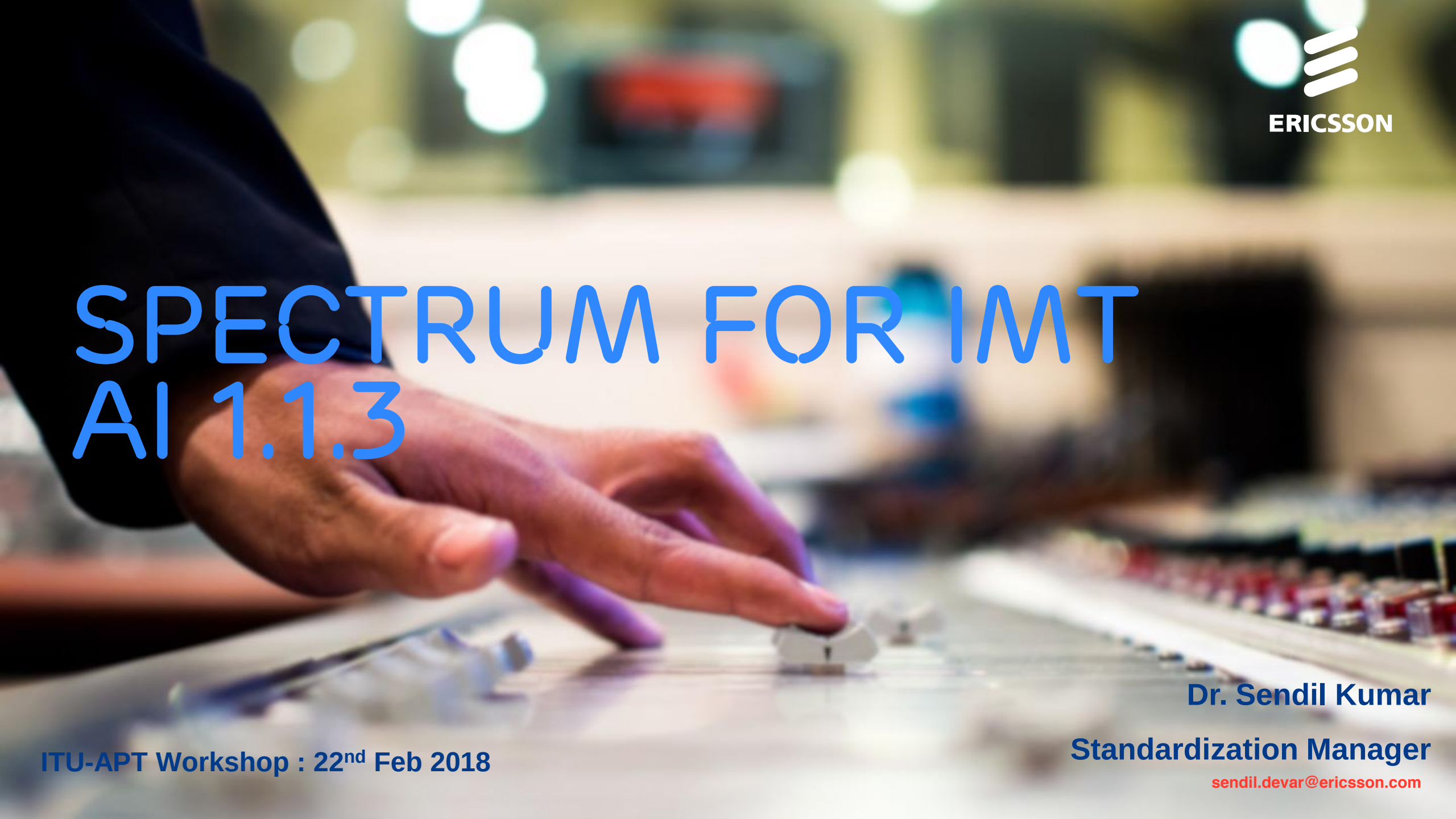


SPECTRUM FOR IMT
AI 1.1.3

ERICSSON

Dr. Sendil Kumar

Standardization Manager

sendil.devar@ericsson.com

ITU-APT Workshop : 22nd Feb 2018

SPECTRUM NEEDS : ITU-R WP5D

Examples	Spectrum Needs
Based on cell-edge user throughput and spectral efficiency targets in Recommendation ITU-R M.2083 with N simultaneously served **users/devices at the cell-edge**	• User experienced data rate of **1 Gbit/s:** **3.33 GHz (N=1),** 6.67 GHz (N=2), 13.33 GHz, (N=4), e.g., Indoor • User experienced data rate of **100 Mbits/s:** 0.67 GHz (N=1), 1.32 GHz (N=2), 2.64 GHz, (N=4), for wide area coverage
Based on cell-edge user spectral efficiency (obtained from 3GPP technical specifications) and data rate targets (from Recommendation ITU- R M.2083) in two given test environments	• 0.83-4.17 GHz (for eMBB Dense Urban) 3-15 GHz (for eMBB Indoor Hotspot)
