Licence Exempt Short Range Devices in the 870 to 876 MHz and 915 to 921 MHz Bands: Technical Proposals

Consultation

Publication date: 18 December 2013

Closing Date for Responses: 19 February 2014

Contents

Section 1

Executive summary

1.1 This document consults on the technical proposals that will subsequently enable the authorisation of licence exempt use of certain Short Range Devices (SRDs) in the frequency bands 870 to 876 MHz and 915 to 921 MHz. These could be used to provide new and improved wireless services such as smart metering and other machine-to-machine communications as well as more effective tracking of goods using RFID technologies. Presently this spectrum remains largely unused following the withdrawal of government and other services.

1.2 We previously consulted on the likely uses of the 870 to 876 MHz and 915 to 921 MHz bands. In our statement of 27 June 2013[1], we concluded that, given the progress made in Europe with new harmonising measures for SRDs and Radio Identification Devices (RFIDs) by the CEPT and European Telecommunications Standards Institute (ETSI), as well as evidence from the responses to our earlier consultation, we should make the bands 870 to 876 MHz and 915 to 921 MHz available on a licence exempt basis consistent with the CEPT's harmonised technical measures so long as those measures permit the efficient use of the spectrum.

1.3 The measures we are proposing to introduce for SRDs and RFIDs in these bands are those recommended by the CEPT, which it will publish both in ECC Report 189[2] and an amendment of the ERC Recommendation 70-03[3]. These CEPT measures have already been subject to a Europe-wide public consultation. Ofcom understands that an assessment of all responses to the CEPT's consultation has taken place and our proposals are aligned to that assessment. However, final publication of these CEPT deliverables is not expected until February 2014, so we have adjusted the timing of our consultation process so that we can take into account the European process and exempt SRDs from licensing as quickly as possible.

1.4 The CEPT proposals consider certain national non-SRD uses in these bands. Helpfully, the CEPT's technical measures include the necessary and sufficient limitations on SRDs to ensure that national, non-SRD uses can be protected. In the UK, there are two non-SRD uses considered: the Met Office's Wind Profiling Radar[4] operating in the west of England, whose frequency is centred on 915 MHz and the potential use of the Extended-GSM-R spectrum for rail communications (including potential use for high speed rail) in the bands 873 to 876 MHz and 918 to 921 MHz. We do not anticipate any significant change to the CEPT's proposals for harmonised technical measures prior to their publication in February 2014, but our draft regulations will include further amendments, should these be required, to ensure that our technical regulations align as far as necessary with those of other European member states.

1.5 After carefully analysing the technical studies carried out by the CEPT we consider that, based on the likely deployment scenarios of SRDs and RFIDs, the condition of having a low capacity to cause interference with other uses and users of the spectrum is met. However, for the one type of device proposed in the ECC Report 189, known as Network Relay Points (NRPs), we think individual licensing or light

1 http://stakeholders.ofcom.org.uk/consultations/870-915/
2 http://www.cept.org/ecc/tools-and-services/ecc-consultation
3 http://www.cept.org/ecc/tools-and-services/ecc-consultation
4 A second WPR is operated by the Met Office outside the UK in the Isle of Man.

licensing would be required to prevent harmful interference to other spectrum users. We are not proposing to exempt these higher duty cycle NRPs from licensing. We will review whether we should permit higher duty cycle NRP devices to use the bands should evidence of demand for these support this.

1.6 Comments on the proposals outlined in this document are invited by **5pm 19 February 2014**. Following subsequent consultation on the necessary regulations, we anticipate that the licence exemption will be in force, and hence the band usable by new application by **July 2014.**

Section 2

Background

Introduction

2.1 This document consults on the technical proposals that will subsequently enable the authorisation of licence exempt use of certain Short Range Devices (SRDs) in the frequency bands 870 to 876 MHz and 915 to 921 MHz. We previously consulted on the likely uses of the 870 to 876 MHz and 915 to 921 MHz bands. In our statement of 27 June 2013[5], we concluded that, given the progress made in Europe with new harmonising measures for SRDs and Radio Identification Devices (RFIDs) by the CEPT and European Telecommunications Standards Institute (ETSI), as well as evidence from the responses to our earlier consultation, we would make the bands 870 to 876 MHz and 915 to 921 MHz available on a licence exempt basis consistent with the CEPT's harmonised technical measures so long as those measures permit the efficient use of the spectrum.

2.2 This section sets out how we intend to intend to make the bands 870 to 876 MHz and 915 to 921 MHz available on a licence exempt basis to apparatus meeting the specific technical parameters set out in Section 3 of this consultation document.

Framework for licence exemption

2.3 Ofcom is responsible for authorising civil use of the radio spectrum and achieves this by granting wireless telegraphy licences under the WT Act or by making regulations exempting users of particular equipment from the requirement to hold such a licence. Under section 8(1), Wireless Telegraphy Act 2006 (the "Act"), it is an offence to establish, install, or use wireless telegraphy equipment without holding a licence granted by Ofcom, unless the establishment, installation or use is exempt from the need for a licence. Under section 8(4) of the Act, Ofcom is obliged to make regulations to exempt such equipment if its use meets the criteria set out in section 8(5). Namely, that the use of the equipment is not likely to:

- involve undue interference with wireless telegraphy;
- have an adverse effect on technical quality of service;
- lead to inefficient use of the part of the electromagnetic spectrum available for wireless telegraphy;
- endanger safety of life;
- prejudice the promotion of social, regional or territorial cohesion; or
- prejudice the promotion of cultural and linguistic diversity and media pluralism.

2.4 In making a device exempt from licensing we specify the characteristics of the equipment that can be used. Licence exempt devices are commonly low power, short range devices (SRDs) or handsets that are controlled by a licensed network (e.g.

5 http://stakeholders.ofcom.org.uk/consultations/870-915/

mobile phone handsets). This is mainly because large numbers of devices can use the same frequencies due to their low transmitting power and limited range.

2.5 Unlike many licensed services, users of licence exempt devices need to be aware that there are no guarantees that the spectrum will be free of interference. Devices operate on a non-interference, un-protected basis. This means that no claim of protection can be made if interference is received from another authorised device or service, including, in this instance, the two existing Wind Profiling Radars operated by the Met Office. How we propose to protect these Radars is set out in section 3 and Annex 5.

Impact assessment

2.6 The analysis presented in this document represents an impact assessment, as defined in section 7 of the Act[6]. Impact assessments provide a valuable way of assessing different options for regulation and showing why the preferred option was chosen. They form part of best-practice policy-making. This is reflected in section 7 of the Act, which means that generally we have to carry out impact assessments where our proposals would be likely to have a significant effect on businesses or the general public or when there is a major change in our activities. However, as a matter of policy, we are committed to carrying out and publishing impact assessments in relation to the great majority of our policy decisions. For further information about our approach to impact assessments, see the guidelines "Better policy-making: Ofcom's approach to impact assessment"[7].

The citizen and/or consumer interest

2.7 Our principal duty under section 3 of the Act is to further the interests of citizens in relation to communications matters; and of consumers in relevant markets, where appropriate by promoting competition. We take account of the impact of our decisions upon both citizen and consumer interests in the markets we regulate. We must, in particular, secure the optimal use for wireless telegraphy of spectrum and have regard to the principle under which all regulatory activities should be targeted only at cases in which action is needed.

2.8 In addition to section 3 we must have regard to the desirability of encouraging investment and innovation in relevant markets as well as to further the interests of citizens and consumers.

Our policy objective

2.9 We seek wherever possible to reduce the regulatory burden upon our stakeholders, in this case users of the radio spectrum. One way in which we can do this is to remove the need for spectrum users to apply for individual licences to authorise the use of radio equipment. As stated in paragraph 2.3 we must exempt equipment if it meets the criteria of 8(4) of the Wireless Telegraphy Act 2006.

2.10 Exemption is realised by describing the details of equipment and the parameters under which it may be used in a Statutory Instrument (secondary legislation called regulations) that exempts users of such equipment from the need to hold a WT Act licence provided they comply with the terms of the regulations.

[6] www.opsi.gov.uk/acts/acts2003/pdf/ukpga_20030021_en.pdf .
[7] Which are on our website at http://www.ofcom.org.uk/about/policies-and-guidelines/better-policy-making-ofcoms-approach-to-impact-assessment/

2.11 There are one-off administrative costs associated with making a Statutory Instrument. We consider the implementation costs of licence exemption to be low and offset by the potential benefits. There may also be a slight reduction in spectrum management costs in certain areas.

2.12 Ofcom also has a duty to ensure the optimal use for wireless telegraphy. Part of this involves working with international administrations and bodies on regional and global spectrum allocation decisions. From time to time this may require us to change our allocation policy in order to promote optimal use of the spectrum.

2.13 We note that on 29th November 2013 the European Commission released a discussion document on the focus and timeframe for the sixth update of the SRD Decision (Decision 2006/771/EC), which harmonises frequency bands and the related technical parameters for spectrum usage by short-range devices[8]. The proposal made is to extend the frequency bands available for use by SRDs to include the 870 to 876 MHz and 915 to 921 MHz bands; and to do so by July 2014.

Equality Impact Assessment

2.14 Following an initial assessment of our policy proposals we consider that it remains reasonable to assume that any impacts on consumers and citizens arising from these proposals would not differ significantly between groups or classes of UK consumers and citizens, all of whom would have access to these services; potentially at end-user prices reflective of all general input costs, including opportunity costs of spectrum used.

2.15 We note that one potential SRD use is for Assistive Listening Devices (ALDs). Our proposal is to permit the use of these devices in the band 915 to 921 MHz. The availability of this additional spectrum band should benefit those citizens and consumers who use ALDs by encouraging the development of new technologies and increasing choice. We do not consider that there is evidence to suggest that costs for ALD users would differ significantly relative to consumers in general. However, the band will be available to all compliant SRDs and exempting SRDs from licensing means that there is no limit to the numbers of compliant devices that can be operated.

