Response from UKSA to Ofcom consultation on "The future role of spectrum sharing for mobile and wireless data services"

This document has been prepared by the UK Space Agency (UKSA).

General points

The UK Space Agency (UKSA) are pleased for the opportunity to comment on the future role of spectrum sharing for mobile and wireless data services.

Our principle concerns are over the expansion of the use of WiFi and RLANs in the 5 GHz band which is allocated to EESS on a primary basis. The UK space agency and its predecessors and the Met Office have invested heavily in spacecraft that use this region of spectrum. Much of the 5GHz band is already allocated to WiFi, with some restrictions to protect remote sensing. The 5 350 – 5 470MHz segment is the only spectrum currently guaranteed to be free of interference from WiFi and RLANs and has been the focus of our investment in to satellite based synthetic aperture radars (SAR) by the European Space Agency and through the EU Copernicus programme. The major applications of SAR data of interest to the UK Earth observation community are:

- Global stress/strain mapping and related work on geohazards – in particular measuring surface displacements due to earthquakes and volcanic activity.
- Forest cover and forest cover change monitoring
- Flood extent monitoring
- Ice monitoring in polar waters
- Glaciology including movements and changes of heights of ice sheets
- Sea level, state and ocean circulation

The EU has identified GMES/Copernicus as one of its two space flagship programmes alongside Galileo. The joint investment by the EU and ESA in GMES until 2013 will exceed €3.2 billion of which the space component represents €2.3B. In 2014-2020 the expected new investment in Copernicus will be €3.8B plus €1.2B to develop the next generation of Sentinel satellites. We have UK interests in both the data and in the development and construction of the space segment and have already invested £400M in the programme and expect to invest a further £600M by 2020.

A cost benefit analysis[1] undertaken for the Commission in 2011 estimates that GMES will deliver benefits at least twice the investment by 2020 and four times by 2030. A related socio-economic benefit study[2] undertaken in 2011 states that the discounted benefits aggregate is in the order of €120 billion over the period 2014 – 2030; and based on the same cost base in both studies, the benefit-cost ratio (BCR) is about 10. This implies that for every £1 of tax payers money invested in GMES, the citizen receives the equivalent of £10 public benefits back.

Our main priorities in the future programme are for the development of services (particularly for climate change information) and the maintenance of existing observational capabilities (as opposed to developing entirely new missions, as being funded in the current budget). These elements account for the vast majority of the proposed budget.

The UK space industry, both in satellite manufacture and downstream services, is a UK success story and a major focus of BIS' growth strategy. The Space Innovation and Growth Strategy aims to increase UK space turnover to £40Bn by 2030, creating 100,000 high skilled jobs. GMES/Copernicus will be a stimulus to growth by delivering long-term and reliable observations on which business can

[1] The full report can be found at:
http://ec.europa.eu/enterprise/policies/space/files/gmes/studies/ec_gmes_cba_final_en.pdf

[2] The full report can be found at:
http://www.espi.or.at/index.php?option=com_content&view=article&id=758:25-november-2011-espi-report-39-on-the-socio-economic-benefits-of-gmes-online&catid=39:news-archive&Itemid=37

develop value added environmental and security services into the global market. Businesses have so far struggled to establish themselves in this because of the lack of such observations and the high investment costs which could not be borne by the private sector acting alone. The funding will also sustain growth in the upstream hi-tech space sector with the manufacture of repeat satellites and instruments.

In addition, the UK leads in Europe in the rapidly growing area of added value services based on Earth observation data with over 50 companies[3] employing around 400 highly qualified staff by 2012.

Our belief is that all of this UK investment, approaching £1B by 2020, and the much larger downstream benefits would be placed at risk if EESS observations can not be made due to interference from IMT and RLANs. We fear that if WiFi is permitted in the 5 350 – 5 470 MHz bands, a significant capability provided by the SARs on Sentinels 1 and 3 will be lost and we therefore ask Ofcom to ensure existing and future EESS use of this band is fully protected.

Responses to Consultation Questions

Our response to this consultation is limited to issues in relating to sharing with space based sensors, we do not feel it appropriate for UKSA to comment on the accuracy or otherwise of capacity requirement forecasts or on the future applications of Wi-Fi in the band. We therefore have not commented on these aspects. However, we would wish to point out that even where a band is specified for indoor use there is always a risk of accidental or illegal outdoor use and this use has the potential to cause severe and unacceptable interference to the Earth Exploration Satellite Service (EESS). We understand the ITU are currently considering a 5% accidental outdoor use factor which could result in significant and unacceptable interference to SARs. Consequently we do not consider the introduction of license exempt equipment with a limitation to indoor use being sufficient, in the real world, to protect EESS and fear the effort required to police indoor only use may become a significant burden of EESS operators and on Ofcom. Additional mitigation factors may be needed to protect EESS which we assume would be included in a new standard should the 5GHz band be extended. There is a precedent for this as DFS mitigation is already mandated in 5 GHz Wi-Fi standards to protect Meteorological Radars. We note from recent industry reports that in several cases, non-compliant equipment has been placed on the market which has caused unacceptable interference to Met Radars. It is difficult to see how such equipment can be stopped from entering the country and we would be interested to understand how Ofcom intend to police this and prevent its use. We are also concerned that although indoor use is specified, the term indoor is not clearly defined and this could permit inappropriate use, for example in buildings where the construction of the building and the materials used result in very little indoor to outdoor attenuation.

