Improving consumer access to mobile services at 3.6 GHz to 3.8 GHz

Executive Summary:

Consumer data demand continues to grow and the ICT sector is continuing to innovate, so it is necessary that telecommunication operators continue to meet that demand however a technology neutral approach needs to be adopted in order to truly meet this demand. Ofcom should first encourage Infrastructure investment and re-farming of existing mobile spectrum to continue before auction additional spectrum in one go, we are pragmatic of the need to make available additional mobile spectrum however it should not be detrimental to existing services and if any additional spectrum is warranted it should be for "hotspots" during peak periods only.

We take note that the RSPG has identified 3.4-3.8 GHz (part of the existing satellite "C-Band") as the "primary band suitable for the introduction of 5G use in Europe before 2020". However various discussions have already take place in the UK on 3.6-3.8GHz in relation to existing FS and Satellite (FSS) use relative to opening the band up to mobile (IMT-2020) use, we hope that Ofcom can take stock of these discussion and reflect upon them before deciding their next course of action.

What isn't clear yet is when that point is likely to be, how extensively this spectrum may be deployed outside of urban and inner suburban areas, or how much contiguous spectrum may be required to meet demand. Furthermore it is not clear how the course of action described under Option B is consistent with the ECC requirement that service designation in this band should be on a non-exclusive basis and we would ask be grateful for clarification from Ofcom on this point. For example, does Ofcom envisage that spectrum made available for terrestrial service in this band will be licensed on an exclusive basis for 5G?

Intelsat believes that it is important that, where required, the option to protect existing satellite earth stations from undue interference continues to be available given the importance of the traffic that is carried and the benefits that satellite connectivity provides to UK businesses, consumers and government.

Question 1: Do you agree with our proposed approach towards registered fixed link and satellite earth stations users of the 3.6 GHz to 3.8 GHz band?

For the reasons set out further below, Intelsat does not entirely agree with OFCOM's proposed approach towards registered fixed-satellite service (FSS) earth station (ES) users in the 3.6 to 3.8 GHz band.

OFCOM's proposed option goes against Ofcom's own duty and does not respect the spirit of European Decisions.

As set out in our response to the October 2016 consultation *Improving Consumer Access to Mobile Services at 3.6 to 3.8 GHz*, Intelsat does not believe that Ofcom has done enough to address the concerns of FSS-ES operators. Our submission at that time indicated that Option B was an overreaching proposal, as it goes against the decisions of the CEPT Electronic Communications Committee (ECC) and the need to protect incumbent services[1].

While Ofcom is clearly seeking to promote Option B, it should also recognises FSS services and their protection, surely the right direction to take is that existing users should continue to be supported at minimum through localised coordination. It is also noted, however, that in the equivalent German consultation the regulator has avoided an all or nothing 'option A/B' approach by just protecting teleports.

In addition, Intelsat believes that the course of action outlined in Option B is contrary to the requirements prescribed in the European Commission (EC) Decision 2008/411/EC[2], as amended by Decision 2014/276/EU[3], which seeks to harmonise conditions for the availability and efficient use of the 3.4 to 3.8 GHz frequency band.

Article 2 of Decision 2014/276/EU states that 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 *"without prejudice to the protection and continued operation of other existing uses in this band"*.

We also note the conditions set out in the separate ECC Decision (11)06 *Harmonised frequency arrangements for mobile/fixed communications networks (MFCN) operating in the bands 3400-3600 MHz and 3600-3800 MHz*[4] that "CEPT administrations shall designate the frequency bands 3400-3600 MHz and 3600-3800 MHz on a *non-exclusive* basis to mobile/fixed communications networks (MFCN), without prejudice to the protection and continued operation of other existing users in these bands".[5] In addition, the ECC Report 254 *Operational guidelines for spectrum sharing to support the*

[1] While Ofcom's primary duty is to further the interests of citizens and of consumers, when considering the use of the 3.6 – 3.8 GHz band by the FSS it is important to recognise that UK industry stakeholders have international interests which may not directly impact citizen benefits, but will benefit the UK economy and promote UK interests.

[2] Available at www.erodocdb.dk/Docs/doc98/official/pdf/2008411EC.PDF.

[3] Available at http://www.erodocdb.dk/Docs/doc98/official/pdf/2014276EU.PDF.

[4] Available at http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC1106.PDF.

