

Implementing Ofcom's decisions on the 57 – 71 GHz band

Notice of proposal to make the Wireless Telegraphy (Exemption and Amendment) (Amendment) (No. 2) Regulations 2018

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1 Introduction

I am grateful for the opportunity to comment on the proposed Regulations to extend the top of the '60GHz licence-exempt band' for fixed wireless services upwards from 66 to 71GHz. Unfortunately, there are a number of shortcomings in the Interface Requirement IR2078, which forms an integral part of these regulations. Some of these affect the compliance of the Interface Requirement with the Radio Equipment Directive, and must therefore be addressed before the Statutory Instrument is published.

I have reviewed the draft Regulations from the perspective of the potential use of the 66-71GHz band by track-to-train wireless systems to provide broadband connectivity to rail passengers. This band is promising for this application, because it is not currently used and is unlikely to be a pioneer band for deployment of 5G by mobile operators.

2 Response to Consultation Question

Q: Do you have any comments on the drafting of the Proposed Regulations in Annex A1?

Although the question only refers directly to the draft Statutory Instrument in Annex A1, this SI includes dated normative (mandatory) references to the two Interface Requirements IR 2030 and IR 2078. In the language of the Radio Regulations, these Interface Requirements are "incorporated by reference", and therefore an integral part of the draft Regulation.

The proposed Regulations in Annex A1 of the consultation implement the Statement correctly, but the proposed modifications to IR 2078 in Annex A3 do not deliver the intended outcome, because:

- i) The 66-71GHz band is outside of the scope of the ETSI Standard that is referenced, which therefore cannot be applied without further information in the IR. Without this, there is no information on Essential Requirements such as spectrum emission mask.
- ii) The technical provisions in this IR are based on mm-wave technology from more than a decade ago, which cannot be applied to the current mm-wave technology that Ofcom expects would be deployed now.

Section 4 of this response discusses these shortcomings in more detail, and Section 5 proposes how to address them.

3 Background

The Government has stated its view that "High quality services on heavily loaded, high capacity trains, would require at least 1 Gbps to each train today - this would support video-

streaming to several hundred passengers. Given the expected growth in passenger demand, a realistic, future-proofed approach would be to target backhaul of tens of gigabits per train, particularly on the busiest routes.”¹ Realistically, the spectrum bandwidth needed to deliver such bit rates is only available at mm-wave frequencies. I believe that the 66-71GHz band is the most promising band for this application², because it is currently not used³ and is unlikely to be a pioneer band for deployment of 5G by mobile operators.

The Interface Requirements that Ofcom proposes to amend are based on standards that are a decade old. They are based on technologies for implementation that are now obsolete, and cannot be applied to the new technology of active array antennas, which would be used by any new deployments including track-to-train wireless systems. A small modification to the technical conditions in the Interface requirement would provide the regulatory clarity needed to facilitate the development of fixed wireless systems for operation in the 66-71GHz band (this would also overcome difficulties in conformity testing, described below).

I am pleased to see in Ofcom’s statement on fixed wireless services⁴: “Regarding the need to consider trackside to train applications at 60 GHz, Ofcom is currently considering the spectrum options for supporting trackside to train applications and is planning to shortly publish its advice to DCMS on the spectrum aspects of trackside connectivity solutions.” Ofcom should ensure that the proposed Regulations facilitate the deployment of track-to-train wireless networks and other types of fixed wireless system in the 66-71GHz band; this would not prevent Ofcom from subsequently making specific Regulations for trackside connectivity solutions, if these were needed.

4 Analysis of shortcomings of Interface Requirement IR 2078

4.1 Reference documents and technical operating parameters

In the current version of IR 2078, there are two references; ECC Recommendation (09)01 and EN 302 217. The scope of these documents does not include the 66-71GHz band ; Rec. (09)01 applies to 57-64GHz and EN 302 672 is effectively limited to either 57-066GHz or 71-86 GHz through the frequency ranges applicable to Annexes H, I and J of EN 302 217-2. It is therefore necessary to define the technical conditions, such as unwanted emissions, that apply in this frequency range. The ideal way to do this would be through a national standard, but it is sufficient to describe in the Interface Requirement how to apply the existing ETSI standard EN 302 217 to this frequency range.

