29 April 2013

Graham.Howell@ofcom.org.uk
Ofcom
Riverside House
2a Southwark Bridge Road
London, SE1 9HA

Re.: **Future demand for mobile broadband spectrum and consideration of potential candidate bands**

Dear Graham:

SES is pleased to submit this response to Ofcom's Spectrum Review consultation. As a satellite service provider offering significant services to U.K. customers, SES S.A. on behalf of its various UK interests including wholly-owned subsidiaries SES ASTRA UK, Ltd, SES Satellites (Gibraltar) Ltd. and SES Satellite Leasing Ltd. (collectively, "SES"), very much appreciates the opportunity to participate in this consultation and to contribute to Ofcom's review of spectrum used for point-to-point and other services. SES also holds an approximately forty-five percent (45%) interest in O3b Limited, a non-geostationary Ka-band satellite operator located in Jersey, Channel Islands.

SES is a provider of fixed satellite service ("FSS") and broadcast satellite services ("BSS") in Europe, the Americas, Asia and Africa. Several SES satellites are located in UK orbital positions,[1] many are launched and/or operated pursuant to UK authority,[2] many have UK manufactured satellite components, and many are insured by UK entities. SES is a provider of a wide variety of important satellite services to customers in the UK including for direct-to-home ("DTH") services, satellite news gathering, private networks, broadband services, and more. For more than a decade, SES has been an important provider of satellite capacity in the UK market. In particular, more than ten (10) million UK households receive DTH television services via SES spacecraft.

SES will essentially respond to Questions 8 and 9 of the consultation document, following introductory remarks and a recap on FSS C-band.

[1] For example, SES's AMC-18, AMC-21 and NSS-11 satellites operate at UK orbital positions filed with the ITU at the request of the Gibraltar Regulatory Authority on behalf of SES Satellites (Gibraltar) Ltd.

[2] These include satellites launched and/or operated pursuant to space activities licences issued by the UK Space Agency and the Gibraltar Regulatory Authority pursuant to the Outer Space Act 1986 (UK) and the Outer Space Act 1986 (Gibraltar) Order 1996.

Introduction

The text of WRC-15 Agenda Item 1.1 reads as follows:

> 1.1 to consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution **COM6/8 (WRC 12)**;

This agenda Item is of concern for SES, particularly with respect to the C-band. Current concerns with regard to C-band and operation of BWA services in the band 3400-3800 MHz have already been expressed several times in the past. Those concerns would intensify if proponents of mobile broadband and IMT might be looking for more C-band spectrum. SES opposes any further allocation or identification of spectrum for IMT.

SES would appreciate if Ofcom would take a careful and balanced approach regarding this agenda item, taking into account the view of *all* concerned stakeholders who contribute to the UK economic *and* social benefits.

FSS C-band usage in Europe and the UK

SES uses C-band spectrum in the UK for teleports and domestic and international services. Today, the UK represents the largest share of SES C-band spectrum use in Europe (500 out of 950 MHz).[3] We anticipate that this business will grow steadily**.**

Our customers use the C-band due to the robustness of this spectrum (relative immunity from weather conditions), the size of the satellite beams (enabling broad connectivity over very large geographical areas (*e.g.,* transcontinental services between the UK and the rest of the world) and the ability to rely on wide bandwidth.

Preferences for use of one frequency over another are determined by a variety of factors. In some cases, large coverage areas are required for long-distance or regional communications (*e.g.,* backhaul, international links, point-to-multipoint broadcast distribution). C-band is ideally suited for this. SES' UK customers use C-band to provide services into Asia, Africa and Latin America, particularly into equatorial regions. C-band also enables coverage of almost one third of the Earth with a single beam. A customer with sites all over Africa can use one broadcast outbound carrier to cover all sites, reducing costs of having to uplink onto multiple beams as may be required in the Ku and Ka-bands.

[3] More than 150 C-band FSS earth stations were registered by Ofcom in 2009.

