The WRC series
Enabling IMT at WRC-19

November 2018

Agenda Item 1.13 at WRC-19 seeks to identify new mmWave spectrum above 24 GHz for IMT. Certain bands, such as 26 GHz and the 40 GHz range, already have strong multi-regional support while other bands also have significant traction such as 66-71 GHz. The large amount of spectrum required for 5G means that the range 45.5-50.2 GHz also needs to be considered. Global harmonisation should be possible in these three bands and realising their full potential will unlock the best performance from mmWave IMT.

The ITU-R has carried out sharing and compatibility studies between IMT and other services allocated in the bands being considered. Some of these have indicated that extra conditions are necessary for certain services, in particular EESS/SRS (passive). However, most of the studies for other services have shown that there is already sufficient protection margin between the level of emissions expected from an IMT network and the level that could potentially cause interference. In these cases, no extra conditions are necessary.

The Draft CPM Report for Agenda Item 1.13 is now a complex compendium of many possible conditions and options. It is possible, through the current text, to identify a band for IMT on paper, but effectively render it unusable in practice. There is a risk at WRC-19 that, unless only the optimal technical conditions are applied, IMT use of the bands will be severely restricted.

Where conditions are necessary to protect other services, they should be applied. Where conditions have been found by the technical studies to be unnecessary, it will be harmful to 5G deployment to impose them without reason.

Checklist

The ITU-R technical and regulatory work has prepared the ground for finding the optimal conditions for IMT at WRC-19.

- **Sharing studies between IMT and various services have been carried out in the range 24.25-86 GHz.**
- **Results for sharing with FSS, as well as with both active and passive space science services have been finalised.**
- **Sharing with FSS is feasible and no technical or operational conditions on IMT are necessary.**
- **Compatibility with passive services can be ensured by using existing or new regulations depending on the band under consideration.**
- **For other space science services, national or bilateral coordination is sufficient.**

26 GHz

What: Identifying 24.25-27.5 GHz for IMT

Why: Potential for global harmonisation to boost mmWave 5G leading to early deployment.

How: For the 26 GHz band (24.25-27.5), support for IMT starts with Method A2, Alternative 2: identify the band for IMT in the mobile service.

Beyond this, a number of conditions are potentially available. Condition A2a for protection of passive services in the adjacent band at 23.6-24 GHz is the one necessary condition for this band. In this case, unwanted emissions limits will be imposed on IMT networks through Resolution 750 (Rev. WRC-15).

Beyond this, technical studies have shown other conditions are not needed for a variety of reasons. Imposing additional unnecessary conditions would be harmful to broadband development in these frequencies.

Summary:

- **The band has multi-regional support**
- **Optimal conditions are needed to protect passive services; other technical conditions are unnecessary; excessive conditions will hinder 5G.**
- **The 26 GHz band is adjacent to 28 GHz, allowing wide harmonisation, economies of scale and early device availability**

Method A2 Alternative 2

Condition	A2a: EESS/SRS passive	A2b: EESS 50 GHz (second harmonic)	A2c: EESS/SRS (s-E) earth stations	A2d: FSS (E-s) transmitting earth stations	A2e: ISS/FSS (E-s) space stations	A2f: RAS	A2g: General
Option	1: Resolution 750	3: No conditions	4: No conditions	4: No conditions	9: No conditions	3: No conditions	4: No conditions
Reason	IMT emission limits necessary	Existing RRs sufficient; large frequency separation (>22 GHz); would create complex precedent	Small coordination distances can be addressed on national basis	The coordination between IMT and FSS ES can be addressed on national or bilateral basis using existing procedures	Studies show large margins	Small coordination distances required, to be dealt with on a national or bilateral basis	No need for any pre-requisite conditions as suggested under this Condition

66-71 GHz

What: Identifying 66-71 GHz for IMT, on a technology-neutral basis

Why: Additional spectrum for 5G opens the door for more use cases and leaves room for future growth

How: 66-71 GHz will become an important 5G band and has widespread support (it is expected to be used primarily on a licence-exempt basis). The GSMA supports the identification of the band 66-71 GHz for IMT and that it should be available for use by 5G systems with flexibility to allow different licensing regimes, enabling both IMT and non-IMT technologies.

Method J2 Alternative 2

Condition	J2a: MGWS / WAS	J2b: Footnote 5.553	J2c: Multiple services
Option	1: Invite ITU-R to develop Recs. and Reports to ensure efficient use	1: Remove 66-71 GHz from footnote	3: No condition necessary
Reason	Band may be used for both IMT and MGWS/WAS systems	Reference of the band in this FN makes use by Land Mobile service secondary to space services and IMT does not operate on secondary basis	No such prerequisite conditions are necessary, and those proposed under Options 1 and 2 are not implementable or enforceable

40 GHz range

What: Identifying the whole range from 37 to 43.5 GHz for IMT

Why: Provides necessary capacity for 5G and identifying the whole range offers Administrations flexibility

How: The 40 GHz range (37-43.5 GHz) incorporates the following three bands under consideration for Agenda Item 1.13. It is important to identify the full range so as to provide the flexibility for administrations to utilise suitable parts of the globally harmonised range for IMT within their country.