2.16 We have not carried out a full Equality Impact Assessment in relation to race equality or equality schemes under the Northern Ireland and disability equality schemes. This is because we were not aware that our proposal is intended to (or would, in practice) have a significant differential impact on different gender or racial groups, on consumers in Northern Ireland or on disabled consumers compared to consumers in general.

Document Structure

2.17 The document is structured as follows:

- Section 3 sets out the technical assessment and our proposals based on the published ECC Reports 189 and 200 and our supplementary studies on compatibility between SRDs and Wind Profiling Radar;

[8] See: https://circabc.europa.eu/sd/d/13702e25-0422-4ef3-af5b-5b4cffc3e211/RSCOM13-78%20Preliminary%20considerations%20on%20Commission%20guidance%20on%20SRD%206th%20update.pdf

- Section 4 provides information on the implementation of our proposal to licence exempt SRDs;
- Section 5 considers the control of unwanted emissions from SRDs;
- Annexes 1 to 3 explain our consultation principles and how to respond to this consultation;
- Annex 4 sets out the consultation question;
- Annex 5 provides a detailed assessment of the compatibility between SRDs and Wind Profiling Radar; and
- Annex 6 presents an extract from draft European Recommendation for SRDs (ERC Rec 70-03 Amendment) and highlights the changes that are being proposed.

Next steps

2.18 We welcome stakeholder feedback to this consultation document. The deadline to submit responses to us is **5pm on 19 February 2014**. We expect to release a Statement on this consultation in **April 2014**, having taken into account stakeholder responses to our proposals.

2.19 Following this, if we decide to proceed with proposal to licence exempt these equipments, as required by section 122(4) and (5) of the WT Act 2006 we would need to give notice of our intention to make proposed regulations. The draft regulations will be subject to a further minimum one month consultation to ensure that they correctly reflect the stated policy position. After this consultation we will publish a final regulatory statement and proceed with making the regulations. These usually enter force 21 days after being signed. We expect the regulations to come into force by **July 2014**.

Section 3

Summary of the Technical Assessment and Technical Proposals

Introduction

3.1 In this section we present a summary of the technical assessments completed by CEPT and Ofcom, and our proposals for the set of least restrictive technical parameters possible for SRDs, which fulfil the condition of having a low capacity to cause interference.

3.2 This summary reflects the analysis that was undertaken in CEPT (see ECC[9] Report 200[10]) to ensure the proper protection of in-band and adjacent band radiocommunications services common across Europe, including GSM, GSM-R and the proposed E-GSM-R. It also summarises the additional study Ofcom has undertaken regarding the protection of the Wind Profiling Radars operated by the Met Office, which is unique in Europe to the British Isles.

3.3 The summary also details the proposals made by CEPT in ECC Report 189[11]. The proposals, which are summarised here, are the result of the initial CEPT resolution meeting to considered comments received during the public consultation of ECC Report 189.

Background

3.4 Most of the technical studies undertaken to understand whether devices can share frequencies with one another are carried out by the CEPT, which draws on representatives and radio experts from the administrations of 47 European countries including Ofcom.

3.5 In addition to its role advising the European Commission (EU) on radio spectrum matters, the CEPT produces a range of technical and regulatory advice that informs the development of spectrum management across CEPT member countries. The work done in CEPT is also used by European standardisation organizations such as the European Telecommunications Standards Institute (ETSI)[12] and European Committee for Electro-technical Standardisation (CENELEC)[13] to develop harmonised European standards for equipment. It is on the basis of much of this advice that devices can be considered for authorisation in the UK. Ofcom is aware of work ongoing in ETSI to develop suitable Harmonised Standards for the 870 to 876 MHz and 915 to 921 MHz bands that are intended to be fully consistent with the proposals made by CEPT and carried forward in this consultation.

3.6 The technical assessment that CEPT has undertaken in relation to SRD use of the 870 to 876 MHz and 915 to 921 MHz bands is contained within the ECC[14] Reports

[9] The Electronic Communications Committee of CEPT
[10] http://www.erodocdb.dk/docs/doc98/official/pdf/ECCRep200.pdf
[11] http://www.cept.org/ecc/tools-and-services/ecc-consultation
[12] http://www.etsi.org/WebSite/AboutETSI/AboutEtsi.aspx
[13] http://www.cenelec.eu/
[14] The Electronic Communications Committee of CEPT

200[15] and 189[16] . This assessment has investigated the compatibility between SRD and the existing/planned primary[17] radiocommunication services, operating across Europe, either in-band or in adjacent spectrum. In addition, these reports consider sharing between SRDs in the band.

3.7 The technical assessment considers the impact of a range of devices including:

- Non-Specific SRDs;
- Tracking, Tracing and Data Acquisition;
- Transport and Traffic Telematics (TTT);
- Radio microphone applications including aids for the hearing impaired; and
- Radio frequency identification applications (RFIDs).

Wind Profiling Radar

3.8 In the UK, there are two pre-existing Wind Profiling Radars (WPRs) operated by the Met Office. One WPR is sited near Camborne in Cornwall. There is a further similar Met Office system operating on the Isle of Man. These WPRs operate with a receiving bandwidth partially within the 915 to 921 MHz band (at a centre frequency around 915 MHz). As the only CEPT country to deploy WPRs the analysis undertaken in ECC Report 200 is driven by UK contributions and the studies that Ofcom and the Met Office have undertaken together, but the WPR compatibility studies that we have undertaken nationally go beyond the studies completed in ECC Reports 200 and 189 to ensure that we have taken full account of the Met Office's requirements.

ECC Report 200: Co-existence studies and our proposals for technical parameters for licence exempt SRDs

3.9 The technical compatibility analysis undertaken in Europe and underpinning our decision to exempt SRDs from individual licensing is given in ECC Report 200, which was published in September 2013[18]. That report investigates the compatibility between SRDs and a number of adjacent services; and to services likely to be found sharing the same bands. In the case of the UK the adjacent band services, public cellular mobile and GSM-R, are common to those services found throughout Europe. Within the bands the UK Met Office has an existing Wind Profiling Radar located near Camborne, Cornwall and one located on the Isle of Man, which we have considered in detail. We have also considered the development of high speed rail communications in the Extended GSM-R bands. The Extended GSM-R and WPR uses are both considered in the ECC Report 200.

3.10 ECC Report 200 considers the simulated probability of interference (for unwanted emissions and receiver blocking modes) to other radiocommunication services, which it defines as the ratio of carrier to interference plus noise powers expressed as a percentage (e.g. C/(N+I) %).

[15] http://www.erodocdb.dk/docs/doc98/official/pdf/ECCRep200.pdf
[16] http://www.cept.org/ecc/tools-and-services/ecc-consultation
[17] Primary services include both licenced services and government services
[18] http://www.erodocdb.dk/docs/doc98/official/pdf/ECCRep200.pdf

3.11 It is custom and practice in ECC Reports to consider SRDs as having a low capacity to cause harmful interference if the probability of interference is calculated to be less than 5% for the worst case scenario and so this is the criteria adopted in Report 200. The worst case scenario is one where a minimum separation between SRD transmitters and victim receivers is assumed and where the victim is operating at the limit of its range. Using this definition the CEPT has concluded that:

a) for SRDs to the GSM-R downlink across the 921 MHz band (e.g. 917 to 921 MHz) the probability of interference is found to be less than 2.6%;

b) the probability of interference from SRDs to E-GSM-R is found to exceed the 5% criteria unless SRDs are constrained both in duty cycle and the maximum continuous transmission time (T_{on}). If these parameters are constrained in the bands 873 to 876 MHz and 918 to 921 MHz then the probability of interference to E-GSM-R falls below the 5% criteria and SRDs can co-exist.

European Recommendation for 870 to 876 MHz, ERC Rec 70-03

3.12 The CEPT recommend an allocation across the entire 870 to 876 MHz frequency band for low power generic SRDs and a reduced allocation within the band for two higher power, specific SRD technologies. This arrangement is recommended by CEPT to allow sub-bands of spectrum where low power, low duty cycle apparatus may find a predictable and relatively quiet segment of spectrum to operate (875.8 to 876 MHz), while allowing less polite SRDs the maximum opportunity for communications. Relatively quiet sub-bands of spectrum are important for SRDs such as alarm systems where low latency in transmission is required. The arrangement recommended is as follows:

i) 870 to 875.8 MHz, 25 mW, 1% duty cycle, max 600 kHz (plus the additional restrictions necessary to protect in-band use of E-GSM-R – See Table 1);

ii) 870 to 876 MHz, 25 mW, 0.1 % duty cycle, 200 kHz (plus the additional restrictions necessary to protect in-band use of E-GSM-R – See Table 1);

iii) 870 to 875.6 MHz, for Metropolitan/ Rural Infrastructure Networks, 500 mW, with Adaptive Power Control[19](APC), ≤200 kHz Up to 2.5% duty cycle for Network Relay Points; and

iv) 870 to 875.8 MHz, Transport and Traffic Telematics (vehicle to vehicle) 500 mW APC of at least 20 dB range, 0.1 % duty cycle, maximum bandwidth. 500 kHz and 870-875.8 MHz, Transport and Traffic Telematics (in vehicle only)100 mW APC, 0.1 % duty cycle.

3.13 Figure 1 below shows the band plan arrangement for 870 to 876 MHz recommended by ECC Report 189.

[19] Adaptive Power Control is a mechanism specified in Harmonised Standards for apparatus, intended to reduce the power to that necessary for successful transmission. Bi-directional communication is a prerequisite for (APC). In this case, the APC must have a range to be capable of reducing the power to 5 mW (20dB from maximum power). .

