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| Summary:  |
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| Proposal: |
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DRAFT CEPT BRIEF ON AGENDA ITEM 1.16

1.16 to consider issues related to wireless access systems, including radio local area networks (WAS/RLAN), in the frequency bands between 5 150 MHz and 5 925 MHz, and take the appropriate regulatory actions, including additional spectrum allocations to the mobile service, in accordance with Resolution 239 (WRC-15);

# ISSUE

## Resolution 239 (WRC‑15)

This agenda item will consider the results of studies concerning Wireless Access Systems including radio local area networks (WAS/RLAN) in the frequency bands between 5 150 MHz and 5 925 MHz and take appropriate actions. This will encompass the following elements, set out in full in Resolution 239 (WRC-15):

* WAS/RLAN technical characteristics and operational requirements in the 5 GHz frequency range;
* Sharing and compatibility studies between WAS/RLANs and existing primary services, in particular to look at suitable RLAN mitigation techniques to enable RLAN use in the following frequency bands:, 5 350-5 470 MHz, 5 725-5 850 MHz and 5 850-5 925 MHz;
* Sharing and compatibility studies between WAS/RLAN applications and incumbent services in the frequency band 5 150-5 350 MHz with the possibility of enabling outdoor WAS/RLAN operations including possible associated conditions and additional mitigation techniques;

The agenda item also encompasses further sharing and compatibility studies between WAS/RLAN applications and incumbent services addressing:

i) whether any additional mitigation techniques in the frequency band 5 350-5 470 MHz beyond those analysed in the studies referred to in recognizing a) Resolution 239 (WRC-15) would provide coexistence between WAS/RLAN systems and EESS (active) and SRS (active) systems;

ii) whether any mitigation techniques in the frequency band 5 350-5 470 MHz would provide compatibility between WAS/RLAN systems and radio determination systems;

iii) whether the results of studies under points i) and ii) would enable an allocation of the frequency band 5 350-5 470 MHz to the mobile service with a view to accommodating WAS/RLAN use;

In addition, detailed sharing and compatibility studies, including mitigation techniques, between WAS/RLAN and incumbent services in the frequency band 5 725-5 850 MHz with a view to enabling a mobile service allocation to accommodate WAS/RLAN use are to be performed.

Finally, this agenda item calls to conduct detailed sharing and compatibility studies, including mitigation techniques, between WAS/RLAN and incumbent services in the frequency band 5 850-5 925 MHz with a view to accommodating WAS/RLAN use under the existing primary mobile service allocation while not imposing any additional constraints on the existing services.

# Preliminary CEPT position

CEPT supports studies to be performed under Agenda item 1.16 in accordance with Resolution 239 (WRC-15).

In the 5 150-5 350 MHz band, CEPT would support relaxing the access conditions applicable to WAS/RLANs, if results of studies show that sharing and compatibility can be achieved with EESS, radars, MSS feeder links, aeronautical radionavigation and aeronautical telemetry (see No 5.446C).

In the 5 350-5 470 MHz band, CEPT opposes any new allocation to the mobile service with a view to accommodating WAS/RLAN use unless the mitigation techniques (such as DFS for radars) can be shown to provide co-existence with EESS (all types of sensors) and compatibility with all radio determination systems (including Meteorological Radars), taking into account their feasibility (including real implementation at international level) and effectiveness.

In the 5 725-5 850 MHz band, CEPT would support a new mobile allocation to accommodate WAS/RLANs use if sharing and compatibility studies can demonstrate the effectiveness of any new proposed interference mitigation techniques to ensure the protection of radars, fixed service (see No 5.455) and FSS uplinks. It is to be noted that CEPT will take into account compatibility studies between RLAN and specific applications within CEPT (e.g. road tolling systems).

In the 5 850-5 925 MHz band, CEPT is still in discussion over its initial preliminary position for this band, taking into account the need to not impose any additional constraints on existing services such as FSS and existing applications under the mobile service such as ITS.

# Background

ITU-R WP 5A has the responsibility for the studies under this Agenda item in their respective organisations.

5 GHz frequency range is attractive for WAS/RLAN implementation. However, the considerable part of the frequency bands is allocated to other incumbent services (including radio determination services, FSS and EESS (active)) on a primary basis.

Some the bands in this the Agenda item were already studied during the last study period under WRC-15 Agenda item 1.1 and some of the bands already have a mobile allocation for RLAN use under Resolution 229 (5 150-5 350 MHz).

