

Comments:

Overall, the proposed release of this band, and the resulting creation of a contiguous 57-64GHz band, is to be welcomed. Its use for high-capacity point to point communications should stimulate the further development of equipment aimed at the enterprise communications market. The one issue its proposed release opens up, however, is that of co-existence with the existing light-licensed 64-66GHz band. Successful resolution of this issue would allow both bands to be used which, given their different attributes, and therefore uses, would maximise the positive socio-economic impact of mm-wave technology in the UK.

Question 1: Do you agree

a) With the proposal shown in figure 1 to combine the existing 57-59GHz band with the new 59-64GHz band for Fixed Wireless Systems?

Yes

b) That the CEPT channel plan given in ECC/REC/(09)01 should not be mandated with the exception of two 100MHz guard bands at the band ends to protect adjacent users?

The absence of a channel plan for 59-64GHz, and for the resulting 57-64GHz band is entirely consistent with the envisaged use of this band – high capacity, short-hop point-to-point data links. A channel plan is usually proposed and adopted only when interference avoidance (between users of the same band) is an issue. Given the levels of atmospheric absorption within this band, and in particular, the average level of absorption across the band, such an avoidance mechanism does not seem necessary – though logically, there is a limit to this argument as deployment densities increase (see answer to question 3). It is important to note, however, that the atmospheric absorption figure of 15dB/km is (as stated) a peak value. Furthermore, this is a narrow-band absorption characteristic, with a peak at 60GHz. As shown in figure 3 of Annex 6 of the consultation document, the typical absorption figure at the upper band edge (64GHz) is around 8dB/km⁽¹⁾.

The fact that the absorption at the upper band edge is significantly lower than at the centre of the band (down by 7dB, or more than a factor of 4 in absolute power terms) does not challenge the logic underpinning the absence of a channel plan. The argument for this remains strong, in view of the high average absorption level across the proposed extended 57-64GHz band. However, it would appear to challenge the decision to recommend only a 100MHz guard-band at the top end. The figure of 100MHz appears to have been taken from the present arrangements for 57-59GHz – see top-half of

figure1 of the consultation document. However, in the 57-59GHz case, this guard-band is at 59GHz, where atmospheric Oxygen absorption is around 13dB/km⁽²⁾. This is 5dB greater than the corresponding figure at 64GHz (a factor of 3 in absolute power terms). Logically, the width of any guard-band needs to take into account the level of absorption that affects signals within it – the lower the absorption, the wider the guard-band (the negative slope in the atmospheric absorption would offset the positive slope in the attenuation of a stop-band filter mechanism). This suggests that Ofcom's laudable aim of ensuring co-existence of 57-64GHz (the proposed expanded license-free band) and the pre-existing light-licensed 64-66GHz band will necessitate the widening of the proposed guard band at 64GHz. Purely by way of illustration, doubling this upper guard-band width to 200MHz would lead to a reduction in available bandwidth within the proposed band, of only 1.5%. Such a reduction in frequency bandwidth would seem a small price to pay for ensuring co-existence with the neighbouring band. This issue is felt to be important, as an analysis of likely use-cases for 57-64GHz and 64-66GHz would indicate that co-location, or near co-location of equipment operating in these bands is not unlikely – were it to be, then there would be no logical argument in support of any 64GHz guard band.

- (1) Several versions of the atmospheric Oxygen absorption characteristic exist in the public domain. Some of these show the absorption level at 64GHz to be as low as 6dB/km. This is some 9dB down on the peak absorption – a factor of 8 in absolute power terms.
- (2) Appreciating that the graph is included for indicative purposes only, it would however appear that in the atmospheric absorption graph shown in figure 3 of Annex 6, the line purporting to represent 59GHz is actually at 58GHz. Given the slope of the absorption characteristic at these frequencies, this could give a false estimation of absorption level at 59GHz – indicating it to be closer to 9dB/km, rather than 13dB/km.

Question 2: do you agree that a maximum EIRP limit of 55dBm together with a maximum transmitter output power limit of 10dBm are the minimum technical conditions required to allow flexible use of this band by FWS while maintaining adequate protection for other services?

No response at this stage

Question 3: do you agree with a license exempt approach for the 60GHz band?

A license exempt approach is entirely consistent with the envisaged use of the 57-64GHz band, in view of the average atmospheric absorption across the band. However, it would appear logical to assume, that as some localised deployment densities increase (e.g. building to building links in business parks where each building is a multiple occupancy building) there will be a limit to the deployment density for equipment operating in a license-exempt band,

and without a mandated channel scheme. Requirements for high density deployments would, however, be addressable through the use of the light-licensed band, 64-66GHz, where the use of the light-licensing database registration system, provides the level of link co-ordination necessary to ensure interference-free operation under high-density deployment scenarios. This appears to be the logical use-case separation between the two bands (57-64GHz and 64-66GHz) being facilitated by the differences in licensing regime. In light of this, what is being proposed by Ofcom in terms of license exemption for 57-64GHz appears both rational and workable.