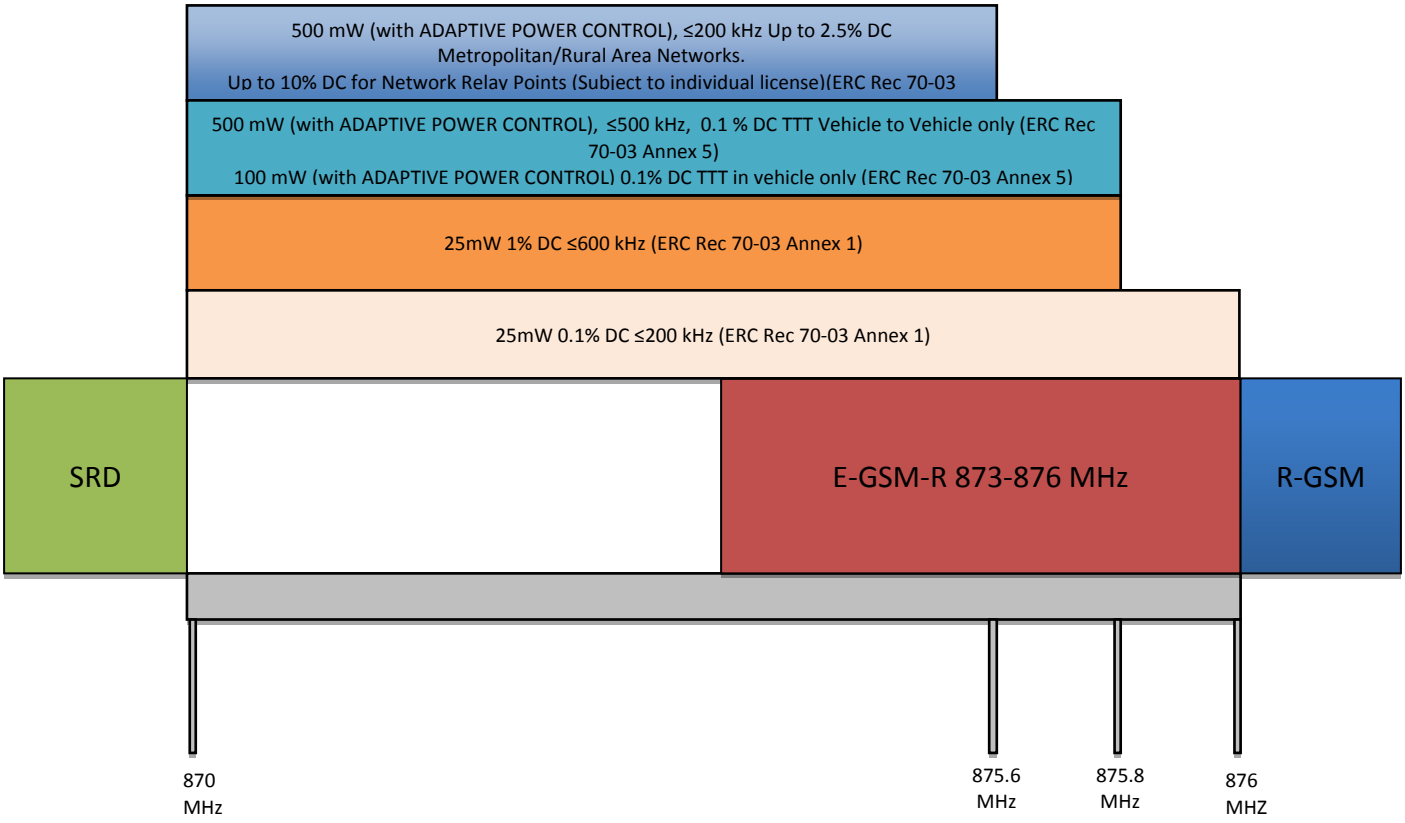

Figure 1 – 870 to 876 MHz band plan proposed by ECC Report 189

3.14 However, the ECC Report also recognises the limitations that will be required in the 873 to 876 MHz band where the SRDs share the spectrum with E-GSM-R apparatus (the Extended GSM-R band). These additional limitations from the draft amendment to ERC Rec 70-03 are set out in Annex 6 of this consultation

European Recommendation 915 to 921 MHz, ERC Rec 70-03

3.15 The CEPT has recommended an allocation of 915 to 921 MHz for low power generic SRDs with an allocation to higher duty cycle generic SRDs across most of the band. In common with the 870 to 876 MHz band, the CEPT has determined that this arrangement will allow sub-bands of the 915 to 921 MHz band where low power, low duty cycle apparatus may find a predictable and relatively quiet segment of spectrum to operate, while allowing less polite SRDs the maximum opportunity for communications. The CEPT also recommended an allocation of four higher power channels for non-specific SRDs at 100 mW, for Assistive Listening Devices at 10 mW and for RFIDs at 4 Watts.

3.16 The arrangement recommended for the band 915 to 921 MHz is as follows:

i) 915.0 to 915.3 MHz, 25 mW, 0.1% duty cycle (diversity, battery life, alarms and other devices needing similar predictable spectrum sharing).

ii) 920.9 to 921.0 MHz, 25 mW, 0.1% duty cycle (diversity, battery life, alarms and other devices needing similar predictable spectrum sharing).

iii) 915.3 to 920.9 MHz, 25 mW, 1% duty cycle 600 KHz.

iv) 916.1to 916.5 MHz, 917.3 to 917.7 MHz, 918.5 to 918.9 MHz and 919.7 to 920.1 MHz 100mW, 1% duty cycle.

v) Assistive Listening Devices 916.1 to 916.5 MHz, 917.3 to 917.7 MHz, 918.5 to 918.9 MHz, 919.7 to 920.1 MHz, 10 mW, 25% duty cycle 400 kHz channels.

vi) RFID interrogators 916.1 to 916.5 MHz, 917.3 to 917.7 MHz, 918.5 to 918.9 MHz and 919.7 to 920.1 MHz, 4 Watt 400 kHz channels with no duty cycle limitation. However, "operation only permitted when necessary to complete the intended operation, i.e. when tags are expected to be present" – plus the Detect-And-Avoid[20] (DAA) option essential to protect E-GSM-R.

3.17 Figure 2 below shows the band plan arrangement for 915 to 921 MHz recommended by ECC Report 189

[20] Detect-And-Avoid is a cognitive mechanism designed to avoid transmissions in channels where E-GSM-R signals are detected. The mechanism is described in relevant Harmonised Standards.

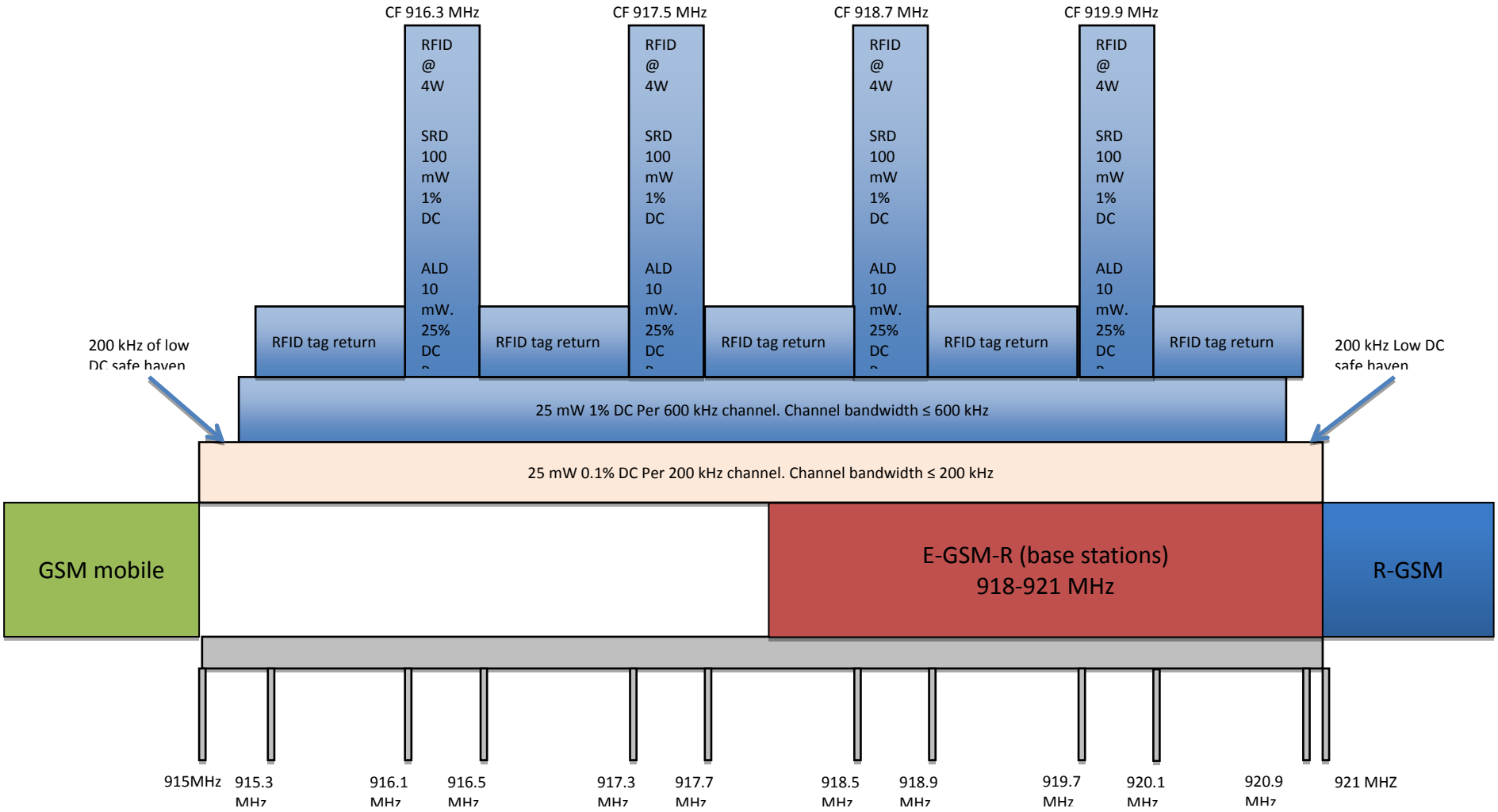

Figure 2 – 915 to 921 MHz band plan proposed by ECC Report 189

3.18 However, the ECC Report also recognises the limitations that will be required in the 918 to 921 MHz band where the SRDs and RFIDs share the spectrum with E-GSM-R apparatus. These additional limitations from the draft amendment to ERC Rec 70-03 are set out in Annex 6 of this consultation.

