

# Global mobile Suppliers Association

## Setting the Scene: Building the 6G Connectivity Ecosystem

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Chair, Global Spectrum Team, GSA

6<sup>th</sup> December 2022

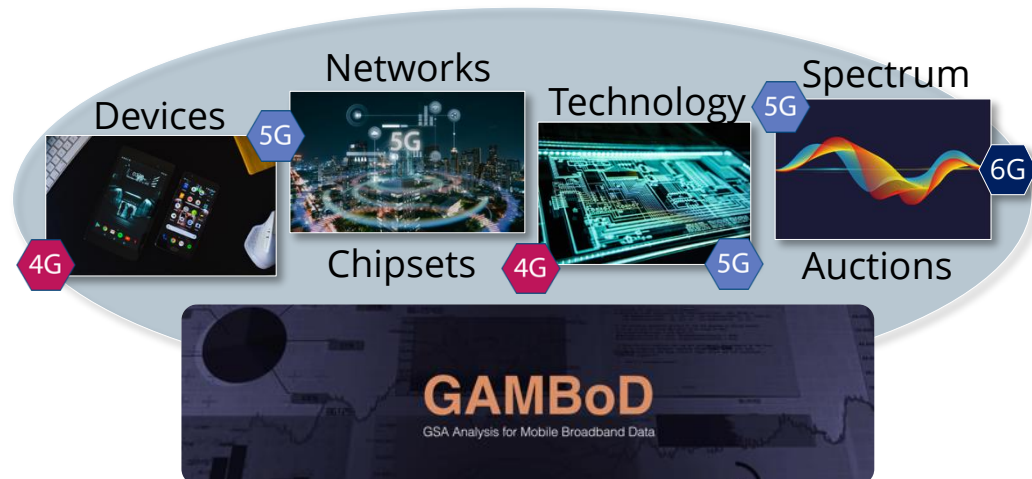


# About GSA

- Representing the global mobile ecosystem since 1998
- 9 Major Industry Executives



- Extensive research & database
  - Free industry reports
  - Member reports & GAMBoD Access
- GSA Spectrum Group
  - 185+ participants regionally grouped
  - Advocacy, education and technical support
  - Cooperation with other industry groups such as COAI, CTIA, GSMA, TechUK, etc
- GSA Standards Group
  - 6G-Joint Working Group
- Focused Working Groups & Forums
- 87 Associates subscribing to GSA data
  - Regulators-Analysts-Operators etc.



