

WRC-27 Agenda Item 1.13 India preparations

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Group Function - Standards & Industry Initiatives

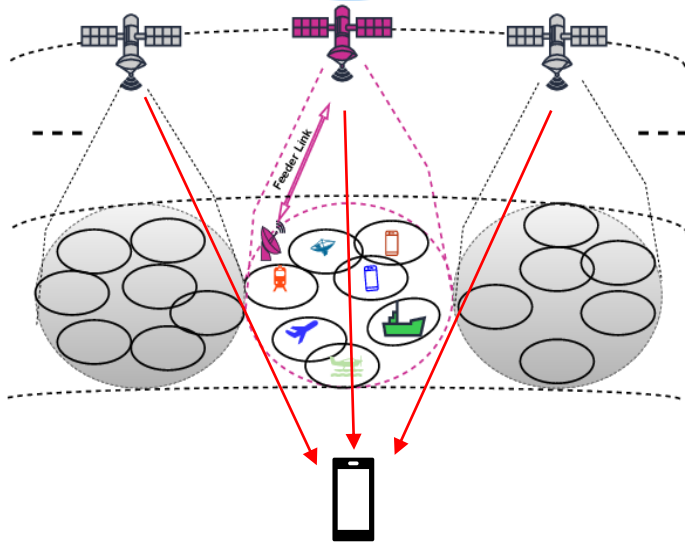
Protection of terrestrial IMT from DC-MSS-IMT



Define proper regulatory measures (pfd/epfd limits) based on IMT protection criterion and considering aggregate interference from multiple satellites in DC-MSS-IMT systems

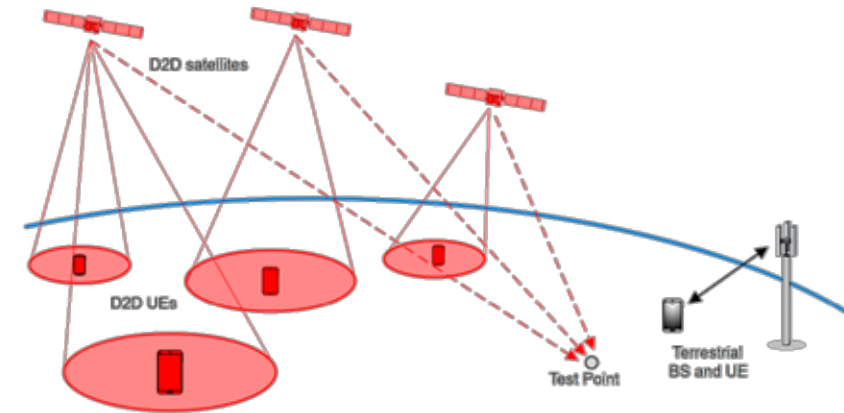
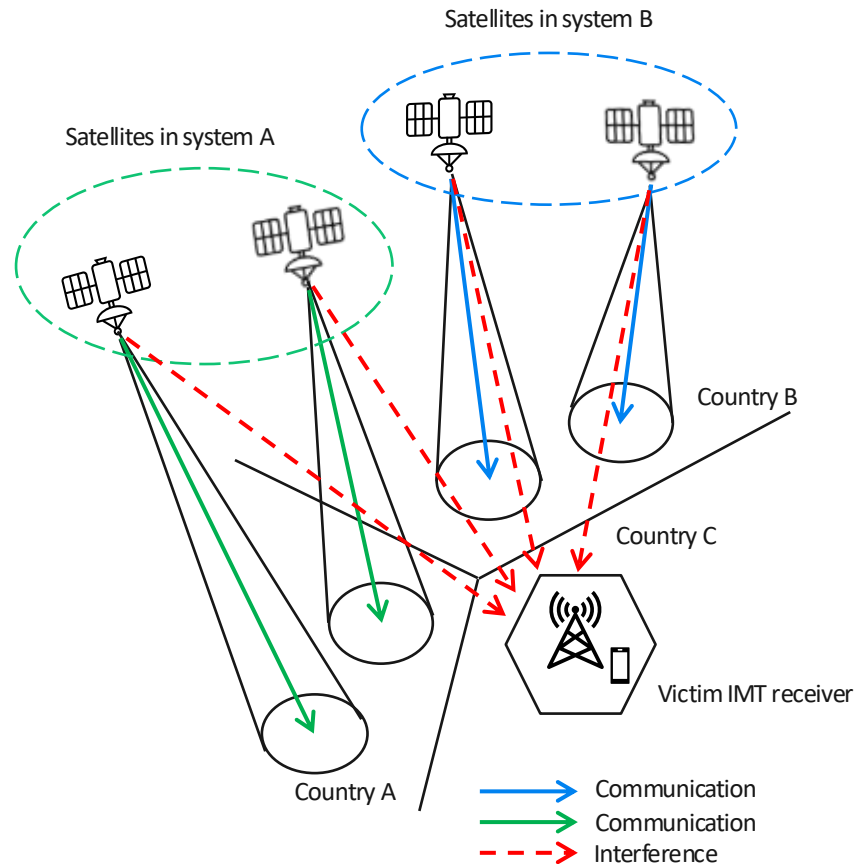
Consider multi-system aggregation factor to include aggregate interference from multiple DC-MSS-IMT systems serving different countries when defining regulatory measures per system

