|  |  |  |
| --- | --- | --- |
|  | | Doc. TEMP501 - CPG15(15)084 Annex V-01G |
| CPG-15-8 | |  |
| Bergen, Norway, 14th - 18th September 2015 | |  |
|  | |  |
| Date issued: | 18th September 2015 | |
| Source: | Minutes CPG15-8 | |

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.

# 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,

* The following bands are supported for mobile broadband:

1427-1518 MHz

3400-3800 MHz

* The following bands are not supported for mobile broadband/RLAN:

470 – 694 MHz

1300-1350 MHz\*

1350-1400 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

5350-5470 MHz

5725-5850 MHz

5925-6425 MHz

\*) These bands are not considered as candidate band under Agenda Item 1.1 in the CPM Report.

In addition CEPT supports the following regulatory provisions related to the bands that are supported for mobile broadband:

* Mandatory limits for unwanted emissions in the 1400-1427 MHz band for both mobile terminals and base stations operating in adjacent bands consistent with those in Report ITU-R RS.2336.
* No regulatory constraints shall be adopted by WRC-15 for Region 1 regarding the aeronautical mobile service and land mobile service in the band 1427 - 1518 MHz. In order to protect aeronautical telemetry countries listed in No. 5.342 should reach bilateral cross-border coordination agreement with the neighbouring countries on the basis of the principle of equitable access. In particular, in accordance with No. 5.342, the use of telemetry in the band 1 452-1 492 MHz requires prior agreement from neighbouring countries.
* 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).
* Further to WRC 15, there is a need to develop an ITU-R Recommendation providing technical measures to facilitate adjacent band compatibility between MSS above 1518 MHz and IMT below 1518 MHz and, as necessary, guidance to facilitate coordination with neighbouring administrations.
* In the band 3400-3800 MHz: coordination under No. 9.18 and No. 9.17 between transmitting stations in the mobile service and FSS receiving earth stations will apply; stations of the mobile service shall not claim more protection from space stations than that provided in the current version of Table 21‑4 of the Radio Regulations (i.e. Edition of 2012). Europe recognizes, that there may be difficult coexistence situations in some regions outside Europe where there are ubiquitous deployment of uncoordinated receiving FSS earth stations in some countries and IMT deployment in neighbouring countries in particular in the band 3 600-3 800 MHz. For these regions, administrations having these earth stations in their territory may wish to include provisions based on existing conditions in No. 5.430A (WRC-07).

# 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-2). In this Report, estimated spectrum requirements are calculated using the spectrum calculation methodology in Recommendation ITU-R M.1768[[2]](#footnote-3). 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-4) 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-5) 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 Report ITU-R 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 Recommendation ITU-R 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/or identified for IMT should be taken into account as well as the amount of spectrum currently used for IMT in each Region with a view to optimizing the use of these bands to increase spectrum efficiency.

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 5 150 - 5 250 MHz, 5 250 - 5 350 MHz and 5 470 - 5 725 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

The following frequency bands have been studied:

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, 1 695-1 710 MHz, 2 025-2 110 MHz, 2 200-2 290 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 and 5 925-6 425 MHz.

Comments and conclusions during the debate within CEPT are added:

470 - 694 MHz

This band is not supported for mobile broadband due to the extensive use of this band by broadcasting services and the need for separation distances between broadcasting and IMT stations of around 300 km or higher.

The 470 – 694 MHz is used extensively by the Terrestrial Broadcasting service for the provision of television content and for PMSE in many CEPT countries. It is generally the only TV platform delivering free-to-air TV programmes to citizens. Allocation of additional spectrum within this band for the mobile service on a primary basis may constrain future development of the broadcasting service.

Sharing and compatibility in this band between IMT systems and broadcasting is very difficult. ITU-R JTG 5-6 studies, in the previous study period, have shown the need for separation distances between broadcasting and IMT stations of around 300 km or higher. This has been confirmed by recent studies carried out in CPG PTD and ITU-R JTG4-5-6-7.

The terrestrial broadcasting service is a cost-efficient solution for high-quality media delivery to the whole population. It is the main TV platform delivering free-to-air TV programmes to citizens and will remain as such in the 470-694 MHz for the foreseeable future. Various deliverables at European level support confirmed this context (see ECC Report 224, RSPG Opinion on WRC 15 and Lamy's Report (presented to the European Commission in September 2014)).

1 300 - 1 525 MHz range

1 300 - 1 350 MHz:

This band is not supported for mobile broadband. This band is used by civil and military radars systems.

1 350 - 1 400 MHz:

This band is not supported for mobile broadband. The band is used by civil and military radar.

In some CEPT countries the band 1 350-1 375 MHz and/or 1 375 - 1 400 MHz is used for fixed radio link operation, commercial or governmental.

Studies show co-channel sharing between radiolocation service and the downlink of mobile service is not feasible. Protection of Radio Astronomy stations operating under 5.149 require separation distances to IMT Base Stations of order 130 to 500kms; for user terminals, the distances are 52 to 85km. Compatibility in adjacent bands with radiolocation service 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. To protect the passive services in the 1400-1427MHz band, compatibility studies have been conducted to establish limits for unwanted emissions, for both mobile terminals and base stations, if deployed in adjacent bands.

The studies on WRC15 Agenda item 1.2 have concluded that further studies are needed to find additional bands for SAB/SAP (PMSE or wireless microphones), on a regionally harmonised basis. In this regard, the band 1 350-1 400 MHz is suggested as a new tuning range for PMSE.

To protect the passive services in the 1400-1427 MHz band, compatibility studies have been conducted to establish limits for unwanted emissions, for both mobile terminals and base stations, if deployed in adjacent bands.

1 427-1 452 MHz:

This band is supported for mobile broadband. In some CEPT countries this band is used for fixed links (including tactical radio relays). Migration of services (such as low capacity long distance point to point links to other possible frequency bands (e.g. 6GHz)) is a national matter for the concerned administrations which requires a number of technical and regulatory considerations which are not part of the studies under this agenda item and have not been studied.

Studies indicate that, when IMT services are to be implemented in this band, there is a need to protect the incumbent services through cross-border coordination between concerned administrations or through national measures within an administration.

To protect the passive services in the 1 400-1 427 MHz band, compatibility studies have been conducted in ITU-R to establish limits for unwanted emissions, for both mobile terminals and base stations, if deployed in adjacent bands.

1 452-1 492 MHz:

The band is supported for mobile broadband. The band is subject to harmonisation in Europe for mobile SDL IMT. BSS satellite networks in the band 1 452-1 492 MHz have to be currently coordinated with terrestrial services, pursuant to No. 9.11. However, 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 and an administration not responding in the four months after a coordination request is regarded as unaffected.

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.

Appendix 5 would also be modified so as to enable countries wishing to continue to apply coordination procedure under 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 No. 9.11, because of more stringent protection requirement (e.g. in order to protect telemetry systems).

1 492-1 518 MHz

This frequency band is supported for IMT identification to provide a future possible option for administrations who wish to implement IMT in this band, taking into account the requirements and usage of existing services in this band. CEPT is studying compatibility between MSS above 1518 MHz and IMT below 1518 MHz. Initial studies related to the coexistence between MSS Earth Station and IMT Base stations, indicate that a combination of a frequency separation of 3 MHz determined by IMT OOBE based on possible future harmonised technical conditions for IMT in line with a Block-Edge-Mask (BEM) based on ECCDecision(13)03 and up to 5MHz determined by the MES receiver performance would lead to separation distances between IMT base stations and Mobile Earth Stations in the range of 0.25-1.6km for the land mobile rural case. Compatibility between the services could be achieved at a national level following the guidance in a future ITU-R Recommendation. Therefore, no additional technical constraints in the RR are needed. It is also noted that improved BEM compared to current assumption and the improved receiver performance for earth stations through harmonised standards will foster spectrum efficiency and reduce any required frequency and geographical separations. CEPT will further investigate the issue based on the results of the WRC15 for IMT identification and, when appropriate, developing harmonised technical conditions for the usage of IMT below 1518 MHz.

