COAI

An Overview of 4G Rollouts & Future Roadmap for 4.5G & 5G Technology in India till 2020

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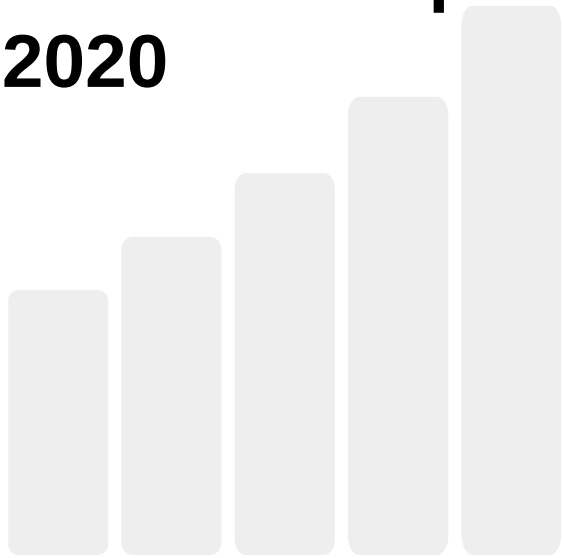


About COAI

Core Members

Associate Members

COAI was constituted in 1995 as a registered, non-governmental society. COAI's vision is to establish India as the global leader of innovative mobile communications infrastructure, products and services and achieving a national tele-density of 100%, including broadband. The association is also dedicated to the advancement of modern communication and towards delivering the benefits of innovative and affordable mobile communication services to the people of India.

Indian Telecom Sector

Vital Role in Government's Nation Building Agenda

Lowest tariff in the world

Over 5,00,000 villages covered

Among Highest contributors in FDI in last two decades – INR 92,700 crores

Contributes 6.5% to India's GDP

Contributes directly to 22 Lakh employment and indirectly to 18 Lakh jobs

Among the highest contributors to Govt.: nearly INR 70,000 crores p.a.

2nd largest private sector investment in infrastructure – INR 9,20,000 crores

Investment in Spectrum Auctions since 2010.: INR 3,27,000 crores

* Source: GSMA The Mobile Economy India Report, 2016, Industry Estimates

Indian Telecom Sector Commitments for 2020

100 smart cities

2,50,000 villages to be covered under BharatNet by 2017

Contribution to India's GDP by 2020 – 8.2 % of total GDP

Number of M2M connections by 2020 – 72 million

Contribute directly to 30 Lakh jobs by 2020

To provide data connectivity to next 1 billion citizens

Incremental Private sector investment in infrastructure by 2020 – INR 5,00,000 crores

* Source: GSMA The Mobile Economy India Report, 2016, Cisco, Industry Estimates

Significant Role in Government's Nation Building Agenda

10% increase in mobile penetration incur

0.60%-0.81% GDP increase

0.60% increase for high income economies
0.81% increase for medium and low income

World Bank (2009)

10% increase in high-speed internet connections

boosts annual GDP 1.38%

World Bank (2012)

10% substitution from 2G to 3G penetration

increases GDP per capita growth 0.15%

GSMA (2012)

Doubling of mobile data use

leads to a GDP per capita growth rate increase of 0.5%

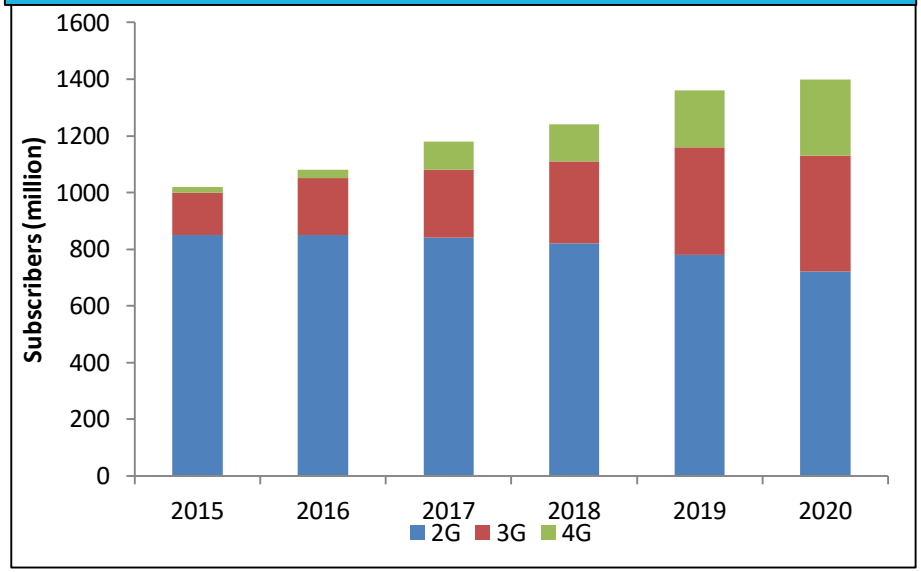
1.2% for South Korea
0.5% for medium income economies
Negligible for low-income economies

