CGMS-XXXI USA-WP-15
Prepared by USA
Agenda Item: I.1

Problems Caused by Car Radios in the 21 – 27 GHz Range

This paper provides a summary of the USA position on the use of the 21 –27 GHz band and its use for car radars. The USA reviewed its position on the use of car radars systems operating in the 21 – 27 GHz band. The 24 GHz band is an exclusive and unique band for sensing characteristics of the atmosphere needed to forecast weather and climate throughout the world. Accordingly this band has been granted additional protection from Radio Frequency Interference (RFI) as stated in international ITU-R Regulation Number 5.340 ("all emissions are prohibited in the following bands:..."). The critical importance of this band for accurate and early weather forecasting has resulted in NOAA studies of the proposed use of this band for UWB devices and services, especially automotive radars. These studies resulted in a NOAA determination that the extensive proliferation of automotive radars in high density areas (e.g., metropolitan or urban areas) could seriously and permanently compromise the availability of weather data from this critical band. Most meteorological agencies, including NOAA, have also noted that the automotive radar functions could be performed in the 77 MHz band instead of the 24 GHz band, thereby ensuring that this unique 24 GHz resource would not be irreparably contaminated and remain available for its natural weather forecasting potential.

Problems Caused by Car Radios in the 21 – 27 GHz Range

The FCC in the USA issued a "First Report and Order" (ET Docket 98-153) on April 22, 2002 regarding the use of ultra-wideband transmissions including the use of this technology for "Vehicular Radar systems". Although this document concludes that no harmful interference will be caused to meteorological satellite measurements, it is expected that the associated spectrum masks and operation values used in this document are not giving the required protection to EESS usage in the band. It has, therefore, to be expected that the introduction of the new service will invalidate measurements of instruments operated on meteorological satellites. Wrong measurement values will be achieved and will invalidate not only the measurements in the 24 GHz band but also all other measurements of these instruments. This could result in a major degradation in meteorological processing based on these measurements. A phased approach for the introduction of the Vehicle Radar System (VRS) has been proposed by reducing the output power of SRR equipment after certain dates to compensate for the growing number of operating devices and the related cumulative interference from serious high numbers of equipment. Although this could improve the sharing situation, there are still doubts whether this will give the required protection. It is also noted that the equipment will be operated under part 15 of FCC rules, i.e. as unlicensed equipment.

ITU has discussed the issue of UWB and has decided that a Task Group(TG 1/8) be established in Study Group 1 in order to urgently address the compatibility between UWB devices and radio communication services (Q.227/1), the spectrum management framework related to the introduction of UWB devices (Q.226/1), and appropriate measurement techniques for UWB devices.

Considering the criticality of this issue to the space-component of the GOS and to its allweather sounding capability, CGMS members are invited to express their concerns to their national frequency administrations.

2. USA Response and Recommendation

The USA reviewed its position on the use of car radars systems operating in the 21 – 27 GHz band. The 24 GHz band is an exclusive and unique band for sensing characteristics of the atmosphere needed to forecast weather and climate throughout the world. Accordingly this band has been granted additional protection from Radio Frequency Interference (RFI) as stated in international ITU-R Regulation Number 5.340 ("all emissions are prohibited in the following bands:..."). The critical importance of this band for accurate and early weather forecasting has resulted in NOAA studies of the proposed use of this band for UWB devices and services, especially automotive radars. These studies resulted in a NOAA determination that the extensive proliferation of automotive radars in high density areas (e.g., metropolitan or urban areas) could seriously and permanently compromise the availability of weather data from this critical band. Most meteorological agencies, including NOAA, have also noted that

the automotive radar functions could be performed in the 77 MHz band instead of the 24 GHz band, thereby ensuring that this unique 24 GHz resource would not be irreparably contaminated and remain available for its natural weather forecasting potential.

United States of America

CHARACTERISTICS OF DEVICES USING ULTRA-WIDEBAND (UWB) TRANSMISSIONS

Study Group 1 at the meeting in Geneva in July 2002 established Task Group 1/8 and assigned it Question ITU-R 227/1, entitled "Compatibility between ultra-wideband (UWB) devices and Radiocommunication Services," and Question ITU-R 226/1, entitled "Spectrum management framework related to the introduction of ultra-wideband (UWB) devices." Question ITU-R 226/1 includes the following:

"further decides

1 that in order to perform the necessary studies, key technical and operational data characteristics of UWB devices should be collected and appropriately documented."

Question ITU-R 227/1 includes the following:

"further decides

2 that in order to perform the necessary studies, key technical data and operational characteristics of devices using UWB technology should be collected and appropriately documented."

The following appendix provides a working document toward a preliminary draft new Recommendation, "Characteristics of devices using ultra-wideband (UWB) transmissions", that includes technical data and operational characteristics of some UWB devices that may be used, in addition to other relevant data and information, to initiate the studies called for in Questions ITU-R 226/1 and ITU-R 227/1.

