ESOA
EMEA SATELLITE OPERATORS ASSOCIATION

ESOA response to the OFCOM consultation document: "Invitation to tender for frequency blocks for the national provision of mobile telecommunications services in Switzerland"

6 April 2018

1. Introduction

In this document, ESOA provides comments to the Swiss Federal Communications Commission (ComCom) and the Swiss regulatory authority OFCOM in response to their consultation document: "Invitation to tender for frequency blocks for the national provision of mobile telecommunications services in Switzerland". Our comments are related to the plans for authorisation of 5G systems in the "1400 MHz band" (1427-1517 MHz) and the "3.6 GHz band" (3500-3600 MHz and 3600-3800 MHz).

With the identification of C-band as one of the pioneer bands for 5G, and with the new EC Decision on implementation of mobile broadband in the 1400 MHz band, the European Commission (EC) has put pressure on Member States to make these bands available in a timely manner for such services, subject to national demand. ESOA does not dispute the potential or importance of 5G services, nor does it wish to undermine the efforts of Administrations to find adequate frequency resources to allow the development of 5G services. However, ESOA is concerned that the conditions for use of these frequency bands for terrestrial 5G systems must include adequate measures to protect satellite applications operating in the same bands or adjacent frequency bands.

2. The 1400 MHz band

In section 2.3.2.2 of the consultation document, the protection of Mobile Earth Stations (MESs) is raised. In Switzerland, as in most European countries, the band 1518-1559 MHz ("L-Band") is used for MSS downlinks, i.e. for land terminals, ships and aircraft to receive emissions from GSO satellites. L-Band MSS is used for safety of life communications and mission-critical voice and data services (including GMDSS and AMS(R)S) throughout Europe and around the globe.

L-Band MSS is of particular importance to aviation users. Because of the importance of satellite communications to ensuring flight safety, a satellite communications terminal is required to fly in many preferred flight tracks. If the terminal is not able to be successfully tested at the airport prior to takeoff, a plane will have to adjust its route, resulting in travel delays and unforetold economic impacts. Additionally, L-Band MSS is a key element of the Single European Sky ATM Research (SESAR) air traffic modernisation plans. Iris is the European Space Agency programme to support the development of a satellite-based communication system for European air traffic management, which is under development now and will be fully deployed by 2028. MSS is similarly essential to maritime operations. L-Band MSS terminals are a means of complying with International Maritime Organisation (IMO) Safety-of-Life At Sea (SOLAS) communications equipment requirements in all sea areas, and in some areas they are the only permissible equipment. As such, many ships rely upon Inmarsat terminals to meet this obligations, and if the terminal is unable to pass a systems test, the ship cannot legally sail.

Land-based L-Band MSS terminals are relied upon by emergency responders, military users, and diverse industries including the transportation, energy, and agriculture sectors for mission-critical voice and data applications. These terminals are used for essential coordination and communications after natural and man-made disasters. While terrestrial infrastructure is overloaded or unreliable, these terminals ensure that life-saving services are delivered when and where they are needed. Additionally, energy production and distribution, transportation, construction, and other industries use MSS terminals to provide mobile communications with a level of reliability and ubiquity not delivered over terrestrial networks. Going forward, lightweight L-Band MSS terminals with low power consumption will be key to driving innovation in areas such as intelligent transportation systems and the Internet of Things.

L-Band MSS terminals are vulnerable to interference from mobile base stations transmitting in the adjacent 1400 MHz band. Important MSS operations in Switzerland could be at risk of harmful interference if adequate measures to ensure compatibility are not included in the 5G licence conditions for the 1400 MHz band.

CEPT has conducted a number of studies and has produced a number of deliverables related to the use of MFCN in the 1400 MHz band, as listed below.

ECC Report 263	Adjacent band compatibility studies between IMT operating in the frequency band 1492-1518 MHz and the MSS operating in the frequency band 1518-1525 MHz
ECC Report 269	Least restrictive technical conditions for Mobile/Fixed Communications Networks in 1427-1518 MHz
ECC Decision (17)06	The harmonised use of the frequency bands 1427-1452 MHz and 1492-1518 MHz for Mobile/Fixed Communications Networks Supplemental Downlink (MFCN SDL)
CEPT Report 65	Report from CEPT to the European Commission in response to the Mandate "to develop harmonised technical conditions in additional frequency bands in the 1.5 GHz range for their use for terrestrial wireless broadband electronic communications services in the Union"

OFCOM proposes to authorise the use of the 1427-1517 MHz band for supplemental downlink (SDL). In footnote 9 of the consultation, OFCOM notes that compatibility studies regarding the use of L-Band frequencies have not been completed, and that technical conditions will be placed on the upper range of these frequencies in order to ensure protection of MES above 1518 MHz. In section 2.3.2.2 of the consultation, OFCOM proposes to specify provisionally in the licence the limits for MFCN base stations, including in-band and out-of-band EIRP limits, specified in ECC/DEC Decision (17)06. It should be noted that these limits will not provide adequate protection for MSS operations in Switzerland in several aspects. As such, ESOA respectfully suggests that OFCOM adopt further protections for MSS operations above 1518 MHz. As explained in further detail below, these protections could include (a) not licensing the frequencies in the upper portion of the 1427-1517 MHz band, (b) adopting more restrictive in-band EIRP limits for base stations operating in the upper portion of the band, and (c) implementing PFD limits at ports and airports to protect critical MSS users.

