O3b Limited ("O3b") is a UK-notified satellite operator and the holder of multiple UKSA launch and operations licenses. O3b has long been an active participant in Ofcom consultations regarding satellites and spectrum use, including the related consultations known as the "Spectrum Management Strategy" (SMS), the "Mobile Data Strategy" (MDS), the "below 6 GHz" consultation, and the "above 6 GHz" consultation. O3b is pleased to be able to continue to work with Ofcom by responding to this Call for Input (CFI) on a "Strategic Review of Satellite and Space Science Use of Spectrum".

**Question 1: Do you have any comments on our approach to this review?**

O3b does have some concerns about the "approach" to this review [Q1 above]. Although the CFI claims to "complement" the work being done in other sectors [1.9], its language is phrased as how to "mitigate" demand for satellite spectrum [*see* "About this document"], whereas the language in the 2014 "Mobile Data Strategy" Consultation is phrased as how to "facilitate" terrestrial mobile services. [MDS at 1.1] This subtle difference in approach suggests that Ofcom now sees its mission as the reduction of use of spectrum by satellite services. O3b are thus concerned that Ofcom has already decided that the use of spectrum by space-based services is somehow not as "valuable" to the UK as is the use of spectrum by terrestrial-based services. This despite the fact that only with space-based satellite services can the global telecommunications infrastructure provide truly universal service to the UK and the world.

Furthermore, the UK's goal is to create "the most competitive regulatory environment for space business,"[1] and to encourage investment in the space sector so as to "capture 10% of the global [space] market for the U.K. by 2030."[2] The U.K. has been aggressively searching for ways to become more "space friendly," as exemplified by the 2010 Space Innovation and Growth Strategy (IGS) that culminated in the 2014 Space Growth Action Plan. "Britain is open for business [and] space is a global market," as the Minister for Universities and Science said in the Foreword to the Government's Response to that Action Plan.[3]

Thus, Ofcom now has to opportunity to further the "interests of citizens and consumers"[4] by furthering the interests of the satellite industry that serves those citizens and consumers. Although consumers may only think about the phone in their hands, Ofcom can think about all the interconnected technologies involved (wired and wireless; terrestrial and space-based) in getting those phones connected universally. Ofcom can support communications satellite technologies, which will both benefit the consumer and grow the UK's share of the international space marketplace.

Ofcom is empowered through the Communications Act 2002 to act as an arm of Her Majesty's government, and as such, Ofcom must take a government's broad remit when looking at "value" to its citizens. In the case of spectrum use, Ofcom should not necessarily value market price over other government goals, such as universal access, public safety, disaster and emergency services, or national

[1] Space IGS Restack, Theme 6, December 2013.
[2] Government Response to the UK Space Innovation and Growth Strategy 2014-2030 and to the Space Growth Action Plan April 2014, Foreword.
[3] Government Response to the UK Space Innovation and Growth Strategy 2014-2030 and to the Space Growth Action Plan April 2014, Foreword.
[4] Communications Act (2003) section 3(1).

security. Furthermore, UK satellite and space science companies provide connections from the UK to other countries, as well as services within those countries that cannot be provided efficiently otherwise (such as delivery of BBC news and television, and cellular backhaul via satellite). A spectrum's "highest value" may not be solely based on its market price.

Ofcom is faced with an interesting position, in that it is one of the world's leading regulatory influencers. Ofcom's decisions have far-reaching influence, even as it strives to make the best decision for its own population. O3b encourages Ofcom to also wield its strong global influence on behalf of the satellite and space science industries, which are designed for large-scale regional and global services. Ofcom cannot make a decision about spectrum use without affecting all of Europe and the world.

The scope of the consultation appears to focus on spectrum needs in a narrow local context without taking into consideration the wider implications of spectrum allocations in the global context, particularly when globalization has become the major driving force cross all facets of the economy. The UK public is connected globally by virtue of communications networks, and UK citizens globally are limited in their ability to communicate or conduct business to the extent these networks are inadequate. Satellite services help ensure the reach of UK business (oil and mineral extraction, communication and entertainment networks) and access by UK citizens wherever they may be, by providing connectivity to global markets and in places that are underserved by terrestrial networks. Moreover, satellite networks are very much integrated into the architecture of mobile networks, either to provide backhaul or to further extend those networks geographically.

