 48.2-50.2 GHz on a non-coordinated basis shall implement measures to ensure that harmful interference is not caused to those radio astronomy stations which are entitled to protection in CEPT administrations, in the band 48.94-49.04 GHz (see Annex 2);
4. that CEPT administrations shall inform the Office of the specific radio astronomy stations in their territory which should be protected from emissions from FSS earth stations capable of operating in the band 48.94-49.04 GHz and 51.4-54.25 GHz (see Table 1);
5. that this Decision **enters into force** on 5 November 2021;
6. that the preferred **date for implementation** of this Decision shall be 5 May 2022;
7. that CEPT administrations shall communicate the **national measures** implementing this Decision to the ECC Chairman and the Office when this ECC Decision is nationally implemented.”

Note:

Please check the Office documentation database <https://docdb.cept.org/> for the up to date position on the implementation of this and other ECC Decisions.

ANNEX 1: GUIDANCE ON COORDINATION OF FSS EARTH STATIONS AND TERRESTRIAL STATIONS IN THE BANDS 47.2-50.2 GHZ AND 50.4-52.4 GHZ

Through this ECC Decision, the bands 47.2-50.2 GHz and 50.4-52.4 GHz may be used by FSS earth stations in the Earth-to-space direction, on a coordinated basis with respect to terrestrial services.

ECC Report 173 [7] identifies limited FS use of the bands 48.5-50.2 GHz, 50.4-52.4 GHz and 51.4-52.6 GHz. The Report does not indicate any use of the band 47.2-48.2 GHz for fixed links in CEPT. Although FS use of these bands is limited, it may be necessary to establish national coordination procedures to ensure that FSS earth stations do not cause interference to terrestrial station receivers. Report ITU-R S.2463 [6] includes some example calculations of separation distances between GSO FSS earth stations operating in the band 51.4-52.4 GHz and FS stations.

Fixed links typically need to be coordinated with one-another, to ensure that one fixed link's transmitter does not cause interference to another link's receiver. Those administrations which already have fixed links in these bands are likely to have tools available to manage such coordination and it may be possible to adapt such tools to include transmitting earth stations in place of a FS transmitter, as the same basic principles apply. Similarly, administrations may have tools available to manage sharing between transmitting earth stations and fixed links in other shared frequency bands, and those tools could be adapted to cover the bands 47.2-50.2 GHz and 50.4-52.4 GHz.

Regarding potential cross-border interference, administrations may establish arrangements with neighbouring countries and the ITU process for coordination can be used to establish the necessary coordination area for a proposed earth station and hence to establish the countries with which coordination would be required. Appendix 7 of the Radio Regulations [1] describes the methodology to establish coordination areas for cross-border coordination, with the applicable parameter values for the earth station and terrestrial stations for the band contained in Table 7c. The assumptions for the parameter values and the propagation model in Appendix 7 are generally cautious, meaning that FS stations located in the coordination area may be able to operate, subject to more detailed analysis. Recommendation ITU-R SF.1006 [8] provides a methodology that may be used to assist administrations in a more detailed interference assessment. This more detailed assessment should take account of the actual characteristics of the FS station and earth station, and the specific terrain and any clutter loss should be taken into account in the propagation model (for example see Recommendation ITU-R P.452 [9]). A more detailed interference assessment may show that FS stations located in the coordination area are able to operate without harmful interference from FSS earth stations.

A similar approach may be taken by administrations for coordination of FS stations with respect to earth stations in the same country. In this case, the approach described in Recommendation ITU-R SF.1006 may also be used, but similarly to the case for cross-border coordination, the actual station parameters should be used, and specific terrain data should be used, to provide the most accurate analysis.

One consequence of this approach to coordination is that information on the fixed links must be available, including the location of transmitters and certain characteristics such as receiver noise figure, antenna radiation pattern, antenna height above ground, antenna azimuth and elevation angle. Similarly, for the earth station, the location of the station, its antenna characteristics (radiation pattern, azimuth and elevation angle) and transmit power are required.

For the purpose of being able to identify potential locations for new FSS earth stations, it is necessary for an earth station operator to have knowledge of the location of any terrestrial stations located in the same country, and sometimes in neighbouring countries. Such information could be provided, for example, through the availability of the FS station information on the administration website.

