



CEPT Report 003

**Report from CEPT to the European Commission
in response to the Mandate to:**

**HARMONISE RADIO SPECTRUM
TO FACILITATE A COORDINATED EU INTRODUCTION OF
AUTOMOTIVE SHORT RANGE RADAR SYSTEMS**

Report approved on 9 July 2004 by the:



Electronic Communications Committee (ECC)
within the European Conference of Postal and Telecommunications Administrations (CEPT)



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Annex 1Mandate issued by the European Commission on SRR

Annex 2Draft ECC Decision on frequency bands for the permanent use of SRRs



Executive summary

This report is developed in response of a mandate pursuant to art 4 of the Radio Spectrum Decision. The report provides a detailed description of the spectrum management issues including required protection of other services associated with the two frequency bands given in the Mandate and a possible 'package solution' for implementation. The elements of this are:

- A permanent frequency band at 77-81 GHz range (79 GHz) for Short Range Radar (SRR) applications in Europe. An ECC Decision has been developed and adopted by the ECC in March 2004 (ECC/DEC(04)03). The 79 GHz band should be made available within EU member states and other CEPT countries by January 2005 in order to encourage industry development of components and technology for this frequency band
- A possible temporary use of 21.625-26.625 GHz (24 GHz) frequency band with limited number of equipment in the market place in Europe and only applicable for a limited time frame. Technical conditions on SRR implementation should be established in order to ensure protection of the existing services in the 21.625-26.625 GHz band. The report suggests a power level limited to -41.3 dBm/MHz with attenuation for 23.6-24 GHz 30° above the horizontal plane as already included in the FCC Regulations.

Furthermore regulatory means should be found to limit the placing on the market of 24 GHz equipment to a defined period in time in accordance with the results of the sharing studies as agreed by the SE WG (ECC Report 23). It has been suggested in the current report to limit the percentage of vehicles equipped with SRR devices to 7.0% on each national market. Not all manufacturing groups will implement 24 GHz SRR from the outset or at all so there is confidence that the absolute 7.0% limit would not be exceeded.

To provide certainty of the applicability of the possible temporary solution a reporting programme for 24 GHz equipment placed on the market in Europe must be arranged together with a commitment from car manufacturers to publish market figures and to accept the maximum penetration limits required by the Administrations.

An ECC Decision on the temporary use of the 24 GHz band has been developed and has been adopted for public consultation by the ECC. Furthermore provisions for legal certainty need to be agreed by the Radio Spectrum Committee and the TCAM as appropriate.

- A review process would allow all parties involved to consider the results of the reporting programme and to agree on necessary action as required to ensure adequate protection of other services. This process would however not review the possible 'package solution' as such.

The designation of frequency bands for SRR equipment is developed under the explicit condition that SRR equipment is not considered as safety of life applications in accordance with the Radio Regulations and must operate on a non-interference and non-protected basis.



In considering the Short Range Radar issues, it was recognised that a stable and permanent frequency band for SRR equipment is essential for the automotive industry to make the substantial investments necessary for deployment of the 79 GHz frequency band. It was also recognised that the 24 GHz band contains an extensive number of existing users who have all expressed considerable concern about the future of their very substantial existing long-term investments.

The acceptance of the temporary solution at 24 GHz is conditional on a number of agreed elements including protection of the existing services in the 21.625 - 26.625 GHz band and the legal certainty from the Radio Spectrum Committee and TCAM of stopping the placement on the market of 24 GHz equipment at an agreed date.

Additionally particular regulation and legal certainty should be provided on the reporting arrangement including the reporting on vehicles imported to national market from outside EU.

Conclusions

The European Commission has determined that short range radar is a key component of the Community's e-safety initiative. Text from the mandate Introduction of Short Range Radars based on Ultra Wide Band technology in Europe should be based on the following frequency management considerations in full respect of the long-term protection of the existing services:

1. A permanent frequency band at 77-81 GHz (the '79 GHz range') should be made available as soon as possible for Short Range Radars. ECC/DEC/(04)03 has been finally adopted by the ECC at its March 2004 meeting. The frequency band should be made available by January 2005 in order to encourage industry development of components and technology for this band.
2. In order to allow early introduction of SRR applications in Europe the frequency band the '24 GHz range' may be used on a temporary basis with limited number of equipment in the market place in Europe for a limited time frame. The implementation of such temporary solution requires agreement and commitment in some cases with legal certainty from CEPT Administrations, the European Commission (Radio Spectrum Committee and the TCAM) and the automotive industry. It shall be taken as a clear incitement for manufacturers to develop SRR in the 79 GHz range.
3. The temporary solution must be limited in time and scope as follows:
 - a. The characteristics of SRR systems shall be limited to an e.i.r.p. mean power density of -41.3 dBm/MHz, an e.i.r.p. peak limit of 0 dBm/50 MHz, with a vertical attenuation of 25 dB from 2005 and 30dB from 2010 for any emissions within the 23.6-24 GHz band that appear 30° or greater above the horizontal plane, and a narrow-band emission mode limited to an unmodulated carrier within frequency band 24.05 -24.25 GHz with a maximum peak power of 20 dBm e.i.r.p.
 - b. Vehicles fitted with 24 GHz SRR equipment must contain an automatic deactivation mechanism to ensure protection of Radio Astronomy stations in Europe as well as a manual deactivation to allow cross border enforcement if some CEPT countries not being member of the European Union do not implement the interim solution. In order to allow an early implementation of 24 SRR Systems the automatic deactivation should only be made mandatory



- after a transitional period of 24 months. During the transition period manual deactivation is required.
- c. The temporary solution is limited in time until the reference date that is set to 1st January, 2013. After this reference date all new SRR equipment placed on the market shall use the 79 GHz band only, but the installed 24 GHz SRR equipment may still be used until the end of the lifetime of the vehicles.
 - d. In order to protect other existing services within the frequency band including in particular the Fixed Service and the Earth Exploration Satellite Service (EESS) the percentage of vehicles equipped with SRR devices must be limited to less than 7.0 percent in each national market.
 - e. The reference date may be set earlier, in case the 7% national market penetration threshold would be exceeded in one EU country or associated European country where R&TTE Directive is applicable. The Radio Spectrum Committee and the European Commission should consider whether the area of such country is significant and decide whether the ‘reference date’ shall be brought forward (i.e. set earlier).
 - f. In order to ensure that the actual penetration level does not exceed the limit mentioned above a reporting process should be established where information about the number of vehicles equipped with 24 GHz SRR and intended for the European or national markets is provided and made available to administrations and parties involved. The Radio Spectrum Committee should establish the necessary legal means to collect and publish the information received.
 - g. A review should take place during 2009 in order for the Radio Spectrum Committee and the parties involved to consider and confirm that the number of equipment in use on a national basis is still consistent with the agreed solution.
 - h. Development of 79 GHz equipment should be monitored by the Radio Spectrum Committee and the committee should take action should as appropriate.
4. An ECC Decision designating the 24 GHz frequency band has been developed by the ECC and is adopted for public consultation in parallel with the other elements of the “package solution”. The ECC Decision includes the designated frequency bands, the maximum power levels allowed and associated regulatory provisions.
 5. CEPT administrations and the European Commission shall make sure that any such temporary authorization of 24 GHz SRR systems is exceptional and can not be used as a precedent for possible introduction of other transmitter devices in bands where RR footnote 5.340 is applicable, for temporary or permanent use.
 6. The designation of frequency bands for SRR equipment is developed under the explicit condition that SRR equipment is not considered as safety of life applications in accordance with the Radio Regulations. No mandatory measures shall therefore be envisaged for the protection of SRR applications from existing services.
 7. To manage a temporary use of the 24 GHz frequency band a number of agreements between parties involved need to be in place and legal as well as regulatory certainties need to be provided by the TCAM/Radio Spectrum Committee and the European



Commission before any introduction of SRR equipment operating in the 24 GHz band can be permitted. In particular the following issues need detailed regulation and legal certainty:

- a. Stop placing on the market of 24 GHz SRR
- b. forbidding of after-market sales
- c. Legal certainty of the availability of the 79 GHz band
- d. Legal certainty of the temporary availability of the 24 GHz band for SRR
- e. Legal certainty on the reporting arrangement including participation of automotive manufacturers from outside the European Union.
- f. Certainty about harmonised standard for the 24 GHz equipment and the 79 GHz equipment



0 Introduction

This draft report has been developed by the European Conference of Postal and Telecommunications Administrations (CEPT) to the European Commission (EC) under a mandate pursuant to article 4 of the Radio Spectrum Decision to harmonise radio spectrum to facilitate a coordinated EU introduction of automotive *Short Range Radar systems*. (See Annex 1).

The mandate was issued to CEPT on 5 August 2003. The draft outline of the Report was presented to the RSC meeting 1st October 2003 and the first interim report was provided to the European Commission 30 October 2003. Furthermore a status report regarding the most recent developments within the SRD/MG was provided to the RSC meeting 10 December 2003. The final report with the requested deliverables is expected from the ECC by July 2004.