Results of the sharing studies for the band 1 429-1 518 MHz indicate that, in order to provide protection of aeronautical mobile telemetry ground receivers in Region 1 from co-frequency interference caused by IMT stations, required separation distances would generally exceed some hundred kilometres. However, when applying mitigation techniques (e.g. sector antenna disabling at IMT base stations) separation distances may be reduced to few tens of kilometres. This will be addressed during coordination between the concerned administrations. Given that the frequency band is already allocated to mobile service no regulatory constraints shall be adopted by WRC-15 for Region 1 regarding the aeronautical mobile service and land mobile service.

In order to protect aeronautical telemetry, countries listed in No. 5.342 should reach bilateral cross-border coordination agreement with the neighbouring countries on the basis of the principle of equitable access. In particular, in accordance with No. 5.342, the use of telemetry in the band 1452-1492 MHz requires prior agreement from neighbouring countries.

In some CEPT countries this band is used for fixed links (including tactical radio relays). Migration of services (such as low capacity long distance point to point links to other possible frequency bands (e.g. 6GHz)) is a national matter for the concerned administrations which requires a number of technical and regulatory considerations which are not part of the studies under this agenda item and have not been studied. Studies indicate that, if IMT services are to be implemented in this band, there is a need to protect the incumbent services through cross-border coordination between concerned administrations or through national measures within an administration.

ECC meeting in March 2015 confirmed that the current activity in CPG PTD on adjacent band co-existence at 1518 MHz between the Mobile Satellite service and IMT issue should be transferred to ECC PT1 from 1st December 2015 at the latest. ECC will invite ECC PT1 to start to work at the beginning of 2016 with a target developing an ECC Report taking into account the results of CPG PTD and the output WRC 15.

Further to WRC 15, there is a need to develop an ITU-R Recommendation providing technical measures to facilitate adjacent band compatibility between MSS above 1518 MHz and IMT below 1518 MHz and, as necessary, guidance to facilitate coordination with neighbouring administrations.

Amending Resolution 223 (WRC-12) ensures that when WRC‑15 identifies 1 427-1 518 MHz for IMT it also provides a commitment that ITU‑R will develop the necessary Recommendation on adjacent band compatibility.

1 518-1 525 MHz

This frequency band is not supported for mobile broadband due to the results of the sharing studies with MSS.

1 695-1 710 MHz

This band is not supported for mobile broadband due to incompatibility of IMT systems with existing meteorological satellite service applications in this band.

2 025-2 110 MHz

This band is not supported for mobile broadband due to incompatibility of IMT systems with existing space and science services applications in those bands.

2 200-2 290 MHz

This band is not supported for mobile broadband due to incompatibility of IMT systems with existing space and science services applications in those bands.

2 700-2 900 MHz

This band is not supported for mobile broadband. Report ITU-R 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).

2 900-3 100 MHz

This band is not supported for mobile broadband due incompatibility between radiolocation and mobile (IMT) services.

3 300-3 400 MHz

This band is not supported for mobile broadband due incompatibility between radiolocation and mobile (IMT) services.

3 400-3 600 MHz

This band is supported for mobile broadband.

This band is already identified for IMT in a large number of countries including the majority of CEPT countries, see No. 5.430A. ECC Decision (ECC/DEC/ (11)06) on the use of 3 400 -3 800 MHz for mobile broadband has been updated to respond to the requirement of future usage of IMT systems with larger bandwidth and higher power emissions 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 co-channel separation distances are large. Furthermore, considering studies conducted by the JTG for IMT, as reflected in Report ITU-R S.2368, the new IMT parameters do not change the overall conclusion of the previous studies. The extent of harmonisation and the regulatory measures to be adopted for this frequency band will largely depend on the support outside Europe for the use of this band for IMT.

3 600-3 800 MHz

This band is supported for mobile broadband.

ECC Decision (ECC/DEC/ (11)06) on the use of 3 400 -3 800 MHz for mobile broadband has been updated to respond to the requirement of future usage of IMT systems with larger bandwidth and higher power emissions 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 co-channel separation distances are large. Furthermore, considering the studies conducted by the JTG 4-5-6-7 for IMT, as reflected in Report ITU-R S.2368, the new IMT parameters do not change the overall conclusion of the previous studies. As noted in the RSPG Opinion on Common Policy Objectives for WRC-15, outside Europe the 3 600-4 200 MHz band plays an important role for satellite communications as high rainfall in Equatorial Regions means that alternative satellite frequency bands are less practical to use, which is not the case in Europe. This may limit the possibility of worldwide identification for IMT. Therefore, the extent of harmonisation and the regulatory measures to be adopted for this frequency band will largely depend on the support outside Europe for the use of this band for IMT.

3 800-4 200 MHz

This band is not supported for mobile broadband.

The use of this band by the FSS is extensive in many countries of the world and organisations such as ICAO, IMO and WMO rely on FSS in this band. CEPT determined that there is no potential for global or regional harmonisation for IMT or mobile broadband in this 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 co-channel separation distances are large. Furthermore, considering the studies conducted by the JTG 4-5-6-7 for IMT, as reflected in Report ITU-R S.2368, the new IMT parameters do not significantly change the overall conclusion of the previous studies.

4 400-4 500 MHz

This band is not supported for mobile broadband due to current usages in many CEPT countries, including aeronautical mobile. In addition studies have not been provided to ITU-R regarding the protection of radio-altimeters in the adjacent band (4 200-4 400 MHz). Also compatibility studies in ITU-R indicate that sharing between aeronautical mobile applications and IMT systems is not feasible.

4 500-4 800 MHz

This band is not supported for mobile broadband due to current usages in the band including aeronautical mobile and Appendix 30B Plan. 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. Also compatibility studies in ITU-R indicate that sharing between aeronautical mobile applications and IMT systems is not feasible.

4 800-5 000 MHz

This band is not supported for mobile broadband due to current usages in the band, including aeronautical mobile. 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). Also compatibility studies in ITU-R indicate that sharing between aeronautical mobile applications and IMT systems is not feasible.

5 350-5 470 MHz

This band is not supported for RLAN at WRC-15.

Key European policies are implemented through the GMES/Copernicus Programme. This Programme relies on the operational use of the Sentinel satellites and their EESS (active) sensors working in this frequency band. In addition, this band is used by important governmental radiolocation systems.

CEPT has concerns on the feasibility of RLAN usage in the band 5350-5470 MHz, as current compatibility studies show that there is significant enough negative margin to conclude that sharing between EESS (active) 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).

Some mitigation techniques have been proposed and considered to address these negative margins.

Two additional mitigation techniques have been proposed (i.e. DFS, EIRP mask) and studies have concluded that they are not effective and/or implementable to provide protection for EESS (active systems).

Studies were also conducted on Spreading and channelling arrangements as a mitigation technique and it was concluded that it does not provide, on its own, enough added mitigation to enable sharing between RLAN and EESS (active).

Other additional mitigation techniques (i.e. Spectrum access system using geo-location database and further restrictions on maximum RLAN power) have also been considered.

Initial studies looking at further reducing the maximum power levels allowed by RLANs possibly down to 25mW including a minimum TPC range have not reached any firm conclusions. Further studies looking at appropriate power distributions as well as the effectiveness and the feasibility of implementing these power distributions in RLANs will need to form part of any further analysis.

Spectrum access system using Geo-location databases as a means of sharing the band based on separate time and location sharing has been proposed. A number of questions/issues on the feasibility, implementation and enforcement of this mitigation technique on an international basis to protect EESS operations have been raised. No conclusions could be drawn on this at this time without further analysis.

In addition, it should be noted that existing DFS standards at 5 GHz have not been developed to specifically protect radars that employ advanced and fast frequency hopping techniques and bi-static radar and that no solution has been found to address the protection of these radars in the band 5 350-5 470 MHz from RLANs at this stage.

It has been noted that further studies on some possible mitigation techniques may be carried out in the ITU-R and CEPT but it is unlikely that these studies would be concluded in the timescales associated with WRC-15. Therefore, at this stage, after consideration of the results of the current studies and without the conclusions of these further studies it would not be possible to support an identification of the 5 350-5 470 MHz band for RLAN 5 GHz at WRC-15.