Impact of latency and spectral efficiency targets and a typical user throughput value on spectrum needs	• With a file transfer of 10 Mbits by a single user at cell-edge in 1 msec: 33.33 GHz (one direction) • With a file transfer of 1 Mbit by a single user at cell-edge in 1 msec: **3.33 GHz** (one direction) • With a file transfer of 0.1 Mbits by a single user at cell-edge in 1 msec: 333 MHz (one direction)

Tele-densities	24.25-33.4 GHz	37-52.6 GHz	66-86 GHz	Total
Overcrowded, Dense urban and Urban areas	3.3 GHz	6.1 GHz	9.3 GHz	18.7 GHz
Dense urban and Urban areas	2.0 GHz	3.7 GHz	5.7 GHz	11.4 GHz

5G BANDS : AI 1.13 BANDS AND 28GHZ

3.25GHz + 2GHz = 5.25 GHz.

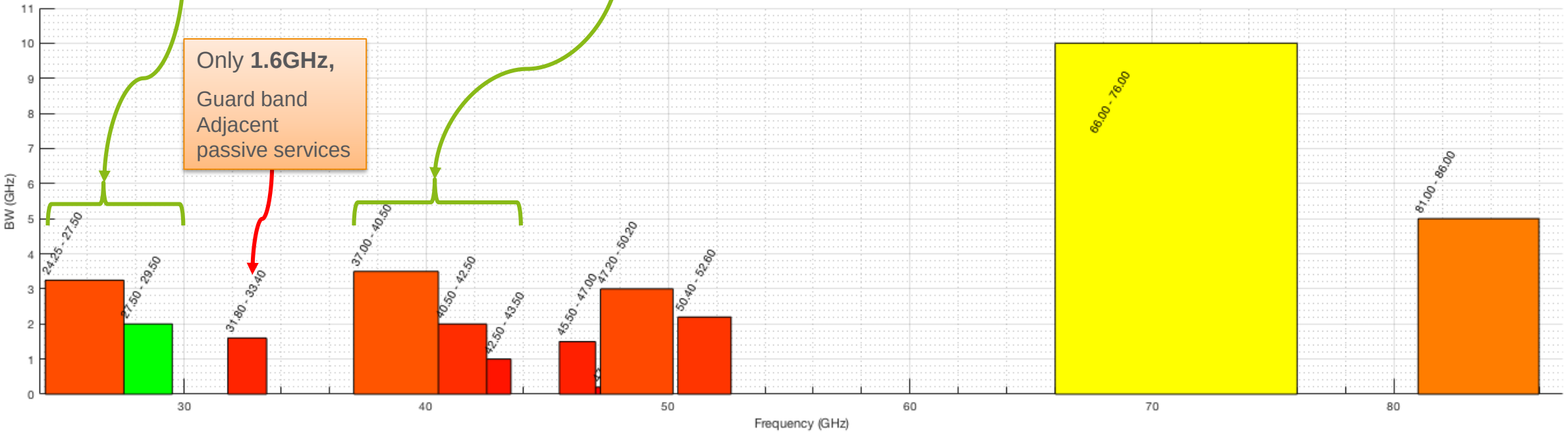
- best outdoor-to-indoor propagation characteristics compared to the other
- FCC : 27.5-28.35 GHz for the mobile service, possible eco-system by harmonizing, international roaming.
- **More countries aligning for 28GHz**

3.5 + 2 + 1 GHz = 6.5 GHz.