FSS / IMT interference concerns in C-band

The 3400-3800 MHz C-band has already been opened to BWA services throughout the EU, and the UK (Ofcom) has gone further than the EU by granting licensing rights to broadband at 3.9 GHz as well as 3.6 GHz, despite the satellite sector's expressed serious concerns.[4] Although sharing with fixed point-to-point links is possible in C-band under specific and well defined licensing conditions ensuring compatible satellite/terrestrial operations, using this spectrum for BWA for high capacity links with mobile devices raises serious coordination problems for FSS.

Studies leading up to the WRC-07 provide evidence of the extreme difficulties that would be caused by allowing FSS and BWA services to share the same frequency band, notably when these include both fixed and mobile wireless access.[5] This evidence actually led the WRC to reject a global allocation for IMT in the band 3600-4200 MHz and to ensure that satellite services remained in the 3400 – 4200 MHz bands to continue critical satellite services.[6]

Under the agreement reached at WRC-07, new BWA entrants can operate in the 3400 - 3600 MHz frequency band provided that they mitigate any harmful interference they would otherwise cause to existing services, such as FSS. This arrangement was extended within Europe to 3400-3800 through the EC decision on BWA 2008/411/EC.

Coordination criteria need to be strictly observed, ensuring that BWA deployments protect existing C-band installations. The ITU concluded that in order to provide an FSS receive earth station with protection from interference in both long-term and short-term propagation conditions, a co-frequency IMT base station must maintain a minimum distance separation of at least several tens of kilometres and potentially hundreds of kilometres relative to the FSS receive earth station. Any BWA use of the 3800-4200 MHz band would have to ensure protection not just of the earth stations operating in the UK, but also those in neighbouring countries. The geographic areas where BWA could operate would be extremely limited.

The most recent Report ITU-R S.2199 on the "Studies on compatibility of BWA systems and FSS networks in the 3400-4200 MHz band", approved jointly by ITU-R Study Groups 4 and 5, has again re-confirmed the lack of compatibility between BWA and FSS. Any increased sharing in this band would have substantial disadvantages for satellite operations, increasing the risk of interference and effectively preventing the deployment of new earth stations.

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[4] *See* SES and European Satellite Operators Association comments submitted back in 2009.

[5] See ITU-R Report M.2109 plus ITU Recommendations ITU-R S.1432 and SF.1006. BWA is defined by the ITU as including Mobile Wireless Access (MWA), Nomadic Wireless Access (NWA), and Fixed Wireless Access (FWA).

[6] More details about the range of critical services which our industry provides, and the problems of satellite and terrestrial compatibility as sustained by ITU studies can be found from: www.fss-toolkit.com.

Various countries have already reported several cases of interference due to WiMAX deployed in the 3400 – 3800 MHz band only using the *Fixed* allocation in the ITU RR. Evidence indicates a clear threat to the quality of service the FSS can provide to end-users in the band. The same problem would occur above 3800 MHz and would be even more critical in the band 3800-4200 MHz as FSS is using this band more extensively in Europe than the 3400-3800 MHz band, leading to more significant constraints for any BWA application in the higher band.

SES takes note of Ofcom's views that: "The consideration of sharing and compatibility in the ITU context will focus on the international impact, i.e. the impact on a neighbouring country's spectrum use or on space services. It does not normally consider domestic matters because these are within the responsibility of the national administrations. It should also be noted that in the past, studies have indicated that sharing would be difficult, or subject to a number of constraints, and new allocations have still been agreed. Studies that reveal considerable difficulties with sharing do not necessarily imply that a WRC would not add a new allocation." (para. 2.15).

In fact, if the WRC decided to make a new allocation while studies revealed considerable difficulties with sharing, this means that the victim service would be considerably impacted when applications of the new service have been deployed, or that migration plans have to be put in place in order to ensure that the applications in the victim service could be moved to other frequency bands. It is therefore extremely important that in case of incompatibility, the WRC is made aware of all the consequences before deciding on a new allocation.

Response to Question 8

What are your views about the pros and cons of the frequency ranges in Table A6.1 in Annex 6 for mobile broadband and for existing applications using this spectrum? Do you have views on other bands that are not in Table A6.1?

