

Subject: Response to RSPG Public Consultation on “*Draft 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*”

Noordwijk, 14 December 2023

Dear Sir, Madam,

The European Space Agency appreciates the opportunity to comment on the *Draft 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*.

ESA is a relevant stakeholder for the following reasons:

- ESA has been instrumental at the early days of MSS S-band (before and since the MSS Decision 2009/449) to support the development of essential building block for the MSS S-band industrial ecosystem. An ESA-initiated co-funding scheme between operators Eutelsat/SES/Solaris and Inmarsat, industries and ESA supported the development of critical equipment on ground and space, initiated MSS S-band standards at ETSI and piloted user applications. Trials over a Japanese S-band satellite were financed by ESA to collect propagation characteristics and validate various technical developments over-the-air. ESA initiated developments were always implemented in concert with related FP7/H2020 projects co-financed by the Commission.
- The ARTES (Advanced Research in Telecommunication Systems) programme has financed and co-financed ARTES industry in their development of many innovations and products that are relevant to future MSS S-band systems.
- While the topic of 5G/6G Non-Terrestrial Networks (NTN) is currently a well-accepted topic in the press and at trade shows, ESA was one of the main initiators to have satellite networks considered by 3GPP. Initial meetings between EC and ESA discussing this topic were held as early as 2015, contributing to the incorporation of Non-Terrestrial Networks in 3GPP Release 17 in 2022. At the same time, ESA is still providing a neutral forum for all satellite operators to discuss NTN-related 3GPP contributions, and funds activities to support necessary efforts for contributions at standardisation bodies such as 3GPP. The ESA-initiated *Satellite Standardization Interest Group* (SSIG) is a valuable forum to collect and harmonise the NTN standardization in 3GPP, which also covers the MSS S-band.
- By actively studying the positioning capabilities of Non-Terrestrial Networks (NTN) and recognizing the potential value of MSS S-band for innovative positioning services, ESA is at the forefront of exploring new use cases for the MSS S-band, which involves the integration of navigation components into 3GPP radio access technologies.
- Several new technologies have been developed as part of ESA projects which would allow to use the future MSS S-band spectrum in more efficient manner since the Decision 2007/98/EC in February 2007.
- At the same time, ESA co-finances a considerable number of start-ups and new entrants located in Europe which intend to offer services over the MSS S-band, using some of the technologies referred to above.

Considering above, ESA would like to offer its comments to the Draft Opinion.

The RSPG is kindly requested to consider these responses from the perspective of a European organisation that has deep insight into the current MSS S-band landscape and is aware of future technologies that might impact any future MSS S-band usage and any future authorisation process, and fosters an efficient spectrum use and innovative services by a European industrial base.

ESA is not planning to offer any commercial service but is supporting several entities that plan to offer services using the MSS S-band.

Comments on the RSPG Recommendations (section 0.4)

While ESA can find itself in the main recommendations, a few specific comments are listed below.

1. Recommendation 2,4 and 5

The interplay between licensing regimes and their duration in different EU Member States and adjacent administrations, ITU coordination and notifying administrations in and outside the EU, possible policy interest of the EC around governmental communications and related developments within the IRIS2 programme, PNT interests and initiatives in Europe, the likely desire of Commission to foster innovation by new entrants, evolutions in 3GPP and non-3GPP technology and corresponding satellite technology could lead to a large number of “what-if” scenarios.

ESA suggests that the RSPG recommends that above scenarios are studied in detail, possibly in the study (*“Study on Mobile Satellite Services (MSS) in the 2 GHz Band in the EU – Implementation of the Current Regulatory Framework and an Overview of the Satellite Connectivity Market”*) that the EC might commission.

2. Recommendation 7

ESA suggests that the RSPG recommends to the EC and Member States that as part of the examination and possible modification of the underlying 2 GHz MSS legal framework specific attention is paid to the enforcement, spectrum usage monitoring and opportunities for new entrants and spectrum management innovations.

3. Recommendation 9

ESA considers that the proposed band segmentation in option 2,3 and 4 do not cater for operators requiring only a limited amount of bandwidth. Multiple technologies (even those now existing and evolving in 3GPP – such as NB-IoT NTN and RedCap NTN) would allow to operate in bandwidths less than 5 MHz.

Furthermore, option 2,3 and 4 suggest that one band (e.g. 2* 5 MHz) is only assigned to one operator. ESA advocates that sharing of one band by multiple operators for e.g. low data rate service should still be possible. (See as an example also the explicit reference to systems sharing spectrum in recently approved Agenda Item for WRC-27 RESOLUTION COM6/8 (WRC 23)).

ESA suggests to RSPG to consider band segmentations and options which cater for operators that only need limited bandwidth.

4. Recommendation 10

ESA strongly agrees. The “continuity scenario” (Option 1) is not an attractive option unless the MSS service providers are committed or requested to innovate and evolve their services.

In addition, ESA suggests that opportunities for technical and service innovations by new entrants should be facilitated.