That said, O3b agrees that the four areas of concentration listed in Question 1 seem appropriate.

1) Regarding Ofcom's proposal to understand current use:

Ofcom is to be commended for noting the "long planning times and lifecycles for satellite and space science investment" [§1.5] and the "international context" for satellites [§2.4]. These are two of the ways in which the valuation of space-based services must be handled differently than the valuation of terrestrial-based services. When considering "geography," commercial communications satellites must be looked at in continental or global terms, both with respect to direct end users and to satellites' role in linking disparate portions of terrestrial networks.

Currently the Ka band frequencies used by O3b are widely used by several UK satellite operators, and the even-higher Q and V bands are being actively considered for commercial services. These higher frequency bands are of the utmost importance and value for satellite communications, and UK satellite operators have already built and launched numerous satellites that will operate in the Ka band for decades. Billions of pounds have been invested in the development of these satellites and the associated ground segment.

2) Regarding Ofcom's proposal to consider trends:

The greatest trend is to be connected at all times in all places. Space-based satellite services may be the surest way to provide that in the UK and the rest of the world. End-users will want to keep their connectivity when they travel, whether they need Internet access on airplanes or ships or abroad. Ofcom needs to be the enabler of this technology by ensuring the availability of spectrum to satellite services that ensure reach to all end-users irrespective of location.

O3b notes that our global constellation serves both of the "future trends" that Ofcom particularly calls out (demand for broadband [§2.8] and ESOMPs [§2.9]), as do other UK-filed HTS systems. Convergence is another obvious trend, and O3b exemplifies that as well, as one of O3b's main services is backhaul of terrestrial-based mobile networks, and another large customer base is the provision of trunking for ESOMPs (earth stations on mobile platforms), made possible by technological advances enabling mobility in the FSS.

The recent developments in technology and the sharp rise in demand for low latency broadband around the globe have ignited interest in non-geostationary satellite systems, another trend led by O3b. Some of the most ground-breaking satellite systems being announced this year are non-geostationary, whether in Medium Earth Orbit (MEO) or Low Earth Orbit (LEO). A key driver is that the lower orbit reduces latency, and allows the satellite systems to be used for interactive applications. O3b's lower orbit and broader bandwidth make it fungible with fiber for backhaul, which is ideal for remote or rugged areas where fiber deployment is difficult, or non-existent. O3b's roundtrip latency can be as low as 65ms mouth-to-ear, and O3b achieves the very highest mean opinion score for voice quality as defined by the ITU, producing clear voice without echo or noticeable speech delay. [ITU Recommendation P.800, *Methods for objective and subjective assessment of quality*, (08/96).]

3) Regarding Ofcom's proposal to consider mitigating technologies:

O3b notes that commercial communications satellites already share spectrum with each other (GSO, NGSO, and MSS), and that most of the FSS and MSS bands are already co-primary either with Fixed Services or other users. Satellites in general use dynamic modulation and frequency re-use and mixed polarizations so as to be doubly and triply efficient; O3b's network reuses spectrum 40 times over on a global basis.

Re-farming or re-purposing of 2G spectrum is also a mitigating action. 2G is being phased out for 3G and 4G use in many places globally.[5]

Antenna design is constantly being improved, both to increase the service quality and to decrease the potential for interference with other systems. The development of flat and phased-array antennas is an example of this.[6]

We encourage Ofcom to support impartial technical studies regarding spectrum sharing and mitigating technologies. We note that the Satellite Applications Catapult might be a fine partner for Ofcom to support such studies and to support the development of mitigating technology.

