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RADIO SPECTRUM POLICY GROUP

RSPG Opinion on assessment of different possible scenarios for the use of the frequency bands 1980-2010 MHz and 2170-2200 MHz by the Mobile Satellite Services beyond 2027

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0 Introduction

0.1 Role of RSPG

The role of the Radio Spectrum Policy Group (RSPG) is to assist and advise the European Commission on radio spectrum policy issues. This includes advice on the coordination of policy approaches, on the preparation of multiannual radio spectrum policy programmes and, where appropriate, on harmonised conditions with regard to the availability and efficient use of radio spectrum necessary for the establishment and functioning of the internal market. In particular, the RSPG “shall assist and advise the Commission [...] where appropriate, on harmonised conditions with regard to the availability and efficient use of radio spectrum, necessary for the establishment and functioning of the internal market...”.¹ Furthermore, “the Group shall assist Member States in cooperating with each other and with the Commission [...] in support of the strategic planning and coordination of radio spectrum policy approaches in the Union, by: [...] coordinating Member States' approaches to the assignment and authorisation of radio spectrum use and publishing reports and opinions on radio spectrum related matters”.²

0.2 Scope of this Opinion

The current EU regulatory framework on Mobile Satellite Services (MSS) consists of various legal initiatives and basis:

- Commission Decision 2007/98/EC under Radio Spectrum Decision (Decision 676/2002/CE) on the harmonised use of radio spectrum in the 2 GHz frequency bands for the implementation of systems providing mobile satellite service (MSS),
- EP and Council Decision 626/2008/EC on the selection and authorisation of systems providing mobile satellite services (MSS), as Decision 2007/98/EC in particular, does not cover procedures for assignment of spectrum and granting rights of use for radio frequencies, but includes follow up actions at EU Member States level and relevant timing (authorisations), further to a call for application for EU-wide systems providing mobile satellite services (MSS), Commission Decision 2009/449/EC ”on the selection of operators of pan-European systems providing mobile satellite services (MSS)” and
- Commission Decision 2011/667/EC on modalities for coordinated application of the rules on enforcement with regard to mobile satellite services (MSS) pursuant to Article 9(3) of Decision No 626/2008/EC.

Pursuant to this MSS framework, two operators were selected to provide MSS in the European Union in the EU-harmonised 1 980 - 2 010 MHz and 2 170 - 2 200 MHz (“2 GHz”) frequency band until mid-2027 (Commission Decision 2009/449/EC).

The expiry of the current national licenses/authorisations in 2027 in some Member States concurs with important recent technological and market developments in the satellite sector in Europe and worldwide. This provides a timely opportunity to assess at the EU level the current and future use of the 2 GHz MSS frequency band, in order to maximise its efficient use and socio-economic impact across

¹ Art. 2 (1) (f) of Commission Decision 2019/196/EC on setting up the Radio Spectrum Policy Group and repealing Decision 2002/622/EC.

² Art. 2 (2) (c) of Commission Decision 2019/196/EC on setting up the Radio Spectrum Policy Group and repealing Decision 2002/622/EC.

the EU in a coordinated manner. When drafting this Opinion in response to the request from European Commission, RSPG focus its analysis and recommendations in order to avoid a fragmented situation in the Union concerning the use of the MSS frequencies after 2027.

0.3 Response to public consultation

A public consultation on the Draft for this Opinion was held from 09 November 2023 to 21 December 2023. 15 responses were received. The majority of responders appreciated the approach to assess different possible scenarios for the use of the frequency bands 1980-2010 MHz and 2170-2200 MHz by the MSS beyond 2027 and the possibility to comment on the draft. Most of the comments support, explicit or implicit, the recommendations 1 – 9 as submitted to public consultation. The majority of comments relate to the possible future scenarios, including recommendation 10 as submitted to public consultation. In all comments, preferences for one or more options were expressed. Whilst [BUSINESS CONFIDENTIAL] expressed the view, to maintain the current usage, others favour the possibility to introduce new usages and to allow for new entrants. Some comments suggest to add a further opportunity to allow smaller bandwidth than the proposed smallest 5 MHz block, including open it for test purposes. Further some comments related to other MSS allocations and to WRC-27 Agenda Items with relevance to MSS were made. The RSPG analysed all comments and suggestions to the draft Opinion and included relevant modifications where appropriate.

Moreover, since a number of comments related to future steps of the decision-making progress (e.g. concerning a future operator selection process or the subsequent licencing and enforcement processes, etc.) RSPG wishes to underline, that its Opinion aims to pave the way towards an informed decision about the future scenario itself. Once a scenario will be chosen, further steps are required to implement it. Interested stakeholders are welcomed to follow and contribute thereto, as appropriate.

Some comments referred to potential results of WRC-27 Agenda Items, under which other MSS spectrum and related usage will be considered. However, the results of WRC-27 would not be available in time for deciding about future scenarios for the 2 GHz MSS band. Further, RSPG will discuss related WRC-27 matters under the relevant Opinion to be developed.

RSPG Opinion

The European Commission invited RSPG to assess different possible scenarios for the use of the frequency bands 1980-2010 MHz and 2170-2200 MHz beyond 2027. RSPG considered, inter alia, the existing national licenses/authorisations and the current use of that band for MSS in the EU and in some other countries of the European geographical area (section 1) and the latest technological developments in satellite communications and trends in the provision of mobile satellite services (section 2). RSPG identified future different possible MSS usages of these frequency bands 1980-2010 MHz and 2170-2200 MHz beyond 2027: 1) CGC/EAN, 2) Generic MSS (voice, data), 3) M2M/IoT ecosystem, 4) (Wideband) NTN – D2D (section 3). Further to an assessment, taking into account relevant EU policies and considering the efficient and effective use of the said frequency bands, RSPG identified different possible scenario(s) for the use of the frequency bands 1980-2010 MHz and 2170-2200 MHz beyond 2027 (section 3.2) and possible band segmentations of the 2 GHz MSS frequency band beyond 2027 (section 3.3).

Based on its strategic assessment and its analysis supporting inter alia EU interests and the provision of EU-wide services, the RSPG provides the following recommendations as to the most appropriate way forward:

0.4 Recommendations

1. RSPG recognises that under the European legal framework issuing rights of use is a national responsibility to allow Member States to customise rights of use to any relevant national circumstances. There is no indication that this fundamental assumption has changed. Consequently, RSPG recommends no changes to the European framework in this regard.
2. In order to avoid fragmented national authorisation initiatives, RSPG recommends to European Commission and Member States to reach a sufficient understanding regarding what scenario will be chosen and the respective next procedural steps, including a potential operator selection process at EU level. Such visibility will benefit also to Member States having implemented a general authorisation in order to update their framework on a coordinated manner.
3. RSPG recommends that due regard be given to the investments and market developments of existing operators as well as to the need for new entrants to support innovation and to offer an increasing number of services and emphasizes the linkage with the EU-level policy priorities.
4. EU-level regulatory framework for Service provision / terminals operation inside the EU is without prejudice of the obligation of an ITU coordination for the respective filings. If no new EU MSS framework were implemented, additional coordination at the ITU level may not be needed. If a new EU framework were to be implemented, a coordination with the other notifying administrations on ITU level will be necessary.
5. RSPG recommends to maintain a technology neutral approach beyond 2027 under the current MSS allocation.
6. RSPG recommends to the European Commission and to Member States to examine the underlying 2 GHz MSS legislation and framework, under existing EU law, for a competitive outcome in a timely fashion before the current 2 GHz MSS national authorisations expire.

This includes to examine Decision 2007/98/EC in order to preserve the current technical harmonisation for MSS in the 2 GHz band in the EU.

7. RSPG recommends the end of second quarter of 2025 as an adequate date in order to reach sufficient common understanding on which scenario will be chosen and the respective next procedural steps. All efforts should be done in that regard.
8. RSPG recommends a band segmentation, with the focus on a limited number of options. This possible segmentation of the 2x30 MHz available spectrum is provided aiming for an EU-wide common scenario, also taking into account the elements in Recommendation 3.
9. When addressing NB IoT demands, RSPG notes that a 2x5 MHz could be shared among multiple NB IoT service providers due to reduced operating bandwidth and that other spectrum resources above 1 GHz could be allocated at international level at WRC-27. The latter should be discussed under the RSPG Opinion on WRC-27.
10. Option 1 (no new band segmentation) presents the disadvantages, that it may limit competition in MSS service provision, as well as future innovation or development, e.g. excluding other stakeholders or usages, and may deprive from an opportunity to increase Europeans strategic autonomy.

