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DRAFT CEPT BRIEF ON AGENDA ITEM 1.1

to consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution 233 (WRC-12)

# ISSUE

Resolution 233 calls for studies on additional spectrum requirements for International Mobile Communications (IMT) and potential candidate frequency bands. The studies on spectrum requirements should take into account technical and operational characteristics of IMT systems and the bands currently identified for IMT, the technical conditions of their use and the possibility of optimizing the use of these bands with a view to increasing spectrum efficiency. The studies should also take into account the evolving needs, including user demand for IMT and other terrestrial mobile broadband applications and the time-frame in which spectrum would be needed.

The study on potential candidate frequency bands should take into account sharing and compatibility studies with services already having allocations in the potential candidate bands and in adjacent bands, as appropriate as well as the current and planned use of these bands by the existing services, as well as the applicable studies already performed in ITU‑R.

# Preliminary CEPT position

CEPT supports:

* the results of the ITU-R studies which indicate that by the year 2020, the total spectrum requirement for pre-IMT, IMT-2000 and its enhancements and for IMT-Advanced is between 1960MHz (for higher user density settings) and 1340MHz (for lower user density settings). However CEPT recognises that the national spectrum requirements may vary.
* harmonised allocations to the mobile service and identification for IMT to facilitate the global roaming and reduction of equipment-cost through economies of scale;
* that when considering identification of additional frequency bands for IMT, CEPT takes into account current use of these bands and the results of ECC and/or ITU-R sharing/compatibility studies with respect to existing services in those bands and adjacent bands.

Based on the available studies CEPT is currently of the view that:

The following bands are supported:

* 1427-1452 MHz
* 1452-1492 MHz
* 3400-3600 MHz
* 3600-3800 MHz

The following bands are subject to further consideration taking into account sharing and compatibility studies:

* 470 – 694 MHz
* 1350-1375 MHz
* 1375-1400 MHz
* 1492-1518 MHz
* [3800-4200 MHz]
* 5725-5850 MHz
* 5925-6425 MHz

The following bands are not supported for mobile broadband:

* 1300-1350 MHz
* 1518-1525 MHz
* 1695-1710 MHz
* 2025-2110 MHz
* 2200-2290 MHz
* 2700-2900 MHz
* 2900-3100 MHz
* 3300-3400 MHz
* [3800-4200 MHz]
* 4400-5000 MHz

Taking into account already existing studies, further consideration and sharing/compatibility studies are needed before being able to decide in which bands an allocation to the mobile service or identification to IMT should be made.

In addition CEPT supports the following regulatory provisions for candidate bands

* Mandatory limits for unwanted emissions in the 1400-1427 MHz band for both mobile terminals and base stations operating in adjacent bands.
* Given that the 1427-1518 MHz is already allocated to mobile service no regulatory measures shall be adopted by WRC-15 for Region 1 regarding the aeronautical mobile service and land mobile service.
* A pfd limit in Article 21 applicable to the broadcasting satellite service in the band 1452-1492 MHz, with possibility for countries wishing to do so to continue to apply coordination under No. 9.11 (e.g. for protection of specific applications such as aeronautical telemetry).

RLAN in the band 5350-5470 MHz

CEPT has large concerns of the feasibility of RLAN usage in the band 5350-5470 MHz, as initial studies indicate that sharing between EESS (active) and RLANs may be feasible only if additional mitigation measures are implemented. Current studies show that negative margins ranging from 6 to 30 dB depending on the assumptions. Some potential additional mitigation techniques have been proposed to address these negative margins, but some questions were raised on the feasibility and appropriateness of implementing these methods. Additional studies are required to evaluate these and any other mitigation measures to ensure the protection of EESS (active).

In addition, the RLAN community will have to provide information on how any mitigation measures proposed can be feasibly implemented, as at this stage, no technique has been shown to be implementable in practice and/or sufficient to enable sharing with EESS.

# Background

## Previous studies on estimates for spectrum requirements

In preparation for WRC-07 ITU-R studied spectrum requirements for the future development of IMT‑2000 and IMT-Advanced. These estimates have been documented in Report ITU-R M.2078[[1]](#footnote-1). In this Report, estimated spectrum requirements are calculated using the spectrum calculation methodology in Recommendation ITU-R M.1768[[2]](#footnote-2). The Report also specifies the values of the parameters relating to market/service and radio aspect to be used in the methodology. Some of these values are based on those provided in Reports ITU-R M.2072 and ITU-R M.2074, respectively, as follows:

* Report ITU-R M.2072[[3]](#footnote-3) summarizes a set of market parameters, such as user density, session arrival rate per user, mean service bit rate, average session duration, and mobility ratio, relevant to the estimation of the spectrum bandwidth requirements. The values of these parameters are based on the members’ responses to the questionnaire.
* Report ITU-R M.2074[[4]](#footnote-4) summarizes radio aspect parameters relevant to the preparation for the estimation of the spectrum bandwidth requirements such as technical characteristics, values of the required radio parameters, spectrum efficiency values, and suitable spectrum range from a technical aspect.

The calculations developed estimated the total spectrum bandwidth requirements ranging from 1 280 MHz to 1 720 MHz which represented a lower and higher market setting as developed from the data in Report ITU-R M.2072. The additional spectrum identified at WRC-07 for IMT was not adequate to meet the spectrum requirements as studied in ITU-R Report M.2078.

Since WRC-07 the mobile broadband traffic has increased significantly, driven by several factors like improved performance of mobile networks and the availability of new devices, like smartphones and tablets, and new mobile applications introducing new ways using mobile devices and services.

## estimates on Spectrum requirements

ITU-R has studied the future spectrum requirements for IMT. This study consisted of four elements: methodology, traffic parameters, radio parameters and the spectrum estimate calculation. ITU-R has approved an update for Recommendation ITU-R M.1768 “Methodology for calculation of spectrum requirements for the terrestrial component International Mobile Telecommunications” by correspondence. Based on the methodology in M.1768-1, the Report ITU-R M.2290 concludes that by the year 2020, the total spectrum requirement for pre-IMT, IMT-2000 and its enhancements and for IMT-Advanced is 1960 MHz (for higher user density settings) and 1340 MHz (for lower user density settings). In some counties, national spectrum requirement can be lower than the estimate derived by lower user density settings and in some countries, national spectrum requirement can be higher than the estimate derived by higher user density settings.

In Radio Regulation for Region 1 there is already an allocation for mobile service on primary basis and identification for IMT for 981 MHz of spectrum. In addition there is an allocation for mobile service and identification for IMT for 200 MHz in more than 80 countries by footnote 5.430A. For the lower user density this corresponds to additional spectrum requirement of 159 - 359 MHz and for higher user density 779 - 979 MHz.

When considering additional spectrum to be allocated to the mobile service and/or identified for IMT, the amount of spectrum already allocated to the Mobile Service and identified for IMT should be taken into account.

The results of ITU-R studies indicate that the estimate for the minimum total spectrum requirement for non-IMT mobile broadband applications in the 5 GHz frequency range by the year 2018 is 880 MHz. Resolution 229 (WRC03) sets the framework for the use of the bands 5150 - 5250 MHz, 5250 - 5350 MHz and 5470 - 5725 MHz by mobile service for the implementation of wireless access systems including radio local area networks. These bands equal 455 MHz for radio local area network in the 5 GHz band.

## Consideration of frequency bands

CEPT is considering the following frequency bands based on input to both CEPT and to the JTG:

470-694 MHz, 1 300-1 350 MHz, 1 350-1 375 MHz, 1 375-1 400 MHz, 1 427-1 452 MHz, 1 452-1 492 MHz, 1 492-1 518 MHz, 1 518-1 559 MHz, 2025-2110 MHz, 2200-2290 MHz, 2 700-2 900 MHz, 2 900 – 3 100 MHz, 3 300 – 3 400 MHz, 3 400-3 600 MHz, 3 600-3 800 MHz, 3 800-4 200 MHz, 4 400 – 4 500 MHz, 4 500 – 4 800 MHz, 4 800 – 5 000 MHz, 5 350-5 470 MHz, 5 725-5 850 MHz, 5 850 - 5 925 MHz, 5 925-6 425 MHz.

Comments and conclusions during the debate within CEPT are added:

470-694 MHz

No common view. A CEPT wide long term strategy for the UHF broadcasting band is under development in ECC TG6.

1300 - 1525 MHz

1300-1400MHz: This band is used by civil and military radars systems.

1300-1350 MHz: CEPT does not support this frequency band as candidate band

CEPT is conducting studies on 1350-1375 MHz, 1375- 1400 MHz, 1427-1452 MHz and 1492-1518 MHz to assess the opportunity of mobile IMT in these bands. In some CEPT countries the band 1375 - 1400 MHz is used for fixed radio link operation. [CEPT considers also the band 1375 - 1400 MHz as possible solution for SAB/SAP.]