4) Regarding Ofcom's question about whether any regulatory action is needed:

Ofcom is well-versed in analyzing markets and competition. We are somewhat concerned, however, that the microeconomic forces that guide consumers are being given greater weight in Ofcom's

[5] http://www.therakyatpost.com/business/2015/06/16/the-end-of-gsm-is-nigh/
*See also:*
http://www.iicom.org/resources/regulatory-watch/1660-singapore-joins-2g-switch-off-club
[6] http://spacenews.com/37101o3b-enlists-kymeta-for-flat-panel-antennas/
*See also:*
*http://www.satellitetoday.com/telecom/2012/02/01/agile-apertures-antenna-and-beam-technologies-redefining-satellite-landscape/*

decision-making than the macroeconomic forces that affect the UK economy on a global scale. Although consumers may only be concerned with the impact on their wallet, Ofcom's obligations to UK consumers extend beyond that: Ofcom must look at the larger picture and the longer term and must make decisions that will elevate the UK economy vis-à-vis the world. Any regulatory action must be taken with the global positioning of the UK economy in mind. In this respect Ofcom should look to measures that will grow the UK's share of the global space industry, rather than localized policies that may yield only short-term benefits. Any regulatory action that Ofcom takes must ensure the continued global allocation of FSS spectrum on a primary basis, and support of ITU initiatives for ESOMPs.

**Question 2: Do you have any comments on our broad overview of the satellite sector set out in this section? In particular, do you have comments on the completeness of the list of applications, their definitions and their use of the relevant ITU radiocommunications service(s)?**

The CFI seems to divide satellite services into either "direct to consumer" or "not direct to consumer," which implies that "direct to consumer" is the baseline. This does the UK consumer a disservice by depicting satellite services as stand-alone and divorced from the global communications infrastructure. Such a depiction would be inaccurate, as it would leave out the important role that satellites play in the global telecommunications infrastructure. O3b provide a network that connects developed and undeveloped markets that benefits the economies of both. We bring all of the applications that fiber supports (voice, data, video, business and consumer communications, data file transfer, entertainment, online learning, e-health and ecommerce) to parts of the world that cannot receive them any other way. That allows UK-based companies to serve new markets, bringing them opportunities for growth, and it provides a utility for economic and social development for emerging markets where the UK has interests.

There are also several significant satellite services that are not listed, such as trunking, cellular backhaul, and fiber back-up (redundancy) or extension.

Satellite services are an integral part of the global communications infrastructure, and satellite is the most practical technology at the edge of many terrestrial networks because of the characteristics of broad coverage and high quality. O3b has added the element of fiber equivalent performance, which makes the utility even greater. O3b's network directly enables the provision of terrestrial mobile services in many markets by providing fiber-like connectivity in areas that are either not served or underserved by fiber. As mobile networks increasingly rely on backhaul to manage network traffic, satellite networks are indispensable to efficient operation of national and global communications networks.

O3b – unlike some traditional satellite services – is not a technology of last resort. It is a fully capable fiber alternative. It is an example of how satellites both complement and enable provision of services over terrestrial networks, well beyond the CFI's narrow characterization of satellite as merely back-up or traffic overflow for traditional landline telephony networks.

The consultation's characterization of certain 'end user' applications also tends to minimize the current scope of satellite services, and does not take into account that connectivity demands for satellite services will grow apace with ever-greater demands for bandwidth for terrestrial applications. In other words, both the size of data demands, and the size of groups or geographic areas seeking broadband

connectivity, are growing exponentially, and those demands will be met by satellite as well as other communications networks.

The global communications infrastructure is characterized by large main trunks between developed centers which "fan out" to smaller cities and rural areas with lower capacity links. It is these extensions of terrestrial networks that satellite serve well, and both consumers and businesses in those areas will experience the same growth in demand for broadband data that businesses and consumers in densely populated urban areas do. O3b is uniquely able to scale capacity for this exponential growth.

Consumers now expect to be connected everywhere, and increasingly resist the idea that connectivity will be limited based on location. Accordingly, airlines increasingly rely on satellite to ensure that passengers are connected on-board. In Europe, the development and adoption of ECC decisions and ETSI standards for ESOMPs for FSS (both GSO and NGSO) are indicative of consumer expectations of connectivity irrespective of location, and of the role of satellite in ensuring that this connectivity will be available. Demand drivers for ESOMPs mirror those for land-based mobility, i.e. the ability to stay connected irrespective of location. It follows that spectrum demands for satellite services will grow and must be met in order to meet growing demands for connectivity.

