Comments on the "Notice of Ofcom's proposal to exempt the use of automotive short-range radar equipment at 24GHz from Wireless Telegraphy licensing - Consultation document".

Issued: 21 April 2005
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Introduction.

Ofcom has stated that it now welcomes representations from Amateur and other users of the 24GHz band, concerning the introduction of vehicle UWB SRR. The Radio Society of Great Britain welcomes the opportunity to make comments on this proposal.

What follows is a section-by-section comment on the relevant paragraphs in the Proposal, with highlighting as considered appropriate.

The Amateur and Amateur Satellite Services in IARU Region 1, as defined in ITU Regulations, have a Primary allocation in the 24GHz band (24.000 to 24.050GHz) and a Secondary allocation (24.050 to 24.150GHz, with permission of the Secretary of State in the UK – **this permission has never been granted**). A further Secondary allocation exists (24.150 to 24.250GHz), but is no longer commonly used in ITU/IARU Region 1, principally in the interests of international harmonisation or "commonality of usage", as agreed at the IARU Region 1 Conference, San Marino, 2002.

Annexe 1 is an appendix showing that the Amateur Services employ communication techniques in the Primary segment 24.000 to 24.050GHz which clearly classifies them as "extremely weak signal flux" services. There also may be high-power signals from other Primary users, from which SRR cannot claim protection.

Analysis and Comments

Comment on Section 1.2: The word "Decision ***should***" is inappropriate, inferring an option, not a mandate.

Comment on Section 2.4: Similarly the italicised words "… it (is) ***recommended that Member States should take the appropriate measures based on their particular national radio spectrum situation***….. to make sufficient radio spectrum available on a harmonised basis in the 24 GHz range radio spectrum band (21.65 to 26.65 GHz), while protecting existing services operating in that band from harmful interference", infers an option at national level, not a mandate.

Comment on Section 2.7: The proposed measures for protection of existing services are insufficient to assure adequate protection to the existing ("extremely weak signal flux") services.

Comment on Section 3.3: This is conditional on the Island Authorities accepting the proposal and can not, therefore, be considered to be "harmonised".

Comment on Section 3.5: This infers that the Primary Services will be protected and means that "no harmful interference may be caused to other licensed or protected users of the band and no claim may be made for protection from harmful interference received from other licensed systems or services operating in the band". Both Amateur Services are currently licensed to use the band 24.000 – 24.250GHz. Section 3.5 goes on to say ***"The exemption from the requirement to hold a licence will only apply where the equipment does not cause harmful interference to other users of the band".*** This is unproven – why, therefore, are there designated protection zones around Radio Astronomy sites?

Comment on Section 3.8: How is this to be regulated and practically implemented?

Comment on Section 3.10: How is this to be regulated and practically implemented?

Comment on Section 3.11: Without technical resources, how does Ofcom propose to support this and how is this to be implemented? What are the "alternative mitigation techniques which ***may*** be possible, and in how many years?

Comment on Section 3.12: This is much too vague and speculative, and makes too many assumptions as to what ***"may"*** happen in the next 10-20 years. For example: "Ofcom believes", "currently being developed by manufacturers", "should alternative mitigation techniques be identified", "(should) these offer equivalent protection", "Ofcom encourages" etc.

Comment on Section 3.13: All the services identified are "extremely weak signal flux" services, as defined by CEPT ECC and others.

Comment on Section 3.15: Without technical resources, how do Ofcom propose to support this and how is this to be implemented?

Comment on Section 3.17: The Amateur Services, also, are particularly sensitive to interference from SRR equipment (see Appendix 1). **The Amateur services would be well served if the upper limit of the Primary "exclusion" band can be extended to 24.050GHz and the Primary allocation is finally recognised as such**. The Amateur Primary band (24.000 to 24.050GHz) has existed since WARC '79, has never been fully recognised as a Primary allocation and, to the writer's best knowledge, has not caused interference to the Radio Astronomy Service, although the Amateur Services have always had to accept the possibility of interference from other Primary users. As far as the writer is aware, there has been none. The rest of this section is not supported by the lack of Ofcom technical resources and is, therefore, unsustainable.

Comment on Section 3.21: The amateur community in the UK submitted its comments on the 24GHz band ***solely in support of the long-standing allocation of the 79GHz band for SRR***, therefore Ofcom's comment that "these comments were out of the scope of that consultation" is unjustified.

Comment on Section 3.22: The Amateur Services do not contest the fact that Ofcom has no option but to implement the EC decision. However, "compatibility work" appears, to the Amateur Services, to be badly flawed, insofar as it does not recognise the needs of the Amateur Services to be similar to those of the Radio Astronomy Service or the Space Research Service: that is, the ability to exploit "extremely weak signal flux" techniques. Furthermore, Section 2.4 states "… it (is) ***recommended that Member States should take the appropriate measures based on their particular national radio spectrum situation***….." which is completely contradictory to the statement that "***Ofcom has no option but to implement the EC decision,"*** and is therefore an option, not a mandate!