Detail of the Technical Characteristics for each SRD Application

3.19 The ERC Rec 70-03 sets out the recommendation for SRDs in separate chapters (Annexes) that classify SRDs by application type. This method of classification is carried across into both European harmonisation Decisions for SRDs and in existing UK national regulations.

3.20 Proposals are made for applications that use the 870 to 876 MHz and 915 to 921 MHz. These applications are:

a) Generic (Non-specific) SRDs;

b) Tracking, Tracing and Data Acquisition;

c) Transport and Traffic Telematics;

d) Radio microphone applications including aids for the hearing impaired; and

e) Radio frequency identification device applications

3.21 In the sections below, we set out the technical criteria, application by application, which we propose to adopt as the technical basis for our UK national regulations and national radio interfaces for SRDs in the 870 to 876 MHz and 915 to 921 MHz bands.

Generic (Non-specific) Short Range Devices

3.22 The technical proposals for non-Specific SRDs are set out in the extract from the draft amendment to ERC Rec 70-03, at Annex 6 of this consultation. These proposals include provision to protect E-GSM-R.

Table 2: show CEPT criteria and our technical proposals for non-specific SRDs

Frequency Band	Power / Magnetic Field	Spectrum access and mitigation requirements	Modulation /maximum occupied bandwidth
870 to 876 MHz	≤ 25 mW e.r.p.	≤ 0.1% duty cycle For E-GSM-R protection (873 to 876 MHz), the duty cycle is limited to ≤ 0.01% and limited to a maximum transmit on-time of 5ms/1s.	≤ 200 kHz
870.0 to 875.8 MHz	≤ 25 mW e.r.p.	≤ 1% duty cycle For E-GSM-R protection (873 to 875.8 MHz), the duty cycle is limited to ≤ 0.01% and limited to a maximum transmit on time of 5ms/1s.	≤ 600 kHz
915.200 to 920.8 MHz	≤ 25 mW e.r.p. except for the 4 channels identified in note b where ≤ 100 mW e.r.p. applies	≤ 1% duty cycle (note a) For E-GSM-R protection (918 to 920.8 MHz),, the duty cycle is limited to ≤ 0.01% and limited to a maximum transmit on-time of 5ms/1s.	≤ 600 kHz except for the 4 channels identified in (note b) where ≤ 400 kHz applies

Frequency Band	Power / Magnetic Field	Spectrum access and mitigation requirements	Modulation /maximum occupied bandwidth
915.000 to 921.000 MHz	≤ 25 mW e.r.p.	≤ 0.1% duty cycle For E-GSM-R protection (918 to 921 MHz), the duty cycle is limited to ≤ 0.01% and limited to a maximum transmit on-time of 5ms/1s.	≤ 200 kHz

Note a: RFID tag emissions responding to RFID interrogators operating on centre frequencies 916.3 MHz, 917.5 MHz, 918.7 MHz and 919.9 MHz are not duty cycle limited.
Note b: The available channel centre frequencies are 916.3 MHz, 917.5 MHz, 918.7 MHz and 919.9 MHz. The channel bandwidth is 400 kHz

3.23 The low power and duty cycle proposal represents typical SRD parameters. These are similar to the generic SRD parameters currently authorised for use in the spectrum band 863 to 870 MHz. The compatibility analysis of ECC Report 200 concludes there is a low capacity to cause interference in both 870 to 876 MHz and 915 to 921 MHz if these low power and duty cycle constraints are adopted.

3.24 The additional restrictions we are proposing for the bands 873 to 876 MHz and 918 to 921 MHz are also intended to ensure there is a low capacity to cause interference to E-GSM-R.

Tracking, Tracing and Data Acquisition

3.25 The technical proposals for Tracking, Tracing and Data Acquisition are set out in the extract from the draft amendment to ERC Rec 70-03, at Annex 6 of this consultation. These proposals include provision to protect E-GSM-R.

Table 3: show CEPT criteria and our technical proposals for Tracking, Tracing and Data Acquisition

Frequency Band	Power / Magnetic Field	Spectrum access and mitigation requirements	Channel spacing	Notes
870.0 to 875.6 MHz	≤ 500 mW e.r.p.	≤ 2.5% duty cycle and adaptive power control required. For E-GSM-R protection (873 to875.6 MHz), the duty cycle is limited to ≤ 0.01% and limited to a maximum transmit on time of 5ms/1s.	≤ 200 kHz	Metropolitan/Rural Area Networks Adaptive Power Control required. The Adaptive Power Control is able to reduce a link's transmit power from its maximum to ≤ 5 mW.

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3.26 The more permissive limitations on maximum power and increased duty cycle (of 2.5 %) are proposed on the basis that compatibility can be maintained so long as the devices are limited to network infrastructure and there are a set of robust technical constraints, including adaptive power control. Ofcom is aware that ETSI is developing a harmonised standard for this class of SRD. Apparatus brought into use will be required either to comply with that standard or it must be demonstrable how they

have met the spectrum access requirements necessary for compatibility with other radiocommunications apparatus.

3.27 This consultation is limited in scope to proposals to allow licence exempt apparatus in the bands 870 to 876 MHz and 915 to 921 MHz. The ECC Report 189 also includes proposals for higher duty cycle Network Relay Points (NRPs).

3.28 Based on the outcome of the CEPT studies[21], if the duty cycle[22] of these devices is to exceed a threshold of 2 ½ % we think these devices would need individual licences or light licensing. We are not proposing to exempt these higher duty cycle NRPs from licensing. We will review whether we should permit higher duty cycle NRP devices to use the bands should evidence of demand for these support this.

Transport and Traffic Telematics

3.29 The technical proposals for Transport and Traffic Telematics (TTT) are set out in the extract from the draft amendment to ERC Rec 70-03, at Annex 6 of this consultation. These proposals include provision to protect E-GSM-R.

Table 4: show CEPT criteria and our technical proposals for Transport and Traffic Telematics (TTT)

Frequency Band	Power / Magnetic Field	Spectrum access and mitigation requirements	Channel spacing	Notes
870.000 to875.800 MHz	≤ 500 mW e.r.p. restricted to vehicle-to-vehicle applications. ≤ 100 mW e.r.p. restricted to in-vehicle applications.	≤ 0.1% duty cycle For E-GSM-R protection (873 to 875.8 MHz), the duty cycle is limited to ≤ 0.01% and limited to a maximum transmit on-time of 5ms/1s.	≤ 500 kHz	Adaptive Power Control is required. The Adaptive Power Control is able to reduce a link's transmit power from its maximum to ≤ 5 mW.

3.30 The more permissive limitations on maximum power are proposed on the basis that compatibility can be maintained so long as the devices are limited to TTT applications and there are a set of robust technical constraints, including Adaptive Power Control. Ofcom is aware that ETSI is reviewing the Generic harmonised standard for SRDs, with a view to including this class of SRD. Apparatus brought into use will be required either to comply with that standard or it must be demonstrable how they have met the spectrum access requirements necessary for compatibility with other radiocommunications apparatus.

[21] Duty cycle is defined in The SRD Harmonised Standard EN 300 220 Section 7.10 http://www.etsi.org/deliver/etsi_en/300200_300299/30022001/02.03.01_20/en_30022001v020301c.pdf

[22] Duty cycle is defined in The SRD Harmonised Standard EN 300 220 Section 7.10 http://www.etsi.org/deliver/etsi_en/300200_300299/30022001/02.03.01_20/en_30022001v020301c.pdf

Radio microphone applications including aids for the hearing impaired

3.31 The technical proposals for Radio Microphones and Assistive Listening Devices (ALDs) are set out in the extract from the draft amendment to ERC Rec 70-03, at Annex 6 of this consultation. These proposals include provision to ensure protection of E-GSM-R.

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Table 5: show CEPT criteria and our technical proposals for Digital Assistive Listening Device Systems (ALDs)

Frequency Band	Power / Magnetic Field	Spectrum access and mitigation requirements	Channel spacing	Notes
916.1 to 916.5 MHz, 917.3 to 917.7 MHz, 918.5 to 918.9 MHz, 919.7 to 920.1 MHz	≤ 10 mW e.r.p.	< 25 % duty cycle	≤ 400 kHz	Indoor Digital Assistive Listening Device Systems

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3.32 ECC Report 189 and ECC Report 200 suggest that ALDs should be allocated to the same spectrum bands as RFID interrogators. Digital ALDs operate at a relatively high duty cycle of up to 25%. Their low power makes them easily compatible with adjacent channel devices. However, they potentially cause interference to other SRDs that are limited to a much lower duty cycle requirement. The ECC's proposal is based on the likely separation between most users of ALDs and RFID interrogators. RFIDs are typically used in industrial or logistics applications on industrial sites, without public access. Other pre-existing and licence exempt ALD spectrum allocations are available in the UK if two applications are not compatible at a single site or location.

Radio frequency identification applications

3.33 The technical proposal for RFID applications are set out in the extract from the draft amendment to ERC Rec 70-03, at Annex 6 of this consultation document and is summarised in table 6 below. These proposals include provisions to protect E-GSM-R.

