

Notice of Ofcom's proposal to make regulations in connection with the award of 2.3 GHz and 3.4 GHz spectrum

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Abstract — This paper highlights the need for Ofcom to consider the auction for 3.4 GHz to apply to cities, town centres, and places of public focus such as stadia, stations and out of town shopping centres. Ofcom should retain rural areas for licensing WISPs.

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1 Introduction

Cambium Networks welcomes the opportunity to respond to the consultation on the auction of 2.3 and 3.4 GHz spectrum. We will restrict our comments to 3.4 GHz since that is where we have most knowledge.

Spectrum is a valuable national commodity and it is Ofcom's responsibility to enable the best use of that commodity. It is also necessary for Ofcom to help to implement government policy where possible. In this case government is trying to implement a policy of Broadband for all through BDUK but this consultation fails to help BDUK by omitting any reference to the WISP industry. (See presentation from Chris Townsend to UKWISPA 18th January 2017)

We believe that an auction in the manner proposed leaves a huge missed opportunity. We believe that the spectrum should be enabled for dual use, with the same frequencies being used by mobile operators and fixed operators in separated localities. (See section 4)

The auction is being pushed forward to enable manufacturers and operators of 5G systems to know that this spectrum will be available to them. It is noted that, product is not yet available for use in this band. Unfortunately, uncertainty concerning spectrum availability will delay the availability of product. Thus, we do not wish to delay the auction unnecessarily, we merely wish to propose that the licensing conditions are modified to align with the applications and use cases which the mobile operator will actually want and use. This spectrum is unlikely to be usable for rural mobile operation and so should not be licensed for that purpose. The opportunity is to divide areas of the country into high and low density. Ofcom should restrict the mobile operator to areas of high density and retain the low density areas for rural broadband. The supply of licenses for rural broadband can be left to another consultation although this is much more urgent than the mobile requirement.

Ofcom will note that Cambium responded to the consultation "Improving consumer access to mobile services at 3.6 to 3.8 GHz" and that all of the comments made in that response also apply to the 3.4 to 3.6 GHz band.

2 Background to the need for 3.4 to 3.8 GHz for business and residential broadband in the rural economy

After attending a meeting with Ofcom on 26 January 2016, it became obvious that Ofcom do not realise that the only way to deliver on government policy to provide access to broadband for the 4 million people who do not currently have access is to provide that access predominately by wireless.

Unfortunately a study by Analysys Mason commissioned by Ofcom and delivered in November 2016 titled "Estimating the cost of a broadband Universal Service Obligation" incorrectly dismisses FWA as a contender for part of this. It did it by not considering the various technologies (FTTC, FTTP, FWA, Satellite) as complementary to one another each having its own niche. It is clear that FWA can delivery superfast speeds efficiently and the coverage of Dartmoor and Exmoor is testament to that fact. Occasionally there will, for instance, be a need to use satellite when other alternatives are not able to reach the premises. 3.4 to 3.8 GHz is an ideal frequency for delivering the majority quantity of FWA for broadband. As described there is a relatively large spectrum available at high power. Currently most FWA is provided by 5.8 GHz where there are restrictions on power, the need to abide by DFS requirements, and to observe the notch for RTTT. These restrictions lead to there only being one useable 40 MHz channel available in the 5.8 GHz band. They also lead to restrictions in range and the ability to penetrate lines of trees. Tree penetration is easier at 3.5 than 5.8 GHz and the increased power increases the probability of penetration.

The fact that there is only one 40 MHz channel means that there is no opportunity to use separate channels to give frequency reuse. There seems to be an urban myth that LTE can deliver three times the capacity by using the same spectrum three times on a three sectored cell site. This is simply untrue. If the sectors are being used simultaneously then there is interference from one sector to another. This interference reduces the capacity from three times to approximately one and a half times. In addition this is shared capacity where the Erlang effect may cause an overall reduction in efficiency which offsets the 50% increase in capacity.