0.5 Options for possible band segmentation

Based on its assessment, RSPG proposes to consider the following options for the use of the 2 GHz MSS frequency band beyond 2027:

0.5.1 Option 1 – no new band segmentation

(1) 2 selected operators

- 2 x 15 MHz EAN/CGC and any MSS evolution
- 2 x 15 MHz Generic MSS (individual voice/data, IoT and any other evolution)

It has to be noted that this option presents the disadvantages, that it may limit competition in MSS service provision, as well as future innovation or development, e.g. excluding other stakeholders or usages, and may deprive from an opportunity to increase Europeans strategic autonomy.

0.5.2 Options 2-4 - Introducing competition based on the current regulatory situation

In order to stimulate competition but also to guarantee a smooth transition from the current regulatory situation, limited parts of the segmented spectrum could remain available for the current selected operator to continue providing services and exploiting infrastructures already developed (e.g., the European Aviation Network, MSS generic and IoT). With this, the current selected operators would have opportunity to cope with evolution of technologies and also to compete with new spectrum usages. Remaining part of the spectrum is available for emerging technologies, e.g. (wideband) NTN-D2D with minimum bandwidth of 2x10 MHz and any other evolution of MSS.

Examples of a segmentation below:

(2) More than 3 potential operators:

- 2 operators with each 2 x 10 MHz

- 1 operator with 2 x 5 MHz
- multiple operators sharing 2 x 5 MHz*

(3) 3 potential operators:

- 1 operator with 2 x 10 MHz
- 1 operator with 2 x 10 MHz
- 1 operator with 2 x 10 MHz

(4) 3 or more potential operators with:

a)

- 1 operator with 2 x 15 MHz
- 1 operator with 2 x 10 MHz
- 1 operator with 2 x 5 MHz

or

b)

- 1 operator with 2 x 15 MHz
- 1 operator with 2 x 10 MHz
- multiple operators sharing 2 x 5 MHz*

The above options may limit the current selected operators and their already planned investments and services provision. Nevertheless, these options would enable Europe for other usage, e.g. for the inclusion of IRIS².

() When addressing NB IoT demands, a 2x5MHz could be shared by multiple NB IoT service providers due to reduced operating bandwidth (e.g. 250 kHz).*

In addition, a small part of such 2x5 MHz block could be opened for test purposes.

1 Existing licenses and the current use of that band for MSS in the EU and in other countries

RSPG examined the existing situation on the national authorisations to use existing satellite services by notified and coordinated satellite systems as described in section 2.1 (Impact of Coordination and Notification processes on ITU level) with dedicated terminals to assess the national markets under the relevant business models as proposed by the stakeholders as listed in section 2.6.2 (List of stakeholders' responses under the respective scenario) for future use beyond 2027.

1.1 Authorisation regimes, authorisations

RSPG evaluated the current situation based on the study “*MSS authorisation regimes, authorisations and enforcement in the EU Member States*”, which was prepared by iDate for the European Commission in 2018.³ The study provided a high-level analysis of the legal framework of the authorisations for the provision of MSS/CGC, national authorisations issued and the enforcement regimes across the EU Member States. RSPG updated this information based on results to a questionnaire to Member States about the current situation regarding the MSS operators and covering, inter alia, authorisation regimes, national MSS market and possible other interested stakeholders.⁴ By analysing the responses and the information available from the previous study, the summary is following:

1.1.1 Authorisation scheme

During the investigation, a distinction must be made between the authorisation method required for the provision of the service and, possibly, for the use of frequencies used to the service, emphasizing that both are relevant from the point of view of the MSS service provision. RSPG notes that the EU legal framework on authorisation has been changed since the beginning of MSS and is implemented in EU Member States.

The EU's regulatory framework for electronic communications, established in 2002, was revised in 2009 to take into account the market developments, and the new rules were to be transposed into national legislation in the Member States by the end of May 2011. The next review was launched in September 2016 via the so-called ‘Connectivity Package’. In December 2018 the Directive 2018/1972 establishing the European Electronic Communications Code⁵ (hereinafter: the EECC) has been adopted.

From the service provision authorisation point of view according to Article 12(1) of the EECC, Member States shall ensure the freedom to provide electronic communications networks and services, subject to the conditions set out in this Directive. “The rationale of the EECC provision on general authorisation, and in particular of Article 12 “general authorisation of electronic communication networks and services” (also in the light of recital 42), is to minimise requirements and administrative costs borne by undertakings willing at providing ECS or ECN, as well to harmonise them across EU, with a view to

³ European Commission, Directorate-General for Communications Networks, Content and Technology, Gerus, V., Manero, C., Pujol, F. et al., *Mobile Satellite Services (MSS) authorisation regimes, authorisations and enforcement in the EU Member States – Final report*, Publications Office, 2019, <https://data.europa.eu/doi/10.2759/974409>

⁴ The questionnaire was issued in March/April 2023. 28 Responses were received from EU Member States, and also from Albania, Serbia and Switzerland.

⁵ OJ L321, 17.12.2018, p.36. <https://eur-lex.europa.eu/legalcontent/EN/TXT/PDF/?uri=CELEX:32018L1972&from=EN>

pursuing a proper functioning of the internal market. Therefore, the policy objective is to ensure that all undertakings in the EU rely on a lean and general authorisation regime, by removing unnecessary, administrative burdens, to ECS and ECN providers.”⁶ In accordance with Article 12(4) BEREC established a General Authorization Database (GADB)⁷, as European Union (EU) database that includes notifications per EU Member States from providers of electronic communications networks and services transmitted to the competent authorities in the EU Member States by undertakings subject to the general authorisation regime. Both selected applicants (EchoStar and Inmarsat) are listed in GADB. Nevertheless, there is no information in the relevant notification on the frequency band where the MSS operates nor what type of MSS is provided within the referred country.

Decision 626/2008/EC⁸ (hereinafter ‘the MSS decision’) states in Article 7 that ‘*Member States shall ensure that the selected applicants (...) shall have the right to use the specific radio frequency identified in the Commission decision adopted pursuant to Articles 5(2) or 6(3) and the right to operate a mobile satellite system. They shall inform selected applicants of those rights accordingly*’. This Decision refers also to common conditions applicable to selected operators.

The Decision 2007/98/EC aimed to harmonise conditions for the availability and efficient use of the 2 GHz MSS spectrum, and Member States were required to make that spectrum available as of 1 July 2007. The consequence of this initiative under the Spectrum Decision is a current EU spectrum harmonisation for MSS services.

Moreover, within EU Member States, different authorisation regimes can be discerned in regard to both MSS service provision and Complementary Ground Components (CGC): general authorisations or individual rights of use.

1.1.1.1 MSS

For MSS, a majority of the Member States have opted for a general authorisation (15) on their national territory. The other Member States (12) have granted individual right of use for radio spectrum to the selected operators. Not all Member States have granted MSS authorisations to both MSS operators: one Member State has only granted an MSS authorisation to Inmarsat. The right of operators to use spectrum must be distinguished from the right to use terminal equipment. The right for the user terminals to access spectrum is generally without an individual authorisation.

