

## Cover sheet for response to an Ofcom consultation

### BASIC DETAILS

**Consultation title:** Ofcom's proposal to exempt the use of automotive short-range radar equipment at 24GHz from Wireless Telegraphy licensing

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No

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Name *Murray Niman*

Signed (if hard copy)



# UK Microwave Group Response to Ofcom Notice on Automotive Short Range Radar at 24GHz

Submitted 23-May-2005

## 1. Who We Are

The UK Microwave Group (UKuG, [www.microwavers.org](http://www.microwavers.org)) is the representative body specifically for UK amateur radio enthusiasts who operate on the microwave bands. It is affiliated to the Radio Society of Great Britain (RSGB, [www.rsgb.org](http://www.rsgb.org)) and the RSGB Spectrum Forum. UKuG also liase with AMSAT-UK and BATC who are also users of UK Amateur Microwave allocations. This response is intended to complement and in no way replaces the RSGB response.

UK Microwave Group membership includes operators of Terrestrial, Amateur Satellite and Earth-Moon-Earth (EME) links, using a variety of leading edge weak signal receivers. Systems also include Microwave Propagation Beacons, Voice Repeaters and Fast-Scan Television Repeaters. Our membership base includes many people with professional backgrounds and extensive experience in science, engineering and communications, which has informed this response. Needless to say, our membership includes plenty of car drivers who appreciate safety aids – provided they are sensible and reliable.

**It should be noted that at 24GHz, as is the case in all amateur microwave allocations, our members and other Amateurs will have invested years of their own time and effort in the development and implementation high performance equipment. Most of this activity is centred on 24.048GHz in our Primary Allocation. Results of these endeavours are made freely available to the wider engineering community. The fact that this is now at risk is particularly disturbing.**

**We strongly believe that the 24GHz band is unsuitable for automotive radar, and make our case below for measures to be fully implemented in the Ofcom regulations which will restrict it, and thus incentivise its early migration to the 79GHz band.**

## 2. Introduction

The Amateur and Amateur Satellite Services have allocations in the 24GHz band, including an active **Primary Allocation at 24-24.05GHz** (See Table), which is harmonised worldwide. In the UK most of the 24GHz allocations in the table are either not available in practice and are secondary. The narrow allocation at 24-24.05GHz is notable, as it is the only Primary one that the Amateur Services have in the main microwave bands. This has made it the focus of much development effort, both on the ground, and in orbit with the Amsat Oscar-40<sup>1</sup> satellite. As mentioned above most of this activity is centred at 24.048GHz using highly optimised equipment that would be difficult to retune.

In our previous response to the Ofcom 79GHz notice [1], the UKuG response [2] accepted the use of SRR in the 77-81GHz band (even though it overlapped Amateur allocations). We recognised that this was an appropriate band for such wideband applications, and that we could also coexist with 77GHz Car LRR on the basis that EU35 would be implemented to permit the existing Amateur Primary Allocation to remain at 75.5-76GHz. This was facilitated by CEPT fully accepting that the Amateur Services would suffer interference from car SRR in its report [3] and decision [4], and mitigated it with allocation note EU35. UKuG looks forward to Ofcom implementing EU35 in the UK prior to the end of December-2006, as promised in its response [6]

This submission concentrates on regulatory issues. Readers are referred to the RSGB response for a detailed analysis and parameters of typical amateur stations. Peter Day G3PHO, a leading 24GHz Operator and UKuG Chairman, has submitted a separate response along with other Amateurs.

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<sup>1</sup> OSCAR, Orbiting Satellite Carrying Amateur Radio – In total 52 Oscar satellites have been successfully launched and orbited, starting with Oscar-1 in 1961 upto Oscar-52 in 2005.

### 3. UK Microwave Group Position

In general UKuG welcomes technological developments<sup>2</sup> in the higher millimetre-wave bands, where amateurs are undertaking pioneering work at 76GHz, 142GHz and higher. Our approach here is twofold – to encourage early adoption of 79GHz for SRR, and to protect our members, other amateurs and the wider public from legal uncertainties surrounding SRR.

