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| Summary:  |
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| Proposal: |
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DRAFT CEPT BRIEF ON AGENDA ITEM 1.10

1.10 to consider spectrum requirements and possible additional spectrum allocations for the mobile-satellite service in the Earth-to-space and space-to-Earth directions, including the satellite component for broadband applications, including International Mobile Telecommunications (IMT), within the frequency range from 22 GHz to 26 GHz, in accordance with Resolution 234 (WRC-12);

# ISSUE

“to complete, for WRC 15, sharing and compatibility studies towards additional allocations to the mobile-satellite service in the Earth-to-space and space-to-Earth directions, within portions of the bands between 22 GHz and 26 GHz, while ensuring protection of existing services within these bands as well as taking into account No. 5.340 and No. 5.149”.]

# Preliminary CEPT position

CEPT sees difficulties, in particular in sharing, for MSS allocations within the frequency range 22-26 GHz and does not support such additional allocations under this Agenda Item. Further to this agenda item CEPT does not see a need for additional spectrum and therefore requests justification for possible spectrum allocations for the MSS in the frequency range 22-26 GHz.

# Background

The frequency range 22 to 26 GHz is allocated to a large number of radio services on primary and secondary basis with numerous major utilisations within CEPT, as given in ERC Report 25. Regarding the allocations to radio services on a primary basis the following services can be found in the Table of Allocations of Article 5 of the Radio Regulations as amended at WRC-15 (see Table 1):

Table 1

|  |  |
| --- | --- |
|  **Frequency Band** |  **Radio Service** |
| 24-24.05 GHz | Amateur |
| 24-24.05 GHz | Amateur-Satellite |
| 22.21-22.5 GHz (passive), 23.6-24 GHz (passive), 25.5-27 GHz (s-E) | Earth Exploration-Satellite |
| 22-23.6 GHz, 24.25-25.25 GHz (Regions 1 and 3), 25.25-27 GHz | Fixed |
| 24.65-24.75 GHz (E-s) (Regions 1 and 3); 24.75-25.25 GHz (E-s) | Fixed-Satellite (Earth-to-space) |
| 22.55-23.55 GHz, 24.45-24.75 GHz, 25.5-27 GHz | Inter-Satellite |
| 22-23.6 GHz; 24.25-25.25 GHz (Region 3), 25.25‑27 GHz | Mobile |
| 22.21-22.5 GHz, 23.6-24 GHz | Radio Astronomy |
| 24.05 24.25 GHz  | Radiolocation |
| 24.25-24.65 GHz (Regions 2 and 3) | Radionavigation |
| 24.65-24.75 (E-s) (Region 2) | Radiolocation-Satellite |
| 22.21-22.5 GHz (passive), 22.55-23.15 GHz (E-s), 23.6-24 GHz (passive), 25.5 -27 GHz (s-E) | Space Research |

For radio services on a secondary basis the Table of Allocations in Article 5 provides the following entries (see Table 2):

Table 2

|  |  |
| --- | --- |
|  **Frequency Band** |  **Radio Service** |
| 24.05-24.25 GHz | Amateur |
| 24.05-24.25 GHz (active) | Earth Exploration-Satellite |
| 25.25-27 GHz (E-s) | Standard Frequency and Time Signal-Satellite |

In addition, it is stated in the Radio Regulations that in making assignments to stations of other services to which the bands 22.01-22.21 GHz, 22.21-22.5 GHz, 22.81-22.86 GHz and 23.07-23.12 GHz are allocated, administrations are urged to take all practicable steps to protect the radio astronomy service from harmful interference. Emissions from spaceborne or airborne stations can be particularly serious sources of interference to the radio astronomy service (see provision 5.149).

In accordance with the NATO Joint civil/military Frequency Agreement 2002 as of 22.08.2005, the frequency band 24.05-24.25 GHz is used for radiolocation purposes and in the frequency band 25.25-27.5 GHz there is a military requirement for planned fixed and mobile systems.

Furthermore, within Europe the frequency range 21.65-26.65 GHz has been designated for short range radar (SRR) applications. The frequency range 21.65-24.25 GHz is available until 30 June 2013 while the frequency range 24.25-26.65 GHz is available until 01 January 2018. The latter date is extended by 4 years for automotive short range radars applications for which type-approval application has been submitted and has been granted before 01 January 2018. Furthermore, the frequency range 24.05-27 GHz has been designated for tank level probing radar applications. The operation of devices of the aforementioned radio applications is permitted through ECC- and EU-Decision. They operate on a non-interference, non-protected basis and must comply with general requirements given in those Decisions.