The band is also subject to studies under an EC mandate to CEPT (RSCOM13-32rev3).

Some CEPT administrations have indicated that they intend to continue to provide input contributions to support a possible future agenda at WRC-19 for additional RLAN allocations. These administrations consider this future agenda item in WRC-19 should focus on possible new mobile allocations to meet overall future RLAN spectrum requirements.

5 725 - 5 850 MHz:

This band is not supported for mobile broadband/RLAN at WRC15.This band is used by the FSS in ITU-R Region 1 and Radiolocation worldwide. Operation of RLAN in other 5 GHz frequency bands raised coexistence issues with terrestrial radars which were under investigation at CEPT and EU level but it was concluded that this was due to illegal use and/or use of noncompliant RLAN equipment (ECC Report 192).

The existing DFS standards at 5 GHz have not been developed to specifically protect radars that employ advanced and fast frequency hopping techniques. Further sharing studies are being carried out in CEPT.

CEPT is of the view that in order to support the introduction of a mobile allocation for RLAN use in the frequency band 5 725 – 5 850 MHz, it will be required to demonstrate that coexistence between RLANs and existing services, especially with radars not previously covered by Recommendation ITU-R M.1638 can be achieved.

However the 5 725-5 850 MHz band is allocated as an ISM band and CEPT countries already allow generic SRD use (including RLAN) up to 25 mW in the band 5 725-5 875 MHz without DFS under ERC Recommendation 70-03 (annex 1). In addition a number of CEPT countries allow use of the band 5 725-5 875 MHz by BFWA up 4W with the inclusion of DFS to provide suitable mitigation under ECC Recommendation (06)04. Therefore, the impact of existing interference from ISM devices and these radio communication applications into radiolocation systems would need to be considered when discussing mitigation techniques.

The band is subject to studies under an EC mandate to CEPT (RSCOM13-32rev3).

CEPT is still conducting studies for radio services/systems operating in the band 5 725-5 850 MHz, in particular between RLANs and FSS (earth-to-space), BFWA, TTT and the new radio applications wireless industrial application (WIA). Studies in CEPT for RLAN in this band are still on-going. There were no substantial sharing and compatibility studies carried out at the ITU-R Joint Task Group 4-5-6-7 on IMT/ mobile broadband/RLANs in this band.

There is only one option NOC in the draft CPM text.

In conclusion, CEPT does not support the allocation of the frequency band 5 725-5 850 MHz for RLAN or IMT at WRC-15.

Some CEPT administrations have indicated that they intend to continue to provide input contributions to support a possible future agenda at WRC-19 for additional RLAN allocations. These administrations consider this future agenda item in WRC-19 should focus on possible new mobile allocations to meet overall future RLAN spectrum requirements.

5 925-6 425 MHz

This band is not supported for mobile broadband. This band is heavily used in many CEPT countries for fixed links. This band is also heavily used by the Fixed Satellite Service (Earth-to-space).

Studies conducted by the JTG 4-5-6-7 for IMT, as reflected in Report S.2367, have shown that sharing with C-band FSS would impose additional requirement on IMT stations such as limiting the IMT deployment to indoor and a maximum eirp of IMT base stations limited to 10-15 dBm per 20 MHz (which corresponds to 10-30 mW per 20 MHz, to be compared with envisaged eirps of 200mW and up to 1W).

## 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 No 5.312 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 No. 4.10 coexistence of IMT systems with the aeronautical radionavigation stations will be difficult.

The frequency band 608-614 MHz is also allocated to the radio astronomy service on a secondary basis in Europe, where it is used in 11 countries under No. 5.149. Studies indicate that RAS/IMT in-band sharing will be very difficult, if not impossible, as it requires a separation distance of a thousand kilometres between IMT base-stations and an RAS antenna, and of 130 kilometres for user equipment. For the case of IMT systems operating adjacent to the RAS band, a separation distance of 75 kilometres is needed for IMT base-stations, and of one kilometre for user equipment, for an unwanted emission level of -50 dBm/MHz.

Report ITU-R BT.2302 provides the results of a questionnaire on the spectrum requirements for terrestrial television broadcasting in the UHF frequency band in Region 1 and the Islamic Republic of Iran. Based on this report it is concluded that at least the 28 channels of 8 MHz bandwidth in the range 470-694 MHz are required to satisfy spectrum requirements for the BS for the majority of administrations who responded. European long-term strategy for UHF broadcasting band has been developed in ECC TG6 (see ECC Report 224).

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.

1 300-1 518 MHz range

Main issue on compatibility and sharing:

aeronautical mobile service in the 1 429-1 525 MHz band, limited to telemetry applications in accordance with RR 5.342

EESS (passive) and Radio Astronomy in the band 1 400-1 427 MHz covered by No. 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 No. 4.10

Adjacent band compatibility studies with the MSS operating in the band above 1 518 MHz and IMT systems below 1518MHz should be completed within CEPT and ITU-R after WRC-15.

EESS (passive) and Radio astronomy 1 400 - 1 427 MHz

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

The band 1 400-1 427 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 Report ITU-R 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 1 350-1 400 MHz and 1 427-1 452 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.

Report ITU-R RS.2336 confirms the need to develop unwanted emissions limits for mobile service terminal stations and base stations.

These studies show that, for base-stations, the following levels of unwanted emissions in the 1 400-1 427 MHz frequency band are required:

–80 dBW/27 MHz in the case where both 1 375-1 400 MHz and 1 427-1 452 MHz frequency bands are considered to be used simultaneously by IMT mobile applications;

–75 dBW/27 MHz in the case where only one of the 1 375-1 400 MHz or 1 427‑1 452 MHz frequency bands is to be considered for IMT mobile applications.

As for UE, these studies depict a quite important deficit compared to the currently recommended level of –60 dBW/27 MHz and show that the following level of unwanted emissions in the 1 400‑1 427 MHz frequency band is required:

–65 dBW/27 MHz[[5]](#footnote-6) to be considered for IMT mobile applications.

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.

Radio astronomy 1 330 - 1 427 MHz

The band 1 400-1 427 MHz is allocated on a primary basis to the radio astronomy service (RAS) and 10 administrations in Europe are also using the band 1 330-1 400 MHz under No. 5.149 for radio astronomy. Both bands are 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.

Protection of the radio astronomy stations operating under 5.149 in the band 1 330-1 400MHz in case of in-band sharing with IMT systems requires separation distances between IMT base stations and an RAS antenna of up to 133 km for a single-entry interference case, or up to 500 km in an aggregate interference scenario;. For user terminals the distances are 52 and 85 km, respectively.

Protection of the radio astronomy stations in the band 1 400-1 427 MHz from IMT systems in adjacent bands, for an unwanted emission limit of -64 dBm/MHz (i.e., the limit for base stations required to protect the EESS(passive) in the band),requires separation distances between an RAS antenna and IMT base stations of about 120 km in the case of an aggregate interference scenario. For user terminals the distances are of a few km.

Radiolocation 1 350 - 1 400 MHz

Studies show that:

* co-channel sharing between the radiolocation service and the Downlink of mobile service is not feasible.
* compatibility in adjacent bands in cases where radiolocation service only use part of the band[[6]](#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 1 429 -1 535 MHz

One preliminary analysis showing impact of the IMT BS to the ground station of aeronautical telemetry system within 1 429-1 492 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. This agreement also needs to ensure equitable access at the border.

In addition to the primary services listed in the Table of Frequency Allocations, for the band 1 429 – 1 535 MHz there is also additional allocation (No. 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."

With respect to Region 1, Report ITU-R M.2286 indicated the operation of telemetry on-board receivers.

However, some administrations not listed in No. 5.342 expressed the view that such airborne relay receivers cannot be considered as an assignment in conformity with No. 5.342 and such stations cannot be considered as a part of telemetry application and shall not be considered for protection.

MSS 1 518-1 559 MHz, 1 626.5-1 660.5 MHz and 1 668-1 675 MHz

The 1 518-1 559 MHz, 1 626.5-1 660.5 MHz and 1 668-1 675 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 1 525-1 559 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 1 518-1 525/1 668-1 675 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 4-5-6-7 (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 1 695-1 710 MHz

The 1 695-1 710 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 contained in Report SA.2329. In addition, this band is not considered relevant for mobile service due to the limited bandwidth available.