Table 6: shows the CEPT criteria for Radio Frequency Identification (RFID) interrogators.

Frequency Band	Power / Magnetic Field	Spectrum access and mitigation requirements	Channel spacing	Notes
916.1 to 916.5 MHz, 917.3 to 917.7 MHz, 918.5 to 918.9 MHz, 919.7 to 920.1 MHz	≤ 4 W e.r.p.	For E-GSM-R protection (918 to 921 MHz), DAA is required	≤ 400 kHz	Operation only when necessary to perform the intended operation, i.e. when RFID tags are expected to be present.

3.34 RFIDs are a particular category of SRD. RFID is a form of radio bar-coding used to wirelessly read the tags attached to goods at a range of a few metres. Presently the

European harmonised spectrum for RFID is 865 to 868 MHz. However, in the USA and many other parts of the world use RFID in the band 902 to 928 MHz.

3.35 Because many of world regions use the 900 MHz bands for RFIDs, the tags tend to be tuned to receiving signals there. This is a disadvantage to users of RFIDs in Europe, as the signals received are degraded when compared to those received from exactly the same tag in regions that already allow RFIDs at 902 to 928 MHz. This degradation manifests itself as a reduction in range. Aligning with other world regions in the 915 to 921 MHz band will enhance the performance of RFIDs.

3.36 The performance of RFIDs will be further enhanced if the RFID allocation suggested by the ECC Reports is implemented, as the available bandwidth will be widened to 400 kHz from 200 kHz for the pre-existing RFID installations at 865 to 868 MHz. This enhanced bandwidth should improve the likelihood of a tag being correctly identified.

3.37 Taking the cumulative impact of the change to the 915 to 921 MHz band, the wider bandwidth and the increase in peak power over the 865 to 868 MHz band, we expect RFID performance to be significantly improved by this new allocation and bring benefits from economies in scale from harmonisation with allocations elsewhere in the world.

Compatibility with Wind Profiler Radar operated by the Met office

3.38 In our statement[23] of 27 June 2013, we noted the Met Office's response that it could not fully envisage how a license exempt regime will provide sufficient assurance of the ability to protect its existing wind profiling radars (WPRs) from harmful interference; and thus believed that some form of licensing regime would be preferable in respect of maintaining a suitable separation distance. The Met Office also highlighted that WPR use currently focuses on the sub-band 915 to 917 MHz and that future requirements for WPR operation could expect to include an expanded network across the UK over a wider bandwidth.

3.39 We have undertaken further analysis of the potential for coexistence of SRDs and the existing WPRs, including the possible need to protect the existing WPR sites by using a geographical exclusion zone around each of their two sites. Our further analysis of this option is set out at Annex 5 of this consultation document. We have concluded that;

a) Of all SRD-type apparatus, RFID devices present the highest risk of being an interferer to WPRs, due to their higher power and relatively wide bandwidth compared to other SRD applications.

b) RFIDs however are likely to have a lower density of operation in more rural locations like those where the two existing WPRs are deployed.

c) The minimum coupling distance between RFIDs and WPRs is reduced because of the way in which RFIDs operate. They are used pointing downwards towards pallets of goods and tend to be semi-shielded or shielded within buildings.

Conclusion of the Summary of the Technical Assessment

3.40 Ofcom believes that the compatibility studies and recommendations provided by CEPT (ECC Report 189, ECC Report 200 and the proposed amendment to ERC Rec

[23] http://stakeholders.ofcom.org.uk/binaries/consultations/870-915/statement/statement.pdf

70-03) are sufficient to demonstrate that licence exempt SRDs present a low capacity to cause interference to existing in-band and adjacent band services. See Annex 5.

3.41 In the single incidence where these studies have not suggested compatibility (the high duty cycle Network Relay Points) we are not proposing to licence exempt that apparatus.

3.42 We note that SRDs and RFIDs are freely circulated throughout the single European market.

3.43 For these reasons we therefore do not think it would be proportionate to specify exclusion zones around the two existing WPRs.

3.44 In reaching this conclusion regarding the protection of the two existing WPRs, we recognise that the regulations[24] for licence exempt devices require that they shall not cause or contribute to any undue interference to any wireless telegraphy. Therefore, if undue interference is caused to WPR, Ofcom can if necessary take enforcement action.

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[24] http://www.legislation.gov.uk/uksi/2003/74/contents/made and http://www.legislation.gov.uk/uksi/2010/2512/contents/made

Section 4

Implementing our proposals

4.1 As stated in paragraph 2.3, we are obliged to exempt use of equipment from the obligation to hold a WT Act licence if it meets the requirements set out in section 8(5) of the WT Act. Our technical assessment in section 3 suggests that the relevant equipment meets these requirements and therefore that we would be obliged to licence exempt the use of these devices.

4.2 This provision comes from the Authorisation Directive; it requires Member States to put in place the least onerous authorisation system. It goes on to say that this can be best achieved by general authorisations (in the UK we call this licence exemption). We note that many of these SRDs currently operate in other bands already on a licence exempt basis. We do not see how these devices differ significantly from these devices and a licensing requirement would be not appropriate.

4.3 Therefore if the proposals in this document are agreed we will proceed with making regulations to exempt the use of equipment based on the parameters set out in the tables 2 to 6 of Section 3 of this consultation.

4.4 If agreed, these proposals will be included in IR 2030 and we will make regulations under section 8. In accordance with the requirements of section 122(4) of the WT Act it is a statutory requirement that we give one month's notice of any proposed regulations. It is our current expectation that the consultation on the draft regulations will be published by April 2014.

Section 5

Ensuring the control of unwanted emissions from SRDs

5.1 In the previous [25]consultation we received a request to monitor the spectrum adjacent to the bands 870 to 876 MHz and 915 to 921 MHz.

5.2 We have considered this request and concluded that the unwanted emission limits for SRDs, as set out in EN 300 220, are very stringent and that monitoring is neither proportionate nor practical based on previous monitoring campaign by the CEPT to understand the utilisation of the spectrum allocated previously to SRD.

5.3 The previous monitoring of SRDs attempted by CEPT (FM Project Team 22) was of limited success. This was because many SRDs are transient in transmission and often use very low duty cycle operation. These factors coupled with their inherent low power made it difficult for the monitoring test equipment, utilised by Ofcom and the partner monitoring bodies of other European member states, to actually detect the operation of SRDs.

5.4 The unwanted emissions of SRDs are some orders of magnitude (perhaps 20 to 30 dB) below the intended in-band power levels. Therefore, Ofcom does not consider it feasible to undertake a monitoring campaign of SRD unwanted emissions, both because unwanted emissions are already covered by equipment compliance (lawful CE marking) and for the very practical reason that the signals are too small to detect in a repeatable and reliable manner using the monitoring apparatus currently available to Ofcom.

5.5 Ofcom does however intend to continue our market surveillance activities; including ensuring SRD apparatus is compliant with respect to its unwanted emissions.

[25] http://stakeholders.ofcom.org.uk/consultations/870-915/statement/

Annex 1

Responding to this consultation

A1.1 Ofcom invites written views and comments on the issues raised in this document, to be made by 5pm on 19 February 2014.

A1.2 Ofcom strongly prefers to receive responses using the online web form at http://stakeholders.ofcom.org.uk/consultations/short-range-devices/howtorespond/form, as this helps us to process the responses quickly and efficiently. We would also be grateful if you could assist us by completing a response cover sheet (see Annex 3), to indicate whether or not there are confidentiality issues. This response coversheet is incorporated into the online web form questionnaire.

A1.3 For larger consultation responses - particularly those with supporting charts, tables or other data - please email robin.donoghue@ofcom.org.uk attaching your response in Microsoft Word format, together with a consultation response coversheet.

A1.4 Responses may alternatively be posted or faxed to the address below, marked with the title of the consultation.

Robin Donoghue
3rd Floor
Technology Policy SPG
Riverside House
2A Southwark Bridge Road
London SE1 9HA

A1.5 Note that we do not need a hard copy in addition to an electronic version. Ofcom will acknowledge receipt of responses if they are submitted using the online web form but not otherwise.

A1.6 It would be helpful if your response could include direct answers to the questions asked in this document, which are listed together at Annex 4. It would also help if you can explain why you hold your views and how Ofcom's proposals would impact on you.

Further information

A1.7 If you want to discuss the issues and questions raised in this consultation, or need advice on the appropriate form of response, please contact Robin Donoghue on 020 7981 3107.

Confidentiality

A1.8 We believe it is important for everyone interested in an issue to see the views expressed by consultation respondents. We will therefore usually publish all responses on our website, www.ofcom.org.uk, ideally on receipt. If you think your response should be kept confidential, can you please specify what part or whether all of your response should be kept confidential, and specify why. Please also place such parts in a separate annex.

A1.9 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and will try to respect this. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.

A1.10 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's approach on intellectual property rights is explained further on its website at http://www.ofcom.org.uk/about/accoun/disclaimer/

Next steps

A1.11 Following the end of the consultation period, Ofcom intends to publish a statement in 28 March 2014.

A1.12 Please note that you can register to receive free mail Updates alerting you to the publications of relevant Ofcom documents. For more details please see: http://www.ofcom.org.uk/static/subscribe/select_list.htm

Ofcom's consultation processes

A1.13 Ofcom seeks to ensure that responding to a consultation is easy as possible. For more information please see our consultation principles in Annex 2.

A1.14 If you have any comments or suggestions on how Ofcom conducts its consultations, please call our consultation helpdesk on 020 7981 3003 or e-mail us at consult@ofcom.org.uk . We would particularly welcome thoughts on how Ofcom could more effectively seek the views of those groups or individuals, such as small businesses or particular types of residential consumers, who are less likely to give their opinions through a formal consultation.

