Draft CEPT Brief on Agenda Item 1.3

Agenda item 1.3:

"In accordance with Resolution 747 (WRC-03), consider upgrading the radiolocation service to primary allocation status in the bands 9 000-9 200 MHz and 9 300-9 500 MHz and extending by up to 200 MHz the existing primary allocations to the Earth exploration-satellite service (active) and the space research service (active) in the band 9 500-9 800 MHz without placing undue constraint on the services to which the bands are allocated"

Issue

Resolution 747 (WRC-03) calls for the technical characteristics, protection criteria, and other factors of radiolocation, radionavigation, EESS (active) and space research (active) systems that ensure compatible operations in the band 9 300-9 500 MHz and the study of the compatibility between terrestrial radars of the radiolocation and radionavigation services, and spaceborne radars of the Earth exploration-satellite and space research services in the band 9 300-9 500 MHz.

In the event that sharing studies in the 9 300-9 500 MHz band lead to unsatisfactory conclusions which do not fully satisfy the requirement for an increase by up to 200 MHz of contiguous spectrum for EESS (active) and space research (active) services, additional sharing studies in the alternative frequency range 9 800-10 000 MHz are to be performed.

Specifically, it consists of two parts:

1 The upgrading of the radiolocation service to a primary allocation in the bands 9 000-9 200 MHz and 9 300-9 500 MHz

2 The extension by up to 200 MHz into the band 9 300-9 500 MHz of the EESS (active) and the space research service (active) allocations, or if this is not possible, into the band 9 800-10 000 MHz.

Preliminary CEPT position

1. CEPT supports the upgrade of radiolocation service to a primary allocation in the bands 9 000-9 200 MHz and 9 300-9 500 MHz without any additional footnote which would give a lower status to radiolocation service vis-à-vis the radionavigation service .

2. CEPT supports the additional worldwide allocation of the frequency band 9300-9500 MHz to the EESS (active) and to the SRS (active) indicating that this extension is limited to EESS (active) and to the SRS (active) systems that need a bandwidth wider than that available between 9 500-9 800 MHz and provided that the present RR provision 5.476A protecting radionavigation and radiolocation, is also extended to this band.

3. CEPT further supports the additional worldwide allocation of the frequency band 9 800-9 900 MHz to the EESS (active) and to the SRS (active) indicating that this extension is limited to EESS (active) and to the SRS (active) systems that need a bandwidth wider than that between 9 300-9 800 MHz and provided that the present RR provision 5.476A protecting radionavigation and radiolocation, is also extended to this band. Protection of the

Fixed Service in the band 9800-9900 MHz is ensured by a new footnote.

4. The upgrade of the Radiolocation service should not be conditional on an additional allocation for EESS (active) and SRS (active).

Background

Issue 1:

The 9 GHz band is in particular extensively in use in Europe for shipborne, airborne and ground based radars in the radiolocation and radionavigation services. There is a need to provide contiguous spectrum from 8 500 – 10 500 MHz for the radiolocation service allocated on a primary basis worldwide, in order to provide adequate spectrum for new radar systems to function. Emerging requirements for increased range resolution and increased range accuracy necessitate wider contiguous emission bandwidths than are currently available. To meet existing and future operational requirements of all type of radiolocation applications (aeronautical, maritime, meteorological, etc.) the upgrade of the radiolocation service from secondary to primary in these portions of the band is needed. Pulsed radars in the Radiolocation services have been demonstrated to successfully share with the Radionavigation service in other bands, however some newer radars in this service use continuous wave signals. Therefore, compatibility studies need to be conducted to analyse continuous wave type radars.

For ships subject to the SOLAS Convention radars operating in the band 9.3 - 9.5 GHz are the most important element in radio navigation. Additionally, 9.3-9.5 GHz radar transponders are the main equipment in the Global Maritime Distress and Safety System (GMDSS) for locating survivors in distress situations. These safety services have to remain protected from, radiolocation systems.

The 9 GHz band is also used extensively for aeronautical (ground and airborne) radar systems for short-range surveillance and precision object definition up to a 50 km range. For airborne weather radar systems, their shorter wavelength is very suitable for the detection of storm clouds, turbulence and windshear. This band is also used for surface detection radar. The continuing aeronautical uses of the band need to be protected, as there is no alternative system identified providing similar services.

Finally, meteorological radars in the 9300-9500 MHz are currently seen as the solution to improve the coverage of the radar networks deployed in the 2.8 and 5.6 GHz bands in a number of areas where precipitation detection is not satisfactory or even not manageable, due in particular to the relief. Meteorological radars in this band are also expected to participate to short-scale hydrological survey.