## 5 150- 5 250 MHz & 5 250- 5 350 MHz

The agenda item is to look at possible outdoor WAS/RLAN use under the existing primary mobile allocation in these bands in which currently in Europe and elsewhere in the world there are indoor only restrictions. However, in US, Canada and in some other countries there is outdoor usage allowed in some or all of these bands. Incumbent primary services in the band 5 150-5 250 MHz are FSS (Earth-Space) and Aeronautical Radionavigation; and in the band 5 250-5 350 MHz are EESS (active) and Radiolocation.

EESS (active) is allocated in the 5 250-5 350 MHz band in which number of Altimeters and Scatterometers sensors are currently operated and planned to operate in the future. This band represents a key spectrum source for Europe’s policy Earth exploration through the GMES/Copernicus Programme with Sentinel and EUMETSAT satellites. Recent compatibility studies between EESS (active) and RLAN systems in the 5 250-5 350 MHz frequency range using similar RLAN parameters agreed within JTG 4-5-6-7 (see Annex 27 to Document 5A/298-E, Nov 2016) give already negative results with the current indoor-only RLAN regulations, once full RLAN deployment levels will be reached.

Results of one compatibility study show that providing usage of outdoor WAS/RLAN systems in the frequency band 5 250-5 350 MHz would require development of effective measures for reducing interference to operation of air-borne and ground-based radars. The effect of DFS as a mitigation technique has not been taken into account in this study.

## 5 350-5 470 MHz

The agenda item is to look at a possible new mobile allocation to accommodate WAS/RLAN in the band. Studies carried out previously under WRC-15 Agenda item 1.1 indicated that sharing would only be feasible if further additional mitigation techniques could be applied. The incumbent primary services in the bands are EESS (active, all types of sensors) and Radiodetermination (including Aeronautical).

EESS (active) is allocated in the 5 350-5 470 MHz band in which SAR (Synthetic Aperture Radars), Altimeters and Scatterometers sensors are currently operated and planned to operate also in the future. The band 5 350-5 470 MHz represents a key spectrum source for Europe’s policy Earth exploration through the GMES/Copernicus Programme with Sentinel and EUMETSAT satellites. Compatibility studies performed prior WRC-15 showed that there is significantly enough negative margin to conclude that sharing between EESS (active) SARs and RLAN systems in the 5 350-5 470 MHz frequency range is not feasible unless additional mitigation techniques are identified that can provide the necessary protection to EESS (active). Additional compatibility studies performed since WRC-15 (see Annex 27 to Document 5A/298-E, Nov 2016) have shown that similar conclusion is reached for Altimeters and Scatterometers. At the current stage, compared to the situation prior to WRC-15, no new elements have been presented either in ITU-R WP 5A or CPG/PTD on any additional mitigation techniques that could be envisaged to provide co-existence with all types of EESS sensors.

In the band 5 250-5 850 MHz, different radiodetermination systems are deployed, including:

* Ground based radars for air surveillance and weapon systems;
* Aeronautical radars such as synthetic aperture radars;
* Shipboard sea and air surveillance radars used for ship protection;
* Test range instrumentation radars used to provide highly accurate data position on space launch vehicles and aeronautical vehicles undergoing developmental and operational testing.
* Ground-based meteorological radars.

Among those radiodetermination systems, some radars operate throughout the whole frequency range, such as air defence radars.

It is worth pointing-out that the main threat to military sensors, especially to air defence radar, is jamming. One effective solution to prevent from it is frequency agility, which is only possible when significant portions of frequency spectrum are available without constraints. Thus, a new mobile allocation in this band would create interference to radars and reduce the amount of spectrum available for them leading to a serious impact on the EPM (Electronic protective Measure) and /or ECCM (Electronic Counter Counter Measure) sensors capabilities. In addition, in some specific scenarios, this may reduce the military radars ability to identify the required target. Also, due to the military requirement for deployability, the mobile use of many air surveillance radar and weapon system radar often excludes time-consuming site coordination or complex geographical separation.

Currently, the only realistic mitigation technique identified to protect radars from RLAN interference is the DFS (Dynamic Frequency Selection). However, the existing DFS techniques at 5 GHz have not been designed to protect radars that employ advanced and fast frequency hopping techniques as well as bi-static radars. At this stage, no solution has been found to address the protection of these radars in the band 5350-5470 MHz from RLANs.