The report was developed by the Short Range Device Maintenance Group (SRD/MG) of the FM WG. Special meetings have been arranged and participation was open for industry representatives from SARA¹ and recognised observers as well as CEPT administration representatives and representatives from the EC (Counsellor) and the European Radiocommunications Office (ERO).

For the purpose of this Report, the following definitions shall apply:

- (1) The '24 GHz range' or '24 GHz SRR band' shall mean a 5 GHz wide band centred on the frequency 24.125 GHz, which is frequency band 21.625 – 26.625 GHz.
- (2) The '79 GHz range' or '79 GHz SRR band' shall mean a 4 GHz wide band centred on the frequency 79 GHz, which is frequency band 77 – 81 GHz.
- (3) SARA shall mean an ad hoc grouping of manufacturers and suppliers from the European automotive industry¹.

It shall be further noted that, for the purpose of this Report, SRR systems refer to *vehicular radar systems* operating in the 24 GHz and 79 GHz frequency ranges as given above but exclude narrow-band *vehicular radar systems* that operate as per the conditions given in Annex 6 of ERC/Rec.70-03. Specific measures that could be developed in relation to the temporary designation of the 24 GHz SRR band are therefore not applicable to such narrow-band systems.

1 STATUS OF OTHER REGIONS

1.1 FCC Regulations

The Federal Communications Commission (FCC) issued the First Report and Order for revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems, 22 April 2002. The Report and Order provides regulations for Vehicular Radar Systems in the 24 GHz range as follows:

¹ SARA is currently made up of the following automobile manufacturers and suppliers: Audi, Autocruise, Autoliv, BMW, Bosch, CEL, Continental Termic, DaimlerChrysler, Delphi, Denso Europe, Fiat, Ford, Hella, InnoSenT, Jaguar, MAN Nutzfahrzeuge, Opel/GM, Porsche, Saab, Seat, Siemens VDO Automotive, Skoda, sms, TDK, TRW, Tyco Electronics, ValeoRaytheon Systems, Visteon, Volkswagen, and Volvo



“Vehicular Radar Systems: Provides for the operation of vehicular radar systems using directional antennas on terrestrial transportation vehicles provided the center frequency of the emission and the frequency at which the highest radiated emission occurs are greater than 24.075 GHz. The -10 dB bandwidth must be between 22 and 29 GHz. These devices are able to detect the location and movement of objects near a vehicle, enabling features such as near collision avoidance, improved airbag activation, and suspension systems that better respond to road conditions. Attenuation of the emissions below 24 GHz is required above the horizontal plane in order to protect space borne passive sensors operating in the 23.6-24.0 GHz band.”

The vertical attenuation limit for emissions within the 23.6-24.0 GHz band that appears 30 degrees or greater above the horizontal plane is set by FCC at different values with time; -25 dB by 2005, -30 dB by 2010 and -35 dB by 2014. It is also indicated that vehicular radar systems should employ directional antennas or other methods that will attenuate the emissions 38 degrees or higher above the horizontal plane in the 23.6-24.0 GHz band by at least 25 dB below the Part 15 general emission limits.

Apart from the vertical attenuation limits, the FCC Regulations contain provisions for the operation of vehicular radar systems. The provisions specify that “These devices shall operate only when the vehicle is operating, *e.g.*, the engine is running. Operation shall occur only upon specific activation, such as upon starting the vehicle, changing gears, or engaging a turn signal.”

In the USA the FCC has considered footnote 5.340 as subject to national implementation and has accepted the development and use of the 24 GHz Short Range Radars.

The FCC Regulation was a controversial proceeding and was based on extensive public consultation and sharing studies carried out within the National Telecommunication and Information Administration (NTIA) in order to ensure protection of certain services within the frequency range suggested. However, it is understood that detailed sharing studies were not carried out with respect to the Fixed Service where density of the fixed links in USA is much lower than in Europe. The USA is currently the only country known to have specifically authorised the use of UWB Short Range Radars at 24 GHz, although it is believed that no vehicles containing these devices have yet been marketed.

Following the WRC-2000 results the FCC has initiated a proposed rule making on the future frequency allocations within the band 76-81 GHz. The bands 76-77.5 GHz and 78-81 GHz are allocated to the Radio Astronomy service and Radiolocation Service on an equal primary basis.

In the United States, the FCC reviewed a proposal from the automotive industry to use 24 GHz short range automotive radar. After a public consultation on this and other proposals, including direct input from the government agencies responsible for operation of EESS, the FCC adopted technical emission levels that permit implementation of SRR to serve the public interest.

Further details may be found on the [FCC web site](#).

1.2 Developments in Japan

In Japan automotive long range radar systems are available in the 77 GHz range but limited to narrow-band design (below 500 MHz).



Japanese vehicle industries as well as microelectronic manufacturers are seeking to establish a narrow band 77 GHz technology. Mitsubishi Electronics announced recently a MMIC chipset for 77 GHz automotive radars. Toyota and Honda began the implementation of ACC radars on some of their vehicles for limited pre-crash applications.

These applications do not provide, however, the same functionalities as SRRs and are not yet available at affordable prices.

2 PERMANENT FREQUENCY BAND FOR SRR SYSTEMS IN EUROPE

2.1 Designation of the permanent frequency band

Based on the technical requirements on frequency range and power levels described in the System Reference document from ETSI (ETSI TR 102 263), the frequency band 77-81 GHz has been identified by the FM WG as the permanent frequency band for Short Range Radars (SRR).

It was noted that the 76-77 GHz band, which is harmonised on a worldwide basis for the Radiolocation Service, is designated in ECC/DEC/(02)01 for Road Transports and Traffic Telematics, more specifically for *infrastructure and vehicular radar systems*. The 76-77 GHz band is commonly used by Automotive Long Range Radars which are commercially available since 1999 from European vehicle manufacturers. However, it has been indicated by the automotive industry that Short Range Radar systems based on Ultra Wide Band technology are not compatible with Long Range Radars if operating within the same frequency band. Consequently, SRR requires the designation of a new band allowing a 4 GHz bandwidth operation in the 79 GHz range (77-81 GHz).

The European Research project Radarnet (IST 14031) started in 2000 and had as objective to study and develop on a pre-competitive basis the realization of a synchronized 77 GHz radar network with improved performance by multilateration techniques between 4 short and one long range radar. Both a new MMIC chipset and advanced signal processing techniques were intended to improve advanced driver assistance functions. A new chipset was not realized due to Infineons leaving of the project.

SARA however indicated that 79 GHz technology is not yet available for mass production.

The adoption and early implementation of the ECC Decision for the 79 GHz band was seen as critical to provide a clear indication to the automotive industry as well as the component industry that the required frequency bands will be made available on time and on a Europe-wide and permanent basis. A stable and permanent frequency band for SRR equipment is important for the automotive components industry to make the substantial investments necessary for deployment of the 79 GHz frequency band.

The FM WG agreed that the frequency band 77-81 GHz should be made available throughout Europe as soon as possible and not later than January 2005. This is included in Decides 4 of the ECC Decision and thus administrations committing to the ECC Decision also commit to an early implementation.

The 79 GHz frequency designation should be harmonised within EU member states and other CEPT countries applying the R&TTE Directive and the equipment operating in the 79 GHz band should be agreed as 'class 1' equipment in accordance with the R&TTE Directive and the Commission Decision 2000/299/EC (6.4.2000). It is envisaged that the Radio Spectrum Committee provides the necessary legal certainty to the implementation of the ECC Decision in order to ensure a permanent harmonised solution within EU member states.



An ECC Decision designating the 79 GHz range for Automotive Short Range Radars was developed by SRD/MG based on preliminary conclusions from Project Team SE24 of SE WG. Decision ECC/DEC/(04)03 was finally adopted by the ECC at its meeting 15-19 March 2004. See ERO web site www.ero.dk

2.2 Protection of Radiocommunication Services in the 79 GHz range

Based on the technical requirements on frequency range and power levels from the industry and described in the initial System Reference document from ETSI (ETSI TR 102 263), Project Team SE24 of WGSE had carried out in 2003 initial compatibility studies on SRR operating at 79 GHz with radiocommunication services. For the purpose of these studies, only radiocommunication services with a primary allocation status within frequency band 77 – 81 GHz were considered i.e. the Amateur and Amateur Satellite, the Radio Astronomy and the Radiolocation Services.

NATO informed the CEPT that there are no radiolocation systems operational in the 79 GHz frequency range and that there are currently no plans to introduce such systems. No compatibility studies were therefore conducted with radiolocation systems in this frequency range.

Preliminary conclusion for the Radio Astronomy Service was that regulatory measures could be identified enabling the coexistence between SRR within the band 77-81 GHz and the Radio Astronomy Service.