Question 2: Will an extension of the 5 GHz band be required if Wi-Fi is to play a sustainable role in meeting the growing demand for indoor wireless connectivity?

No comment on the Wi-Fi requirement but we do note that the 5 350-5 470 MHz section which has been identified in this document, is an extremely important band for remote sensing, an area where the UK have made considerable investments and where investment has been concentrated because it is the only segment left that can be expected to be free of interference from Wi-Fi systems. We note indoor only use is expected be we do not see from the document how Ofcom propose to enforce indoor only use and how accidental or deliberate outdoor use will be detected and eliminated.

Question 5: Will the increased deployment of Wi-Fi access points outdoors create a risk of reduced quality of service performance over the longer term and, if so, will approaches to co-ordinate access point performance be able to mitigate this risk?

[3] ESARC "A survey into the State and Health of the European Services Industry" September 2013, http://earsc.org/file_download/155/Industry+Survey+final+report+Sept2013+%C2%A9+EARSC.pdf

While the consultation document mentions the potential for intra-Wi-Fi system interference where there are a large number of uncoordinated, license exempt access points deployed, in its solution it appears to have given little consideration to the effect of this on the incumbent users of the spectrum. We find this disappointing as although the development of ubiquitous broadband is important, so are the applications of the incumbent users sharing the spectrum, including EESS. We agree that co-ordination will be required to prevent direct interference to EESS operations and to prevent an uncontrolled longer term increase in the noise floor which will be difficult to detect and could lead to false data. We feel much more emphasis needs to be placed on mitigation able to guarantee the protection of EESS.

Question 7: Which frequency bands are most likely to be best suited to providing geographical shared access, including via a geolocation database approach, for use by mobile broadband, for example small cells and M2M applications?

We note here that to protect space use a geo-location database is of limited value unless it also contains and makes use of information to allow systems to be disabled during satellite overpasses. The database therefore needs to be aware of all the EESS satellites and their orbits. This database will need to include many satellites from global agencies and will need regular updating as spacecraft orbits change due to orbital manoeuvres, atmospheric drag and the introduction of new systems. We doubt such a database would be practical, but would be interested to see the proposals.

Question 8: Would access to these bands best be realised through licensing or licence exemption?

Our opinion is that for a potential extension to 5 GHz the use of license exemption is inappropriate. A full licensing regime will be needed in order to protect the incumbent services. Should interference occur, full licensing will allow sources of interference to be more readily identified and the interference eliminated. As we know from the experience of interference in the passive bands at 10.6GHz, once license exemption is introduced it is very difficult and time consuming to clear the band should there be interference problems.

Question 10: Do you believe DSA could play an important future role in the future in enabling a better quality of service and low barriers to spectrum access alongside conventional licensed and LE spectrum approaches?

DSA clearly has potential to facilitate spectrum sharing, but it will require great care in implementation. There may be opportunities to use spectrum when it is known that EESS is not active over an area, but there are several pitfalls. As noted in our response to Question 8, any use of geo-location would also need to be aware of EESS use and be regularly updated and we have the potential for non-compliant equipment to enter the market and the well known difficulties in subsequent enforcement should this happen. An appropriate DSA system may appear to users to have reduced QoS when it ceases transmissions during satellite passes in order to protect EESS. Frustrated users may be tempted to disable the protection.

Question 11: What barriers still remain to the realisation of cost-effective sensing appropriate for low-cost consumer devices and what activities are ongoing to try to address them?

There is a fundamental problem in the sensitivity of low cost equipment to detect the weak wideband signals transmitted from spacecraft. The cumulative interference effect is important and the field of view of a SAR is relatively large compared to the coverage of a Wi-fi system which means there are potentially many Wi-Fi systems cumulatively able to cause interference. Due to the scanning nature of EESS SAR it is unlikely that a DFS implementation would be able to react quickly enough to detect and then cease transmitting in time to protect the sensitive SAR receiver, which is moving rapidly over the terrain.

Question 13: What role should Ofcom play, if any, to support the development of DSA and relevant technologies?

We believe Ofcom should take a strong regulatory role with respect to the 5GHz extension in order to fully protect the incumbent EESS services. This will require considerable effort in ensuring compliance in equipment and deployment and in enforcement of the regulations. The UK has made significant investment into EESS and derives considerable public benefit from the data.

Question 14: Do you have any other views on any of the issues discussed in this consultation?

See general comments.

Question 16: What are the potential benefits of using a geolocation database approach for short-term access to spectrum for R&D and how would you see this working from a practical perspective? Are there alternative approaches that could deliver similar benefits?

Please see our response to Question 8.