Issue 2:

Currently the Radio Regulations allocate to the EESS (active) the frequency band 9500-9800 MHz on a worldwide primary basis. Since this band is well suited for imaging applications and because technological progress today offers the possibility to improve the features for a global monitoring for environment and security, there is a need to increase the spectrum available for EESS in this part of radio spectrum, for systems requiring bandwidth larger than the currently allocated 300 MHz in the 9500-9800 MHz.

Optical and radar Earth remote sensing techniques complement each other in providing knowledge about different physical parameters, but also by being of different usefulness under different

weather conditions. The progress in optical instrumentation for Earth remote sensing from space is such that it is now necessary to improve radar Earth remote imaging from space, in order to keep it both comparable and competitive with optical imagery.

The current spectrum available for Earth Exploration Satellite Service (active) from 9500 MHz to 9800 MHz is well suited for imaging and remote sensing applications. Moreover, during the last 30 years, many technologies have been developed in the field of microwave devices especially high power solid state transmitters, low noise receivers, active phased array antennas and frequency sources. The next available frequency range is between 13250 and 13750 MHz and such a 500 MHz bandwidth is more applicable to radar altimetry while its usage is not so well suited for imaging as the 9 GHz band is. As confirmed by recent studies and ongoing pan-European initiatives, Earth remote imaging from space is recognized as a strategic technology for the fulfilment of the objectives of global environmental monitoring and safety as endorsed on both the national and the international scale.

Civilian space agencies have been successfully flying X-band synthetic aperture radars in space since 1994. At least one space agency has proposed an X-band SAR mission using a 450 MHz bandwidth and at least one further agency is planning an X-SAR mission with 600 MHz bandwidth both with the following main mission objectives:

– Environmental monitoring, surveillance and risk management applications of institutional entities;

– Environmental resources management, maritime management, earth topographic mapping, law enforcement, informative/science applications of other institutional, scientific and commercial entities.

Although previous synthetic aperture radars had a resolution of 3-15 meters, there are plans to enhance the spatial resolution to the order of 1 m or below to improve the features for global monitoring for environmental purposes, thus requiring up to 500 MHz bandwidth or more.

It should be remembered at this point, that optical technology is now such that resolutions of 1m are plausible. For images rendered from the two different techniques to remain comparable, a higher bandwidth is a necessity.

Another feature offered by a wider bandwidth would be to scan a wider strip of the surface of the Earth instead of enhancing resolution. This possibility would greatly improve the versatility of SAR instruments for Earth remote sensing in emergency mitigation and disaster protection.

CEPT is reminded of the European position going into WRC-03:

“Consider the allocation of the frequency band 9 300 –9 500 MHz to EESS (active) in Regions 1, 2 and 3” (Annex VI of the CPG03-5 Report, Doc CPG (2002) 93r1)
Consideration of the band 9 800 – 10 000 MHz was a compromise that had to be reached with the US delegation within WRC-03 and was of no explicit European interest since it did not correspond to the system planned in Europe.

In fact, some resistance is expected from organizations both inside and outside of Europe regarding the use of this “upper band”.

In conclusion, it can be said that the rationale behind the CEPT position can be summarized as:

- The proposal from Europe for having this agenda item at WRC-07

- The need for an increased bandwidth to improve resolution in order to maintain position alongside optical technologies while ensuring protection of existing services
- The need for a further allocation of 200 MHz, providing 500 MHz was based on the available technology prior to WRC-03
- The need for an additional allocation of 100 MHz in excess to 200 MHz indicated above is based on technological progress, the requirement for higher resolution or larger field of view

Summary of technical and operational studies and relevant ITU-R Recommendations

Recommendation ITU-R M.1372-1, “Efficient use of the radio spectrum by radar stations in the radiodetermination service”. This Recommendation provides information on the various mitigation techniques that radars use among themselves to prevent pulsed interference from degrading their operations. Many of the radars tested in the below mentioned reports and recommendations employ these types of techniques.

Draft new Recommendation ITU-R M.[8/143], “Characteristics of and protection criteria for radars operating in the radiodetermination service in the frequency band 8.5-10.5 GHz”. This Recommendation contains characteristics and protection criteria for radiodetermination systems operating in the band 8.5-10 GHz. The radiolocation waveforms that were used in the testing were developed from information contained in this recommendation. The radionavigation systems that were tested are also representative of those in the Recommendation.

Report ITU-R M.[8/52], “Test results illustrating the susceptibility of maritime radionavigation radars to emissions from digital communication and pulsed systems in the bands 2 900-3 100 and 9 200-9 500 MHz”. This report contains results of tests with marine radionavigation systems and pulsed interference.

Preliminary draft new Report ITU-R M.[Mitigation Factors], “Factors that mitigate interference from radiolocation and EESS/SRS (active) radars to maritime and aeronautical radionavigation radars in the 9.0-9.2 and 9.3-9.5 GHz bands and between EESS/SRS (active) radars and radiolocation radars in the 9.3-9.5 and 9.8-10.0 GHz bands”.

