

## **ESOA Response to Ofcom's Consultation on Improving Consumer Access to Mobile Services at 3.6 to 3.8 GHz**

14 December 2016

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### **Introduction**

The C-Band 3400 – 4200 MHz has been a cornerstone of many satellite services for decades. In addition to its key function in providing connectivity within and to areas of high rain fall, where other available bands are inappropriate, C-band is used for a number of other critical functions.

While no one disputes that mobile data traffic is increasing, mobile operators should also be encouraged to first improve the network density and efficiency within their existing spectrum before asking for additional spectrum which is already extensively used by other services. Satellite receivers are extremely sensitive devices because they are designed to receive extremely low-power signals from satellites located in space 36,000 kilometres above the equator. Satellite services have co-existed with terrestrial microwave links from fixed points for many years, primarily because of microwave's use of highly directional antennas which can avoid high power interfering signals in the direction of a satellite earth station.

The satellite industry is counting on continued access to the 3600 – 3800 MHz in future satellite deployments due to continued demand for satellite services. In particular, if the band is opened to IMT services, it would be very difficult and costly for satellite earth stations to relocate to new bands or alternative means of delivery. One option to enable such services to continue operating is to implement adequate measures to protect incumbent services and ensure their commitment and quality of services to their customers continues unimpeded to guarantee long term stability within this band for satellite operators. Ofcom has recently, as part of its overarching strategy, emphasised the increased role of spectrum sharing envisaged in the future<sup>1</sup>.

The band 3600-3800 MHz is an opportunity to put this vision into effect, allowing the FSS to continue operating in the band by ensuring sufficient geographical separation with new services, possibly supplemented by mitigation techniques based on a coordinated effort with the new comer.

### **About ESOA**

The EMEA Satellite Operators Association (ESOA) has the honour of replying to Ofcom's consultation "Improving Consumer Access to Mobile Services at 3.6 to 3.8 GHz" and to bring to Ofcom's attention the strategic importance of C-Band FSS earth stations use of spectrum in the UK. ESOA is a CEO-driven association representing satellite operators in Europe, the Middle East, and Africa.

More information about the associations is available from: [www.esoa.net](http://www.esoa.net)

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<sup>1</sup> As cited for example in the *Spectrum Management Strategy* Statement of April 2014 and the *Framework for Spectrum Sharing* consultation of July 2015.

**Question 1: Do you have any comments on the use of the 3.6 to 3.8 GHz band by existing services?**

The 3600 - 3800 MHz band is currently used by several services including the Fixed Satellite Service (FSS). FSS Earth Stations (“FSS-ES”) are bringing significant economic benefit to the UK. In a world powered by demand for information, access to the internet has become increasingly important. Advances in access technology and High Throughput Satellites (HTS) have made accessing the internet over satellite services a reality, resulting in further growth in data traffic using the 3600-3800 MHz spectrum due to the coverage attributes that C-band<sup>2</sup> provides today. Most of the world’s coverage via C-band is anchored through FSS-ES which are based in Europe and the UK, and is used for intercontinental links and links with high reliability requirements (including broadcast distribution and TT&C).

Satellite operators rely heavily on C-band because it has a number of advantages over other frequency bands. These advantages include:

- **Reach.** The large geographic coverage area of C-band satellite beams allows for whole regions or continents to be connected – resulting in a very cost-effective communications network.
- **Resilience.** C-band is resistant to rain fade. While services in higher frequencies sometimes experience degradation of their signal, services provided in C-band offer extremely high reliability, even during heavy rain.

These are key reasons why many UK companies use C-band spectrum to provide services globally, particularly in equatorial regions in Asia, Africa and Latin America. 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.

This brings strategic advantages to the UK, since the data traffic that is being served by millions of users worldwide eventually breaks out from a UK based teleport operating in the 3600 – 3800 MHz band, bringing expertise and data management services to the UK economy. This also has a strategic advantage to satellite operators, since one of the main reasons why such FSS-ES exist in the UK and elsewhere in Europe is due to the strong high throughput fibre infrastructure. In fact, the UK is truly considered as one of the major fibre hubs in the world, which makes it ideally suited to be a satellite hub too.

Currently, 84 MHz of the 3600-3800 MHz spectrum band is assigned to UK Broadband (3605-3689 MHz) allocated along with satellite FSS services and Fixed Services (FS). Ensuring growth and coexistence without harmful interference between terrestrial wireless services and FS/FSS users in C-band 3600 - 3800 MHz will become critical and should be considered a priority for Ofcom. This is not only a licensing issue but also an issue where appropriate regulatory mechanisms should exist to ensure regulatory stability and a transparent dialogue between existing users and newcomers, with Ofcom’s support and if necessary arbitration.