# 10 billion 3GPP connections surpassed in 2022

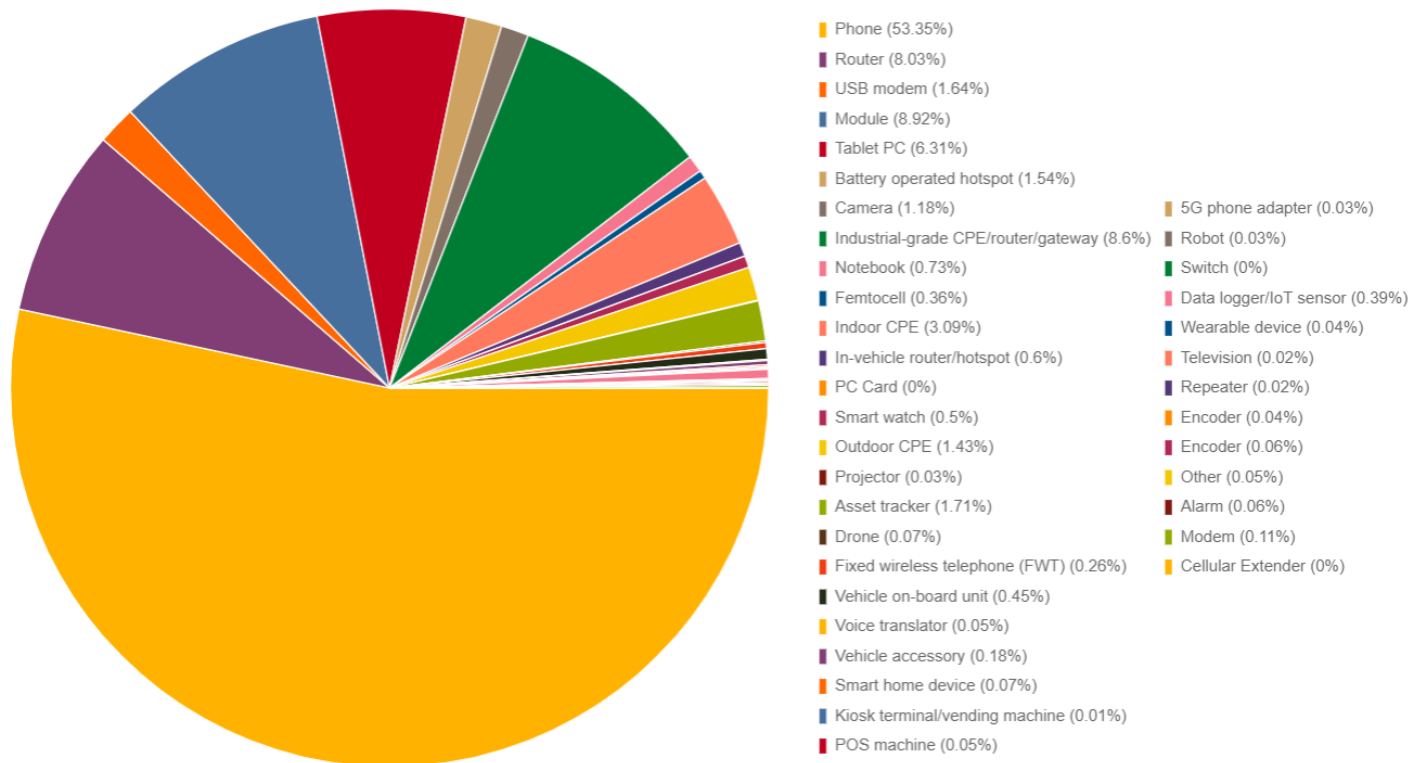
\*

Number of 3GPP-based connections per head of the population in 2Q22



# 23,548 3GPP-based devices, far beyond phones

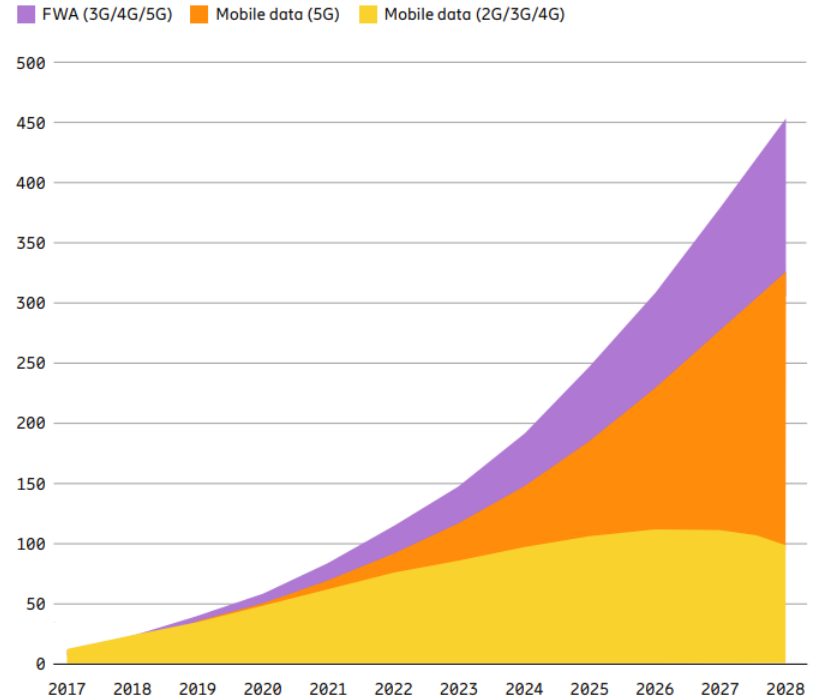
## 4G and 5G devices by form factor\*



# Mobile data traffic

- Smartphones and video driving up mobile data traffic
- Average monthly usage per smartphone expected to surpass 15GB in 2022
- Global monthly mobile data traffic excluding fixed wireless access (FWA) projected to reach 282EB, or 39GB per smartphone, in 2027.
- Including FWA takes monthly mobile network traffic to over 450EB in 2028