Although the UK has committed to provide superfast broadband to 95% of UK homes and businesses by 2017[7], Ofcom's CEO, Sharon White, noted that to serve the last underserved 5% will entail a combination of wireless and satellite, and that encouraging investment in technology is the only way to find an overall solution to universal service. [8]

As an illustration of the potential size of demand from consumers, O3b connectivity is currently being provided to vessels on a scale not seen before. A new generation of Royal Caribbean cruise line ships is carrying more than 6500 passengers and crew on each vessel; passengers on these vessels demand and can receive through access to the O3b system the same fiber-like connectivity they expect on land.

The CFI could be more forward-looking in anticipation of both commercial and non-commercial demands for satellite services. Its reference to disaster relief, for example, references only the communications needs of humanitarian aid and support. However, more recent experiences of humanitarian crises indicate that the masses of people affected by such crises are increasingly relying on their own personal mobile devices for assistance. This trend will generate demand not only for access to mobile networks, but for satellite networks to support or in many cases supply network connectivity. In many disasters the terrestrial infrastructure is damaged or wiped out. Satellite is the quickest and most viable method for providing a temporary infrastructure that supports all communications, both for disaster logistics (first responders) as well restoration of connectivity to affected communities (consumers and local institutions).

**(Question 3 only applies to space sciences.)**

[7] https://www.gov.uk/government/publications/the-digital-communications-infrastructure-strategy/the-digital-communications-infrastructure-strategy

[8] Evidence of Sharon White before the Commons Select Committee, 14 July 2015, at minute 11:15:52. http://www.parliament.uk/business/committees/committees-a-z/commons-select/culture-media-and-sport-committee/news-parliament-2015/evidence-ofcom-15-16/

**Question 4: Do you have any comments on our representation of the value chain for the satellite sector? How do you think industry revenues are broken down between players at different positions in the chain?**

O3b's role in the value chain is as a satellite operator that enables other telecommunications providers to deliver their services, be it to consumers, businesses, governments, etc. In other words, O3b is a "carrier's carrier". Our multi-satellite constellation is one of the most novel and cutting-edge architectures developed in the last decade. As a non-traditional satellite network, O3b has been able to compete with fiber as well as traditional geostationary satellites.

It is worth noting, however, that O3b's next generation system is being designed to be more accessible to smaller enterprise and businesses. This will be done by increasing the system efficiency (therefore lowering cost to users) and by investing in new ground systems technologies that simplify access. Thus, the next generation of O3b's system stands to play a bigger role in the telecommunications value chain. It is a widely known fact that enabling smaller businesses is one of the key drivers for economic growth.[9] It is also an established fact that Internet access spurs economic growth.[10]

**Question 5: What is the extent of your organisations' role(s) in the value chain? Which satellite applications (as summarised in Table 1 in section 3) does your organisation:**

- **use;**
- **provide: or**
- **help to deliver?**

**Please list all applications that apply and your role in each in your response.**

In our first year of operation the kinds of services we can provide and help deliver continue to expand. Overall the value O3b brings is in the ability to:

- expand addressable markets for businesses,
- decrease time to market,
- fulfill government universal service obligations,
- improve reliability of telco services, and
- support the offering of new services such as 3G, LTE, HD Video streaming, and cloud-based apps to geographies that could not have supported them without high performance satellite connectivity.

O3b operates a multi-satellite constellation, currently operating 12 satellites, but expects to contract for eight additional satellites by year-end. The satellites are in a circular, equatorial, non-geostationary, medium Earth orbit, which as discussed above permits low latency and fiber-like performance. O3b provides applications such as trunking, cellular backhaul (2G, 3G and 4G), and maritime mobile communications. O3b provides direct provisioning of terrestrial mobile networks, and extension of fiber

[9] "*SMEs: The Key Enablers of Business Success and the Economic Rationale for Government Intervention,"* BIS Analysis Paper Number 2, December 2013, available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/266304/bis-13-1320-smes-key-enablers-of-business-success.pdf

[10] "*How is the Internet Fueling Economic Growth in the Developing World? New Research,"* available at: http://journalistsresource.org/studies/society/internet/internet-contribution-firm-development and referring to a 2015 study, "Overcoming Obstacles: The Internet's Contribution to Firm Development," available at: http://wber.oxfordjournals.org/content/early/2015/04/14/wber.lhv010.abstract

networks. Among O3b's customers are local telephony providers; mobile network operators; large enterprises such as the oil and gas and mineral extraction industries; and government services such as e-government, higher education, e-health, universal service, and disaster relief.