[5] ECC Decision (11)06, at 6 (emphasis added).

implementation of the current ECC framework in the 3600-3800 MHz range[6] notes that "in the case that FS systems are deployed in the band 3600-3800 MHz, there is the potential for interference from FS stations to MFCN base stations and UEs".[7]

It is not clear to Intelsat how the course of action described under Option B is consistent with the ECC requirement that service designation in this band should be on a non-exclusive basis. For example, does Ofcom envisage that spectrum made available for terrestrial service in this band will be licensed on an exclusive basis for 5G? Intelsat would be grateful for clarification from Ofcom on this point.

It is Intelsat's strong contention that the proposed approach towards registered fixed link and FSS-ES users in the 3.6-3.8 GHz band is incompatible with the requirements stipulated by both the EC and the ECC, and is therefore an unsatisfactory way to proceed.

Facilitating coexistence for satellite earth stations in the UK.

FSS-ES are deployed in a variety of locations across the UK, and it is important that Ofcom take this into account; it is one thing to arrange protection for an ES situated in a well-shielded rural area, and quite a different proposition to mandate protection for an ES with beams pointing across urban areas. The two options set out by Ofcom are possibilities, but are blunt instruments. The optimal approach almost certainly lies somewhere in the middle.

For example, FSS-ES and FS terrestrial links in sub-urban or rural areas would be afforded protection, while incumbent users in mega cities and urban areas would need their protection be assessed on a case-by-case basis. If it were determined that protection would be withdrawn, then a suitable notice period – to be determined taking into account the need of incumbent users – would be applied in order to give ample time for a transition with minimal disruption to services. For incumbent users classified as sub-urban and rural, exclusion/coordination zones would be put in place around the sites, which new mobile licensees would be required to respect. The mobile licensee could negotiate with the operators of rural links to modify these zones, as necessary.

Whilst we recognise that this approach would leave a dilemma for Ofcom in specifying which sites fall into which category, that is merely reflective of Ofcom's own statement in Paragraph 1.23 of the Consultation:

"To facilitate continued operation of satellite services in the band where possible, we will explore applying localised restrictions in future mobile licences, where these would not have a material impact on mobile deployment. Such conditions would place technical restrictions on a mobile network operator deploying base stations in the immediate vicinity of satellite earth station sites. In general, we would expect these arrangements to apply to relatively small areas. However, we will consider larger areas if these would not have a material impact on mobile deployment."

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[6] Available at http://spectrum.welter.fr/international/cept/ecc-reports/ecc-report-254-operational-guidelines-sharing-3600-3800-MHz.pdf.

[7] ECC Report 254, at 8.

We therefore urge Ofcom to ensure a technology neutral approach, and ensure growth for both the mobile and the satellite sectors by making sure protection is afforded to incumbent installations regardless of the economic cost of that protection.

Ofcom's proposal for Option B, and the proposed approach with respect to FSS-ES takes away important operational certainty for satellite ES operators.

Ofcom proposes to no longer take into account *registered* FSS-ES with a receive component in the 3.6-3.8 GHz band, and refers in the Consultation to the *net* benefits for citizens and consumers. In Ofcom's proposed approach there is also benefit for terrestrial mobile operators and equipment providers. However, there is *no* benefit for incumbent users of the 3.6-3.8 GHz spectrum. Ofcom proposes an "appropriate" notice period, and from Section 8.8 of the Consultation it appears that by 1 June 2020 FSS-ES operators would need to have made the necessary adjustments to their operations to avoid interference. Intelsat also notes Ofcom's expectation that "most, if not all the benefits currently delivered by services in this band could continue to be achieved using alternative frequencies and technologies".

Intelsat believes such a 2020 migration period as proposed by Ofcom is too short, and reiterates earlier comments that, in fact, reconfiguring FSS receive ES in the 3.6-3.8 GHz band is, in practice, not possible for the following reasons:

- Migration to upper parts of the C-band downlink spectrum would require existing satellite service providers to revisit long-term commercial arrangements with ES operators.
- Migration to other parts of the C-band downlink spectrum could require extensive renegotiation between service providers and satellite operators.
- ES operator's currently using frequencies in the 3.6-3.8 GHz band have limited scope to transition to the upper part of the C-band downlink spectrum, as this band is already extensively used for satellite services.
- There are no guarantees that this time-consuming and costly process will identify alternative C-band capacity, which may result in lapses in, or full termination of, services to customers in the UK and beyond.

Ofcom's proposal to allow full roll out of mobile 5G services in the 3.6-3.8 GHz band does not address any concerns with respect to the impact to FSS-ES operating in the 3.8-4.2 GHz band.