## Global mobile data traffic (EB per month)

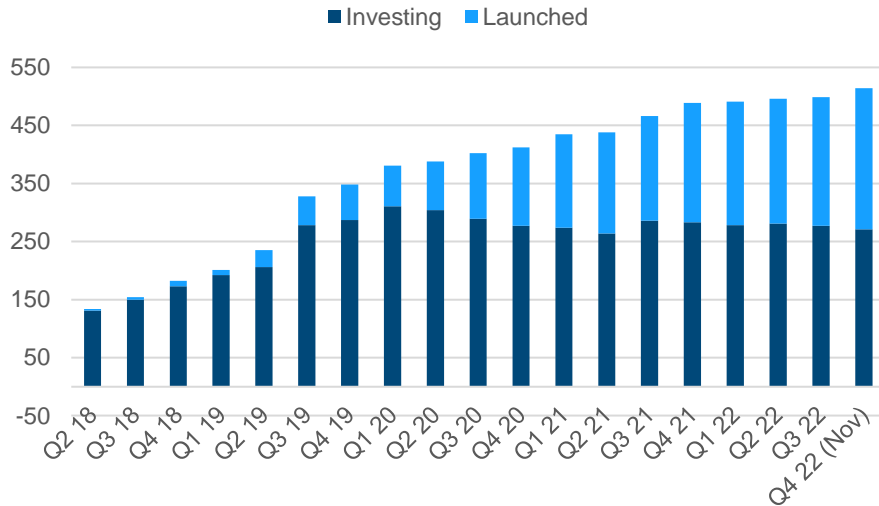


Source: Ericsson Mobility Report, November 2022

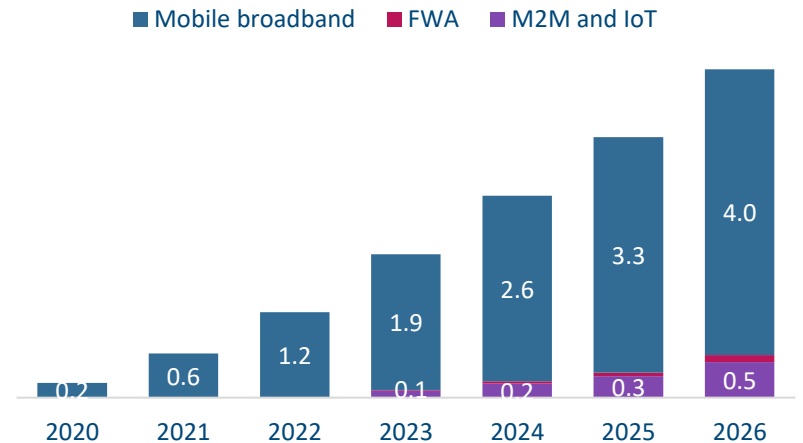
Note: Data traffic forecast, both global and regional, represents the estimated traffic volume in all networks over the duration of a month. Traffic, in terms of throughput, in high-traffic areas will be much higher than the average traffic.