As referenced above in the context of the growth in demands for mobility and broadband connectivity, demand for O3b capacity is strong and growing. For this reason O3b is already planning construction of eight additional satellites for its current constellation. Potential uses of O3b spectrum cannot always be predicted – service to cruise lines did not figure into O3b's original business plans – and in fact can be expected to expand as the capabilities of the system are better understood by the market. O3b capacity is very dynamic, in that its steerable beams can be deployed – or re-deployed – rapidly to address changing supply and demand in any region covered by its satellites.

For expansion to meet new connectivity demands of consumers, the satellite sector continues to invest in technologies enable deliver of broadband irrespective of location, including steerable satellite beams, highly directive antennas, and flat-panel electronically steered antennas. The increasing emphasis on mobility means that satellite services are distributed not just to network and service providers, but to separate commercial sectors like aviation and airline passenger services, maritime passenger services, and to any other sectors requiring broadband connectivity on mobile platforms. ESOMPs in this context should be considered a nascent sub-sector of the industry, which is fully expected to expand as additional platforms are identified as needing broadband connectivity.

***Question 6: For each of the satellite applications you use, provide or help deliver (as identified in Question 5), and taking into account your role in the value chain, where applicable please provide:***

- ***the specific spectrum frequency ranges used for each application, distinguishing between the frequencies used for service provision, for the feeder / backhaul links and for TT&C ;***

O3b uses Ka band for its user, gateway, and TT&C links. O3b's usage of spectrum cannot be localized or "boxed" geographically – O3b is a global system that can operate anywhere. O3b uses 17.8-18.6 GHz and 18.8-19.3 GHz for downlinks and telemetry; and 27.6-28.4 GHz and 28.6-29.1 GHz for uplinks and command frequencies.

As is the case with any satellite system, the TT&C frequencies occupy a small fraction of the spectrum used for the provisioning of services.

It must be noted that O3b plans to use additional spectrum in its future satellites. O3b expect to expand into the 19.3-20.2 GHz and 29.3-30 GHz bands in order to expand its service offerings and to take advantage of the different ITU regulatory provisions that govern each band.

- ***the coverage area for services links; or, in the case of TT&C and feeder / backhaul links, the location of the gateway station(s);***

O3b's service area is global between roughly 45 degrees north and south of the equator. O3b has nine gateways around the globe (some of which also provide TT&C): Sunset Beach, Hawaii, USA (service and TT&C); Vernon, Texas, USA (service and TT&C); Lurin, Peru (service and TT&C); Hortolandia, Brazil (service); Sintra, Portugal (service); Nemea, Greece (service and TT&C); Hawkesbay, Pakistan (service); Perth, WA, Australia (service and TT&C); and Dubbo, NSW, Australia (service).

- ***the estimated number of users (e.g. MSS terminals, DTH subscribers, FSS earth stations);***

As O3b's customers are themselves large communications companies and large corporate enterprises, it is difficult to estimate the number of end-users. O3b notes that the entire populations of many island nations are the end-users of O3b's spectrum. O3b's customers include the main telecoms operators on American Samoa, Christmas Island, Cook Island, East Timor, Easter Island, the Galapagos Islands, Madagascar, Micronesia, Norfolk Island, Palau, Papua New Guinea, and the Solomon Islands, thus serving some millions of end users.

O3b is also offering service to tens of thousands of end-users on the Royal Caribbean cruise ships; on oil and gas platforms in the Gulf of Mexico and the Gulf of Guinea; and throughout the countries of Chad, Colombia, the Democratic Republic of Congo; Somalia, and South Sudan.