Preliminary draft new Report ITU-R M.[Duty Cycle Tests], “Test results illustrating the effective duty cycle of frequency modulated pulsed radiolocation and EESS waveforms in a marine radionavigation receiver.”

Preliminary draft new Report ITU-R M.[Compatibility Tests], “Test results illustrating compatibility between representative radionavigation systems and radiolocation systems in the band 8.5-10 GHz”. While the aforementioned documents are considered to be sufficient to support conclusions to the Agenda item 1.3, it should be noted that theoretical protection criteria for radiodetermination systems need to be improved. In particular, the impact of radiolocation radars using tenths per cent duty cycles need further studies. There is currently no recommendation specifying the maximum acceptable duty cycle limit a radar receiver could be subject without harmful operational disturbance.

Recommendation ITU-R RS.1166-3, “Performance and interference criteria for spaceborne active sensors”.

Recommendation ITU-R RS.1280, “Selection of active spaceborne sensor emission characteristics to mitigate the potential for interference to terrestrial radars operating in frequency bands 1-10 GHz”.

Preliminary draft new Report ITU-R RS.[9 GHz COMPAT], “Studies related to the compatibility between EESS (active) and the radiodetermination service in the 9 300-10 000 MHz band and between EESS (active) and the fixed service in the 9 800-10 000 MHz band”.

Analysis of the results of studies

Issue 1

Recommendation ITU-R M.1461-1 states that the effect of pulsed interference is difficult to quantify and is strongly dependent on receivers/processor design and mode of operation. Testing is one manner to quantify the effect of interference. Report ITU-R M.[8/52] and preliminary draft new Reports ITU-R M.[Compatibility Tests] and ITU-R M.[Mitigation Factors] provide detailed information on the characteristics and interference mitigation techniques for radionavigation radars, EESS/SRS (active) systems, and radiolocation radars to mitigate interference. Preliminary draft new Report ITU-R M.[Duty Cycle Tests] presents test results showing how the effective duty cycle of FM pulsed signals is reduced as they pass through the receiver chain of marine radionavigation radars.

Testing was conducted to determine the ability of radionavigation radars to mitigate interference from radiolocation radars. Tests using a variety of radionavigation radars (maritime, precision approach radar, airborne weather, and airport surface detection equipment) showed a radar’s ability to suppress pulsed interference is closely related to duty cycle, pulse width of the interfering waveform, and to the bandwidth of the receiver. The test results showed typical radionavigation systems did not suffer any degradation in performance from interfering radiolocation waveforms at an I/N of +40 dB. In general, the pulse length and modulation characteristics of the potential interferer and the victim receiver are very different. The longer duty cycles of chirped waveforms are reduced to a value where the interference can be mitigated with interference mitigation circuitry (illustrated in Recommendation ITU-R M.1372). The test results show compatibility between the radionavigation and radiolocation services in the band 9 000-9 200 MHz and 9 300-9 500 MHz.

Issue 2

Recommendation ITU-R RS.1166-3 specifies the performance and interference criteria for spaceborne active sensors. Recommendation ITU-R RS.1280 provides a methodology for selecting active spaceborne sensor emission characteristics to help mitigate the potential for interference to terrestrial radars operating in frequency bands 1-10 GHz. Preliminary draft new Report ITU-R RS.[9 GHz COMPAT] contains details on the pertinent compatibility studies and interference analyses performed over the 2003-2007 study cycle for the possible EESS (active) extension in the 9 GHz band under this agenda item.
When assessing the compatibility between radionavigation radars and systems operating in the EESS/SRS (active), tests and measurements along with analyses should be used for a more complete overview of the sharing potential. The test and analysis results show representative radionavigation and radiolocation radars do not suffer any degradation to their performance from representative EESS (Active) waveforms at an I/N of +40 dB1 for shipborne systems, I/N of +54 dB for airborne systems, I/N of +50 dB for ground-based systems, and an I/N of +28 dB for ground-based meteorological radars. Dynamic simulations show systems operating in 9 300-9 500 MHz may experience interference levels up to an I/N of +52 dB for shipborne systems, I/N of +45 dB for airborne systems, I/N of +23 dB for ground based systems, and an I/N of +27 dB for ground-based meteorological radars. Dynamic simulations performed to determine the impact of

[1] An *I*/*N* of +40 dB was the highest level used in the tests. This value does not imply a level greater than +40 dB will degrade radar performance.

radiodetermination systems on the EESS (active) show a global deployment of 1 000 radar systems would not exceed the EESS (active) interference criteria defined in Recommendation ITU-R RS.1166. Based on these results combined with the short durations of occurrence for the EESS (active) interference, compatibility between the EESS and radiodetermination systems operating in 9 300-9 500 MHz can be concluded.