# 5G roll-out and uptake continues to grow

**Growth of 5G: number of operators investing in and operating commercial networks**



**5G connections by type, worldwide (billions)**



- By end-November 2022, 514 operators are investing in 5G, 47% of which have launched commercial services
- 5G connections are set to double in 2022 to reach 1.2 billion

# Each 3GPP generation enriches the user experience



Analog voice

**1G (1984)**



App-based touch screens

**3G (2004)**



High-speed eMBB and vertical services

**5G (2019)**



**2G (1996)**

Digital voice, text, e-mail



**4G (2011)**

True wireless Internet phone



**6G (2030)**

Extreme connectivity and immersive augmented experiences



# 5G spectrum for coverage, capacity and ultra experience

24.25 GHz to 29.5 GHz,  
37.0 GHz to 43.5 GHz, etc

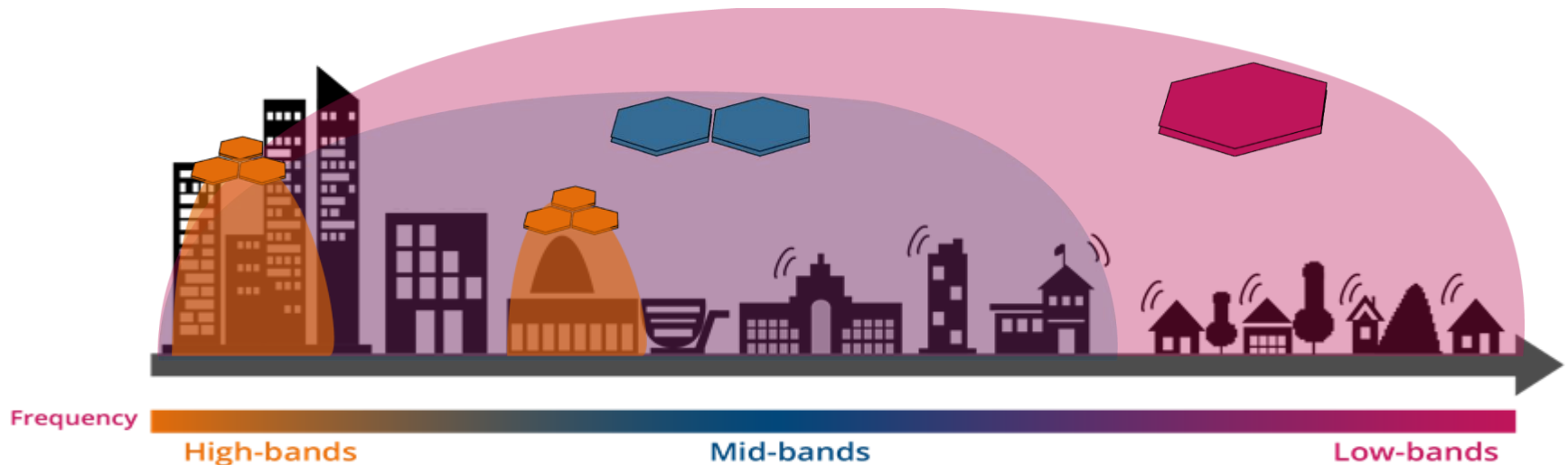
High-bands  
Ultra experience layer

1.8 GHz, 2.3 GHz, 2.6 GHz, 3.3  
GHz to 4.2 GHz, 4.4 GHz to 5  
GHz, etc

Mid-bands  
Capacity-coverage layer

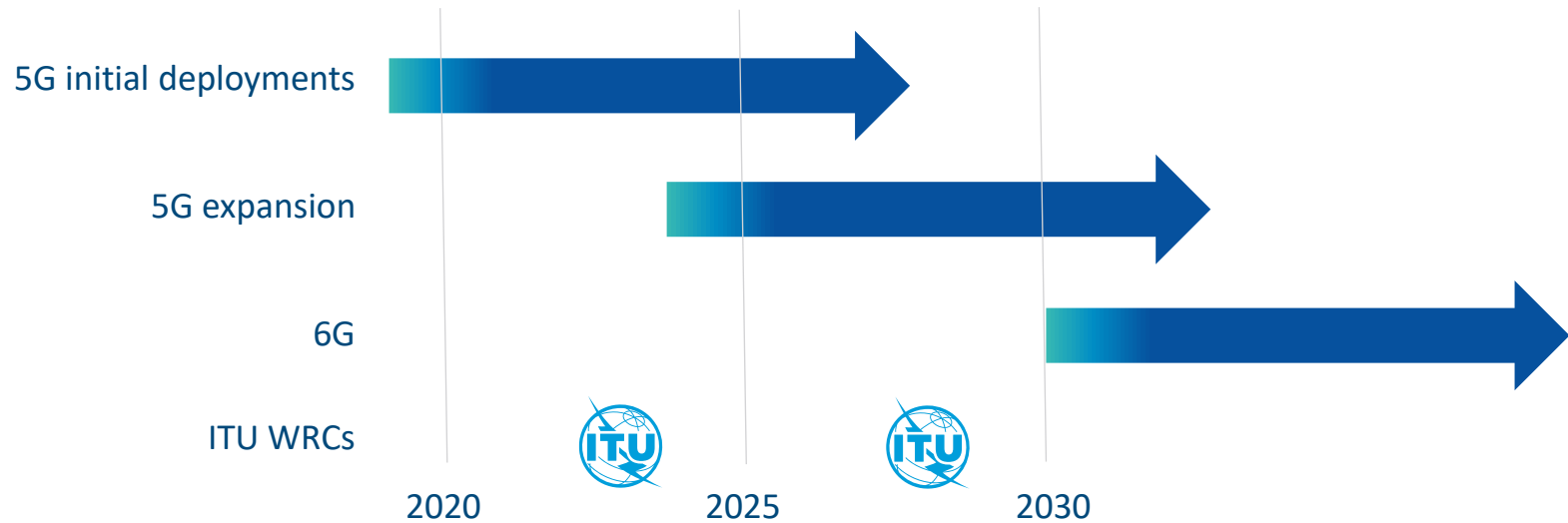
600 MHz, 700 MHz, 800 MHz,  
etc

Low-bands  
Basic coverage layer





# IMT / 3GPP Spectrum 2020-2030



- 5G underway with licensing and roll-outs
- 5G expansion spectrum planning underway in some countries, with a timeframe from 2023/25
- 6G early research and planning discussions commencing, targeting a timeframe from 2030

# 5G Initial Deployment & Expansion Spectrum

## Examples in APT region

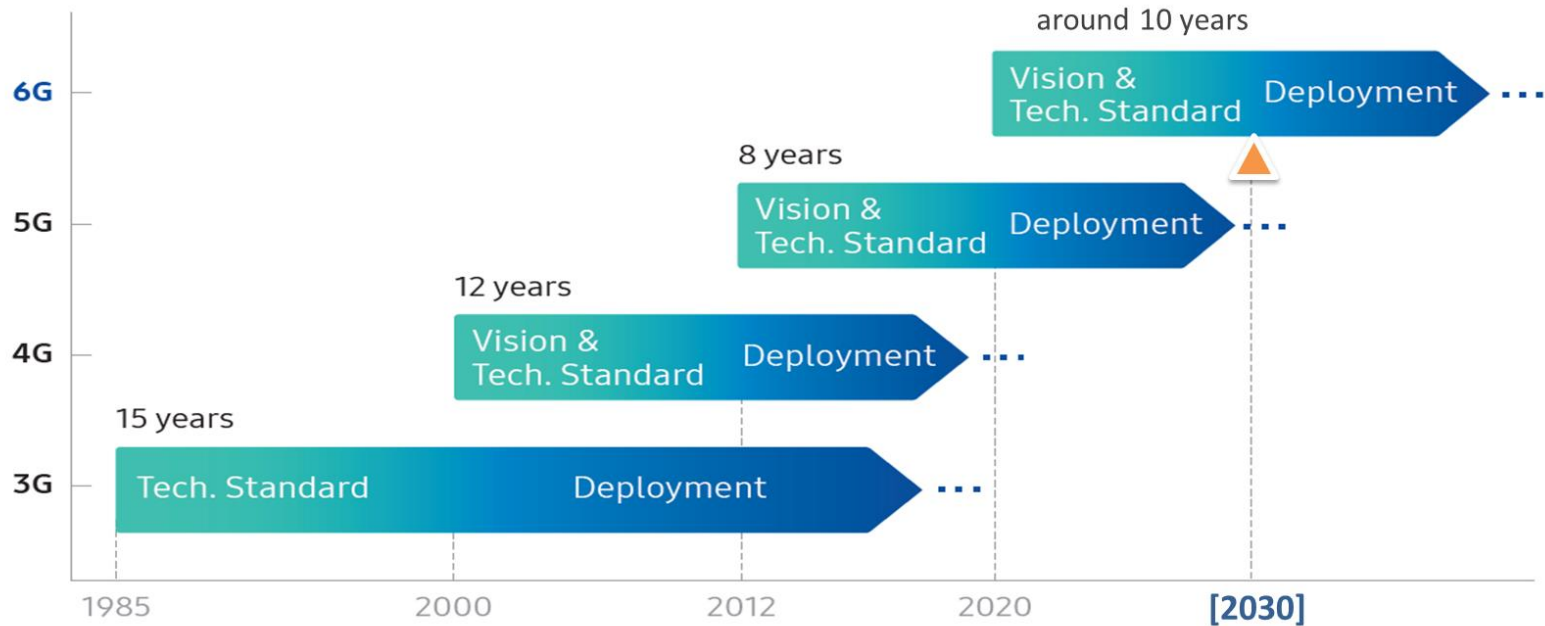
**Launch Phase**  
Licenced for deployment