1.1.1.2 CGC

Information concerning EU/EEA countries:

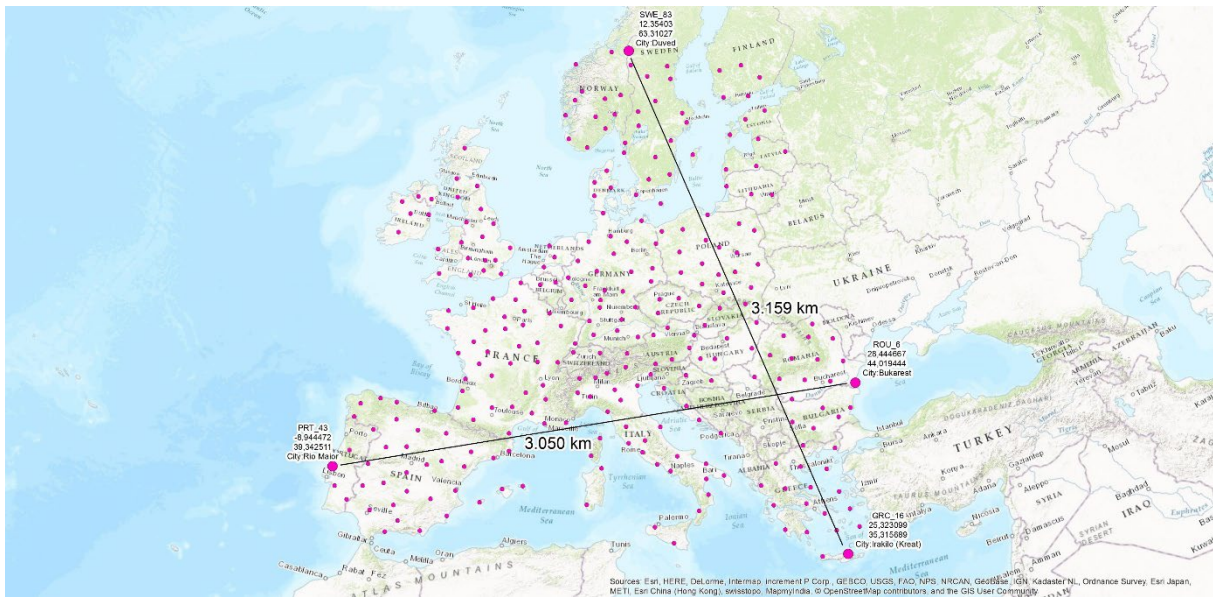
Concerning CGC authorisations, the majority of the Member States have opted to grant individual right of use for radio spectrum per CGC station and selected operators. Only one Member State has opted to grant a general authorisation to Inmarsat leaving flexibility on CGC stations to be rolled out.

Operator EchoStar holds several CGC individual authorisations across the EU Member States.

⁶ BEREC Opinion on the national implementation and functioning of the general authorisation, and on their impact on the functioning of the internal market, pursuant to article 122, paragraph 3 EECC, BoR (21) 178; https://www.berec.europa.eu/sites/default/files/files/document_register_store/2021/12/BoR_%2821%29_178_BEREC_Opinion_on_General_Authorisation_FOR_PUBLICATION.pdf

⁷ <https://gadb.berec.europa.eu/#!/view=Providers&sort=ProviderName|ASC>

Inmarsat's integrated EAN ground network component (CGC) consists of about 300 LTE base stations across the 27 EU Member States, plus UK, Switzerland and Norway:



Source: <https://www.telekom.com/resource/blob/514074/c029d9e7388a0bf6dbf097e213e88485/dl-ean-07-ean-lte-basieres-bodennetz-karte-data.jpg>

Generally, MSS user terminals are operating freely and are exempting from individual right of use in line of ECC Decision (12)01 on Exemption from individual licensing and free circulation and use of satellite mobile terminals operating under the control of networks in the range 1 to 3 GHz.

Additionally, individual rights of use were issued for EchoStar for Earth calibration stations⁹ in Cyprus (1), Denmark (1), France (1), Germany (1), Greece (2), Ireland (1), Italy (1), Malta (1), Poland (1), Portugal (1), Romania (1), Spain (1), Sweden (1) and UK (1). Further, Inmarsat holds an individual right of use for one TT&C Earth station in Greece.

Information concerning non-EU/EEA countries:

RSPG observer country Albania provided information for the questionnaire stating that the authorisation regime is not yet defined and no operators are authorised in 2 GHz for MSS.

RSPG observer country Serbia also provided information for the questionnaire stating that no authorisation was issued and the frequency bands are partly used for military purposes.

RSPG notes, that the UK - neither an EU Member State, nor an RSPG observer country - , introduced special regulations, which govern the authorisation of operators to use the relevant frequencies for earth-to-space and space-to-earth communications for the satellite component. As for the CGC, the UK granted individual right of use to both operators under a special regulation. Terrestrial 2 GHz MSS satellite terminals (i.e. land mobile terminal) are licence exempt in the UK.

Switzerland – neither an EU Member State, nor an RSPG observer country – provided information about the satellite radio authorisation of EchoStar and Inmarsat, which have been granted until 31 December 2027.

⁹ These stations are not regarded as a CGC according to the MSS decision.

1.1.2 Duration of rights

1.1.2.1 MSS

Article 7(2)(e) of Decision 626/2008/EC on 30 June 2008 of the European Parliament and of the Council¹⁰ states, that ‘any necessary rights of use and authorisations shall be granted for the duration of eighteen years from the date of the selection decision’.

Information concerning EU/EEA countries:

The majority of the Member States follow this duration for both MSS operators, with MSS right of use for frequency ending at or around 13 May 2027 except when a general authorisation is in force (no expiry date in that case). In this regard, there are slight differences in interpretation of the 18-year period from 13 May 2009 onwards resulting from different expiry date in 2027 or no expiry date.

Inmarsat	EchoStar
AT (15.03.27)	AT ()
BE ()	BE (13.05.27)
BG (13.05.27)	BG (13.05.27)
CY (13.05.27)	CY (13.05.27)
CZ (13.05.27)	CZ (13.05.27)
DE (13.05.27)	DE (13.05.27)
DK (12.05.27)	DK (12.05.27)
EE (unlimited)	EE ()
FI (13.05.27)	FI (13.05.27)
FR (12.05.27)	FR (12.05.27)
GR (13.05.27)	GR (13.05.27)
HR (12.05.27)	HR (12.05.27)
HU (13.05.27)	HU (13.05.27)
IT (12.05.27)	IT (12.05.27)
LT (14.05.27)	IE ()
LU (no service)	LT (14.05.27)
LV (12.05.27)	LV (12.05.27)
MT (no service, 12.05.27)	MT (12.05.27)
NL (13.05.27)	NL (13.05.27)
PL ()	PL ()
PT (14.05.27)	PT (14.05.27)
RO (13.05.27)	RO (13.05.27)
SE (14.05.27)	SE (14.05.27)
SI (13.05.27)	SI (13.05.27)
SK (13.05.27)	SK (13.05.27)
SP (14.05.27)	SP (14.05.27)

Information concerning non-EU/EEA countries:

EchoStar - In four cases the respective country specified an expiry date for the MSS: the UK 13.05.2027, Switzerland 31.12.2027, Montenegro 2027, [BUSINESS CONFIDENTIAL].

Inmarsat - In four cases the respective country specified an expiry date for the MSS: [BUSINESS CONFIDENTIAL] Switzerland 31.12.2027, and the UK 13.05.2027. Other countries granted overflight rights or general authorizations.

¹⁰ OJ L 172, 2 July 2008, page 15ff.

1.1.2.2 CGC

Concerning the duration of CGC authorisations, the majority of the Member States also follows the 18-year period as stated in the MSS decision. There are also slight differences in interpretation of the 18-year period with dates ending at or around 13 May 2027. One Member State has opted for an indefinite authorisation, whereas another Member State has different durations of the authorisations going beyond 13 May 2027, depending on the date of authorisation.

Concerning non-EU countries, four countries granted authorizations for the CGCs with expiry date: UK until 13 May 2027, [BUSINESS CONFIDENTIAL]. Individual right of use for MSS radio spectrum in 2 GHz band for 2 CGC stations have been assigned by Montenegro to the selected operator Inmarsat Ventures Ltd, according to national legal framework for the period of 5 years validity, expiring on 25 April 2024.

1.1.3 Renewal

The renewal is one of the new legal instruments of the EECC. The EECC Article 50 is on Renewal of individual rights of use for harmonised radio spectrum: *“National regulatory or other competent authorities shall take a decision on the renewal of individual rights of use for harmonised radio spectrum in a timely manner before the duration of those rights expired, except where, at the time of assignment, the possibility of renewal has been explicitly excluded. For that purpose, those authorities shall assess the need for such renewal at their own initiative or upon request by the holder of the right, in the latter case not earlier than five years prior to expiry of the duration of the rights concerned. This shall be without prejudice to renewal clauses applicable to existing rights.”*

As for terms and conditions of a renewal of individual rights of use, Member States have opted to either connect this to the MSS decision or have not adopted specific provisions for the renewal.

When a Member State has granted an individual authorisation the process of renewal of individual rights of use shall be launched before the expiry of the individual authorisation, noting that the date to launch the process could differ from Member State to Member State, which does not necessarily lead to the same result in all Member States.