As far as ground-based meteorological radars operating in the frequency band 5 350-5 470 MHz are concerned, their technical and operational characteristics are described in Recommendation ITU-R M.1849-1. These characteristics are similar to those found in the meteorological radars operating in the band 5 600-5 650 MHz. The DFS mechanism as specified in ETSI EN 301 893 (V1.8.1) is implemented in WAS/RLAN systems to facilitate sharing with the meteorological radars in the frequency band 5 600 MHz-5 650 MHz. The same DFS mechanism would ensure protection of the similar meteorological radars operating in the band 5 350-5 470 MHz. ETSI has initiated already the corresponding studies to evaluate mitigation techniques for radars including the extension of the DFS implementation in WAS/RLAN to the band 5 350-5 470 MHz.

Moreover, the DFS requirements as given Annex 1 to Recommendation ITU‑R M.1652-1 do not consider the radars with pulse widths of less than 1 μs and channel availability check time of more than 60 s, which are typical for the meteorological radars in the bands 5 350-5 470 MHz and 5 600-5 650 MHz as described in Recommendation ITU-R M.1849-1. Furthermore, some important parameters in relation to the DFS performance when detecting the meteorological radars transmissions, like pulse repetition frequency and waveform types, are not at all specified in Recommendation ITU-R 1652-1.

In view of the above and if WRC-19 decides to allocate the frequency band 5 350-5 470 MHz to the mobile service with the purpose to accommodate WAS/RLAN use, a similar package of cross references to ITU-R deliverables as shown in Resolution 229 (Rev. WRC-12) for the protection of meteorological radar in 5 600-5 650 MHz band, plus any other relevant referenced ITU-R deliverables, will have to be developed to ensure the protection of meteorological radars the band 5 350-5 470 MHz.

Overall, in the 5 350-5 470 MHz band, the situation is that no solutions have been currently found to ensure relevant protection to all incumbent services, and in particular EESS (active) systems and certain types of radiolocation systems.

## 5 725- 5 850 MHz

The agenda item is to look at possible new mobile allocation (limited to WAS/including RLAN) in the band. The incumbent primary services in the bands are FSS (E-S) and Radiolocation. CEPT regulations also authorise the use of several type of applications as well.

Studies carried out by CEPT previously under EC mandate presented an agreed methodology and a large number of calculations with results, although these provided some relevant results, at this stage it is too early to draw definite conclusions from these studies and additional considerations on the potential for RLAN–FSS sharing are still needed. There is also some debate around sharing between RLAN and radiolocation as there is already RLAN, SRD (including WAS/RLAN limited to 25mW), Road Tolling and other applications used at various power levels throughout CEPT or some of its countries. It should be noted that in the rest of the world in some countries outside CEPT, RLAN are authorised in this band without the need for DFS being applied as a mitigation technique. The 5 725-5 875 MHz band is also designated as an ISM band in the Radio Regulations so services using this band would be expected to be robust enough to operate in a challenging environment.

As stated earlier in the document various different radiodetermination systems are deployed across 5 250-5 850 MHz band. Among those radiodetermination systems, some radars operate throughout the whole frequency range, such as air defence radars. Similar areas of concern raised in the background text for 5 340-5 470 MHz band with respect to these types of radar would also apply in this band for some countries within CEPT where these type of radars are deployed.

## 5 850- 5 925 MHz

The agenda item is to look at possible outdoor RLAN use under the existing primary mobile allocation in the band. Studies carried out by CEPT previously under EC mandate presented an agreed methodology and a large number of calculations with results, although these provided some relevant results, at this stage it is too early to draw definite conclusions from these studies and additional considerations on the potential for RLAN–FSS sharing are still needed. There is an EC spectrum Decision for non-exclusive ITS use under the existing primary mobile allocation in this band and CEPT studies also looked at sharing between ITS/RLAN. These studies and similar studies in the US have initiated work in the standards bodies looking at possible mitigation techniques. The 5 725-5 875 MHz band is also designated as an ISM band in the Radio Regulations so services using this band would be expected to be robust enough to operate in a challenging environment. There are co-primary allocations to FSS (E-S), Fixed and Mobile in this band.