1350-1400 MHz: Studies show co-channel sharing between radiolocation service and the downlink of mobile service is not feasible. [Protection of radioastronomy stations operating under 5.149 may require separation distance of hundred of km for base stations and few tens of km for user terminal.] Compatibility in adjacent bands in case of replanning (if [justified/required]) radiolocation service[[5]](#footnote-5) could be achieved when appropriate combinations of mitigations techniques are applied such as: frequency and distance separations, additional filtering in Base Station and Radar, antenna pattern nulling for Base Stations.

1400-1427MHz: Compatibility studies are needed to establish unwanted emissions limits in the 1400-1427 MHz band for both mobile terminals and base stations if deployed in adjacent bands, to protect the passive services in this band.1427-1518 MHz: The band 1452-1492 MHz is subject for harmonisation in Europe for mobile SDL IMT. [BSS satellite networks in the band 1 452-1 492 MHz have to be coordinated with terrestrial services, pursuant to RR No. 9.11. Appendix 5 of the RR only includes overlapping bandwidth as the criteria for triggering coordination, which takes into account existing terrestrial assignments, and those to be brought into use within the next three years.

In order to facilitate the coexistence between IMT and BSS systems in the band 1 452-1 492 MHz, the RR could be modified by inserting a pfd value of -113 dBW/m²/MHz in Article 21 with the view to provide a more stable (long-term stability) situation to IMT systems.

RR Appendix 5 would also be modified so as to enable countries wishing to continue to apply coordination procedure under RR No. 9.11 to do so. Therefore the new pfd limit will apply to the BSS with respect to terrestrial services except in countries wishing to continue to apply RR No. 9.11, because of more stringent protection requirement (e.g. in order to protect telemetry systems).]

Other frequency band in L-band: 1492-1518 MHz is under due consideration and none common view has been agreed. For the band 1429-1518 there will be a need for large separation distances between [receiving] aeronautical mobile service stations (exclusively for Telemetry) and the land mobile service stations and mobile terminals. Given that the frequency band is already allocated to mobile service no regulatory measures shall be adopted by WRC-15 for Region 1 regarding the aeronautical mobile service and land mobile service. [as RR 5.342 applies/In order to protect aeronautical telemetry countries listed in RR 5.342 should reach bilateral cross-border coordination agreement with the neighbouring countries on the basis of the principle of equitable access.]

1518-1525 MHz: CEPT does not support this frequency band as candidate band due to the results of the sharing studies with MSS.

2025-2110 MHz

CEPT does not support this frequency band as candidate band due to incompatibility of IMT systems with existing space and science services applications in those bands.

2200-2290 MHz

CEPT does not support this frequency band as candidate band due to incompatibility of IMT systems with existing space and science services applications in those bands.

2 700-2 900 MHz

. ITU-R Report M.2112 further confirmed by recent studies already submitted to PTD show non-compatibility between mobile service and radiodetermination service in this band in the same geographical area. CEPT noted the issues highlighted in ECC Report 174 and is recommending the band for use by cordless cameras – see ECC/REC 02(09).

3300-3400 MHz

CEPT does not support this frequency band as candidate band due incompatibility between radiolocation and mobile (IMT) services.

3 400-3 600 MHz

This band is already identified for IMT in a large number of countries including the majority of CEPT countries, see RR FN 5.430A. ECC Decision (ECC/DEC/ (11)06) on the use of 3400 -3800 MHz for mobile broadband has been updated to respond to the requirement of future usage of IMT systems with larger bandwidth in this frequency band. ECC Report 100 and in Report ITU-R M.2109 have demonstrated that there is no technical compatibility between the FSS and MS operation in the same geographical area and that required separation distances are large. Furthermore, considering the updated IMT parameters provided by WP 5D to JTG 4-5-6-7 for its July 2013 meeting, this is not likely to significantly change the overall conclusion of the existing studies.

3 600-3 800 MHz

ECC Decision (ECC/DEC/ (11)06) on the use of 3400 -3800 MHz for mobile broadband has been updated to respond to the requirement of future usage of IMT systems with larger bandwidth in this frequency band. ECC Report 100 and in Report ITU-R M.2109 have demonstrated that there is no technical compatibility between the FSS and MS operation in the same geographical area and that required separation distances are large. Furthermore, considering the updated IMT parameters provided by WP 5D to JTG 4-5-6-7 for its July 2013 meeting, this is not likely to significantly change the overall conclusion of the existing studies.

3 800-4 200 MHz

CEPT does not support this band as candidate band. Use of this band by FSS in many countries of the world and reliance of organisations such as ICAO, IMO and WMO on FSS in this band significantly reduce harmonisation possibilities even on regional basis.. ECC Report 100 and in Report ITU-R M.2109 have demonstrated that there is no technical compatibility between the FSS and MS operation in the same geographical area and that required separation distances are large. Furthermore, considering the updated IMT parameters provided by WP 5D to JTG 4-5-6-7 for its July 2013 meeting, this is not likely to significantly change the overall conclusion of the existing studies.

4 400-4 500 MHz

CEPT does not support this frequency band as candidate band due to current usages in many CEPT countries.

4 500-4 800 MHz

CEPT does not support this frequency band as candidate band due to current usages in the band. ECC Report 100 and in Report ITU-R M.2109 have demonstrated that there is no technical compatibility between the FSS and MS operation in the same geographical area and that required separation distances are large.

4 800-5 000 MHz

CEPT does not support this frequency band as candidate band due to current usages in the band. Careful consideration should also be given to adjacent band protection requirements of RNSS in the bands 5010-5030 MHz (space-to-Earth)(space-to-space) and 5000-5010 MHz (Earth-to-space).

5 350-5 470 MHz

CEPT has large concerns of the feasibility of RLAN usage in the band 5350-5470 MHz, due to current and planned usages in the band. Systems under the EESS (active) primary allocation, in particular GMES systems, supported by ESA/EU projects, are planned/operating in the band.

Initial studies indicate that sharing between EESS (active) and RLANs may be feasible only if additional mitigation measures are implemented. Current studies show that negative margins ranging from 6 to 30 dB depending on the assumptions. Some potential additional mitigation techniques have been proposed to address these negative margins, but some questions were raised on the feasibility and appropriateness of implementing these methods. Additional studies are required to evaluate these and any other mitigation measures to ensure the protection of EESS (active).

In addition, the RLAN community will have to provide information on how any mitigation measures proposed can be feasibly implemented, as at this stage, no technique has been shown to be implementable in practice and/or sufficient to enable sharing with EESS.

5 725 - 5 850 MHz

No common view as prospect for candidate bands for RLAN. Current operation of RLAN in other 5 GHz frequency bands raised coexistence issues with terrestrial radars which are under investigation at CEPT and EU level. Further sharing studies are to be initiated in CEPT. This band is used by the FSS in some regions of the world and is usually paired with 3500-3625 MHz. The current version of ETSI standard EN302502 does not include provisions for DFS to mitigate interference to frequency hopping radars.

5 850-5 925 MHz

This frequency band benefits already of a mobile service allocation.. Further sharing studies are to be initiated in CEPT CEPT[ under the EC mandate on the 5 GHz band, but this band is not included in the list of candidate in the draft CPM text, due to the existing mobile allocation]. This band is used by the FSS in some regions of the world, including CEPT countries and is usually paired with 3625-3700 MHz. Some parts of the band benefit of European Harmonisation for ITS (automotive) systems and others applications.

5 925-6 425 MHz

This band is heavily used in many CEPT countries for fixed links. This band is also heavily used by the FSS as an uplink band paired with the downlink band 3700-4200 MHz and sharing studies have shown that sharing would impose additional requirement on IMT stations such as[ limited] EIRP[ limitation of 10 to 15 dBm] and only indoor deployment. [This would lead to marginal [which do not correspond to the] operational [IMT ]deployment [characteristics / which corresponds compared ]to IMT-Advanced deployment-related parameters within approved ITU-R Report M.[IMT.ADV.PARAM] and inline with anticipated deployment parameters of future IMT systems (beyond IMT-Advanced) in unlicensed bands with similar limitations].

## Additional information and conclusions on the bands considered

470-694 MHz

The frequency range 470-694 MHz is allocated to the broadcasting service on a primary basis in Region 1. There are also additional footnote allocations to various services in different countries, including allocations to mobile service in some of them. In particular, according to 5.312 RR in some countries of Region 1 the band 645-694 MHz is allocated to the aeronautical radionavigation service on a primary basis. Since aforementioned allocation is subject to the provisions of 4.10 RR coexistence of IMT systems with the aeronautical radionavigation stations will be difficult.

[The frequency band 608-614 MHz is also used for Radioastronomy in several European countries.]