2 025-2 110 MHz, 2 200-2 290 MHz ranges

The frequency bands 2 025 – 2 110 MHz and 2 200 – 2 290 MHz are allocated to space research, Earth exploration satellite and space operation services in the following directions (2 025 – 2 110 MHz: Earth-to-space and space-to-space; 2 200 – 2 290 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 No. 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 as contained in Report ITU-R SA.2325 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.

2 700-2 900 MHz, 2 900-3 100 MHz and 3 300-3 400 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 Report ITU-R 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.

The band 2 700-2 900 MHz is adjacent to the band 2 690-2 700 MHz, which is allocated on a primary basis to the earth exploration-satellite service (passive), the radio astronomy service and the space research service (passive), and the use of which is subject to No. 5.340 (“all emissions are prohibited”). Protection of the radio astronomy service in the band 2 690-2 700 MHz requires a separation distance of about 60 kilometres between an RAS antenna and IMT base-stations and about one kilometre for user equipment, for an assumed unwanted emission level of –50 dBm/MHz.

CEPT is studying possible usage of PMSE (wireless-cameras) in the 2 700 – 2 900 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 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.

3 400 - 4 200 MHz and 4 500 - 4 800 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 3 400 – 3 600 MHz.

Sharing studies contained in 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 co-channel separation distances are large.

Furthermore, considering the studies conducted by the JTG 4-5-6-7 for IMT, the new IMT parameters do not change the overall conclusion of the existing studies, as shown by the conclusions of Report ITU-R S.2368 “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 in the WRC study cycle leading to WRC-15”,

“The sharing between IMT-Advanced and FSS is feasible only when FSS earth stations are at known, specific locations, and deployment of IMT-Advanced is limited to the areas outside of the minimum required separation distances for each azimuth to protect these specific FSS earth stations. In this case, the FSS protection criteria should be used to determine the necessary separation distances to ensure protection of the existing and planned FSS earth stations.

When FSS earth stations are deployed in a typical ubiquitous manner or with no individual licensing, sharing between IMT-Advanced and FSS is not feasible in the same geographical area since no minimum separation distance can be guaranteed.

Deployment of IMT-Advanced would constrain future FSS earth stations from being deployed in the same area in the bands 3 400-4 200 MHz and 4 500-4 800 MHz as shown by the studies.”

Results for the adjacent band studies were summarized as follows: “For a specific macro-cell deployment scenario studied, the required separation distances from the edge of the IMT-Advanced deployment area are in the range of 30 km to 20 km with an associated guard band of 2 MHz to 80 MHz respectively.”

In most European countries the 3 800-4 200 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 3 400 – 4 200 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. 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 3 400 – 3 800 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 4 500-4 800 MHz band. In addition to technical issues the band 4 500-4 800 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.

In Europe the band 3 400 – 3 800 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. Outside Europe, it is recognized that some administrations/region may wish to limit IMT identification to the lower part of the band due to the ubiquitous deployment of uncoordinated receiving FSS earth stations within their territory or/and within their neighbouring countries. In such a case, these administrations and/or their neighbouring countries may wish to include provisions based on existing conditions in Nos. 5.430A, 5.432A, 5.432B or 5.433A.

In general, global spectrum harmonization leads to lower prices for the equipment thus increasing the adoption of the technology and having a direct and indirect impact on the economic growth. This growth consists of enhancement of productivity, job creation, entrepreneurship, infrastructure investment, taxation; all leading to GDP growth.

Globally harmonized spectrum bands and band plans will lead to following benefits:

provide economies of scale,

allow consumer wider choice of service providers and brands of devices,

avoid fragmented markets,

decrease potential for radio interference within land mobile services,

facilitate global roaming,

maximise the total economic value.

The band 3 400-3 800 MHz has been designated for mobile broadband use in most of the CEPT countries but global harmonization and global identification would enhance the benefits of harmonization as listed above. Countries outside from CEPT could benefit from the initial economies of scales resulting from CEPT wide market. It may also be possible to achieve alignment in terms of a TDD band plan, which for some scenarios may simplify coexistence with other systems.

The band 3 400-3 800 MHz offers the great possibility for very wide channel bandwidths to be supported by IMT-Advanced enabling high data rates.

The band 3 400-3 600MHz is so far the highest frequency band identified for IMT (in No. 5.430A). It is also a band that has the capacity to support up to 100MHz bandwidths. It is understood that sooner or later countries may need a high capacity band and it is beneficial to consider to 3 400-3 600 MHz and as well as the band adjacent to it, the 3 600 - 3 800 MHz band.

However, global harmonisation of the band 3 400-3 800 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 3 800 MHz due to use of wideband LNA in currently deployed FSS Earth stations.

For the band 3 800-4 200 MHz, CEPT determined that there is no potential for global or regional harmonisation for mobile broadband in this band.

4 400 - 4 500 MHz band

This band is allocated to the Fixed Satellite (space to Earth) (the provisions of the Appendix 30B FSS Plan apply), fixed and mobile services in all ITU-R 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 4 400 – 5 000 MHz

4 500 - 4 800 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 4 400 – 5 000 MHz.

4 800 - 5 000 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 4 400 – 5 000 MHz

5 350 - 5 470 MHz band

This frequency band is allocated to the Earth exploration-satellite (active), radiolocation, radionavigation, aeronautical radionavigation, and space research (active) services. 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.
* 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.

With respect to RLAN and EESS(active) the results of sharing analysis carried out in CPG/PTD can be seen in CPG-PTD(14)223\_A05\_’RLAN-EESS 5GHz reference document’.

This document, considers the various technical studies carried out in CPG/PTD and ITU-R, and as a result concerns have been raised about the feasibility of RLAN usage in the band 5350-5470 MHz, as current studies show that there is a significant enough negative margin to conclude that sharing with EESS (active) is not feasible unless additional sharing/mitigation techniques are identified that can provide the necessary protection to EESS (active).

Two additional mitigation techniques have been proposed (i.e. DFS, EIRP mask) and studies have concluded that they are not effective and/or implementable to provide protection for EESS (active systems).

Studies were also conducted on Spreading and channelling arrangements as a mitigation technique and it was concluded that it does not provide, on its own, enough added mitigation to enable sharing between RLAN and EESS (active).

Other additional mitigation techniques (i.e. Spectrum access system using geo-location database and further restrictions on maximum RLAN power) have also been considered.

Initial studies looking at further reducing the maximum power levels allowed by RLANs possibly down to 25mW including a minimum TPC range have not reached any firm conclusions. Further studies looking at appropriate power distributions as well as the effectiveness and the feasibility of implementing these power distributions in RLANs will need to form part of any further analysis.

Spectrum access system using Geo-location databases as a means of sharing the band based on separate time and location sharing has been proposed. A number of questions/issues on the feasibility, implementation and enforcement of this mitigation technique on an international basis to protect EESS operations have been raised. No conclusions could be drawn on this at this time without further analysis.

It has been noted that further studies on some possible mitigation techniques may be carried out in the ITU-R and CEPT but it is unlikely that these studies would be concluded in the timescales associated with WRC-15. Therefore, at this stage, after consideration of the results of the current studies and without the conclusions of these further studies it would not be possible to support an identification of the 5350-5470 MHz band for RLAN 5 GHz at WRC-15.

The band 5 250-5 850 MHz is also used for terrestrial radiolocation systems.

With respect to RLAN and Radiolocation the results of sharing analysis carried out in CPG/PTD can be seen in CPG-PTD(14)223\_A06\_’RLANs and Radiolocation reference document’.

Studies have indicated that RLAN can harmfully interfere with radars if appropriate mitigation techniques are not implemented.

It should be noted that the versions of DFS outlined in the ETSI standards (i.e. EN301893 and EN302502) for the bands currently available for WAS/RLAN/BFWA use in 5 250 - 5 850 MHz do not include specific provisions for DFS to mitigate interference to radars not previously covered by ITU-R M.1638 (in particular Bi-static radar and radar that employ advanced and fast frequency hopping techniques).