1.1.4 EU level framework for granting authorisations

The question arises, whether the existing European legal framework concerning authorisation is sufficient to grant authorisations on national level, noting the wish to facilitate an EU wide service provision by making effort to avoid a fragmented situation in the Union concerning the use of the MSS frequencies after 2027.

The relevant provisions in force are:

Article 4(3)c EECC: *“Member States shall, through the RSPG, cooperate with each other and with the Commission in accordance with paragraph 1, and upon their request with the European Parliament and with the Council, in support of the strategic planning and coordination of radio spectrum policy approaches in the Union, by: (c) coordinating their approaches to the assignment and authorisation of use of radio spectrum and publishing reports or opinions on radio spectrum related matters.”*

Article 4(4) *“The Commission, taking utmost account of the opinion of the RSPG, may submit legislative proposals to the European Parliament and to the Council for the purpose of establishing multiannual radio spectrum policy programmes, setting out the policy orientations and objectives for the strategic planning and harmonisation of the use of radio spectrum in accordance with this*

Directive, as well as for the purpose of releasing harmonised radio spectrum for shared use or for use not subject to individual rights.”

Article 37“Two or several Member States may cooperate with each other and with the RSPG, taking into account any interest expressed by market participants, by jointly establishing the common aspects of an authorisation process and, where appropriate, also jointly conducting the selection process to grant individual rights of use for radio spectrum.”

Article 38(1) “Where the Commission finds that divergences in the implementation by the national regulatory or other competent authorities of the regulatory tasks specified in this Directive could create a barrier to the internal market, the Commission may, taking the utmost account of the opinion of BEREC or, where relevant, the RSPG, adopt recommendations or, subject to paragraph 3 of this Article, decisions by means of implementing acts to ensure the harmonised application of this Directive and in order to further the achievement of the objectives set out in Article 3.”

Article 45(2) “[...] For the purpose of the first subparagraph, and in the context of the development of technical implementing measures for a radio spectrum band under Decision No 676/2002/EC, the Commission may request the RSPG to issue an opinion recommending the most appropriate authorisation regimes for the use of radio spectrum in that band or parts thereof. Where appropriate and taking utmost account of such opinion, the Commission may adopt a recommendation with a view to promoting a consistent approach in the Union with regard to the authorisation regimes for the use of that band.”

European Parliament and Council Decision 626/2008/EC on the selection and authorisation of systems providing mobile satellite services (MSS), as Decision 2007/98/EC in particular, does not cover procedures for assignment of spectrum and granting rights of use for radio frequencies, but includes follow up actions at EU Member States level and relevant timing (authorisations). Based on this current European legal framework different authorisation methods were chosen by Member States according to their national circumstances, no fragmentation concerning the use of the MSS frequencies can be ascertained within the EU. The Request for Opinion aims to avoid a fragmented situation in the Union concerning the use of the MSS frequencies after 2027 as well.

Under the principle of subsidiarity, in areas which do not fall within its exclusive competence – that is the case for the spectrum field under investigation herein – , the Union shall act only if and in so far as the objectives of the proposed action cannot be sufficiently achieved by the Member States, either at central level or at regional and local levels, but can rather, by reason of the scale or effects of the proposed action, be better achieved at Union level. The reasons for concluding that a Union objective can be better achieved at Union level shall be substantiated by qualitative and, wherever possible, quantitative indicators. Draft European legislative acts shall take account of the need for any burden, whether financial or administrative, falling upon the Union, national governments, regional or local authorities, economic operators and citizens, to be minimised and commensurate with the objective to be achieved.

RSPG notes, that once the choice of a scenario will be made, several steps are still needed to implement a common EU scenario. This includes potentially an EU-level selection process.

The process for renewal of individual authorisations may start for some Member States during 2025, with an obligation to provide to existing authorised operators the relevant information regarding a potential renewal process.

RSPG recognises that under the European legal framework issuing rights of use is a national responsibility to allow Member States to customise rights of use to any relevant national circumstances. There is no indication that this fundamental assumption has changed. Consequently, RSPG recommends no changes to the European framework in this regard.

In order to avoid fragmented national authorisation initiatives, RSPG recommends to European Commission and Member States to reach a sufficient understanding regarding what scenario will be chosen and the respective next procedural steps, including a potential operator selection process at EU level. Such visibility will benefit also to Member States having implemented a general authorisation in order to update their framework on a coordinated manner.

1.2 Current use

In regard to the national MSS market, 14 Member States have stated that there is no information on this. This might be either due to a lack of monitoring of the market, or to the fact that user terminals operate under a license exemption scheme.

Some Member States have stated that Inmarsat is active in their country, providing EAN services and having equipped aircrafts with EAN terminals. One Member State has provided specific data on the use by Inmarsat: This is confirmed by publicly available information: Inmarsat offers commercial in-flight broadband internet throughout Europe to airline customers of British Airways, Iberia, Vueling and AEGEAN.¹¹

One Member State mentioned that EchoStar offers IoT services, but there is no information available on their current use. Furthermore, there is not much information on the national market regarding EchoStar's activities.

RSPG also examined the current use of the MSS 2GHz band by the selected operators via a specific questionnaire to the operators, covering the specifications of the satellite, the authorizations, including legal succession, and also services outside the EU. RSPG provided opportunity to the MSS operators to elaborate their responses on a hearing, during which particular questions were formulated and later sent as additional questions to the operators. From the questionnaire, hearing and additional questions, the summary is following:

1.2.1 EchoStar

EchoStar Corporation has acquired in December 2013 all stock in Solaris Mobile, which was the selected operator for MSS 2GHz by the Selection decision¹² and in March 2015 the company was renamed EchoStar Mobile (registered address: 3 Dublin Landings, North Wall Quay, Dublin 1, Ireland).

¹¹ <https://www.europeanaviationnetwork.com/en/eas/introduction-to-eas.html>

¹² Commission Decision 2009/449/EC of 13 May 2009 on the selection of operators of pan-European systems providing mobile satellite services (MSS) in each Member State

1.2.1.1 Satellite and authorisations

In 2017, when EchoStar launched its EchoStar XXI satellite to meet European requirements, EchoStar launched its first satellite terminal and has since launched several terminals. These terminals leverage the power and technology of the EchoStar XXI network in the European market.

Name of the satellite	Expiry date of the license for the satellite in orbit providing MSS	Start date of operation of the satellite in orbit	Expected lifetime of the satellite
EchoStar XXI (3GSAT-G17R (France))	2028.12.24	2017.12.17	2037

The satellite provides voice and narrowband data including LoRa and 3GPP-NTN direct to device, 5G services.

As for the geographical coverage, EchoStar has the right to provide services in the MSS 2 GHz band with EchoStar XXI in the EU Member States [BUSINESS CONFIDENTIAL] Switzerland and the United Kingdom within Europe [BUSINESS CONFIDENTIAL].

In Germany, EchoStar is working with SkyFive to test the combined use of the EchoStar XXI satellite and terrestrial base stations operating in the same band, an integrated 2 GHz service to support Urban Air Mobility (UAM) use case.

1.2.1.2 Service

- Satellite Services MSS (voice and data)
- Satellite direct-to-sensor (IoT)
- Satellite direct-to-device (Smartphone)
- B65 Experimental licenses for terrestrial private networks

1.2.2 Inmarsat

Inmarsat Ventures Ltd was one of the selected operators by the Selection decision. Ahead of the implementation of Brexit, Inmarsat Ventures Ltd was converted into a Societas Europea and redomiciled to Luxembourg in 2019, currently operating as Inmarsat Ventures SE (registered address 6 rue Eugène Ruppert, Luxembourg 2453, Luxembourg). This change did not result in any change to the identity of the awardee as it is the same legal entity that simply changed of legal structure and moved to a different EU Member State.

The Inmarsat group has been acquired by Viasat Inc.. This acquisition did not result in any change of the identity of the awardee and licence holder for EAN, namely Inmarsat Ventures SE.

1.2.2.1 Satellite and authorisations

Name of the satellite	Expiry date of the license for the satellite in orbit providing MSS	Start date of operation of the satellite in orbit	Expected lifetime of the satellite
Hellasat HS3-IS, EAN (INMARSAT-S4-R) is positioned at 39°E.	EAN (INMARSAT-S4-R) is in the MIFR with a period of validity of 25 years from 2017 (launch date). Once this date is reached it can be extended provided that the satellite is still active.	The satellite was launched on 28 June 2017. After orbit raising and in-orbit testing as well as CGC and MSS integration testing, the system was ready by September 2017. The commercial entry into service was March 2019 with the first equipped British Airways planes.	The design life time of the EAN satellite is 2032. However, fuel availability is expected to enable the satellite to operate until 2034.