Even more difficult sharing and compatibility situation in this band relates to coexistence of IMT systems and broadcasting.. JTG 5-6 studies in the previous study period have shown the need for separation distances of transmitting broadcasting and IMT stations of around 300 km or higher. This has been confirmed by recent studies made in CPG PTD and ITU JTG4-5-6-7, based on the protection requirements of both services. Taking into account the interference from IMT base stations into DTT and the interference from DTT into IMT uplink, significant separation distances would be required, which make sharing the same band between these services unviable.

Terrestrial Broadcasting service still plays an important role in provision of television content to the population and is used extensively in many CEPT countries. It is generally the only TV platform delivering free-to-air TV programmes to citizens. In addition broadcasting service is currently in the process of transition from SD to HD broadcasting. Allocation of additional spectrum for mobile service on a primary basis may constrain future development of broadcasting service.

In 2012, as part of its preparations for submission of material to the ITU-R Joint Task Group 4-5-6-7 preparing for WRC-15, the WP6A prepared and distributed a questionnaire on spectrum requirements for terrestrial television broadcasting in the frequency band 694-790 MHz in Region 1 and the Islamic Republic of Iran (Circular Letter 6/LCCE/78 updated to 24 July 2013)[[6]](#footnote-6).

On the basis of the information received, WP6A has been developing for several months a preliminary draft new Report BT.[DTTBSPECREQ].

The analysis of responses shows that a majority of Region 1 countries need 224 MHz or more (320 MHz) for their terrestrial broadcasting platforms. In those CEPT countries with important DTT platforms, that leaves little perspective for IMT in the short/medium term.

European long-term strategy for UHF broadcasting band is being developed in ECC TG6 with a target of finalising the work by summer 2014.

Last but not least, the current UK initiative on TVWS is noted and is interesting to follow. TVWS are mobile usage which may not be IMT. In order to facilitate the use of IMT in these bands identified with potential for such use, it may be necessary to implement technological solutions and other mitigation techniques to facilitate spectrum sharing and coexistence, to guarantee that those existing services will be able to continue to operate at an appropriate level.

1300-1518 MHz range

CEPT identifies that there is a need for compatibility studies between IMT-systems and other services in the band or in adjacent band with the goal to develop appropriate technical and regulatory provisions for coexistence. This includes:

* aeronautical mobile service in the 1 429-1 525 MHz band[, limited to telemetry applications in accordance with taking into account] RR 5.342.
* EESS (passive) and Radioastronomy in the band 1 400-1 427 MHz covered by RR 5.340 Other applications in the fixed mobile radiolocation and broadcasting services
* radionavigation satellite service (RNSS) in the bands 1 164-1 300 MHz (space-to-Earth)(space-to-space) and 1 300-1 350 MHz (Earth-to-space), taking into account RR No. 4.10

The band 1 400-1 427 MHz is covered by RR No 5.340 and cannot hence be considered for any active service allocation, such as Mobile service.

The band 1400-1427 MHz is currently used by the ESA SMOS (Soil Moisture and Ocean Salinity) satellite that has already proved, since its launch in 2009, its huge benefit to a number of Earth observations activities and in particular operational meteorology and climate change monitoring. It should be stressed that the band 1400-1427 MHz is already under big threat due to the large number of cases of interference to SMOS from systems operating in adjacent bands (mainly radars) and even in the passive band itself.

Coexistence studies between the Mobile service and EESS (Passive) at 1.4 GHz have already been carried out in ITU-R TG 1/9 in preparation for WRC-07 agenda item 1.20 and led to the adoption of ITU-R Report SM. 2092 (section 6). However, these studies only considered the uplink case (handset emissions) in Japan (2G and 3G) in the 1427-1452 MHz band and roughly concluded that, under various assumptions and conditions, a level of unwanted emissions of -60 dBW/27 MHz is required to ensure protection of EESS (passive). This level of -60 dBW/27 MHz was subsequently included in Resolution 750 (rev. WRC-12) as a “recommended level” for Mobile bands 1350-1400 MHz and 1427-1452 MHz.

Under agenda item 1.1 (WRC-15), it became obvious that these studies have to be reconsidered to take into account the surrounding of the passive band by both uplink and downlink of mobile systems, the larger deployment of mobile networks compared to the situation in Japan, the deployment of base stations and not only handsets as well as most likely different characteristics of mobile systems expected in these frequency bands.

CEPT/JTG studies (in Preliminary draft new Report ITU-R RS.[EESS 1.4 GHz]) confirm the need to develop unwanted emissions limits for mobile service terminal stations and base stations. The studies currently show that that depending on the scenario (one band or both 1 375-1 400 MHz and 1 427-1 452 MHz frequency bands are considered for IMT), unwanted emissions levels around -75 or -80 dBW/27 MHz (for base stations) and in the range of -62.6 to -69 dBW/27 MHz (for terminal stations) in the 1400-1427 MHz band are required to ensure protection of EESS (passive).

Overall consistently with Decision ECC(11)01, should any decision made about identification of the bands 1375-1400 MHz and 1427-1452 MHz for IMT, these unwanted emissions values will have to be included as “mandatory” limits in Table 1-1 referred to in Resolve 1 of WRC Resolution 750.

As such, they would also have to be duly taken into account in any 3GPP standards or equivalent (e.g. ETSI).

[CEPT approved in November 2013 ECC DEC(13)03 on “the harmonised use of the frequency band 1452-1492 MHz for Mobile/Fixed Communications Networks Supplemental Downlink (MFCN SDL)”. The designation of the frequency band 1452-1492 MHz to MFCN SDL does not prevent administrations from using part of the band for other terrestrial applications such as broadcasting to adapt to national circumstances.]

Radiolocation 1375 - 1400 MHz

Preliminary studies shows that:

* co-channel sharing between the Radiolocation Service and the Downlink of Mobile Service is not feasible.
* compatibility in adjacent bands in case of replanning (if [justified/required]) radiolocation service[[7]](#footnote-7) could be achieved when appropriate combinations of mitigations techniques are applied such as: frequency and distance separations, additional filtering in Base Station and Radar, antenna pattern nulling for Base Stations.

Aeronautical telemetry 1429 -1535 MHz

One preliminary analysis showing impact of the IMT BS to the ground station of aeronautical telemetry system within 1429-1492 MHz band concludes that Macro BSs could be deployed in a coordinated manner with bilateral cross-border agreement by defining a suitable separation distance on a case-by-case basis. [Such appropriate separation distance may be obtained by filtering and/or a frequency separation from Mobile systems. This agreement also needs to ensure equitable access at the border as well Network planning for terrestrial telemetry receivers.]

In addition to the primary services listed in the Table of Frequency Allocations, for the band 1429 - 1535 MHz there is also additional allocation (RR Footnote 5.342):

"Additional allocation: in Armenia, Azerbaijan, Belarus, Bulgaria, the Russian Federation, Uzbekistan, Kyrgystan and Ukraine, the band 1 429-1 535 MHz is also allocated to the aeronautical mobile service on a primary basis exclusively for the purposes of aeronautical telemetry within the national territory. As of 1 April 2007, the use of the band 1 452-1 492 MHz is subject to agreement between the administrations concerned."

[The airborne receivers of the aeronautical telemetry issue had been also considered during preparation to WRC-03 in the framework of agenda item 1.31. It was concluded that these systems are considered as telecommand systems.]

In the RR there is no definition of aeronautical telemetry but the definition for telemetry can be found in No. 1.131: "The use of telecommunication for automatically indicating or recording measurements at a distance from the measuring instrument.".

Hence for the sharing studies [only the protection of ground receivers[ (receiving aeronautical station)]]/[protection of ground and airborne receivers] should be considered[ and the protection of airborne receivers (receiving aircraft station) is to be excluded].

Radio astronomy 1330 - 1427 MHz

The band 1 400-1 427 MHz is allocated on a primary basis to the radio astronomy service (RAS) and some administrations are [also] using the band 1 330-1 400 MHz under RR Footnote 5.149 for radio astronomy. [This band is used for observations of Doppler-shifted radiation from the so-called 21 cm spectral line of neutral hydrogen (rest frequency 1 420.4 057 MHz), which is one of the most important spectral lines for astronomy.] Relevant conditions such as separation distances and IMT unwanted emissions need to be considered to ensure the protection of RAS observations. Studies indicate large separation distances (hundreds of km) between IMT base stations and RAS antennas for in-band sharing of the band 1 330-1 400 MHz, or parts of this band, and moderate separation distances (tens of km) for the 1 400-1 427 MHz band to ensure RAS-IMT compatibility.

