

Ofcom Consultation - Hybrid sharing: enabling both licensed mobile and Wi-Fi users to access the upper 6 GHz band

Executive Summary

JRC and its Members welcome the opportunity to respond to this consultation and as critical system operators JRC Members depend on access to spectrum and as such are pleased that one of Ofcom's considerations regarding sharing of the upper 6GHz band considers the usage of fixed links by the utility sector.

The fixed links used by the utility sector in the upper 6GHz band support mission critical communication links supporting the real time control and monitoring of electricity system assets. Any impact on quality or availability of these links will impact the stability of the electricity distribution grid and in certain circumstances could result in power outages. To this end, we are seriously concerned that insufficient importance is being attached to the stable operation of mission critical fixed links when compared to the perceived socioeconomic benefits of incremental enhancements to consumer grade Wifi or LTE connectivity.

Whilst Ofcom has proposed some interesting and innovative methods for protecting incumbent users from interference caused by adjacent WiFi and / or LTE systems, from a JRC perspective it is not important which technology is deployed – they both represent a source of interference to 6GHz fixed links. Unfortunately, JRC remains to be convinced of the effectiveness of the proposals including several variations of 'keyhole' shaped exclusion zones, real time sensing and automated database look-ups and cross referencing. It is JRC's opinion that all three proposed methods for interference mitigation are open to significant failings coupled with errors in timing information, location information and straightforward breach of any new regulations which would in practice be very difficult to implement and police. Where interference occurs between LTE and WiFi services the result would likely be a minor inconvenience to consumer grade, 'best efforts' connections which would easily be mitigated in real time by devices switching to another Wifi access point or alternative LTE frequency. This would not be the case if point to point links suffered interference – the identification of interference and resolution could take days or weeks (requiring on site measurements) and in the interim there would be an impact equivalent to the electricity company's control centre having no remote control or monitoring of parts of their network.

JRC recognise that there is a global initiative to explore the potential for LTE and WiFi services to be introduced in the upper 6 GHz and welcomes Ofcom's perspective that more work is required in this area of hybrid sharing and is actively participating in the work within CEPT. To this end, we direct Ofcom to the significant work carried out in North America in connection with the likely impact on thousands of 6GHz links operated by the members of the Utilities Telecoms Council in the United States. Numerous representations have been made by UTC¹ to both FCC and US Government backed up by detailed measurements which indicate that even low power WiFi installations are capable of creating harmful interference to fixed links several kilometres away.

In the event that a hybrid sharing arrangement is established, for LTE and Wifi in the 6 GHz band, then we encourage Ofcom to ensure that the regime it adopts is appropriately robust to ensure the continued use of the band for critical system applications as per those existing in the energy networks – where availability can not be compromised by increased interference. Otherwise Ofcom will be effectively sterilising the band to the incumbent fixed link application which would be unjustified and effectively a regulatory failure.

¹ <https://utc.org/6ghz/>

In summary JRC believes that whilst hybrid dynamic spectrum sharing may be an option for consumer connectivity on LTE and Wifi networks, it is not at this time compatible with fixed links carrying mission critical traffic.

Background

Joint Radio Company Ltd (JRC) is a wholly owned joint venture between the UK electricity and gas industries specifically created to manage the radio spectrum allocations for these industries used to support operational, safety and emergency communications.

JRC manages blocks of VHF and UHF spectrum for Private Business Radio applications, telemetry & telecontrol services and network operations. JRC created and manages a national cellular plan for co-ordinating frequency assignments for several large radio networks in the UK.

The VHF and UHF frequency allocations managed by JRC support telecommunications networks to keep the electricity and gas industries in touch with their field engineers. These networks provide comprehensive geographical coverage to support installation, maintenance and repair of plant in all weather conditions on 24 hour/365 days per year basis.

JRC's Scanning Telemetry Service is used by radio based Supervisory Control And Data Acquisition (SCADA) networks which control and monitor safety critical gas and electricity industry plant and equipment throughout the country. These networks provide resilient and reliable communications at all times to unmanned sites and plant in remote locations to maintain the integrity of the UK's energy generation, transmission and distribution.

JRC supports the European Utility Telecommunications Council's Radio Spectrum Group, and participates in other global utility telecom organisations. JRC participates in European Telecommunications Standards Institute (ETSI) working groups developing new radio standards, and European telecommunications regulatory groups and workshops.

JRC also manages microwave fixed link and satellite licences on behalf of the utility sector.

JRC works with the Energy Networks Association's Future Energy Networks Groups assessing ICT implications of Smart Networks, Smart Grids & Smart Meters and is an acknowledged knowledge source for cyber-security in respect of radio networks.

JRC's Detailed Response to Questions

Q 1. Hybrid sharing could mean that the upper 6 GHz band will be used for mobile outdoors, and Wi-Fi indoors. What are your views on the priorities for each of these two services, assuming that suitable coexistence mechanisms are developed?

Q 1. JRC Response

Confidential? No.

JRC are not concerned with the differences between WiFi and LTE in outdoor Vs indoor implementations. From a JRC perspective both technologies and all deployment scenarios represent a real and increased interference threat to mission critical fixed links – as demonstrated in Ofcom's own desktop analysis and through field measurements carried out by UTC in North America.

Q 2. Hybrid sharing could mean that the upper 6 GHz band will be used for mobile in some locations, and Wi-Fi in others. We would like feedback on the priorities for each of these two services, assuming that suitable coexistence mechanisms are developed.

a) From the point of view of mobile, is the upper 6 GHz band most useful to provide outdoor coverage, or indoor coverage? Is it most useful in urban areas, or in those base stations that are currently carrying more traffic, or some other split?

b) Similarly, what are the priorities from the point of view of Wi-Fi deployments?