## Estimated future spectrum requirements in the frequency range 22 to 26 GHz

ITU-R WP 4C develops Report ITU-R M.[ MSS KA\_REQ] on traffic forecasts and estimated spectrum requirements for the future development of broadband applications of the mobile-satellite service in the frequency range 22-26 GHz. However, very little progress has been made so far on this Report.

## General sharing considerations

For the protection of the incumbent services it is necessary to carry out sharing and compatibility studies with characteristics of potential MSS systems to facilitate the identification of frequency bands in the range 22‑26 GHz suitable for additional allocations for the MSS.

When identifying candidate bands for MSS up- and downlinks the following issues may need to be taken into consideration:

Within CEPT a number of ECC Decision, Recommendations and Reports have been developed to harmonise the use of a wide range of applications in the frequency range 22-26 GHz. Furthermore, for the Member States of the European Union a number of Commission Decisions and CEPT Reports have been developed. The relevant documents can be found in the section list of relevant documents.

### Sharing with the Amateur Service

Although only low activity in the amateur service in the frequency bands 24-24.05 GHz and 24.05-24.25 GHz could be observed, there are characteristics of amateur systems for Morse on-off keying in Table 1 and characteristics of amateur analogue voice systems in Table 3 of Recommendation ITU-R M.1732 available which can be used in sharing and compatibility studies. It should be noted that the latter frequency band is allocated to the amateur service on a secondary basis.

In Region 1, and globally for Earth-Moon-Earth communication, the frequency 24.0481 GHz is used as the narrow-band calling frequency. In the United States of America the frequency 24.1921 GHz is used as the narrow-band calling frequency.

No sharing/compatibility studies have been performed yet.

### Sharing with the Amateur-Satellite Service

The frequency band 24-24.05 GHz is allocated to the amateur-satellite service on a primary basis. No activity in this service could be observed in the frequency band 24-24.05 GHz. However, characteristics of amateur-satellite systems in the Earth-to-space direction for different modes of operation can be found in Tables 5 and 6 of Recommendation ITU-R M.1732 which can be used in sharing and compatibility studies. A satellite project is planned in this band in the near future.

No sharing/compatibility studies have been performed yet.

### Sharing with the Earth Exploration-Satellite Service

The frequency bands 22.21-22.5 GHz and 23.6-24 GHz are allocated to the earth-exploration service (EESS) (passive). In the latter frequency band all emissions are prohibited (see provision 5.340 of the Radio Regulations). Both frequency bands are allocated on a primary basis.

The frequency band 25.5 – 27 GHz is allocated to the EESS (space-to-Earth) and is used for data links for EESS payloads. Relevant sharing criteria for this service are given in Recommendation ITU-R SA.1027. Studies have been performed with SRS receiving Earth stations tracking non-GSO SRS satellites and are reported in section 3.2.12. These studies, using protection criteria given in Recommendation ITU-R SA.609 show no compatibility between MSS downlink and SRS. Since the sharing criteria in Recommendation ITU-R SA.1027 are globally more stringent than the protection criteria in Recommendation ITU-R SA.609, it is expected that similar conclusions would apply to the EESS (space to-Earth). With regard to MSS uplinks, it has been shown that separation distances larger than 330 km would be required for SRS. These distances would even be larger when considering EESS.

Furthermore, the frequency band 24.05-24.25 GHz is allocated to the earth-exploration service (active) on a secondary basis.

No explicit sharing/compatibility studies with regard to the EESS have been performed yet.

### Sharing with the Fixed Service

The frequency bands 22-23.6 GHz (23 GHz band) and 24.25-27 GHz (26 GHz band), with the exception of the band 24.25-25.25 GHz in Regions 2, are allocated to the fixed service on a primary basis. Within ITU‑R, a range of recommendations provide information on the characteristics and the protection criteria of the fixed service in the relevant frequency bands. Recommendation ITU-R F.758 contains the appropriate fixed service characteristics for sharing and compatibility studies between fixed service and other services. Recommendations ITU-R F.699, ITU-R F.1245, and ITU-R F.1336 provide fixed system antenna patterns to be used in relevant studies. Recommendations ITU-R F.637 and ITU-R F.748 provide the requisite channelling arrangements for fixed systems between 22-26 GHz.

ERC Technical Recommendation T/R 13-2 recommends a range of channel arrangements for the harmonised use frequencies by paired radio-relay systems with different carrier spacing in the frequency bands 22.0-22.6 GHz and 23.0-23.6 GHz, including those making use of frequencies in the centre-gap in the frequency bands 22.6-22.75 GHz and 22.84-23.0 GHz, as well as unpaired radio-relay systems in the frequency band 22.75-22.84 GHz.