GSMA (2012)

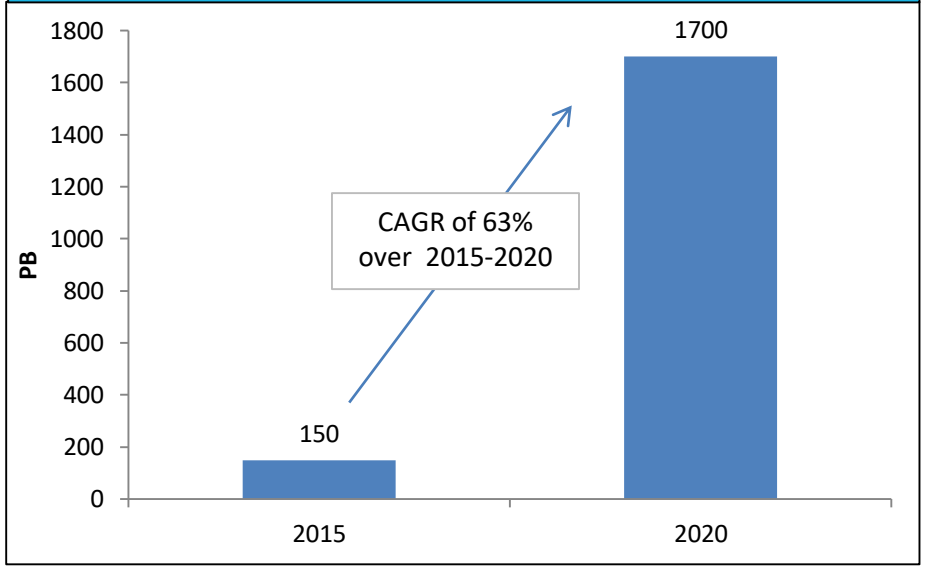
Source: GSMA; World Bank

Growing Broadband

Subscriber Connections by Technology



Mobile data traffic data per month in India



- Between 2014 and 2015, mobile data traffic in India increased 89%
- Mobile data traffic is expected to grow 12-fold between 2015 and 2020, a CAGR of 63%.
- This is ahead of growth in the Asia Pacific region overall, forecast at a CAGR of 54%.

Source: GSMA, CISCO VNI

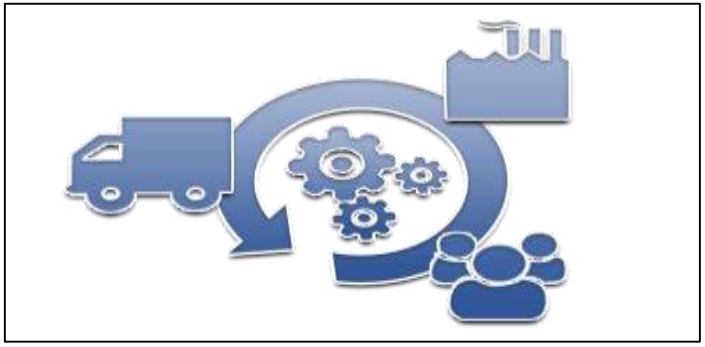
Facts & Forecasts - India

1. **India Ranks 36 in Global LTE Download Speeds, Up From 50 Last Year**
2. **Mobile data traffic will :-**
   a. Grow 12-fold from 2015 to 2020, a compound annual growth rate of 63%.
   b. Reach an annual run rate of 20.6 Exabytes by 2020, up from 1.8 Exabytes in 2015.
   c. Grow 2 times faster than fixed IP traffic from 2015 to 2020.
   account for 34% of Indian fixed and mobile data traffic by 2020, up from 11% in 2015.
3. **Number of smartphones grew 52% during 2015, reaching 239 million in number.**
4. **Number of smartphones will grow 2.9 fold between 2015 and 2020, reaching 702 million in number.**
5. **No. of PAN India 4G BTSs : approx. 4,00,000**