High-power terrestrial IMT/5G transmissions anywhere in the C-band downlink bands could effectively prevent the entire C-band from being used for satellite operations because these terrestrial transmissions can overwhelm the ability of FSS-ES to receive low-power satellite transmissions anywhere in the band, cause intermodulation effects, and create other interference issues. It is not at all certain that such impacts can be effectively addressed through interference mitigation measures, such as filtering, RF screening, and imposition of power limits around receive ES sites. Even if such measures could be implemented, there are actual implementation costs (e.g., costs of upgraded equipment, labour and downtime, among others) and ongoing performance impacts (e.g., installation of a filter to shield the 3.6-3.8 GHz band would reduce performance across the entire C-band receive spectrum) that must be addressed.

In addition, C-band satellite systems are generally designed with hard frequency pairings, meaning that they cannot transmit on certain C-band uplink frequencies if the signals cannot be received in the paired C-band downlink frequencies. Thus, terrestrial IMT transmissions in the 3.6-3.8 GHz downlink band could potentially preclude use of the paired C-band uplink. Similarly, even if a gateway earth station in the UK does not receive communications traffic in the extended C-band frequencies, it must still monitor transmissions in the band sent to remote terminals outside of the UK. The inability for gateways to access the extended C-band spectrum in the UK would effectively preclude them from monitoring and diagnosing communications traffic issues. This would have an immediate impact on service provider's day-to-day operations, and will make it difficult to effectively provide commercial services in this band throughout the region. Any disruption to the C-band services will have a severe impact for countries relying on satellite services for their communication needs, and some service providers that utilize these frequencies (e.g. Vodafone, BBC, BT, etc.) agree that any decision limiting FSS access to the extended C-band will have effects in the UK and beyond. Ofcom should consider these significant additional impacts in its decision-making.

Ofcom's proposed licensing changes raise further questions.

With regards to licensing, we note Ofcom's commitment to "shortly write to licensees and grant holders in the band setting out details of how, under option B, we would propose to implement our proposals by (i) varying existing authorisations for satellite earth stations operating under PES licences and grants of RSA for ROES and (ii) revoking licences for fixed links"[8].

Noting the above concerns about the difficulty of relocating a receive ES signal from one frequency to another due to already implemented design specification of a network, Intelsat seeks clarification from Ofcom on how the actions outlined under Option B can be reconciled with current FSS licensing policy provisions. Specifically, Intelsat requests information from Ofcom on the following points:

i) Will additional grandfathered GES sites be allowed to renew existing licensing?
ii) Can licensees deploy further antennas within the grandfathered GES site?
iii) What compensation is Ofcom planning to introduce for existing users of this band who suffer financial loss as a result of the course of action described in Option B?[9]

Intelsat stated in its response to the October 2016 consultation that Ofcom should endeavour to allow all existing services in the 3.6-3.8 GHz band to continue providing service, and existing services should be grandfathered and protected. Ofcom has not addressed this point in the present Consultation. Therefore, Intelsat asks Ofcom to consider taking steps to ameliorate these concerns before proceeding any further.

Ofcom's statements concerning the 3.8-4.2 GHz band do not provide for an explicit recognition that this band will not be subject of future measures, creating further uncertainty for FSS-ES operators.

[8] *Id*.
[9] Such loses are being quantified through bitrate discussion with teleport operators and services providers.

Intelsat is wary about the precedent being created by the course of action outlined under Option B, and its potential impact on frequencies at the upper end of the C-band downlink spectrum (3.8-4.2 GHz), which are more extensively used by satellite services. Intelsat also is particularly concerned about the potential opening of the C-band to geographical sharing. First, as Ofcom recognises, the 3.8-4.2 GHz band is likely to be used to accommodate migration from the 3.4-3.8 GHz band. Second, there is no evidence that other users need access to the 3.8-4.2 GHz spectrum. Third, these actions would create precedent and sends the wrong signal to other countries. Last but not least, such a sharing would severely constrain any further development of satellite operations in the 3.8-4.2 GHz band.

We note that in para 8.8, 'The proposed variations would not affect the remainder of the licences / grants which would continue to authorise the use of other frequencies (outside the 3.6GHz to 3.8GHz band) as relevant in each case.', this is very important. Ofcom's proposal to allow full roll out of mobile 5G services in the 3.6 - 3.8 GHz band does not address any concerns with respect to the impact to earth stations operating in the 3.8 - 4.2 GHz band. Intelsat believes that in moving to this new model, existing use in the 3.8GHz – 4.2GHz should remain as is and Ofcom should make clear statement on its intention to ensure the regulatory certainty is available for future investment.