In Europe, but also in a number of countries outside Europe, the frequency bands are extensively used by fixed links to provide the infrastructure requirements for existing 2G and 3G mobile networks and to develop broadband fixed wireless networks. It can be seen from ECC Report 173 that in the frequency bands 22-23.6 GHz and 24.5-26.5 GHz there are many thousands of operational FS links across CEPT. These FS links would limit or preclude operation of MSS earth stations across these bands.

In the case of additional MSS allocations (space-to-Earth) in the frequency bands allocated to the fixed service, the results of a probabilistic analysis shows that hard pfd limit at the Earth’s surface would need to be applied to emissions from the space stations:

Table 3

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Band | Service | Limit in dB(W/m²) for angles of arrival(δ) above the horizontal plane | Reference bandwidth |
|  |  | 0° - 5 ° | 5° - 25° | 25° - 90° |  |
| Relevant band(in the range 22-26 GHz, if allocated) | Mobile-satellite service(space-to-Earth) | -125 | -125 + 0,5(δ - 5) | -115 | 1 MHz |

For an additional allocation to the MSS (Earth-to-space), a separation distance would be required between GSO MES and FS receiving station. In the case where an antenna of a transmitting MES and the antenna or a FS receiving station are pointing towards each other, and there are no any obstacles along the signal propagation path, the separation distances calculated in accordance with Recommendation ITU-R P.452 will reach several tens of km. In the case of AES, the required separation distance will be determined by the visibility limits between the aircraft and FS receiving station. Taking into account the large number of existing FS stations in some frequency bands, such separation distances could make operations of MES/AES impossible in the whole territory of a country in these bands.

The existing provisions of RR can be applied to provide protection for the existing FS stations which are used for data transmission between base stations in the existing 2G and 3G mobile networks from the emissions created by transmitting MSS earth stations. In particular RR No.9.17 of Appendix 7 can be applied for determination of the coordination distances.

Studies up to date do not address MMES and AES operations. In addition, no studies have been performed with regard to interference from FS systems into potential MES.

### Sharing with the Fixed-Satellite Service

The frequency bands 24.65-24.75 GHz in Regions 1 and 3 and 24.75-25.25 GHz in all Regions are allocated to the fixed-satellite service (Earth-to-space) on a primary basis for feeder links in the broadcasting-satellite service (BSS). They are commonly used to provide feeder links for the BSS networks in all Regions and for some multimedia systems in Region 2. Feeder links for BSS are characterized by a relatively small number of large earth stations in known locations. Earth station antennas in the frequency band 24.65-25.25 GHz in Region 1 and earth stations in the frequency band 24.65-24.75 GHz in Region 3 are limited to a minimum diameter of 4.5 m.

The following recommendations and reports are applicable to the FSS in these bands:

* Recommendation ITU-R S.465 – Reference radiation pattern of earth station antennas in the fixed satellite service for use in coordination and interference assessment in the frequency range 2 to 31 GHz.
* Recommendation ITU-R S.1323 – Maximum permissible levels of interference in a satellite network (GSO/FSS; non-GSO/FSS; non-GSO/MSS feeder links) in the fixed satellite service caused by other co-directional FSS networks below 30 GHz.
* Recommendation ITU-R S.1432 – Apportionment of the allowable error performance degradations to fixed-satellite service (FSS) hypothetical reference digital paths arising from time invariant interference for systems operating below 30 GHz.
* Recommendation ITU-R S.1716 – Performance and availability objectives for fixed satellite service telemetry, tracking, and command systems.
* Report ITU-R BO.2071 – BSS system parameters between 17.3 GHz and 42.5 GHz and associated feeder links.

No sharing/compatibility studies have been performed yet.

### Sharing with the Inter-Satellite Service

The frequency bands 22.55-23.55, 24.45-24.75 and 25.25-27.0 GHz are allocated to the inter-satellite service (ISS) on a primary basis.

The bands 22.55-23.15 and 23.15-23.55 GHz are used for transmissions from data relay satellites in geostationary satellite orbits to user spacecraft in non-geostationary satellite orbits performing space research, Earth exploration-satellite service applications, and between satellites in the HIBLEO-2 non-GSO MSS constellation. The inter-satellite service allocation in the band 25.25-26 GHz is limited to the space research and Earth exploration-satellite service applications by RR No. 5.536 and is used for transmissions from user spacecraft in non-geostationary satellite orbit to data relays in geostationary satellite orbits.