Specific comments on the Draft Opinion

5. Limited consideration of low-data rate services (section 3.3.2)

While the Draft Opinion states “*With this, the current selected operators would have opportunity to cope with evolution of technologies and also to compete with new spectrum usages.*”, ESA partially disagrees.

ESA advocates that the Option 2,3 and 4 are suggesting direct link between the bands within a segmentation and an operator. For low data rate services, ESA considers that multiple operators could operate in 2 * 5 MHz, even going down to the use case in which individual operators only access 200 KHz.

Evolutions within 3GPP technologies (e.g., RedCap NTN, NB-IoT NTN) and within non-3GPP allow for services to be offered in much smaller bandwidth than 5 MHz. All these developments are very likely to mature within time frame of a future MSS authorisation.

Furthermore, none of the segmentation options caters for those operators who might need an uplink only, or a downlink only.

Finally, in section 3.2.4.1.1 it is suggested that a minimum carrier bandwidth of 15 MHz is required. ESA believes a minimum carrier bandwidth of 5 MHz in the downlink is technically possible, allowing also a finer granularity with a band segmentation.

ESA suggests to RSPG to consider Options and band segmentations which also include a finer granularity of bandwidths and future technology evolutions.

6. Technology neutrality (section 2.2)

The Draft Opinion seems to relate technology neutrality to satellite orbits (“*...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.*”).

ESA agrees that orbits should not matter, and operators should be able to offer their services from either GSO or NGSO or both. However, in the proposed band segmentations in Options 1 to 4 the spirit of technology neutrality has vanished as the band segmentation seems to be mainly driven by a minimum bandwidth granularity of 5 MHz in both up- and down-link, suggesting 3GPP-only technology.

This excludes various new technologies that have been developed by European companies which are well suited for use over MSS S-band, and are currently used over operational systems, such as:

- Non-3GPP technologies standardised by ETSI such as S-MIM [TS 102 721] or as part of the LTN family [GS LTN 003, TR 103 526, TS 103 357 and TS 103 358],
- Proprietary technologies from European companies which are commercial deployed.

Some of the technologies can offer a service using only the downlink or only the uplink (see also section 3.2.3.1 of the Draft Opinion). This could impact any future frequency band plans. Some entities have plans for using e.g., the downlink-only for distress messaging, navigation updates or to transmit control information of other networks. Other proponents are interested to deploy transmit-only uplink nodes which solely collect very small messages from deployed sensors, without the need for any downlink.

It is foreseen that many new technologies will be developed during the new authorisation period. One could expect that new cognitive approaches, new medium access mechanisms, new interference cancellation methods and other spectrum related innovations will mature during the next years. ESA recommends that any future usage of the MSS S-band should benefit from these developments.

ESA suggests to RSPG to emphasise all aspects of technology neutrality in their Opinion, including air interfaces, standards, sharing models, and orbits.

7. Limited consideration of spectrum sharing options (section 3.1.1.2)

While the Draft Opinion addresses the main methods for spectrum sharing, ESA considers that sharing between several low data rate systems is not given sufficient attention. An example of multiple systems sharing the same frequency bands can be found in ERC DEC 99(06). All these systems have proven to be able to co-exist.

ESA also draws the RSPG's attention to the explicit mentioning of systems sharing spectrum in recently approved WRC-27 Agenda Item for low data rate systems in MSS (RESOLUTION COM6/8 (WRC 23)). The headline of the main press release of ITU on the WRC-23 is "*World Radiocommunication Conference revises the ITU Radio Regulations to support spectrum sharing and technological innovation*". This innovative spirit is not evident in the Draft Opinion.

On a higher level, sharing schemes such as the Collective Use of Spectrum (CUS) model and Licensed Shared Access (LSA) model which were already investigated by the RSPG (Report RSPG21-016 FINAL, "RSPG Report on Spectrum Sharing A forward-looking survey") are equally applicable to future use cases in the MSS S-band.

Spectrum sharing methods between systems in the same frequency bands have been addressed by many EC-funded FP7/H2020 and ESA projects. Only a very limited number of these methods are in practical use nowadays. Encouraging – and possibly rewarding - such methods should be seriously considered to stimulate efficient spectrum use, now that there is an opportunity to propose new rules for the MSS S-band.

ESA suggests that RSPG considers in any new authorisation framework a unique opportunity to introduce novel spectrum sharing methods.

ESA suggests that RSPG also considers band segmentation plans which are favourable to operators that are willing to share spectrum, even in overlapping frequency ranges.

8. Limited consideration of PNT services

ESA considers that besides data services, PNT services and solutions in the MSS S-band are starting to gain traction due to the introduction of *network verified location* in Release 18 of 3GPP. Similar to the technological evolution witnessed for terrestrial networks, enhanced and more advanced non-terrestrial networks (NTN) positioning is expected to be studied and specified by 3GPP in the coming releases.

Some of the technologies and positioning methods can work in downlink-only while two-way methods are also needed for regulatory applications.