Comment on Section 4.4: At best, this is debateable. What happens if the SRR is off, due to an "exclusion zone": Is the driver at fault, or is the equipment faulty? There is no absolute proof that "intelligent systems" based on electronics are any more reliable than human intelligence and experience. Are these systems "fail-safe"? Do vehicle drivers take any note of "warnings"? Do existing road safety systems (for example, speed cameras) really prevent accidents? The answer to most of these hypothetical questions is "Not proven". How can "manual deactivation" for the early SRR systems possibly be enforced?

Comment on Section 4.11: Of course the majority of accidents (on or off roads) are caused by human error! In the opinion of the writer, IVS systems will not reduce road accidents by anything like the figures quoted in support of the introduction of SRR in the 24GHz band as an "interim" measure.

Comment on Section 4.14: This goes on to say that ***"Although the 24GHz frequency range is heavily used in the UK for a wide range of applications, including Primary allocations for Fixed Services, Radio Astronomy Services, Earth Exploration Satellite Services and Amateur users, due to a variety of factors such as low initial usage of these devices, the likelihood of time-limited SRR use causing harmful interference to other services in the 24GHz band is expected to be low".***

This is complete nonsense! How can it be logical to say that "the likelihood of time-limited SRR use causing harmful interference to other services in the 24GHz band is expected to be low", when all the services mentioned are "extremely low signal flux" services (CEPT's own words), and "time-limited" is a span of probably more than ten years and up to eight (or more) devices per vehicle are planned?

The statement "Amateur users" should be "The Amateur Service and Amateur Satellite Service", recognised internationally as legitimate Primary services in the 24.000 to 24.050GHz segment. Such a statement plays down the role of amateurs in the development of radio and communications technology.

Comment on Section 4.15: 7% of the total number of vehicles in circulation from 2006 to (?) 2020 using 24GHz, with up to 8 devices per vehicle, is an awful lot of potential interference to the Fixed Service, Radio Astronomy Service, Earth Exploration Satellite Service and the Amateur Services. As before, without technical resources, how will Ofcom monitor the situation?

Comment on Section 4.16: This is inconsistent with the earlier statement in Section 4.15 which expects take-up to be low, since Section 4.16 says it is intended to "enable the rapid development and operation of early SRR devices".

Comment on Section 4.17: It is **assumed**, but not proven, that the reliability of radar speed devices is "not expected to be affected by the operation of automotive SRR to any significant extent".

Comment on Section 4.19: Another unproven assumption.

Comment on Section 4.22: Whilst the mitigation techniques applicable to the Radio Astronomy Service may or may not be effective in that case, this may not apply to the Amateur Services for the reason that long distance communication in the 24.000 to 24.050GHz Primary segment often "looks" at the horizon – for instance long distance terrestrial tropospheric propagation and Moonbounce (EME) where the multiple sources of SRR will not be "transitory" and it is likely that, as a consequence, the UWB SRR signals will raise the noise-floor to an unacceptable degree. It is also unsafe to assume that the SRR signals travel only limited distances.

Comment on Sections 4.28, 4.29, 4.30 and 4.31: These sections admit that there is a risk of the "mitigation proposals" not working as expected, and again refer to assumptions. Without technical resources, how do Ofcom propose to support this and how is this to be implemented?

Conclusions

- The Amateur Services in the UK have already responded positively to the proposal for licence exemption in the 24GHz band, albeit having outlined their concerns about the likely interference scenario to "extremely weak signal flux" services (Amateur, Amateur Satellite, Radio Astronomy and Space Research) from vehicle (multiple per vehicle) SRR devices.

- The EU "Decision" appears to be founded on commercial considerations, faulty logical arguments and many assumptions.

- It should also be noted that Ofcom have virtually no technical resources with which they can support their claims to monitoring or investigating interference to other licensed users of the band.

- The decision ignores ITU radio Regulations, footnote 5.340, which applies to the band 23.6 to 24.0GHz and which states that ***all emissions are prohibited in this band, not just in the proposed "exclusion zones"***. Furthermore, the original EU documents accept that the SRR is an exception but should not set a precedent (for other uses, as is now widely happening in the 2400MHz "WiFi" band) - Ofcom must adhere to this principle in the 24GHz band.

- There appear to be no specifications for harmonic emissions from the proposed 24GHz SRR devices – these harmonics will fall in the 47 and 75.5GHz bands where the Amateur Services also have Primary status. Has this been taken into consideration?

- Ofcom needs to encourage innovation and speedier development of SRR in the allocated 79GHz band, but not at 24GHz where it is extremely doubtful whether the protection criteria can ever be met or enforced.