A1.15 If you would like to discuss these issues or Ofcom's consultation processes more generally you can alternatively contact Graham Howell, Secretary to the Corporation, who is Ofcom's consultation champion:

Graham Howell
Ofcom
Riverside House
2a Southwark Bridge Road
London SE1 9HA

Tel: 020 7981 3601

Email Graham.Howell@ofcom.org.uk

Annex 2

Ofcom's consultation principles

A2.1 Ofcom has published the following seven principles that it will follow for each public written consultation:

Before the consultation

A2.2 Where possible, we will hold informal talks with people and organisations before announcing a big consultation to find out whether we are thinking in the right direction. If we do not have enough time to do this, we will hold an open meeting to explain our proposals shortly after announcing the consultation.

During the consultation

A2.3 We will be clear about who we are consulting, why, on what questions and for how long.

A2.4 We will make the consultation document as short and simple as possible with a summary of no more than two pages. We will try to make it as easy as possible to give us a written response. If the consultation is complicated, we may provide a shortened Plain English Guide for smaller organisations or individuals who would otherwise not be able to spare the time to share their views.

A2.5 We will consult for up to 10 weeks depending on the potential impact of our proposals.

A2.6 A person within Ofcom will be in charge of making sure we follow our own guidelines and reach out to the largest number of people and organisations interested in the outcome of our decisions. Ofcom's 'Consultation Champion' will also be the main person to contact with views on the way we run our consultations.

A2.7 If we are not able to follow one of these principles, we will explain why.

After the consultation

A2.8 We think it is important for everyone interested in an issue to see the views of others during a consultation. We would usually publish all the responses we have received on our website. In our statement, we will give reasons for our decisions and will give an account of how the views of those concerned helped shape those decisions.

Annex 3

Consultation response cover sheet

A3.1 In the interests of transparency and good regulatory practice, we will publish all consultation responses in full on our website, www.ofcom.org.uk.

A3.2 We have produced a coversheet for responses (see below) and would be very grateful if you could send one with your response (this is incorporated into the online web form if you respond in this way). This will speed up our processing of responses, and help to maintain confidentiality where appropriate.

A3.3 The quality of consultation can be enhanced by publishing responses before the consultation period closes. In particular, this can help those individuals and organisations with limited resources or familiarity with the issues to respond in a more informed way. Therefore Ofcom would encourage respondents to complete their coversheet in a way that allows Ofcom to publish their responses upon receipt, rather than waiting until the consultation period has ended.

A3.4 We strongly prefer to receive responses via the online web form which incorporates the coversheet. If you are responding via email, post or fax you can download an electronic copy of this coversheet in Word or RTF format from the 'Consultations' section of our website at www.ofcom.org.uk/consult/.

A3.5 Please put any parts of your response you consider should be kept confidential in a separate annex to your response and include your reasons why this part of your response should not be published. This can include information such as your personal background and experience. If you want your name, address, other contact details, or job title to remain confidential, please provide them in your cover sheet only, so that we don't have to edit your response.

Cover sheet for response to an Ofcom consultation

BASIC DETAILS

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

CONFIDENTIALITY

Please tick below what part of your response you consider is confidential, giving your reasons why

Nothing ☐

Whole response ☐

Part of the response ☐

Name/contact details/job title ☐

Organisation ☐

If there is no separate annex, which parts?

If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom seeks to publish responses on receipt. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here. ☐

Name

Signed (if hard copy)

Annex 4

Consultation question

QI. Do you agree that regulations should be made to enable the licence exempt use of SRDs in the 870 to 876 MHz and 915 to 921 MHz frequency bands, in line with the amendment of ERC Recommendation 70-03.

Annex 5

Wind Profiling Radar (WPR) centred on 915 MHz.

A5.1 In this annex we consider the technical studies undertaken by the CEPT and by Ofcom and the Met Office.

Technical Analysis

Probability of Interference

A5.2 The analysis in ECC Report 200[26] assumed a worst case sharing analysis. At 36 dBm in a 400 kHz bandwidth, the highest power devices proposed are RFIDs and these are therefore assumed to cause the maximum potential for interference. The analysis assumed a WPR could be placed in any location in the UK.

A5.3 Our national study has augmented the probability of interference analysis described in ECC Report 200 with a series of calculations of minimum coupling distance. The technical analysis presented in this annex describes how the probability of interference has been modelled and determined using both methods.

A5.4 The highest density of use of RFIDs is expected to be found around distribution centres used in the logistics industry for moving goods and parcels. The CEPT technical studies have modelled these RFID clusters using a form of probabilistic Monte Carlo analysis (SEAMCAT[27]). In the probabilistic analyses, RFID installations are located randomly around each of these clusters. The maximum density of RFIDs under these circumstances was estimated at 480 RFIDs per km^2. This was calculated as the greatest density of RFID enabled “dock doors” in clusters of distribution centres per km^2. This worst case assumed a WPR was placed in the middle of a cluster of distribution centres and within this 480 per km^2 density of RFID, with the RFID interrogator centred on 916.3 MHz. In this worst case scenario, without any minimum separation distance between any of the RFIDs and the WPR, the probability of interference was calculated as 4.7 %.

A5.5 SRDs are defined in the European recommendation for SRDs (ERC Rec 70-03[28]) as:

- "The term Short Range Device is intended to cover the radio transmitters which provide either unidirectional or bi-directional communication, which have low capability of causing interference to other radio equipment."

A5.6 A probability[29] of less than 5% is usually considered to be sufficient to meet this general requirement, to be considered an SRD.

A5.7 In practice, the existing WPRs are within areas that are fenced off. As such the nearest and potentially most interfering RFID, assumed in the CEPT study, cannot exist in practice unless it operates inside a fenced off area. Furthermore, in practice

[26] http://www.erodocdb.dk/docs/doc98/official/pdf/ECCRep200.pdf
[27] http://www.seamcat.org/
[28] http://www.erodocdb.dk/docs/doc98/official/pdf/rec7003e.pdf
[29] Probability as defined in section 1.1.1.and 1.1.2 of the SEAMCAT Handbook http://www.cept.org/files/1050/documents/SEAMCAT%20Handbook%20January%202010.pdf

we think the density of RFIDs is likely to be lower than that assumed in the CEPT study because the WPRs are not in the centre of an area where RFIDs are likely to operate. Therefore in our view both the density and distribution of RFIDs is likely to be less (perhaps significantly less) than assumed for the CEPT study. Reducing both the density and distribution of RFIDs will diminish the likelihood of interference occurring to the existing WPRs. The benefit of the CEPT study is that it sets an upper bound to the for interference potential from RFIDs to WPRs.

A5.8 Ofcom and the Met Office have undertaken further theoretical work and re-run the CEPT probability analysis using information provided by the Met Office, which it considers more relevant to its specific requirements.

A5.9 We have also considered whether there may be other means to mitigate against the likelihood of interference from SRDs. Ofcom understands that it may be possible to add shielding using radio frequency absorbing material (RAM) to the WPR enclosures, which may further reduce the potential for interference from RFIDs. For indicative purposes only, a further analysis was completed assuming additional r.f. shielding was deployed.

A5.10 The table 7 below indicates the probability of interference over a range of densities of RFID per km^2 with and without r.f. shielding.

Number of RFID per km^2	**Probability of interference (%) for WPR without shielding**	**Probability of interference (%) were an additional 10 dB of r.f. absorbing material fitted to the WPR.**
480	4.7%	0.49%
100	2.8%	0.26%
50	1.78%	0.11%
20	0.87%	0.07%
10	0.47%	0.03%
5	0.27%	0.01%

Table 7 – Probability of interference with and without additional r.f. shielding of WPRs

Minimum Coupling Distance

A5.11 In determining the minimum coupling distance and in common with many compatibility studies in CEPT, the Hata rural propagation model has been used. The r.f. energy from an RFID was calculated and this was compared to minimum sensitivity of the WPR. The resulting power difference was then converted to a minimum coupling distance.

Defining the RFID emissions

A5.12 In Europe, RFIDs operation is closely defined by harmonised standards. The proposed amendment of the relevant harmonised standard, ETSI EN 302 208-1,

states in its General Requirement that “Interrogators shall transmit on any of the high power channels, for the purpose of communicating with tags”. It further states, “Interrogators shall transmit on any of the high power channels, but for no longer than is necessary to complete the intended operation”. As such, RFIDs cannot be used in a way that would continuously point directly towards the WPRs.

A5.13 ETSI TR 103 151[30] Annex C sets out the likely transmissions from RFIDs that are expected in practice and it records a number of measurements of real installations. RFIDs tend to be pointed towards the product being interrogated. Most often, this means that they are also pointing downwards. Additionally, RFID are semi-shielded when they are located within the doorway of distribution centres for example. The ETSI TR considers a number of scenarios of use and suggests that the likely emission level from a 36 dBm e.r.p. RFID interrogator would be approximately 20 dBm e.r.p. in the horizontal plane; i.e, approximately 16 dB below the off axis bore sight level expected from an RFID. The ETSI TR further explains that the level of 36 dBm e.r.p. is reduced in some applications and that in these cases the off axis emissions are likely to be between 4 and 8 dBm e.r.p.

Defining the WPR susceptibility

A5.14 The WPR receiver bandwidth is 2.5 MHz (assumed to be the 3 dB bandwidth). Figure 3 depicts where the lowest frequency RFID interrogator channel overlaps with this bandwidth.

