



# ECC Decision (15)04

The harmonised use, free circulation and exemption from individual licensing of Land and Maritime Earth Stations On Mobile Platforms (ESOMPs) operating with NGSO FSS satellite systems in the frequency ranges 17.3-20.2 GHz, 27.5-29.1 GHz and 29.5-30.0 GHz

**Approved 3 July 2015**

**Amended 8 March 2019**

## EXPLANATORY MEMORANDUM

### 1 INTRODUCTION

This ECC Decision addresses the use of Land and Maritime Earth Stations On Mobile Platforms (ESOMPs)<sup>1</sup> which operate with Fixed-Satellite Service (FSS) NGSO satellite systems in the frequency bands 17.3-20.2 GHz (space-to-Earth), 27.5-29.1 GHz and 29.5-30.0 GHz (Earth-to-space). ESOMPs are terminals with directional antennas tracking the satellites in NGSOs for the provision of broadband communication services. These ESOMPs may be mounted on ships or land vehicles or may be transportable devices used in motion or at temporary halts. ESOMPs on ships may operate in national waters and also in international waters.

### 2 BACKGROUND

In recent years, a number of GSO and NGSO FSS networks have begun operating in the “Ka-band” frequencies (17.0-30.0 GHz). Several other Ka-band networks are under construction and expected to be launched over the coming years. Ka-band satellites typically use small spot beams, which leads to increased efficiency of spectrum usage and allows for small user terminal antennas. Also the increased efficiency allows for broadband communications at costs lower than those available by using typical Ku-band systems.

Studies carried out by the ITU-R (see Report ITU-R S. 2223 [1]) and the CEPT (see ECC Report 217 [2]) have recognised the risk of interference arising from ESOMPs to be no different to that from typical uncoordinated FSS earth stations. This is primarily because of the advanced technology deployed for ESOMPs ensures that all technical criteria set for typical earth stations are also met by ESOMPs. Such technical criteria include, amongst other things, measures to avoid miss-pointing of the terminal antenna. Advanced technology deployed with ESOMPs ensures that stabilised earth station antenna maintains a high degree of pointing accuracy even on rapidly moving platforms, and “closed-loop tracking” and an automatic capability of muting transmission to ensure that transmissions away from the intended space station do not occur.

The regulatory framework adopted in these bands to accommodate ESOMPs ensure that it does not prejudice the use of these bands by other FSS and terrestrial applications operating in conformance with other relevant ECC Decisions and the relevant provisions of the Radio Regulations. Specifically the band 28.6-29.1 GHz, according to RR 5.523A, is subject to the application of the provisions of RR 9.11A, and this means all satellite networks are subject to coordination, including the current and future non GSO or GSO FSS networks.

Studies carried out by the ITU-R and the CEPT have also established the technical and regulatory requirements for the use of ESOMPs. These are described below.

Relevant International regulations:

The ITU-R has examined issues relating to the operation of ESOMPs in Ka-band FSS networks. Report ITU-R S.2261 [3] identifies the technical and regulatory requirements to be considered with the deployment of ESOMPs.

Relevant European regulations:

The ECC Report 217 details the studies carried out by the CEPT on technical and regulatory requirements relating to the use of land and maritime ESOMPs operating to Ka-band NGSO systems. This Report specifies the technical and regulatory requirements for use of ESOMPs, and the report concludes that compliance with such conditions would enable ESOMPs to operate without causing harmful interference to other FSS networks and Fixed services, in the latter case when ESOMPs operate in bands identified for uncoordinated FSS earth stations per ECC Decision (05)01 [4] and ECC Decision (05)08 [5].

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<sup>1</sup> It should be noted that ESOMPs mentioned in this Decision without a qualification refer to Land and Maritime ESOMPs operating to NGSO satellite systems. When reference is made to ESOMPs operating to GSO networks, they are referred to as “GSO ESOMPs”

The ECC has adopted several Decisions relating to the use of the Ka-band frequencies and licensing of Ka-band FSS Earth stations. Some of these Decisions specifically relate to GSO FSS networks. These ECC Decisions are:

- ECC Decision (05)01 designates different parts of the 27.5-29.1 GHz band for the use of Fixed Service (FS) and uncoordinated transmit FSS earth stations. The intention of this Decision is to provide technical conditions to allow ESOMPs to operate in parts of the 27.5-29.1 GHz band available for uncoordinated FSS earth stations, and in the band 29.5-30.0 GHz. Although the frequency arrangements in the range 27.5-29.1 GHz are well harmonised within the CEPT through this Decision ECC Decision (05)01, there may be cases where a band available for uncoordinated FSS in one country is used for FS systems in a neighbouring country. This could occur, for example, in the band 28.8365-28.9485 GHz, which is designated for uncoordinated FSS earth stations, but is also used for FS in some CEPT countries;
- In addition, ECC Decision (05)08 identifies certain frequency bands for uncoordinated FSS earth stations, including the band 29.5-30.0 GHz in the Earth-to-space direction. The exemption from individual licensing of low power (e.i.r.p. not exceeding 34 dBW) and high power (e.i.r.p. in the range 50 – 60 dBW) earth stations operating to GSO networks are provided through Decisions ECC Decision (06)02 [6] and ECC Decision (06)03 [7], respectively;
- The ECC Decision (13)01 [8] specifically addresses the harmonised use, free circulation and exemption from licensing of Ka-band GSO ESOMPs, consolidating many of the technical and regulatory findings in Decisions mentioned above, and establishing additional relevant technical and regulatory requirements. Studies relating to these technical and regulatory requirements for GSO ESOMPs can be found in the ECC Report 184 [9].

### **Harmonised Use, Free Circulation and exemption from licensing of ESOMPs**

This ECC Decision addresses the harmonised use, free circulation and exemption from individual licensing of land and maritime ESOMPs operating with NGSO FSS satellite systems in the frequency range 17.3-20.2 GHz, 27.5-29.1 GHz and 29.5-30.0 GHz. The technical and regulatory requirements relating to such aspects are presented in detail in the ECC Report 217. Some background information is offered below.

In the case of land based ESOMPs operating in the bands available for uncoordinated FSS earth stations, there is no change to the current interference environment since ESOMPs may operate in any location, just like uncoordinated FSS earth stations.

As for maritime ESOMPs, the interference environment is different from that for land ESOMPs in some respects. In particular, maritime ESOMPs often operate in international waters (typically well beyond 12 nautical miles from the low-water mark of any country), therefore they may operate in any part of the 27.5-29.1 GHz band, including within those bands designated for the FS. Hence, it is necessary to ensure that FS deployments are adequately protected from interference from maritime ESOMPs. Consequently, this Decision applies a PFD threshold to maritime ESOMPs. This threshold applies at the low-water mark of any affected country in any part of the band 27.5-29.1 GHz designated for use by the FS in that country. The PFD constraint may be relaxed with the agreement of the administrations concerned.

To comply with the PFD values applicable to maritime ESOMPs, any ESOMPs operating in the range 27.5-29.1 GHz must monitor its location and have knowledge of, and control over, other characteristics such as e.i.r.p. and antenna pointing direction. This function may be accomplished by the NCF of the satellite system, which shall have the possibility of reducing the e.i.r.p. of ESOMPs, or where appropriate ceasing transmission. This Decision places an obligation on any ESOMPs operator, intending to operate ESOMPs within the framework of this ECC Decision, to submit a declaration to the Office to declare that the operator's NGSO system complies with the requirements of this Decision, and provide details of a designated point of contact. This can be found in Annex 3 to this Decision.

The electromagnetic compatibility between satellite terminals and aircraft avionics has been examined in ECC Report 272 on the "Earth Stations operating in the frequency bands 4-8 GHz, 12-18 GHz and 18-40 GHz in the vicinity of aircraft" [10] This Report provides the maximum earth station e.i.r.p. levels to ensure compliance with aircraft High Intensity Radiated Field (HIRF) protection criteria.

Maximum e.i.r.p. levels for earth stations retained in this Decision are equal to or lower than maximum e.i.r.p. based on ECC Report 272 that ensures compliance with aircraft HIRF protection criteria. Therefore, the maximum e.i.r.p. levels indicated in this Decision implicitly provide the necessary protection for aircraft HIRF.

This Decision does not address aircraft mounted ESOMPs operating in the 27.5-29.1 GHz and 29.5-30.0 GHz bands since the technical parameters of such systems have not yet been fully developed.

### **3 REQUIREMENT FOR AN ECC DECISION**

ESOMPs are being deployed in Europe. As ESOMPs are generally intended to be used while in motion and move from one country to another, a Decision is required to ensure that ESOMPs comply with the necessary technical requirements and to provide for the harmonised use, exemption from individual licensing and free circulation of these terminals in CEPT.