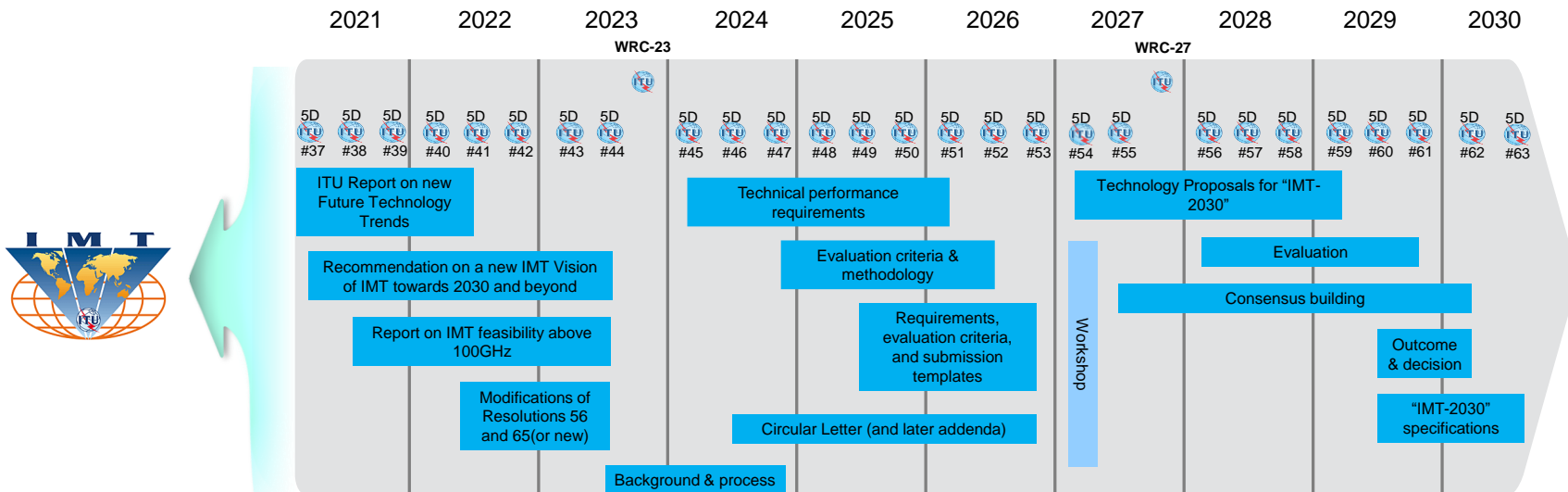
**Expansion Phase**  
Potential bands under consideration