- Comparable absorption losses with sufficient bandwidth
- *US considering lower part*

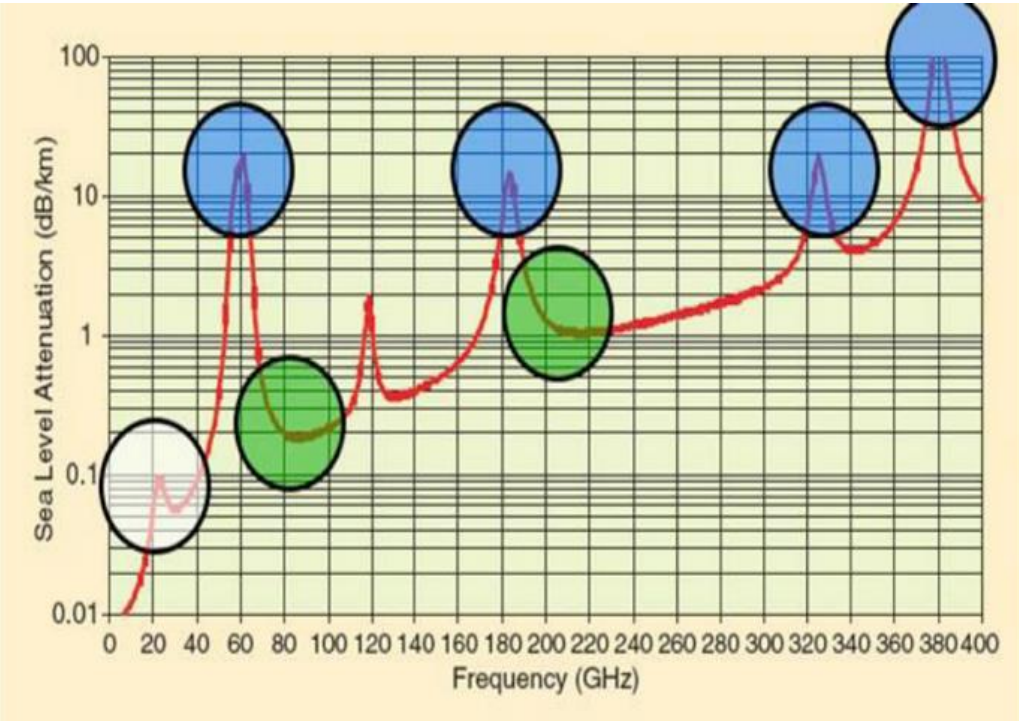
Only **1.6GHz,**

Guard band
Adjacent
passive services

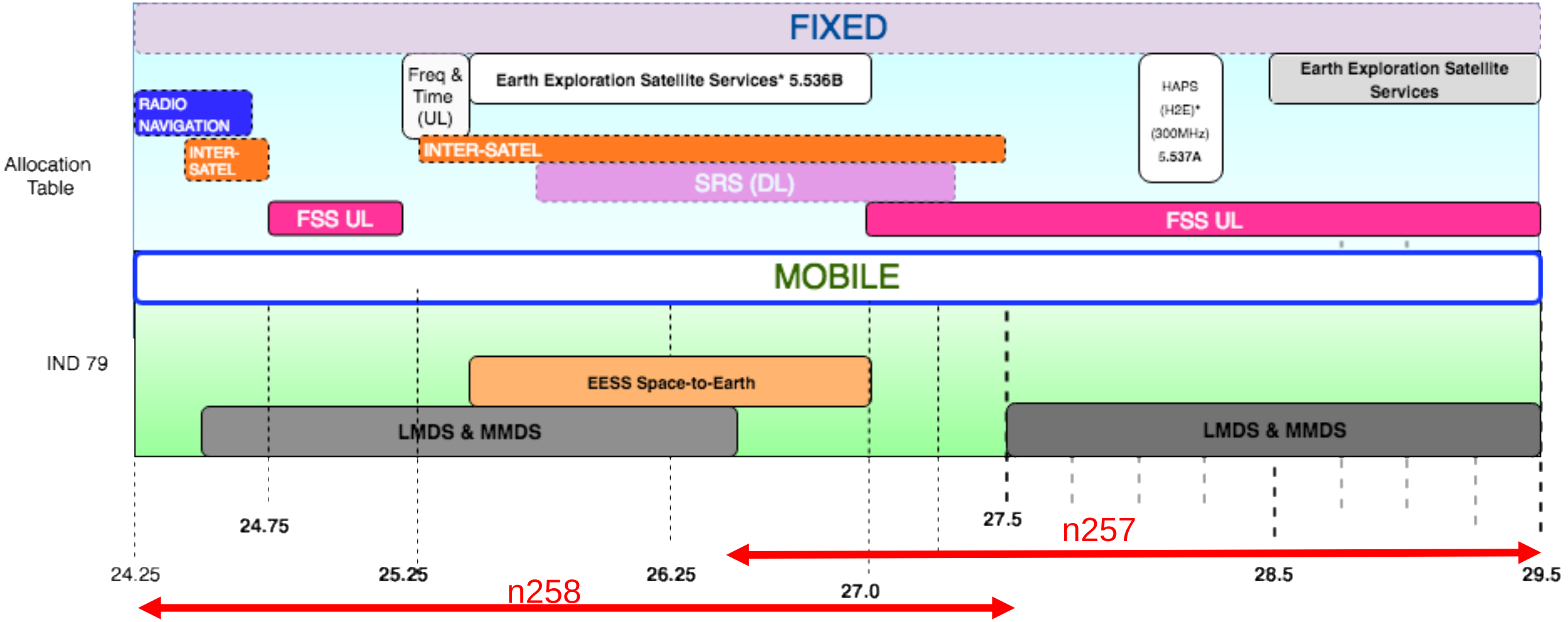


ADDRESSING THE NEEDS

1. Higher Density
2. Number of Operators
    a. Equal opportunity
    b. Guard band between operators
3. Guard-band between services
4. Adjacent Band co-existence
5. International roaming