APPENDIX 1

WORKING DOCUMENT TOWARD A PRELIMINARY DRAFT NEW RECOMMENDATION ITU-R SM.[UWB]

Characteristics of devices using ultra-wideband (UWB) transmissions

(Questions ITU-R 226/1 and ITU-R 227/1)

The ITU Radiocommunication Assembly,

considering

a) that devices using ultra-wideband (UWB) transmissions are being considered for intentional operation across numerous frequency bands and may overlay, simultaneously, several services;

b) that UWB emissions spread over a very large frequency range;

c) that UWB technology can be integrated into many applications such as communication devices and radar imaging capabilities for public protection, construction, engineering, science, law enforcement, consumer devices, and transportation systems such as near collision avoidance and intelligent transportation system applications;

d) that these applications could potentially result in mass usage of devices using UWB technology in various environments (home, office, store, industry, public places, etc.) where radiocommunication services may have already been deployed and are in operation;

e) that the spectrum requirements and operational restrictions for devices using UWB technology may vary according to their application;

f) that studies are being undertaken of the impact of UWB devices and applications on the electromagnetic environment; and

g) that information on regulatory decisions made by administrations and the technical and operational characteristics of UWB devices and applications is needed for these studies,

recommends

1 that the technical data and operational characteristics of devices using UWB technology contained in the Annexes to this document, as well as other relevant data and information, be used to initiate the studies called for in Questions ITU-R 226/1 and ITU-R 227/1; and

2 that as additional technical data and operational characteristics become available, this information be considered in the studies.

ANNEX 1

Communications and Measurement

One administration has approved regulations, including operating restrictions, authorizing the use of UWB devices on an unlicensed basis for communications and measurement applications. The characteristics given in Table 1 provide an example of two products that are being designed to operate under those regulations.

TABLE 1

Characteristics of some UWB communications devices

	Device A	**Device B**	**Device C**
Max. ave. eirp (dBm/1 MHz)	–41.3	–41.3	-41.3
Lower –20 dB and –10 dB emission limits (GHz)	3.1, 3.6	≥ 3.1 (–10 dB down)	3.1, 3.6
Upper –10 dB and –20 dB emission limit (GHz)	9.6, 10.1	≤ 10.6 (–10 dB down)	9.6, 10.1
Antenna pattern	Omni	Omni	Omni
Pulse rate (Mpps)	> 500	≥1	>1000
Bit rate (Mbps)	≤ 100	≤ 40	≤ 500
Range (m)	~10	< 100	4-10
Max. ave. eirp (dBm/1 kHz) in 960-1 610 MHz	≤–90	≤–85.3	≤-90
Max. ave. eirp (dBm/1 MHz) in 960-1 610 MHz	<–90	≤–75.3	≤-90
Max. ave. eirp (dBm/1 MHz) in 1 610-3 100 MHz	<–63.3	≤–53.3	≤-63.3

Device A is intended for operation within an office or home applications for transmission of data up to 100 Mbps. It is also intended for operation between hand held devices that may be outside and that do not employ a fixed infrastructure. Such applications include links among personal digital assistants (PDA) or lap top computers. Within a LAN, it may carry multiple digital video signals among components of a video system such as between a video camera and a computer, between a cable set-top box and a TV, or between a high-end plasma display and a DVD player.

Device B is a multi-purpose device intended for use indoors for industrial, commercial, and consumer applications where communications, precision positioning or radar sensing is required. The device can be configured to operate over a range of data rates. The operating range depends upon the data rate.

Device C is intended for operation within an office or home applications for transmission of data up to 500 Mbps. These higher data rate devices are intended to provide wireless

connectivity for many of the same applications as Device A, but also serve to provide wireless cable replacement for high-speed wired connections such as USB or IEEE 1394.

ANNEX 2

Vehicular radar systems

One administration has approved regulations authorizing the use of UWB devices on an unlicensed basis for vehicular radar applications in the band surrounding 24 GHz. The characteristics given in Table 1 provide an example of products that are being designed by several companies to operate under those regulations. UWB vehicular radar systems use higher frequency bands than those used by UWB communications systems. These devices are being designed 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. Accordingly, UWB vehicular radar systems are being designed to address a high percentage of all causes of traffic accidents.

Vehicular radars emit an UWB signal over a well-defined frequency range, and the spectral emissions are mainly defined by the modulation characteristics and additionally by resonant components such as antennas.

TABLE 1

Characteristics of some UWB vehicular radar devices

Parameter	Value
Center frequency (GHz)	~24.125
Max. PSD (eirp) (dBm/1 MHz)	–41.3*
-10 dB occupied bandwidth (GHz)	Between 22.125 and 26.125
Pulse repetition frequency (MHz)	0.1 – 5
Max. peak power (eirp) (dBm/50 MHz)	0
Antenna pattern	Directional
Mounting height (m)	~ 0.50
Range (m)	~ 20
Target separation (cm)	15 – 25

* Regulations adopted by the administration require that emissions in the 23.6-24 GHz band at angles of 38º or greater above the horizontal plane be attenuated below this level by 25 dB. For equipment authorized, manufactured or imported on or after January 1, 2005, the required attenuation applies to emissions at angles of 30º or greater. On January 1, 2010, the required attenuation increases to 30 dB, and on January 1, 2014, it increases to 35 dB. This level of attenuation can be achieved through the antenna directivity, through a reduction in output power or any other means.

Operational Characteristics of Vehicular Radars

Spectrum sharing calculations for vehicular radars should take into account the peak car density, the percentage of the Earth's surface where those densities are achieved, and the market penetration of UWB vehicular radars over time.