MSS 1518-1559 MHz, 1626.5-1660.5 MHz and 1668-1675 MHz

The 1518-1559 MHz, 1626.5-1660.5 MHz and 1668-1675 MHz bands (for short denoted the 1.5/1.6 GHz MSS bands) are of great importance to the mobile-satellite service (MSS). The bands 1525-1559 MHz and 1626.5-1660.5 MHz are heavily used by the MSS and will continue to be used by this service for the foreseeable future. The first satellite to use the 1518-1525/1668-1675 MHz bands was launched in 2013.

The most recent GSO MSS satellites use spot beams which cover small areas, of the order of 1000 km in diameter, and this facilitates high frequency re-use and higher satellite antenna gain that improves the link budget on the forward and return links, allowing the use of smaller user terminals.

The 1.5/1.6 GHz MSS networks have from the outset been a key component of safety communications for the maritime community, as the main provider of satellite communications within the Global Maritime Distress and Safety System (GMDSS), in fact only 1.5/1.6 GHz MSS satellite systems meet the requirements set down by the International Maritime Organization (IMO) for provision of safety services within the GMDSS. The 1.5/1.6 GHz MSS networks also provide today safety communications for aircraft within aeronautical mobile satellite (route) service in oceanic regions. Within the European Union’s SESAR initiate, it is anticipated that aircraft safety systems will make much greater use of the 1.5/1.6 GHz MSS spectrum in the near future, including use in continental airspace.

The ability of the MSS systems to share with other services is very limited, partly due to the ubiquitous coverage provided by the MSS and partly due to the high sensitivity of the terminals and the satellites to interference. Most of the ITU frequency allocations to the MSS in the 1.5/1.6 GHz band are not shared with other services, and the few MHz of spectrum which is allocated to other services has very little use by those services. This reflects the limited scope for frequency sharing.

Sharing studies are being developed by JTG 4567 (see Annex 7 to 4-5-6-7/242) which currently recommend that the bands 1 518-1 559 MHz, 1 626.5-1 660.5 MHz and 1 668-1 675 MHz should be considered as not feasible for operation of terrestrial IMT systems. Similar studies have been considered by CEPT, also concluding that it is not possible to share these bands between terrestrial IMT and MSS.

Meteo Sat 1695-1710 MHz

The 1695-1710 MHz band is widely used by meteorological satellites systems (Space to Earth) and in particular European satellites operated by EUMETSAT. This use represents a large number of receiving Earth Stations that would not be compatible with typical mobile deployment as confirmed by technical studies presented in JTG. In addition, this band is not considered relevant for mobile service due to the limited bandwidth available. CEPT therefore considers as preliminary position that the frequency band is not suitable.

2025-2110 MHz, 2200-2090 MHz ranges

The frequency bands 2025 – 2110 MHz and 2200 – 2290 MHz are allocated to space research, Earth exploration satellite and space operation services in the following directions (2025 – 2110 MHz : Earth-to-space and space-to-space; 2200 – 2290 MHz : space-to-Earth and space-to-space).

These bands are heavily used by scientific satellite applications on the one hand but also for most of other types of satellites (Commercial or governmental Earth observation, navigation, telecommunications, broadcasting), as well as launchers. These bands are used for TT&C (Telemetry, Tracking and Command), where tracking includes ranging (localisation of the satellite) and telemetry encompasses information on the state of the satellites as well as payload sensors data.

Previous studies have shown the impossibility of sharing between EESS (Earth-to-space) and high density IMT networks. In this regard it should be noted that footnote 5.391 of the Radio Regulations and the Recommendation ITU-R SA.1154 prohibit the deployment of high-density mobile systems within these bands.

The large number of satellites in operation indicates that this band is heavily used which increases the difficulty for coordination and would lead to cases of interference amongst the satellite services. In particular, the on-board satellite antennas are omnidirectional, with limited gain and satellite would hence be in visibility of for instance all Europe at one moment in time, thus in view of several tens of thousands of base stations or terminals.

New studies submitted to the JTG assessed the feasibility for accommodation of IMT systems in both the 2 025-2 110 MHz and 2 200-2 290 MHz and show that sharing is not feasible with incumbent Data Relay Satellites forward and return links operating in these bands in the space research (space-to-space), Earth exploration-satellite (space-to-space) and space operations (space-to-space) services. Additionally it would be difficult to protect mobile receivers from the space-to-earth emissions of low orbit satellites that often use omni-directional antennas and high power transmissions.

On these bases, CEPT therefore considers as preliminary position that the frequency bands 2025 – 2110 MHz and 2200 – 2290 MHz are not suitable for IMT.

2700-2900 MHz, 2900-3100 MHz and 3300-3400 MHz ranges

The band 2700-2900 MHz is allocated to aeronautical radionavigation service on primary basis and radiolocation on secondary basis in all Regions. The band 2900-3100 MHz is allocated to radiolocation and radionavigation services globally on a primary basis. The band 3300-3400 MHz is allocated to radiolocation on a primary basis. All of these bands are extensively used by different radar application.

From the studies in the ITU-R Report M.2112 as well as from more recent studies, it can be concluded that IMT systems and radars in the band 2 700-2 900 MHz operating on a co-frequency basis are not compatible, presenting large required separation distances of several hundreds of kilometers. In many regions IMT deployment within the band could impose serious constraints on radar operations and future radar deployments. Taking into account similarity of radiodetermination radars technical characteristics and propagation conditions between bands 2700-2900 MHz and 2900-3100 MHz it is concluded that operating on a co-frequency basis between IMT systems and radiolocation /radionavigation systems is not compatible.

For the band 2700 - 2900 MHz a further study on adjacent channel sharing has been initiated in JTG 4-5-6-7.

CEPT is studying possible usage of PMSE (wireless-cameras) in the 2700 – 2900 MHz

2 900-3 400 MHz: This band is heavily used by radiolocation systems

For Radiolocation in the band 3300 - 3400 MHz a preliminary study initiated in the JTG-4-5-6-7[[8]](#footnote-8) indoor base stations and radar systems in urban environment does not consider appropriate assumptions (propagation model, scenario) to address the sharing between IMT and radar systems. A study in PT D with appropriate assumptions showed that indoor base stations cannot share with Radiolocation receiver within this band.

3400 – 4200 MHz and 4500 - 4800 MHz range

It should be noted that this band was thoroughly considered in advance of WRC-07, with technical studies contained in ECC Report 100 and in Report ITU-R M.2109. Taking these studies into account, and considering the use of this band by the FSS throughout the world, WRC-07 agreed some national footnotes to the Radio Regulations to allow for IMT systems in some countries in the band 3400 – 3600 MHz.

In most European countries the 3800-4200 MHz band is mainly used for satellite Earth stations of the Fixed-Satellite Service (FSS) and terrestrial fixed links. There are approximately 160 geostationary-orbit satellites operating in the band 3400 – 4200 MHz providing essential services (mainly governmental and security services) to consumers (NGO and non-NGO and IGO) around the world, some 60 of which are providing coverage to all or part of Europe and interconnecting Europe with other regions of the world. Additional satellites using the C-band are under construction and new C-band Earth stations are being deployed all around the world.

C-band is also used for Galileo (GDDN), for satellite systems relevant for ICAO, IMO and WMO information distribution processes, such as EUMETCAST and GEONETCAST, for public sector emergency applications (e.g., see www.emergency.lu) as well as by embassies and diplomatic missions due to the very high robustness of these frequencies towards atmospheric conditions. There is also ITU Resolution 154 (WRC-12) addressing use of the band for aviation security and reliable distribution of meteorological information. The band is also used for feeder links for the GMDSS. Sharing conditions between satellite and terrestrial services are complex, and it has been demonstrated that there is no technical compatibility between the FSS and MS operation in the same geographical area and that required separation distances are large. The number of European FSS earth stations using the band 3800 – 4200 MHz is more than eight times the number of those using the band 3400 – 3800 MHz which is likely to limit the opportunities for terrestrial mobile applications in the band.

Similar sharing and compatibility issues are also valid for the 4500-4800 MHz band. In addition to technical issues the band 4500-4800 MHz is a part of FSS Plan in accordance with RR Appendix 30B, established to guarantee equitable access to the geostationary-satellite orbit for all countries.

Furthermore, in Europe, the band 3400 – 3800 MHz has already been identified for potential use for mobile/fixed communication networks (MFCN) systems through Decision ECC/DEC/(11)06 and to BWA systems through Decision ECC/DEC/(07)02, giving potential access to 400 MHz of spectrum for broadband mobile systems including IMT, without prejudice to the protection and continued operation of other existing users in these bands, including the FSS.

However, global harmonisation of the band 3400-3800 MHz and full potential of associated benefits could be difficult to achieve due to the use of this band or its parts by FSS in many countries of the world. Furthermore, according to available information there are already registered cases of adjacent band interference from existing broadband systems into FSS Earth stations operating above 3800 MHz due to use of wideband LNA in currently deployed FSS Earth stations.