Smart Infrastructure

Convergence

New Supply Chain model & Regulations



IoT/M2M

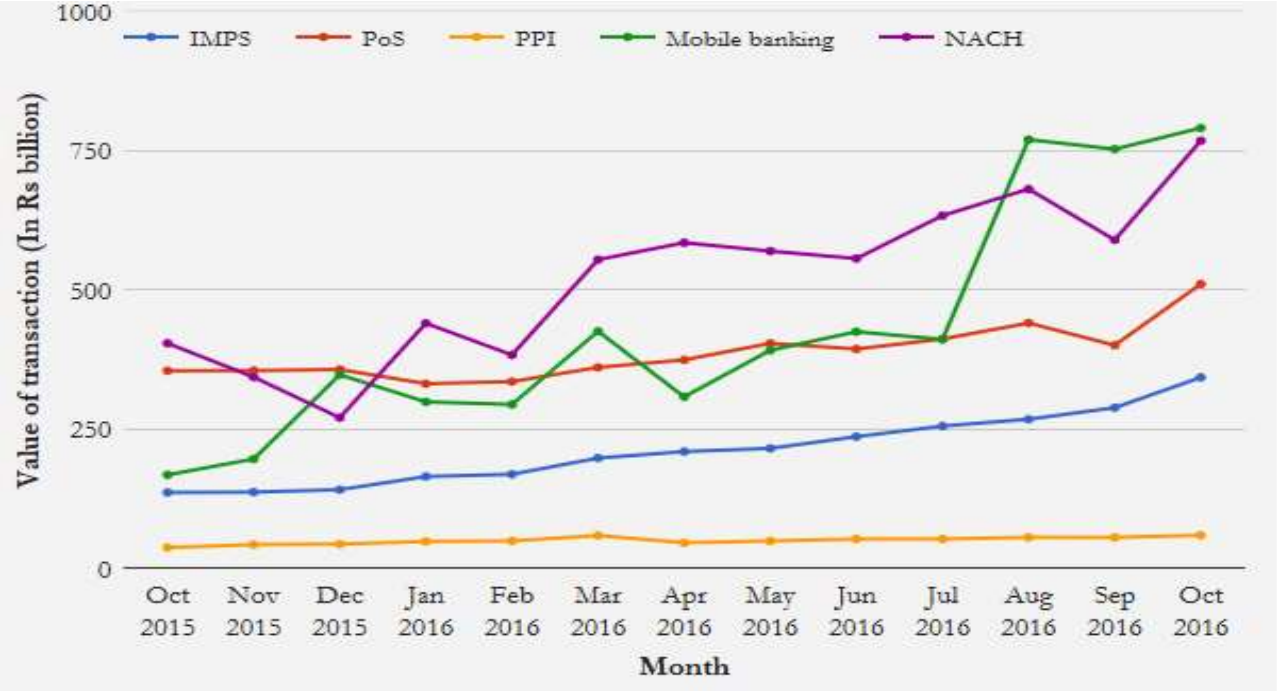
M2M/IoT enables seamless communication by making the ICT ecosystem domain 'intelligent'

Smart Cities/ Communities

Financial Inclusion

Mobile a key instrument in JAM (Jan Dhan, Aadhaar and Mobile) trinity

Cashless Transactions have increased 22% in 2016; Mobile is fastest growing



Source: Reserve Bank Of India, Monthly Bulletins for 2016

Government of India Programmes

Government of India Programmes - Potential

Initiative	Broadband	NOFN Restructured as BharatNet	Smart Cities
Target	600 million by 2020	150,000 Villages by Mar 2018	100 Cities by 2020
Achievement	218 million in Nov 2016	20,000 in Mar 2015	List of 20 cities announced
Task Ahead	7.79 million subscribers/ month	~3600 villages every month	Need to cover 80 cities