First, the parameters specified in ECC/DEC Decision (17)06 for base stations operating in the 1492-1517 MHz band would allow for very high out-of-band (OOB) emissions (-0.8 dBm/MHz) into the MSS band at 1518-1520 MHz making use of this 2 MHz of MSS spectrum potentially unviable. To avoid the effective removal of spectrum from existing MSS operations, ESOA encourages regulators to adopt technical conditions which reduce the base station OOB emission in the band 1518-1520 MHz. This can best be achieved by not assigning the 1492-1517 MHz frequencies, or at least uppermost frequency blocks (1507-1517 MHz) to mobile systems in Switzerland. Should OFCOM proceed with assigning licences in these frequencies, then lower out-of-band EIRP limits should be applied on emissions in the band 1518-1520 MHz, e.g. to -30 dBm/MHz, as is proposed for the band 1520-1559 MHz.

Second, the in-band EIRP limits specified in ECC/DEC Decision (17)06 will cause blocking interference to currently operating land MSS terminals. Land MSS terminals are vulnerable to receiver overload from MFCN base stations operating below 1517 MHz and currently operating terminals will likely be inoperable in any areas where 5G is deployed. While it is anticipated that next generation terminals will be more resilient to receiver overload, currently deployed terminals will remain in use for up to 20 years. Again, the best solution would be for OFCOM to refrain from assigning the upper part of the 1400 MHz band (i.e. 1492-1517 MHz) in Switzerland until mobile earth stations are replaced by next generation terminals through the typical equipment replacement cycle. However, If it is planned to deploy mobile base stations in the 1492-1517 MHz band, lower EIRP limits would be required to avoid interference to MSS operations. ESOA suggests adopting an EIRP limit of 38 dBm on mobile base stations operating in the 1492-1517 MHz band. This limit would provide greater protection for land MES while still allowing mobile operators to deploy SDL service in a small cell configuration to provide significantly increased capacity for existing networks in areas of high network demand.

Finally, the parameters identified in ECC/DEC Decision (17)06 do not protect MSS operations at ports and airports. ECC Project Team PT1 is developing a draft ECC Report that will address this issue in detail and is expected to define mitigation measures such as pfd limits at ports and airports, to ensure that important maritime and aeronautical MSS operations can continue. The draft ECC Report is planned for completion in October 2018. Additionally, the Radio Spectrum Committee of the European Commission Directorate-General for Communications Networks, Content and Technology (DG CONNECT) recently approved a draft EC Implementing Decision recognising the need for further measures at the national level to protect ports and airports. Switzerland is home to several major airports and three ports that are visited by SOLAS vessels, each of which require protection to ensure the effective operation of critical MSS terminals. Accordingly, ESOA recommends that OFCOM defines geographic locations at airports, ports and major inland waterways in Switzerland where operation of MSS terminals is expected and define the protection measures in the mobile operators licence to avoid interference to those locations. To ensure protection of MSS terminals, ESOA suggests that terrestrial mobile systems should meet PFD levels shown in the Annex at airports, seaports, and inland waterways. Details of these requirements would need to be included in the mobile operators licence conditions.

The above points lead to the need to carefully evaluate the technical conditions for mobile operations in the 1400 MHz band and to define adequate protection measure for compatibility with MSS operations in the adjacent band. Naturally, such measures should be clearly defined before an award can take place.

3. The 3.6 GHz band

The ComCom has decided to put out to tender frequency blocks in the 3500-3800 MHz (3.6 GHz) frequency band. The Electronic Communications Committee (ECC) of the European Conference of Postal and Telecommunications Administrations (CEPT) provided a technical toolkit for Administrations to consider coexistence with satellite earth stations in C-band[1]. Any approach that promotes 5G deployment and allows for continued uninterrupted FSS usage will offer the greatest benefits to both OFCOM and customers of both mobile and satellite services within Switzerland. This view is reflected in the 2nd opinion of the Radio Spectrum Policy Group (RSPG) on 5G networks,[2] which encourages Administrations to find a proper balance between the benefits of allowing 5G use and keeping access to satellite operators in the 3.6 GHz band.

[1] *See* ECC Report 254 (Approved 18 November 2016).