	Launch Phase Licenced for deployment	Expansion Phase Potential bands under consideration	
<b>Australia</b>	<p>26 and 28 GHz (within)</p> <p>3.4 – 3.7 GHz</p>	<p>40, 46 and 47 GHz (within)</p> <p>1.5, 1.8, 1.9, 2.3, 2.5 and 3.4-4.2 GHz (within)</p> <p>700 MHz, 800 MHz</p>	<p>Australian Communications and Media Authority, Five-year spectrum outlook 2022–27 and 2022–23 work program, SEPTEMBER 2022</p>
<b>China</b>	<p>2.1, 2.6, 3.3-3.6, 4.8-5.0 GHz</p> <p>700 MHz</p>	<p>24.25-27.5 GHz, etc</p> <p>6 GHz, etc</p>	<p>Zhang Hong, Bureau of Radio Regulation, MIIT, The 8th Asia-Pacific Spectrum Management Conference, Apr. '22 Zhao Zheng, Bureau of Radio Regulation, MIIT, GSMA MWC Shanghai, Feb '21 Xu Fei, CAICT, IMT-2020 (5G) PG 5G Trial Progress, PT Expo CHINA 2020, Oct. '20</p>
<b>India</b>	<p>24.25-27.5 GHz (within)</p> <p>3.3-3.67 GHz</p> <p>700 MHz</p>	<p>27.5-28.5, 37.0-43.5 GHz (within), etc.</p> <p>3.67-3.8 GHz</p> <p>600 MHz</p>	<p>DoT, India releases 5G auction guidelines, June 2022 DoT, India releases revision of Nation Frequency Allocation plan covering mmWave spectrum beyond 26GHz.</p>
<b>Japan</b>	<p>27.0-28.2 GHz, 29.1-29.5, 28.2-29.1(*)</p> <p>3.6-4.1, 4.5-4.6, 4.6-4.9 GHz(*)</p>	<p>25.25-27.0, 37.0-43.5 GHz, etc.</p> <p>2.3, 2.6, 4.9-5.0 GHz, etc.</p>	<p>MIC, 5G spectrum policy, July '18 MIC, Local 5G policy, Dec '19, Dec '20 (*) for Local 5G MIC, spectrum action plan, Sept, 22</p>
<b>Rep. of Korea</b>	<p>26.5 – 28.9 GHz, 28.9-29.5(*)</p> <p>3.4 – 3.7 GHz, 4.72-4.82 GHz(*)</p>	<p>24.25-26.5 GHz (within), 37.0-43.5 GHz (within), etc.</p> <p>2.3, 2.6, 3.4-3.42, 3.7–4.0 GHz, etc.</p> <p>700 MHz, etc</p>	<p>MSIT, 5G+ Spectrum Plan, Dec '19 MSIT, Local 5G (e-Um) policy, Jan '21 MSIT, Local 5G (e-Um) policy, Jun '21 MSIT, 5G+ spectrum policy, Jun '22 (*) for Local 5G (e-Um)</p>