2.1 The need for this band in rural broadband delivery

It might be argued that FWA is providing a useful service in the 5.8 GHz band despite the restrictions mentioned above. Unfortunately, the operators are delivering on the need to provide coverage of the 4 million people on the basis that only 30% or so will take up the service in the first year. The expected take up of superfast will increase substantially in the second and third years partly because of the consumers extricating themselves from existing contracts and partly because of more services being available. This parliamentary briefing dated Aug 2016¹ gives an insight from BDUK on the take up rate of the new superfast services. There is a danger of failure if the 3.4 to 3.8 GHz band is not provided to rural service providers on favourable terms.

3 The need for 3.4 to 3.8 GHz for mobile.

The mobile operators do not need this spectrum now. Unlike the FWA industry the mobile industry is very well funded and consequently able to lobby for more and more spectrum. Ofcom need to look carefully to understand whether and when this is really required. The FWA industry has had to apply the most advanced wireless innovations to enable broadband delivery in the small bandwidths available. In particular, Cambium and Mimosa are delivering MUMIMO solutions which increase

¹ http://researchbriefings.files.parliament.uk/documents/SN06643/SN06643.pdf

capacity in the spectrum available by factors of greater than three. Cambium's 14×14 solution is being used on about 100 FWA cell sites in USA and Italy with deployments in many other countries almost immediately. The number of FWA cell sites increase every day since the product launch in September 2016. Figure 1 shows how Cambium have been increasing this sector capacity in 20 MHz over 12 years.



Figure 1 Cambium downstream capacities available in 20 MHz bandwidth by year.

By contrast, the mobile devices through 4G have been able to receive MUMIMO signals but the infrastructure has not provided MUMIMO. If mobile really needed the spectrum then they would have already deployed LTE advanced. As it is, to my knowledge there are no MUMIMO mobile basestations in use globally. Indeed there does not appear to be a plan to deploy LTE advanced until 2020. It seems illogical to bow to the demands of the mobile industry for more spectrum until the current spectrum is used efficiently.

FWA needs this spectrum today and if it was provided today it would be used with only a few months lead time since FWA product is available for use in this band from many companies. The band is available for FWA access in many countries.

It has been stated in a letter to me from Sharon White that 5G *could* solve the rural broadband problem. Unfortunately "could" is not good enough for the rural community who need superfast broadband today. The government requires farmers to prepare their returns on line. Many businesses have to have an online presence

in order to compete. BDUK are commissioned to deliver the capability to 2 million new people by the end of this year. 5G will likely not become a reality for 10 years.

I have not found a definitive use case for mobile use of this band. It is likely only to be necessary for city high streets, stadia and stations.

4 The missed opportunity

As explained previously the 3.4 GHz band and the adjacent 3.6 GHz band are ideal for the purpose of Fixed Wireless Access in rural areas. The bands also have use for increasing mobile bandwidth in town centres, railway stations and stadia. These two applications are inclusive rather than exclusive and can be allowed to coexist. The consultation document does not recognise the need for both uses to be enabled. There is no provision for geographic licensing.

The lost opportunity is that mobile operators will only want the spectrum for use in the high density environment. Propagation for mobile is very different than for fixed. Simply put:

- 1. mobile antennas are typically 1.5 m above ground,
- 2. mobile antennas have -8 to -5 dBi gain,
- 3. coverage is required everywhere in the coverage space,

Whereas:

- A. fixed antennas have gains of 18 to 25dBi,
- B. fixed antennas can be deployed at 7-15 m above ground, and
- C. fixed antennas can be placed in the best location without requiring to provide large individual coverage space.