[2] *See* RSPG18-005 FINAL (30 January 2018).

Earth station receivers are designed to receive signals from satellites located far away in space – 36,000 kilometres above the equator – which are orders of magnitude weaker than terrestrially based signals. That fact makes them extremely sensitive to interference. In this response, ESOA would like to focus on the protection solution of FSS earth stations, which is vital for the continued provision of critical satellite services.

Therefore EOSA would like to request that the protection of the down link in the 3500 –3800 MHz band be safeguarded as satellite operations in this band are linked with the uplink bands which are subject to regulatory rights to operate, as per the licensing obligations from OFCOM.

ESOA appreciates the efforts made by OFCOM in their document to address the protection of the FSS earth stations in Geneva, canton Valais and Immenstaad, Leuk and Vernier, and notes that specific polygons were created for the Leuk satellite earth station. However, ESOA would like to seek clarification on a number of points

Will OFCOM produce and publish similar polygons for the other FSS earth stations mentioned in the consultation document, together with the assumptions used to derive these contours (terrain, IMT base station power and deployment density, potential aggregate effects)?

Could OFCOM provide further clarification on how the values provided for P1 and P2 in Table 3 of the document are derived?

In order for ESOA members to continue providing interactive services to its customers, the 3.5 - 3.8 GHz receive band coordination zones are required to maintain interference at an acceptable level to ensure undisturbed service provision of the FSS earth station receiver. LNB saturation is a concern as well for the parts of the 3.5 – 3.8 GHz band that might not have been licensed for FSS earth station, and could be used by IMT base stations, since these transmission would still fall within the LNB filter range.

4. Conclusion

Regarding the 1400 MHz band, assuming demand is identified for this band for mobile operations in Switzerland, it is necessary for OFCOM to carefully evaluate the technical conditions for mobile operations in the 1400 MHz band and to define adequate protection measure for compatibility with MSS operations in the adjacent band.

Regarding the 3.6 GHz band, the satellite industry depends on continued access to the 3.6 - 4.2 GHz spectrum for existing and future satellite deployments due to continued demand for existing and new services. While recognizing the importance of 5G mobile communications, ESOA is of the view that the provision of services with existing FSS earth stations using C-band has an economic significance that cannot be underestimated. Due to the critical nature of these facilities, even more important than the economic value is the consideration of the societal impact of the continued C-band satellite services to both commercial customers and critical communications around the world.

In order to determine adequate protection for all FSS receive earth stations, ESOA encourages OFCOM to continue to conduct their assessment on the required coordination trigger zone using the known topology and antenna parameters for modelling typical FSS earth stations and the IMT-Advanced parameters available from ITU and ECC Recommendations for modelling the 5G network.

Annex

PFD values for protection of ports/airports in Switzerland

A two-phased approach to protection of ports and airports is supported, with more stringent protection based on current terminals and more relaxed protection in the future based on future generations of terminals.

Table 1 PFD limits for IMT BS with single LTE channel transmission

Phase	**Phase 1**			**Phase 2**		
	PFD limit for emissions in the band 1492-1502 MHz (dBW/m^2)	PFD limit for emissions in the band 1502-1512 MHz (dBW/m^2)	PFD limit for emissions in the band 1512-1517 MHz (dBW/m^2)	PFD limit for emissions in the band 1492-1502 MHz (dBW/m^2)	PFD limit for emissions in the band 1502-1512 MHz (dBW/m^2)	PFD limit for emissions in the band 1512-1517 MHz (dBW/m^2)
Ports and inland waterways	-57.9	-71.9	-83.9	No limit required	-27.9	-37.9
Airports	-28.9	-42.9	-58.2	No limit required	-27.9	-37.9

Table 2 PFD limits on IMT BS with multiple LTE channel transmissions

Phase	MSS terminal antenna gain (dBi)	Phase 1		Phase 2	
		PFD limit emissions in the band 1492-1512 MHz (dBW/m^2)	PFD limit for emissions in the band 1512-1517 MHz (dBW/m^2)	PFD limit emissions in the band 1492-1512 MHz (dBW/m^2)	PFD limit for emissions in the band 1512-1517 MHz (dBW/m^2)
Ports and inland waterways	3	-77.9	-88.9	-30.9	-40.9
	19	-93.9	-104.9	-46.9	-56.9
Airports	3	-53.5	-63.4	-30.9	-40.9
	17	-67.5	-77.4	-44.9	-54.9

These pfd values are based on an MES with a range of antenna gain values. There are some cases where the antenna gain towards the horizon can exceed 3 dBi, in particular where high gain aeronautical MES antennas (maximum 17 dBi) and high gain maritime MES antennas (maximum 19 dBi) are used with a low elevation angle towards the satellite. PFD values for these cases are included in the table.