- It is understood that several leading car manufacturers (Mercedes, Jaguar, Volvo?) are already using the 79GHz band for LRR (Long Range Radar) and ACC (Adaptive Cruise Control). Is it naïve to assume, therefore, that 79GHz UWB RF hardware and Modulation technology already exists, and that "intelligent software/firmware" is the only remaining component which needs (10 years) to be developed?

- If so, there is absolutely no justification for seeking to use the 24GHz band for such purposes, other than political and commercial expedience. It is therefore likely that allowing “temporary” use of the 24GHz band will delay development of 79GHz systems and their adoption by other motor manufacturers.

Dr. M. W. Dixon, G3PFR, RSGB Microwave Manager.

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Annexe 1

High End 24GHz EME Amateur Station on CW—W5LUA running 80W and a 10ft dish.

Characteristics	Values
Frequency Band (MHz)	24000-24050 (Commonly 24048, A/AS Primary)
Channel Spacing	Random
Information Rate	CW: 10bit/s
Emission Type(s)	A1A
Transmitter Power (dBW)	19dBW (80W)
Transmission Line Loss (dB)	Transmit: 0 Receive: 0
Antenna Polarization	Circular, RHCP Transmit, LHCP Receive
Antenna Maximum Gain (dBi)	55 (est. at 50% efficiency)
Maximum e.i.r.p. (dBW)	74
Receiver IF Bandwidth	CW: 50 Hz
Receiver Noise Figure (dB)	2.25
Receiver Thermal Noise (dBW)	-197 (10 Kelvin background)
“Hot body” noise capability	Sun noise +13dB, Moon Noise +3dB
Receiver Signal-to-Noise Ratio (dB)	+1
Availability Target %	99 (when moon is in view)
Maximum Path Length (km)	396,000 one way to moon at nominal apogee

Typical 24GHz EME Amateur Station (RW3BP and VE3MA)

The typical EME model is capable of CW communication with other EME stations.

Characteristics	Values
Frequency Band (MHz)	24000-24050 (Commonly 24048, A/AS Primary)
Channel Spacing	Random
Information Rate	CW: 10 bit/s
Emission Type(s)	A1A
Transmitter Power (dBW)	17 (50W)
Transmission Line Loss (dB)	Transmit: 0 Receive: 0
Antenna Polarization	Circular, RHCP Transmit, LHCP Receive
Antenna Maximum Gain (dBi)	50
Maximum e.i.r.p. (dBW)	67
Receiver IF Bandwidth	CW: 50 Hz
Receiver Noise Figure (dB)	1.6
Receiver Thermal Noise (dBW)	-196 (10 Kelvin background)
“Hot body” noise capability	Sun noise +15dB, Moon Noise +3.3dB
Receiver Signal-to-Noise Ratio (dB)	+1
Availability Target %	99 (when moon is in view)
Maximum Path Length (km)	396,000 one way to moon at nominal apogee

High End 24GHz SSB/CW (Terrestrial) Amateur Station

The high-end amateur station communicates with other stations using troposcatter.

Characteristics	Values
Frequency Band (MHz)	24000-24050 (Commonly 24048, A/AS Primary)
Channel Spacing	Random
Information Rate	Speech/CW
Emission Type(s)	J3E/A1A
Transmitter Power (dBW)	10
Transmission Line Loss (dB)	Transmit: 0 Receive: 0
Antenna Polarization	Horizontal
Antenna Maximum Gain (dBi)	45
Maximum e.i.r.p. (dBW)	55
Receiver IF Bandwidth	SSB:2500 Hz CW:100 Hz
Receiver Noise Figure (dB)	1.0
Receiver Thermal Noise (dBW)	-198
Receiver Signal-to-Noise Ratio (dB)	+6
Maximum Path Length (km)	Depends on propagation mode

Typical 24GHz SSB/CW (Terrestrial) Amateur Station

The typical amateur station communicates with other stations using troposcatter.

Characteristics	Values
Frequency Band (MHz)	24000-24050 (Commonly 24048, A/AS Primary)
Channel Spacing	Random
Information Rate	Speech
Emission Type(s) (Note2)	J3E/A1A
Transmitter Power (dBW)	3
Transmission Line Loss (dB) (Note 1)	Transmit: 0 Receive: 0
Antenna Polarization	Horizontal
Antenna Maximum Gain (dBi)	45
Maximum e.i.r.p. (dBW)	48
Receiver IF Bandwidth	SSB:2500 Hz, CW:100Hz
Receiver Noise Figure (dB)	2.0
Receiver Thermal Noise (dBW)	-172 (155 Kelvin background), -186 (CW)
Receiver Signal-to-Noise Ratio (dB)	+6
Maximum Path Length (km)	Depends on propagation mode

Note 1: Mast mounted transverter setup to eliminate the need for expensive feedlines and associated losses.