Source: TRAI Recommendations on Delivering Broadband Quickly: What do we need to do?; TRAI

Technology Landscape

	Total BTS	GSM	CDMA	3G	4G	WIMAX
Total BTSs*	1,420,392	6,59,608	28,645	3,25,361	4,03,016	3,762
% age	100	46.44	4.34	22.91	28.37	0.26

- Over 14 lakh BTSs installed
- Over a Billion Mobile Telephone connections
- Over 5,00,000 villages covered
- 2nd largest private sector investment in infrastructure – INR 9,20,000 crores
- Lowest Tariffs in the world

World Class infrastructure using state of the art technologies: Ready to serve M2M/IoT needs of the country

* Source : Tarang Sachar Portal

Spectrum Requirements for Mobile Broadband Services

BAND	USAGE
700 MHz	New spectrum for LTE, in some markets previously used for TV, referred to as “digital dividend” band
1800 MHz	Originally only used for GSM and CDMA, progressive redeployment to 3G HSPA and recently to LTE
2100 MHz	Originally only used for GSM, progressive redeployment to LTE
800/900 MHz	Currently used for 3G, upgrading to dual carrier HSPA+ and LTE
2300 MHz	Originally used for WiMax, now a standardised LTE band for capacity
2500 MHz	New capacity band for LTE

LTE Enhances Wireless Broadband User Experience

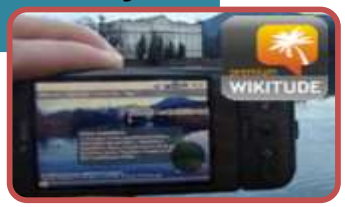
LTE will change the Way of Connection & Communication