The consequence is that:

- a. mobile technology is very unlikely to be used in rural areas at 3.4 GHz,
- b. mobile technology will be used in areas where public density is high and will consequently need more spectrum,
- c. fixed technology is uncompetitive in urban environments because cable, fibre to the cabinet and fibre to the home is not as expensive to deploy and generally gives higher speeds.
- d. recent deployments in the UK (Dartmoor and Exmoor as an example) have shown how effective using fixed wireless to deliver broadband to villages, farms and small businesses can be.

The mobile operator has a very different business from the fixed wireless broadband operator. Mobile is well established and requires national coverage of service. In order to provide ubiquitous coverage they will deploy the spectrum most suitable for long range coverage in rural and use all the frequencies available to them in urban to get the required throughputs. Sometimes the urban deployment will require the use of these higher frequencies of 3.4 GHz in order to provide larger bandwidths to the target coverage area.

Fixed wireless is not so well established but has received interest from government because it can provide broadband coverage to rural communities. The fixed wireless operator is normally focussed on out of town areas where there is little competition from other technologies. Operators tend to be focussed on very small areas of a few villages up to regional areas. There are no national operators (although there is a national license holder).

It has been acknowledged that the rural FWA operator is essential to provide the final 5-10% of broadband service in the UK². The evidence is in the provision of subsidies from BDUK to enable the broadband service to be provided in rural areas. The government is promoting the digital economy and, for example, now require that farmers make returns on-line. Service is sometimes provided by the mobile infrastructure using EE's 4G service. This is the exception rather than the rule, and while data rates can be high the subscriber cost can be prohibitive for large data quantities. FWA technology is designed for higher speed and higher quantity access which is enabled through the use of high gain antennas on houses.

The only spectrum available to WISPs (excluding UK Broadband) for longer range deployment is at 5 GHz. There are two bands (which have different regulations) available;

- one is at 30 dBm EIRP 5.470 to 5715 MHz (the 5.4 band), and
- the other is at 5715 to 5795 and 5815 to 5850 using 36dBm EIRP (the 5.8 band).

The 5.4 band is only really suitable for in-village distribution because of the low power while the 5.8 band provides Line-of-Sight ranges of about 5 km. The 5.8 band is difficult to use efficiently because of the split nature. There are only 4×20 MHz channels or 1×40 MHz channel. Since the 5.8 band is lightly licensed it can be subject to interference, as can the 5.4 band. Both bands are subject to intermittent service since the 5 GHz user has to make way for radar when present.

The opening of 3.4 and 3.6 GHz band to Fixed Wireless Access for broadband would transform the businesses. I anticipate that an EIRP of 40 to 50 dBm would be allowed and this would enable excellent coverage into very rural areas. As an example

² http://ukwispa.org/wp-content/uploads/2017/01/Chris-Townsend-UKWISPA-18-January-2017 -slides.pptx

it is likely that Dartmoor and Exmoor could have been covered with a substantial reduction in the number of masts than were actually required.

5 Conclusion

The WISP industry in the UK have made exceptional use of the 5 GHz bands to deliver service to 20,000 subscribers or more, it now urgently needs access to the 3.5 GHz bands in order to flourish and deliver to the remaining 4 million subscribers.

It seems that Ofcom considers that the ability to pay for spectrum is a good indicator of the usefulness of that spectrum for a particular application. That might be an unreliable indicator in some circumstances.

The government apparently believes that broadband is useful in rural communities, and is unwilling to leave provision of that service entirely to market forces, to the extent that operators are presently supported in bringing broadband to rural subscribers. It makes more sense to consider the total cost to taxpayers to provide broadband access in areas where fibre and copper do not presently reach. Revenue for spectrum auctions should be considered together with the cost of subsidising universal service.

6 References

- Presentation to UKWISPA by Chris Townsend of UKBD³
- Report on Universal service from Analysys Mason⁴

³ http://ukwispa.org/wp-content/uploads/2017/01/Chris-Townsend-UKWISPA-18-January-2017 -slides.pptx

⁴ https://www.ofcom.org.uk/__data/assets/pdf_file/0027/95580/annex6.pdf