As for the Amateur and Amateur Satellite Services, it was concluded that the use of 79 GHz SRR systems might be incompatible. WGFM agreed consequently to extend the timescales given in footnote 5.559A, which permits Radio Amateur Service on a primary basis within band 75.5-76 GHz beyond 2006. This change was included in the update of the European Common Allocation Table, January 2004. This Frequency Management solution compensates for potential incompatibility problems with the Amateur (Satellite) Service that operates with a primary status in the 77.5-78 GHz band.

A specific ECC Report is expected to present the final compatibility studies for 79 GHz SRR systems. This Report should consider the effects of SRR systems on allocated Radiocommunication Services operating in the frequency range 77 to 81 GHz but not interference from radiocommunication services into SRR or automotive EMC issues.

3 Consideration of a temporary frequency band for SRR systems

3.1 General description of the temporary solution

SARA has indicated that all components for a 79 GHz SRR technology are not yet available for mass production. Early implementation and legal certainty on the harmonised availability of the frequency band is intended, however, to support this development. The Automotive Components Industry would hence need to be encouraged to work towards an early introduction of equipment operating in the 79 GHz band by means of intensive research and development programmes in complement to what is done in the 76-77 GHz range.

It was reported that 79 GHz components developed in relation with European Union Research programs are expected to be available by 2008.



In order to allow an early introduction of the SRR applications in Europe and meet some of the requirements of the *e*-safety initiative, a temporary solution should be considered with possible introduction of 24 GHz equipment up to year 2013 acknowledging that the related technology is now available for deployment.

The date until when placing on the market of 24 GHz SRR equipment would be allowed in Europe is referred to as the '**reference date**'. After the reference date, all new SRR equipment placed on the market shall use the 79 GHz SRR band, but the installed 24 GHz SRR equipment may still be used until the end of the lifetime of the vehicles.

The power level shall be limited to -41.3 dBm/MHz with vertical attenuation for any emissions within the 23.6-24 GHz band that appear 30° or greater above the horizontal plane as already included in the FCC regulations.

In addition to the limitation set by the reference date that applies on a European wide basis, the percentage of vehicles equipped with SRR devices must be less than 7.0 percent in each national car fleet, which may be referred to as the '**national market penetration threshold**'. Not all manufacturing groups will implement 24 GHz SRR from the outset or at all. This increases the probability that the limit of 7.0% would not be exceeded.

Finally, vehicles fitted with 24 GHz SRR systems must contain an automatic deactivation mechanism to ensure protection of Radio Astronomy Service. In order to allow an early implementation of 24 GHz SRR Systems the automatic deactivation should only be made mandatory after a transitional period of 24 months. During this transition period, manual deactivation is required.

3.2 Possible implementation of the temporary solution

The 24 GHz range is already heavily used across Europe by a range of services including the Fixed Service, Radio Astronomy Service, Earth Exploration Satellite Service and Radiolocation Service. Existing users of these services in Europe have expressed significant concern about the effect that SRR would have on their activities. All these services represent critical national or European services and/or wide economical interest and for which very substantial existing long-term investments have been and are to be made.

The scientific and meteorological communities and a number of administrations have expressed their concern about the implications for the passive Services of encouraging emissions on a license exempt basis in the 23.6-24 GHz band despite the obligations placed on Administrations by RR 5.340.

In addition, many Administrations have extensively licensed a large number of fixed links (more than 40000 links as given in ECC report 3 "Fixed Service in Europe, Current Use and Future Trends Post 2002") in this frequency range. These not only support existing second generation cellular networks but also the developing third generation mobile networks. The rollout of third generation mobile networks requires a high level of start-up investment and there is concern that the loss of confidence that would be caused by SRR could affect 3G rollout with consequent knock-on effects on the Community's *e*-information initiatives.

Possible interference from cars equipped with SRR into fixed service equipment would be very difficult to identify. Due to the moving nature of the cars, the interferer will be undetectable at the moment when the interference occurs and the network operator would have no means to complain about harmful interference from the SRR. Such kind of



interference would affect the proper performance of fixed radio telecommunications networks established around 24 GHz and lead to possible security impairment due to the disruption of communications. The bands used by operators are subject to authorisation and to the payment of fees for their use. Precise specifications are established concerning the quality of service to be provided to the public.

It is essential that any temporary introduction of SRR systems at 24 GHz in Europe shall only be on a basis that ensures full protection of other services in the band from harmful interference. Resolution of these issues is an essential pre-requisite.

Any interim solution shall be based on the following principles for the use of SRR *vis-à-vis* the Fixed Service:

- No compulsory refarming, even limited, of Fixed Service links that could potentially be affected by 24 GHz SRR systems can be envisaged;
- Restrictions for future deployment of Fixed Service links as well as harmful interference to existing and future systems in the fixed service are not acceptable.

3.2.1 Reference date

If the proposed temporary use of the 24 GHz band is approved, a firm **reference date** for stopping the placement of 24 GHz SRR equipment on the market must be agreed. After this date only 79 GHz SRR equipment should be permitted to be placed on the market in Europe but the 24 GHz equipment may still be used in existing vehicles preferably without any further restriction of use within EU countries and other CEPT countries until the end of the lifetime of the vehicle.

The reference date is considered in connection with the envisaged vehicle parc penetration of SRR equipment as well as industry requirements for introduction of the equipment in a complete line of production while also taking into account the requirement for protection of the existing services in the 24 GHz range in accordance with the ECC Report 23. In addition, the reference date should be defined such as encouraging SRR manufacturers to start at the earliest possible development of SRR at 79 GHz.

As stated previously, the reference date implies that 24 GHz equipment installed in vehicles before this date continue to be in operation and used until the end of lifetime of the vehicles. Given the average vehicle lifetime the aggregate emission level at the end of the interim period will decrease slowly for a considerable number of years after the reference date..

The most sensitive service to aggregate interference from SRR is the Earth Exploration Satellite Service for which a maximum of 5.9% of SRR penetration can be accepted in each EESS pixel. This criteria should be considered in connection with the fact that the SRR will not to be uniformly deployed all over Europe but is likely to be more concentrated in geographic areas with high levels of economic activity or urban areas. However, based on further consideration, the ECC agreed on a compromise 7% penetration rate per country.

Limiting the average penetration of SRR to 7.0% all over Europe will not ensure that several EESS pixels would not be polluted, hence jeopardising the whole measurements in the band. In order to avoid such a concentration effect, it is therefore felt necessary to determine the reference date in a way that would limit the average 24 GHz SRR penetration ratio to only a few percents in the original European market forecast.



In addition, the so-called “2 phases approach” or “package solution” shall clearly represent an incitement for manufacturers to develop the 79 GHz SRR technologies for which a 5 years delay was reported.

On this basis, should associated regulatory and legal certainty issues be adopted, it is recognised that a 2013 reference date would be consistent with the spirit and the general principle of the two phase approach in that it will:

- allow an early introduction of SRR applications in Europe,
- encourage and incite manufacturers to start at the earliest the development of 79 GHz SRR systems,
- ensure the protection for the existing services.

3.2.2 National market penetration threshold

The **reporting process** as described in section 3.2.3 may however result in bringing forward the reference date, in case the 7.0% national market penetration threshold would be exceeded in one EU country or associated European country where R&TTE Directive is applicable.

The Radio Spectrum Committee and the European Commission should consider whether the area of such country is significant with regards to a typical EESS pixel size which is assumed to be 200 km² and decide whether the ‘reference date’ shall be brought forward (i.e. set earlier).

As stated above in the section dealing with the final date, the 7.0% criteria should be considered in connection with the fact that the SRR will not be uniformly deployed all over Europe but will likely be more concentrated in geographic areas with high economical level or urban areas.

In this case also, limiting the average penetration of SRR to 7.0% in each national market will not ensure that existing services would not be interfered, in particular with regard to the fact that cars equipped with SRR 24 GHz would be free to circulate all around Europe.

Therefore, in order to ensure the protection of existing services all around Europe, the 7.0% threshold to stop placing 24 GHz SRR on the market in Europe shall apply to the first national market in which this threshold will be exceeded.

3.2.3 Reporting process

To ensure that the actual penetration level does not exceed the agreed maximum national market penetration threshold in any European country, a reporting process should be established where information about the number of vehicles equipped with SRR and intended for the various European national markets is provided and made available to administrations and parties involved.

The Radio Spectrum Committee and national administrations shall provide the necessary legal means to collect and publish the information received.

To achieve accurate figures for the introduction of 24 GHz SRR equipment in Europe in the interim solution, it is further noted that no after-market for SRR equipment should be allowed.