It should be noted that at 79GHz, CEPT accepted that interference to amateur services could occur. The same rf systems scenario equally applies at 24GHz, with the added complexity of more existing users, with higher powers. The Ofcom consultation in paragraph 3.22 incorrectly implies that Amateur interests were fully considered. In fact despite submissions being made, they were almost totally ignored by CEPT<sup>3</sup> in ECC Report-23. ETSI had also mistakenly treated the Amateur Services as Secondary in its 24GHz System report [11]. **Thus interference to the Amateur Services has not been accounted for.** Only the issue of high power interference from Amateurs to SRRs was however noted in the final CEPT decision.

UKuG and its members welcome any genuine contributions to road safety, and although we are Primary users, we wish to operate in a responsible manner. We therefore take this opportunity to request that the Ofcom regulations should more explicitly account for safety/interference related issues than currently proposed, or were thought sufficient in the 79GHz band. Likewise as Primary users we request that the full spirit and letter of the EU Decision is implemented explicitly in the UK regulations. This would fully restrict 24GHz SRR, enhance protection for the Amateur, RAS and other Services, and to act as incentive for use of 79GHz (which Ofcom is obliged to encourage).

### 4. The EU Commission Decision

UKuG wish to highlight to Ofcom that the official CEPT decision was not the draft output at the 8<sup>th</sup> CEPT meeting at Gothenburg on 9-July-2004, but was formally adopted at the 9<sup>th</sup> meeting in Brugge on 12-November-2004, as ECC Decision ECC/DEC/(04)10 [7]. The ECC decision formed the basis of the EU Commission Decision on 17-Jan-2005 [8]. Supporting reports are ECC Report-23 [9] **and ECC Report-46** [10]. We emphasise this as [8][10] explicitly noted the presence of high power users including the Amateur Services in the 24GHz band<sup>4</sup>, the possibility of interference from these Primary users, and placed the onus on SRRs to cope with such signals. Whilst we note that SRR will be permitted on a non-protected basis, a more explicit note regarding these matters to safeguard existing users is requested in Ofcom's final regulations because of the safety implications.

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<sup>2</sup> In its 79GHz SRR submission UKuG stated: 'That UKuG wishes to foster UK and EU technology and educational developments on the millimetre wavebands, much of it by UK Companies and Universities.'

<sup>3</sup> ECC Report-23 Sec-3 p14: "A number of those services were not considered in the study since SRR 24GHz was not assumed to present interference potential. However, this has not been validated by technical studies". – *including the Amateur and Amateur Satellite Services which have Primary Allocations*

<sup>4</sup> Extracts from ECC Decision ECC/DEC/(04)10:-

- v) that there is a world wide primary amateur and amateur satellite service allocation at 24.00-24.05GHz and stations within this service can radiate a significant power;
- y) that SRR-equipment is not considered as a safety of life applications in accordance with the Radio Regulations. SRR in the 24GHz band must operate on a non-interference and non-protected basis in accordance with the Radio Regulations;
- z) that ECC Report 046 shows that SRR will have to operate in a high level of interference in the vicinity of FS transmitters and stipulates that it is the responsibility of the SRR manufacturers to carefully design their systems to minimize the effect of interference from radiocommunication services (in particular Fixed Service) as well as other SRR devices by implementing adequate mitigation techniques; - *the Amateur Service can easily radiate similar powers to the Fixed service*

We would like to briefly highlight issues, leeway and obligations that are within the Decision:-