Note 2: CW is often necessary on transmit to extend the range at this power level.

High end 24GHz SSB Satellite Downlink Amateur Station (G3WDG/G4KGC)

Characteristics	Values
Frequency Band (MHz)	24000-24050 (Commonly 24048, A/AS Primary)
Channel Spacing	Random
Information Rate	Voice
Emission Type(s)	A3J
Transmitter Power (dBW)	N/A (receive only)
Transmission Line Loss (dB)	0
Antenna Polarization	RHCP, Horizontal, or Vertical
Antenna Maximum Gain (dBi)	55 (3m dish)
Maximum e.i.r.p. (dBW)	N/A (receive only)
Receiver IF Bandwidth	2.4kHz
Receiver Noise Figure (dB)	1
Receiver Thermal Noise (dBW)	-200 (155 Kelvin background)
Receiver Signal-to-Noise Ratio (dB)	+7
Maximum Path Length (km)	45,000km

Note: Mode S uplink on AO40 retransmits in the 24GHz downlink band, 24048-24050

Typical 24GHz SSB/CW Satellite Downlink Amateur Station

Characteristics	Values
Frequency Band (MHz)	24000-24050 (Commonly 24048, A/AS Primary)
Channel Spacing	Random
Information Rate	Voice
Emission Type(s)	J3E
Transmitter Power (dBW)	N/A (receive only)
Transmission Line Loss (dB)	0
Antenna Polarization	RHCP, Horizontal, or Vertical
Antenna Maximum Gain (dBi)	40 (2ft dish at est. 50% efficiency)
Maximum e.i.r.p. (dBW)	N/A
Receiver IF Bandwidth	2.5kHz SSB
Receiver Noise Figure (dB)	3
Receiver Thermal Noise (dBW)	-185
Receiver Signal-to-Noise Ratio (dB)	+7
Maximum Path Length (km)	45,000km

Note: Mode S uplink on AO40 retransmits in the 24GHz downlink band, 24048-24050

Typical 24GHz portable Amateur Station

The typical portable amateur station can communicate with other portable and fixed amateur stations.

Characteristics	Values
Frequency Band (MHz)	24000-24050 (Commonly 24048, A/AS Primary)
Channel Spacing	Random
Information Rate	Speech/CW
Emission Type(s)	A1A,J3E, F3E
Transmitter Power (dBW)	100mW to 3W
Transmission Line Loss (dB)	Transmit: 0 Receive: 0
Antenna Polarization	Horizontal
Antenna Maximum Gain (dBi)	40 (2ft dish at est. 50% efficiency)
Maximum e.i.r.p. (dBW)	30 to 40
Receiver IF Bandwidth	2.5kHz SSB, 300Hz CW
Receiver Noise Figure (dB)	2
Receiver Thermal Noise (dBW)	-175 (155 Kelvin background)
Receiver Signal-to-Noise Ratio (dB)	+ (SSB), + (CW), +7 (FM for 12 dB SINAD)
Maximum Path Length (km)	Depends on propagation mode

High End 24GHz Beacon Amateur Station

Used to detect and monitor propagation characteristics over terrestrial paths.

Characteristics	Values
Frequency Band (MHz)	24000-24050 (Commonly 24048, A/AS Primary)
Channel Spacing	N/A (Single allocated channel)
Information Rate	CW
Emission Type(s)	A1A, F1A
Transmitter Power (dBW)	1W
Transmission Line Loss (dB)	Transmit: 0 Receive: 0
Antenna Polarization	Horizontal
Antenna Maximum Gain (dBi)	15dBi sectoral horn
Maximum e.i.r.p. (dBW)	15
Receiver IF Bandwidth	N/A
Receiver Noise Figure (dB)	N/A
Receiver Thermal Noise (dBW)	N/A
Receiver Signal-to-Noise Ratio (dB)	N/A
Maximum Path Length (km)	Depends on propagation mode

Typical 24GHz Beacon Amateur Station

High gain omnidirectional antennas are often used to maximize the possibility of detecting band openings in different directions.

Characteristics	Values
Frequency Band (MHz)	24000-24050 (Commonly 24048, A/AS Primary)
Channel Spacing	N/A (Single allocated channel)
Information Rate	CW
Emission Type(s)	A1A, F1A
Transmitter Power (dBW)	1W
Transmission Line Loss (dB)	Transmit: 0 Receive: 0
Antenna Polarization	Horizontal
Antenna Maximum Gain (dBi)	10dBi omni directional
Maximum e.i.r.p. (dBW)	15
Receiver IF Bandwidth	N/A
Receiver Noise Figure (dB)	N/A
Receiver Thermal Noise (dBW)	N/A
Receiver Signal-to-Noise Ratio (dB)	N/A
Maximum Path Length (km)	Depends on propagation mode