Ofcom Consultation questions

Improving Consumer Access to Mobile Services at 3.6 to 3.8 GHz

Intelsat Response.

Executive Summary

The C-Band 3.4 - 4.2 GHz 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, the C-band is used for a number of 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 kilometers 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/dishes and the orderly deployment of these links.

The satellite industry depends on continued access to the 3.6 - 3.8 GHz spectrum for future satellite deployments due to continued demand by incumbent and new services. Therefore, if the band is re-farmed for IMT services, it may not be possible 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 is continued unimpeded to ensure long term stability within this band for satellite operators. This will allow the FSS services 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 Intelsat:

Thousands of organizations serving billions of people worldwide rely on Intelsat to provide ubiquitous broadband connectivity, multi-format video broadcasting, secure satellite communications and seamless mobility services. The end result is an entirely new world, one that allows us to envision the impossible, connect without boundaries and transform the ways in which we live. Intelsat operates the world's first Globalized Network, delivering high-quality, cost-effective video and broadband services anywhere in the world. Intelsat's Globalized Network combines the world's largest satellite backbone with terrestrial infrastructure, managed services and an open, interoperable architecture to enable customers to drive revenue and reach through a new generation of network services.

Intelsat is pleased to provide the following response to Ofcom's consultation on improving consumer access to mobile services at 3.6 - 3.8 GHz.

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

The 3.6 - 3.8 GHz 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 including the introduction of High Throughput Satellites (HTS) have made accessing the internet over satellite services a reality, resulting in further growth in data traffic using the 3.6 - 3.8 GHz spectrum due to the coverage attributes that C-band[1] provides today.

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 into Asia, Africa and Latin America. C-band enables coverage of almost one third of the Earth with a single beam. Multiple continents can be covered simultaneously with a single C-band beam, which makes ideally suited for broadcast and cellular backhaul applications.

This brings strategic advantages to the UK because many global networks relies on UK gateway earth stations operating in the 3.6 - 3.8 GHz 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 extensive and highly reliable 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 3.6 - 3.8 GHz 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 amongst terrestrial wireless services and users in C-band 3.6 - 3.8 GHz between FS and FSS will become critical and should be considered a key priority for protection by Ofcom. This is not only a licensing issue but also an issue where appropriate regulatory mechanisms should exist to ensure regulatory certainty and transparency where dialogue between existing users and newcomers is encouraged and facilitated by Ofcom.

It is also important to note that ITU studies (ITU-R Reports M.2109, S.2199 and S.2368) clearly showed that sharing between IMT-Advanced systems and FSS in the 3.6 - 3.8 GHz frequency bands is not feasible/ possible in the same geographic area. Intelsat has long argued that the use of C-band by IMT systems in 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. Intelsat considers that a key

[1] Satellite transmissions in C-band frequencies (3.4 - 4.2 GHz downlink and 5850 - 6700 MHz in the uplink)

priority is the continued sustainable and viable spectrum access to the 3.6 - 3.8 GHz band for the FSS to deliver existing and planned services. The satellite industry continues to grow and innovate, and this requires continued access to the spectrum it currently uses. It is therefore imperative that the needs of the satellite communications industry for viable access to C-band spectrum as allocated by the ITU must be taken into account 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?

We recognise that Ofcom plans to make the 3.6 - 3.8 GHz band available for mobile broadband, which 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 3.4 - 3.8 GHz. This Decision seeks to harmonise the conditions for the availability and efficient use of the 3.4 - 3.8 GHz frequency band for terrestrial systems a shared basis. Intelsat notes that Ofcom has made explicit reference to this EC Decision in Annex 6 of the consultation document. ("Any award of the 3.4 GHz to 3.8 GHz band has to be compliant with the Commission Decision." From paragraph A6.32)

While we take a pragmatic approach to the identification the 3.6 - 3.8 GHz 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 3.4 - 3.8 GHz 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 3.4 - 3.8 GHz frequency band for terrestrial electronic communications networks, in compliance with the parameters set out in the Annex...". On this basis, Option B proposed by Ofcom appears to be inconsistent with the requirements of this Decision.

The designation and making available of the 3.4 - 3.8 GHz band in accordance with the Commission Decision recognizes the fact that there are other existing applications within these bands, such as FSS. Further, the Commission Decision 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 with a Permanent Earth Station (PES) authorization, Option A (the Retain option) is better than Option B (the Remove option). However, it is unclear as to what extent the licensing fees would change if option A is adopted. Depending on the methodology used for calculating the licensing fees, there is a potential for a very high increase in licensing fees for existing FSS PES users. If the fees are excessive, both options would ultimately have the same effect – to remove FSS earth stations from the band - contrary to the requirements of the EC Decision, leading to having 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 3.6 - 3.8 GHz available for future mobile services including 5G. This would entail awarding the remaining 116 MHz of the band for mobile use which is not 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, allowing the coexistence with incumbents such as FSS-ES, as opposed to the two options as proposed by OFCOM, we believe, 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 3.4 - 3.8 GHz band. We note that UK Broadband has stated that they intend to expand their services, to include future mobile broadband services. But the same is also true with FSS services as they look to innovate and expand their 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 to equate for long term and short term threshold. However, we would like to point out that based on the results shown in Table 3 of Annex 5, these only indicate possible interference to FSS-ESs that are in close proximity to London

but do not provide a full accurate assessment and characteristics of other FSS-ES deployments across the UK.