- 37-40.5 GHz **Method C2 Alternative 2 is required**
- 40.5-42.5 GHz **Method D2 Alternative 2 is required**
- 42.5-43.5 GHz **Method E2 Alternative 2 is required**

With all three bands being part of the same tuning range, it is important for the widest possible harmonisation to consider all three together. Countries can then pick and choose which part of the range is best suited to their own needs for 5G and which for other allocatec services. A globally harmonised band can be achieved if this approach is taken. Some regional groups have supported this through proposing the identification of the whole band, while others have proposed identifying those parts which they plan to use while not objecting to the other parts of the range being identified.

Summary:

- **Identifying the whole range (37-43.5 GHz) sets the stage for a globally harmonised tuning range allowing countries to pick and choose those parts they wish to make use of.**
- **Studies show unwanted emissions are within acceptable limits, and no technical conditions to protect other services are required.**

Method C2 Alternative 2

Condition	C2a: EESS/SRS passive (36-37 GHz)	C2b: FSS (s-E) earth stations	C2c: SRS (s-E) earth stations (37-38 GHz)	C2d: SRS/EESS (E-s) earth stations	C2e: General
Option	4: No conditions required	6: No conditions required	3: No conditions required	2: No conditions required	3: No conditions required
Reason	EESS protection criteria not exceeded; 36-37 GHz shared with active services; Resolution 752 limits adequate	Sharing is feasible with very small separation distances and any HDFSS under 5.516B can be addressed at national/regional level also taking into account FS	IMT coordination with SRS receive ES is a national matter	Existing procedures for coordination of EESS / SRS ES are sufficient	All services are co-primary, with equal status, and their coexistence should be based on sharing among these services without preconditions in the RRs

Method D2 Alternative 2

Condition	D2a: FSS (s-E) earth stations	D2b: RAS	D2c: General
Option	5: No conditions required	3: No conditions required	3: No conditions required
Reason	Sharing is feasible and any HDFSS use under RR 5.516B in R2 countries can be addressed at national/regional level taking into account FSS and IMT needs	Can be dealt with on national or bilateral basis	Since sharing is feasible, no other provisions are necessary

Method E2 Alternative 2

Condition	E2a: FSS (s-E) earth stations	E2b: RAS	E2c: General
Option	7: No conditions required	3: No conditions required	4: No conditions required
Reason	No mandatory technical conditions required since sharing is feasible with large margin	RAS protection from co-primary mobile service is addressed by RR 5.149 and no additional measures are needed. IMT identification does not impact RR 5.149	No need for any provisions for sharing among the services with co-primary allocations

Compatibility with EESS (passive)

26 GHz

Ensuring compatibility with EESS (passive) in the adjacent band at 23.6-24 GHz is an important issue. EESS systems need to be protected with appropriate unwanted emissions limits and Resolution 750 (Rev. WRC-15) amended accordingly. However, highly onerous limits on IMT which are detrimental to broadband growth continue to be supported in some regions. These would be stifling for IMT in the 26 GHz band. Such rules would prevent mobile operators from building effective 5G networks in a large tranche of the 26 GHz band. An optimal limit needs to be applied which is both protective of EESS and allows IMT to function.

The GSMA's study on this issue is TG 5/1 Input Document 350: **https://www.itu.int/md/R15-TG5.1-C-0350/en.** This shows that values of -32 to -35 dB(W/200 MHz) can be considered for IMT-2020 base stations and still protect EESS passive services. Some regions have shown support for limits under which IMT systems can flourish and multi-regional support has been agreed for the following limits:

- **-32 to -37 dB(W/200 MHz) for IMT BS**
- **-28 to -30 dB(W/200 MHz) for IMT UE**

When implementing IMT every dB counts. The value of -37 dB(W/200 MHz) for unwanted emissions limit from IMT-2020 base stations would still have adverse implications for 5G networks and services. However, a value in the range -32 to -37 dB(W/200 MHz), which is supported by other compatibility study results from both administrations and industry, would give adequate protection for passive services in the adjacent band.

40 GHz

In the 40 GHz range, the band 37-40.5 GHz has an adjacent band at 36-37 GHz which is allocated to EESS (passive). Unlike the 23.6-24 GHz band, however, this band is already shared with active services, with sharing conditions established in Resolution 752 (WRC-07). Studies in TG 5/1 indicate that the level of unwanted emissions does not exceed the relevant EESS protection criterion, and that there is no need to tighten IMT unwanted emissions limits beyond the current limits in 3GPP specifications.

Sharing with FSS and ISS

Sharing studies between IMT and FSS (Earth-to-space) and ISS in the 26 and 40 GHz bands, conducted as part of the work of TG 5/1, give clarity on co-existence between these services. These studies show there is a sufficient protection margin between the level of emissions that would be expected from a 5G network and the level that could potentially cause interference to FSS/ISS space stations.

For the 26 GHz band, in the case of aggregate long-term interference from IMT stations into FSS space stations in a geostationary orbit, results showed that the calculated I/N ranged from -40.62 dB to -19 dB for the baseline case, all below the protection criteria agreed by WP 4A. When considering short term interference, all studies provided results that showed maximum I/N values ranging from -28.3 dB to -15.8 dB for the baseline case, which again satisfy the agreed short-term protection criteria. Similar results are found for 42.5-43.5 GHz.

Despite this, certain conditions are nevertheless being proposed which include EIRP mask (based on elevation angle), TRP limit per base station, and/or restrictions on base station antenna tilting. Any such conditions would have a negative impact on the deployment, operation and performance of 5G networks and services. The positive margins in the results of sharing studies show that they are not required and 'no condition required' should be applied in this case.

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