**ECC DECISION OF 3 JULY 2015 ON THE HARMONISED USE, FREE CIRCULATION AND EXEMPTION FROM INDIVIDUAL LICENSING OF LAND AND MARITIME EARTH STATIONS ON MOBILE PLATFORMS (ESOMPS) OPERATING WITH NGSO FSS SATELLITE SYSTEMS IN THE FREQUENCY RANGES 17.3-20.2 GHz, 27.5-29.1 GHz AND 29.5-30.0 GHz (ECC/DEC/(15)04), AMENDED ON 8 MARCH 2019**

“The European Conference of Postal and Telecommunications Administrations,

*considering*

- a) that, the introduction of new ESOMPs systems will enhance broadband communications over wide territories in the CEPT, making them available on platforms such as ships and ground vehicles;
- b) that, administrations should work towards the exemption of relevant radio equipment from individual licensing based on harmonised criteria detailed in ERC Recommendation 01-07 [11];
- c) that, in the ITU Radio Regulations (ITU RR) [12], the band 17.3-17.7 GHz is allocated on a worldwide and primary basis to the Fixed-Satellite Service (FSS) (Earth-to-space) limited to feeder links for the BSS and is subject to ITU RR Appendix 30A, and is also allocated on a primary basis in Region 1 to the FSS (space-to-Earth);
- d) that, the band 17.7-19.7 GHz is allocated on a worldwide and primary basis to both the Fixed Service (FS) and the FSS (space-to-Earth), among other services, in the ITU RR [12];
- e) that, the band 19.7-20.2 GHz is allocated on a worldwide and primary basis to the FSS (space-to-Earth) in the ITU RR [12];
- f) that, the band 27.5-29.1 GHz is allocated on a worldwide and primary basis to the FS, the Mobile Service (MS), and the FSS (Earth-to-space) in the ITU RR [12];
- g) that, the band 29.5-30.0 GHz is allocated on a worldwide and primary basis to the FSS (Earth-to-space) in the ITU RR [12];
- h) that, Decision ECC Decision (05)01 [4] designates certain frequency bands in the range 27.5-29.5 GHz for the use of uncoordinated FSS earth stations and certain others for the use of the FS;
- i) that, Decision ECC Decision (05)01 [4] also designates the band 28.8365-28.9485 GHz for the use of uncoordinated FSS earth stations, without prejudice to the FS systems licensed in this band in some countries before 18 March 2005;
- j) that, the Office collects information regarding, in particular, the usage of FS applications in the CEPT in the frequency bands within the ranges 17.7-19.7 GHz and 27.5-29.1 GHz and that this information is publicly available in the ECO Frequency Information System (EFIS)<sup>2</sup>;
- k) that, Report ITU-R S.2261[3] identifies the technical and operational requirements for the operation of ESOMPs in Ka-band on-GSO FSS networks and that ECC Report 217 [2] identifies certain technical conditions for land and maritime ESOMPs to ensure that they do not cause unacceptable interference to other services;
- l) that, ECC Decision (05)08 [5] decides that certain frequency bands in the range 17.3-30.0 GHz are available for high density applications in the FSS, including uncoordinated FSS earth stations;
- m) that, ECC Decision (05)10 [13] and ECC Decision (05)11 [14] have established regulatory requirements allowing for the free circulation and use of aircraft earth stations and earth stations on vessels operating the GSO networks in the 14.0-14.5 GHz band;

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<sup>2</sup> [www.efis.dk](http://www.efis.dk); [EFIS FS Link](#)

- n) that, ECC Decision (13)01 [8] has been developed to provide harmonised use, free circulation and exemption from individual licensing of Ka-band GSO ESOMPs;
- o) that, some of the technical characteristics of the ESOMPs systems are influenced by the technical coordination conditions of the relevant satellite systems as detailed in coordination agreements reached between concerned administrations, and also specific conditions on the use of the frequency bands as stipulated in the ITU RR [12];
- p) that, NGSO systems in the band 28.6-29.1 GHz, within which ESOMPs operate, are subject to the application of the provisions of RR 9.11A [12], and therefore subject to coordination with current and future non GSO or GSO FSS networks;
- q) that, the use of ESOMPs on ships requires authorisation by the relevant national Administration of the country where the ship is registered;
- r) that, some administrations may require a frequency authorisation due to specific national requirements, while other administrations may require some form of notification, exemption, or mutual recognition of the licence issued in the country of registration of the ESOMPs;
- s) that, when operating in the national territory of a CEPT Administration, relevant national regulatory requirements may apply to ESOMPs;
- t) that, in EU/EFTA countries the radio equipment that is under the scope of this Decision shall comply with the RE Directive [15]. Conformity with the essential requirements of the RE Directive may be demonstrated by compliance with the applicable harmonised European standard(s) or by using the other conformity assessment procedures set out in the RE Directive;
- u) that ETSI has developed the Harmonised European Standard EN 303 979 [16] for ESOMPs;
- v) that ECC Report 272 [10] provides the requirements established to ensure compliance with aircraft HIRF protection criteria.