Altogether, six sharing scenarios were considered with the following results:

* for the band 22.55-23.15 GHz

The operation of MSS will create a potential for harmful interference to ISS links supporting the SRS and EESS applications. To protect ISS links from MSS downlinks orbital separations of 2-20 degrees would be needed between each of 32 GSO data relay satellite orbital positions and the nearest MSS satellites depending on the required MSS link availability. To protect ISS links from MSS uplinks specific MSS orbital locations would be precluded for each DRS orbital location.

* for the band 23.15-23.55 GHz

The analysis for the HIBLEO-2 ISS links in the frequency band 23.15-23.55 GHz shows the potential for very large I/N values to occur during co-frequency interference events in which an HIBLEO-2 satellite is within the main beam of the GSO MSS user terminal transmission.

The operation of the MSS will create a potential for harmful interference to ISS links supporting the SRS and EESS applications. To protect ISS links from MSS downlinks orbital separations ranging from 2 to 20 degrees would be needed, depending on the required MSS link availability ranging from 99% to 99.9%, between each of 32 GSO data relay satellite orbital positions and the nearest MSS satellites. To protect ISS links from MSS uplinks specific MSS orbital locations would be precluded for each DRS orbital location.

The protection of stations in the inter-satellite service connected to GSO networks is ensured by application of the current provisions of RR Article 9 (in particular RR No. 9.7) and also by meeting the e.i.r.p. limits. (Note: Orbital separations ranging from 2 to 20 degrees would be needed depending on the required MSS link availability ranging from 99% to 99.9%.

Further, currently provisions of RR Article 9 do not provide coordination procedures covering geostationary satellites with non-GSO to non-GSO inter-satellite service links. However, to provide compatibility of the MSS in the frequency band 23.15-23.55 GHz with the receiving station of ISS in the direction NGSO to NGSO there e.i.r.p. limits shall be met.

* for the band 25.25-25.5 GHz

In order to protect ISS links supporting the SRS and EESS applications, a minimum orbital separation of +/-8 degrees is required between each of 32 GEO data relay orbital locations and any MSS satellite, resulting in only 97 degrees of available orbital arc.

The protection of stations in the inter-satellite service is ensured by application of the current provisions of RR Article 9 (in particular RR No. 9.7). (Note: +/- [7/8] degrees of orbital arc separation is needed around each of the 32 DRS satellite locations, leaving 97 degrees of available orbital arc).

It should be noted that currently the frequency band 66-71 GHz is allocated, inter alia, both to ISS and MSS on a primary basis, although no sharing study has ever been performed between both services.

### Sharing with the Mobile Service

The frequency ranges 22-23.6 GHz and 25.25-27 GHz are allocated to the mobile service on a primary basis in Regions 1 to 3, while the frequency range 24.25-25.25 GHz is allocated to the mobile service on a primary basis in Region 3 only. For the protection of the mobile service the following ITU-R Recommendations and Reports are applicable:

* Recommendation ITU-R F.758 “System parameters and considerations in the development of criteria for sharing or compatibility between digital fixed wireless systems in the fixed service and systems in other services and other sources of interference”;
* Recommendation ITU-R F.1102 “Characteristics of fixed wireless systems operating in frequency bands above about 17 GHz”;
* Recommendation ITU-R F.1336 “Reference radiation patterns of omnidirectional, sectoral and other antennas in point-to multipoint systems for use in sharing studies in the frequency range from 1 GHz to about 70 GHz”;
* Recommendation ITU-R F.1404 “Minimum propagation attenuation due to atmospheric gases for use in frequency sharing studies between systems in the fixed service and systems in the broadcasting-satellite, mobile-satellite and space science services”;
* Recommendation ITU-R F.1704 “Characteristics of multipoint-to-multipoint fixed wireless systems with mesh network topology operating in frequency bands above about 17 GHz”;
* Report ITU-R F.2086 “Technical and operational characteristics and applications of broadband wireless access in the fixed service”.
* Furthermore, Recommendation ERC/REC 25-10 identifies the frequency range 21.2-24.5 GHz with the preferred sub-bands 21.2-21.4 GHz, 22.6-23.0 GHz and 24.25-24.5 GHz for the use by cordless cameras.