4400-4500 MHz band

This band is allocated to fixed and mobile service in all ITU Regions. This band is heavily utilized for FIXED and MOBILE (including aeronautical) applications and is NATO harmonized. Many different military systems are currently operating in this band having had to migrate following the release of lower bands in the past notably to accommodate IMT systems

CEPT is studying possible temporary usage of PMSE (wireless-cameras) in the 4400 – 5000 MHz

4500 - 4800 MHz

This band is allocated to fixed satellite (space to Earth) (Appendix 30B), fixed and mobile service in all ITU Regions. This band is heavily utilized for FIXED and MOBILE (including aeronautical) applications and is NATO harmonized. Many different military systems are currently operating in this band having had to migrate following the release of lower bands in the past notably to accommodate IMT systems

CEPT is studying possible temporary usage of PMSE (wireless-cameras) in the 4400 – 5000 MHz

4800-5000 MHz band

This band is heavily utilized for FIXED and MOBILE (including aeronautical) applications and is NATO harmonized. Many different military systems are currently operating in this band having had to migrate following the release of lower bands in the past notably to accommodate IMT systems

CEPT is studying possible temporary usage of PMSE (wireless-cameras) in the 4400 – 5000 MHz

5350-5470 MHz band

This band is considered in the JTG 4-5-6-7 for extension of the current RLAN allocation in the 5 GHz range

Background on the use of this band by EESS (active):

* In the band 5 250-5 350 MHz, the “other mitigation techniques” that were introduced by WRC-03 in Resolution 229 are still not specified and hence do not provide relevant protection to EESS (active), in particular space-borne Synthetic Aperture Radar (SAR) systems.
* In the band 5 470-5 570 MHz, the technical conditions related to RLAN are not suitable for compatibility with SAR systems of the EESS (active) service. This was decided by WRC-03, since the band was meant for use by other types of instruments (altimeters) that are less sensitive to potential RLAN interference.
* Therefore, the band 5 350-5 470 MHz was selected by a number of space agencies to operate SAR instruments (such ESA Sentinel-1 mission (3 satellites) and Canada RADARSAT-2 mission and upcoming RADARSAT-RCM (3 satellites)), to avoid any potential interference from RLAN.
* The characteristics of current and planned EESS (active) systems are different than those studied prior to WRC-03.
* RR Article 29A which points to Resolution 673 (Rev.WRC-12) that emphasises the importance of Earth Observations radiocommunications applications such as these.

The European Commission and ESA (and hence all its members states) made large investments of several billion Euro in the frame of GMES to develop instruments in the 5350-5470 MHz band that will fly on-board sentinel type satellites.

Editor’s Note: PTD is tasked by CPG15-4 to assess the 2 para below (see CPG15(14)017)

[The band 5250-5850 MHz is used for terrestrial radiolocation systems. RLAN can harmfully interfere with radars if appropriate mitigation techniques are not implemented. It should be noted that the current version of ETSI standard EN301893 does not include provisions for DFS to mitigate interference to frequency hopping radars.

Introduction of RLAN in the frequency bands 5 350-5 470 MHz and 5 725-5 850 MHz shall therefore be conditional to either improvement of current DFS at a worldwide level or any proposal of alternative mitigation techniques that will both need to prove their efficiency to ensure protection of frequency hopping radars, including radar whose frequency changes may occur for each pulse.]

Current operation of RLAN in other 5 GHz frequency bands raised coexistence issues with terrestrial radars and EESS where under investigation at CEPT and EU level. (Text will be added to reflect results of ECC Report 192 when approved for publication by CEPT)

Various studies for the band 5350 ‑ 5470 MHz were considered in CEPT and are available in Annex 7 of CPG-PTD(14)094 CEPT is of the view that there needs to be consistency between parameters to be used in the sharing studies and those ­submitted to justify additional spectrum requirements for RLAN.

CEPT intends to consider carefully input parameters and assumptions for the studies in particular the density of active RLAN equipment and the indoor/outdoor ratio. CEPT noted the ITU-R Recommendation RS.1166-4, which is applicable for the interference criteria.

5725-5850 MHz band

This band is allocated to FSS (Earth - space) and Radiolocation on primary basis in ITU Region 1 and to Radiolocation in Regions 2 and 3.

This band is used by the FSS in some regions of the world and is usually paired with 3500-3700 MHz, which is likely to limit the opportunities and the potential for harmonisation for terrestrial mobile applications in the band.

There are two interference scenarios to be taken into account. Potential interference from FSS Earth stations to the RLAN and potential interference from RLAN to the FSS space station. The latter scenario is particularly relevant if RLAN is operated under a licence exemption regime. The development of FSS Earth stations deployment is also to be taken into account.

The band 5250-5850 MHz is used for terrestrial radiolocation systems. RLAN can harmfully interfere with radars if appropriate mitigation techniques are not implemented. It should be noted that the current version of ETSI standard EN302502 does not include provisions for DFS to mitigate interference to frequency hopping radars.

Introduction of RLAN in the frequency bands 5 350-5 470 MHz and 5 725-5 850 MHz shall therefore be conditional to either improvement of current DFS at a worldwide level or any proposal of alternative mitigation techniques that will both need to prove their efficiency to ensure protection of frequency hopping radars, including radar whose frequency changes may occur for each pulse.

CEPT launched studies for radio services/systems operating in the band 5725-5925 MHz, in particular between RLANs and FSS (earth-to-space), ITS, BFWA, RTTT and the new radio applications wireless industrial application (WIA) and Broadband direct-air-to ground-communication (DA2GC).

5850-5925 MHz band

This band is used by the FSS in some regions of the world and is usually paired with 3500-3700 MHz, which is likely to limit the opportunities and the potential for harmonisation for terrestrial mobile applications in the band.

There are two interference scenarios to be taken into account. Potential interference from FSS Earth stations to the RLAN and potential interference from RLAN to the FSS space station. The latter scenario is particularly relevant if RLAN is operated under a licence exemption regime. The development of FSS Earth stations deployment is also to be taken into account.

CEPT launched studies for radio services/systems operating in the band 5725-5925 MHz, in particular between RLANs and FSS (earth-to-space), ITS, BFWA, RTTT and the new radio applications wireless industrial application (WIA) and Broadband direct-air-to ground-communication (DA2GC)

5925-6425 MHz band

The 5 925-6 425 MHz band is allocated to mobile, fixed and fixed satellite (Earth-to-space) services on the primary basis in all Regions. Among all of the services the impact on fixed satellite space stations is the most difficult from the point of sharing and compatibility studies due to the fact that harmful interference results from simultaneous transmission of multiple IMT stations deployed across different countries and even continents. According to the available studies IMT implementation in this band is only possible with the restriction of maximum EIRP of IMT stations and deployment limited only to indoor. Nevertheless such constrains in this band are inline with projected small cell deployment in different bands. Sharing studies with other services taking into account aforementioned restriction in the band 5 925-6 425 MHz are required, especially with fixed service.

This band is heavily used by the FSS as an uplink band usually paired with the downlink band 3700-4200 MHz. The information on usage of the band 3700-4200MHz is also valid for the band 5925-6425 MHz, which is likely to limit the opportunities and the potential for harmonisation for terrestrial mobile applications in the band..

There are two interference scenarios to be taken into account. Potential interference from FSS Earth stations to IMT and potential interference from IMT to the FSS space station. The development of FSS Earth stations deployment is also to be taken into account.

Several concerns were raised about ways to implements regulatory means which could be used to enforce the protection of FSS satellite reception. Among them the way to respect IMT indoor restriction and to control on a long term basis the aggregate effect of IMT stations deployed on a worldwide basis.

The use of this band for fixed service is not going to decrease in many countries given that the increase in traffic in the mobile access network will have to be handled in the backhauling network too. This band is used for interconnecting local concentration nodes (concentrating the traffic of several mobile base stations) to the mobile operator core network. The band allows a path length of 20-80 kilometers with a throughput over 1Gbps. There are very few alternatives to the use of this band since the other FS bands having comparable characteristics are also congested and since the optical fibre is in many cases not a viable solution. Moreover, currently interferences on fixed service links in this band would be particularly harmful since a single fixed service link typically aggregates the traffic to and from 20-40 base stations meaning that a huge number of customers are impacted by a single interferer.

In many countries the use of this band for fixed service is not going to decrease given that the increase in traffic in the mobile access network will have to be handled in the backhauling network too. One administration expects that with the roll out of IMT-Advanced networks it would be impossible to sustain backbone P-P links in low frequency ranges such as 5925-6425 MHz and they will be eventually substituted by fiber networks. Furthermore with the densification of P-P links higher bands with larger capacities will be used for shorter range hops.