Since the SRS (active) systems operate in the vicinity of planets and celestial bodies other than the Earth or as experimental platforms for future EESS (active) systems, SRS (active) systems were not studied for compatibility with any Earth-based systems. Another possible use of the SRS (active) is as an experimental platform for a future EESS (active) system. However, in this case, the SRS (active) system and the EESS (active) system would be essentially the same. With respect to other types of EESS (active) systems other than SARs, it should be noted that precipitation radars and cloud profile radars cannot operate in this frequency range due to the physics of their intended applications. Altimeters, which are wideband EESS (active) systems operating at relatively low power levels, have been shown to not cause interference to radiodetermination systems in the 9 500-9 800 MHz band. Results for any extension band should be analogous.

Dynamic simulations to determine the interference into a spaceborne SAR operating in the EESS (active) from systems operating in the radiodetermination services indicate that the aggregate interference from a distribution of radiodetermination systems does not exceed the SAR interference criteria. Furthermore, since the SAR interference criteria given in Recommendation ITU-R RS.1166 allows for an exceedance of up to 1% for systematic interference and up to 5% for random interference events, it can be concluded that the radiodetermination systems will not cause excessive interference to the EESS (active) systems.Compatibility between SARs that might operate in the EESS (active) and systems operating in the radiodetermination services in the band 9 800-10 000 MHz would be analogous to the compatibility between such systems in the 9 300-9 500 MHz band. While no specific measurements have been performed for systems in 9 800-10 000 MHz band, the waveforms and test results should be similar to those in the 9 300-9 500 MHz band. Therefore, when assessing the compatibility of radionavigation radars and systems operating in the EESS (active), tests and measurements along with analyses should be used for a more complete overview of the sharing potential

To determine levels of interference into the radiodetermination service, dynamic simulations were used to evaluate the I/N levels at a radar receiver input due to a spaceborne SAR operating co-channel in the 9 800 to 10 000 MHz band. Results of these simulations were similar to those in the 9 300-9 500 MHz band

As in the 9 300-9 500 MHz band, ITU-R studies have shown that the radiodetermination systems operating in the 9 800-10 000 MHz band will not cause excessive interference to the EESS (active) systems that may operate in this band.

With respect to sharing between the EESS (active) and the fixed service, ITU-R studies have shown that interference from a distribution of FS transmitters operating in the 9 800-10 000 MHz band did not exceed the interference threshold of a spaceborne SAR. Furthermore, since the SAR interference criteria given in Rec. ITU-R RS.1166 allows for an exceedance of up to 1% for systematic interference and up to 5% for random interference events, it can be concluded that the fixed service systems will not cause excessive interference to the EESS (active) systems. Preliminary ITU-R studies have examined the interference from EESS (active) systems into FS systems operating in the 9 800-10 000 MHz band and have determined that the worst case interference from such systems does not exceed the long term protection criteria of the fixed service for this band. The short term protection criteria need to be evaluated with respect to these simulation results. Finally, these preliminary studies used the peak power of the SAR to evaluate

the interference into the FS stations while it is more appropriate to use the average power of the SAR for such an evaluation.

Studies have been completed within ITU-R for both bands 9.3-9.5 GHz and 9.8-10 GHz, although some administrations have difficulties with the additional allocation of 100 MHz in excess to 200 MHz and argue that this is beyond the scope of the agenda item. Some administrations have stated in CPM that some specific radar systems were not taken into account in the ITU-R studies because the relevant information was not submitted to WP8B.

Even though not studied as a sharing issue within ITU-R in preparation for the agenda item, there is a potential for destructive interference from transmissions in the band 9.3 - 9.9 GHz from space stations of the EESS (active) to radio astronomy observations in the band 10.6 – 10.7 GHz. This problem has been studied in a similar case concerning the operation of EESS satellites in the bands 94 – 94.1 GHz and has led to the SFCG Resolution 24 –3 and the ITU-R RA. Rec. 1750. A procedure of mutual information and coordination between the involved Agencies is described in these documents.
It is proposed that a similar mechanism will be implemented to prevent distructive interference to radio astronomy stations operating in the 10.6 to 10.7 GHz band from EESS (active) systems operating in the band 9.3 -9.9 GHz

List of other relevant documents

ITU-R 8B/557 of 5 September 2006 (EESS and SRS systems to be considered)
ITU-R Report RS.2094
Doc CPG (2002) 93r1- CPG03-5 Report

Actions to be taken

No further actions can be envisaged at this time.