For an additional MSS allocation (space-to-Earth) in the frequency band 23.15-23.55 GHz the protection of the receiving stations of land mobile service is ensured by meeting the pfd limits:

Table 4

| Frequency band, GHz  | Service  | Limit in dB(W/m²) for anglesof arrival (δ) above the horizontal plane  | Reference bandwidth  |
| --- | --- | --- | --- |
| 0°–5° | 5°–40° | 40°–90° |
| 23.15–23.55 | Mobile satellite (space-to-Earth ) | –121 + 0.8\*δ | –125 + 11\*log(δ) | –107 | 1 MHz  |

In the frequency band 25.25-25.5 GHz, the estimation results show that a distance of 1.5 to 40 km is required to protect a receiving mobile station from a transmitting MES. The application of RR No. 9.17 provides protection for the receiving stations of the mobile service from the transmitting MES in this band.

No explicit sharing/compatibility studies for other frequency bands have been performed yet.

### Sharing with the Radio Astronomy Service

The frequency bands 22.21-22.5 GHz and 23.6-24 GHz are allocated on a primary basis to the radio astronomy service (RAS). Furthermore RR No. 5.149 urges administrations when making assignments to stations of others radio services in the frequency bands 22.01-22.21 GHz, 22.21-22.5 GHz, 22.81-22.86 GHz and 23.07-23.12 GHz to take all practicable steps to protect the RAS from harmful interference in these bands. Member States shall also recognise that no emissions are allowed in the frequency band 23.6-24 GHz (see RR 5.340).

The frequency band 22.21-22.5 GHz is used by the RAS for both continuum observations as well as spectroscopic line observations of the water molecule, whose spectroscopic band in this frequency range is one of the most important for radio astronomy (see Recommendation ITU-R RA.314, Table 40 and the List of Important Spectral Lines of the International Astronomical Union). The water molecule transitions in this band are observed using both single-dish and VLBI techniques.

Recommendation ITU-R RA.769 specifies the protection criteria for radio astronomical observations and gives threshold levels of detrimental interference for primary radio astronomy bands.

For the frequency bands 22.21-22.5 GHz and 23.6-24 GHz, the pfd threshold limit given in Recommendation ITU‑R RA.769 for single-dish line observations made using a channel bandwidth (one of the spectrometer channels) of 250 kHz is –162 dB(W/m²) and -161 dB(W/m²), respectively. Pfd threshold limits of –146 dB(W/m²) and -147 dB(W/m²) are defined for single-dish continuum observations in these bands, across the entire 290 MHz bandwidth or 400 MHz, respectively.

VLBI observations, where signals from widely separated antennas are recorded and correlated after the observations, are much less susceptible to local interference. This is reflected in the threshold pfd level for VLBI observations in this band, –129 dB(W/m²), for a bandwidth of 250 kHz. However, within the footprint of a satellite there may be several radio astronomy stations that may experience the same interference.

For detrimental interference from non-GSO systems, the protection criteria and the relevant methodologies are described in Recommendations ITU-R RA.769 and ITU-R RA.1513, as well as in Recommendation ITU-R S.1586 for FSS systems and in Recommendation ITU‑R M.1583 for MSS and RNSS systems.

The thresholds of detrimental interference levels to the RAS as defined and calculated in Recommendation ITU-R RA.769 are protection criteria above which radio astronomical data are degraded and may be eventually obliterated. In principle, under rather idealised circumstances, if these levels are very slightly exceeded then it may be possible to compensate at the radio astronomy observatory by increased observing time. In doing so, the channel capacity of the telescope is reduced, with a corresponding reduction in scientific throughput. If the level of interference, under the assumptions of Recommendation ITU-R RA.769 (e.g. antenna performance, etc.), becomes 10 dB or more above the Recommendation ITU-R RA.769 definition, then increased observing time will no longer be effective in ensuring that valid scientific data are provided to the scientist. The radio astronomy station will be unable to operate in an affected frequency band, and its ability to provide service will have been lost if no appropriate mitigation techniques can be applied.

No sharing/compatibility studies have been performed yet.

### Sharing with the Radionavigation Service

The frequency band 24.25-24.65 GHz is allocated to the radionavigation service in Regions 2 and 3.

No sharing/compatibility studies have been performed yet.

### Sharing with the Radiolocation Service

The frequency band 24.05-24.25 GHz is allocated to the radiolocation service in Regions 2 and 3.

No sharing/compatibility studies have been performed yet.

### Sharing with the Radiolocation-Satellite Service

In Region 2 the frequency band 24.65-24.75 (Earth-to-space) is allocated the radiolocation-satellite service on a primary basis.

No sharing/compatibility studies have been performed yet.