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<sup>2</sup> Satellite transmissions in C-band frequencies (3400-4200 MHz downlink and 5850-6725 MHz uplink)

For instance, several studies have been conducted in the ITU-R Reports M.2109, S.2199 and S.2368 showed that sharing between IMT-Advanced systems and geostationary satellite networks in the fixed-satellite service in the 3600-3800 MHz frequency bands is not feasible in the same geographic area. ESOA has long argued that the use of C-band by IMT systems is not practical. If however this band is to be made available for mobile broadband systems, then mobile broadband should be required to co-exist with FSS operations. ESOA considers that a key priority is the continued sustainable and viable spectrum access to the band 3600-3800 GHz band for the FSS to deliver existing and planned services. The satellite industry is innovating and increasing its role and impact on communications and this requires continued access to the spectrum in which it is currently operating and for existing satellite spectrum allocations to be safeguarded. It is therefore imperative that the needs of the satellite communications industry for viable access to C-band spectrum as allocated by the ITU are considered and addressed by Ofcom.

**Question 2: Do you agree with our identification of a trend towards the use of mobile in the 3.6 to 3.8 GHz band?**

There have been attempts made by operators over the last few years to provide a successful mobile business in the band 3400-3800 MHz, in the UK and many other countries. In the majority of cases, these attempts have not been successful, and as a consequence business plans have had to be modified (for example to focus on *fixed* wireless access, as in the case of the UK) and in other cases licences have been returned to the regulators due to lack of use. In the meantime, the FSS has continued to make use of this band for receiving earth stations, supporting high value applications throughout the world. Given the poor record of the mobile community in using this band, it seems incongruous to start removing or restricting incumbent services, as this would risk leaving an empty band.

Nevertheless, ESOA recognises that the demands for access to the band 3600-3800 MHz by the mobile community have not gone away and the fact that this band is now touted as a 5G mobile band is again raising the expectation that this band will be an important band for mobile broadband. Furthermore, the interest in this band is in part driven by the European Commission adopted Decision in 2008/411/EC, amended by Decision 2014/276/EU Decision related to the band 3400-3800 MHz. This Decision seeks to harmonise the conditions for the availability and efficient use of the 3400 to 3800 MHz frequency band for terrestrial systems in relation to the 3600 to 3800 MHz on a shared basis. ESOA notes that Ofcom has made explicit reference to this EC Decision in Annex 6 of the consultation document. (“Any award of the 3400 MHz to 3800 MHz band has to be compliant with the Commission Decision.” From paragraph A6.32)

While we take a pragmatic approach to the identification the 3600 – 3800 MHz band for mobile services, we emphasize that Article 1 of the EC Decision states: “This Decision aims at harmonising, without prejudice to the protection and continued operation of other existing use in this band, the conditions for the availability and efficient use of the 3400-3800 MHz band for terrestrial systems capable of providing electronic communications services.”

Article 2 of this Decision repeats: “**Without prejudice to the protection and continued operation of other existing use in this band**, Member States shall designate and subsequently make available, **on a**

**non-exclusive basis** the 3400-3800 MHz frequency band for terrestrial electronic communications networks, in compliance with the parameters set out in the Annex...”

The designation and making available of the 3400 - 3800 MHz band in accordance with the Commission Decision recognizes the fact that there are other existing applications within these bands – such as FSS services – and does not preclude the future use of these bands by other systems and services to which these bands are allocated in accordance with the ITU Radio Regulations (designation on a non-exclusive basis). In consideration of the requirements of the EC Decision, only Option A proposed by Ofcom appears to be consistent. Option B as proposed by Ofcom does not appear to be consistent with the requirements of this Decision.

In any case, for existing users through Permanent Earth Station (PES) authorization, Option A (the Retain option) is preferred over Option B (the Remove option). However it is unclear to what extent the licensing fees would change for Option A. Depending on the methodology used there is a potential for a very high increase in licensing fees to existing FSS PES users. If the fees are excessive, both options would ultimately have the same effect - removing FSS earth stations from the band - contrary to the requirements of the EC Decision, leading to a negative impact on the overall benefits from use of the band in the UK.

**Question 3: Do you agree with our high level proposal to make 116 MHz within the 3.6 to 3.8 GHz band available for mobile and 5G services, bearing in mind our statutory duties and the high level trends we have identified?**

This consultation proposes to make the upper part of the 3600 to 3800 MHz available for future mobile services including 5G. This would entail awarding for mobile use the remaining 116 MHz of the band which is not already assigned to UK Broadband. Whilst we acknowledge Ofcom’s intention here, we do like to emphasize that this identification should not preclude the use of this frequency band by any application of the services to which the band is allocated and does not establish priority in the ITU Radio Regulations.