CEPT is of the view that it will be required to demonstrate that coexistence between RLANs and radars not previously covered by Recommendation ITU-R M.1638 can be achieved. Therefore future sharing and compatibility studies will have to concentrate on ensuring that any proposed mitigation techniques, particularly the enhancement of the DFS mechanism can protect the operation of these types of radar systems mentioned above. Discussions on new radar test signals for the possible inclusion in an appropriate European harmonised standard have been initiated. Future studies should also include a process to evaluate the operational effect of the mitigation techniques on both RLANs and radars not previously covered by Recommendation ITU-R M.1638 within the 5 GHz band.

In addition, CEPT have investigated interference cases to meteorological radars in the current RLAN frequency bands in 5 GHz and concluded that this was due the illegal use and/or use of non-compliant RLAN equipment. The results of these investigations can be seen in ECC Report 192. Results in this Report indicate that:

* All the investigated interference cases related to outdoor WAS/RLAN fixed installations
* Interference cases were also related to equipment that allowed users to either directly switch off DFS or choose a country where DFS was not required in this band.
* the results of these investigations indicate that no issues have been identified with regard to short comings in the specifications of the DFS mechanism itself as specified in the relevant versions of the Harmonised European Standard EN 301 893 (i.e. – v1.5.1 and above).

The results studies carried out in JTG 4-5-6-7 can be seen in document number JTG 4-5-6-7/715 Annexes 34 (terrestrial radar), 35 (EESS), 36 (aeronautical radar).

JTG 4-5-6-7 only retained the “No change” option (Method A) for the band 5 350-5 470 MHz. Section 1/1.1/5.17 of the CPM text mentions (see document number JTG 4-5-6-7/715 Annex 3):

“No change due to unresolved issues:

* 1. Results of studies show that with the RLAN parameters utilized, sharing between RLAN and EESS (active) systems in the 5 350-5 470 MHz range would not be feasible. Sharing may only be feasible if additional RLAN mitigation measures are implemented, but no agreement was reached on the applicability of additional RLAN mitigation techniques. Some additional RLAN mitigation techniques to enable sharing with EESS (active) are being studied by the ITU-R, but no conclusions can be drawn at this time.
  2. The regulatory provisions in the 5 150-5 350 MHz and 5 470‑5 725 MHz frequency ranges contained in Resolution 229 (Rev. WRC-12) are insufficient to ensure protection of certain radar types in the 5 350-5 470 MHz frequency range. Some additional RLAN mitigation techniques to enable sharing are being studied by the expert groups in the ITU-R but no conclusions can be drawn at this time. Further study by ITU-R is required to determine if these additional mitigation techniques can be utilized to mitigate potential interference to these particular radar types.”

5 725-5 850 MHz band

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

For the FSS (E-S) sharing studies there are two interference scenarios that need 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 should also to be taken into account.

CEPT is of the view that in order to support the introduction of a mobile allocation for RLAN use in the frequency band 5 725 – 5 850 MHz, it will be required to demonstrate that coexistence between RLANs and existing services, especially radars not previously covered by Recommendation ITU-R M.1638 can be achieved. Therefore future sharing and compatibility studies will have to concentrate on ensuring that any proposed mitigation techniques, particularly the enhancement of the DFS mechanism can protect the operation of these types of radar systems mentioned above. Discussions on new radar test signals for the possible inclusion in an appropriate European harmonised standard have been initiated. Future studies should also include a process to evaluate the operational effect of the mitigation techniques on both RLANs and radars not previously covered by Recommendation ITU-R M.1638 within the 5GHz band.

However the 5 725 – 5 850 MHz band is allocated as an ISM band and CEPT countries already allow generic SRD use (including RLAN) up to 25 mW in the band 5 725-5 875 MHz without DFS under ERC Recommendation 70-03 (annex 1). In addition a number of CEPT countries allow use of the band 5 725-5 875 MHz by BFWA up 4W with the inclusion of DFS to provide suitable mitigation under ECC Recommendation (06)04. Therefore, the impact of existing interference from ISM devices and these radio communication applications into radiolocation systems would need to be considered when discussing mitigation techniques.

The results of studies carried out in JTG 4-5-6-7, with respect to the Radiolocation Service only, can be seen in document number JTG 4-5-6-7/715 Annex 34 (terrestrial radar).

JTG 4-5-6-7 only retained the “No change” option (Method A) for the band 5 725 - 5 850 MHz. Section 1/1.1/[5.18] of the CPM text mentions (see document number JTG 4-5-6-7/715 Annex 3):

“No change due to unresolved issues:

Some administrations submitted contributions indicating that the study results for the 5 350‑5 470 MHz frequency range are applicable to the 5 725-5 850 MHz frequency range to ensure protection of certain radars that operate across or in portions of the 5 250-5 850 MHz frequency range. Some other administrations raised concerns regarding these results because no RLAN characteristics were previously agreed for the 5 725-5 850 MHz frequency range and that the RLAN characteristics utilized for the 5 350-5 470 MHz frequency range cannot be applied similarly to the 5 725-5 850 MHz frequency range. Some administrations also highlighted that the sharing environment is significantly different between the two bands due to the ISM designation of the 5 725-5 875 MHz frequency band. There are current deployments of RLAN in the 5 725‑5 850 MHz band in some countries in all three ITU Regions. Therefore, agreement was not reached on the conclusions in these documents”

There were no substantial sharing and compatibility studies carried out at the ITU-R Joint Task Group 4-5-6-7 on IMT/ mobile broadband/RLANs in this band.

In conclusion, CEPT does not support the allocation of the frequency band 5 725-5 850 MHz for RLAN or IMT at WRC-15.

5 925-6 425 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.

This band is heavily used by the FSS as an uplink band usually paired with the downlink band 3 700-4 200 MHz. The information on usage of the band 3 700-4 200MHz is also valid for the band 5 925-6 425 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.

Studies conducted by the JTG 4-5-6-7 for IMT, as reflected in Report ITU-R S.2367, have shown that sharing would impose additional requirement on IMT stations such as limiting the IMT deployment to indoor and a maximum eirp of IMT base stations limited to 10-15 dBm per 20 MHz (which corresponds to 10 mW per 20 MHz, to be compared with envisaged eirps of 200mW and up to 1W).

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 5 925-6 425 MHz and they will be eventually substituted by fibre 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 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)

Concerning the frequency bands allocated to the radio astronomy service, studies show that ensuring compatibility with out-of-band emissions of IMT systems requires, e.g. separation distances of order 100 kilometers between IMT base-stations and radio astronomy observatories, for an unwanted emission level of -50 dBm/MHz. Attaining this level may require mitigation measures such as additional filtering of IMT equipment, to be included in the relevant 3GPP standards or equivalents (e.g. ETSI). The results of these studies will need to be taken into account in deriving regulatory conditions for IMT operations.

Sharing studies

During the study period the following Reports on sharing and compatibility issues have been developed and approved by appropriate Study Groups of the ITU-R:

* Preliminary draft new Report ITU-R M.[5 350 MHZ AERO] (Document 4-5-6-7/715 Annex 36) - Compatibility studies between radio local area network systems and aeronautical airborne radar systems in the 5 350-5 470 MHz frequency band
* Preliminary draft new Report ITU-R RS.[EESS RLAN 5 GHZ] (Document 4-5-6-7/715 Annex 35) - Sharing studies between RLAN and EESS (active) systems in the frequency range 5 350-5 470 MHz
* Preliminary draft new Report ITU-R M.[AERO-IMT.SHARING.C-BAND] (Document 4-5-6-7/715 Annex 33) - Sharing and compatibility studies between aeronautical mobile[/ground mobile] applications and potential IMT systems in the 4 400-4 990 MHz band
* Preliminary draft new Report ITU-R M.[RADAR3300] (Document 4-5-6-7/715 Annex 32) - Sharing between indoor IMT systems and radar systems in the frequency band 3 300-3 400 MHz
* Report ITU-R F.2326 - Sharing and compatibility study between indoor International Mobile Telecommunication small cells and fixed service stations in the 5 925-6 425 MHz frequency band
* Report ITU-R S.2367 - Sharing and compatibility between International Mobile Telecommunication systems and fixed-satellite service networks in 5 850-6 425 MHz frequency range
* Report ITU-R F.2327 - Sharing and compatibility study between International Mobile Telecommunication systems and point-to-point fixed wireless systems in the frequency band 4 400-4 990 MHz
* Report ITU-R S.2368 - Sharing studies between International Mobile Telecommunication 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 in the WRC study cycle leading to WRC-15
* Report ITU-R F.2328 - Sharing and compatibility between international mobile telecommunication systems and fixed service systems in the 3 400-4 200 MHz frequency range
* Report ITU-R SA.2325 - Sharing between space-to-space links in space research, space operation and Earth exploration-satellite services and IMT systems in the frequency bands 2 025-2 110 MHz and 2 200-2 290 MHz
* Report ITU-R SA.2329 - Sharing assessment between meteorological satellite systems and IMT stations in the 1 695-1 710 MHz frequency band
* Report ITU-R BS.2340 - Sharing between the mobile service and the broadcasting service in the 1 452 - 1 492 MHz frequency band
* Report ITU-R M.2324 - Sharing studies between potential International Mobile Telecommunication systems and aeronautical mobile telemetry systems in the frequency band 1 429-1 535 MHz
* Report ITU-R RS.2336 - Consideration of the frequency bands 1 375 - 1 400 MHz and 1 427 - 1 452 MHz for the mobile service - Compatibility with systems of the Earth exploration-satellite service (EESS) within the 1 400-1 427 MHz frequency band
* Report ITU-R F.2339 - Sharing and compatibility study between international mobile telecommunication and the fixed service
* Report ITU-R BT.2333 - Co-channel sharing and compatibility studies between digital terrestrial television broadcasting and international mobile telecommunication in the frequency band 694-790 MHz in the GE06 planning area
* Report ITU-R RA.2332 - Compatibility and sharing studies between the radio astronomy service and IMT systems in the frequency bands 608-614 MHz, 1 330-1 400 MHz, 1 400-1 427 MHz, 1 610.6-1 613.8 MHz, 1 660-1 670 MHz, 2 690-2 700 MHz, 4 800-4 990 MHz and 4 990-5 000 MHz
* Report ITU-R F.2331 - Sharing and compatibility between international mobile telecommunication systems and fixed service systems in the 470-694/698 MHz frequency range
* Report ITU-R BT.2337 - Sharing and compatibility studies between digital terrestrial television broadcasting and terrestrial mobile broadband applications, including IMT, in the frequency band 470-694/698 MHz
* Report ITU-R BT.2338 - SAB/SAP spectrum use in Region 1 and the implication of a co-primary allocation for the mobile service in the frequency band 694-790 MHz
* During the work of JTG 4-5-6-7 the following studies were also performed:
* Working document towards preliminary draft new Report ITU-R M.[RLAN5GHz.SHAR] (Document 4-5-6-7/715 Annex 34) - Compatibility studies between radio local area network systems and radiodetermination systems in the 5 350-5 470 MHz frequency band
* Working document toward a preliminary draft new Report ITU-R M.[RADAR2900] (Document 4-5-6-7/715 Annex 31) - Studies on the impact of IMT use on radar systems in the frequency band 2 900-3 100 MHz
* Working document towards preliminary draft new Report ITU-R M.[RADAR2700] (Document 4-5-6-7/715 Annex 30) - Studies on the impact of IMT use on radar systems in the frequency band 2 700-2 900 MHz
* Working document for attachment to the JTG 4-5-6-7Chairman's Report (Document 4-5-6-7/715 Annex 28) - Adjacent band compatibility studies of IMT-Advanced systems in the mobile service in the band below 1 518 MHz with respect to systems in the mobile-satellite service in the frequency band 1 518 1 559 MHz
* Working document towards preliminary draft new Report ITU-R M.[BSS-MS] (Document 4-5-6-7/715 Annex 27) - Sharing and compatibility studies between IMT systems and BSS systems in the frequency band 1 452-1 492 MHz
* Working document towards a preliminary draft new Report ITU-R F.[IMT 1 350-1 530 MHz ADJACENT CHANNEL SHARING] (Document 4-5-6-7/715 Annex 26) - Adjacent channel/adjacent band coexistence between IMT systems and fixed service point-to-point links currently operating in 1 350-1 527 MHz
* Working document toward a preliminary draft new Report ITU-R M.[RADAR1300] (Document 4-5-6-7/715 Annex 25) - Studies on the impact of International Mobile Telecommunication use on radar systems in the frequency range 1 300-1 400 MHz

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 RA.769-2 Protection criteria used for radio astronomical measurements
* ECC Report 224 - Long Term Vision for the UHF broadcasting band
* 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

none

# 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 (July 2015)

APT supports additional identification of IMT for the following frequency bands:

* 1 427-1 452 MHz and 1 492-1 518 MHz

APT supports Method A (NOC to the ITU Radio Regulations) for the following frequency bands:

* 470-694/698 MHz, 1350-1400 MHz, 1518-1525 MHz, 1695-1710 MHz, 2 700-2 900 MHz, 3 400-3 600 MHz, 3 600‑3 700 MHz, 3 700-3 800 MHz, 3 800-4 200 MHz, 4 500‑4 800 MHz, 5 350-5 470 MHz, 5 725‑5 850 MHz, and 5 925‑6 425 MHz

APT does not provide common proposals for the following frequency bands:

* 1 452-1 492 MHz, 3 300-3 400 MHz, 4 400-4 500 MHz, and 4 800-4 990 MHz

ATU (July 2015)

ATU supports additional identification of IMT for the following frequency bands

* 1 350-1 400 MHz, 1 427-1 518 MHz (non-mandatory limits on emissions)

NOC:

* 470-694/698 MHz, 1518-1525 MHz, 1695-1710 MHz, 2700-2900, 3300-3400 MHz, 3700-3800 MHz, 3800 - 4200 MHz, 4400 - 4500 MHz, 4500 - 4800 MHz, 4800 - 4990 MHz, 5350 - 5470 MHz, 5725 - 5850 MHz, 5925 - 6425 MHz

No position

* 3400 - 3600 MHz

Arab Spectrum Management Group (November 2013)

MOD Art 5:

* 1452-1492 MHz and 1492-1518 MHz: Identification for IMT, 3400-3600 MHz: Insertion of MS in the ToFA and Identification for IMT MOD 5. 430 A

NOC:

* 470-694/698 MHz (R1), 1350 – 1400 MHz, 1427-1452 MHz, 1518-1525 MHz, 1695-1710 MHz, 2700-2900, 3300-3400 MHz, 3600-3700 MHz, 3700-3800 MHz, 3800 - 4200 MHz, 4400 - 4500 MHz, 4500 - 4800 MHz, 4800 - 4990 MHz, 5350 - 5470 MHz, 5725 - 5850 MHz, 5925 - 6425 MHz

CITEL (August 2015)

MOD Art 5:

* 1427-1518 MHz: Identification for IMT and other provisions (mandatory limits for unwanted emissions -72 dBW/27 MHz for base stations and -62 dBW/27 MHz for user equipment and NOC to No. 5.343)
* 3400-3600 MHz: Mobile service allocation in 3400-3500 MHz and identification for IMT in 3400-3600 MHz

NOC:

* 410-450 MHz, 1164-1215/1215-1300/1559-1610 MHz, 2025-2110/2200-2290 MHz, 2700-2900 MHz, 3600-4200 MHz, 4500-4800 MHz, 5350-5470 MHz and 5850-6425 MHz

NO IAP:

* 470 - 698 MHz

RCC (April, 2014)

The RCC Administrations support identification of additional frequency bands for IMT on the condition of optimizing the use of already identified frequency bands.

The RCC Administrations consider that by 2020 the overall spectrum requirements for IMT systems could be fulfilled for the RCC countries by using 1065 MHz of spectrum including the bands already identified for the IMT. However the spectrum requirements for IMT systems for provision of coverage don’t exceed 220-260 MHz in the bands below 1.5 GHz including the bands already identified for the IMT.

The RCC Administrations consider that the protection of other services that have allocations within the subject bands and adjacent bands should be ensured and the necessity of their development be taken into account when determining possibilities and conditions for allocation of frequency bands to the MS and their identification for IMT.