### Sharing with the Space Research Service

The frequency bands 22.12-22.5 GHz and 23.6-24 GHz are allocated to the space research service (SRS)(passive) on a primary basis while the frequency band 22.55-23.15 GHz (Earth-to-space) and 25.5-27 GHz (space-to-Earth) are allocated to the SRS.

The allocations to the SRS (Earth-to-space) the frequency band 22.55-23.15 GHz and 25.5 -27 GHz (space-to-Earth) support various missions including referenced lunar missions, Lagrangian missions and other near-Earth space research missions. The number of SRS earth stations transmitting in this band will be small. Rather than building new SRS earth stations, upgrading selected existing SRS earth stations will predominate. The upgrade of earth stations depends on a number of factors, including the type of mission to be supported. The number of SRS earth station sites capable of supporting referenced lunar and/or L2 missions is not expected to exceed ten to fifteen on a global basis over the next few decades.

For the specific case of a mobile satellite service uplink into a space research service earth station receiver operating with a satellite in non-geostationary orbit, aggregate I/N exceeded protection criteria by 23dB. This case involves interference from one earth station into another. In such a case, a coordination zone can be calculated to be larger than 330 km to avoid interference from a MSS user terminal into an SRS earth station.

In the two specific cases of mobile satellite service downlinks from satellites operating in geostationary satellite orbit into space research service earth stations receiving wanted transmissions from the geostationary and non-geostationary satellite orbits, the interference criterion given in Recommendation ITU-R SA.1155 was exceeded by 30 dB and 10 dB respectively. In the specific case of interference to space research service satellite downlinks from geostationary satellite orbits, harmful interference could only be avoided if the space research service and mobile satellite service satellites maintained an orbital separation on the order of 31 degrees. In the specific case of interference to space research service downlinks from non-geostationary satellite orbits, no methods for avoiding exceedance of the interference criterion could be identified.

### Sharing with the Standard Frequency and Time Signal-Satellite Service

The frequency band 25.25-27 GHz is allocated to the standard frequency and time signal-satellite on a secondary basis.

No sharing/compatibility studies have been performed yet.

## Preliminary Conclusions on Sharing and Compatibility Issues

* Passive bands: An allocation to the MSS in the frequency band 23.6-24 GHz is not feasible because of the passive allocations to several radio services. This band needs also to be protected from out-of-band emissions;
* Fixed Service: The results of studies indicate that with an appropriate pfd-hard limit sharing would be feasible in the space-to-Earth direction without causing harmful interference to the FS. The operation of MES will require separation distances up to several tens of kilometres. To avoid interference impacts from FS transmitting stations to the MSS space station an FS antenna off-pointing from geostationary orbit will required. RR No. 21.2 has envisaged small off-point of FS transmitting antenna from geostationary orbit only in the frequency band 25.25-27.5 GHz. Taking into account that the ECC Report 173 shows an extensive use of the frequency bands by the fixed service without the requirement to avoid pointing to geostationary orbit during installation (in bands other than 25.25-26.00 GHz band), interference to geostationary MSS receiving stations will be significant. In order to eliminate or reduce such interference, already installed FS antennae would be required to be off-pointed from geostationary orbit that is practically unfeasible. (Ed. Note: in the frequency band 25.25-25.5 GHz only 201 terrestrial station are notified in the MIFR of the ITU.)
* Radiolocation service: MES transmissions would have to protect the radiolocation service in the frequency band 24.05-24.25 GHz and it would not be compatible with fixed service in the frequency band 24.25-24.45 GHz.
* Fixed-satellite service: FSS (Earth-to-space) transmissions and FS operate across the frequency band 24.65-25.25 GHz, these preclude MSS at least for Earth-to-space transmissions.
* Inter-satellite service: Extremely difficult compatibility issues, co-ordination and operation against NGSO Inter-satellite links in the frequency bands 22.55-23.15 GHz, 24.45-24.75 GHz, and 25.5-26 GHz. The results of the studies indicate that MSS operations in the bands 22.55-23.15 GHz and 25.5-26 GHz will create a potential for harmful interference to ISS links supporting the SRS, EESS, and non-GSO MSS applications. The results of studies with regard to MSS uplink operations indicate that in the bands 23.15-23.55 GHz it will create a potential for harmful interference to ISS links supporting the SRS, EESS, and non-GSO MSS applications. Compatibility of MSS (space-to-Earth) in the frequency band 23.15-23.55 GHz can be provided by application of the current provisions of RR Article 9 and also by meeting the e.i.r.p. limits to protect NGSO to NGSO ISS links. Compatibility of MSS (Earth-to-space) in the frequency band 25.25-25.5 GHz can be provided by application of the current provisions of RR Article 9.
* Earth exploration-satellite service and space research service: In the band 22.55-23.15 GHz, sharing with the space research service (Earth-to-space) would not be feasible. Harmful interference from the mobile satellite service would exceed the space research service protection criteria by as much as 31.6 dB, and harmful interference from the space research service would exceed the interference threshold for the mobile satellite service by as much as 48.2 dB. In the specific case of mobile satellite service earth station uplinks, no methods could be identified for avoiding exceedance of the interference criteria for space research service receivers on non-geostationary satellites. Harmful interference from the mobile satellite service would exceed the space research service protection criteria by as much as 30 dB. In the specific case of harmful interference to space research service downlinks from non-geostationary satellite orbits, no methods could be identified for avoiding exceedance of the interference criteria. See also passive bands above. In the band 25.5-26 GHz, sharing with the Earth exploration-satellite and space research services (space-to-Earth) would not be feasible.
* Radio astronomy service: The RAS in the frequency band 22.21-22.5 GHz needs to be protected in accordance with RR No. 5.149. See also passive bands above.