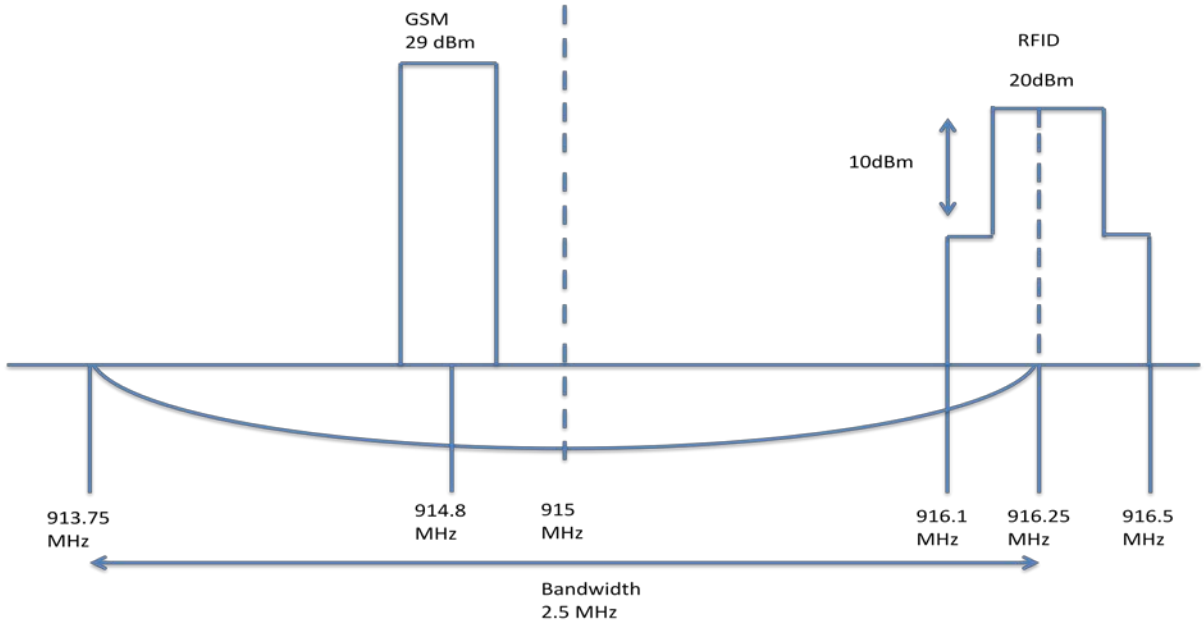

Figure 3 – Potential interferers in the WPR Receiver bandwidth

A5.15 The RFID interrogator signal is not flat across its 400 kHz bandwidth. Figure 4 below shows that the outer 100 kHz of the interrogator signal are 10 dB lower than the peak.

[30] http://www.etsi.org/deliver/etsi_tr/103100_103199/103151/01.01.01_60/tr_103151v010101p.pdf

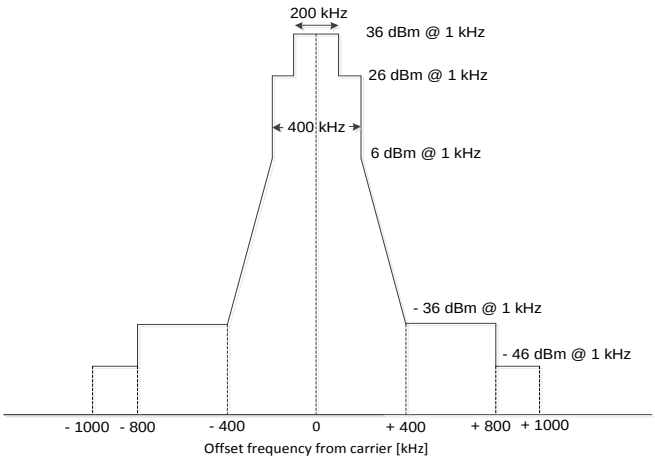

Figure 4 – RFID emission mask

A5.16 The RFID signal occupies the band 916.1 to 916.5 MHz. Within the claimed bandwidth of the WPR (913.75 to 916.25 MHz), the overlap (916.1 to 916.25 MHz) will be 100 kHz at 10 dB lower than the peak signal and 50 kHz at the peak signal. If the maximum power (36 dBm) is assumed for the RFID, then the off axis likely peak emissions are 20 dBm. Summing the peak emission in the 50 kHz to the 10dB lower emissions in the 100 kHz, the assumed RFID emissions in the horizontal are 16 dBm e.r.p. averaged across this 150 kHz overlap.

A5.17 The WPR susceptibility is noted in ECC Report 200 as:

- The WPR receiver noise floor is -112.2dBm over the 2.5 MHz bandwidth of the receiver. This is derived from the receiver kTBF of -146.2 dBW/MHz.
- The WPR antenna gain into the horizontal is -18.7 dB. Ofcom measured the attenuation of the WPR shielding and the typical value assumed is 10 dB.

A5.18 Therefore, the susceptibility of the WPR in the horizontal is -122.2 dBm + 10 dBm + 18.7 dBm = -83.5 dBm.

Calculating the coupling distance

A5.19 Assuming the RFID is operating at its maximum power of 36 dBm, the emissions in the horizontal plane have been shown to be 16 dBm within the bandwidth of the WPR receiver. The coupling distance is therefore the difference between the WPR susceptibility of -83.5 dBm and the RFID emissions of +16 dBm. E.g. 99.5 dB.

A5.20 Using the Hata open (rural) propagation model, where both WPR antenna and the RFID antenna are assumed to be at 1.5m agl, the coupling distance is calculated as 200m.

i) If a lower power of RFID (24 dBm) were used the coupling distance falls to 87.5 dB = 60m.

ii) If a lower power of RFID (20 dBm) were used the coupling distance falls to 83.5 dB = 55m.

A5.21 The Met Office has correctly identified that were future installations of WPR to be centred within the 915 to 921 MHz band, that the WPR receiver would see more potentially interfering RFID RF energy.

A5.22 The Met Office has made further calculations assuming an RFID emission, in the horizontal plane, of 20 dBm / 24 dBm / 36 dBm where the assumed height of the RFID antenna is increased to 3m. The results of this analysis are given in table 9 below. The analysis indicates an an upper and lower figure. The lower figure assumes the kTBF figure of -146.2 dBW/MHz. The upper figure is for the receiver protection of 6 dB lower than kTBF.

	1.5m		**3.0m**	
dBm	**Upper dB**	**Lower dB**	**Upper dB**	**Lower dB**
36	866	585	1284	866
24	395	267	586	395
20	304	206	451	304

Table 9. Calculation of coupling distance with assumed alternative parameters (higher power, higher antenna, increased victim sensitivity)

A5.23 The Met Office has suggested therefore that 1km is an appropriate exclusion zone, for RFID from their installations of WPR.

WPR Analysis and conclusions

A5.24 The rural/semi-rural locations of the existing WPRs suggests that a realistic density of operation for RFIDs will be less than the 480 per km^2 assumed in the ECC Report 200. Further, the existing WPRs operate within fenced, areas where RFIDs could be excluded from operating. As such, the density of RFIDs in the immediate vicinity of the WPRs could be zero. Both these factors imply that the probability of interference from RFIDs is less than the CEPT's studies suggest.

A5.25 The distance where undue interference could potentially occur, based on the coupling distance calculated, will also be influenced by how infrequently the RFIDs operate and whether the Met Office is retrieving data from the smallest (greatest distance) radar return signals. For an RFID operating at full power and at 1.5m agl, the coupling distance is of the order of 200m to 1km. RFIDs also operate only in the "presence or arrival of objects that may be tagged" and as such only operate intermittently. Therefore, for these reasons, any justification for an exclusion zone must take these factors into consideration.

A5.26 The density of operational RFIDs per km^2 is likely to be lower than the assumption made for the theoretical studies. We therefore do not think exclusion zones of 1km radius are proportionate in this case.

Annex 6

Extract from draft European Recommendation for SRD

ERC Rec 70-03 Amendment

Non-specific Short Range Devices

Scope of Annex

A6.1 This annex covers frequency bands and regulatory as well as informative parameters recommended primarily for Telemetry, Telecommand, Alarms and Data in general and other similar applications. Video applications should be preferably used above 2.4 GHz.

A6.2 This annex also includes references to the generic UWB regulation which was primarily developed to allow communication applications using UWB technology in bands below 10.6 GHz; but enables also other types of radio applications.

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	Modulation /maximum occupied bandwidth	ECC/ERC Decision	Notes
G2	870-876 MHz	≤ 25 mW e.r.p.	≤ 0.1% duty cycle For E-GSM-R protection (873-876MHz where applicable), the duty cycle is limited to ≤ 0.01% and limited to a maximum transmit	≤ 200 kHz		This frequency band is also identified in Annexes 2 and 5

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	Modulation /maximum occupied bandwidth	ECC/ERC Decision	Notes
			on-time of 5ms/1s.			
G2 .1	870.0-875.8 MHz	≤ 25 mW e.r.p.	≤ 1% duty cycle For E-GSM-R protection (873-875.8MHz where applicable), the duty cycle is limited to ≤ 0.01% and limited to a maximum transmit on time of 5ms/1s	≤ 600 kHz		The frequency band is also identified in Annexes 2 and 5
g3. 1	915.200-920.8 MHz	≤ 25 mW e.r.p. except for the 4 channels identified in note 9 where ≤ 100 mW e.r.p. applies	≤ 1% duty cycle (note 10) For E-GSM-R protection (918-920.8MHz where applicable), the duty cycle is limited to ≤ 0.01% and limited to a	≤ 600 kHz except for the 4 channels identified in note 9 where ≤ 400 kHz applies		The frequency band is also identified in Annexes 10 and 11

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	Modulation /maximum occupied bandwidth	ECC/ERC Decision	Notes
			maximum transmit on-time of 5ms/1s			
G3	915.000-921.000 MHz	≤ 25 mW e.r.p.	≤ 0.1% duty cycle For E-GSM-R protection (918-921MHz where applicable), the duty cycle is limited to ≤ 0.01% and limited to a maximum transmit on-time of 5ms/1s	≤ 200 kHz		The frequency band is also identified in Annexes 10 and 11

6.2.2 Note 9: The available channel centre frequencies are 916.3 MHz, 917.5 MHz, 918.7 MHz and 919.9 MHz. The channel bandwidth is 400 kHz.