# List of relevant documents

ITU-Documentation (Recommendations, Reports, other)

* Recommendation ITU-R M.1652-1, Dynamic frequency selection in wireless access systems including radio local area networks for the purpose of protecting the radiodetermination service in the 5 GHz band
* Report ITU-R M.2115-1, Testing procedures for implementation of dynamic frequency selection
* Recommendation ITU-R М.1461-1 Procedures for determining the potential for interference between radars operating in the radiodetermination service and systems in other services.
* Recommendation ITU-R М.1632 Sharing in the band 5 250-5 350 MHz between the Earth exploration-satellite service (active) and wireless access systems (including radio local area networks) in the mobile service
* Recommendation ITU-R М.1638-1 Characteristics of and protection criteria for sharing studies for radiolocation (except ground based meteorological radars) and aeronautical radionavigation radars operating in the frequency bands between 5 250 and 5 850 MHz
* Recommendation ITU-R М.1849-1 Technical and operational aspects of ground-based meteorological radars
* Recommendation ITU-R М.1450-5 Characteristics of broadband radio local area networks
* Recommendation ITU-R M.1739 Protection criteria for wireless access systems, including radio local area networks, operating in the mobile service in accordance with Resolution 229 (WRC-03) in the bands 5 150-5 250 MHz, 5 250-5 350 MHz and 5 470-5 725 MHz
* WP 5A chairman’s Report in Document 5A/298:

Annex 10: Elements for draft CPM text for WRC-19 agenda item 1.16

Annex 11: Draft work plan for WRC-19 agenda item 1.16

Annex 23: Working document towards a preliminary draft new Report ITU-R M.[RLAN MITIGATION] - Study of proposed additional mitigation techniques to facilitate sharing between RLAN systems and incumbent services

Annex 24: Compilation of technical information on possible candidate techniques that could be used by RLAN to facilitate sharing

Annex 25: Working document towards a preliminary draft new Report ITU-R M.[RLAN REQ-PAR] - Technical characteristics and operational requirements of WAS/RLAN in the 5 GHz frequency range

Annex 26: Working document towards a preliminary draft new Report ITU-R M.[AGGREGATE RLAN MEASUREMENTS] - Use of aggregate RLAN measurements from airborne and terrestrial platforms to support studies under WRC-19 agenda item 1.16

Annex 27: Working document towards a preliminary draft new Report ITU-R M.[RLAN SHARING] - Sharing and compatibility studies of WAS/RLAN in the 5 GHz frequency range

1. These references will have to be updated after each of the WP5A meetings.

CEPT and/or ECC Documentation (Decisions, Recommendations, Reports)

* CEPT Report 57
* CEPT Report 64
* ECC Report 244
* ECC Report 68
* ECC Decision of 12 November 2004 (ECC/DEC/(04)08) on “The harmonised use of the 5 GHz frequency bands for the implementation of Wireless Access Systems including Radio Local Area Networks (WAS/RLANs)”

EU Documentation (Directives, Decisions, Recommendations, other), if applicable

* EC Decision 2005/513/EC of 11 July 2005 on “on the harmonised use of radio spectrum in the 5 GHz frequency band for the implementation of wireless access systems including radio local area networks (WAS/RLANs)”
* ETSI EN 301 893 (V1.8.1), Broadband Radio Access Networks (BRAN); 5 GHz high performance RLAN; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive

# Actions to be taken

To propose mitigation techniques to ensure potential compatibility of RLAN with the incumbent services and applications currently identified in ECC Report 244;

To review and investigate the applicability of any of these mitigation techniques;

In case the study results show that compatibility of RLAN with the incumbent services is feasible to develop technical and regulatory provisions ensuring RLAN implementation in the relevant portions of the 5 GHz range;

CEPT studies between RLAN and ITS to be performed to ensure sharing and compatibility can be achieved between RLANs and ITS co-channel at 5 855-5 925 MHz and adjacent channel above 5 855 MHz.

# Relevant information from outside CEPT (examples of these are below)

## European Union (date of proposal)

## Regional telecommunication organisations

APT (date of proposal)

ATU (date of proposal)

Arab Group (date of proposal)

CITEL (December 2016)

Preliminary Views

Brazil

The Brazilian Administration supports the necessity for studies to consider possible additional spectrum allocation to be mobile service, including radio local area networks (WAS/RLAN), while ensuring the protection of the C band uplink and of all existing services in the candidate bands.