- 24GHz SRR transgresses Radio Regulation 5.340 for Astronomy and EES. We would be interested to see a comment on what value RSA would have been in this instance, bearing in mind the parallel Astronomy RSA consultation.
- In the Decision, Para-6 and Article-5 require national administrations to protect existing services.
  - **Para-6:** "Therefore, 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 24GHz range radio spectrum band (21.65 to 26.65GHz), **while protecting existing services operating in that band from harmful interference.**"
  - **Article 5:** "The continued availability of the 24GHz range radio spectrum band for automotive short-range radar applications shall be kept under active scrutiny to ensure that **the main premise of opening this band to such systems** remains valid, which **is that no harmful interference is caused to other users of the band**"
- Even with a limit of 7% of all vehicles, with typically four or more devices per vehicle, and a vehicle lifetime of 10-15 years, this will result in millions of 24GHz SRR units being on the road until 2025/2030 unless early deactivation is permitted (see our comment on Draft Regulation 2a regarding Vehicle MOTs later).
- The EU and CEPT Decisions do not specify that Licence Exemption is mandatory.

## 5. 79GHz Developments

UKuG is unconvinced that in the light of recent developments that it would take till 2013 to bring 79GHz SRR to the market. Public domain information and Internet searches are quite revealing. Bosch is already mass producing 77GHz LRR equipment for various car models. Such activity is complemented in the UK and elsewhere. In the UK alone, E2V mass produces 77GHz VCOs for car radar sources, Scottish institutions produce leading-edge 77GHz MMICs (assisted by commercial and regional funds), and other companies such as Qinetiq seek to exploit 79GHz SRR for security and other applications. Compared to 77GHz LRR, 79GHz SRR does not have that much extra microwave complexity, and the rest is merely packaging DSP/software, and car harness integration. SRR at 79GHz benefits from the higher antenna gains available at millimetre-wave frequencies from limited size apertures, than can be achieved at 24GHz.

There is therefore a significant risk that damage (perhaps more than in Ofcom [5]4.31) may occur to nascent 79GHz developments if 24GHz SRR is permitted. UKuG is also greatly concerned that the full width 24GHz band being designated here will become unrestricted and permanent under renewed pressure from SARA.

The production volumes that would result at 77/79GHz would greatly help develop technology and mass-manufacturing techniques for a much larger range of applications in other millimetre wave bands, including complementary vehicle telematics applications in the 63GHz band (also for Driver Aids/Safety). In Articles 1 and 2 of the Commission Decision, Ofcom is asked to actively review/promote 79GHz developments. Ofcom's own Framework Review Implementation Plan would also benefit if technology were more cheaply available in the millimetre-wave bands.

Alternatively data fusion of Lidar, 5.8GHz sensors or CCD cameras (by Cambridge Consultants) has also been shown to provide much more spectrally efficient and potentially lower cost solutions.

## 6. Comments on Ofcom's Proposed Regulations

UKuG recognises that Ofcom is required to implement the EU Decision. In contrast with 79GHz SRR, the 24GHz situation and its context are far more complex. Therefore we take issue with Ofcom's rather sparse draft regulations in Annexe-3 of the consultation document which do not fully implement the spirit and letter of the Decision, and request a more compliant and watertight version. Our detailed comments are:-

**Draft Regulation 1 - Citation:** The current draft regulation makes no reference to the EU Decision. This results in omission of reference and transition dates, market limits, and its temporary and exceptional nature - as per Decision Para (24). An explicit reference to Commission Decision 2005/50/EC should be added here, rather than in the non-binding explanatory notes.

**Draft Regulation 2a:** The phrase "collision mitigation and traffic safety applications" clearly implies that SRR equipment is a dependable safety system just like ABS, seatbelts etc. Similarly the description of SRR as an Intelligent Vehicle System (IVS) also implies this. Thus 2a should account for Para (24) of the EU Decision which states that 24GHz SRR should not be considered a Safety-of-Life Service. Given that it will also be licensed to operate on a non-protected basis and could be subject to interference from other users or de-activation in exclusion zones, there is a murky legal issue here. The responsibility for SRR to account for interference from Amateur and Fixed Services has been highlighted. It is therefore considered important (unlike 79GHz SRR) to add a clarification for the greater public interest in line with Ofcom's duty to citizen consumers. Perhaps a dashboard warning light is necessary for when it is offline.