3.2.4 Deactivation mechanism

A possible temporary solution in the 24 GHz range needs to provide provisions for cross border enforcement if some CEPT countries not being members of the EU do not implement the interim solution in particular as a consequence of footnote 5.340 from the Radio Regulations. Vehicles fitted with 24 GHz SRR equipment must contain a manual deactivation



mechanism to ensure that the use of this equipment is limited to those countries that have implemented the temporary solution

Based on consideration of protection of Radio Astronomy stations as detailed in section 4.2 an SRR system must also be able to be automatically deactivated in case its emissions could interfere with the Radio Astronomy Service (i.e. in geographic areas that would be defined by national Administrations). In order to allow an early implementation of 24 GHz SRR Systems the automatic deactivation should only be made mandatory after a transitional period of 24 months.

Geographical coordinates of Radio Astronomy stations that operate in the 24 GHz range and related protection area for publication before July 2004 are the following:

Country	Name of the station	Geographic Latitude	Geographic Longitude
France	Plateau de Bure	44°38'01'' N	05°54'26'' E
	Floirac	44°50'10'' N	00°31'37'' W
Germany	Effelsberg	50°31'32'' N	06°53'00'' E
Spain	Yebes	40°31'27'' N	03°05'22'' W
	Robledo	40°25'38'' N	04 14'57'' W
Finland	Metsähovi	60°13'04'' N	24°23'17'' E
Italy	Medicina	44°31'14'' N	11°38'49'' E
	Noto	36°52'34'' N	14°59'21'' E
	Sardinia	39° 29'50'' N	09°14'40'' E
UK	Cambridge	52°09'59'' N	00°02'20'' E
	Darnhall	53°09'22" N	02°32'03" W
	Jodrell Bank	53°14'10" N	02°18'26" W
	Knockin	52°47'24" N	02°59'45" W
	Pickmere	53°17'18" N	02°26'38" W
Sweden	Onsala	57°23'45" N	11°55'35" E
Russia	Dmitrov	56° 26'00" N	37° 27'00" E
	Kalyazin	57° 13'22" N	37° 54'01" E
	Pushchino	54° 49'00" N	37° 40'00" E
	Zelenchukskaya	43° 49'53" N	41° 35'32" E

The table above in this report is for information only.

There are indications that the separation distance to protect these sites needs to be around 35 km. Both the stations to be protected as well as the related separation distance need to be specified in an ECC deliverable based on contributions from the administrations concerned.



3.2.5 Review process

In order to ensure the applicability of the temporary frequency band for Short Range Radars and in particular the unknown factors such as the number of equipment provided to the EU market place and to each of the EU member states and other CEPT countries it is suggested that the Radio Spectrum Committee should agree on a review process.

A review of the process should safeguard that placing on the market can be stopped if the agreed level of market penetration/number of equipment in use is exceeded.

A review should take place during 2009 in order for the Radio Spectrum Committee and the involved parties to consider and confirm that the number of equipment in use is still limited in accordance with the agreed solution based on the results of the reporting programme.

As part of the review process, development of 79 GHz equipment should be monitored . If developments are insufficient the RSC should take the necessary steps to encourage 79 GHz developments.

The review process could consider this data for comparison with the actual market penetration figures from the reporting process. The Radio Spectrum Committee should take necessary action as required to prevent penetration levels in excess of the agreed threshold to protect the existing services in the 24 GHz range.

In any case the review is not intended to relax the maximum penetration rate or extend the reference date.

3.3 *Compatibility studies in the 24 GHz range*

ECC Report 23 has been developed by Project Team SE24 of SE WG to clarify the compatibility issues and impact on Radiocommunication Services within the 24 GHz range. The study does not consider the impact of radio communication services on SRR or automotive EMC issues. 3 administrations expressed difficulties with the outcome of this work and reservations were entered into the minutes of the May 2003 meeting of SE WG. No assessment has yet been made on the possibility of interference into the Amateur and Amateur-satellite service, both of which have primary allocation in this range.

It is agreed that the SRR-equipment can not be considered as a safety of life service in accordance with the Radio Regulations, therefore SRR must operate on a non-interference and non-protected basis in accordance with the Radio Regulations. It has however to be ensured that the high power environment in which 24 GHz SRR systems may operate cannot lead to misinterpretation of received signal and potentially affect the vehicle's drive in case of automotive active safety application.

The general study has focused on the following 3 specific primary services to which SRR at 24 GHz is considered likely to present a high interference potential

- Fixed Service (FS)
- Earth Exploration Satellite Service (EESS)
- Radio Astronomy Service (RAS)

Complementary to ECC Report 23, a study on the compatibility between 24 GHz SRR systems and the Radiolocation Service has been developed on a national basis and was considered by the SE WG at its October 2003 meeting.



3.3.1 Radio Astronomy Service

The sharing study shows that compatibility is not feasible with a calculated negative margin in the order for 70 dB for spectral line observations and 90 dB for continuum observations with a device density of 100 devices per km² that transmit in the direction of the radio astronomy station.

It is further indicated in the report that if all of the possible mitigation factors such as local terrain, clutter loss, vehicle density are applicable and if this leads to sufficient reduction in interference level, then sharing between the SRR at 24 GHz and Radio Astronomy could be possible in some cases.

See also section 5 relating to the protection of passive services.

3.3.2 Earth Exploration Satellite Service

For the specific types of EESS satellites studied and currently operating, the results showed that the margins were all negative i.e. that the SRR devices would cause unacceptable interference at 100 % penetration to all EESS satellites.

Projecting the scenario forward to 2020, when the new generation of more sensitive EESS satellites are expected to be operating, the negative impact of the interference is expected to be an order of magnitude more severe.

The sharing study shows that the protection criteria for 100% penetration would be exceeded by 10.8 dB. However, this analysis has been made with the final set of SRR systems characteristics, proposed to be applied from 2014 by FCC (i.e vertical attenuation of 35 dB). It also assumed traffic densities of 330 vehicles per square kilometre and EESS sensitivity levels of 50 mK.

The translation of the 10.8 dB negative margin into a market penetration limit did not take into account that, in the case of an interim solution up to 2013, the SRR systems would present, before these dates, lower vertical attenuation (and hence higher interference potential) namely 10 dB up to 2010 and 5 dB between 2010 and 2013.

Additional calculations by the EESS Service concluded that 5.9% maximum SRR penetration per EESS pixel should be the right value to be used as market penetration limit for SRR's. However, based on further consideration, the ECC agreed on a compromise of 7% penetration rate per country.

See also section 4 relating to the protection of passive services.

3.3.3 Fixed Service

Project Team SE24 of SE WG considered the impact of automotive Short Range Radars at 24 GHz operating at a mean e.i.r.p power density of -41.3 dBm/MHz associated with an e.i.r.p peak limit of 0dBm/50MHz on the Fixed Service in 23 GHz (21.2-23.6) and 26 GHz (24.25-26.5) bands Even though the studies have been limited to the 23-26 GHz Fixed Service band, the calculation results and conclusions are still valid in the 28 GHz band and the 32 GHz band.



The 23 and 26 GHz bands are extensively used by Telecommunications Operators, mainly to provide second and third generation mobile network infrastructure. The 23 GHz band is the fastest growing among all the bands used by Telecommunications Operators. The 26 GHz band has also been identified by several CEPT Administrations for the development of Broadband Fixed Wireless Access Networks. Many of fixed service point to point links are associated with busy roads and could be subject to interference from the 24 GHz SRRs. Most of the fixed links in the 23 and 26 GHz bands have a minimum availability objective of 99.99 %.

The main conclusions of ECC Report 23 were the following:

- If a protection criteria of -20 dB I/N is to be met in all cases, sharing is not feasible with Fixed Service.
- However, sharing is considered to be feasible if an excess of the protection criteria by 10 dB (up to -10 dB I/N) in worst case scenarios can be accepted, as far as the percentage of cars equipped with SRR devices in visibility of the FS receiver is limited to 10% or less.

Some administrations are of the opinion that it is necessary that SRR meets the -20 dB I/N protection criteria in all cases. Some other administrations are of the opinion that an excess of the protection criteria by 10 dB, which still corresponds to an I/N of -10 dB, is acceptable. Consequently, reservations were entered into the minutes of both SE24 and WGSE.

The debate was brought to the ITU level. working party 9A and 9D confirmed the adequacy of the method used for calculation, and the protection criteria for the Fixed Service to be -20 dB I/N taking into account the regulatory status of wide band SRR. On this basis, it is understood that the notion of harmful interference is qualified by a maximum I/N of -20 dB.

For further details about the compatibility studies see ECC Report 23.

SRR would operate on a non-protected/non-interference basis. The issue of SRR immunity is developed in section 5 of this Report.

3.3.4 Radiolocation Service

The services mentioned above do not represent the complete picture. In a number of administrations there are speed radars operated by police forces. These make a major contribution to road safety and there are concerns that the legal basis on which they operate could be undermined if unlicensed emitters were allowed into the same environment.

Some administrations have currently restrictions for the use of short range devices in the 24 GHz band designated in ERC REC 70-03 in order to protect speed meter radars operating as a Radiolocation Service.