General issues on the frequency bands considered as candidate bands

There are currently various operating satellite systems in the RNSS (space-to-Earth)(space-to-space) allocations in the bands 1 164-1 300 MHz, 1 559-1 610 MHz, 5 010-5 030 MHz, with associated (Earth-to-space) allocations in the bands 1 300-1 350 MHz and 5 000-5 010 MHz, including Compass, Galileo, Glonass, GPS, IRNSS, QZSS, and corresponding geostationary augmentation systems. Millions of RNSS receivers are in use today for a wide range of applications using precise positioning, navigation and timing information. Certain RNSS signals are used for safety-of-life applications and subject to RR No. 4.10 which states that “the safety aspects of radionavigation require special measures to ensure their freedom from harmful interference

Therefore, when considering potential candidate bands for IMT / broadband terrestrial mobile systems, careful consideration should be given to the in-band and adjacent band protection requirements of RNSS in the bands 1 164-1 300 MHz, 1 559-1 610 MHz and 5 010-5 030 MHz (space-to-Earth)(space-to-space) and 1 300-1 350 MHz and 5 000-5 010 MHz (Earth-to-space)

Within the range 410 MHz - 6 GHz, a number of frequency bands are allocated to the Radio astronomy. Preliminary studies show that to ensure compatibility with IMT systems indicate requirement for large separation distances between IMT systems and radio astronomy observatories unless mitigation measures in the IMT equipment such as additional filtering are taken and included in the relevant 3GPP standards or equivalent (e.g. ETSI). These studies will need to be taken into account in deriving regulatory conditions for IMT operations.

Sharing studies

Sharing studies related to the protection of the EESS (passive) in the 1400-1427 MHz band from mobile systems in the 1375-1400 MHz and 1427-1452 MHz bands(see CPG-PTD(13)068 Annex 8).

Sharing studies related to compatibility between RLAN and EESS (active) in the 5350-5470 MHz band. (see CPG PTD(13)131 Annex 8)

Preliminary draft new Report ITU-R RS.[EESS 1.4 GHz]: Consideration of the frequency bands 1 375-1 400 MHz and1 427-1 452 MHz for mobile service - compatibility with systems of the Earth exploration-satellite service (EESS) within the 1 400-1 427 MHz frequency band (Attachment 1 to Annex 8 to JTG Chairman’s Report (document 4-5-6-7/242)

Preliminary draft new Report ITU-R SA.[METSAT 1.7  GHz]: Sharing assessment between meteorological satellite systems and IMT stations in the 1 695-1 710 MHz frequency band (Attachment 2 to Annex 8 to JTG Chairman’s Report (document 4-5-6-7/242)

Preliminary draft new Report ITU-R SA.[2 025 - 2 290 MHz]: Feasibility assessment for accommodation of mobile broadband long term evolution (LTE) systems in the 2 025-2 110 MHz and 2 200-2 290 MHz frequency bands (Attachment 3 to Annex 8 to JTG Chairman’s Report (document 4-5-6-7/242)

Preliminary draft new Report ITU-R RS.[EESS RLAN 5 GHz]: Sharing studies between RLAN and EESS (active) systems in the frequency range 5 350-5 470 MHz (Attachment 4 to Annex 8 to JTG Chairman’s Report (document 4-5-6-7/242)

The number of European FSS earth stations using the band 3800 – 4200 MHz is more than eight times the number of those using the band 3400 – 3800 MHz which is likely to limit the opportunities for terrestrial mobile applications in the band. ECC Report 100 and in Report ITU-R M.2109 have demonstrated that there is no technical compatibility between the FSS and MS operation in the same geographical area and that required separation distances are large. Furthermore, considering the updated IMT parameters provided by WP 5D to JTG-4567 for its July 2013 meeting, this is not likely to significantly change the overall conclusion of the existing studies.

Current IMT identifications

Within the Radio Regulations, there are different sets of provisions for the identification of frequency bands for the terrestrial IMT:

* Footnote 5.388 and Resolution 212 were developed by WARC-92, and address the bands around 2 GHz (the so-called “core bands”).
* Footnote 5.317A and Resolution 224 were developed by WRC-2000, and address bands below 1GHz.
* Footnote 5.384A and Resolution 223 were developed by WRC-2000, and address bands just below 2 GHz and the 2500-2690 MHz band.
* Footnote 5.286AA and Resolution 224 (rev WRC07) were developed by WRC-2007 and address the band 450 – 470 MHz
* Footnote 5.317A and Resolution 224 (rev WRC07) were developed by WRC-2007 and address the band 790 – 862 MHz in Region 1
* Footnote 5.430A was developed by WRC-2007 and addresses the band 3400 – 3600 MHz in certain countries
* Footnote 5.384A and Resolution 223 (rev WRC07) were developed by WRC-2007 and address the band 2300 - 2400 MHz

# Footnote 5.312A and Resolution 232 were developed by WRC-2012 and address the band 694 – 790 MHz in Region 1 List of relevant documents

[Report ITU-R M.2030](http://www.itu.int/pub/R-REP-M.2030) Coexistence between IMT-2000 time division duplex and frequency division duplex terrestrial radio interface technologies around 2 600 MHz operating in adjacent bands and in the same geographical area

[Report ITU-R M.2031](http://www.itu.int/pub/R-REP-M.2031) Compatibility between WCDMA 1800 downlink and GSM 1900 uplink, addresses adjacent band compatibility at 1 850 MHz

[Report ITU-R M.2045](http://www.itu.int/pub/R-REP-M.2045) Mitigating techniques to address coexistence between IMT‑2000 time division duplex and frequency division duplex radio interface technologies within the frequency range 2 500‑2 690 MHz operating in adjacent bands and in the same geographical area

[Report ITU-R M.2039](http://www.itu.int/pub/R-REP-M.2039) Characteristics of terrestrial IMT-2000 systems for frequency sharing/interference analysis

Report ITU-R SM. 2092 Studies related to the impact of active services allocated in adjacent or   
nearby bands on Earth exploration-satellite service (passive)

[Report ITU-R M.2109](http://www.itu.int/pub/R-REP-M.2109) Sharing studies between IMT-Advanced systems and geostationary satellite networks in the fixed-satellite service in the 3 400-4 200 MHz and 4 500-4 800 MHz frequency bands

[Report ITU-R M.2110](http://www.itu.int/pub/R-REP-M.2110) Sharing studies between radiocommunication services and IMT systems operating in the 450-470 MHz band

[Report ITU-R M.2111](http://www.itu.int/pub/R-REP-M.2111) Sharing studies between IMT-Advanced and the radiolocation service in the 3 400-3 700 MHz band

[Report ITU-R M.2112](http://www.itu.int/pub/R-REP-M.2112) Compatibility/sharing of airport surveillance radars and meteorological radar with IMT systems within the 2 700‑2 900 MHz band

[Report ITU-R M.2113](http://www.itu.int/pub/R-REP-M.2113) Report on sharing studies in the 2 500-2 690 MHz band between IMT‑2000 and fixed broadband wireless access systems including nomadic applications in the same geographical area

[Report ITU-R M.2146](http://www.itu.int/pub/R-REP-M.2146) Coexistence between IMT-2000 CDMA-DS and IMT-2000 OFDMA TDD WMAN in the 2 500-2 690 MHz band operating in adjacent bands in the same area

[Report ITU-R M.2241](http://www.itu.int/pub/R-REP-M.2241) Compatibility studies in relation to Resolution 224 in the bands 698‑806 MHz and 790-862 MHz

[Report ITU-R M.2243](http://www.itu.int/pub/R-REP-M.2243-2011) Assessment of the global mobile broadband deployments and forecasts   
for International Mobile Telecommunications

[Recommendation ITU-R M.1036](http://www.itu.int/rec/R-REC-M.1036) Frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications (IMT) identified for IMT in the Radio Regulations

Recommendation ITU‑R SA.1154 Provisions to protect the space research (SR), space operations (SO) and Earth exploration‑satellite services (EES) and to facilitate  
sharing with the mobile service in the 2 025-2 110 MHz  
and 2 200-2 290 MHz bands

[Recommendation ITU-R M.1457](http://www.itu.int/rec/R-REC-M.1457) Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2000 (IMT-2000)

[Recommendation ITU-R M.1580](http://www.itu.int/rec/R-REC-M.1580) Generic unwanted emission characteristics of base stations using the terrestrial radio interfaces of IMT- 2000

[Recommendation ITU-R M.1581](http://www.itu.int/rec/R-REC-M.1581) Generic unwanted emission characteristics of mobile stations using the terrestrial radio interfaces of IMT 2000

Recommendation ITU-R RS.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 M.1635](http://www.itu.int/rec/R-REC-M.1635) General methodology for assessing the potential for interference between IMT-2000 or systems beyond IMT-2000 and other services

[Recommendation ITU-R M.2012](http://www.itu.int/rec/R-REC-M.2012) Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications Advanced (IMT‑Advanced)

[Recommendation ITU-R M.1646](http://www.itu.int/rec/R-REC-M.1646) Parameters to be used in co-frequency sharing and pfd threshold studies between terrestrial IMT-2000 and BSS (sound) in the 2 630‑2 655 MHz band

[Recommendation ITU-R M.1654](http://www.itu.int/rec/R-REC-M.1654) A methodology to assess interference from broadcasting‑satellite service (sound) into terrestrial IMT‑2000 systems intending to use the band 2 630‑2 655 MHz

[Recommendation ITU-R M.1768](http://www.itu.int/rec/R-REC-M.1768/en) Methodology for calculation of spectrum requirements of the terrestrial component of International Mobile Telecommunications

Recommendation ITU-R 769-2

CEPT ECC PT1 [Internal Report](http://www.cept.org/files/4549/ECC%20PT1%20internal%20report%20on%20MBB%20-%20ECC%20PT1(11)162%20Annex%2023.docx) on Mobile Broadband landscape

[ECO Report 03](http://cept.org/eco/deliverables/eco-reports) The licensing of 'Mobile bands' in CEPT

ECC Decision (ECC/DEC/(11)01) on the protection of the Earth exploration satellite service (passive) in the 1400 - 1427 MHz band.