In addressing issues of spectrum management, Ofcom operates under a legal and regulatory framework which is set out in more detail in Annex 6 of this consultation. In pursuit of these policy objectives, Article 8 of the Framework Directive (as part of the EU regulatory framework on electronic communications) requires Ofcom to apply objective, transparent, non-discriminatory and proportionate regulatory principles by (amongst other things) ensuring that, in similar circumstances, there is no discrimination in the treatment of undertakings providing electronic communications networks and services; safeguarding competition to the benefit of consumers; and promoting efficient investment and innovation in new and enhanced infrastructures. Some of these policy objectives are reflected in the 2003 UK Communications Act (as amended).

Therefore, we believe that identifying ways to allow the incumbents such as FSS-ES to continue to operate, will result in a more efficient use of the spectrum and greater benefits for UK citizens and consumers. We also believe that making this band available on a shared basis amongst mobile service operators has the potential to help fulfil Ofcom’s duties regarding competition and innovation.

**Question 4: Do you agree with our general approach regarding spectrum currently licensed to UK Broadband?**

UK Broadband already provides terrestrial electronic communications services in this band, and by authorising their current use on a shared basis with respect to FSS earth stations, Ofcom has essentially complied with the decision on harmonisation in the 3400 to 3800 MHz band. We note that UK Broadband has stated that it intends to expand its services, to include future mobile broadband services.

**Question 5: Do you agree with our assumptions, methodology, and conclusions with regards to potential coexistence between mobile and existing fixed links and satellite earth stations? Please refer to annex 5 for further details.**

We agree with the proposal for adopting two different interference thresholds for long term and short term thresholds. However we would like to point out that based on the results shown in Table 3 of Annex 5, these only indicate possible interference into FSS-ESs that are in close proximity to London but do not provide a full accurate assessment.

We also note with interest that the Transfinite analysis shows that there is potential to deploy small cells reasonably close to satellite earth stations on a co-channel basis, provided that adjustments are possible for the location of the base stations and for the antenna orientation. We believe that the right level of geographical separation and other mitigations can reduce the burden on mobile deployment while ensuring regulatory compliance with interference management criteria. For many years the mobile community has been seeking access to this band on the basis that they can share with FSS earth stations, so the onus should be on the mobile operators to take the necessary actions to ensure that they can meet the interference criteria.

Based on the above, we could therefore envisage a hybrid method that could be adopted by Ofcom, where a realistic geographic separation is applied, but on a case by case basis where geographical separation is calculated based on the elevation angle of the FSS-ES and provided that the necessary adjustment are made to the orientation of the base station antenna. Another element that could be incorporated into such a hybrid method is the use of mitigation techniques proposed by Transfinite in regards to site shielding and antenna dimensioning at the satellite earth stations. Such measures could be effective in optimising the deployment of small cells in the vicinity of earth stations. However it must be noted that such a mitigation technique is not possible in bands above 3800 MHz where the use of FSS-ES is much more extensive.

**Question 6: Do you have a view on any of the two options we identified?**

ESOA believes that both options do not fully address the concern of the FSS-ES operator. If we would have no other option, we would prefer to have the retain Option A (or a hybrid solution). However we are concerned that this option is linked to a review of licensing fees. Presumably this would mean

higher licensing fees which would penalize an incumbent that is operating an FSS-ES. A large increase in licence fees could lead to the same result as option B - removal of existing earth stations.

ESOA generally supports Option A, provided that new mobile licenses are subject to terms and conditions aimed at preventing interference to existing licensed satellite earth station receivers that are recognized under PES licenses and RSA.

Ofcom suggests (para 9.8) that this policy “would likely be combined with policies that could eventually allow for more extensive use of mobile resulting from incremental reductions in usage in this band by fixed links and satellite earth stations”. While we would accept a policy under which an earth station licensee could *voluntarily* accept a “lower benchmark spectrum quality”, we would oppose any policy with mandated acceptance of lower spectrum quality for earth station operators.

If coexistence is possible and the geographical separation are adequate given the relatively low FSS-ES deployment in this band in the UK, there is no need to adopt a policy of *mandatory* incremental reduction as in effect this would be the application of the “Remove” option (Option B) as set out by Ofcom. If interference is mitigated then FSS and MS services should be allowed to operate together within the band and fulfil Ofcom’s stated goal of efficient use of spectrum.

On the other hand ESOA believes that Option B is very surprising and is a damaging proposal by Ofcom, as it goes against Ofcom’s statutory duties to protect incumbent services and encourage competition, and this may be contrary to the requirements prescribed by the EC Decision. Satellite earth station operators may have only a limited or indirect ability to choose which frequencies they receive from the entire 3400 - 4200 MHz C-band. This is because they need to connect to a transmitter, often in other continents, via a satellite. The frequencies used may be determined by the operators of the transmitting station (the satellite operator) based on the propagation characteristics of the bands or availability of satellite capacity, or due to coordination constraints with other space systems.