SES has the following additional comments regarding essential satellite spectrum:

C Band 3600-4200 MHz

SES takes good note that "WRC-15 will (…) consider options for new frequency allocations suitable for mobile broadband (including Wi-Fi) and identification of frequency ranges as suitable for International Mobile Telecommunications (IMT)." (para. 2.3).

The band 3400-3800 MHz is available for terrestrial mobile through Decision 2008/411/EC. The band is available to and remains in use by the fixed satellite service (FSS). In general, there has been very little uptake of this band made available for terrestrial wireless broadband for 5 years.

The most likely explanation for the lack of success of terrestrial broadband in the band 3400-3800 MHz is simply the lack of demand (as discussed in the draft RSPG opinion). Due to the relatively high frequency compared to most other terrestrial mobile bands, the coverage possible with C-band is very limited.

This makes it uneconomic to provide meaningful coverage of terrestrial broadband in this band. The use of C-band for mobile broadband was touted mostly as a solution for dense urban areas, but the wide availability of WiFi might also undermine the suggested benefits of C-band. The few cases of meaningful roll-out of BWA in other parts of the world in C-band has mostly been in countries with poor wired broadband service, where fixed broadband access is used to provide broadband to homes.

Sharing is at least difficult in the lower half of the C-band downlink spectrum, i.e. the band 3400-3800 MHz, and in some countries is not possible. The upper half of the C-band downlink spectrum, i.e. the band 3800-4200 MHz, has many times more earth stations than the lower half.

Consequently, sharing between mobile broadband systems and FSS earth stations in the upper half of C-band is many times more difficult than the lower half. Given the clear lack of feasibility for the two applications to share, and given the lack of meaningful roll out of mobile broadband systems in C-band to date, conducting further studies to open 3800-4200 MHz to BWA seems pointless – and is at best undermining the FSS business confidence and reputation.

SES is of the view that the band 3800-4200 MHz, suggested as a candidate band for IMT is not suitable, and should simply be removed from the Table.

C Band 4500-4800 MHz

The band 4 500-4 800 MHz is part of the Appendix 30B Plan, which aims to guarantee, for all countries, equitable access to the geostationary-satellite orbit in this and certain other frequency bands. It is therefore inappropriate to consider this band as a candidate for IMT.

C Band 5850-6425 MHz

SES has similar concerns on the consideration of opening of some of the C-band uplink spectrum to wireless broadband, as is suggested in Annex 1 of the draft Opinion. There are two interference issues to be considered here: 1) interference from a transmitting FSS earth station to terrestrial IMT receivers; and 2) interference from terrestrial IMT stations transmitting in using these bands to FSS satellite receivers.

We are not aware of existing studies which address these issues and hence studies would be necessary if this band would continue to be considered. However, considering the first interference case in particular, there is obviously a potential for the deployment of new earth stations to be constrained by a need to protect terrestrial IMT systems. For that reason the satellite industry is doubtful that this band would be a candidate band for new IMT applications.

Ka-Band 18.1-18.6 GHz

Some other parts of the shared Ka-band spectrum (*e.g.*, the 17.7-19.7 GHz band) are and will increasingly be used by satellite operators for space-to-Earth transmissions to gateways as well as to terminals all over Europe, given the increasing demand for two-way broadband services. Following the adoption of the Ka-band report on *The Use of the Frequency Bands 27.5-30.0 GHz and 17.3-20.2 GHz by Satellite Networks* (ECC Report 152 of September 2010), the CEPT has studied the possibility of using the 17.7-19.7 GHz spectrum for ubiquitous FSS terminals using satellite space-to-Earth communications.

It should be a priority for the UK, as for every other national administration, to ensure that satellite users are guaranteed access to the Ka-band frequencies designated by the ITU for satellite services.

In addition, this shared spectrum (*e.g.,* in the 17.7-19.7 GHz band) can also typically be used in the space-to-Earth direction by larger satellite earth stations such as hubs or gateways (1.2 m and above) that are located at specific locations so that coordination with terrestrial services can be accomplished to ensure a safe reception of the satellite transmissions. Such "hub" stations are invaluable as gateways to connect to the Internet and are an essential part of all satellite networks. These hubs need to be able to access large amounts of contiguous spectrum (between 500 MHz and 1 GHz or more).