ECC Decision (ECC/DEC/(08)01) on the harmonised use of the 5875-5925 MHz frequency band for Intelligent Transport Systems (ITS)

# Actions to be taken

* to contribute to the preparatory work in JTG 4-5-6-7 on:
* Candidate frequency bands
* Sharing and compatibility studies on the candidate frequency bands
* to develop a CEPT view on the spectrum requirements for other terrestrial mobile broadband applications than IMT under AI 1.1.
* to ensure that the CEPT position is adequately reflected in the draft CPM text

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

## European Union (SEPTEMBER 2013)

Commission Decision 2008/411/EC on the harmonisation of the 3 400-3 800 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community designates and makes available these frequencies in 28 CEPT administrations since 2008. The designation is open for wireless broadband use regardless of whether it is mobile, nomadic or fixed.

In September 2013 the Commission issued a Mandate to CEPT covering the possible extension of RLAN in the 5 GHz range. The purpose of the mandate is to study and identify harmonised compatibility and sharing conditions for a sustainable and efficient use on a shared basis of the frequency bands 5350-5470 MHz and 5725-5925 MHz ('WAS/RLAN extension bands') for wireless access systems including radio local area networks (WAS/RLANs). Based on the results of the necessary coexistence studies, the operational sharing conditions for WAS/RLANs should in particular ensure that protection is guaranteed for priority systems supporting EU policies, such as GMES (Global Monitoring for Environment and Security) and ITS (Intelligent Transport Systems) and that coexistence with other systems in these and adjacent frequency bands is safeguarded.

## Regional telecommunication organisations:

APT (date of proposal)

ATU (date of proposal)

Arab Group (date of proposal)

CITEL (March 2014)

410-430 MHz

Brazil: Considering possible identification of the band 410-430 MHz to IMT.

Colombia: Supports the sharing studies of the band 410 – 430 MHz in order to analyze the viability to identify this frequency band to IMT.

USA: Submitted preliminary proposal for NOC in the band 420-450 MHz.

470-698 MHz

Argentina, Brazil, Dominican Republic, Salvador, Ecuador, Guatemala, Nicaragua, Panama and Paraguay: Adopted Inter-American Proposal for NOC in the band 470-698 MHz. These countries are of the view that sharing between broadcasting and mobile/IMT services is not feasible.

Canada and USA: adopted a Draft Inter-American Proposal to add a new worldwide allocation to the mobile service in the band 470-698 MHz (excluding RAS allocation in the band 608-614 MHz in Region 2), with the goal of achieving two objectives:

1. to safeguard the availability of 470-698 MHz band for broadcasting. To achieve this objective, it is propose a mandatory application of Art. No. 9.21 to the operation of mobile/IMT. The consequence of application of Art. No. 9.21 is that broadcasting would maintain coordination priority (i.e., remain super-primary with regard to the new mobile/IMT systems. In particular, under this arrangement, administrations seeking to operate mobile/IMT will be required to seek an explicit coordination agreement of their neighboring administrations that chose to continue to operate broadcasting in the band).

2. to allow administrations the flexibility to use portions of the band for mobile broadband consistent with their domestic priorities and requirements. A globally harmonized international allocation to the mobile service in the 470-698 MHz band, with an exclusion of Radio astronomy band in Region 2, would allow administrations to realize a digital dividend while in complete conformance with the international radio regulations.

1164-1215 MHz, 1215-1300 MHz, and 1559-1610 MHz

Canada/USA: Consider that, in the bands 1 164-1 215 MHz, 1 215-1 300 MHz and 1 559-1 610 MHz, an allocation to the mobile service (MS) should not be considered nor should they be designated for IMT. These frequency bands are actively being used for radionavigation-satellite services. In Canada and the United States, these bands are used by radars and ground-based Global Navigation Satellite Systems (GNSS) networks for various applications.

1300-1525 MHz

Brazil/Colombia: The Brazilian and Colombian Administrations support the sharing studies between IMT and other systems operating in the band 1300-1525 MHz, with an aim to support the identification of one or more portions of bands to IMT in this frequency range. It is necessary to guarantee enough spectrum for the operation of Aeronautical Mobile Telemetry (AMT), as well as to guarantee the operation of passive services in the band 1400-1427 MHz. Additionally, there have been discussions on the definition of a band in this range for Supplemental Downlink (SDL), in order to address the traffic asymmetry between uplink and downlink of IMT-FDD systems. They propose that this discussion be carried out in PCC.II so we can assess the suitability of this approach.

Canada: Canada is of the view that the frequency range 1 427-1 525 MHz should be examined to determine if portions within this range could be identified for the terrestrial component of IMT, taking into consideration potential impact to services operating in the same and adjacent bands. Canada notes that in accordance with footnote 5.343, in Region 2, the use of the band 1 435-1 535 MHz by the aeronautical mobile service for telemetry (AMT) has priority over other uses by the mobile service. Canada makes use of the band 1 452-1 476 MHz for AMT in specific locations within the country. Moreover, it is noted that in Canada, the allocations to broadcasting-satellite service in the band 1 452-1 492 MHz and mobile satellite (space-to-Earth) service in the band 1 518-1 525 MHz were recently removed from its domestic table of frequency allocations. However, Canada recognizes that other administrations may have AMT, BSS and MSS operations in the relevant portions of the band 1 427-1 525 MHz.

Mexico: Considers that frequency band 1452-1492 MHz may be examined by Region 2 administrations so that, in terms of the scope of agenda item 1.1 for WRC-15, it may be identified for International Mobile Telecommunications (IMT) implementation. Mexico invited other OAS/CITEL administrations to submit contributions in future meetings of PCC.II which are aimed at developing Inter-American Proposals for WRC-15 with the objective of identifying these frequency bands as a spectrum for IMT implementation.

USA: The U.S. supports retaining the priority for aeronautical telemetry over other mobile services in Region 2 that is provided by RR No. 5.343, noting the need for test ranges to be free of cross-border interference. Stringent limits based on Recommendation ITU-R M.1459 remain necessary to protect AMT facilities against interfering signals. Thus, the U.S. does not support the globally harmonized identification of the 1435-1525 MHz band for IMT. The U.S. does not object to potential studies on the use of the 1435-1525 MHz band outside of Region 2 for IMT, provided that the studies would include identification of measures to assure protection of AMT, and footnote RR 5.343, for Region 2. In 2003, MSS proponents for the 1435-1525 MHz band used relaxed AMT parameters in Region 1, and attempted to apply the sharing results to all three Regions. The U.S. is of the view that any AMT/IMT studies as well as regulatory provisions emanating there from, which may be Region-specific, should not be automatically applied to Region 2.

1695-1710 MHz

Canada/USA: Support studies to determine the feasibility of a co-primary mobile, except aeronautical mobile, allocation in the 1695-1700 MHz band, identification for broadband wireless systems including IMT, in the band 1 695-1 710 MHz and to develop corresponding technical requirements. These studies should identify sharing arrangements to ensure protection of existing primary services, namely meteorological-satellite service and meteorological aids service.