The RCC Administrations consider that allocation to the MS on a primary basis and identification for IMT as well as identification for IMT of the bands which were already allocated to the MS on a primary basis should not pose any additional constraints to existing services in these bands.

The RCC Administrations support identification of the band 5925-6425 MHz for IMT taking into account results of compatibility studies.

The RCC Administrations do not object to the possible identification of frequency bands 4400-4500 MHz and 4800-4900 MHz for IMT providing that there is a compatibility with existing radiocommunication services.

The RCC Administrations object to the primary allocation to the MS and identification for IMT systems, as well as identification for IMT in the following bands already allocated to the MS on a primary basis, due to their intense use by the incumbent services and possible unacceptable interference to the stations of these services:

- 470-694 MHz used by BS;

- 1350-1400 MHz used by RLS and RNS under No 5.338;

- 1427-1452 MHz, 1452-1492 MHz, 1492-1518 MHz, 1518-1525 MHz used by aeronautical telemetry operating under Nos 5.342 and 4.10;

- 1695-1710 MHz used by meteorological-satellite service (space-to-Earth);

- 2700-2900 MHz and 3300-3400 MHz used by RLS;

- 3600-3700 MHz, 3700-3800 MHz, 3800-4200 MHz and 4500-4800 MHz used by FSS (space-to-Earth).

The RCC Administrations oppose global allocation of the band 3400-3600 MHz to the MS on a primary basis and modification of the allocation conditions for this frequency band, established by No 5.430A.

The RCC Administrations also oppose the primary MS allocation for use by terrestrial broadband systems (e.g. RLAN) in the following frequency bands due to their intense use by existing services and possible unacceptable interference to stations of these services:

- 5350-5470 MHz used by RLS and EESS;

- 5725-5850 MHz used by RLS.

The RCC Administrations are of the view that frequency bands that have not been studied in the ITU-R as well as those bands that have been studied in the ITU-R and excluded from the list of potential candidate frequency bands in accordance with the results of studies should not be considered when making decision on this Agenda item, including the bands 410-430 MHz, 1300-1350 MHz, 1525-1559 MHz, 1626.5-1660.5 MHz, 1668-1695 MHz, 2025-2110 MHz, 2200-2290 MHz, 2900-3100 MHz.

## International organisations

ICAO (June 2015)

To oppose any new allocation to the mobile service for IMT in or adjacent to:

- frequency bands allocated to aeronautical safety services (ARNS, AM(R)S, AMS(R)S);

- frequency bands allocated to RNSS and used for aeronautical safety applications; or

- frequency bands used by fixed satellite service (FSS) systems for aeronautical purposes as part of the ground infrastructure for transmission of aeronautical and meteorological information or for AMS(R)S feeder links, unless it has been demonstrated through agreed studies that there will be no impact on aeronautical services.

Due to the potential for serious impact to aeronautical radar systems, global and/or regional allocations to the mobile service for IMT, and/or identification for IMT, should be opposed in any portion of the potential candidate frequency bands/ranges 1 350 - 1 400 MHz and 2 700 - 2 900 MHz. Allocations/identifications on a country/multi-country basis should be contingent on successful completion of coordination with countries within several hundred kilometres of the IMT proponent country’s border.

Any new allocations to the mobile service for IMT, and/or identification for IMT, in frequency bands/ranges near that used by radio altimeters (4 200 - 4 400 MHz) should be contingent on successful completion of studies to demonstrate that IMT operations will not cause harmful interference to the operation of radio altimeters.

NATO (12 December 2014)



SFCG (August 2015)

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

SFCG does not support consideration of any frequency band that is not included in the list of potential candidate bands as identified in section 1/1.1/4.2 of the CPM report. Out of that list the bands of concern for SFCG are:

* the 1400 – 1427 MHz frequency band, used for EESS (passive) (e.g. Aquarius, SMOS, SMAP missions), whose adjacent frequency bands 1375 – 1400 MHz and 1427 – 1452 MHz are among the candidate bands for IMT identification. Considering current technical studies, SFCG is of the view that any decision made about identification of the frequency bands 1375 – 1400 MHz and 1427 – 1452 MHz for broadband mobile will have to be associated with the inclusion in the RR of the relevant mandatory unwanted emissions limits in the 1400 – 1427 MHz band identified in Report ITU-R RS.2336. Method C1a is supported for the 2 adjacent frequency bands or, alternatively, Method A (no allocation);
* the 1695 – 1710 MHz frequency band, used for meteorological satellite applications. This frequency band is used by all meteorological-satellite systems with Earth stations operated by almost all National Meteorological and Hydrological Services (NMHS) and many other users. This frequency band is essential for providing operational and time-critical meteorological information to the users around the world. For this reason SFCG is opposed to an allocation/identification of the frequency band 1695 – 1710 MHz for terrestrial mobile broadband applications including IMT except if such allocation/identification ensures the protection of MetSat Earth station operations in that band. Method A is supported by SFCG;
* the 3400 – 4200 MHz frequency band, used for Galileo Data Distribution Network and the dissemination of meteorological data by systems like EUMETCast, CMACast and GEONETCast. SFCG supports maintaining sufficient fixed satellite service capacity within the frequency range 3 400-4 200 MHz;
* the 5350 – 5470 MHz active remote sensing frequency band, used for SARs (e.g. Radarsat, GMES Sentinel-1 satellites), and altimeters (e.g. GMES Sentinel-3 satellites, HY-2) and is planned for scatterometers (e.g. SCA on Metop SG). On the basis of the technical studies, which show that RLANs cannot share the band 5350 – 5470 MHz with EESS (active) and that no credible (practical or effective) mitigation technique has been identified, SFCG opposes an allocation to the MS in this band for use by terrestrial mobile broadband applications. Method A is supported (it is the only Method in the CPM Report).

In addition, SFCG opposes any revisiting of the conditions set in No. 5.391 pertaining to the bands 2025 – 2110 MHz and 2200 – 2290 MHz used for space research, earth exploration-satellite and space operation services and therefore objects to any IMT identification in these bands under agenda item 1.1. Studies performed in JTG 4-5-6-7 confirmed the negative conclusions about sharing in these bands.

SFCG also opposes consideration of the 410-420 MHz band, used for proximity and docking operations at the International Space Station. WMO (November2014)

WMO does not object to allocation/identification of the frequency bands 1 350-1 400 MHz and 1 427-1 452 MHz, as appropriate, under conditions that the relevant mandatory unwanted emission levels for the frequency band 1 400-1 427 MHz consistent with Report ITU-R RS.2336 are included in the Radio Regulations (e.g. in Resolution 750 (Rev.WRC‑12)) to ensure the protection of the EESS (passive) systems (i.e. Methods B and/or C (Option C1a) in Draft CPM Report).

WMO opposes allocation/identification for terrestrial mobile broadband applications including IMT of the frequency band 1 695-1 710 MHz and supports no change to the Radio Regulations (i.e. Method A in Draft CPM Report).

WMO opposes allocation/identification for terrestrial mobile broadband applications including IMT of the frequency bands 2 025-2 110 MHz and 2 200-2 290 MHz.

WMO opposes allocation/identification for terrestrial mobile broadband applications including IMT of the frequency band 2 700-2 900 MHz and supports no change to the Radio Regulations (i.e. Method A in Draft CPM Report).

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

WMO is also highly concerned and opposed to an allocation/identification for RLAN in the frequency band 5 350-5 470 MHz, since it will in particular endanger the operation of current and planned EESS systems. Based on the results of the ITU-R sharing studies and affirming the view that any of the current mitigation techniques proposed so far are impracticable to implement and maintain, WMO concurs with the current ITU-R conclusion that proposes no change to the Radio Regulations (i.e. Method A in Draft CPM Report).

## Regional organisations

CRAF (September 2015)

In-band sharing between the RAS and IMT systems will be practically impossible (see Report ITU-R RA.2332). For in-band sharing studies show that separation distances from 500 – 1000 km are required. Therefore allocations leading to RAS-IMT in-band sharing should be avoided.

