ESOA response to RSPG consultation on "Draft RSPG Opinion on Spectrum Sharing – Pioneer initiatives and bands"

26 March 2021

Contact: Ms. Aarti Holla-Maini, Secretary General ESOA (sg@esoa.net)

1. General

ESOA supports the general thrust of this draft Opinion to promote spectrum sharing as one means to improve the efficiency of use of spectrum. Most (perhaps all) spectrum that is used by satellite communication services is already shared to some extent. Some frequency bands are shared between earth stations and terrestrial systems, and bands which are generally not shared with terrestrial services are shared among multiple satellite operators. The satellite industry is already well incentivised to use spectrum efficiently. For example the use of highly directional earth station antennas allows the same frequencies to be used by different networks across the geostationary arc, using satellites separated by as little as two degrees. A number of non-geostationary systems are being deployed to increase the utility of existing satellite bands in Ku-band and Ka-band, using the same frequencies as GSO satellite systems. Satellite operators also invest significantly in new satellite technology such as multiple spot-beam antennas, to allow the same frequencies to be re-used multiple times on the same satellite. The limited frequency bands currently available for satellite use, and the ongoing and increasing demand for satellite services, create a natural incentive to use spectrum more efficiently.

We understand that the focus of the draft Opinion is towards sharing of bands between different services, e.g. the fixed-satellite service and mobile service. While in principle sharing of spectrum may improve overall efficiency, there always needs to be some checks and balances, and some spectrum with no or limited sharing with other services will remain important.

It should not be overlooked that the success of the terrestrial broadcast, terrestrial mobile and satellite sectors in the last few decades has been built upon a foundation of access to non-shared spectrum. For the terrestrial broadcast and terrestrial mobile sectors, access to non-shared spectrum has been the general rule. For broadcasters, spectrum has been preserved exclusively for that use at an international level (with some limited and controlled shared used by PMSE applications).

For mobile operators, most of their spectrum has been made available through exclusive national licences to individual operators. This is a necessity for the fast roll-out of national services and helps to ensure the provision of services in marginal (i.e. rural) areas. The availability of non-shared licences has also facilitated the evolution for mobile networks from 2G through to 5G, which is aided by the fact that there are no significant sharing constraints with other users. Of course, now that European mobile operators have the safe harbour of numerous exclusive licences covering a range of frequency bands, it is feasible for them to supplement their networks with more restricted authorisations which are subject to sharing with other users. However, the need for some non-shared frequencies will remain important for mobile operators.

A similar situation applies for satellite communication uses, where the availability of some bands that are not shared with other services has facilitated successful roll-out and will equally remain necessary. For example, some satellite applications such as satellite broadcast (TVRO) and mobile earth stations, blanket VSATs for service directly to user premises or earth stations in motion (ESIM) cannot practically share with terrestrial users to any meaningful extent. Access to some bands that are not shared with terrestrial services is necessary for these applications, whether they use L-band, S-band, C-band, Ku-band, Ka-band or Q/V-band. The availability of bands that are free from sharing constraints also facilitates innovation, avoiding any constraints to new technology that might arise from the need to share with incumbent services. The development of ESIM technology to provide broadband to ships and aircraft in Ka-band in recent years would not have occurred without the availability of some of the Ka-band spectrum unoccupied by terrestrial systems.

Some satellite applications can share with some terrestrial users with reasonable and flexible constraints, for example in frequency bands which are used by a limited number of gateway earth stations, where shared use with terrestrial services which do not require full national coverage is feasible. These cases of effective sharing do not indicate that all satellite applications can share with terrestrial uses.

There is some sharing of spectrum in the 28 GHz band (27.5-29.5 GHz) for which parts are allocated to fixed terrestrial links in Europe, while the same parts are now available for ESIMs. For this example of shared use, the constraints on satellite use are severe – for example allowing aircraft ESIM to operate only around cruising altitude and ship ESIM to operate only when off-shore by 10s of kilometres. This type of shared use remains valuable for satellite services but can only be exploited when combined with the bands which are *not* shared with terrestrial services. Only the availability of those non-shared bands allows aircraft ESIM to operate when landing/taking off; maritime ESIM to operate in ports; and land ESIM to operate anywhere. The shared use of the 28 GHz band is useful but is only feasible as long as it is used in conjunction with some bands which are not shared with terrestrial services.

Based on the above considerations, ESOA wishes to underline that while supporting consideration of new options for sharing, the need for some bands to be available for satellite use free from sharing with terrestrial services will always remain. Hence scenarios for increased sharing will need to be evaluated on a case-by-case basis, taking account of a broad view of the requirements for satellite services.

2. Specific comments on the draft Opinion

Some comments on specific elements in the draft Opinion are provided below.

2.1. Member States support for on sharing approaches, compatibility and technologies

Paragraph 13 appears to provide unquestioning support "on sharing approaches, compatibility and technologies that would lead to increased possibilities of sharing or co-existence solutions". As noted above, increased possibilities for sharing are not always appropriate. We would like to see a clearer reference to the necessary checks and balances and the need to consider each scenario on a case-by-case basis in this paragraph.

2.2. High performance transmitter and receiver specifications

Paragraph 14 states that "Member States and the Commission should encourage the development by industry and standardization organizations of high-performance transmitter and receiver specifications...". Paragraph 15 states: "Member States should encourage industry to design receivers able to tolerate a given degree of unforeseen interference".