2 025-2 110 MHz and 2 200-2 290 MHz

Mexico/USA: Adopted a Draft Inter-American Proposal for NOC in these bands. ITU-R studies have shown that sharing is not feasible between International Mobile Telecommunications (IMT) systems and systems of incumbent services in the bands

3400-3600 MHz

Brazil/Ecuador: Adopted a Draft Inter-American Proposal in support of the identification of the band 3400-3600 MHz to IMT. It is necessary, however, to establish technical conditions to guarantee sharing of IMT operating in the band 3400-3600 MHz with FSS operating in the adjacent band 3600-4200 MHz. T

3400-4200 MHz

Bolivia, El Salvador, México Nicaragua: Adopted a Draft Inter-American Proposal for NOC in the band. In view of this administrations, the IMT systems in the band would cause unacceptable interference to FSS operations in the band,

3600-4200 MHz

Brazil/Ecuador: Adopted a Draft Inter-American Proposal for NOC in the band. Considering the importance and penetration of the FSS systems, these administration do not support the identification of this band for IMT.

5350-5470 MHz

USA: If compatibility studies determine sharing feasibility and mitigation measures, including appropriate technical and regulatory mechanisms to protect existing services, the United States supports a primary allocation to the mobile (except aeronautical) service for the implementation of wireless access systems including RLANs in the 5350-5470 MHz band.

5925-6425 MHz

Brazil: Considering the importance and penetration of the FSS systems operating in the Brazilian territory, the Brazilian Administration does not support the identification of this band for IMT.

RCC (November, 2013 version)



## International organisations

IATA (date of proposal)

ICAO (date of proposal)

IMO (date of proposal)

NATO (December 2013)



SFCG (June 2012)

SFCG supports the protection of existing space science service and GNSS allocations. No allocations of spectrum to support mobile broadband systems should be made in space science service bands unless acceptable sharing criteria are developed.

The main frequency bands at risk for SFCG member agencies are expected to be:

* the 1675 – 1710 MHz bands used for meteorological satellite applications;
* the bands 2025 – 2110 MHz and 2200 – 2300 MHz used for space research, earth exploration satellite and space operation services. While these bands have been secured in the past by application of RR No. 5.391, the agenda item asks specifically for a review of studies conducted in the past;
* the C-band (3.4-4.2 GHz), used for Galileo Data Distribution Network and the dissemination of meteorological data via EUMETCast and GEONETCast;
* the active remote sensing band (5250-5570 MHz) used for SARs, Scatterometers and Altimeters.
* GNSS allocations: 1164-1300 MHz; 1559-1610 MHz, 5000-5030 MHz.
* In addition, frequency bands adjacent to passive allocations may also be targeted, in particular both sides of the 1400-1427 MHz band used for EESS(passive).

WMO (January 2013)

WMO opposes allocation/identification for terrestrial mobile broadband applications including IMT of the frequency bands 1 675-1 710 MHz, 2 025-2 110 MHz, 2 200-2 290 MHz, 2 700-2 900 MHz and 5 350-5 470 MHz.

WMO opposes any allocation in the 1 400-1 427 MHz frequency band, covered by RR No 5.340, and also requires that protection of sensors in this band be ensured from unwanted emissions of terrestrial mobile broadband applications including IMT if proposed in the adjacent bands.

In addition, WMO states its requirement to maintain relevant fixed satellite service capacity and availability in the 3 400-4 200 MHz frequency band.

## Regional organisations

ESA (September 2012)

The bands 2025-2110 MHz, 2200-2290 MHz and 5350-5470 MHz should be excluded from the consideration of candidate bands for “Broadband Mobile”.

Any identification of the 1375-1400 MHz and 1427-1452 MHz bands for broadband mobile will have to be associated with relevant and mandatory protection of the 1400-1427 MHz “passive band”

EUMETNET (January 2013)

EUMETNET confirms its high concerns in relation to this agenda item and urges that compatibility with and protection of meteorological applications and services be ensured. In particular, consideration of previous compatibility studies will need to be taken into account. To this respect, EUMETNET is strongly opposed to see any Mobile allocation/identification in the 1675-1710 MHz, 2025-2110 MHz and 2200-2290 MHz band as well as 2700-2900 MHz bands. EUMETNET is opposed to see any Mobile allocation in the 1400-1427 MHz band, covered by RR No 5.340, and also requires that compatibility of sensors in this band be ensured from unwanted emissions of IMT systems that would be proposed in the adjacent bands.

Finally, for all proposals under agenda item 1.1, EUMETNET urges, as appropriate, that compatibility with meteorological and Earth Observations related applications be assessed and adequate protection be ensured.

EUMETSAT (April 2013)

The bands 1675-1710 MHz, 2025-2110 MHz, 2200-2290 MHz and 5350-5470 MHz should be excluded from the consideration of candidate bands for “Broadband Mobile”.

Any identification of the 1375-1400 MHz and 1427-1452 MHz bands for broadband mobile will have to be associated with relevant and mandatory protection of the 1400-1427 MHz “passive band”

Eurocontrol (date of proposal)

## OTHER INTERNATIONAL AND REGIONAL ORGANISATIONS

EBU

"The EBU view is that the frequency range 470-694/698 MHz should not be considered under agenda item 1.1.

This frequency range is ideally suited to DTT and is the only UHF (below 1 GHz) spectrum available and allocated worldwide to the Broadcasting Service. Maintaining a worldwide harmonized band for television broadcasting will continue to allow for economies of scale in bringing affordable consumer equipment to market.

The results of ITU-R/WP 6A questionnaire (see document "[4-5-6-7/125-rev 26 July 2013](https://extranet.itu.int/rsg-meetings/jtg4-5-6-7/Share/Forms/Column%20view.aspx?RootFolder=%2Frsg%2Dmeetings%2Fjtg4%2D5%2D6%2D7%2FShare%2FWG%202%20%2D%20Study%20Group%206%20related%20items%20including%20SAB%2DSAP%2FSWG2%2D1%20Refinement%20of%20the%20lower%25)"[[9]](#footnote-9)) show that majority of those Administrations in Region 1 which responded have indicated a requirement for at least 224 MHz of UHF spectrum for DTT."

GSMA

The tremendous increase in mobile broadband data usage over recent years shows no sign of slowing down, and the rapid growth in demand for mobile broadband data is forecast to continue. In order to satisfy this increasing demand, it will be necessary for significant amounts of additional spectrum that is suitable for mobile broadband to be identified and made available for IMT in a timely manner. This spectrum will need to be able to satisfy a range of coverage, capacity and performance requirements that can best be met by spectrum from a combination of different bands below 5 GHz. Other factors will also be important in determining which spectrum will be most suitable, including the needs of developing nations, the ability to deliver international harmonisation, and technical considerations. The GSMA has undertaken work and submitted contributions to ITU-R, CEPT and other Regional bodies in relation to spectrum demand forecasting and suitable frequency ranges for IMT, and will continue to participate in preparatory activities in relation to WRC-15 Agenda Item 1.1.

DIGITALEUROPE

DIGITALEUROPE agrees with the forecasts that predict continued growth in the demand for broadband data services in the years ahead and therefore fully supports the activities within the WRC process to identify additional spectrum resources for mobile broadband technology (MBB).

DIGITALEUROPE supports the work carried out to estimate the spectrum requirements and acknowledges the range of frequency bands under consideration from 470MHz to 4200MHz (IMT) and 5350 – 5470 MHz/5725 – 5850 MHz (RLAN). The specific bands in this range will offer important opportunities to address the range of deployment and traffic scenarios that will characterise future MBB networks.  Lower frequency ranges will be important for coverage considerations whilst the higher frequency ranges will enable capacity and performance capabilities.

The opportunities for global identifications and the possibility to develop larger contiguous frequency blocks should be prime considerations.

1. Report ITU-R M.2078, “Estimated spectrum bandwidth requirements for the future development of IMT-2000 and IMT-Advanced”. [↑](#footnote-ref-1)
2. Recommendation ITU-R M.1768, “Methodology for calculation of spectrum requirements for the future development of the terrestrial component of IMT-2000 and systems beyond IMT-2000”. [↑](#footnote-ref-2)
3. Report ITU-R M.2072, “World mobile telecommunication market forecast”. [↑](#footnote-ref-3)
4. Report ITU-R M.2074, “Radio aspects for the terrestrial component of IMT-2000 and systems beyond IMT-2000”. [↑](#footnote-ref-4)
5. Replanning means to stop operation for radiolocation service in a portion of the band currently allocated to the Radiolocation service to make it available to the IMT systems. [↑](#footnote-ref-5)
6. WP6A received 33 CEPT responses, out of a total of 48 CEPT members. [↑](#footnote-ref-6)
7. Replanning means to stop operation for radiolocation service in a portion of the band currently allocated to the Radiolocation service to make it available to the IMT systems. [↑](#footnote-ref-7)
8. from JTG-4-5-6-7/197 [↑](#footnote-ref-8)
9. Go to "JTG 4-5-6-7 Share Folder", then "SWG2-Study Group 6 related items including SAB/SAP" then "SWG2-1 Refinement of the lower edge" then "Working Party 6A - update to Doc 125 re input Doc 186" [↑](#footnote-ref-9)