Communities, sharing

News, information anywhere

Location

Augmented reality



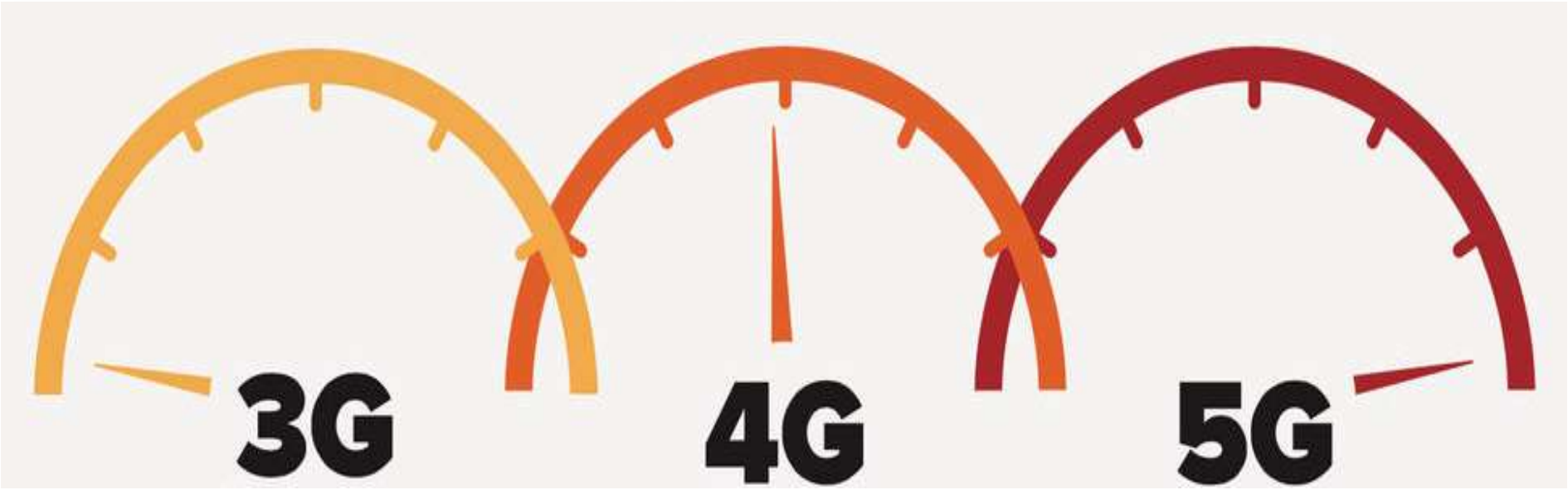
Navigation

Machine 2 Machine

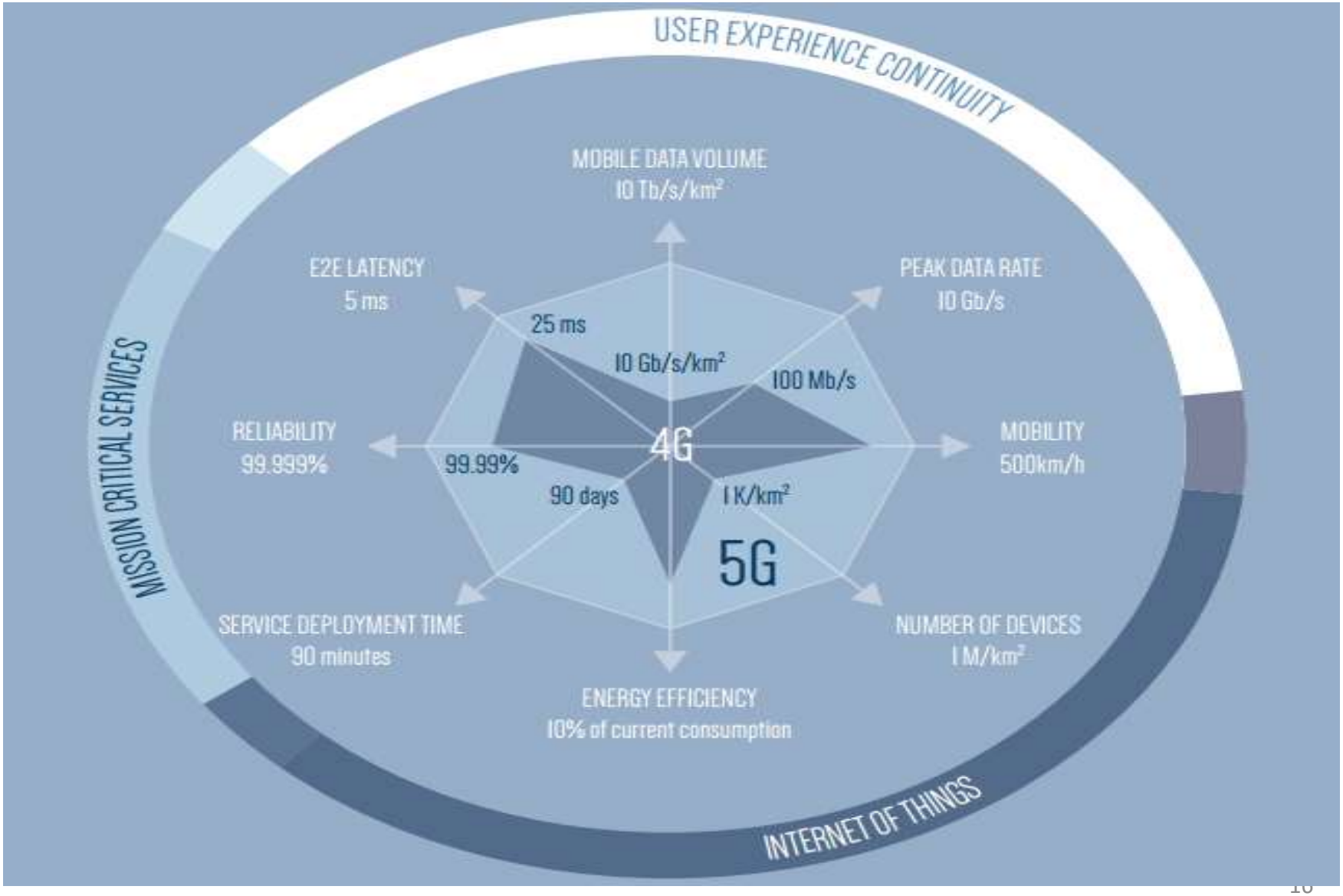
Music and entertainment

Business on the move, email


2G
3G
5G
4G


3G
4G
5G

5G CAPABILITIES



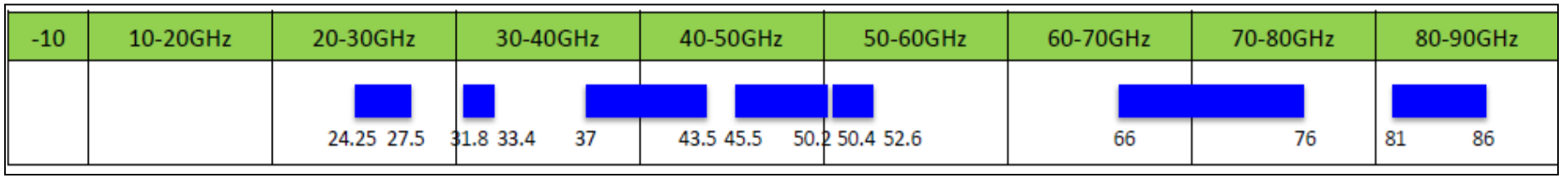
Source: 5GPP, European Commission

Outcomes of WRC-2015 for India

Sl. No.	Band (MHz)	Amount (MHz)	Remarks
1	470-698	228	Supported at WRC-15, but not included in Footnotes.
2	1427-1452	25	Supported at WRC – 2015
3	1452-1492	50	Supported at WRC – 2015
4	1492-1518	26	Supported at WRC – 2015
5	3300-3400	100	Supported at WRC – 2015
6	3400-3600	200	Supported at WRC – 2015

Spectrum Considerations for 5G at WRC – 2019

Sl. No.	Working Group	Scope
1.	WG 2 – 30 GHz	Sharing and compatibility studies: 24.25 – 27.5 GHz, 31.8 – 33.4 GHz
2.	WG 3 – 40/50 GHz	Sharing and compatibility studies: 37 – 40.5 GHz, 40.5 – 42.5 GHz, 42.5 – 43.5 GHz, 45.5 – 47 GHz, 47 – 47.2GHz, 47.2 – 50.2GHz, 50.4 – 52.6GHz
3.	WG 4 – 70/80 GHz	Sharing and compatibility studies: 66 – 76 GHz, 81 – 86 GHz



Status of 5G Spectrum Bands in India

Sl. No	Frequency Ranges (GHz)	Sub Ranges (GHz)	India Remarks	Applications
1	24.25-27.5	24.5-26.5	IND79	LMDS (Local Multipoint Distribution Service)
		25.5-27	IND79	EEES (Earth Station Downlink Operation)
2	31.8-33.4	NA for Mobile	NA for Mobile	NA for Mobile