ANNEX 2: RADIO ASTRONOMY STATIONS CAPABLE OF OPERATING IN THE BANDS 48.94-49.04 GHZ OR 51.4-54.25 GHZ

A number of radio astronomy stations in CEPT are capable of operating in the bands 48.94-49.04 GHz or 51.4-54.25 GHz. Depending on the applicable national regulations, transmitting earth stations may need to ensure adequate geographic separation from those radio astronomy stations. For coordinated earth stations, similar techniques already used for coordination of earth stations with respect to terrestrial stations can be used, with the terrestrial station receiver replaced with the radio astronomy station and using the appropriate protection criteria for radio astronomy stations.

Table 1 shows a list of RAS sites which are currently operating or capable of operating in the band 48.94-49.04 GHz and the band 51.4-54.25 GHz. Administrations will need to determine the specific radio astronomy stations in their territory which require protection from FSS earth stations. FSS operators will need to check with the relevant administrations the RAS protection requirements.

Table 1: European radio astronomy stations currently operating or capable of operating in the 48.94-49.04 GHz and 51.4-54.25 GHz bands

Station Name	Responsible Administration	Location	
		Latitude	Longitude
Metsahovi	Finland	60° 13' 05" N	24° 23' 36" E
Plateau de Bure	France	44° 38' 02" N	05° 54' 28" E
Maido	France	21° 04' 46" S	55° 23' 01" E
Effelsberg	Germany	50° 31' 29" N	06° 53' 01" E
Noto	Italy	36° 52' 33" N	14° 59' 20" E
Sardinia	Italy	39° 29' 34" N	09° 14' 42" E
Medicina	Italy	44° 31' 15" N	11° 38' 49" E
Torun	Poland	53° 05' 43" N	18° 33' 46" E
Pushchino	Russian Federation	54° 49' 20" N	37° 37' 53" E
Yebes	Spain	40° 31' 29" N	03° 05' 13" W
Onsala	Sweden	57° 23' 45" N	11° 55' 35" E
Cambridge	United Kingdom	52° 09' 59" N	00° 02' 20" E
Santa María	Portugal	36° 59' 07" N	25° 7' 33.28" W

Report ITU-R S.2463 [6] assessed the compatibility between GSO FSS gateway stations in the band 51.4-52.4 GHz and radio astronomy stations in the band 52.4-54.25 GHz. The Report includes example coordination distances of between 26 km and 228 km, depending on the level of unwanted emission suppression (in the range 0-45 dB) and the atmospheric absorption (0.15 dB/km or 0.30 dB/km). Studies previously performed under WRC-19 agenda item 1.6 showed that similar separation distances may also be needed for non-GSO FSS earth stations with respect to radio astronomy observations in the bands 48.94-49.04 GHz and 51.4-52.4 GHz.

ANNEX 3: LIST OF REFERENCES

This annex contains the list of relevant reference documents.

- [1] ITU Radio Regulations, Edition of 2020
- [2] [ECC Decision \(05\)08](#): “The availability of frequency bands for high density applications in the Fixed-Satellite Service (space-to-Earth and Earth-to-space)”, amended March 2013, approved June 2005 and amended March 2013
- [3] [ERC Decision \(00\)02](#): “The use of the band 37.5-40.5 GHz by the fixed service and Earth stations of the fixed - satellite service (space-to-Earth)”, approved March 2000
- [4] [ECC Decision \(02\)04](#): “The use of the band 40.5 – 42.5 GHz by terrestrial (fixed service/ broadcasting service) systems and uncoordinated Earth stations in the fixed satellite service and broadcasting-satellite service (space to Earth)”, approved March 2002
- [5] [ERC Recommendation 25-10](#): “The Use of Terrestrial Audio and Video Programme Making and Special Events (PMSE) applications”, approved 1995 and latest amended October 2016
- [6] Report ITU-R S.2463-0: “Sharing with incumbent services in the 51.4-52.4 GHz band and adjacent and nearby bands”
- [7] [ECC Report 173](#): “Fixed Service in Europe Current use and future trends post 2016”, approved April 2012 and amended April 2018
- [8] Recommendation ITU-R SF.1006: “Determination of the interference potential between earth stations of the fixed-satellite service and stations in the fixed service”, approved April 1993
- [9] Recommendation ITU-R P.452: “Prediction procedure for the evaluation of interference between stations on the surface of the Earth at frequencies above about 0.1 GHz”, approved July 2015