As for the geographical coverage, the INMARSAT has the right to provide services in the 2 GHz MSS band with INMARSAT-S4-R in the EU MSs [BUSINESS CONFIDENTIAL] Montenegro, [BUSINESS CONFIDENTIAL], Serbia, Switzerland, UK [BUSINESS CONFIDENTIAL].

[BUSINESS CONFIDENTIAL]

The satellite is supported by a Gateway earth station located in Nemea, Greece. The traffic is routed via a Meet-Me-Point located in Amsterdam in The Netherlands.

70 CGCs have been recorded by their respective National Regulatory Authorities in the Master International Frequency Register (MIFR) of the ITU. Similarly, outside the EU CGCs have been recorded in the MIFR by NRAs.

1.2.2.2 Service

Inmarsat has designed and deployed an MSS system with integrated CGCs in its portion of the 2 GHz MSS band, namely: 1980 MHz to 1995 MHz [U/L] and 2170 MHz to 2185 MHz [D/L]. Through its MSS system, Inmarsat provides connectivity solutions to European airlines on a European-wide basis. The airlines primarily use this to offer In-Flight Connectivity (IFC) to passengers flying within Europe and beyond.

Commercial service introduction (CSI) began in March 2019 once an increasing number of International Airlines Group (IAG) including Iberia, British Airways and Vueling aircraft had been equipped with EAN hardware including the installation of antennas and wireless access points (WAP). Aegean Airlines is the most recent addition to EAN's customer base.

Viasat and Deutsche Telekom recently announced a new, long-term agreement that cements their commitment to providing in-flight connectivity (IFC) solutions to airline partners across the EAN.¹³

Efficient use of frequencies can be achieved through re-use of the same spectrum as often as possible to maximise the amount of data that can be carried by the system (throughput). Because of technological developments in highly directional antennas and the more predictable location of density of use by aircraft, the spectrum Inmarsat have been assigned can be used simultaneously by both the satellite and CGC. This ability lies at the heart of the EAN network planning, and results in an increase in overall spectrum efficiency.

[BUSINESS CONFIDENTIAL]

RSPG recommends that due regard be given to the investments and market developments of existing operators as well as to the need for new entrants to support innovation and to offer an increasing number of services and emphasizes the linkage with the EU-level policy priorities.

¹³ <https://www.inmarsat.com/en/news/latest-news/aviation/2023/viasat-deutsche-telekom-to-deliver-inflight-connectivity.html>

2 Latest technological developments in satellite communications and trends in the provision of mobile satellite services

2.1 Impact of Coordination and Notification processes on ITU level

The 2 GHz MSS band is governed by the ITU rules for the coordination of the space systems. UK and France are the notifying administrations of the current EU licensed space systems for MSS in the 2 GHz band. Decision 626/2008/EC set out the selection procedure for this use in Europe, based on technical and commercial criteria. Decision 2009/449/EC retained two operators and segmented the band. The French and UK GSO filings were coordinated taking into account that both systems were assigned specific bands of 2x15 MHz throughout EU member states. The EU framework limits the relevant rights for frequency assignment/offering services orbits over the EU countries to selected operators. However, ITU priority rules still apply for MSS filings, i.e. a coordination among all notifying administrations.

EU-level regulatory framework for Service provision / terminals operation inside the EU is without prejudice of the obligation of an ITU coordination for the respective filings. If no new EU MSS framework were implemented, additional coordination at the ITU level may not be needed. If a new EU framework were to be implemented, a coordination with the other notifying administrations on ITU level will be necessary.

2.2 Technological developments and trends

RSPG invited the RSPG observers ETSI and CEPT to provide information on the latest technological developments in satellite communications and trends in the provision of MSS services with relevance to the future use of the 2 GHz MSS band. The responses can be summarised as follows:

The current usage by the Mobile-Satellite Service (MSS) / Complementary Ground Components (CGC), has been highlighted, but also potential future opportunities have been outlined for the 2 GHz MSS bands. These include the latest technical developments on Non-Terrestrial Networks (NTN), Machine-type-communication (M2M), Internet-of-Things (IoT) also covering LoRa, Aero-CGC, and generic MSS applications. The ongoing considerations on direct-to-cell (D2C) and direct-to-device (D2D) connectivity are also reflected. It is to be noted that all presented usages and opportunities are equally based on GSO networks and non-GSO systems. This would require, that the principle of technology neutrality continues to apply.

RSPG recommends to maintain a technology neutral approach beyond 2027 under the current MSS allocation.

2.3 Assessment of the 2 GHz MSS allocation among other MSS bands

Three sets of bands in the frequency range 1-3 GHz, including the bands subject to this Opinion, provide the majority of MSS capacity in operation today: Set 1: 1518-1559, 1626.5-1660.5, 1670-1675 MHz, Set 2: 1610-1626.5, 2483.5-2500 MHz, and Set 3: 1980-2010 and 2170-2200 MHz. The combination of globally harmonised bands, excellent propagation characteristics and allocations with wide bandwidth (in respect of MSS use cases) makes those very important for ongoing evolution of various MSS services. Except for IoT/M2M where some time sharing is possible, these 2 GHz MSS bands could

not be used in a sharing approach as these frequency bands do not allow sufficient antenna discrimination for small earth stations so that co-frequency, co-coverage is not possible.

2.4 CEPT regulatory framework

ECC Decisions, addressing designation of the bands for MSS and protection of these services, and Reports¹⁴ applicable to the 2-GHz MSS/CGC bands, including a response to EC mandate, as implemented by CEPT countries, including the EU member states, aim at harmonising the use of spectrum while considering some interference difficulties in Europe. These cover the designation of the band to MSS/CGC, from the 2 GHz MSS bands including making the band available for MSS and sharing with terrestrial services and recommended the European Commission the need of harmonisation measures for the use of the 2 GHz bands for Mobile Satellite Services in the European Union (CEPT report 13 in response to EC mandate under Spectrum Decision).

RSPG noted that CEPT engaged on a broad analysis of Direct to Cells via satellites.

2.5 ETSI deliverables (standards and technical specifications)

There are a number of ETSI standards¹⁵ developed to support the current use of the 2 GHz MSS/ CGC. The ETSI standards applicable to the 2 GHz MSS/CGC band are important in ensuring that the equipment complies with Radio Equipment Directive (RED) in order to place the equipment in the European market. Previously ETSI has defined standards¹⁶ for GSO based satellite networks operating in the 2 GHz MSS frequency band. Those standards are currently mainly used by EchoStar and Inmarsat.

Furthermore, ETSI TC-SES has recently adopted a new work item to update EN 302 574-1 (CGC 2 GHz) and update EN 302 574-2 (User Equipment 2GHz) to align with the latest releases respectively EN 301 908-14 and EN 301 908-13 that are supporting 3GPP access technologies. These recent standards are supporting the evolution of EAN services.

2.6 Current usage and potential opportunities for the use of the 2 GHz MSS frequency band beyond 2027

2.6.1 Overview on current usage and potential opportunities

Based on the responses provided by administrations and the detailed information about the current use and future potentials in Region 1 provided by ETSI and CEPT, four different scenarios (and combinations thereof) have been identified for the use of the 2 GHz MSS frequency band beyond 2027; all of the depicted in the table below are potential future usages:

- EAN/CGC: Satellite component and a CGC supporting in-flight broadband connectivity service (EAN). This application is related to a selected operator and its current usage of part of the 2 GHz MSS band and has been supported by some stakeholders.
- Generic MSS voice/data has been supported by a selected operator and some stakeholders.

¹⁴ ECC Decision 06(09), ECC Decision 06(10), ECC Report 233, CEPT Report 013

¹⁵ ETSI EN 302 574-1, ETSI EN 302 574-2, ETSI EN 302 574-3, ETSI EN 301 473

¹⁶ ETSI TS 101 376, ETSI TS 102 744, ETSI TS 102 721, ETSI GS LTN 003

- M2M/IoT ecosystem: narrowband IoT terrestrial solutions / Machine-to-Machine (M2M) services via satellite (MSS services) have been supported by number of stakeholders including the two selected operators.
- D2C/D2D: Number of stakeholders proposed, in different forms, that part of the 2 GHz MSS band could be used for direct-to-device services.