There are several studies funded by Horizon Europe and ESA addressing the feasibility of PNT services in MSS S-band making use of standard signals with different bandwidths, including as low as 180 kHz (for low energy and coarse accuracy) and as high as 10 MHz (for higher accuracy applications).

ESA suggests that RSPG also considers band segmentation plans which include a finer granularity of bandwidths to favour potential PNT services with different levels of accuracy.

General comments (not related to specific sections)

9. Importance of the 2 GHz MSS S-band for Direct-to-Handheld/Cell for public and commercial services

The delivery of public services (broadcast, warnings, PPDR communications) that would benefit European citizens were part of the selection criteria in DEC 626/2008/EC. ESA considers that this objective has only been partly fulfilled.

Future public services in the fields of security, automotive and transport could benefit from new systems that are addressing these markets. (At the time of the MSS Decision, an MSS S-band system as a communication solution in European for *pay-as-you-drive* applications was considered one of the most cost-effective solutions).

While various interesting “direct-to-cell” initiatives using terrestrial spectrum from space are underway in different parts of the world, the viability to operate such a service in co-existence with (other) terrestrial operators within the European landmass still must be proven. In addition, the regulatory unclarity for such services is confirmed by a recent decision to investigate the related regulatory aspects under the auspices of CEPT (see *ECC WG FM#105 conclusions*). Furthermore, it is to be seen how relevant the recently approved WRC-27 Agenda Item on this topic (RESOLUTION COM6/9 (WRC 23)) is to continental Europe.

Therefore, the MSS S-band is one of the few frequency bands that would allow licensed or authorised satellite services in lower frequency bands throughout Europe, in the near future.

Furthermore, the MSS S-band is a unique (and possibly a sole) opportunity to offer 3GPP-based NTN communications in Europe to handheld or smaller end-user devices with an acceptable performance. Whether Direct-to-Handheld services will be implemented in the other candidate MSS band (i.e., L-band) will be dependent on the commercial plans of incumbent L-band operators, some of them non-European.

ESA suggests that the RSPG emphasizes in the Opinion the unique (and possibly sole) opportunity that the 2 GHz MSS S-band presents to implement future Direct-to-Handheld services. RSPG could possibly recommend that such services shall be implemented, in a similar manner as public policy objectives were part of operator selection criteria in DEC 626/2008/EC

10. Internet-of-Things applications

The MSS S-band is a very suitable band for Internet-of-Things (IoT) applications. The nature of such applications (low duty cycle, reduced service level agreements, short messages) is such that several of such systems can co-exist in the same frequency band.

The RSPG might consider that specific parts of the MSS S-band are dedicated to such low data rate applications. A recent Saudi MSS process could serve as an example, in which parts of the MSS S-band for low data rate applications was a dedicated lot in the selection process.

ESA suggests that the RSPG considers band segmentations as considered by other regulators or auctions.

11. Flexibility and governance

ESA would support that procedures that allow new companies to gain access to the MSS S-band during the new authorisation period. At the same time clear procedures that will revoke authorisations if no proof of reasonable spectrum usage shall be established, with potentially financial implications as implemented by the U.S. Federal Communications Commission (FCC) (e.g., surety bond scheme)

This might require a more active governance of the MSS S-band than is currently in place, possibly with more transparency about actual spectrum usage, verified by independent bodies. Spectrum monitoring is an integrated part of spectrum management (see also *ITU Handbook on Spectrum Monitoring, 2011*).

ESA suggests to RSPG to recommend flexible procedures that allow new entrants to access the MSS S-band during the authorisation periods of other operators. This shall be accompanied by active governance methods, spectrum usage transparency and possibly financial measures or incentives.

12. Innovative spectrum access

The RSPG might consider making available certain parts of the MSS S-band for specific innovations, such as demonstration of new services, pilot applications, experiments, new sharing methods, new 3GPP developments or otherwise innovative methods. This would offer a unique spectrum sand-box opportunity which would be the world's first and would make Europe an exemplary player in this field.

As an example, many ESA-supported activities would have been able to demonstrate their innovation with just 100 kHz of bandwidth. In fact, ESA's experience is that some new initiatives would favour obtaining spectrum access over receiving financial and technical support.

At the same time, such endeavours should not lead to a fragmentation of the MSS S-band.

ESA suggests that RSPG recommends mechanisms which would foster innovation in spectrum management and use, which could include setting apart a small frequency range which is used for demonstrating spectrum management innovations and innovative spectrum use. ESA may be in the position to accommodate a framework for such a limited amount of spectrum (supported by necessary ITU filings) and can commit to deliver the corresponding spectrum innovations.

13. Investment and capitalisation

The EC has invested 10's of millions of Euros in FP7/H2020 R&D projects that were addressing the S-band. These R&D developments by European industry and academia have been capitalised upon only to a limited extent. RSPG might consider during their deliberations that spectrum which is meant to serve the European citizens is preferably served by capitalising upon European R&D efforts.

ESA suggests to RSPG to recommend that the future Opinion is supportive of European-sourced technology and operators or supports initiatives from outside Europe with sufficient opportunities for European suppliers or operators.

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