Canada

Canada is of the view that only the specific frequency bands 5 150-5 350 MHz, 5 350-5 470 MHz, 5 725-5 850 MHz and 5 850-5 925 MHz listed in the resolves and invites ITU-R of Resolution 239 (WRC-15) are to be considered and/or studied under WRC-19 agenda item 1.16 and not the entire 5 GHz frequency range (5 150-5 925 MHz).

Canada is assessing and may contribute to studies listed under invites ITU-R of Resolution 239 (WRC-15).

Mexico

WAS/RLANs have promoted the development of broadband access and have been deployed license-exempt, pursuant to the provisions of CITEL and ITU-R, in the frequency bands 5150-5250 MHz, 5250-5350 MHz, 5470-5600 MHz, 5650-5725 MHz, and 5725-5850 MHz. However, it is considered that a potential additional allocation to the mobile service should be based on evidence of spectrum saturation in existing bands, growth projections, and the non-affectation/degradation of any existing services that might operate in the potential additional spectrum.

RCC (16.09.2016)

The RCC Administrations are in favour of necessary protection from potential WAS/RLAN interference for all the services having allocations in the considered frequency bands, first of all for systems in radiolocation and aeronautical radionavigation services used for the safety of flights.

The RCC Administrations consider that the use of WAS/RLAN in the frequency bands 5350−5470 MHz, 5725−5850 MHz and 5850−5925 MHz is possible only when methods for sharing between WAS/RLAN and the systems in existing radio services would be identified in the considered frequency bands.

## International organisations

IATA (date of proposal)

ICAO (date of proposal)

IMO (date of proposal)

SFCG (June 2016)

SFCG supports a review of the RLAN spectrum, technical and operational requirements in the 5 GHz range, as requested by Resolution 239 (WRC-15) as pre-requisite to any further sharing studies in the range.

SFCG supports a global revision of the sharing situation in the full 5 GHz range for studying compatibility with RLANs. More specifically:

For the 5250-5350 MHz band, SFCG supports 1) verifying if the assumptions made in the studies leading to the mobile allocation for RLANs in that band are still valid and applicable to the current and planned use of the band by RLANs; 2) studying the potential impact on EESS (active) systems of the possibility to authorise outdoor RLAN usage.

For the 5350-5470 MHz band, SFCG supports the consideration of new RLAN mitigation techniques proposed by the RLAN industry, provided that these mitigation techniques are found to be effective, sufficient and enforceable. These mitigation techniques need to consider all types of EESS (active) sensors in that band, namely SAR, altimeters and scatterometers. SFCG does not support reopening sharing studies already completed in JTG 4-5-6-7 leading to the WRC-15 conclusion that sharing would not be feasible, as stated in recognizing a) of Resolution 239 (WRC-15).

For EESS (active) altimeters covering the entire 5250-5570 MHz band, SFCG supports studying potential RLAN mitigation techniques on the basis of invites 2 of Resolution 229 (rev. WRC-12).

WMO and EUMETNET (21.11.2016)

Opposition to new RLAN identification/allocation in the 5350-5470 MHz band

Opposition to the outdoor usage of RLAN in the 5250-5350 MHz band

## Regional organisations

ESA(28/11/2016)

ESA supports the SFCG position

EUMETSAT (January 2017)

EUMETSAT supports the SFCG position

Eurocontrol (date of proposal)

## OTHER INTERNATIONAL AND REGIONAL ORGANISATIONS

EBU (date of proposal)

GSMA (date of proposal)

CRAF (date of proposal)

This agenda item does not consider any frequency bands allocated to the RAS, and therefore CRAF has no position on this item.

IARU (25/11/2016)

The 5 GHz band is challenged by WRC-19 both by AI 1.12 and 1.16.

The frequency band 5 650 to 5 850 MHz (5 650 to 5925 in Region 2) is allocated to the amateur service on a secondary basis.

The frequency band 5 830 to 5 850 MHz is allocated to the amateur satellite service (space-to-Earth) on a secondary basis, and in the frequency band 5 650 to 5 670 MHz, the amateur-satellite service (Earth-to-space) may operate subject to not causing harmful interference to other services operating in accordance with the Table.

The frequency band 5 760 to 5 765 MHz is used for amateur weak-signal communication activity including terrestrial and Earth-Moon-Earth communications and propagation beacons.

There is a growing amateur interest for amateur experimentation, investigation of propagation phenomena, point-to-point communication and space communication in this band.

The IARU requests that existing and future amateur use in this band is protected with special attention to the bands 5 760 to 5 765 and 5 830 to 5 850 MHz.