INDIA REMARKS: 26GHZ AND 28GHZ BAND



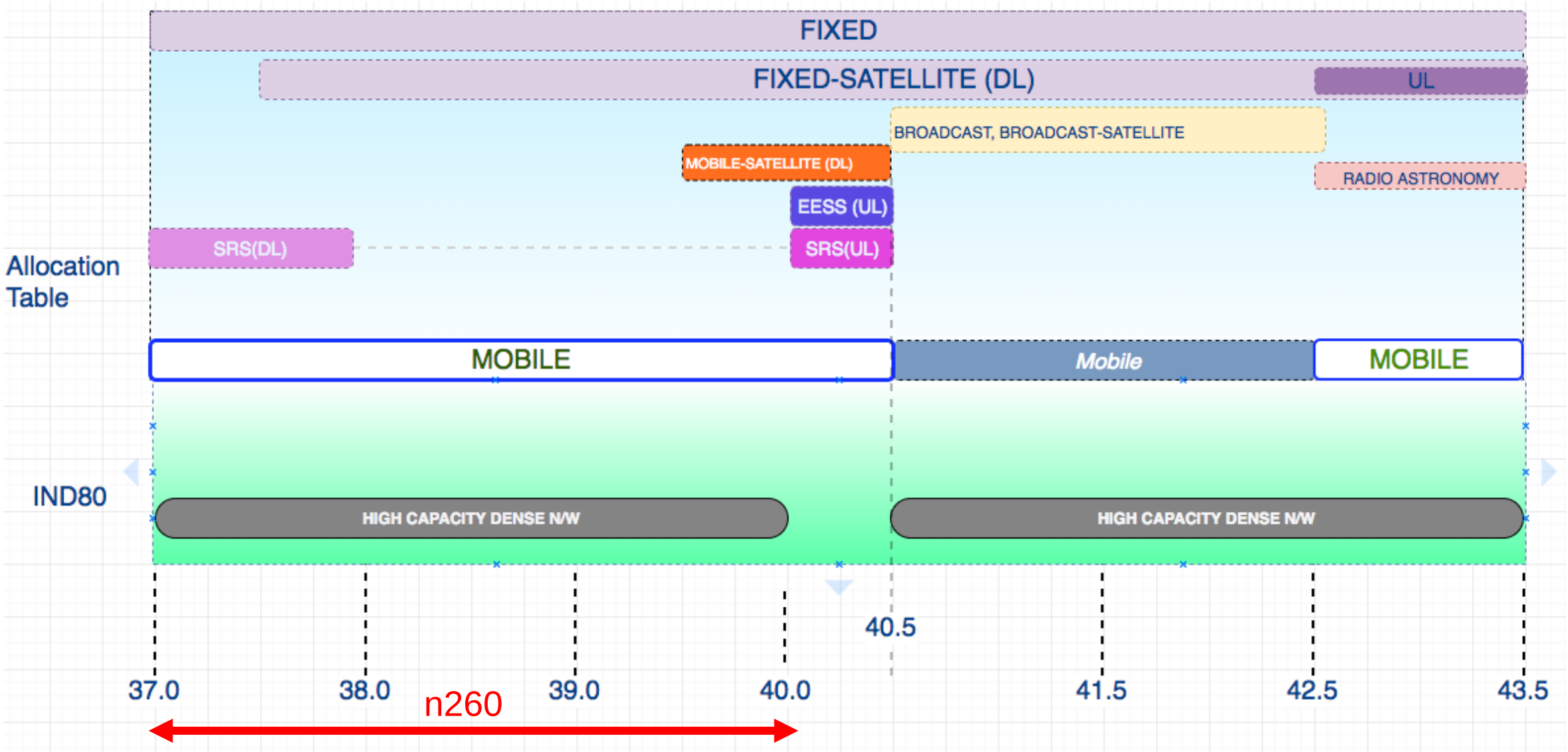
RR NO. 5.536B : 25.5-27GHZ

"**5.536B** In Saudi Arabia, Austria, Bahrain, Belgium, Brazil, China, Korea (Rep. of), Denmark, Egypt, United Arab Emirates, Estonia, Finland, Hungary, **India**, Iran (Islamic Republic of), Ireland, Israel, Italy, Jordan, Kenya, Kuwait, Lebanon, Libya, Lithuania, Moldova, Norway, Oman, Uganda, Pakistan, the Philippines, Poland, Portugal, the Syrian Arab Republic, Dem. People's Rep. of Korea, Slovakia, the Czech Rep., Romania, the United Kingdom, Singapore, Sweden, Tanzania, Turkey, Viet Nam and Zimbabwe, earth stations operating in the Earth exploration-satellite service in the frequency band **25.5-27 GHz** shall not claim protection from, or constrain the use and deployment of, stations of the fixed and mobile services. (WRC-15) "

RR : 5.537A : HAPS

5.537A In Bhutan, Cameroon, Korea (Rep. of), the Russian Federation, India, Indonesia, Iran (Islamic Republic of), Japan, Kazakhstan, Lesotho, Malaysia, Maldives, Mongolia, Myanmar, Uzbekistan, Pakistan, the Philippines, Kyrgyzstan, the Dem. People's Rep. of Korea, Sri Lanka, Thailand and Viet Nam, the allocation to the fixed service in the band 27.9-28.2 GHz may also be used by high altitude platform stations (HAPS) within the territory of these countries. Such use of 300 MHz of the fixed-service allocation by HAPS in the above countries is further limited to operation in the HAPS-to-ground direction and shall not cause harmful interference to, nor claim protection from, other types of fixed-service systems or other co-primary services. Furthermore, the development of these other services shall not be constrained by HAPS. See Resolution **145 (Rev.WRC-07)**. (WRC-07)