A related clarification is also requested with regard to Vehicle MOTs and maintenance. It is currently accepted that safety equipment must work where fitted. If this was applied to SRR it would oblige users to maintain kit for the vehicle lifetime, which could easily be till 2030. We along with the public in general would appreciate knowing whether SRR would be a MOT'able item – and how it could be tested.

**Draft Regulation 3 - Exemption:** The Exemption should be specifically limited to the 30 June 2013 (the reference date) as per Article 3 of the Decision, subject to it being further limited by Article-5 of the Decision. As per the other restrictions to protect existing users, this also acts as incentive to migrate to 79GHz.

Exemption can only occur where harmful interference does not occur, which is far from proven in the 24GHz band. Licence Exemption is not required by the EU Decision. We accept that it is impractical for individual drivers to be licensed. However there is no reason why manufacturers/importers/repairers should not obtain a license. This would give Ofcom a useful tool that could be used to enforce matters in the case that a particular manufacturer/make/car model being incompliant or causing harmful interference, not assisting with record keeping, or providing insufficient advice to drivers on de-activation.

**Draft Regulation 5b - Frequency Range:** This is vague and can be interpreted as absolutely no out-of-band emissions or harmonics being radiated (which of course would be highly desirable!), or that such emissions are not regulated at all (which could cause serious issues). This needs clarifying. For example, the table below shows the huge bandwidths that uncontrolled harmonics would cover.

Parameter	UWB Component, GHz	High Power Carrier, GHz
Fundamental	21.65-26.65	24.05-24.25
2 <sup>nd</sup> Harmonic	43.30-53.30	48.10-48.50
3 <sup>rd</sup> Harmonic	64.95-79.95	72.15-72.75

The UWB component could result in interference in the Amateur Primary Band at 47GHz, and another breach of ITU 5.340 rules in the Astronomy 50/52GHz bands. Similarly, 3<sup>rd</sup> harmonics could interfere with the Amateur Primary 76GHz band and, ironically, the 77/79GHz car LRR/SRR bands. Ofcom is asked to clarify what specification applies to out-of-band, spurious and harmonic emissions and include it in 5b.

**Draft Regulations 6 and 7:** These are as per the EU Decision. UKuG reluctantly accept these and oppose any relaxation that would result in these rules not being compliant with the EU Decision.

**Draft Regulation 8 - High Angle Radiation:** This does not fully implement EU Decision Article-4, para-3. We request that the 30dB protection limit post-2009 be included in the current regulations, which only refer to 25dB. This would fully align it with the Decision, and also act as a migration incentive to 79GHz. In addition to it directly protecting the Earth Exploration Satellite Service, the restriction will also be beneficial to the adjacent Amateur Satellite Service.

**Draft Regulations 9 and 10 - Exclusion Zones:** These provide protection for a limited number of major Radio Astronomy sites. This does not cover other users or Amateur Services or Amateur Radio Astronomers (yes - they do exist!). In contrast to the Decision, the draft regulations do not state that SRR must automatically deactivate after 30-June-2007 in the exclusion zones. In any case it is not at all obvious how users will be expected to know how/where to manually deactivate equipment before then, nor the penalty for not doing so. The regulation should mandate the need for suppliers maintain records of vehicles fitted with manual/auto-deactivated 24GHz SRR in collaboration with the DVLA. The above complies with the Decision and will encourage auto-deactivation and/or migration to the less restricted 79GHz band.

Any implementation, particularly for the interim manual deactivation solution also needs to account for human nature – After all, why would a driver disable a driver/safety aid?

## 7. Other Comments

UKuG requests assurances that 24GHz SRR should not be a precedent for other systems or other applications of these systems in the Amateur Primary Allocation. This is not hypothetical, as we are aware that Qinetiq requested precisely this for 79GHz SRR (where it can at least be more easily accommodated).