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.

Such an approach could be adopted by Ofcom, where a realistic geographic separation is applied, but on a case by case basis where geographical separation is calculated taking into account the actual operational parameters of the earth station and the base station (e.g., earth station elevation angle, orientation of base station, actual power levels, etc.) Other elements that could be incorporated into this alternative method are the mitigation techniques proposed by Transfinite like site shielding or 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 techniques are not be possible in bands above 3.8 GHz where the use of FSS-ES is much more extensive.

Last but not least, it is equally important that FSS-ES operating in the adjacent 3.8 - 4.2 GHz band are also protected from interference from new terrestrial wireless systems. The EC Decision referred above states in para 3 of Article 2 that: “Member States shall ensure that networks referred to in paragraphs 1 and 2 give appropriate protection to systems in adjacent bands”.

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

Intelsat believes that both options do not fully address the concern of the FSS-ES operators. While we would prefer to have Option A (or a modified solution) we are not sure what the reviewing of licensing fees would mean for this option. Presumably it could mean higher licensing fees which penalize FSS incumbents that. High licensing fees will indirectly force incumbents to migrate out of the band to seek other bands with lower fees.

We would support Ofcom if it decides to adopt 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 is adequate, there is no need to adopt a policy of incremental reduction as in effect this would tantamount to choosing Option B. 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.

As for Option B, Intelsat believes to be an overreaching proposal by Ofcom as it goes against Ofcom's statutory duties to protect incumbent services and encourage competition, and it may be contrary to the requirements prescribed by the EC Decision. One must note that receive earth stations often cannot dictate to select which frequency to use out of 3.4 - 4.2 GHz range because this is ultimately determined by the uplink frequency which may be determined by the operators of the transmitting station. So while theoretically it may be possible to relocate a signal from one frequency to another, in practice, this may not be readily possible due to factors that may not be under the control of the receive earth station licensee.

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.

Intelsat is aware of studies presented by the mobile community which suggest that very high economic benefits would arise from the use of the C-band by terrestrial mobile systems. Intelsat would like to bring to the attention of Ofcom a study conducted by VVA, a Brussels-based consultancy. The study concluded that the claims made by Plum and Frontier Economics (other consultancy firms retained by the mobile industry) on the cost and benefit of making C-band available for mobile IMT services were based on key methodological flaws, including:

- The impact on existing C-band users and the stakeholders they serve is ignored;
- Economic benefits are exaggerated by using the 2.6 GHz auctions - a band with different characteristics - as a benchmark for the valuation of C-band spectrum rather than using the 3.5 GHz auctions, which would be much more relevant;
- Country-specific economic indicators were inaccurately applied to other countries with profoundly dissimilar economic situations. Such overreaching generalizations lead to inflated spectrum valuations for those countries used as case studies. These generalizations were further exacerbated when figures were extrapolated. These two errors generate a multiplier effect that leads to further overestimating the economic benefit of allowing mobile to operate in C-band;
- Efficiency gains derived from the usage of alternative access technology methods to provide capacity are expressed qualitatively but they are not quantified. Furthermore alternative options to C-band for spectrum usage are ignored.

For Ofcom's reference the result of the study conducted by VVA Brussels can be found at VVA Brussels website[2]. A closer look at the methodology by VVA shows that recent studies about mobile services ignore the cost of disruption or loss of services for sectors that get evicted to make room for mobile,

[2] http://www.vva.it/content/Upload/cband_study.pdf, last visited on 22. Nov. 2016

noting that for some applications, the mobile service cannot provide any substitute to the evicted service. Furthermore, the studies use incomparable benchmarks and follow a questionable approach to reach their desired conclusions. More importantly, such studies overlook alternative bands and technologies and rely on unproven technical concepts.

There have been attempts made by mobile operators over the last few years to provide a successful mobile business in the 3.4 - 3.8 GHz band, in the UK and many other countries. In the majority of cases, these attempts have not been successful, and as a consequence business plans 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. 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 touted benefits of mobile broadband as suggested by the mobile industry are overly optimistic. In any case, given the doubts over whether a real business case can be made for mobile broadband in C-band, it would be inappropriate to remove incumbent users.

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?

Intelsat believes that the formulation of the question is inherently biased in favour of mobile because the question makes an implicit assumption that some existing users cannot continue to use the 3.6 - 3.8 GHz band. We believe a better formulation should not make an implicit assumption about the fate of existing users. Rather, the starting principle should be that ***all*** existing users must be protected.

Intelsat is of the view that Ofcom should endeavour to allow all existing 3.6 - 3.8 GHz users to continue to provide service in that band. Existing services should be grandfathered and protected.

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

EC Decision 2008/411/EC[3], as amended by EC Decision 2014/276/EU, identifies the 3.4 - 3.6 GHz and 3.6 - 3.8 GHz 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 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.

Finally, Intelsat strongly believes that IMT terrestrial identification should be made within the realm of the decision of the World Radio Conference to ensure global spectrum harmonization.

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