¹ Commercial options for delivering mobile connectivity on trains: Call for Evidence; DCMS and DfT; December 2017:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/670551/Commercial_options_for_delivering_mobile_connectivity_on_trains__Call_for_Evidence.pdf

² See “Spectrum and Technologies for Connectivity to Trains”; Simon Pike, LS Telcom Spectrum Summit 2018; http://www.spectrum-summit.com/fileadmin/content/SS/presentations/Panel1_Martin_Sims/2018_Spectrum_Summit_Simon_Pike.pdf

³ In its consultation on “UK preparations for the World Radiocommunication Conference 2019” (7 June 2018), Ofcom states that “The 66-71 GHz band also appears to have no operating users”.

⁴ Review of spectrum used by fixed wireless services: Our decisions to enable future uses of fixed wireless links; Ofcom, 5 July 2018

4.2 Notification to the Commission

The proposed use of 66-71GHz by fixed wireless systems is not an EU harmonised frequency use, and will therefore need to be notified to the Commission in accordance with Article 8 of the radio Equipment Directive 2014/53/EU. Row 14 of Table 3.1 of the IR is intended for the reference to this notification.

4.3 Applicability of EN 302 217 to current mm-wave technologies

EN 302 217 was first published in 2004, and is based on the mm-wave technology available at that time – a single transmitter feeding an antenna (probably a dish) via waveguide – indeed, section 8.1.1 of EN 302 217-1 has a detailed description of different shapes of waveguide flange (connector). However, current products will employ multi-element active arrays which integrate transmitter and receiver electronics directly with the antenna array.

Clause 5.3.1.1 of EN 302 217-3 specifies that “The clause that gives the test methods for the transmitter power and transmitter power tolerance is clause 5.2.1 of EN 301 126-1”. This clause of EN 301 126-1 references a system block diagram for which the transmit power is measured at a single point (Reference Point B’ or C’). However, as Ofcom notes in the Statement⁴: “Our understanding is that phased array antenna implementation of equipment operating at EIRP levels above 40 dBm includes consideration of cascading existing phased array antenna designs to achieve the higher gain.”. In this case, there is no reference point to make a conducted power measurement. The power amplifier in an individual phased array is also likely to be closely integrated with the antenna elements, so that there is no way to break the connection for measurement. It is therefore not possible to measure the RF transmit power of current mm-wave equipment according to this standard.

In the Statement (paras. 3.31 to 3.35), Ofcom considers the potential impact of revising the limit of +10dBm conducted power on co-existence with other services. However the Ofcom consultation on WRC-19 states that “The 66-71 GHz band also appears to have no operating users”. Therefore, the concerns expressed by Ofcom about co-existence do not apply to this band⁵ - there can be no risk of interference if there are no users.

It is therefore not justified or proportionate to apply +10dBm conducted power limit to the 66-71GHz band. Not doing so would avoid the difficulties in demonstrating conformity to this requirement, and would allow more effective use of this band by microwave wireless systems.

4.4 Geographic restrictions

I assume that the geographic restrictions in Table 4.1 of IR 2078 do not apply to the 66-71GHz band, given the statement by Ofcom on the lack of occupancy of this band³.

⁵ Wideband data transmission systems and fixed wireless systems, which Ofcom proposes to authorise for 66-71 GHz band, will be licence-exempt, operating on a non-interference, no protection basis. They will also generally operate in different environments – one indoor, the other outdoor. Therefore, there is no need to study co-existence between these systems or between equipment of one of the systems,

5 Implementation of proposed solution in IR 2078

To address the shortcomings identified in Section 4 of this response, I suggest that a new table of minimum requirements is added to IR 2078 for the frequency range 66-71 GHz, instead of attempting to add the divergent requirements for 54-66 GHz and 66-71 GHz into the existing table. A proposal for the two tables is given below. The new table for 66-71 GHz has the following differences to the existing table:

- There is information on how to apply EN 302 217 to a frequency range outside of its scope.
- Information on the Interface Notification to the Commission will be added.
- The limit for conducted power is not included, to allow conformity testing of current mm-wave equipment and because it is not needed for coexistence reasons in this frequency range
- The locations where transmission is forbidden are omitted, as they do not apply to this band.