INDIA REMARKS : 40GHZ BAND



SUMMARY

High Momentum around 26 & 28GHz

- Time to Act – Technical co-existence & Sharing studies with incumbents
- To be vocal in Global forums
- Take 26GHz & 28GHz together for 5G, considering projected spectrum demand

40GHz Band : Next larger bandwidths – Necessary to have MS allocation

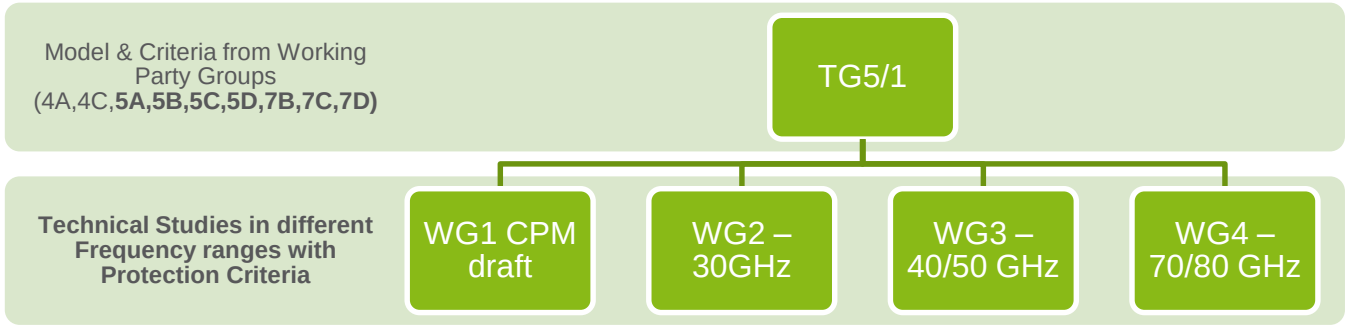
- Different usages – Backhaul & radio-access
- Flexibility to Operators

Joint effort needed with all incumbents in these priority bands


ERICSSON

ITU-R : TG 5/1

TG 5/1 number	Source	Services/Application/Models
23, 56	WP 4C	Mobile-Satellite (MSS)
251, 89	WP 4A	Fixed-Satellite FSS) Broadcasting-Satellite (BSS)
27	WP 7D	Radio Astronomy (RAS)
28, 43	WP 7B	Space Research (SRS) Inter-Satellite (ISS) Earth Exploration-Satellite (EESS)
29	WP 7C	Earth Exploration-Satellite (passive) (EESS (passive)) Space Research (passive) (SRS (passive))
31	WP 5C	Fixed (FS)
32	WP 5A	Mobile – Multiple Gigabit Wireless Systems (MGWS)
33	WP 5B	Aeronautical Mobile (AMS) & Radiodetermination
40	Chairman, WP 6A	Broadcasting (BS)



ITU-R : TG 5/1

Co-existence /Sharing Study with existing services in each of the frequency ranges

- **Protection Distance** of existing deployment (for e.g min. distance between Earth Station & IMT BS/UE). Frequency Separation (cases) where services are in the Adjacent band (outside the frequency ranges under study)

- ***Protection criteria*** required by each services **as per the corresponding** *ITU-R Working Party.*
  e.g. - Interference to be below ***-140dBW/10MHz*** *for* ***p%*** *of the time*

- **Parameters -** *Channel Propagations, Transmission Characteristics, Antenna Radiation Pattern and IMT deployment scenarios are also provided.*

- ***Cases of deployment*** *of Earth-stations locations, their tilt ranges and services may vary across countries. Whereas IMT deployment models have been provided by WP5D.*