Therefore, considering the existing extensive use and the expected future use of the current allocations and the incompatibilities with current services, the likely hood for any practical MSS allocations in the bands 22-26 GHz, is very low. The initial assessment to CEPT is that it should not support MSS allocations in these bands but it will continue to review any new ITU-R studies from other regions to assess the potential impact on existing services within CEPT)…

# List of relevant documents

ITU documentation

4C/TEMP/119, 4C/TEMP/120 and 4C/TEMP/121 of the 13th meeting of Working Party 4C

4C/239 Report of the 12th Meeting of Working Party 4C (incl. Annexes 06, 07, 12 and 13)

4C/173 Report of the 11th Meeting of Working Party 4C (incl. Annexes 08, 09, 14 and 15)

4C/91 Report of the 10th Meeting of Working Party 4C (incl. Annexes 06, 09, 11 and 12)

4C/39 Report of the 9th Meeting of Working Party 4C e

CEPT and/or ECC documentation

CEPT Report 38 in response to the EC Permanent Mandate on the ”Annual update of the technical annex of the Commission Decision on the technical harmonisation of radio spectrum for use by short range devices” (as of 11 March 2011)

CEPT Report 37 Report from CEPT to the European Commission in response to Part 2 of the Mandate on “Automotive Short-Range Radar systems (SRR)” (as of 25 June 2010)

CEPT Report 36 Report from CEPT to the European Commission in response to Part 1 of the Mandate on ”Automotive Short Range Radar systems (SRR)” (as of 25 June 2010)

ECC/DEC/(11)02 on industrial Level Probing Radars (LPR) operating in frequency bands 6 - 8.5 GHz, 24.05 - 26.5 GHz, 57 - 64 GHz and 75 - 85 GHz (as of 11 March 2011);

ECC/DEC/(04)10 The frequency bands to be designated for the temporary introduction of Automotive Short Range Radars (SRR) (as of 1 June 2012);

ECC/REC/(11)01 Guidelines for assignment of frequency blocks for fixed wireless systems in the bands 24.5-26.5 GHz, 27.5-29.5 GHz AND 31.8-33.4 GHz

ERC/REC 25-10 Frequency ranges for the use of temporary terrestrial audio and video SAP/SAB links (Incl. ENG/OB);

ERC/REC 70-03 (Tromsø 1997 and subsequent amendments) Relating to the use of short range devices (SRD) (as of 07 May 2012)

REC T/R 13-02 Preferred channel arrangements for fixed service systems in the frequency range 22.0 - 29.5 GHz;

ECC Report 173 Fixed service in Europe; current use and future trends post 2011, March 2012

ERC Report 25 The European table of frequency allocations and applications in the frequency range 9 kHz to 3000 GHz (ECA Table), Lille 2011

FM38(2005)INFO2 NATO Joint civil/military Frequency Agreement (NJFA) 2002

EU documentation

Commission Implementing Decision 2011/485/EU of 29 July 2011 amending Decision 2005/50/EC on the harmonisation of the 24 GHz range radio spectrum band for the time-limited use by automotive short-range radar equipment in the Community (OJ L 198, 30.07.2011, p. 71);

Commission Decision 2010/368/EU of 30 June 2010 amending Decision 2006/771/EC on harmonisation of the radio spectrum for use by short-range devices (OJ L 166, 01.07.2010, p. 33);

Commission Decision 2006/771/EC of 9 November 2006 on harmonisation of the radio spectrum for use by short-range devices (OJ L 312, 11.11.2006, p. 66);