3	37-43.5	37-40	IND80	HCDN(High Capacity Dense Network)
4	45.5-50.2 50.4-52.6	- 51.4-52.6	- IND80	- HCDN
5	66-76 81-86	64-66 71-76 81-86	IND80 IND81 IND81	HCDN(High Capacity Dense Network) FDD(Frequency Division Duplex) TDD(Time Division Duplex)

Recommendations

1. **Indian needs to actively participate at all ITU meetings (WP, JTG, etc.)**
2. **Coordination with Defence on L Band for early adoption**
3. **Need to provide India inputs to the upcoming JTGs for Indian needs in the WRC identified spectrum bands for 5G**
4. **On UHF Band ask is:**
   a. Requirements of fixed and IMT applications will be considered in the frequency band 470-520 MHz and 520-585 MHz on case-by-case basis.
   b. The requirement of IMT applications, Digital Broadcasting Services including Mobile TV may be considered in the frequency band 585-614 MHz subject to coordination on case-by- case basis.
   c. The requirement for IMT and Broadband Wireless Access will be considered in the frequency band 614 – 698 MHz.
5. **Reserve Price of spectrum needs to be reduced. In Oct 2016 auction, around 80% of the spectrum offered went unsold, 100% in 700 MHz was unsold.**
6. **Need for urgent opening up of E&V bands for backhaul for enhancing broadband coverage in the short time frame for the national objectives.**

Thank you

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http://www.coai.in

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