- ***an estimate of the average use by end user (for those applications for which the demand for spectrum is driven by end user traffic); and***

As O3b does not serve end users directly we will not have these metrics. However, O3b serves major telcos and ISPs so a reasonable proxy would be the average usage for any large mobile network operator rolling out 3G and LTE services in a new area. Rapid user adoption means that the data usage grows very rapidly to a higher level than typical 2G users. O3b would carry that aggregated traffic for its MNO customers from a remote or rural area to a major internet peering point.

- **for applications for which the demand for spectrum is driven by other factors, please state what the factor is and the scale of the factor (e.g. for DTH TV the number of TV channels broadcast by format).**

Simply stated, the explosive growth of the Internet and bandwidth-hungry applications is the dominant driver for spectrum demand for satellite services.

**Please provide your response with respect to the UK, the rest of Europe, and other parts of the world where this may be relevant to UK use.**

O3b is currently providing service to a major cruise ship whose home port is Southampton, even though our original satellite architecture was optimized for 45 degrees north. In the future, O3b is planning ways to provide coverage to more of the UK and Europe, even though O3b's original business plan called for serving the "other 3 billion" users around the world without good access to the internet (it was not originally planned for O3b to serve such fiber- and mobile-rich regions as Europe and North America). Expanded coverage would give O3b the ability to better integrate the provision of service between UK and Europe and the "other 3 billion."

**Question 7: For each of the satellite applications you provide, please could indicate how UK consumers and citizens benefit from their use? Where possible please also provide an indication of the scale of the benefits (either qualitatively or quantitatively).**

Although Ofcom has shown itself to be aware of the inherent regional and even international nature of satellite services, Ofcom should be cautious that its desire to protect and promote the interests of "UK consumers and citizens" does not unintentionally lead it to ignore the importance of satellite

communications to the interests of UK consumers and UK interests globally. For example, any UK enterprise (which is comprised primarily of UK citizens) with business in Africa, South East Asia or South America likely benefits from satellite communications. Any action taken internally to the UK must harmonize globally, so as to ensure the broadest possible connectivity to support UK interests globally and to afford the UK's own satellite operators the chance to compete in the global market.

O3b's next round of satellites will help expand our geographic coverage. For UK consumers this could mean greater access to O3b capacity, beyond the maritime service already in place (at Southampton for the Royal Caribbean Cruise Line). In Europe, even with existing coverage, O3b maritime service is planned to expand beyond the five countries currently served.

**Question 8: From your perspective, what high level trends will affect the satellite sector in the coming years?**

At a very high level, the growth of the Internet, and the Internet of Things, particularly wireless, is certainly the key driver that will affect the satellite sector, and other telecommunications sections, on the demand side of the equation. This demand will stimulate innovation on the supply side in order to simplify technology and make it more accessible to users while at the same time lowering the cost for users. Such trend is exemplified by the number of new entrants in the non-geostationary satellite systems arena, all of whom recognize the need for broadband and are therefore stepping up to the challenge.

Nonetheless, the competing demands for spectrum by the various telecommunications applications create regulatory uncertainty that may stifle the growth of certain telecommunication sectors. Sound spectrum policy will dictate that adequate spectrum resources be available for all components of the international telecommunications infrastructure, to ensure that the connectivity expected everywhere by end-users can be delivered.

**Question 9: For each of the satellite applications you use, provide or help deliver what you see as the a) current demand trends; and b) underlying current and likely future drivers of demand for the satellite application(s) your organisation uses or provides? Please include in your response for both a) and b) above:**

- **the scale and future impact of the trends/drivers on demand;**
- **any variations in the type and scale of trends/drivers by geography (i.e. in the UK, the rest of Europe, and other parts of the world where this may be relevant to UK use) and why;**
- **whether future demand is expected to be temporary or intermittent, and the reasons for this. In your response, please provide any evidence which supports your position on the drivers of demand (e.g. forecasts, studies and statistics).**

Please see O3b's answer to Questions 1 and 8 above.