Proposals from outside CEPT

Regional telecommunication organisations

APT (January 2007)

Preliminary APT View

Issue A: The upgrade of Radiolocation Service in the band 9000-9200 MHz and 9300-9500 MHz

APT Members support upgrading the status of radiolocation service to a primary allocation, taking into account the ITU-R study results which indicate that sharing with the radionavigation service is possible. APT Members supports Method A1 of the draft CPM Report which requires that the radiolocation service operating in the 9 000-9 200 MHz and 9 300-9 500 MHz bands shall not cause harmful interference to, nor claim protection from the stations operating in the aeronautical radionavigation service (9000-9200 MHz) or radionavigation service (9300-9500 MHz). This could be accomplished by addition of an appropriate footnote to protect the aeronautical radionavigation and radionavigation systems. In the band 9 300-9 500 MHz, ground-based radars used for meteorological purposes should continue to have priority over other radiolocation devices (as per RR No. **5.475**).

Issue B: The extension of EESS and Space Research Service by 200 MHz

APT Members support the result of ITU-R compatibility studies between the existing systems operating in the radiolocation and radionavigation services in the 9 300 – 9 500 MHz band and the spaceborne radar systems operating

under EESS (active) and SRS (active). Any expansion of the EESS (active) and SRS (active) allocation beyond the band 9 500-9 800 MHz should ensure that the incumbent services should be fully protected and be limited to systems that cannot be accommodated within the 9 500-9 800 MHz band and that require bandwidths larger than 300 MHz.

Should an expansion be granted to the EESS (active) and SRS (active) to operate spaceborne radar, many APT Members consider that the lower portion (9 300-9 500 MHz) is preferable due to the fact that in the band 9 800-10 000 MHz, fixed service systems are operating or planned in their countries.

Some APT Members prefers that the higher portion (9 800-10 000 MHz) be granted to the EESS (active) and SRS (active) to operate spaceborne radar, while another Member has reservations.

In either case necessary regulatory text, through footnote(s), will be required to ensure the protection and priority of incumbent services.

The following proposal amendment to the Radio Regulations is provided to support Issue A of this Agenda Item:

[Preliminary Draft Common Proposal for WRC-07]

The upgrade of the existing RLS allocation

Article 5

8 500-10 000 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
9 000-9 200	AERONAUTICAL RADIONAVIGATION 5.337 RADIOLOCATION~~Radiolocation~~ 5.471 **ADD** 5.RAD	
9 200-9 300	RADIOLOCATION MARITIME RADIONAVIGATION 5.472 5.473 5.474	
9 300-9 500	RADIONAVIGATION 5.476 RADIOLOCATION~~Radiolocation~~ 5.427 5.474 **MOD** 5.475 **ADD** 5.RAD	

ADD
5.RAD In the band~~s~~ 9 000-9 200 MHz stations operating in the radiolocation service shall not cause harmful interference to, nor claim protection from systems operating in the aeronautical radionavigation service. In the band 9 300-9 500 MHz, stations operating in the radiolocation service shall not cause harmful interference to, nor claim protection from systems operating in the radionavigation service. In the band 9 300-9 500 MHz, ground-based radars used for meteorological purposes have priority over other radiolocation devices.

Reasons: This version of footnote No.5.RAD is derived from the Report of SC to CPM (Doc. CPM07-2/2).

MOD
5.475 The use of the band 9 300-9 500 MHz by the aeronautical radionavigation service is limited to airborne weather radars and ground-based radars. In addition, ground-based radar beacons in the aeronautical radionavigation service are permitted in the band 9 300-9 320 MHz on condition that harmful interference is not caused to the maritime radionavigation service. ~~In the band 9 300-9 500 MHz, ground-based radars used for meteorological purposes have priority over other radiolocation devices.~~

Reasons: Recognizing the importance to protect the existing primary RLS having allocations in these bands, a footnote to protect future operational use of radionavigation systems is needed.

Arab group (September 2006) **:**

WP 9D believes that any consideration of an extension of the EESS (active) allocation in the band 9 800 – 10 000 MHz should only be considered in the event that those sharing studies in the 9 300 – 9 500 MHz band lead to unsatisfactory conclusions as is mentioned in resolves 4 of Resolution 747.

Syria, on behalf of the Arab States, in accordance with No. 5.477 of the Radio Regulations, will object officially to the extension of the active EESS services to this band.

CITEL (October 2006)

CITEL

Draft Inter-American Proposal

A) The upgrade of Radiolocation Service in the band 9000-9200 MHz. and 9300-9500 MHz.