## *DECIDES*

1. that the **purpose of this ECC Decision** is to:
  - a) harmonise the use and allow the free circulation and exemption from individual licensing of ESOMPs of non-geostationary satellite networks operating within the frequency bands 17.3-20.2 GHz (receive band) and 27.5-29.1 GHz and 29.5-30.0 GHz (transmit bands);
  - b) apply the technical conditions necessary to ensure harmful interference is not caused by ESOMPs to stations of the FSS, FS and other services;
2. that CEPT **administrations shall**:
  - a) designate the frequency bands 19.7-20.2 GHz (space-to-Earth) and 29.5-30.0 GHz (Earth-to-space) for the operation of ESOMPs;
  - b) designate the frequency bands 17.3-19.7 GHz (space-to-Earth), 27.5-27.8285 GHz (Earth-to-space) and 28.4445-28.8365 GHz (Earth-to-space), for the operation of ESOMPs;
  - c) designate the band 28.8365-28.9485 GHz (Earth-to-space) for the operation of ESOMPs, in those countries that have not authorised terrestrial systems in this band;
  - d) inform the Office, through the ECO Frequency Information System (EFIS), whether frequencies within 28.8365-28.9485 GHz are designated for ESOMP operations, or not, within their territory;
  - e) allow the free circulation and use of ESOMPs that satisfy the provisions of this Decision;
  - f) exempt ESOMPs from individual licensing;

3. that, for the purpose of this ECC Decision, the **following technical and operational parameters** apply:
  - a) within the frequency bands 27.5-29.1 GHz and 29.5-30.0 GHz, ESOMPs shall operate only in the portions of these frequency bands identified for their use within the territory of operation;
  - b) ESOMPs operating in international waters (which may transmit within the range 27.5-29.1 GHz), shall ensure protection of fixed service systems in the CEPT;
  - c) ESOMPs transmitting in the band 29.5-30.0 GHz shall comply with the requirements in Annex 1;
  - d) ESOMPs transmitting in the band 27.5-29.1 GHz shall comply with the requirements in Annexes 1, 2 and 3;
  - e) ESOMPs receiving in the band 17.7-19.7 GHz shall not claim protection from interference from fixed stations operating in the same band and in conformity with their national regulations;
  - f) ESOMPs receiving in the band 17.3-17.7 GHz shall not claim protection from BSS feeder links operating in the same band and in conformity with their national regulations;
4. that this Decision **enters into force** on 3 July 2015;
5. that the preferred **date for implementation** of this Decision shall be 3 January 2016;
6. 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://www.ecodocdb.dk> for the up to date position on the implementation of this and other ECC Decisions.

**ANNEX 1: TECHNICAL AND OPERATIONAL REQUIREMENTS FOR ESOMPS OPERATING WITHIN THE FREQUENCY BANDS 17.3-20.2 GHz AND 27.5-29.1 GHz AND 29.5-30.0 GHz**

ESOMPs operating within the frequency bands 17.3-20.2 GHz and 27.5-29.1 GHz and 29.5-30.0 GHz shall comply with the following technical and operational requirements:

1. This Annex applies to ESOMPs operating in non-geostationary satellite systems;
2. ESOMP networks shall operate under the control of a Network Control Facility (NCF);
3. The protection of GSO FSS networks operating in 27.5-28.6 GHz and 29.5-30.0 GHz from ESOMPs operating in NGSO systems shall be achieved by complying with the EPFD limits stipulated in No. 22.5D of the ITU Radio Regulations. The protection of FSS GSO networks and FSS NGSO systems operating in 28.6-29.1 GHz shall be on the basis of relevant coordination agreements reached between administrations and operators in accordance with No. 9.11A of the ITU Radio Regulations;
4. The design, coordination and operation of ESOMPs shall take into account the following factors to the extent that they ensure compliance with the conditions specified in No. 3 of this Annex:
  - a) antenna mis-pointing;
  - b) variations in the antenna pattern;
  - c) variations in the transmit e.i.r.p..
5. ESOMPs that use closed-loop tracking of the satellite signal shall employ an algorithm that is resistant to capturing and tracking signals from nearby satellite. ESOMPs shall immediately inhibit transmissions when they detect that unintended satellite tracking has happened or is about to happen;
6. ESOMPs shall be self-monitoring and should a fault which can cause harmful interference to FSS or terrestrial networks be detected, the ESOMPs must automatically cease its transmissions;
7. ESOMPs shall be in conformance with the Harmonised European Standard EN 303 979, "Satellite Earth Stations and Systems (SES); Harmonised European standard for Earth Stations on Mobile Platforms (ESOMPs) transmitting towards satellites in non-geostationary orbit in the 27.5-29.1 GHz and 29.5-30.0 GHz frequency bands covering the essential requirements of article 3.2 of the Radio Equipment Directive" [16].
8. ESOMPs shall comply with the following requirements that ensure compliance with aircraft HIRF protection criteria based on ECC Report 272 [10], using a maximum HIRF field strength of 150 V/m:
  - a) The maximum e.i.r.p. of land-based ESOMPs operating within the airfield boundary shall be limited to 52.4 dBW;
  - b) The maximum e.i.r.p. of land-based ESOMPs operating outside the airfield boundary shall be limited to 70 dBW ;
  - c) The maximum e.i.r.p. of ESOMPs on vessels shall be limited to 70 dBW;
  - d) The maximum e.i.r.p. of ESOMPs, as defined above, operating within TDMA networks shall be respected after taking into consideration the duty cycle (see section 3.3 and 3.4 of ECC Report 272).



## **ANNEX 2: ADDITIONAL TECHNICAL AND OPERATIONAL REQUIREMENTS FOR ESOMPS OPERATING WITHIN THE FREQUENCY BANDS 17.3-19.7 GHz AND 27.5-29.1 GHz**

ESOMPs operating within the frequency bands 17.3-19.7 GHz and 27.5-29.1 GHz must comply (in addition to Annex 1) with the following technical and operational requirements:

1. In the territory of any administration, the off-axis<sup>3</sup> e.i.r.p. spectral density radiated by any ESOMP into the FS bands (i.e. 27.8285-28.4445 GHz, 28.8365-28.9485 GHz (where applicable) and 28.9485-29.1 GHz) shall be limited to -35 dBW/MHz. This limit shall, in any case, be met by ESOMPs on land, on territorial sea or on internal waters, at a direction of 3 degrees or less above the local horizontal plane at the ESOMPs terminal;
2. In the territory of any administration, ESOMPs shall not have their transmit occupied band edges closer than 10 MHz from the edges of the bands identified by that administration for FS operation;
3. The antenna elevation angle shall be higher than 3 degrees;
4. In the band 28.8365-28.9485 GHz, the PFD threshold values in paragraph 6 shall apply to the territory of any administration which authorises FS systems in this band and shall not be exceeded, unless prior agreement has been given by the concerned administration(s) to exceed these values;
5. In the bands 27.8285-28.4445 GHz and 28.9485-29.1 GHz, the PFD threshold values in paragraph 6 shall apply to the territory of all CEPT administrations and shall not be exceeded, unless prior agreement has been given by the concerned administration(s) to exceed these values;
6. For ESOMPs installed on vessels, the PFD threshold value is -109 dB(W/m<sup>2</sup>) in a reference bandwidth of 14 MHz at a height of 20 metres above mean sea level at the low-water mark of the territory of the administrations defined in paragraphs 4 and 5 above<sup>4</sup>;
7. For ensuring compliance with the above PFD provisions ESOMPs shall have self-monitoring functions and automatic mechanisms (locally, or under the control of the NCF) to reduce its e.i.r.p. or cease transmissions;
8. National limitations applicable to uncoordinated FSS earth stations to avoid cross-border interference to fixed or mobile services in the same band in an adjacent country shall apply to land based ESOMPs and ESOMPs operating on territorial sea and on inland waterways in the same country as the uncoordinated FSS earth stations.