Question 2: Do you have any comments on our assessment of the likely costs and benefits of our proposed approach?

If compensation is to be offered, we assume spectrum auction monies to continue to be deposited into Treasury. Therefore regulatory measures should be adopted by Ofcom to ensure that any new terrestrial IMT operators in the band fully compensate incumbent licensees for their relocation costs. Has Ofcom been able to understand the scale of such charges for mitigation or migration activities and discuss these with Government?

For the reasons set out below, Intelsat believes that there are strong arguments for compensation of the costs that ES operations have to incur to migrate, as they might need to make additional investment or lose revenue. **Migration to other parts of C-band is costly, or simply not possible.**

We note in Para 7.48 references movement of FSS services to the 3.8-4.2GHz band, As Intelsat has already explained to Ofcom directly there is very little capacity to migrate customers to the upper band, so in reality, not all services can be migrated. This would then lend credence to a softer version of Option B.

Migration to other parts of the C-band downlink spectrum also would require existing satellite service providers to revisit long-term commercial arrangements with ES operators. Generally, a teleport ES operator enters into a long-term lease agreement with a satellite operator to utilize fixed bandwidth frequency channels on a satellite. Rarely does an ES have unfettered access to the entire uplink or downlink band, but rather it is permitted to use certain frequencies or transponders for the provisioning of services, which must be coordinated on a regional basis given the large footprint of C-band downlink signals. Migration to other parts of the C-band could require extensive renegotiation between service providers and satellite operators. Furthermore, there is no guarantee that this time-consuming and costly process will identify alternative C-band capacity which may result in lapses in, or full termination of, services to customers and end users.

Furthermore Ofcom's statements concerning the 3.8 - 4.2 GHz band do not provide for an explicit recognition that this band will not be subject of future measures, creating further uncertainty for FSS earth station operators.

Studies attempting to quantify the economic value of making the C-band available for terrestrial mobile services tend to be based on methodological flaws, which result in significantly exaggerated economic benefits.

The most common flaws in the economic analysis presented by the mobile community are as follows: i) they tend to underestimate the impact on existing C-band users and the stakeholders they serve; ii) the economic benefits are exaggerated by basing calculations on auctions of the 2.6 GHz spectrum – a frequency band with very different characteristics – as a benchmark to value C-band spectrum; and iii) the efficiency gains derived from the use of alternative access technologies to provide capacity are often underplayed or ignored.

Intelsat notes that there have been recent attempts to establish a mobile business in the 3.4-3.8 GHz band but in the majority of cases these have not been successful, and in a smaller number of cases licenses have been returned to the regulators. Even though the 3.4-3.8 GHz band has now been labelled as a mobile IMT "5G" band, there is still a great deal of uncertainty as to the technical parameters of this technology and the viability of business models developed around it.

As noted above, however, the introduction of terrestrial 5G IMT service in the extended C-band would create significant transition and relocation costs for FSS service providers, as well as affecting existing long-term commercial agreements with satellite operators and customers. These financial burdens should not be born solely by the incumbent satellite service providers. Rather, regulatory measures should be adopted by Ofcom to ensure that any new terrestrial IMT operators in the C-band fully compensate incumbent licensees for their relocation costs.

For these reasons, Intelsat believes that Ofcom's assessments of the likely costs and benefits of the course of action outlined in Option B tend to be overly optimistic and exaggerate the benefits of terrestrial mobile services, and underplay the negative consequence on existing spectrum users and their customers and stakeholders.

Ofcom's proposal sets a concerning precedent by removing current authorisations for incumbent services.

Finally, Intelsat believes that it is important for Ofcom to consider the implications of the course of action described here on spectrum utilization by the satellite industry in other European administrations. As one of the first administrations in Europe attempting to remove current authorisations for fixed links and imposing an ultimatum to registered FSS-ES with a receive component in the 3.6-3.8 GHz band for frequency management purposes, Ofcom's strategy is unprecedented in terms of the potential disruption for existing users of the band. Such actions, if taken on a regional or national basis, will undermine global spectrum harmonisation and could in fact produce similar situation to incumbents in other candidate bands for IMT/5G services.

Intelsat would be grateful for clarification on whether any calculation has been made as to what the implications of this action will be throughout Europe. Ofcom's statement predicts that existing users of the band will be able to migrate elsewhere without incurring significant costs. Our reservations

about this prediction notwithstanding, has Ofcom taken into consideration the potential for a defragmented spectrum allocation across Europe if other European administrations find it difficult to follow a similar course of action due to the potential costs this would entail for existing users of the band.