Regarding transmitter performance, we have noted that regulators have allowed transmitter performance to worsen significantly in some cases in recent years. For example, in the case of the unwanted emission limits specified in European regulations for terrestrial equipment using the band 3400-3800 MHz, the baseline emission limits have been relaxed from -42 dBm/MHz EIRP[1] for 4G equipment in Commission Decision 2008/411/EC, to -9 dBm/MHz EIRP[2] for 5G equipment in Commission Implementing Decision (EU) 2019/235. This relaxation by 33 dB may have been necessary to accommodate new 5G TDD equipment, but it has significantly worsened the ability of terrestrial equipment to co-exist with other services using the adjacent frequencies, which includes FSS receiving earth stations. Regulators seem to have readily accepted poor performing transmitters in 5G equipment in recent years, and so we hope that the RSPG Opinion will also lead to regulators making a more critical and careful examination of mobile equipment transmitter specifications.

Regarding the potential for improvement in receiver specifications, it is important to recognise that some practical constraints limit the scope for receivers to tolerate increased interference. For terrestrial systems, an increase in the receiver noise by 1 dB might be easily compensated by a 1 dB increase in the corresponding transmitter power. In a satellite system, the scope to increase the downlink power to compensate for higher interference at the receiver is limited by at least two factors:

1. Available power on the satellite is limited since satellites are solar powered and have a strictly limited power budget which cannot be increased once the satellite is launched. As an example, an increase of 1 dB in the downlink power to compensate for increased interference would require a 26% reduction to the usable satellite bandwidth to maintain the overall EIRP budget. That would be a significant loss in capacity of the satellite, which could significantly change the economic viability.

2. Increase in the downlink EIRP will have a knock-on effect to other satellite systems which share the same spectrum. The ability of two GSO satellites to operate with small orbital separation is often governed by the downlink interference from one network, received by the earth stations of the adjacent network. A 1 dB increase in the downlink EIRP on one network results in a 1 dB increase in interference to the neighbouring network. Hence the desire to increase the interference tolerated by an earth station impacts not only the network in question but also adjacent networks.

Regarding the potential for improvement in the selectivity of receivers (i.e. to accept greater interference on adjacent band frequencies), there are practical design considerations that limit the scope for improvements. Satellite earth stations generally operate with a low signal level at the receiver (much lower than a typical mobile handset) and have limited scope to introduce filtering without degrading the wanted signal level. Some satellite receivers (for example those used for IoT

[1] A limit of -59 dBm/MHz transmitter power, at frequencies >35% of the assigned block converted to EIRP with an assumed antenna gain of 17 dBi, to give -42 dBm/MHz.

[2] A limit of -2 dBm/5MHz applies to the base station EIRP for a non AAS base station, more than 40 MHz from the band edge, which is equivalent to -9 dBm/MHz EIRP.

applications) are small, battery powered devices that do not have the physical space or available power to accommodate more capable filters.

A requirement to accept greater interference at the receiver also will always come at some cost which needs to be considered before any requirements for receivers to accept greater interference are put into effect. Where users have deployed equipment that meets the receiver requirements mandated at the time of purchase, it could be unreasonable to require the user to meet the costs of replacing the equipment. The situation is quite different for, say, mobile phones which are typically replaced every 2 years, compared with earth station equipment that might be purchased with an expectation of usage for 10 years or more.

2.3. Additional "secondary" users

Paragraph 17 refers to '"secondary"/additional spectrum usage' where the "primary" usage does not take place. While this approach on the face of it could allow sharing without constraints on the primary service, it is difficult to see how such an approach could work in a practical scenario, given that this approach implies that the secondary user would lose their ability to operate in a particular location if and when a new primary user was to start operations in the same area. It is difficult to envisage any application where such a sudden loss of access to spectrum could be tolerated by the customers or users, hence there is a risk that the nominally "secondary" user constrains the ability of the primary user to grow their service. ESOA considers that the RSPG needs to be very cautious about such an approach which, if implemented, should be made explicitly subject to the ability of the secondary user to manage a sudden loss of spectrum access (i.e. with a mandatory requirement).

2.4. Database-assisted spectrum sharing solutions

Paragraph 27 refers to "database-assisted spectrum sharing solutions". ESOA encourages Member States to make detailed data on existing assignments available where possible. To be most useful, this needs to be detailed station-by-station information, including the precise location of stations. This could be useful, for example, in the case of information on fixed-service (FS) links in the 18 GHz band (17.7-19.7 GHz) which is shared with receiving satellite earth stations. Detailed information on FS system deployment could allow satellite earth stations to choose frequencies that avoid interference from nearby fixed links. Ideally, there would be a common format or single database for use across Europe.

3. Summary

ESOA appreciates the opportunity to comment on this draft Opinion. We would agree that there is scope for the application of new sharing approaches as outlined in the draft Opinion, and ESOA would be pleased to cooperate with the RSPG as this work stream progresses. Scenarios for increased sharing will need to be evaluated on a case-by-case basis, and may need to take into account a broad view of the requirements for satellite services. These requirements include the need to grow services and to innovate, and for some satellite applications to be able to operate with user terminals at any location. We underline that for some satellite applications, there is a need for frequency bands to be available which are free from sharing constraints with terrestrial services.