Q 2. JRC Response

No comment.

Q 3. What are your views on a modified AFC or SAS-type approach to enable hybrid sharing? What additional work do you think would be required?

Q 3. JRC Response

Confidential? No.

JRC believes that both AFC and SAS type approaches would have shortcomings when preventing mutual interference between WiFi and LTE systems and would be completely inadequate to protect mission critical fixed links from interference. As indicated in our answer to question 4 any of these approaches has vulnerabilities coupled with inaccurate timing and / or location information.

Q 4. How could existing access protocols and sensing mechanisms be leveraged (i.e., those in Wi-Fi or 5G NR-U) to enable hybrid sharing?

Q 4. JRC Response

Confidential? No.

Existing protocols in 5G NR and Wifi could be utilised to an extent but both have limitations and dependency on external timing and position information which would leave interference to fixed links almost a certainty. The accuracy and availability of timing and position information is limited and by the time any interference issues are identified by such technology then disruption to a mission critical link would have already have occurred. (The 'beacon' signals utilised in WiFi are a good example of this)

Q 5. What mechanisms could potentially enable device-to-device connectivity?

Q 5. JRC Response

No Comment

Q6. If hybrid sharing is eventually adopted, and requires licensed mobile to operate at medium power, in what way would mobile networks use the upper 6 GHz band?

Q 6. JRC Response

No comment

Q 7. How would you suggest that the mechanisms presented here can be used, enhanced, or combined to enable hybrid sharing or are there any other mechanisms that would be suitable that we have not addressed?

Q 7. JRC Response

Confidential? No.

JRC does not believe that the mechanisms can be used to facilitate interference free operation with mission critical fixed links.

Q 8. Assuming the future of the band includes indoor use for Wi-Fi and outdoors use for mobile:

- a) how could this be achieved without creating or suffering interference?
- b) could there be a combination of technical adjustments such as power limits and other mechanisms (including databases or sensing mechanisms)?

Q 8. JRC Response

Confidential? No.

- a) No Comment
- b) JRC would not be comfortable with location data of microwave link ends being shared with operators of 3rd party databases as their locations often coincide with critical national infrastructure sites.

Q 9. We are interested in input about the importance of the upper 6 GHz band for its incumbent users, and on the potential impact of hybrid sharing of the band.

- a) What evidence do you have on whether incumbents are likely to coexist with hybrid sharing of the band with mobile and Wi-Fi? Are there unique advantages of the upper 6 GHz band for these uses?
- b) What are your views on the initial analysis we have conducted around hybrid sharing and coexistence with incumbents?
- c) For any incumbent uses that you view as unlikely to be able to coexist, what alternatives are there? What are the barriers that might prevent those alternatives?

Q 9. JRC Response

Confidential? No.

- a) *As discussed elsewhere in this response JRC does not believe that the introduction of WiFi or LTE services in this band is compatible with utility use of fixed links. The fixed links are designed to very high availability (99.999x%) through a combination of specific RF engineering, equipment diversity and rigorous maintenance regimes. The unique properties of U6GHz are two fold – (i) specific long range microwave propagation (> 60 km) which is difficult to achieve in other microwave bands (ii) in many cases there are no other frequencies available in other frequency bands such as 7.5 GHz, 4GHz or 13 GHz.*
- b) *We agree with Ofcom’s analysis that both LTE and Wifi solutions in this band would be highly likely to cause harmful interference to 6GHz fixed links. Even if large exclusion zones were introduced around link ends (keyhole shaped as suggested by Ofcom) then the control and enforcement of this would be very difficult given the likely proliferation of low cost devices on the market and Ofcom’s limited resources to identify interference. We would encourage Ofcom to consult the work conducted (including analysis and measurement) by UTC in North America².*

² <https://utc.org/6ghz/>

- c) *The most likely options are either migration to an alternative frequency band of microwave link or installation of fixed fibre connectivity between the two link ends. Both options are expensive and time consuming. For a replacement microwave link between two end points there is the pre-requisite that an alternative frequency is available in another suitable microwave band which has suitable propagation characteristics for the length of the link. There is significant cost associated with replacing an U6 GHz link comprising structural work, large parabolic antennas (>1.8 metre) and waveguide installation. For a fibre optic replacement the remoteness of either one or both ends of the microwave link from existing fibre optic connectivity defines the largest cost element of the replacement, as well as complexities and delays in achieving permits and wayleaves.*

Q 10. Do you have any other thoughts that you would like to share about hybrid sharing in the upper 6 GHz band, or about hybrid sharing more generally and its potential for applications in other bands?

Q 10. JRC Response

Confidential? No.

Hybrid sharing solutions may develop sufficiently in time to support introduction of both LTE and Wifi type solutions in a range of bands but they are unlikely to be compatible with mission critical fixed links. JRC would recommend that future considerations for hybrid sharing should be constrained to introducing WiFi into existing LTE bands or vice versa which would avoid major disruption to mission critical users.

Q 11. Do you have any other comments to make on these proposals or on the future use of the upper 6 GHz band?

Q 11. JRC Response

Confidential? No.

If new services are to be introduced in U6GHz requiring migration of existing links then JRC would encourage Ofcom to engage with all users of mission critical links in order to fully understand the associated costs of migration in order that a funding mechanism could be put in place to cover the significant costs of any changes.