Commission Decision 2005/50/EC of 17 January 2005 on the harmonisation of the 24 GHz range radio spectrum band for the time-limited use by automotive short-range radar equipment in the Community (OJ L 21, 25.01.2005, p. 15);

# Actions to be taken

* Justification for additional spectrum for the MSS in the frequency band 22-26 GHz;
* Identification of candidate bands, if necessary;
* Sharing studies to demonstrate the protection of incumbent services)…

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

## European Union (date of proposal)

N/A

## Regional telecommunication organisations

APT (July 2013)

The APT Members are of the view that the frequency requirements for the 22-26 GHz band should be clearly identified for the potential MSS allocation taking into account current allocations for MSS above 19 GHz. The requirements and additional allocations should be based on the compatibility studies in order to adequately protect the existing services and their future developments.

ATU (date of proposal)

N/A

Arab Group (December 2013)

* Not Supporting the allocations to the MSS within the frequency range from 22 GHz to 26 GHz because most of the frequency bands in this range are allocated to terrestrial fixed and mobile services on primary basis, the frequencies of this range are heavily used by terrestrial services.
* Follow up the current studies
* The UAE will conduct a sharing studies and submit to WP4C

CITEL (April 2013)

CAN/USA

Believes that existing MSS allocations at Ka-band are sufficient to accommodate the needs of MSS.

Is of the view that sharing with existing allocated services would be difficult.

B/USA

Before WRC-15 considers any potential allocation to the MSS, the study results must show that MSS is compatible with the incumbent services and does not place undue constraints on those services.

RCC (November 2013)

The RCC Administrations consider that an additional spectrum allocation to the MSS in the Earth-to-space and space-to-Earth directions, including the satellite component for broadband applications, including IMT, within the frequency range from 22 GHz to 26 GHz is possible only if the compatibility with existing terrestrial and space services is ensured in the same and adjacent frequency bands (taking into account RR Nos. 5.149 and 5.340 RR), and if such allocations to MSS do not impose additional constraints on the existing services. However, the level of unwanted emissions from earth and space stations in the MSS in the frequency bands 22.01-22.21 GHz; 22.21-22.5 GHz; 22.81-22.86 GHz and 23.07-23.12 GHz shall be limited to ensure the protection of the EESS (passive), SRS (passive) and radio astronomy service.

The RCC Administrations consider that when determining additional spectrum requirements for the MSS, it is necessary to take into account already existing allocations to the MSS in the Ka-band.

## International organisations

IATA (date of proposal)

N/A

ICAO (November 2013)

To oppose any new mobile satellite service allocation unless it has been demonstrated through agreed studies that there will be no impact on aviation use in the 24.25 – 24.65 GHz frequency band in Regions 2 and 3.

IMO (date of proposal)

N/A

NATO (December 2013)

[TBD]

SFCG (July 2013)

SFCG supports the protection of all the space science bands in the range 22-26 GHz considered under this AI. No new allocations to the MSS should be made unless acceptable sharing criteria with the affected space science service are developed.

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

* The SRS Earth-to-space allocation in the band 22.55 – 23.15 GHz
* The Inter-satellite band 22.55 – 23.55 GHz and the first 750 MHz of the Inter-satellite band 25.25 – 27.5 GHz.
* The EESS (passive) band 23.6-24 GHz (purely passive, but to be protected against unwanted emissions taking into account interference apportionment and the levels contained in ITU Resolution 750 (Rev. WRC-12))
* The first 500 MHz of the EESS/SRS space-to-Earth band 25.5 – 27.0 GHz

Note: The lack of clarity on the technical parameters of these new MSS systems is another element of concern for SFCG

WMO (January 2013)

WMO opposes new MSS allocations in the 23.6-24 GHz and 25.5–26.0 GHz frequency ranges. Allocations to MSS in other portions of the 22-26 GHz frequency range will have to be associated with the adequate protection of EESS applications from emissions of MSS systems.

## Regional organisations

CRAF (January 2013)

CRAF supports the protection of all of the RAS bands in the range 22-26 GHz considered under this AI. No new allocations to the MSS should be made unless acceptable compatibility criteria with the RAS are developed and included in appropriate regulation.

ESA (date of proposal)

Same as SFCG

EUMETNET (November 2012)

EUMETNET does not support MSS allocations in the 22-26 GHz range. However, should such allocations be considered, EUMETNET urges that compatibility with meteorological and Earth Observations related applications be assessed and adequate protection be ensured.

Eurocontrol (date of proposal)

N/A