Background

The proposal addresses the upgrade of radiolocation service in the band 9 000-9 200 MHz and 9 300-9 500 MHz. As identified in Resolution **747** (WRC-03), there is a need to provide contiguous primary spectrum around the 9 GHz band in order for existing and planned radiolocation systems to satisfy their required missions. Changes in technology and emerging requirements for increased image resolution and increased range accuracy necessitate wider contiguous emission bandwidths. Therefore, there is a need to upgrade the status of frequency allocations to the radiolocation service in the frequency range 9 000-9 200 MHz and 9 300-9 500 MHz.

The bands 9 000-9 200 MHz and 9 300-9 500 MHz are allocated on a primary basis to aeronautical radionavigation and radionavigation, respectively. The Radio Regulation No. **4.10** recognizes radionavigation as a safety service. The radiolocation services and the radionavigation service have demonstrated compatible operations over many years through the use of similar system characteristics such as low-duty cycle emissions, scanning beams and interference reduction techniques. For example, past operational experience in the 2 900-3 100 MHz band as found in Report ITU-R M.2032 “Tests illustrating the compatibility between maritime radionavigation radars and emissions from radiolocation radars in the band 2 900 - 3 100 MHz” confirms that it is possible to mitigate interference from radiolocation radars to maritime radionavigation radars in the band.

Some studies have been completed within ITU-R WP 8B that characterize the technical performance and protection criteria of radiolocation and radionavigation systems that ensure compatible operations in the bands 9 000-9 200 MHz and 9 300-9 500 MHz. Recommendation ITU-R M.1313 contains the technical characteristics and protection criteria for maritime radars in the band 9 300-9 500 MHz and that Recommendation ITU-R M.1372 identifies interference reduction techniques which enhance compatibility among radar systems.

The ITU-R studies that have been completed on radionavigation radars and emissions from radiolocation radars in the band 9 000–9 500 MHz illustrate compatibility between the two services in this band. These

studies indicate that typical radionavigation radars can suppress emissions from other radars, even when the radars receive interference with very high interference-to-noise (I/N) ratios if the unwanted pulsed waveform is asynchronous and has a low effective duty cycle. These study results support the successful historical sharing experience between the services in the 9 000-9 500 MHz band. Therefore a primary allocation for radiolocation can be added to the 9 000 - 9 200 and 9 300 - 9 500 MHz bands.[2]

Proposal

B/CAN/URG/USA/1.3/01
MOD

Allocation to services		
Region 1	**Region 2**	**Region 3**
9 000-9 200	AERONAUTICAL RADIONAVIGATION 5.337 ~~Radiolocation~~ RADIOLOCATION 5.471 **ADD** 5.472[A]	
9 200-9 300	RADIOLOCATION MARITIME RADIONAVIGATION 5.472 5.473 5.474	
9 300-9 500	RADIONAVIGATION 5.476 ~~Radiolocation~~ RADIOLOCATION 5.427 5.474 **MOD** 5.475 **ADD** 5.472[A]	

Reasons: Provides a worldwide contiguous primary allocation to meet the required missions of radiolocation systems.

B/CAN/URG/USA/1.3/02

MOD

5.475 The use of the band 9 300-9 500 MHz by the aeronautical radionavigation service is limited to airborne weather radars and ground-based radars. In addition, ground-based radar beacons in the aeronautical radionavigation service are permitted in the band 9 300-9 320 MHz on condition that harmful interference is not caused to the maritime radionavigation service. ~~In the band 9 300-9 500 MHz, ground based radars used for meteorological purposes have priority over other radiolocation devices.~~

Reasons: Priority of the meteorological ground-based radars is included in added provision RR 5.472[A].

[2] These modifications to the paragraph all come from CCP.II-RADIO/1112/06

B/CAN/URG/USA/1.3/03

ADD

5.472[A] In the band 9 000 – 9 200 MHz stations operating in the radiolocation service shall not cause harmful interference to, nor claim protection from systems operating in the aeronautical radionavigation service. In the band 9 300 – 9 500 MHz stations operating in the radiolocation service shall not cause harmful interference to, nor claim protection from systems operating in the radionavigation service. In the 9 300 - 9 500 MHz band, ground-based radars used for meteorological purposes have priority over other radiolocation uses.[3]

Reasons: Provide primary allocation to the radiolocation service, contiguous across 8 500 – 10 000 MHz, with sufficient bandwidth to meet emerging requirement for increased image resolution and increased range accuracy. The radionavigation service and the meteorological ground-based radars will continue to be protected from stations of the radiolocation service.

B) The 200 MHz extension of the primary EESS (active) and SR (active) allocations in the 9500-9800 MHz band.

Background:

The band 9 500-9 800 MHz is allocated on a primary basis to the Earth exploration-satellite (EESS) (active), space research (SRS) (active), radiolocation and radionavigation services. In order to satisfy global environmental monitoring requirements for increased resolution, EESS (active) and the SRS (active) allocations require an increase of 200 MHz. This additional bandwidth will greatly improve the resolution of the features for global monitoring and for environmental and land-use purposes.