Compatibility tests have been carried out on a number of Radar Speed Meter equipment operated in Europe.

The effects of the UWB emission component of SRR to RSMs were investigated in a first series of test carried out in 2003 and no interference to the RSM could be found.

In further tests carried out March 2nd, 2004, the interference potential of the narrow-band component (i.e. residual carrier or optional Doppler radar signal) was investigated on one RSM equipment.



The test results show that there will be no wrong or false speed reading at the RSM due to the SRR residual/Doppler mode emission. However, the probability of suppressed speed readings due to residual carriers or Doppler mode signals emitted by UWB-SRR sensors that fall within the RSM receiver bandwidth is as a first assessment below 10^{-4} .

This low probability of interference is directly related to the type of narrow-band emission component of 24 GHz SRR, which shall therefore be limited to an unmodulated carrier (e.g. residual carrier or optional Doppler radar signal).

In order to avoid blocking of the RSM (i.e. suppressed speed readings), the police speed meter radars might require a frequency decoupling of carriers of both SRR and police radars. The need to limit the narrow-band emission component of 24 GHz SRR within the band 24.18 – 24.25 GHz – and to have consequently the centre frequency of a SRR shifted at 24.215 GHz – is under discussion. Compatibility studies are ongoing on a national basis.

It should however be noted that ISM radio equipment are already allowed in this band with higher power levels. Use of narrow band automotive radar limited to this ISM band is also under study on a national basis.

3.3.5 Services not covered by ECC Report 23

3.3.5.1 Radio Amateur Service.

The Radio Amateurs have a primary Amateur and primary Amateur-Satellite allocation in this frequency range. Growth in the use of this band is anticipated and although current use is estimated as light, The International Amateur Radio Union has identified an interference issue.

3.3.5.2 Short Range Devices.

Recommendation 70-03 lists allocations for SRDs in this band and ECC Decisions have been proposed for such Short Range Devices. However, these operate on a non-interference basis and claim no protection from SRR.

3.3.5.3 Broadcasting Satellite Service

BSS in the band 21.4-22.0 GHz may be affected by both in band and out of band emissions of the SRR. Studies performed by SARA indicate that a compatibility problem exists unless the emissions limits of SRR are lowered to -61.3 dBm/MHz below 22 GHz, i.e. to the same value as adopted by the FCC in the US.

4 PROTECTION OF PASSIVE SERVICES

4.1 ITU-R footnote 5.340

Footnote 5.340 from the Radio Regulation (RR) prohibits all emissions within the band 23.6-24 GHz. CEPT administrations agreed during their SE WG meeting in Yalta (October 2003) on the following general principles:

- It is not possible to record in the Master Register any stations in the 5.340 bands, even for information purpose under No. 4.4.
- Administrations are discouraged to introduce stations in these bands.



- But this does not strictly prevent administrations from the use of such bands providing that there are neither impacting services of other administrations nor trying to have international recognition of such use.

Additionally it should be noted that article 0.4 of the Preamble of the Radio Regulations applies:

0.4 All stations, whatever their purpose, must be established and operated in such a manner as not to cause harmful interference to the radio services or communications of other Members or of recognized operating agencies, or of other duly authorized operating agencies which carry on a radio service, and which operate in accordance with the provisions of these Regulations (No. 197 of the Constitution).

CEPT administrations, as well as, the European Commission should make sure that any such temporary authorization of 24 GHz SRR systems must not be used as a precedent for possible introduction of other transmitter devices in bands where RR footnote 5.340 is applicable, for temporary or permanent use.

The scientific and meteorological communities fear that an interim solution for the deployment of SRR in the 24 GHz band will create damaging side effects. The validity of the footnote 5.340 will be weakened and development of future sensitive radiometers may be delayed. Furthermore arguments to limit the unwanted emissions in purely passive bands could be affected.

It has to be emphasized that any misapplication of the interim use of the 21.5-26.5 GHz band by SRR or any lack of certainty of the abovementioned regulation and legal elements will lead to tremendous negative consequences for the existing services, and in particular to passive services for which the 23.6-24 GHz is a unique natural resource:

- the EESS measurements will be jeopardized hence severely endangering safety of life related warnings and procedures, meteorological forecasts as well as scientific programs that are being developed in the field of weather and climate;
- the Radio Astronomy Service will not be protected in this part of the radio spectrum due to complex physical and regulatory conditions.

4.2 Protection of the Radio Astronomy Service (RAS)

In the following countries Radio Astronomy stations are using or planning to use the frequency range 22.21-24 GHz including the band 23.6-24 GHz:

Finland (1)
France (2),
Germany (1)
Italy (3)
Russian Federation (4)
Spain (2)
Sweden (1)
United Kingdom (5).



Using the protection criteria contained in Recommendation ITU-R RA.769 (Protection Criteria Used for Radio astronomical Measurements) for the band 22.21–24 GHz, the compatibility study found that sharing between SRR and RAS is not feasible.

If all of the possible mitigation factors such as local terrain, clutter loss, vehicle density are applicable and if this leads to sufficient reduction in interference level, then sharing between the SRR at 24 GHz and Radio Astronomy could be possible in some cases.

However, conditional to the deployment of SRR in the band 21.625 - 26.625 GHz is the use of an automatic deactivation mechanism of the SRR device within the protection area around the RAS stations. This protection area is to be determined by each national concerned administration, if necessary in cooperation with neighbouring administrations in case of stations located close to country borders. In order to allow an early implementation of 24 GHz SRR Systems the automatic deactivation should only be made mandatory after a transitional period of 24 months.

It is uncertain whether such a protection area can be determined to ensure the protection of Radio Astronomy Stations in Europe for SRR operating in the 21.625 - 26.625 GHz, since in this part of the radio spectrum the physical and regulatory conditions are complex.

The physical conditions are highly variable with frequency since the band includes spectral lines of H₂O at ~22 GHz and NH₃ (ammonia) at ~23 GHz. At these frequencies calculations indicate that separation distances could be estimated as several tens km from a Radio Astronomy Station, taking into account that these estimates for frequency bands that include these spectral lines cannot be taken elsewhere within the 22.21-24 GHz frequency band since the effect of these lines on separation distances is unknown. As a function of frequency these distances can increase with at least a factor of 3 w.r.t. the values just mentioned.

Another difficulty is that no generally accepted method exists on how to calculate separation distances for a frequency band to which ITU Radio Regulations footnote 5.340 applies. Therefore, the separation distance necessary to protect Radio Astronomy Stations operating in the band 23.6-24.0 GHz is currently undetermined.

Further consideration on the deactivation mechanism is given in section 4.2.4.

4.3 Protection of the Earth Exploration Satellite Service (EESS)

Out of the 447 MHz bandwidth allocated for purely passive applications in the first 30 GHz of the spectrum, the 400 MHz in the band 23.6-24 GHz represents by far the largest share. This in itself indicates the importance of this band for the passive services. This band covers the flank of the water vapour spectral line.

The measurements made at 24 GHz directly lead to the total column water vapour content in the atmosphere. This is crucial for weather forecasting at local and global level. The potential loss of these data that are assimilated in Numerical Weather Prediction (NWP) models will affect the quality of weather forecasting. National meteorological offices and international weather centres are increasingly relying on satellite data. Compared to traditional measuring networks (e.g. radiosondes), satellite remote sensing is a unique and crucial method of achieving global geographical and time coverage.

Also, this band is used for correcting temperature measurements (made between 50-60 GHz) for attenuation due to water vapour. Without correct measurements at 24 GHz, temperature measurements at 50-60 GHz cannot be corrected for attenuation due to water vapour content in the atmosphere and thus have larger errors that again feed in the NWP models and potentially result in wrong interpretation and weather forecasts.

It should also be highlighted that information from measurements in this band is not only used for weather forecasts, but also for climate research. Especially for this application, continuity



of these measurements over a long period (i.e. many years) is crucial to the understanding of the climate, its related changes and its variability on all timescales.

In particular, EESS observations in the 24 GHz band play an important role in the GMES (Global Monitoring for Environment and Security) initiative promoted and coordinated in Europe by the European Commission and ESA, aiming at an operational European warning system.

One of the objectives of GMES is to improve traffic safety by improving severe weather forecasting. Moreover, these observations are needed to develop scenarios for climate change, which, among others, contribute substantially to governmental policy making on traffic safety. Such a policy requires the development of scenarios to cope with climate developments. GMES is the European contribution to the Global Earth Observations (GEO) and warning system which development was triggered as an immediate consequence of the Earth Observation Summit held in Washington in 2003.

The protection of this fundamental band implies limitations on the vertical antenna pattern of 24 GHz SRR. Such limitations shall be detailed in the relevant Harmonised standard. For equipment authorized, manufactured or imported from January 1st, 2005 to December 31st, 2009, this level of attenuation shall be 25 dB and 30 dB from 2010 for any emissions within the 23.6-24.0 GHz band that appear 30 degrees or greater above the horizontal plane.