Some stakeholders refer also to the IRIS² initiative and possible opportunities for supporting IRIS² objectives including Lightgov.

RSPG noted also number of comments from stakeholders on recent standardisation initiative/progress in 3GPP with NTN standards (NR-NTN, IoT NTN specifications in R17) and a reference to the 2 GHz MSS as band n256.

RSPG noted interest of various stakeholders for various types of MSS services provisions including Inmarsat and EchoStar (see table below).

2.6.2 List of stakeholder responses under the respective scenario

	MSS usage of 1980-2010 and 2170-2200 MHz			
	Potential			
	Current		(wideband) NTN	
	EAN/CGC	Generic MSS individual voice/data	M2M/IoT (incl LoRa)	D2C/D2D
Responses	Deutsche Telekom EchoStar Inmarsat Omnispace	EchoStar Globalstar Inmarsat Omnispace	AST SCIENCE EchoStar Eutelsat Hispasat & SES Inmarsat Kepler Kinéis Lacuna OQTechnology Sateliot Omnispace Space X Vodafone (AST Space Mobile) ThalesAleniaSpace	AST SCIENCE Deutsche Telekom EchoStar Eutelsat Hispasat & SES Globalstar Inmarsat Omnispace Space X Vodafone (AST Space Mobile) ThalesAleniaSpace

3 Strategic Assessment

3.1 Assessment criteria

In order to allow for an adequate assessment of the current and possible future use cases/scenario(s) of the 2 GHz MSS bands, the determination of appropriate, clear and concise assessment criteria is required. They can be segmented into technical and procedural/administrative criteria.

The following sections explain and justify various criteria which could be used when selecting most appropriate scenario(s), including relevant questions.

3.1.1 Technical criteria

3.1.1.1 Spectrum requirements

The spectrum to be made available can impact the intended usage and should be assessed according to spectrum requirements: capacity, required bandwidth for a given MSS service: generic MSS, IoT/M2M, EAN, NTN.

- Relevant criteria:
 - (necessary) capacity, bandwidth ...
- Relevant questions are:
 - Which portions of the spectrum are needed for the intended use?
 - Which capacity/bandwidth is required?

3.1.1.2 Spectrum sharing

Spectrum sharing can be facilitated through four main methods, but in case of assumed/intended simultaneous coverage of European countries by several operators, spatial and time separation may not be taken into account. Therefore, these other methods remain:

- Frequency separation: channelling plans, band segmentation, frequency division multiple access (FDMA), control of emission, spectrum characteristics, frequency tolerance limitation, demand assignment multiple access (DAMA), frequency diversity
- Signal separation: signal coding and processing, forward error correction (FEC), interference rejection, code division multiple access (CDMA), Spread spectrum methods (direct sequence, frequency hopping etc.), power/bandwidth limitations i.e. power flux density (pfd) and spectral power flux density (spfd), modulation diversity, antenna polarization
- Antenna discrimination

Those are usually part of coordination between operators, also based on other criteria in this listing.

- Relevant criteria:
 - Frequency/signal separation (see individual above) ...
- Relevant questions are:
 - Is sharing possible? Under which conditions?

3.1.1.3 Coverage/Geographical reach

The satellite coverage area is another essential criterion, which defines the visibility of the satellite over an intended area. Closely related to this are the beam size, which can define the number of users, but also limit maximum capacity per user and the frequency reuse per beam.

Being aware, that the focus of RSPG lays in the assessment the possible future usage of the 2 GHz MSS band in Europe, taking into account a potential wider reach, since it has an effect on economies of scale.

- Relevant criteria:
 - Coverage area, beam size, frequency reuse per beam ...
- Relevant questions are:
 - What is the intended service area? Service accessible to how many users?

3.1.2 Procedural/Administrative criteria

3.1.2.1 Required steps for the implementation of a scenario

This criterion does not cover future authorisation related elements.

In order to implement a scenario supporting EU policy and objectives, various (legal) steps have to be taken into account on ITU-, EU- and national level.

Main question here is on the timing/timelines.

- What are the timelines of:
 - ITU: filing, examination, coordination, notification, bringing into use, projected life-cycle
 - EU: timeline
 - National: (landing rights) authorisation, extension of authorisation
- Relevant criteria:
 - favourable finding, projected life-cycle, authorisation duration
- Relevant questions are:
 - Which is the notifying administration? How long will the satellite still provide service?

3.1.2.2 Investments

Usually, due to the immense costs of any satellite system or network, the possible business case and/or possible customers are identified at the beginning of the process. Therefore, operators include these considerations in the early stages of the planning.

- Business plan, bringing into use, projected life-cycle
- Services already in operation

3.1.2.3 Further benefits/incentives to the EU

One main question is about the incentives of the considered business cases to EU policy, including EU security or EU interest, and / or to EU companies.

- Relevant criteria:

- Benefits, harmonisation (via EU standards), continuity of service, ...
- Relevant questions are:
 - Can the business case foster/support European Policies and companies? If yes, which one? In which way?

3.2 Assessment of different possible technical scenarios for the use of the 2 GHz MSS frequency band beyond 2027

3.2.1 Scenario 1 - Satellite component and a complementary ground component (CGC) supporting in-flight broadband connectivity service (EAN)

This scenario is the current usage of part of the MSS 2 GHz band – Inmarsat being one of the two current selected operators in the band supported by Deutsche Telekom AG, which provides the ground network (CGC) for Inmarsat’s satellite network providing D2C services to any aeronautical vehicle in EU air-space. The system consists of a terrestrial element, too.

3.2.1.1 Technical criteria

3.2.1.1.1 Spectrum requirements

The current selected operator considers minimum spectrum necessary to provide connectivity solutions to European airlines on a European wide basis is 2x15 MHz in order not to limit the current exponential growth of the system within the next five years. Nevertheless, noting the frequency reuse possible, there is no additional spectrum necessary to cover the whole EU territories with the necessary CGCs. [BUSINESS CONFIDENTIAL]

RSPG has no visibility on the required bandwidth for CGC operation (either 4G or 5G). [BUSINESS CONFIDENTIAL]

3.2.1.1.2 Spectrum sharing

Sharing would bring additional challenges, e.g. it might cause interference issues and/or require complex technological solutions to mitigate such issue and will result in limiting the network capacity. The deployment (see below) would not allow for geographical sharing.

3.2.1.1.3 Coverage/Geographical reach

The system provides high-speed connectivity across all 27 EU Member States and according to Inmarsat in more than 40 European countries in total. The deployment of the CGC as part of the scenario could still be extended to cover the same areas as the MSS, which allows for the coverage of the whole territories of the EU (Malta and Canary Islands partially).

3.2.1.2 Procedural/administrative criteria

3.2.1.2.1 Required steps for the implementation of a scenario

All necessary filings are already in place.

3.2.1.2.2 **Investments**

The investment in the existing infrastructure and potential evolution needs to be taken into account, when deciding on the future usage. It should be also assessed, whether the resulting infrastructure could be used in other bands or for other purposes, in case of other usage scenarios are chosen.

3.2.1.2.3 **Further benefits/incentives to the EU**

The EU territories could benefit from an extended number of European airlines providing the same in-flight broadband connectivity service. The airlines primarily use this to offer In-Flight Connectivity (IFC) to passengers flying within Europe and beyond, with increasing demands for data.

3.2.2 **Scenario 2 - Generic MSS (individual voice/data)**

The main usage of generic MSS is voice and small data to user terminals and user equipment (for instance satellite phones).

3.2.2.1 **Technical criteria**

3.2.2.1.1 **Spectrum requirements**

In the current scheme, national authorisations are referring to 2x15 MHz based on common generic requirements and commitments from selected operators for generic MSS operations. Nevertheless, for other usages lesser spectrum maybe necessary.

Spectrum sharing

3.2.2.1.2 **Spectrum sharing**

General MSS (voice, data), sharing would bring additional challenges and might cause interference issue. Sharing require complex technological solutions to mitigate such issue and will result in limiting the network capacity.

3.2.2.1.3 **Coverage/Geographical reach**

MSS can cover largely Europe, and beyond. Depending on the type of satellite or constellation, possible limitations to coverage in the Northern areas should be taken into account to ensure adequate reach. Possible global coverage could be taken into account, since some of the MSS operators hold geographical reach beyond Europe for the 2 GHz band.