The ITU-R studied the compatibility between EESS (active) and the existing services in the two bands identified by Resolution **747 (WRC-03)** for consideration as extension bands.

Results of ITU-R tests and measurements indicate that representative radiolocation and radionavigation radars do not suffer any performance degradation due to any of the representative EESS (active) waveforms. These various ITU-R compatibility studies combined with tests and measurements indicate that sharing is feasible in the additional 200 MHz of spectrum between the EESS (active) and existing services in either the 9 300-9 500 MHz band or the 9 800-10 000 MHz band. In addition, these studies demonstrate that narrow band (less than 300 MHz) SAR present higher interference potential compared to wide band (300 MHz or greater) SAR extending over the whole 9300-9800 MHz band. With respect to sharing between the EESS (active) and the fixed service, ITU-R studies have shown that interference from a distribution of FS transmitters operating in the 9 800-10 000 MHz band did not exceed the interference threshold of a spaceborne SAR.

Recognizing further that narrow bandwidth (less than 300 MHz) SAR can operate in the existing frequency band (9 500 - 9 800 MHz) and that the requested extension is only justified for SAR systems requiring more than 300 MHz bandwidth, a limitation of such 200 MHz extension to these wideband (300 MHz or greater) SAR systems could limit the risk of interference to meteorological radars while

[3] This modification to 5.472[A] was taken from CCP.II-RADIO/1112/06. However, in CCP.II-RADIO/1112/06 the footnote was labeled 5.YYY.

responding to the need for 200 MHz EESS extension to, as expressed in the above background section, *"greatly improve the resolution of the features for global monitoring and for environmental and land-use purposes"*.

Since the SRS (active) systems operate in the vicinity of planets and celestial bodies other than the Earth or as experimental platforms for future EESS (active) systems, SRS (active) systems were not studied for compatibility with any Earth-based systems. Another possible use of the SRS (active) is as an experimental platform for a future EESS (active) system. However, in this case, the SRS (active) system and the EESS (active) system would be essentially the same. With respect to other types of EESS (active) systems other than SARs, it should be noted that precipitation radars and cloud profile radars cannot operate in this frequency range due to the physics of their intended applications. Altimeters, which are wideband EESS (active) systems operating at relatively low power levels, have been shown to not cause interference to radiodetermination systems in the 9 500-9 800 MHz band. Results for any extension band should be analogous.[4]

[4] This paragraph comes from the middle of page 4 of CCP.II-RADIO/1112/06

Proposal:

CAN/USA/1.3/04 MOD

Allocation to services		
Region 1	**Region 2**	**Region 3**
9 300-9 500	RADIONAVIGATION 5.476 ~~Radiolocation~~ RADIOLOCATION EARTH EXPLORATION-SATELLITE (active) **ADD** 5.XXX SPACE RESEARCH (active) **ADD** 5.XXX 5.427 5.474 **MOD** 5.475 **ADD** 5.YYY **MOD** 5.476A	
9 500 – 9 800	EARTH EXPLORATION SATELLITE (active) RADIOLOCATION RADIONAVIGATION SPACE RESEARCH (ACTIVE) **MOD** 5.476A	

Reasons: Provides a worldwide contiguous primary allocation to meet the requirements of EESS (active) systems.

CAN/USA/1.3/05
ADD

5.XXX: The use of the band 9300-9500 MHz by Earth exploration-satellite service (active) and space research service (active) is limited to systems having assigned frequency bandwidths 300 MHz or greater and that cannot be accommodated within the 9 300-9 500 MHz band.

CAN/USA/1.3/06
MOD

~~**5.476A** : In the band 9 500-9 800 MHz, sStations in the Earth exploration-satellite service (active) and space research service (active) in the band 9 300-9 800 MHz and space research service (active) in the band 9 500 – 9 800 MHz shall not cause harmful interference to, or constrain the use and development of, stations of the radionavigation and radiolocation services~~

5.476A In the band 9 3~~5~~00-9 800 MHz, stations in the Earth exploration-satellite service (active) and space research service (active) shall not cause harmful interference to, or constrain the use and development of, stations of the radionavigation and radiolocation services. (WRC-~~97~~07)

[*Editor's Note: Due to the number of revision marks, the proposed modification to 5.476A from Doc. 1080 Rev 2/06 has been deleted and replaced with text indicating only the current proposed modification to 5.476A.*]

Reasons: The radionavigation and radiolocation services will continue to be protected from EESS (active) and SRS (active) systems.

Preliminary Views:

RCC:

Upgrading of status allocation of the bands 9 000-9 200 MHz and 9 300-9 500 MHz to the radiolocation service to a primary is supporting. Stations in the radiolocation service shall not cause harmful interference to the maritime and aeronautical radars of the radionavigaion service.