It is therefore critical that, in its position on AI 1.1, the UK ensure that such big earth stations still have the possibility to access the entirety of the shared spectrum, as today identified by the ITU, on the basis of individual coordination.

Ka Band 27-29.5 GHz

Some new satellite services in the Ka band will involve the deployment of a large number of small, transmit-receive terminals. To allow the use of ubiquitous satellite terminals, the ITU has identified a number of uplink and downink frequency bands which are *exclusively* for satellite usage.

Because of the scarcity of the spectrum resources, certain portions of the Ka-band are *shared* on a co-primary basis between satellite and terrestrial services in the ITU table of frequency allocations. Such dual use of the spectrum is possible provided that appropriate coordination is conducted in order to avoid mutual interference.

This shared spectrum (*e.g.,* in the 27.5-29.5 GHz band) can typically be used in the Earth-to-space direction by larger satellite earth stations such as hubs or gateways (1.2 m and above) that are located at specific locations so that coordination with terrestrial services can be accomplished. Such "hub" stations are invaluable as gateways to connect to the Internet and are an essential part of all satellite networks. These hubs need to be able to access large amounts of contiguous spectrum (between 500 MHz and 1 GHz or more).

Here again, it is critical that, in positioning on AI 1.1, the UK ensure that such big earth stations still have the possibility to access the entirety of the shared spectrum, as identified by the ITU, on the basis of individual coordination.

SES has already suggested that a waiver mechanism should be developed by Ofcom, which would allow access to any parts or the entire band 27.5-29.5 GHz for coordinated satellite earth stations.[7] The fact that access to the band 27.5-29.5 GHz had been granted to certain permanent earth stations prior to the 2002/2003 auctions of the 27/28/29 GHz bands demonstrate that coexistence between coordinated satellite earth stations and other services in the 27.5-29.5 GHz band is technically possible.

Response to Question 9

Question 9: Are there any other bands that are not in Table A6.1 for which you think we should be considering their pros and cons for mobile broadband and for existing applications using this spectrum?

Extensive reference has been made by Ofcom on the RSPP and RSPG draft opinion on Wireless Broadband. (paras. 1.7, 2.21, 2.22, 2.23 of the consultation document).

Annex 1 to the RSPG draft opinion establishes a preliminary identification of frequency bands for wireless broadband in Europe between 400 MHz and 6 GHz. A total of nearly 3 GHz of spectrum (i.e. 3000 MHz) is already in use, or is a future potential, for WBB – the exact amount being 2951.50 MHz, the bulk of which (2778.5 MHz) is for Terrestrial + WiFi.

It is to be highlighted that, in excluding as potential bands for terrestrial wireless broadband the 600 MHz of FSS C-band spectrum[8] and the 60 MHz of MSS 2 GHz spectrum[9] that are proposed, **Terrestrial + WiFi would still, together, benefit from nearly 2.2 GHz of spectrum** – the exact amount being 2178.5 MHz. Without the need for further satellite spectrum to be made available for terrestrial wireless broadband, this goes well beyond the IMT spectrum targets identified by most stakeholders; and this does not even consider the contribution of satellite communications to achieve the EU broadband objectives.

SES understands that "Ofcom has commissioned an external study to obtain as robust an estimate as possible for the long-term demand for spectrum for mobile broadband applications in the UK." (para. 4.4). It would be very educational to look at this estimate in light of the RSPG findings, and best reconsider the necessity to exclude the bands that are *not* appropriate as candidate for IMT such as:

[7] SES comments on the UK Ofcom Spectrum Review, May 2012

[8] 600 MHz of C-band spectrum consisting of the bands 3800-4200 MHz, 5725-5875 and 5875-5925 MHz.

[9] 60 MHz of MSS 2 GHz spectrum, consisting of the bands 1980-2010 MHz and 2170-2200 MHz.

3800-4200 MHz
4500-4800 MHz
5850-6425 MHz

Best regards

Cécil Ameil
Senior Manager Regulatory Affairs, SES