5 SHORT RANGE RADAR IMMUNITY

The SE WG of the Electronic Communications Committee (ECC) has conducted an analysis on the immunity of 24 GHz automotive SRRs.

This analysis is presented in ECC Report 046 on 'Immunity of 24 GHz automotive SRRs operating on a non interference and non protected basis from emissions of the primary fixed service operating in the 23 GHz and 26 GHz frequency bands'.

ECC Report 046 considers the impact of FS systems in the 23 and 26 GHz bands into the 24 GHz Short Range Radars (SRRs).

It gives the interference situations in which 24 GHz SRR would be likely to operate in the vicinity of FS systems (P-P and P-MP) and elaborates on the means that such SRR are expected to implement in order to overpass these situations.

The analysis has been done following different scenarios, recognising that while FS systems can coexist in a close environment due to a high level of discrimination, due to frequency separation and/or angular separation, all FS systems operating in the 23 and 26 GHz bands fall into the SRR receiver bandwidth.

The calculations of interference from FS to SRR operating at 24 GHz show that SRR will have to operate in a high level of interference in the vicinity of FS transmitters, presenting in particular I/N levels above +20 dB along the FS path.

The ability of SRR to operate in such an environment mainly depends on the design of the SRR and the resulting processing gain (see section 2.1 of ECC Report 46 that estimates a minimum processing gain of 67 dB).

As SRR will operate on non-interference and non protected basis, it is therefore 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 such as spread spectrum technique that can provide processing gain above 50dB and further interference suppression techniques (see section 2.2 of ECC Report 46).

Based on the information provided by industry (see section 2.2 of ECC Report 46), acknowledging however the lack of details, it can be assumed that adequately designed SRR would be able to restore to a high degree signals distorted by strong interference. Where the level of interference would be detrimental to the 24 GHz SRR operation as could occur from the operation of FS, it can be assumed that the SRR devices would be temporarily disabled. This report shows that the protection of 24 GHz SRR cannot be guaranteed.

6 AFTERMARKET FITMENT

It is noted that a fully operational SRR system requires a complex integration with several functional units within the vehicle. Nevertheless, two types of aftermarket fitment are possible:

- 1) A partial fit, offering limited functionality to a vehicle not designed for SRR. This may be attractive to some owners, but is unlikely to offer many of the benefits of an SRR system integrated by a manufacturer, or qualify for insurance discounts.
- 2) A full fit, to a vehicle not designed for SRR. This is viewed by the automotive industry as too difficult to affect market penetration.

Manufacturers must take measures to prevent SRR being added retrospectively to vehicles designed with SRR as an option, and it is recommended that manufacturers also report the level of sales of SRR sensors as spare parts.

7 NEED FOR FREQUENCY REGULATION AND LEGAL CERTAINTY

7.1 Need for frequency regulation: timescales and responsibilities

CEPT administrations consider that an interim solution at 24 GHz could only be accepted “if and when all the conditions for the package solution are sufficiently clear, accepted and guaranteed” (ECC meeting, Luxembourg 11-15 November 2002).

The timescales for the designation of a frequency band for the temporary solution as well as for the permanent solution should therefore be linked to the legal certainty to be provided by the TCAM/Radio Spectrum Committee and the European Commission.

The intention with this CEPT Report to the Commission is twofold:

- to clarify the frequency management issues regarding the designation of frequency bands for SRR equipment;
- to provide requirements for necessary legal certainty to the Radio Spectrum Committee and the European Commission.

Some of the legal initiatives may be taken after the delivery of the final CEPT Report and after final adoption of the ECC Decision.

Availability of frequency bands for SRR systems within all EU member states is expected as a consequence of the relevant EC Decision together with the required legal certainty.



It was however questioned whether the R&TTE Directive would be the appropriate tool for such a regulation. The possible use of the Automotive Directive was suggested as this Directive is still based on the concept of type approval.

7.2 Requirement for legal certainty

In particular the following issues need detailed regulation and legal certainty:

- a) Stop placing on the market of radio equipment after the reference date but continued use for vehicles already equipped.
- b) Forbidding of after-market sales should be defined and legal certainty provided by the European Commission.
- c) Legal certainty of the availability of the 79 GHz range band within all EU member states. ECC/DEC/(04)03 has been finally adopted by the ECC at its March 2004 meeting.
- d) Legal certainty of the availability of the 24 GHz range within all EU member states. The ECC Decision at 24 GHz is adopted for public consultation in July 2004 Final adoption by the ECC is foreseen in November 2004.
- e) Legal certainty on the reporting arrangement including participation by automotive manufacturers from outside the European Union.
The European Manufacturers Association ACEA has initiated consideration of a commitment for manufacturers intending to provide 24 GHz equipment under a temporary solution. Other vehicle manufacturers must also be included in such an agreement in order to cover vehicles imported into the EU market.
- f) Certainty about the harmonised standard for the 24 GHz equipment and the 79 GHz equipment and in particular the possible relation needed between the harmonised standard and provisions to stop placing on the market of 24 GHz equipment. Limitations of vertical antenna pattern for the vehicle radars and automatic deactivation mechanism based on geographical location should clearly appear in the Harmonised standard.
- g) The designation of frequency bands for SRR equipment is developed under the explicit condition that SRR equipment is not considered as a safety of life applications in accordance with the Radio Regulations. No mandatory measures shall therefore be envisaged for the protection of SRR applications from existing services.

8 CONCLUSIONS

The European Commission has determined that short range radar is a key component of the Community's e-safety initiative. Text from the mandate Introduction of Short Range Radars based on Ultra Wide Band technology in Europe should be based on the following frequency management considerations in full respect of the long-term protection of the existing services:

1. A permanent frequency band at 77-81 GHz (the '79 GHz range') should be made available as soon as possible for Short Range Radars. ECC/DEC/(04)03 has been finally adopted by the ECC at its March 2004 meeting. The frequency band should be made available by January 2005 in order to encourage industry development of components and technology for this band.



2. In order to allow early introduction of SRR applications in Europe the frequency band the '24 GHz range' may be used on a temporary basis with limited number of equipment in the market place in Europe for a limited time frame. The implementation of such temporary solution requires agreement and commitment in some cases with legal certainty from CEPT Administrations, the European Commission (Radio Spectrum Committee and the TCAM) and the automotive industry. It shall be taken as a clear incitement for manufacturers to develop SRR in the 79 GHz range.
3. The temporary solution must be limited in time and scope as follows:
 - a. The characteristics of SRR systems shall be limited to an e.i.r.p. mean power density of -41.3 dBm/MHz, an e.i.r.p. peak limit of 0 dBm/50 MHz, with a vertical attenuation of 25 dB from 2005 and 30dB from 2010 for any emissions within the 23.6-24 GHz band that appear 30° or greater above the horizontal plane, and a narrow-band emission mode limited to an unmodulated carrier within frequency band 24.05 -24.25 GHz with a maximum peak power of 20 dBm e.i.r.p.
 - b. Vehicles fitted with 24 GHz SRR equipment must contain an automatic deactivation mechanism to ensure protection of Radio Astronomy stations in Europe as well as a manual deactivation to allow cross border enforcement if some CEPT countries not being member of the European Union do not implement the interim solution. In order to allow an early implementation of 24 GHz SRR Systems the automatic deactivation should only be made mandatory after a transitional period of 24 months. During the transitional period manual deactivation is required.
 - c. The temporary solution is limited in time until the reference date that is set to 1st January, 2013. After this reference date all new SRR equipment placed on the market shall use the 79 GHz band only, but the installed 24 GHz SRR equipment may still be used until the end of the lifetime of the vehicles.
 - d. In order to protect other existing services within the frequency band including in particular the Fixed Service and the Earth Exploration Satellite Service (EESS) the percentage of vehicles equipped with SRR devices must be limited to less than 7.0 percent in each national market.
 - e. The reference date may be set earlier, in case the 7.0% national market penetration threshold would be exceeded in one EU country or associated European country where R&TTE Directive is applicable. The Radio Spectrum Committee and the European Commission should consider whether the area of such country is significant and decide whether the 'reference date' shall be brought forward (i.e. set earlier).
 - f. In order to ensure that the actual penetration level does not exceed the limit mentioned above a reporting process should be established where information about the number of vehicles equipped with 24 GHz SRR and intended for the European or national markets is provided and made available to administrations and parties involved. The Radio Spectrum Committee should establish the necessary legal means to collect and publish the information received.
 - g. A review should take place during 2009 in order for the Radio Spectrum Committee and the parties involved to consider and confirm that the number of equipment in use on a national basis is still consistent with the agreed solution.