The extension by up to 200 MHz of the allocation in the band 9 500-9 800 MHz to the EESS (active) and the space research service (active) shall be based on possibility to protect the radiolocation and radionavigation services in the band 9 300-10 000 MHz.

International organisations

ICAO:

Accept the upgrading of the radiolocation service to primary status in the bands 9 000 - 9 200 MHz and 9 300 9 500 MHz, on the basis of agreed studies which take into account the protection of the use of these bands by aviation. Any upgrading of the radiolocation service shall be made with the condition that no harmful interference is caused to the aeronautical radionavigation service and the radionavigation service in these bands and that no protection is required to the radiolocation service from these radionavigation services.

Any suggestions for the sharing of radionavigation band 9 300 - 9 500 MHz with EESS and SRS under this agenda item can only be considered on the basis of agreed studies, which take into account the use of the band by aviation. Any allocation to EESS and SRS shall be made with the condition that no harmful interference is caused to the (aeronautical) radionavigation service in the band 9 300 – 9 500 MHz and that no protection is required to the EESS and SRS from the (aeronautical) radionavigation service.

No change to Nos. 5.337, 5.427, 5.474 and 5.475. No. 5.476 can be deleted since the date indicated has expired.

IMO:

While there is a long history of successful co-band operations between radiolocation and radionavigation systems near 9 GHz, new systems may not necessarily be compatible with existing systems. Therefore, IMO supports measurement tests and ITU-R studies to ensure compatible operation in these bands. If the outcome of these measurements and studies is favourable, IMO anticipates supporting the allocation upgrades for radiolocation. However, it is the position of IMO that there would also need to be regulatory text in the form of a footnote to protect radionavigation systems so that there will be no constraints on radionavigation use in these bands, regardless of the outcome of the studies. Concerning the possible extension to the EESS and SRS allocations, IMO could support such an extension provided that there is a favourable outcome from the sharing studies and that the existing primary services are protected. Some regulatory text in the form of one or more applicable footnotes may be necessary to ensure such protection.

NATO (February 2007)
NATO Military Position

(a) The upgrading of the Radiolocation service in the bands 9 000-9 200 MHz and 9 300-9 500 MHz is supported. For the protection of the Radionavigation service a footnote similar to RR .424A is acceptable.

(b) The extension of the existing primary allocations to the Earth exploration-satellite service (active) and to the space research service (active) beyond the band 9 500- 9 800 MHz by maximum 200 MHz, is acceptable, with a strong preference for the band 9 300-9 500 MHz and provided that the present RR 5.476A provision protecting radionavigation and radiolocation is also extended to the newly allocated band(s).

(c) In any case, the upgrade of Radiolocation should not be tied to an additional allocation for EESS (active) and SR (active) with 200 MHz in the 9 GHz sub-band. The two allocation actions should be treated separately based on their merits and on the results of ITU-R sharing studies, and not be iewed as a package deal.

SFCG (September 2006) :

SFCG supports a 200 MHz extension to the current 9.5-9.8 GHz allocation to both the EESS (active) and SRS (active). SFCG prefers the extension to be in 9.3-9.5 GHz band as given in Method A in the draft CPM Report. SFCG members are encouraged to take an active role in the development of proposals and positions within their respective Administrations' preparatory processes for the CPM and WRC-07.

WMO and EUMETNET (January 2007):

WMO and EUMETNET support the upgrade to primary of Radiolocation Service in the band 9 300-9 500 MHz on an equal footing with Radionavigation Service retaining (either in the current or new footnote) the provisions of RR 5.475 that addresses meteorological radars.

WMO and EUMETNET could support extension to the band 9 300-9 500 MHz of the EESS (active) and the space research service (active) allocations. The present RR footnote 5.476A would also need to be extended to this band. Also, WMO and EUMETNET are of the view that, to limit the risk of interference, such extension should be limited to EESS (active) systems that need a bandwidth higher than the current 300 MHz allocation. Should EESS (active) and space research service (active) allocations not be possible in the lower band, WMO and EUMETNET could support such allocations in the 9800-9975 MHz band as an acceptable alternative but is of the view that such an EESS/SRS (active) allocation in the 9975-10000 MHz band could preclude the use of this band by meteorological services if the compatibility, not studied in ITU-R, is found to be problematic.

Regional organisations

EUROCONTROL:

To support that the upgrading of the radiolocation service to primary status in the bands 9.000-9.200 MHz and 9.300-9.500 MHz can only occur after the relevant ITU studies and recommendations are established to ensure that no harmful interference is caused to the Aeronautical Radionavigation Service and that no protection is required from these radiolocation services.

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