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<sup>3</sup>Off-axis refers to angles greater than 7° from the axis of the main beam or to angles greater than the declared minimum elevation angle of the ESOMPs, whichever is lower.

<sup>4</sup>The PFD value above is not defined as under "free-space" conditions. The percentage of time that should be used in the propagation model when assessing compliance with this PFD threshold should be 0.007%.

**ANNEX 3: INFORMATION AND DECLARATION TO BE SUBMITTED BY ESOMPS OPERATORS TO THE OFFICE**

Any ESOMPs operator intending to operate ESOMPs within the framework of this ECC Decision is required to submit to the Office (<http://www.cept.org/eco>) a declaration that their system complies with the requirements of this Decision and the information (with any subsequent changes) contained in Table 1 below.

**Table 1: Information to be provided to the Office**

Information	To be fillen in
Network operator name	
Network operator address	
Network Control Facility (NCF) designated point of contact: <ul style="list-style-type: none"> <li>▪ Contact name</li> <li>▪ Contact telephone number</li> <li>▪ Contact email address</li> </ul>	

## ANNEX 4: LIST OF REFERENCES

This annex contains the list of relevant reference documents.

- [1] Report ITU-R S.2223-1: "Technical and operational requirements for GSO FSS earth stations on mobile platforms in bands from 17.3 to 30.0 GHz"
- [2] ECC Report 217: "The Use of Land and Maritime Earth Stations on Mobile Platforms Operating with NGSO FSS Satellite Systems in the Frequency Range 17.3-20.2 GHz, 27.5-29.1 GHz and 29.5-30.0 GHz"
- [3] Report ITU-R S.2261-0: "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"
- [4] ECC Decision (05)01 : "The use of the band 27.5-29.5 GHz by the Fixed Service and uncoordinated Earth stations of the Fixed-Satellite Service (Earth-to-space)"
- [5] 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
- [6] ECC Decision (06)02: "Exemption from Individual Licensing of Low e.i.r.p. Satellite Terminals (LEST) operating within the frequency bands 10.70-12.75 GHz or 19.70-20.20 GHz space-to-Earth and 14.00-14.25 GHz or 29.50-30.00 GHz Earth-to-space", March 2006
- [7] ECC Decision (06)03: "Exemption from Individual Licensing of High e.i.r.p. Satellite Terminals (HEST) with e.i.r.p. above 34 dBW operating within the frequency bands 10.70-12.75 GHz or 19.70-20.20 GHz space-to-Earth and 14.00-14.25 GHz or 29.50-30.00 GHz Earth-to-space"
- [8] ECC Decision (13)01: "The use, free circulation, and exemption from individual licensing of Earth stations on mobile platforms (ESOMPs) in the frequency bands available for use by uncoordinated FSS Earth stations within the ranges 17.3-20.2 GHz and 27.5-30.0 GHz"
- [9] ECC Report 184: "The use of earth stations on mobile platforms operating with GSO satellite networks in the frequency ranges 17.3-20.2 GHz and 27.5-30.0 GHz", February 2013
- [10] ECC Report 272: "Earth Stations operating in the frequency bands 4-8 GHz, 12-18 GHz and 18-40 GHz in the vicinity of aircraft", January 2018
- [11] ERC Recommendation 01-07: "Harmonised regime for exemption from individual licensing for the use of radio spectrum", amended June 2004
- [12] ITU Radio Regulations Edition of 2016
- [13] ECC Decision (05)10: "The free circulation and use of Earth Stations on board Vessels operating in fixed satellite service networks in the frequency bands 14-14.5 GHz (Earth-to-space), 10.7-11.7 GHz (space-to-Earth) and 12.5-12.75 GHz (space-to-Earth)"
- [14] ECC Decision (05)11: "The free circulation and use of Aircraft Earth Stations (AES) in the frequency bands 14-14.5 GHz (Earth-to-space), 10.7-11.7 GHz (space-to-Earth) and 12.5-12.75 GHz (space-to-Earth)"
- [15] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC
- [16] ETSI Harmonised European Standard EN 303 979 V2.1.2: "Satellite Earth Stations and Systems (SES); Harmonised Standard for Earth Stations on Mobile Platforms (ESOMP) transmitting towards satellites in non-geostationary orbit, operating in the 27.5 GHz to 29.1 GHz and 29.5 GHz to 30.0 GHz frequency bands covering the essential requirements of article 3.2 of the Directive 2014/53/EU"