3.2.2.2 **Procedural/administrative criteria**

3.2.2.2.1 **Investments**

The investment in the existing infrastructure and potential evolution needs to be taken into account, when deciding on the future usage. It should be also assessed, whether the resulting infrastructure could be used in other bands or for other purposes, in case of other usage scenarios are chosen.

3.2.2.2.2 **Further benefits/incentives to the EU**

The benefit to the EU is the EU wide coverage.

3.2.3 Scenario 3 – M2M/IoT ecosystem

Two main usages are considered below: D2D for IoT and D2D for M2M, with the narrow and/or wideband implementation, provided by either nGSO (LEO/MEO) or GSO. M2M systems use point-to-point communications between machines, sensors and hardware over satellite network, usually in small intermittent bursts of data at low power, for applications such as remote monitoring, evaluating performance measurements, telemetry-control, alert or wake up devices when they enter specific areas etc. M2M systems are often isolated, stand-alone networked equipment while IoT systems bring together disparate systems into one large, connected ecosystem. IoT systems rely on IP-based networks to send data collected from IoT-connected devices to the cloud or middleware platforms.

3.2.3.1 Technical criteria

Depending on application, some require only uplink (such as sensors), some require downlink only (such as actuators, distress messages, navigation updates, control information).

In order to stimulate innovation, a small duplex portion of spectrum (e.g. 1MHz or less) could be considered, e.g. for testing sharing possibilities and concepts between multiple applications that target MSS spectrum access.

3.2.3.1.1 Spectrum requirements

For IoT, the following three technologies are applicable.

- NB-IoT (M2M/IoT)
- NR-NTN / IoT-NTN
- LoRa

NB-IoT

For NB-IoT, a minimum of 200 kHz bandwidth is required in the downlink, possible implementations require e.g. 2x250 kHz.

The 2 GHz bands were chosen by industry because:

- allocated to MSS across all three ITU Regions;
- these symmetrical paired bands that can be exploited in FDD (i.e. same size UL/DL component);
- wide support from industry to develop future applications;

This does not preclude that other frequency bands may be specified for NB-IoT NTN in the future. WRC-27 agenda item 1.12 addresses such use and could result in additional spectrum for such use allocated by WRC-27. These matters are to be discussed under the RSPG Opinion on WRC-27. Due to channels not being able to be shared in 3GPP standard, frequency allocation is needed. For this purpose, 2x 1MHz in the S-Band is already sufficient.

Also, for wideband M2M applications in the future, several MHz bandwidths could be facilitated.

NR-NTN / IoT-NTN

- NTN-NR is for wideband usage and requires a minimum bandwidth of 5 MHz in the downlink.
- Possible implementation varies between 2x15 MHz and 2x5 MHz.
- NTN-D2D implementations could also support IoT-NTN.

LoRa

When a band is chosen for LoRa few MHz is sufficient. Required minimum bandwidth has not been identified.

3.2.3.1.2 Spectrum sharing

Depending on the implemented technology, sharing and/or exclusive access can be considered.

3.2.3.1.2.1 Technologies

If a band is chosen for LoRa or similar technology, the spectrum can be shared by time allocation. Access to IoT spectrum could be shared by time allocation, between different space systems, for co-frequency operations. With 3GPP NB-IoT technology (M2M/IoT) it is not possible to share bands.

Dedicated spectrum assignment approach (segmentation) ensures coexistence between different MSS operators in the 2x30 MHz (effective sharing). This also applies for wide and narrowband M2M applications.

Except in case of IoT where sharing may be implemented under certain conditions (except 3GPP NB-IoT technology (M2M/IoT) where sharing is not possible), it is assumed that only one satellite operator is being able to provide EU-wide MSS services in a relevant part of proposed segmentation.

3.2.3.1.2.2 Geographical separation

Geographic separation can be achieved by narrow beams (spot beams).

3.2.3.1.2.3 Frequency sharing schemes

Sharing schemes will be difficult to implement, but they should be encouraged. Recent technological developments permit sharing schemes and other spectrum-access models. Frequency reuse has become possible with the introduction of beamshaping, beamforming, cognitive radios, satellite diversity and new spectrally efficient waveforms, among other spectrum-sharing capabilities.

3.2.3.1.2.4 Band segmentation

In general, in order to manage the quality of service, avoid uncontrollable delay (listen-before-transmit) and interference, the exclusive access model to the spectrum can be appropriate. For instance, co-located operations of omnidirectional terminals by different satellite operators on the same frequency, where such MSS systems could potentially operate CGCs to complement the satellite service, may lead to band segmentation due to the interference environment.

3.2.3.1.3 Coverage/Geographical reach

The satellite network architecture could be based on LEO/MEO constellation or GSO satellites to ensure continuous service over 27 EU Member States territories as well as non-EU Member States.

3.2.3.2 Procedural/administrative criteria

3.2.3.2.1 Investments

Some satellite networks and user terminals are already in place. Further investments to NGSO constellation and GSO satellites and user terminals that collect data from sensors are foreseen in the upcoming years. Possible development of hybrid satellite/ terrestrial solution where for instance the M2M service is offered by both terrestrial and satellite networks within a single terminal.

3.2.3.2.2 Further benefits/incentives to the EU

The benefits to the European market are envisaged for powering and optimising its key national industries, such as Smart Grid/ Energy, Billing, Security, Automotive, Logistics, Telemedicine, Agriculture, Maritime, Transportation and Traffic control, Oil and Gas, among others, for enabling mission-critical applications, remote asset monitoring, sensor-based connectivity and monitoring abilities that provide functionality to detect events, beyond the European terrestrial networks.

3.2.4 Scenario 4 - (Wideband) NTN – D2D

This scenario follows the 3GPP 5G NTN standard for MSS Non-Terrestrial Network (NTN) direct connectivity between satellites and 5G smartphones in the 2 GHz band and is therefore able to adapt to bandwidths from 5 MHz to 30 MHz in each direction, to deliver D2D mobile broadband services, including voice, to consumer smartphones.

3.2.4.1 Technical criteria

Noting that the usage is still under development, further technical studies to assess the suitability of various architectures could be considered.

3.2.4.1.1 Spectrum requirements

The spectrum required to implement the 5G MSS Non-Terrestrial Network (NTN) service is a multiple of 2 x 5 MHz using the frequency pairings in 3GPP Band n256. Thus, the ideal block size for interested operators is claimed to be a 2x15 MHz block.

Alternatively, a minimum bandwidth of 2x10 MHz could be also considered as a mean to increase competitiveness, with additional licenses being granted to the satellite service supporting NTN-D2D.

For compatibility with mobile terminals, the lower part of the band is preferred as is adjacent to the spectrum used by telecom operators for LTE services, thus providing complementary coverage in areas where the deployment of terrestrial services is either not possible or too costly.

3.2.4.1.2 Spectrum sharing

Enabling ubiquitous 5G connectivity towards regular smartphones requires exclusive spectrum use over the service area to ensure the appropriate link quality, thus spectrum must be divided and exclusively used by separate operators to avoid interference in the 2 GHz S-band.

One stakeholder mentioned, that operators can coordinate coexistence with another operator to use the same spectrum through spectrum leases or other agreements, but they do rely on a basis where only a single user of a frequency is possible at one time.

3.2.4.1.3 Coverage/Geographical reach

The systems may be designed for a worldwide coverage, taking advantage of the wide harmonization of the MSS 2 GHz band on a global basis.

The architecture could be based on LEO and/or MEO constellations, so it is important to ensure that all EU member states and European Economic Area (EEA) Members, including northern countries located above 60 degrees, receive high quality service.

It is expected that the geographical reach of the LEO satellite constellation initially covers most European Union member states and as the deployment is supplemented with polar orbit constellations, reliable coverage for portable end user devices can be achieved in Scandinavian countries (Norway, Sweden, Finland, Denmark), Baltic countries (Estonia, Latvia, Lithuania) and Iceland (as an EEA member).

LEO constellations are necessary for the satellite to deliver mobile broadband services, as they include characteristics such as global continuous coverage and deliver mobile broadband services directly to cellular user devices, enabling the inter-operability of satellite and terrestrial with lower latencies relative to GEO (~40ms versus 700ms) and higher system capacity.