UKuG also requests that Ofcom resist any renewed pressure from SARA or similar to extend 24GHz usage/tenure.

UKuG is mindful of the reviews requested of interference and 79GHz developments, and would be glad to be included in these discussions, and assist Ofcom with such.

## 8. Summary

- UKuG prefers SRR Operation to be at 79GHz and not at 24GHz both on a mutual interference basis, and to foster technology development in the higher millimetre wave bands.
- That it should be noted that ITU 5.340 designates no transmission anywhere in 23.6-24GHz – not just in modest exclusion zones, and that 24GHz SRR has unfortunately breached this. What value RSA?
- UKuG requests that the full scope of the EU Decision, including all limits and reference dates, is included within the Ofcom Regulations as per our detailed comments in Section-6.
- That Licence Exemption may not be wholly adequate, especially for suppliers/vendors
- That 24GHz UWB SRR must not be treated as a precedent for other systems being put into the Amateur 24GHz Primary Allocation.
- That issues relating to Safety, Mutual Interference and Liability be clearly addressed in the regulations.
- That the RIA is modified to account for incomplete CEPT studies, market damage to mm-wave technology developments and the uncertainties of restricted 24GHz SRR as now permitted.

## 9. References

- [1] "Notice of Ofcom's proposal to exempt automotive short-range radar users at 79GHz from wireless telegraphy licensing", Ofcom, 9-Dec-2004
- [2] UK Microwave Group Response to Ofcom Notice on Automotive Short Range Radar at 79GHz
- [3] "Compatibility of Automotive Collision Warning Short Range Radar Operating at 79GHz with Radiocommunication Services", CEPT ECC Report 56, Stockholm, October 2004
- [4] "ECC Decision of 19 March 2004 on the frequency band 77–81GHz to be designated for the use of Automotive Short Range Radars", CEPT Electronic Communications Committee ECC/DEC/(04)03
- [5] Ofcom's decision to exempt the use of automotive short-range radar equipment at 79GHz from wireless telegraphy licensing - Statement and Statutory Regulations 24 February 2005
- [6] "Notice of Ofcom's proposal to exempt the use of automotive short-range radar equipment at 24GHz from wireless telegraphy licensing", Ofcom, 21-April-2005
- [7] ECC/DEC/(04)10 - CEPT ECC Decision of 12 November 2004 on the frequency bands to be designated for the temporary introduction of Automotive Short Range Radars
- [8] Commission Decision 2005/50/EC of 17 January 2005 on the harmonisation of the 24GHz range radio spectrum band for the time-limited use by automotive short-range radar equipment in the Community
- [9] "Compatibility of Automotive Collision Warning Short Range Radar Operating at 24GHz with FS, EESS and Radio Astronomy", CEPT ECC Report 23, Cavtat, May 2003
- [10] "Immunity of 24GHz Automotive SRRs Operating on a non-interference and non-protected basis from emissions of the primary fixed service operating in the 23GHz and 26GHz frequency bands", CEPT ECC Report 46, Galati, May 2004
- [11] ETSI TR 101 982 v1.2.1 (2002-07) - "Electromagnetic compatibility and Radio spectrum Matters (ERM); Radio equipment to be used in the 24GHz band; System Reference Document for automotive collision warning Short Range Radar", July 2002

Frequency, GHz	Max Power, PEP	Amateur Service Allocation	Amateur Satellite Service Allocation	Comment
24.000 - 24.050	26dBW (400W)	Primary	Primary	Centre of activity 24.048
24.050 - 24.150	26dBW (400W)	Secondary May only be used with the written consent of the Secretary of State	Not Allocated	<b>Consent has never been granted</b> Will be Subject to High Power SRR Carriers
24.150 - 24.250	26dBW (400W)	Secondary	Not Allocated	Will be Subject to High Power SRR Carriers

**Table-1: Amateur Services Allocations in the 24GHz Band**