# 6G: "3GPP-2030" vision and standards timeframe



# Agreed\* ITU-R 3GPP-2030 timeline

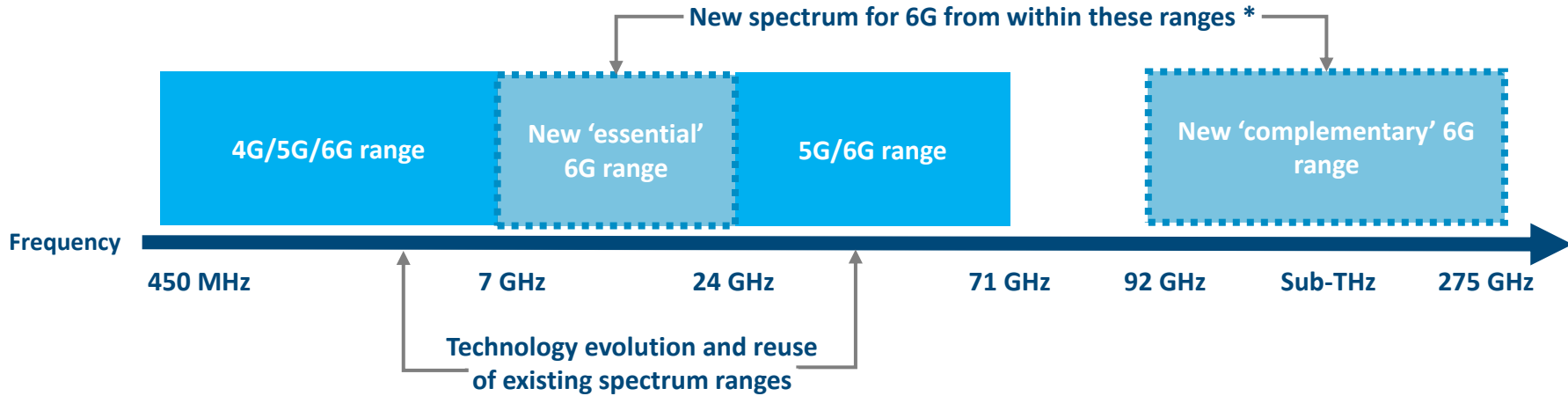


Note 1: Meeting 5D#59 will additionally organize a workshop involving the Proponents and registered IEGs to support the evaluation process  
 Note 2: While not expected to change, details may be adjusted if warranted. Content of deliverables to be defined by responsible WP 5D groups

Close collaboration between ITU-R and 3GPP as an external organisation for the development of 3GPP-2030



# Spectrum for 6G



- \* Frequency bands from within these ranges will need to be selected for further study, taking into account sharing possibilities of IMT with other Radiocommunication Services allocated on a primary basis.
- \* Existing users of mobile applications such as those supported by UWB should also be considered for relevant bands where applicable.
- \* The lower the frequency the better from within the 'essential range' in terms of propagation, cell size and economic network deployments.
- \* IMT Agenda Item for WRC-27 is a key step towards a successful device ecosystem and economies of scale

# Global 6G research and framework

## China



[www.caict.ac.cn](http://www.caict.ac.cn)

## Europe



[www.hexa-x.eu](http://www.hexa-x.eu)

## Japan



[www.b5g.jp/en](http://www.b5g.jp/en)

## India



[www.dot.gov.in](http://www.dot.gov.in)

## Korea



Ministry of Science and ICT

[www.msit.go.kr](http://www.msit.go.kr)

## ITU



[www.itu.int](http://www.itu.int)

## USA

NEXT G  
ALLIANCE

[www.nextgalliance.org](http://www.nextgalliance.org)

# 6G / IMT-2030 spectrum summary

- 6G research is globally accelerating
- IMT-2030/6G standards to be completed by 2030 (ITU-R Working Party 5D Recommendation IMT-2030 radio interface(s) specifications, in cooperation with external organisations such as 3GPP)
- Commercialization target around 2030 & onwards
- 6G will need the combination of all frequency ranges from low up to extremely high bands to meet coverage and enhanced capacity requirements as well serve new emerging use cases for 6G
- In addition to existing spectrum, new spectrum from within the 'essential' range 7-24 GHz and 'complementary' sub-THz range is recommended to be considered
- India is encouraged to continue national and international dialogue around the development of a 6G strategy and to consider support of a new agenda item for IMT towards WRC-27
- Global / regional harmonisation (spectrum, standards, timing, etc) remains critical
- GSA, in cooperation with other national and regional organisations, stands ready to assist the development of a 6G strategy and technical support for a potential WRC-27 IMT agenda item

# Global mobile Suppliers Association

The Industry Voice of the Global  
Mobile Ecosystem

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