The exact commercial agreements, and technical constraints, shared among these parties will vary from case to case. In some cases, the frequencies to be used may also change from time to time, leading some earth station operators to seek flexibility to access the entire C-band.

Therefore Option B is not supported by ESOA.

**Question 7: Do you have any quantitative evidence on the costs and benefits associated with the options? This include costs for existing users and/or consumers of existing services associated with potential changes, and benefits to UK consumers in gaining access to mobile services in this band.**

ESOA is aware of studies presented by the mobile community during the study cycle towards WRC-2015 that have looked at the economic aspects of the use of the C-band for mobile broadband (e.g. Plum, Frontier Economics). Such studies have suggested that very high economic benefits would arise from the use of the C-band by terrestrial mobile systems. However, we would like to bring to the attention of Ofcom a research conducted by VVA, a Brussels-based consultancy, which discovered that the claims being made in such studies are based on a flawed methodology, including:

- The impact on existing C-band users and the stakeholders they serve is ignored;
- Economic benefits are overestimated by using auctions on 2.6 GHz - a band with different characteristics - as a benchmark for spectrum value rather 3.5 GHz auction values;
- Country specific factors, obtained by using an inaccurate calculation approach, further inflate spectrum value for many countries used as case studies. Wrong quantifications are then extrapolated for considered regions. These two errors generate a multiplier effect that leads to further overestimating calculated benefits;
- Efficiency gains deriving from the usage of alternative methods to provide capacity are expressed qualitatively but are not quantified. Alternative options to C-band for spectrum usage are ignored.

For Ofcom's reference the result of the study can be found here.<sup>3</sup>

As mentioned above, recent attempts in the UK and elsewhere to build a successful mobile broadband business in this band in the UK and elsewhere have not been successful. Even though the band 3.4-3.8 GHz is now labelled as a "5G" band, there is still doubt as to whether a successful business model can be developed. With this evidence it appears that the benefits of mobile broadband in this band are not so significant as suggested by some in the industry (vendors in particular).

Any (new) studies concerning the costs and benefits associated with the options as proposed by Ofcom would therefore have to be assessed very carefully, taking the elements, as indicate above, into account.

**Question 8: Do you have any other suggestions that would allow widespread 5G availability using the 3.6 to 3.8 GHz band across the UK while allowing certainty for at least some existing users to continue to provide the benefits currently provided by use of the 3.6 to 3.8 GHz band?**

ESOA does not agree with the formulation of the question, as it seems Ofcom is already assuming that some existing users cannot continue to use the band. For our response below we are interpreting the question as follows: **"Do you have any other suggestions that would allow widespread 5G availability using the 3.6 to 3.8 GHz band across the UK while allowing certainty for existing users to continue to provide the benefits currently provided by use of the 3.6 to 3.8 GHz band?"**

FSS services have been successfully sharing with the FS in many places with point-to-point applications. IMT are characterized by a large number of base stations and user terminals, and we would encourage Ofcom to implement a policy where mobile services are using existing spectrum more efficiently rather than identifying new spectrum. Therefore, ESOA is of the view that there is no need to only allow *some* existing users to continue operation. Instead, Ofcom should endeavour to allow all existing 3600-3800 MHz users to continue to provide service in that band. Existing services should be grandfathered and protected.

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<sup>3</sup> [http://www.vva.it/content/Upload/cband\\_study.pdf](http://www.vva.it/content/Upload/cband_study.pdf)



There may be a win-win solution that allows existing services to continue operating in the band while allowing mobile to operate, provided sufficient geographical separation exists, or adequate mitigation techniques are applied.

**Question 9: Do you have any comments in relation to these proposals?**

EC Decision 2008/411/EC<sup>4</sup>, as amended by EC Decision 2014/276/EU, identifies the 3400 – 3600 MHz and 3600 – 3800 MHz frequency ranges for IMT applications within Europe. However EC Decision 2008/411/EC states that sharing with FSS-ES is considered feasible due to the extent of their deployment in Europe, geographical separation requirements and case-by-case evaluation using actual terrain topography. This decision also requires member states to take account of the need for protection of services in the adjacent frequency bands. The adjacent band 3800-4200 MHz is more heavily used by FSS earth stations in the UK and hence licence conditions on mobile systems will be needed to ensure protection of those earth stations.

Finally ESOA would like to make it clear to Ofcom that they should not support any IMT terrestrial wireless use that is outside the scope of the ITU and only adopt measure for the 3600-3800 MHz and no IMT allocation above 3800 MHz.

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<sup>4</sup> Available on the European Communications office (ECO) website at:  
[www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC1106.PDF](http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC1106.PDF).