For adjacent band compatibility separation distances range from a few km for user equipment to up to 200 km for base stations, based on a maximum unwanted emission level of -50 dBm/MHz. These lower maximum unwanted emission levels should be adopted in the relevant standards (e.g. 3GPP and ETSI standards) for IMT equipment. Any allocation immediately adjacent to passive service bands protected by No 5.340 should be avoided. The combination of spurious emissions falling into the passive service band and the filtering needed to operate in-band in the presence of strong emissions immediately outside, would greatly compromise use of the band by passive services.

CRAF most strongly opposes the proposed allocations in or directly adjacent to the bands used by the RAS, i.e., 608-614 MHz, 1 330-1 400 MHz, 4 800-4 950 MHz and 4 950-4 990 MHz, under Methods B and C.

CRAF opposes the proposed allocations immediately adjacent to the passive service bands at 1 400 – 1 427 MHz and 2 690 – 2 700 MHz, under Methods B and C.

For the proposed frequency band 1 427 – 1 452 MHz modification of footnote 5.338A is proposed which refers to an updated Resolution 750, which in turn puts mandatory limits of unwanted emission power in the passive band 1 400 – 1 427 MHz on IMT base stations and IMT mobile stations. Based on these mandatory emission limits Report ITU-R RA.2332 concludes that separation distances of 105 – 140 km are required for IMT base stations operating in the band 1 427 – 1 452 MHz in order to protect radio astronomy stations operating in the band 1 400 – 1 427 MHz..

In the embedded map of Europe the locations of the radio telescopes operating at 1400-1427 MHz and exclusion zones of 140 km are marked to protect them from the IMT emissions at 1427-1452 MHz.

ESA (August 2015)

Supports SFCG positions

EUMETNET (January 2015)

Supports WMO positions

EUMETSAT (April 2013)

The bands 1 675-1 710 MHz, 2 025-2 110 MHz, 2 200-2 290 MHz and 5 350-5 470 MHz should be excluded from the consideration of candidate bands for “Broadband Mobile”.

Any identification of the 1 375-1 400 MHz and 1 427-1 452 MHz bands for broadband mobile will have to be associated with relevant and mandatory protection of the 1 400-1 427 MHz “passive band”

Eurocontrol (May 2015)

European Aeronautical Common Position:

To oppose any new allocation to the mobile service in or adjacent to:

- frequency bands allocated to aeronautical services (ARNS, AM(R)S, AMS(R)S);

- frequency bands allocated to RNSS and used for aeronautical safety applications; or

- frequency bands used by fixed satellite service (FSS) systems for aeronautical purposes as part of the ground infrastructure for transmission of aeronautical and meteorological information or for AMS(R)S feeder links

Unless it has been demonstrated that there will be no impact on aeronautical services.

Due to the potential for serious impacts to aeronautical radar systems, global and/or Regional allocations to the mobile service for IMT, and/or identification for IMT, should be opposed in any portion of the potential candidate frequency bands/ranges 1 350-1 400 MHz and 2 700-2 900 MHz.

Any new allocations to the mobile service for IMT, and/or identification for IMT, in frequency bands/ranges adjacent to that used by radio altimeters (4 200-4 400 MHz) should be contingent on successful completion of studies to demonstrate that IMT operations will not cause harmful interference to the operation of radio altimeters.

## OTHER INTERNATIONAL AND REGIONAL ORGANISATIONS

EBU

The 470-694 MHz band

The EBU does not support the allocation of the 470-694 MHz band to the mobile service under agenda item 1.1.

The 470-694 MHz frequency band is the only UHF spectrum which is allocated worldwide to the Broadcasting Service. Maintaining this worldwide harmonized band for television broadcasting will continue to allow for economies of scale in bringing affordable consumer equipment to market. There is no technical and economic evidence that any other platform can deliver broadcasting content as it is currently provided by DTT. Moreover the programme making and special events (PMSE) sector requires access to UHF spectrum on a shared basis with DTT to create content which is delivered on all broadcasting platforms.

ITU-R studies have shown that sharing and compatibility in this band between IMT systems and broadcasting is very difficult: separation distances of several hundreds of kilometres between broadcasting and IMT stations would be needed to make them share the same band.

According to Report ITU-R BT.2302 ‘Spectrum requirements for terrestrial television broadcasting in the UHF frequency band in Region 1 and the Islamic Republic of Iran’, at least 224 MHz of UHF spectrum for DTT is required for the majority of those Administrations in Region 1 which responded.

Regulatory clarity and certainty are, therefore, required for the DTT platform to thrive, evolve and innovate. Broadcasters, associated industries and the public require such certainty to make significant long term investments into developing technology. In that context, CEPT should ensure that DTT has access to sufficient spectrum to enable services to evolve and innovate.

The 1 452-1 492 MHz band

The EBU supports the flexible use of the band 1 452 - 1 492 MHz for terrestrial mobile/fixed communications networks supplemental downlink (MFCN SDL) and terrestrial digital audio broadcasting within the framework of the MA02revCO07 Special Arrangement.

Such flexible use needs to be reflected in the table of frequency allocations in the Radio Regulations if allocation to the mobile service is added in the band.

Background: In Europe, the use of the frequency band 1 452 - 1 479.5 MHz is governed by the MA02revCO07 Arrangement. This arrangement was designed to facilitate the introduction of T-DAB. The ECC Decision ECC/DEC/(03)02 designated the frequency band 1 479.5 - 1 492 MHz for use by satellite DAB systems.

The use of the 1 452-1 492 MHz band has been subsequently amended to allow the introduction in the band of terrestrial mobile multimedia systems other than T-DAB, in particular those that require a larger bandwidth. This is covered in the ECC Decision (13)013[[7]](#footnote-8) which harmonises the use of the 1 452–1 492 MHz band for terrestrial mobile/fixed communications networks supplemental downlink (MFCN SDL) while allowing individual countries to adapt to specific national circumstances in part of the band for terrestrial broadcasting and other terrestrial applications. The ECC Decision ECC/DEC/(03)02 has subsequently been withdrawn.

The 3 400-4 200 MHz band

The frequency range 3 400 to 42 00 MHz is currently used by broadcasters for programme contribution and programme distribution (including the backbone for DTT networks), nationally, regionally and globally. The use and locations of downlink receivers, used by broadcasters for distribution, are rarely registered as there is usually no requirement to do so. Therefore a global allocation to IMT in these bands will offer no protection to these broadcasters’ operations.

The EC decision C(2014)2798 harmonises the use of the band 3 400 to 3 800 MHz for wireless broadband services. Given the impact on broadcasting of making this spectrum available to IMT, the remaining spectrum from 3 800 to 4 200 MHz is even more important to broadcasters. There is significant use of this spectrum within Europe, and, as is the case between 3 400 and 3 800 MHz, there is widespread use by broadcasters (including European broadcasters) of this spectrum outside Europe.

Studies on technical and regulatory conditions for coexistence between MFCN (Mobile/Fixed Communication Networks) and fixed links and fixed satellite services in the frequency band 3400-4200 MHz are included in Report ITU-R F.2328 and Report ITU-R [FSS-IMT C-BAND DOWNLINK number to be inserted after the meeting of SG4], respectively. The results show that the required separation distances to avoid interference could go up to tens of km or over 100 km in some particular cases.

Taking into account the above, EBU does not support the allocation of the 3800-4200 MHz band to the mobile service.

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-2)
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-3)
3. Report ITU-R M.2072, “World mobile telecommunication market forecast”. [↑](#footnote-ref-4)
4. Report ITU-R M.2074, “Radio aspects for the terrestrial component of IMT-2000 and systems beyond IMT-2000”. [↑](#footnote-ref-5)
5. This value is derived under the assumption of one terminal transmitting at an average output power of 15 dBm (over all Resource Block (RB)) per sector, as shown in the section 3.1.1. It would therefore have to be verified consistently according to these conditions. [↑](#footnote-ref-6)
6. It 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)
7. ECC Decision (13)013: 'The harmonised use of the frequency band 1452-1492 MHz for Mobile/Fixed Communications Networks Supplemental Downlink (MFCN SDL)'. [↑](#footnote-ref-8)