- h. Development of 79 GHz equipment should be monitored by the Radio Spectrum Committee and the committee should take action should as appropriate.
4. An ECC Decision on the temporary use of the 24 GHz frequency band has been developed and has been adopted for public consultation by the ECC. It is expected to be finally adopted in parallel with finalising the other elements of the “package solution”. The ECC Decision includes the designated frequency bands, the maximum power levels allowed and associated regulatory provisions.
5. CEPT administrations and the European Commission shall make sure that any such temporary authorization of 24 GHz SRR systems is exceptional and can not be used as a precedent for possible introduction of other transmitter devices in bands where RR footnote 5.340 is applicable, for temporary or permanent use.
6. The designation of frequency bands for SRR equipment is developed under the explicit condition that SRR equipment is not considered as a safety of life application in accordance with the Radio Regulations. No mandatory measures shall therefore be envisaged for the protection of SRR applications from existing services.
7. To manage a temporary use of the 24 GHz frequency band a number of agreements between parties involved need to be in place and legal as well as regulatory certainties need to be provided by the TCAM/Radio Spectrum Committee and the European Commission before any introduction of SRR equipment operating in the 24 GHz band can be permitted. In particular the following issues need detailed regulation and legal certainty:
 - a. Stop placing on the market of 24 GHz SRR
 - b. forbidding of after-market sales
 - c. Legal certainty of the availability of the 79 GHz band
 - d. Legal certainty of the temporary availability of the 24 GHz band for SRR
 - e. Legal certainty on the reporting arrangement including participation of automotive manufacturers from outside the European Union.
 - f. Certainty about harmonised standard for the 24 GHz equipment and the 79 GHz equipment

**MANDATE TO CEPT TO HARMONISE RADIO SPECTRUM TO FACILITATE A
COORDINATED EU INTRODUCTION OF AUTOMOTIVE SHORT-RANGE RADAR SYSTEMS**

Title

A mandate to CEPT to identify radio spectrum for the introduction of automotive short-range radar devices (SRR) in the European Union.

Purpose

Pursuant to art. 4 of the Radio Spectrum Decision, CEPT is mandated to undertake all necessary work to ensure the availability of harmonised radio spectrum in the European Union for the deployment of automotive short-range radar systems to be used for improving road safety. In order to expedite the introduction of this type of radio application in the EU, additional appropriate frequency bands ought to be considered for a limited temporary introduction of SRR systems, besides the identification of permanent SRR spectrum bands for the long term. The protection of other services operating in or near the temporary band(s) must be ensured by introducing specific operating limits for such SRR systems and by moving their operation to the permanent band by a fixed transition date.

Justification

Automotive SRR systems have been identified by the EU policy *eSafety* initiative² as a significant technology for the improvement of road safety in Europe by active means, and as one of a number of active and passive measures that could be introduced together to address the overall transport policy goal of cutting road fatalities in Europe by half by 2010³.

In this context, the achievement of this policy goal would be supported by enabling the operation of SRR devices in new vehicles sold on the European market at the earliest. For this to happen, radio spectrum needs to be rapidly identified and harmonised at Community level.

Background

In Europe, CEPT ECC/DEC/(02) 01 designates the band 76-77 GHz for vehicular or infrastructure radar systems. However, SRR systems require a wider bandwidth than currently available to obtain the required resolution. Furthermore, the automotive industry⁴ holds that the immediate implementation of SRR systems in or around this frequency range would not be feasible at the present time, given the stated relative lack of maturity and cost-effectiveness of the available technology for this band. The

²see http://europa.eu.int/information_society/programmes/esafety/index_en.htm

³ Commission Communication on a European Road Safety Action Programme, COM(2003)311, June 2nd, 2003 at http://europa.eu.int/comm/transport/road/library/rsap/com_2003_0311_en.pdf, and Council [Conclusions on the European Road Safety Action Programme, June 5th, 2003.](#)

⁴ SARA (Short Range Automotive Radar Frequency Allocation group) representing 16 car manufacturers and 11 automotive components companies.



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automotive industry believes that in the short term operation around the 24 GHz band is the only commercially-viable solution, with a subsequent migration to the 77 GHz or to another band after some years, by which time appropriate technology solutions are expected to have become cost-effective and the SRR concept validated in the market.

The SRR systems proposed by the automotive industry⁵ for the initial market introduction of SRR devices use ultra-wide band transmission principles and emit with a bandwidth of 5 GHz around a carrier, potentially affecting the operation of several existing and important radio applications operating in or near the 24 GHz band, such as passive Earth Observation services, wireless telecommunications fixed links, the Radio Astronomy Service (RAS), and various short-range device applications (SRDs)⁶. It should be underlined that some of these services also play a major role in the security and well-being of European citizens, in particular space-borne passive sensing for meteorological applications.

Based on studies on compatibility between SRR systems and the Fixed Service, the Earth Exploration Satellite Service and the Radio Astronomy Service, CEPT studies⁷ indicate that an unlimited deployment of SRR systems at 24 GHz will create unacceptable harmful interference to important existing radio applications operating in or close to this band.

The protection of all concerned services⁸ must be taken into account and safeguarded in the designation of spectrum for automotive SRR systems. Technical or regulatory solutions to protect other radio services must therefore be considered, while avoiding undue delays in the introduction of this technology. In this context, some proposals about a programmed phased approach have been discussed in the Electronic Communications Committee (ECC) of CEPT, with SRR systems initially deployed in or near the 24 GHz band for a limited period of time during which their numbers would be expected to remain below a level where interference could become harmful to other existing users. The second part of this phased approach would consist in a proposed migration of the operation of automotive SRR devices to a permanent band.

The compatibility studies carried out by CEPT so far conclude that harmful interference to the FS and EESS services from SRR devices operating in the 24 GHz band according to agreed industry specifications will not be significant as long as the maximum density of vehicles and other vehicles equipped with SRR systems remains limited and in any case below 10% of all vehicles within visibility of victim radio services.

Given the mobility within and across EU borders of automotive equipment, a harmonised withdrawal of designation for SRR systems of the 24 GHz band across the EU is essential for this approach to be feasible. A reference date for the termination of placing on the market of SRR devices operating in the temporary band therefore ought to be defined at EU level in the context of their expected market penetration in this band. From this reference date, all *new* SRRs devices would have to use the 77 GHz band (or any other designated permanent band) while the operation of *existing* SRR systems would remain authorised in the temporary band to the end of their operational lifetime.

In order to ensure that this withdrawal will be effective from the set date referred above, and to provide a strong incentive for the automotive sector to develop viable technologies

⁵ Such as defined by draft ETSI Harmonised Standard EN 301 091

⁶ The band 24-24.25 GHz is designated for ISM applications.

⁷ ECC Report 23 on the compatibility of automotive collision warning short range radars operating at 24 GHz with FS, EESS and Radio Astronomy.

⁸ May also include radars used for road speed limit control, the Amateur Radio Service and the Broadcasting Satellite Service (BSS).



for the permanent frequency range, this band should be available as soon as possible. CEPT is invited therefore to specify the conditions for use of the 77 GHz band (or any other designated band) as soon as possible, but at the latest in parallel with any interim approach.

While any agreed solution must aim to minimise the necessity to refarm other services already operating in the SRR-designated bands, the proposed time schedule on the introduction of SRR should take into account the needs of Administrations possibly concerned by such refarming activities.

Regulatory Context

This mandate is one element of an integrated action aiming at promoting the timely introduction of SRR systems in the European Union in the context of the *eSafety* initiative. If it is decided to designate temporarily the 24 GHz band for SRR systems, other elements that will need to be considered by the European Commission are the following:

- a) **Regulatory EU and national measures.** Any possible operation of SRR systems at 24 GHz must be linked to halting the introduction on the market of any *additional* equipment operating in this band by a specific date related to an expected penetration threshold. Consideration on how this can be achieved across the EU will include (but not necessarily be limited to) the possibility of a harmonised prohibition of the placing on the market of new SRR systems in the temporary band under the RTT&E Directive.
- b) **Harmonised standards.** A new harmonised standard for the permanent frequency band would need to be developed as early as possible and with the highest priority. Furthermore, a harmonised standard from ETSI for SRR devices at 24 GHz produced in the context of the R&TTE Directive will only be accepted by the Commission *provided* it is in line with the various elements of the overall approach agreed to in the Radio Spectrum Committee.
- c) **A collective commitment** by the automotive industry. The commitment would include monitoring of the market penetration of SRR devices in the provisional band. The gathering of monitoring information according to an agreed format would be carried out by ACEA (*European Automobile Manufacturers Association*) in coordination with other automotive associations and presented to the Radio Spectrum Committee annually, or as often as needed. Issues related to the after-sales market may also need to be considered.
- d) **A review mechanism.** The RSC to undertake a full review of the adopted regulatory approach at some set date, well before the reference date for withdrawal of placing on the market of SRR systems in the temporary band. The RSC may decide to hold such a review at an earlier date, due for instance to a faster-than-expected penetration of SRR systems in the 24 GHz band, or harmful interference that may arise into other services operating in or near the 24 GHz band due to SRR systems.