3.2.4.2 Procedural/administrative criteria

3.2.4.2.1 Required steps for the implementation of a scenario.

The developed technologies are designed to operate under the Mobile Satellite Service, as defined by the ITU Radio Regulations and the 3GPP 5G NTN standards rely on the MSS 2GHz known as band n256.

An ITU filing covering the system characteristics is required to fulfil international regulatory requirements. One stakeholder mentioned, the 5G NTN satellites would incorporate the specifications included in 3GPP Release-17 (Rel-17), which was finalised in June 2022.

The services would be ready as soon as the satellites are deployed and provided the necessary contractual arrangements are in place, following receipt of necessary regulatory approvals and execution of definitive agreements with MNOs. Each stakeholder has its own planning, and the deployment phases vary from 2024 to 2028, with services to be available by or even before the deadline of May 2027.

There are different scenarios to deploy the targeted services, either on dedicated satellites, on existing constellations or on other constellations projects (e.g., a candidate system could be used to provide services responding to high-level policy objectives of the EU, such as IRIS², or contrariwise).

The fixed earth station services can also be provided partnering with a ground-station-as-a-service provider.

Tests were already conducted with an experimental satellite to demonstrate the capability to connect with unmodified standard customer smartphones using a LEO satellite (voice calls and 4G downlink speeds above 10 Mbps).

At least one stakeholder would be prepared to serve the EU market from 2027 onwards.

3.2.4.2.2 Investments

The range of cost for the space part of the constellation will heavily depend on coverage and level of service. It could range between a few hundred million with Europe coverage only and focus on emergence messaging and several billions for voice and internet on a global coverage.

An initial deployment of satellites limited to a non-continuous service in targeted geographical areas may generate revenue for the investment in the remaining uncovered areas.

3.2.4.2.3 Further benefits/incentives to the EU

- Systems with a worldwide potential market using standardised technologies, will create economies of scale in user equipment for the 2 GHz MSS band that have not previously existed and will bring costs down for consumers and businesses and help reduce cross border interference issues and facilitate users roaming, as the spectrum will be harmonized without fragmentation.
- LTE devices are already able or would only require very light modifications to be able to make use of this band to communicate with satellites.
- If 5G NTN direct-to-device service becomes available in the EU, remote, unserved areas in all Member States will receive the desired connectivity for the first time, with the potential of achieving 100% geographic coverage.
- Provide service resilience and emergency services in the event of major operational disruption of cellular terrestrial networks.
- Using 4G/5G public standards that are compliant with 3GPP ensures cryptographically secure communications.
- Using ground-earth-stations that reside in European Union member countries, integrated into MNO core networks, enables the service to comply with existing national and EU regulations on mobile network operators.
- The NGSO systems are able to close the link with standard mobile phones making the best use of the excellent propagation and RF characteristics of the 2 GHz MSS band, which is challenging to provide from GSO infrastructure. By using lower orbital altitudes, the systems can ensure lower latency, therefore enhancing the available service offerings and use cases.

3.3 Assessment of possible band segmentations of the 2 GHz MSS frequency band beyond 2027

The assessment of possible band segmentations has been done taken into due consideration the characteristic of the MSS 2GHz frequency band. Based on the spectrum requirements and spectrum sharing options any of the scenarios is assessed for possible future band segmentations, because below 3 GHz, except for IoT services (under certain conditions), due to the physical characteristic of these satellite band, the lack of terminal spatial discrimination does not enable co-frequency co-coverage sharing between satellite systems (either GSO or NGSO). The assessment of technical scenarios described above are merged into several band segmentations, considering spectrum requirements, and, relevant sharing possibilities, in order to stimulate competition between MSS services and satellite operators. Limitation in sharing opportunities should be considered when addressing possible band segmentation.

3.3.1 Option 1 – no new band segmentation

(1) 2 selected operators

- 2 x 15 MHz EAN/CGC and any MSS evolution
- 2 x 15 MHz Generic MSS (individual voice/data, IoT and any other evolution)

It has to be noted that this option presents the disadvantages, that it may limit competition in MSS service provision, as well as future innovation or development, e.g. excluding other stakeholders or usages, and may deprive from an opportunity to increase Europeans strategic autonomy.

3.3.2 Options 2-4 - Introducing competition based on the current regulatory situation:

In order to stimulate competition but also to guarantee a smooth transition from the current regulatory situation, limited parts of the segmented spectrum could remain available for the current selected operator to continue providing services and exploiting infrastructures already developed (e.g., the European Aviation Network, MSS generic and IoT). With this, the current selected operators would have opportunity to cope with evolution of technologies and also to compete with new spectrum usages. Remaining part of the spectrum is available for emerging technologies, e.g. (wideband) NTN-D2D with minimum bandwidth of 2x10 MHz and any other evolution of MSS.

Examples of a segmentation below:

(2) More than 3 potential operators:

- 2 operators with each 2 x 10 MHz
- 1 operator with 2 x 5 MHz
- multiple operators sharing 2 x 5 MHz*

(3) 3 potential operators:

- 1 operator with 2 x 10 MHz
- 1 operator with 2 x 10 MHz
- 1 operator with 2 x 10 MHz

(4) 3 or more potential operators with:

a)

- 1 operator with 2 x 15 MHz
- 1 operator with 2 x 10 MHz
- 1 operator with 2 x 5 MHz

or

b)

- 1 operator with 2 x 15 MHz
- 1 operator with 2 x 10 MHz
- multiple operators sharing 2 x 5 MHz*

The above options may limit the current selected operators and their already planned investments and services provision. Nevertheless, these options would enable Europe for other usage, e.g. for the inclusion of IRIS².

() When addressing NB IoT demands, a 2x5MHz could be shared by multiple NB IoT service providers due to reduced operating bandwidth (e.g. 250 kHz).*

In addition, a small part of such 2x5 MHz block could be opened for test purposes.

3.4 Conclusions on possible future usage

RSPG recommends to the European Commission and to Member States to examine the underlying 2 GHz MSS legislation and framework for a competitive outcome in a timely fashion before the current 2 GHz MSS national authorisations expire.

This includes to examine Decision 2007/98/EC in order to preserve the current technical harmonisation for MSS in the 2 GHz band in the EU.

RSPG recommends the end of second quarter of 2025 as an adequate date in order to reach sufficient common understanding on which scenario will be chosen and the respective next procedural steps. All efforts should be done in that regard.

RSPG recommends a band segmentation, with the focus on a limited number of options. This possible segmentation of the 2x30 MHz available spectrum is provided aiming for an EU-wide common scenario, also taking into account the elements in Recommendation 3.

When addressing NB IoT demands, RSPG notes that a 2x5MHz could be shared among multiple NB IoT service providers due to reduced operating bandwidth and that other spectrum resources above 1 GHz could be allocated at international level at WRC-27. The latter should be discussed under the RSPG Opinion on WRC-27.

Option 1 (no new band segmentation) presents the disadvantages, that it may limit competition in MSS service provision, as well as future innovation or development, e.g. excluding other stakeholders or usages, and may deprive from an opportunity to increase Europeans strategic autonomy.

4 Abbreviation/Glossary

A2G (Air-to-Ground)

CGC (Complementary Ground Component)

CSI (Commercial service introduction)

D2C (Direct-to-Consumer) is the connection direct to the cell providing coverage on a certain plane/vehicle

D2D (Direct-to-Device) is the connection direct to the individual user

EAN (European Aviation Network)

ECN (electronic communications network)

ECS (electronic communications service)

EECC (European Electronic Communications Code) Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code

GSO (Geostationary Satellite Orbit) at 36 000 kilometres above the Earth, a place where they appear fixed in the sky when observed from the ground

IFC (In-Flight connectivity)

IoT (Internet of Things) IP-based networks to send data collected from IoT-connected devices to the cloud or middleware platforms

LoRa (Long Range) is a low power wireless transmission protocol for connecting IoT devices

M2M (Machine-to-Machine) point-to-point communications between machines, sensors and hardware

MIFR (Master International Frequency Register) ITU database containing all registered frequency assignments

MSS (Mobile Satellite Service)

Non-GSO (non-geostationary satellite orbit) altitudes from 20 000 kilometres to 400 kilometres above the Earth

NTN (Non terrestrial networks)

RED (Radio Equipment Directive)

WAP (Wireless Access Points)