6.2.3 Note 10: RFID tag emissions responding to RFID interrogators operating on centre frequencies 916.3 MHz, 917.5 MHz, 918.7 MHz and 919.9 MHz are not duty cycle limited.

Table 10 – Extract from ERC Recommendation 70-03 – Annex 1 Non Specific SRD

Additional Information

Frequency issues

A6.3 Sub-bands g5) to g8)

A6.4 Use of all or part of sub-bands g5) to g8) may be denied in some European countries that use all or part of these sub-bands for defence/governmental systems. In other countries that use sub-bands 873-876 / 918-921 MHz for GSM for railways, extended band (E-GSM-R), access to the part 873-876 / 918-921 MHz by non-specific SRD applications require implementing additional mitigation measures such as transmission timing limitations as set out in ECC Report 200. See Appendix 3 for national implementation concerning E-GSM-R and defence/governmental services.

A6.5 The adjacent frequency bands below 915 MHz and above 876 MHz as well as 921 MHz may be used by high power systems. Manufacturers should take this into account in the design of equipment and choice of power levels.

Tracking, Tracing and Data Acquisition

Scope of Annex

A6.6 This annex covers frequency bands and regulatory as well as informative parameters recommended for a number of specific devices including:

- Emergency detection of buried victims and valuable items such as detecting avalanche victims;
- Meter Reading;
- **Sensors** (water, gas and electricity; meteorological instruments; pollution measurement; environmental data, such as levels of allergens (pollen, dust), electromagnetic pollution (solar activity), noise) and **actuators** (controlling devices such as street or traffic lights);
- Medical Body Area Network Systems (MBANS), used for medical data acquisition, are intended to be used in healthcare facilities and patients' homes. They are low power area network systems used for the transmission of non-voice data to and from medical devices for the purposes of monitoring, diagnosing and treating patients as prescribed by duly authorised healthcare professionals and are defined in the context of medical applications only.

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	Channel spacing	ECC/ERC Decision	Notes
c	870.0-875.6 MHz	≤ 500 mW e.r.p.	≤ 2.5% duty cycle and Adaptive Power Control required (note 1) For E-GSM-R protection (873-875.6MHz where applicable), the duty cycle is limited to ≤ 0.01% and limited to a	≤ 200 kHz		Individual license may be required for Metropolitan/Rural Area Networks Adaptive Power Control required (APC). The APC Control is able to reduce a link's transmit power

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	Channel spacing	ECC/ERC Decision	Notes
			maximum transmit on time of 5ms/1s (note 2)			from its maximum to ≤ 5 mW. The frequency band is also identified in Annexes 1 and 5

6.6.1 Note 1: a duty cycle of up to 10% may be allowed for network relay points forming part of metropolitan/rural area networks such as for utilities or other applications for the purpose of data acquisition. Network relay points should be individually licensed.

6.6.2 Note 2: except if a procedure with the railway operator is employed (e.g. coordination or cognitive techniques) in order to avoid interference into occupied ER-GSM channels.

Table 11 – Extract from ERC Recommendation 70-03 – Annex 2 Tracking, Tracing and Data Acquisition

Additional Information

Frequency issues

A6.7 Sub-band c)

A6.8 Use of all or part of sub-band d may be denied in some European countries that use all or part of these sub-bands for defence/governmental systems. In other countries that use sub-band 873-876 MHz for GSM for railways, extended band (E-GSM-R), access to the part 873-876 MHz by non-specific SRD applications require implementing additional mitigation measures such as transmission timing limitations as set out in ECC Report 200. See Appendix 3 for national implementation concerning E-GSM-R and defence/governmental services.

Technical parameters also referred to in the harmonised standard

A6.9 No information

Transport and Traffic Telematics (TTT)

Scope of Annex

A6.10 This annex covers frequency bands and regulatory as well as informative parameters recommended for radio systems used in the field of transport and traffic telematics (road rail, water and air, depending on the relevant technical restrictions), traffic management, navigation and mobility management. Typical applications are used for interfaces between different modes of transport, communication between vehicles (e.g. car-to-car), between vehicles and fixed locations (e.g. car-to-infrastructure), communication from and to users as well as radar system installations.

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	Channel spacing	ECC/ERC Decision	Notes
new	870.000-875.800 MHz	≤ 500 mW e.r.p. ≤ 100 mW e.r.p.	≤ 0.1% duty cycle For E-GSM-R protection (873-875.8MHz where applicable), the duty cycle is limited to ≤ 0.01% and limited to a maximum transmit on-time of 5ms/1s	≤ 500 kHz		500 mW restricted to vehicle-to-vehicle applications 100 mW is restricted to in-vehicle applications Adaptive Power Control (APC) is required The APC is able to reduce a link's transmit power from its maximum to ≤ 5 mW. The frequency band is also identified in Annexes 1 and 2

Table 12 – Extract from ERC Recommendation 70-03 – Annex 5 Transport and Traffic Telematics (TTT)

Additional Information

Frequency issues

A6.11 Sub-band (new):

A6.12 Use of sub-band (new) may be denied in some European countries that use all or part of this band for defense/governmental systems. In other countries that use sub-band 873-876 MHz for GSM for railways, extended band (E-GSM-R), access to the part 873-876 MHz by automotive SRD applications requires implementing additional mitigation measures such as transmission timing limitations as set out in ECC Report 200. See Appendix 3 for national implementation concerning E-GSM-R and defense/governmental services

Radio microphone applications including aids for the hearing impaired

Scope of Annex

A6.13 This annex covers frequency bands and regulatory as well as informative parameters recommended for radio microphone applications (also referred to as wireless microphones or cordless microphones) including aids for the hearing impaired (also referred to as assistive listening devices). Radio microphones are small, low power (typically 50 mW or less) transmitters designed to be worn on the body, or hand held, for the transmission of sound. The receivers are more tailored to specific uses and may range from small and portable to rack mounted modules as part of a multichannel system. This annex covers professional and consumer radio microphones, both hand-held and body-worn, and aids for the hearing impaired.

A6.14 Because of the difficulty in determining harmonised frequency bands for radio microphones, frequency band limits should be regarded as tuning ranges within which a device can be designated to operate. In most cases, Appendix 3 indicates those parts of the range that are not available in individual countries but this does not apply to the broadcasting bands at 174-216 MHz and 470-862 MHz where national geographical and licensing restrictions are likely to exist and the national administration should be contacted.

A6.15 The sub-bands below are intended for the following applications:

- Aids for the hearing impaired: sub-bands b), c), d), h1), h2), i)
- Radio microphones: sub-bands a), c), d), e1), e2), e3), e4), f), g), j).

A6.16 Aids for the hearing impaired are specific radio microphone applications which capture an acoustic signal that is transmitted by radio to the hearing aid receivers.

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	Channel spacing	ECC/ERC Decision	Notes
c1	916.1-916.5 MHz, 917.3-917.7 MHz,	≤ 10 mW e.r.p.	< 25 % duty	≤ 400 kHz		Indoor Digital Assistive Listening Device

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	Channel spacing	ECC/ERC Decision	Notes
	918.5-918.9 MHz, 919.7-920.1 MHz		cycle			Systems The frequency band is also identified in Annexes 1 and 11

Table 13 – Extract from ERC Recommendation 70-03 – Annex 10 Radio Microphone applications

Additional Information

Harmonised Standards

A6.17 EN 300 422 all sub-bands

A6.18 EN 301 357 sub-band c)

Frequency Issues

A6.19 Sub-band c1):

A6.20 The available channel centre frequencies are 916.3 MHz, 917.5 MHz, 918.7 MHz and 919.9 MHz.

A6.21 Use of all or part of sub-band c1) may be denied in some European countries that use all or part of these sub-bands for defence/governmental systems or, in some countries that use sub-band 918-921 MHz for GSM for railways, extended band (E-GSM-R). See Appendix 3 for national implementation concerning E-GSM-R and defence/governmental services.

Technical parameters also referred to in the harmonised standard

A6.22 No information

Radio frequency identification applications

Scope of Annex

A6.23 This annex covers frequency bands and regulatory as well as informative parameters recommended for radio frequency identification (RFID) applications including for example automatic article identification, asset tracking, alarm systems, waste management, personal identification, access control, proximity sensors, anti-theft systems, location systems, data transfer to handheld devices and wireless control systems. It should be noted that other types of RFID systems can be operated in accordance with other relevant annexes.

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	Channel spacing	ECC/ERC Decision	Notes
c	915.0-921.0 MHz	≤ 4 W e.r.p. (note 1)	For E-GSM-R protection (918-921 MHz where applicable), DAA is required	≤ 400 kHz		The frequency band is also identified in Annexes 1 and 10 Operation only when necessary to perform the intended operation, i.e. when RFID tags are expected to be present

6.23.1 Note1: Interrogator transmission in band c at 4 W e.r.p, are only permitted within the four channels centred at 916.3 MHz, 917.5 MHz, 918.7 MHz and 919.9 MHz; each with a maximum bandwidth of 400kHz.

Table 14 – Extract from ERC Recommendation 70-03 – Annex 11 Radio Frequency Identification Applications

Additional Information

Harmonised Standards

A6.24 EN 302 208 Sub-bands b1), b2), b3) and c)

Frequency Issues

A6.25 Sub-band c):

A6.26 Use of all or part of sub-band c) may be denied in some European countries that use all or part of these sub-bands for defence/governmental systems. In other countries that use sub-band 918-921 MHz for GSM for railways, extended band (E-GSM-R), access to the part 918-921 MHz by UHF RFID applications requires implementation of additional mitigation measures such as Detect-And-Avoid (DAA) as set out in ECC Report 200. See Appendix 3 for national implementation concerning E-GSM-R and defence/governmental services.