The above mentioned elements should be prepared in parallel with the execution of this mandate and considered by CEPT when providing its deliverables under this mandate.

Order and Schedule

1. The CEPT is hereby mandated to undertake all relevant work to identify harmonised radio spectrum for the deployment of automotive short-range radar in the EU without



undue delay. The radio frequency bands should therefore be chosen according to criteria of equipment cost and of technological maturity. At the same time, a high degree of consideration must be given to the protection of existing radio services in or near the bands to be designated for such short-range radar systems.

Work on the identification of a permanent appropriate band for SRR devices, possibly around 77 GHz, should be undertaken as soon as possible, but at the latest in parallel with any interim approach.

The viability of a time-limited introduction of SRR systems in or near the 24 GHz band should be explored in detail, as this frequency range is considered by the automotive industry as being currently the most appropriate in terms of equipment cost and of technological maturity.

2. More specifically, CEPT is mandated to:

- undertake all necessary technical compatibility studies between automotive SRR systems and other radio services for possible SRR bands;
- designate as a matter of urgency a permanent frequency band(s) for automotive SRR systems, and specify the conditions required for the use of this band;
- consider the designation of a temporary frequency band to enable SRR systems to be introduced in a timely and cost-effective fashion, and specify the conditions required for the use of this band;
- consider the implications of encouraging emissions on a licence-exempt basis in the 23.6-24.0 GHz band, in view of the protection provided by ITU footnote 5.340 to passive services;
- define the threshold market penetration of vehicles equipped with SRR systems operating at or near 24 GHz where interference would be harmful to other existing radio services, and the way this level should be evaluated;
- propose technical and regulatory measures to protect the EESS and FS services from harmful interference by limiting the deployment of automotive SRR systems in the 24 GHz band, and notably by defining a reference date for a programmed mandatory transition of SRR operation to the permanent frequency band in relation to the expected market penetration of SRR systems at European, national and local level. Other potentially affected services ought also to be considered, in particular Radio Astronomy.
- define the information required to ensure the continued relevance of the technical compatibility identified between SRR systems and other services over the period of operation in the temporary frequency band;

CEPT is expected to summarise the results on the above-mentioned tasks in a report to the Commission.



3. The CEPT is mandated to provide Mandate deliverables according to the following schedule:

Delivery date	Deliverable	Subject
October 2003	First Report from CEPT to the Commission	Description of work undertaken under this Mandate and orientation for future work.
January/March 2004	Draft ECC Decisions on a possible interim and a permanent harmonised frequency band	Validation of draft ECC Decisions for public consultation.
March/July 2004	ECC Decisions	Adoption of the ECC Decisions on the interim solution, if any, and on the permanent harmonised frequency band.
March/July 2004	Final Report from CEPT to the Commission	Description of work undertaken and results achieved under this Mandate

4. The result of this Mandate can be made applicable in the European Community pursuant to Article 4 of the Radio Spectrum Decision⁹.

In implementing this Mandate, the CEPT shall, where relevant, take the utmost account of Community law applicable.

⁹ Decision 676/2002/EC of the European Parliament and of the Council of 7 March 2002 on a regulatory framework for radio spectrum policy in the European Community, OJ L 108 of 24.4.2002, p.1.

ELECTRONIC COMMUNICATIONS COMMITTEE

ECC Decision
of 19 March 2004
on the frequency band 77 – 81 GHz to be designated for
the use of Automotive Short Range Radars

(ECC/DEC/(04)03)



EXPLANATORY MEMORANDUM

1 INTRODUCTION

Within Europe, there are proposals to improve road safety by using new information communications technologies, including building a European strategy to accelerate the research and development, deployment and use of intelligent road safety systems such as Automotive Short Range Radars (SRR).

SRR systems will be a significant element of a future transport infrastructure for Europe and in particular contribute to the long term goal of the European Commission *e*-safety initiative.

To support a quick development and deployment of SRR systems within a trans-European road network, it is essential that common frequency bands and associated harmonised equipment standards be available throughout Europe. A stable and permanent solution needs to be made available as soon as possible in order to support the European industry developments in this area.

2 BACKGROUND

To meet the requirement for a permanent, long term solution for short range radars the frequency band 77-81 GHz has been identified. Compatibility issues within this band have been successfully studied and a system reference document with market information as well as technical information has been agreed within ETSI as the basis for a frequency designation within the ECC.

The 76-77 GHz frequency band was designated for vehicular and infrastructure radar systems in ERC Recommendation 70-03 and in ECC Decision (02)01. This frequency band is used by long range radar systems which are not compatible with Ultra Wide Band (UWB) SRR systems. Thus a new frequency band of 4 GHz for Automotive (UWB) Short Range Radars is needed within the 79 GHz range 77-81 GHz.

In order to support industry developments of the general and specific SRR technology within the 79 GHz range the frequency band 77-81 GHz should be made available throughout Europe as soon as possible.

3 REQUIREMENT FOR AN ECC DECISION

The allocation of radio frequencies in CEPT member countries is laid down by law, regulation or administrative action. The ECC recognizes that for SRR systems to be introduced successfully throughout Europe, manufacturers and operators must be given the confidence to make the necessary investment in the new pan-European radiocommunications systems and services. A commitment by CEPT member countries to implement an ECC Decision will provide a clear indication that the required frequency bands will be made available on time and on a Europe-wide basis.

**ECC Decision
of 19 March 2004**

on the frequency band 77 – 81 GHz to be designated for the use of Automotive Short Range Radars

(ECC/DEC/(04)03)

“The European Conference of Postal and Telecommunications Administrations,

considering

- a) that within Europe, there are proposals to improve road safety by using new information communications technologies, including building a European strategy to accelerate the research and development, deployment and use of intelligent road safety systems such as Automotive Short Range Radars (SRR);
- b) that the availability of spectrum for SRR equipment in Europe would contribute to the long term goal of the European Commission *e*-Safety-initiative;
- c) that in order to give the automotive industry as well as the components industry the confidence to make substantial investment in Short Range Radar technology, they need a clear indication that the required frequency bands will be made available on time, and on a Europe-wide and permanent basis;
- d) that in order to address these goals the EC issued a mandate to CEPT 31 July 2003 under the Spectrum Decision 676/2002/EC ‘Mandate to CEPT to harmonise radio spectrum to facilitate a coordinated EU introduction of Automotive Short Range Radar systems’
- e) that the use of the 79 GHz frequency range (77-81 GHz) has been considered as the most suitable band for Short Range Radars;
- f) that the development and use of the 79 GHz technology will have a beneficial effect to European industry;
- g) that the sharing with Radio Astronomy Service has been studied concluding that regulatory measures could be identified enabling the coexistence between SRR in the frequency band 77-81 GHz and the Radio Astronomy Service, which is dependent on the aggregated impact of SRR devices transmitting in the direction of a radio astronomy station;
- h) that the use of SRR within the band 77-81 may be incompatible with the Radio Amateur Service which has been resolved by allowing the Amateur Service to remain in the 75.5-76 GHz band after 2006 (see footnote 5.559A);
- i) that information has been received from NATO that there are currently no radiolocation systems operational in the band and there are no plans to introduce such systems;
- j) that the frequency band 76-77 GHz is already designated for long range automotive radars (vehicular and infrastructure radar systems) (ECC DEC(02)01 on Road Transport and Traffic Telematic Systems. Sharing studies conducted by the automotive industry have concluded that sharing is not achievable between Ultra Wide Band Short Range and Long Range Automotive Radars;
- k) that the 79 GHz band should be made available on a European basis for SRR equipment as soon as possible and not later than January 2005 in order to provide an incentive for industry to place SRR products on the market using this frequency range;
- l) that SRR-equipment is not considered as a safety of life service in accordance with the Radio Regulations, therefore SRR must operate on a non-interference and non-protected basis in accordance with the Radio Regulations;

DECIDES

1. that for the purpose of this Decision, SRR equipment are defined as applications providing road vehicle based radar functions for collision mitigation and traffic safety applications;
2. that the 79 GHz frequency range 77-81 GHz is designated for Short Range Radar (SRR) equipment on a non-interference and non-protected basis with a maximum mean power density of -3 dBm/MHz e.i.r.p. associated with an peak limit of 55 dBm e.i.r.p.;
3. that the maximum mean power density outside a vehicle resulting from the operation of one SRR equipment shall not exceed -9 dBm/MHz e.i.r.p.;
4. that the 79 GHz frequency range (77-81 GHz) should be made available as soon as possible and not later than January 2005;
5. that this Decision will enter into force on 19 March 2004;
6. that CEPT administrations shall communicate the national measures implementing this Decision to the ECC Chairman and the Office when the Decision is nationally implemented.”

Note:

Please check the ERO web site (<http://www.ero.dk>) for the up to date position on the implementation of this and other ERC/ECC decisions.