Table 3.1: Minimum requirements for the use of: FWS operating in the 57.1 – 66 GHz band		
Mandatory (1-10)		
1	Frequency band(s)	57.1 – 63.9 66 GHz
2	Radiocommunication Service	Fixed
3	Application	Fixed Links
4	Channelling	
5	Modulation / Occupied bandwidth	
6	Direction / Separation	
7	Maximum Transmit Power / Power Density	Maximum transmit power of 10 dBm and a maximum EIRP of 55 dBm. Minimum antenna gain of 30 dBi. Transmission not permitted in certain areas (See table 4.1)
8	Channel access and occupation rules	
9	Authorisation regime	Licence exempt
10	Additional essential requirements	N/A
Informative (11-13)		
11	Frequency planning assumptions	
12	Planned changes	
13	Reference	ETSI EN 302 217 - Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas. ECC Recommendation (09)01 - Use of the 57 - 64 GHz frequency band for point-to-point fixed wireless systems.
14	Notification	
15	Remarks	None

Table 3.2: Minimum requirements for the use of: FWS operating in the 66 – 70.875 GHz band

Mandatory (1-10)		
1	Frequency band(s)	57.1–63.9 66 – 70.875 GHz
2	Radiocommunication Service	Fixed
3	Application	Fixed Links
4	Channelling	
5	Modulation / Occupied bandwidth	
6	Direction / Separation	
7	Maximum Transmit Power / Power Density	Maximum transmit power of 10 dBm and a maximum EIRP of 55 dBm. Minimum antenna gain of 30 dBi. Transmission not permitted in certain areas (See table 4.1)
8	Channel access and occupation rules	
9	Authorisation regime	Licence exempt
10	Additional essential requirements	N/A
Informative (11-13)		
11	Frequency planning assumptions	
12	Planned changes	
13	Reference	ETSI EN 302 217 - Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas. <u>Annex H or Annex I of EN 302 217-2 may be applied, with the following modifications:</u> i) <u>References to frequency ranges of 57-64GHz, 57-66GHz and 64-66GHz shall be interpreted as 57-71GHz.</u> ii) <u>The frequency arrangements described in Sections H.1, H.2.1, I.1 and I.2.1 are informative.</u> iii) <u>The requirements in row 7 of this table shall replace the requirements for EIRP limit and G_{ant} in these annexes.</u> <u>NOTE: As a result, the statements in Sections H.3.2 and I.3.2 that “above limitations automatically imply” are no longer valid.</u> ECC Recommendation (09)01 – Use of the 57 – 64 GHz frequency band for point to point fixed wireless systems.
14	Notification	<i>[to be added]</i>
15	Remarks	None

6 Future actions needed by Ofcom

At present, there is no Harmonised Standard applicable to the 66-71 GHz band to demonstrate conformity to Article 3.2 of the Radio Equipment Directive. The provisions proposed for row 13 of Table 3.2 above will enable a Notified Body to develop a Technical File to demonstrate this conformity; however, this has less legal certainty than a Harmonised Standard and is an increased burden for manufacturers.

Ofcom should therefore initiate a work item in ETSI to develop or update a Harmonised Standard applicable to fixed links in the 66-71GHz band. The best way of achieving this is probably the addition of a new annex to EN 302 217-2. It is also necessary to review the test methods, to ensure that they are appropriate for current implementations of mm-wave fixed wireless systems.

CEPT Working Group FM has requested the Short Range Devices Maintenance Group to consider the 66-71GHz band for Wideband Data Transmission Systems⁶. Ofcom should contribute to this work.

⁶ Minutes of the 91st WG FM Meeting, Section 4.7.8; Doc. FM(18)113.