Need for having a compliance verification methodology and process by ITU to check the compliance of DC-MSS-IMT systems with the limits



Identify the maximum tolerable interference to avoid harmful interference to IMT (UE, CPEs, BS) based on IMT protection criterion

Define regulatory measure (pfd/epfd limits) for protection of IMT



Source: [Analysing the PFD from D2D Systems using Visualyse Professional](#)

Protection of UE



IMT UE from harmful interference due to MSS-DC-IMT, the maximum aggregate PFD due to all visible satellites operating co-frequency (either in one constellation or in multiple constellations) should not exceed the value obtained by equation (1).

$$\text{Maximum aggregate PFD} = 10\log_{10}(kTB) + NF + \frac{I}{N} - G_{UE} - 10\log_{10}\left(\frac{\lambda^2}{4\pi}\right) \quad (1)$$

where:

k : Boltzmann's constant (-228.6 dB(W/(K × Hz)))

T : receiver noise temperature (300 K)

B : reference bandwidth (1 MHz)

NF : receiver noise figure in dB

I/N : protection criterion in dB

G_{UE} : antenna gain of IMT UE in dB

Considering 3 dB multi-system aggregation factor, aggregate PFD limit per system (single entry PFD limit) can be obtained using equation (2)

$$\text{Aggregate PFD} = \text{Maximum aggregate PFD} - 3$$

Frequency range	<1 GHz		1.5 GHz		> 2 GHz	
I/N (dB)	-6*		-6*		-6*	
Frequency (MHz) for calculating PFD values	700		1500		2000	
Noise figure (dB)	9		9		9	
UE antenna gain (dBi)	-3	0	-3	0	-3	0
Body loss (dB)	4	0	4	0	4	0
Maximum aggregate PFD limit dB(W/(m².MHz))	-116	-123	-109	-116	-107	-114
Aggregate PFD limit per system dB(W/(m².MHz))	-119	-126	-112	-119	-110	-117

* Considering the fact that the protection criterion for IMT is irrespective of the number of interferers, an appropriate apportionment factor can be considered depending on other interference sources/services including adjacent channel IMT operation.

Protection of BS



from harmful interference due to DC-MSS-IMT systems, the aggregate interference received by IMT BSs due to all visible satellites **operating co-frequency** (either in one constellation or **in multiple constellations**) should not exceed $I_{\max} = 10 \log_{10}(kTB) + NF + \frac{I}{N}$.