**Question 10: Taking into account the drivers you have identified in your response to Question 9 above, what (if any) challenges is your organisation concerned about in meeting potential future demand? Please provide the information by application and band, along with any supporting evidence, if available.**

Access to spectrum is one of O3b's greatest challenges. We have enormous unmet demand for our services already, and could easily sell more beams if we had them. Any regulatory uncertainty around spectrum to which O3b already has access, or to expansion spectrum for a future constellation, would seriously impair O3b's ability to meet this demand.

**Question 11: Do you have any comments on the list of potential mitigations we have identified? What likely impact would each of the mitigations have on spectrum demand? E.g. what order of magnitude increase in frequency re-use might be achieved? To what extent do you believe that these mitigations apply only to certain applications?**

It is unlikely that the advanced and expensive mitigation techniques cited here will be implemented near-term globally. This means that should spectrum already allocated for satellite services be designated for sharing in a way that burdens incumbent satellite use, the solution in markets that do not implement mitigation techniques (due to expense, or lack of readily available network intelligence) may simply be band segmentation, or less spectrum for all services using the band.

**Question 12: What other mitigation opportunities do you foresee that we should consider? For what applications are these likely to be applicable and what scale of improvement are they likely to deliver?**

Cognitive radio (CR) technology promises to increase the efficiency of spectrum utilization. It may also enable opportunistic use of spectrum without impact to current incumbent. For example, studies have shown that Ka band spectrum allocated exclusively to the fixed service in Europe may in fact be usable by satellite receive earth stations, providing certain mitigation techniques are adopted such as CR or dynamic spectrum management techniques. However, the current regulatory framework in Europe does not allow or provide a regulatory status for such use. (http://www.cept.org/files/1051/Tools%20and%20Services/Public%20Consultations/2015/Draft%20ECC%20Report%20232%20for%20PC.doc)

**Question 13: Beyond the activities already initiated and planned for the satellite sector (e.g. as part of WRC-15), do you think there is a need for additional regulatory action that may, for example, help your organisation to address the challenges it faces? In your response, please indicate what type of action you consider may be needed and why, including any evidence to support your view.**

O3b must mention the hurdles faced at WRC-15 and WRC-19 despite Ofcom's dismissal of these as outside the purview of this CFI, as these WRCs will dictate and control the industry's use of spectrum for decades. There is no other more pressing regulatory action. Ofcom simply must support its growing satellite operator industry by refusing to allow exclusive access for IMT and by protecting those bands already used by incumbent satellite operators from encroachment from terrestrial mobile service which cannot share.

For this reason O3b would also argue against an IMT spectrum identification at Ka band for WRC-19.

The “non-interference basis” (NIB) for ESOMPs is a barrier to growth of the mobility sector. Technological advances (antenna directivity/innovation) together with extensive study and careful spectrum planning (ECC Decision + ETSI standard) should warrant a higher status of ESOMPs-based services under an ITU framework. It is neither logical nor prudent to have such services operate commercially but on a non-interference basis in an environment of rapid supply-side growth fueled by order-of-magnitude growth in demand for broadband connectivity everywhere.

Finally, O3b encourages Ofcom to bolster its technical staff. Although Ofcom is well-suited for economic and competition analyses, Ofcom’s growing responsibilities as an ITU filing administration for satellite systems requires its spectrum engineers be experienced in as broad a range of services as possible, from all the industries that use spectrum. The expected introduction of additional NGSO systems, as well as the study of introduction of various terrestrial services in bands allocated to satellite services, will place new demands on Ofcom’s expertise in the satellite and space science industries, to enable Ofcom to make informed decisions about what is best for these industries.

As a concluding note, O3b truly hopes to continue working with Ofcom on how best to grow the UK satellite and space industry, and O3b hopes that Ofcom’s intentions towards this industry are in fact “space friendly.” Otherwise, the UK’s influence over satellite policy regionally and globally can be expected to wane as operators choose to establish satellite networks and systems with other countries within the satellite’s footprint whose regulations and policies are more welcoming.

With kind regards,

Ruth Pritchard-Kelly
Director, Regulatory Affairs