- interfering signal comes from multiple satellites
- IMT BS has a directional antenna, the impact of PFDs from different satellites on its performance depends upon the relative gain towards these interfering satellites. This means the total interference received by the IMT BS is

$$I_{total} = 10 \log_{10} \sum_i I_i - L_f = 10 \log_{10} \sum_i \left(\frac{10^{\frac{P_i}{10}} G_{Sat}(\theta_i)}{4\pi d_i^2} G_{BS}(\varphi_i) \frac{\lambda^2}{4\pi} \right) - L_f$$

where

P_i : transmit power of the i -th interfering satellite in dBW

$G_{Sat}(\theta_i)$: the gain of the i -th interfering satellite toward the victim receiver

$G_{BS}(\varphi_i)$: antenna gain of the victim receiver antenna in the direction of the i -th interfering satellite

θ_i and φ_i : angles to specify the direction between the victim receiver and the i -th interfering satellite

d_i : the distance between the victim receiver and the i -th interfering satellite

L_f : feeder losses

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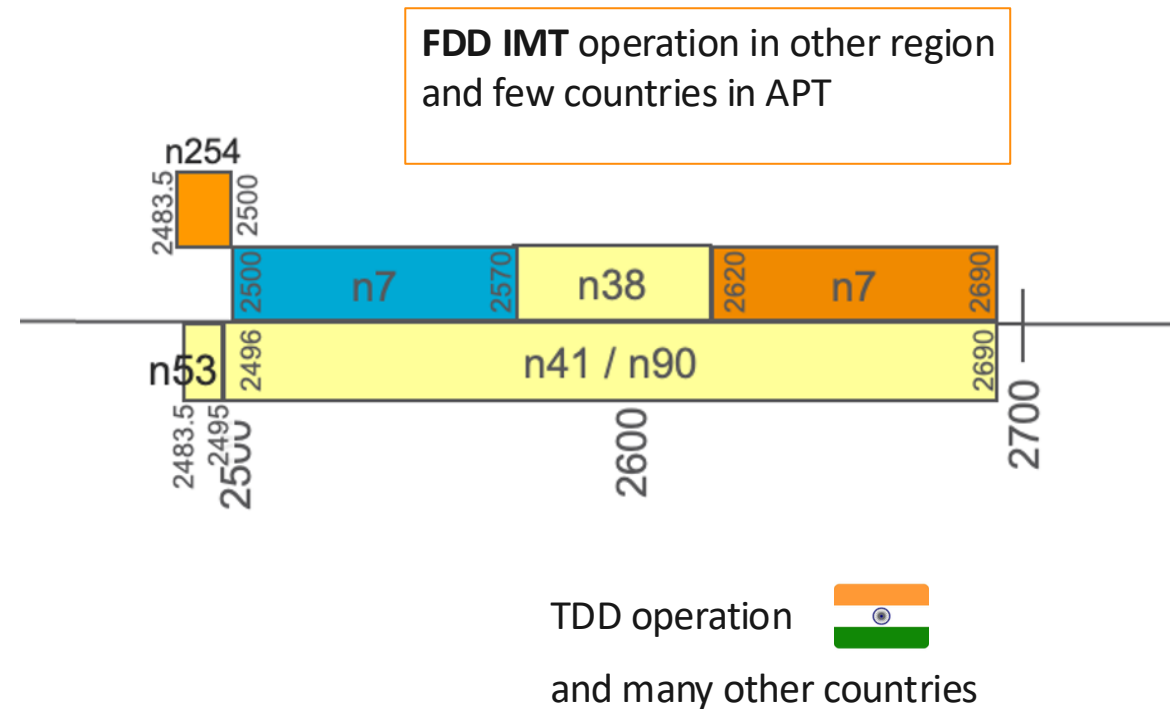


- **Contributions in 4C**

- Aggregation Factor
- IMT Characteristics
- lbyN

- **Key Issues/Aspects from India (TDD bands)**

- 2600MHz band
 - Legacy MSS systems,
 - protection from DC-MSS-IMT into RDSS, BSS
- 2300MHz



Approach



- **Derived the aggregate PFD and EPFD limits** per system for protecting terrestrial IMT UE (and CPEs) and IMT BS respectively from DC-MSS-IMT satellite to Earth transmissions and
- consider 3 dB multi-system aggregation factor when defining aggregate PFD/ EPFD limits per system for protection of terrestrial IMT
- consider the proposed aggregate PFD and EPFD limits per system for protecting terrestrial IMT UE and IMT BS respectively from DC-MSS-IMT ***satellite- to-Earth transmissions*** and include them in the main body of the working document
- ***New Secondary Allocation for DC-MSS-IMT with “Directions of operation of MSS”***
- Consider including the proposed PFD/EPFD limits ***compliance verification methodology*** in the main body of the working document

