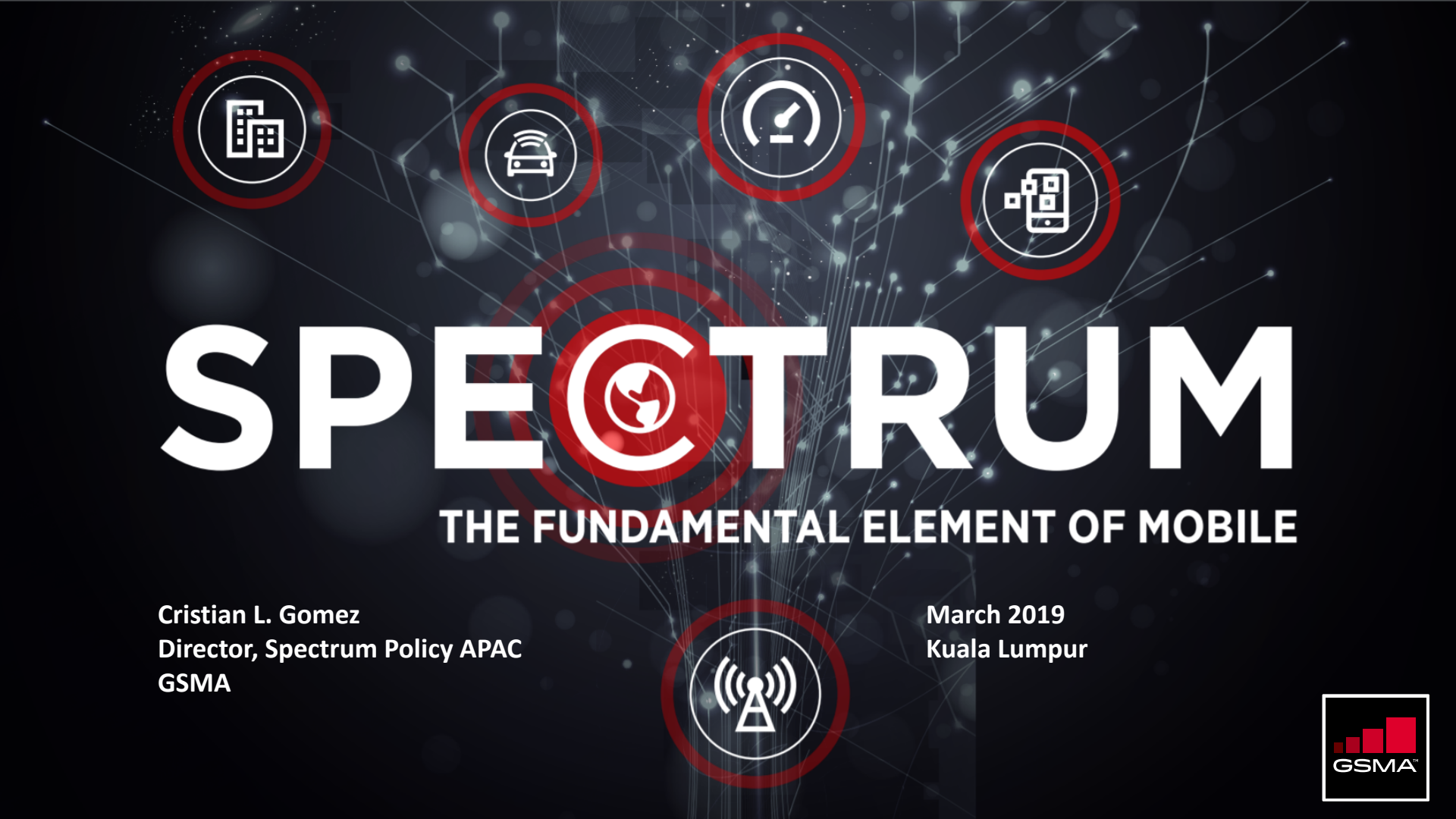


Cristian L. Gomez
Director, Spectrum Policy APAC
GSMA

March 2019
Kuala Lumpur

Spectrum Availability and Harmonisation Are Fundamental to the Success of 5G Deployment…

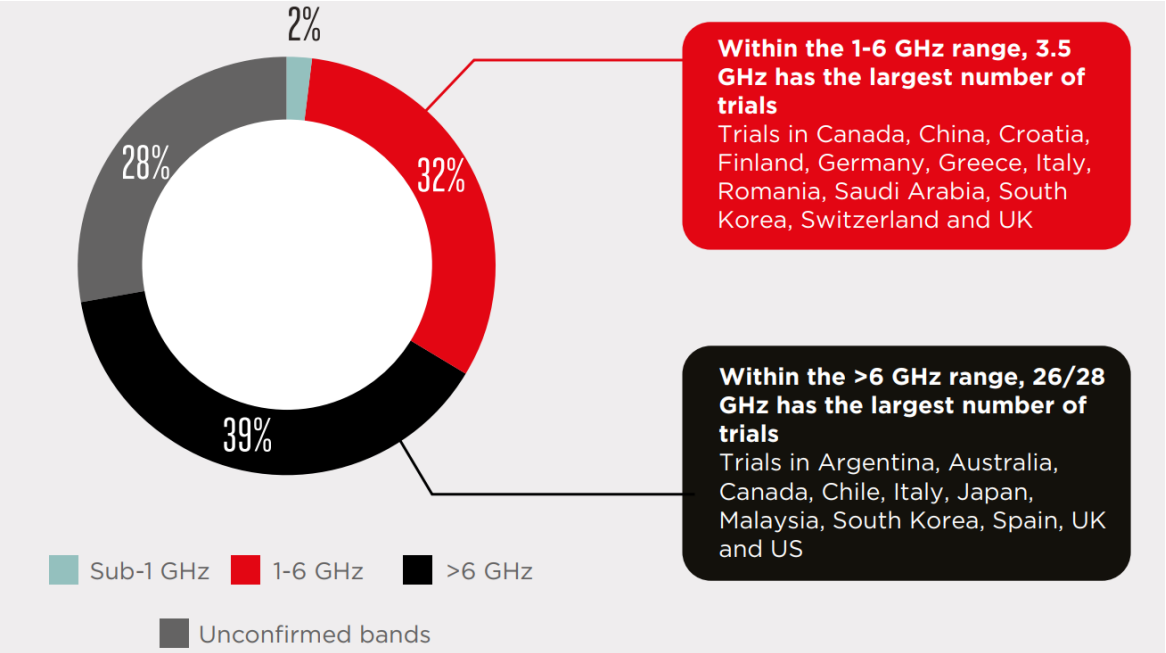
5G needs spectrum across three ranges

Sub-1 GHz
- Widespread coverage
- IoT services

1-6 GHz
- Good balance of coverage and capacity benefits

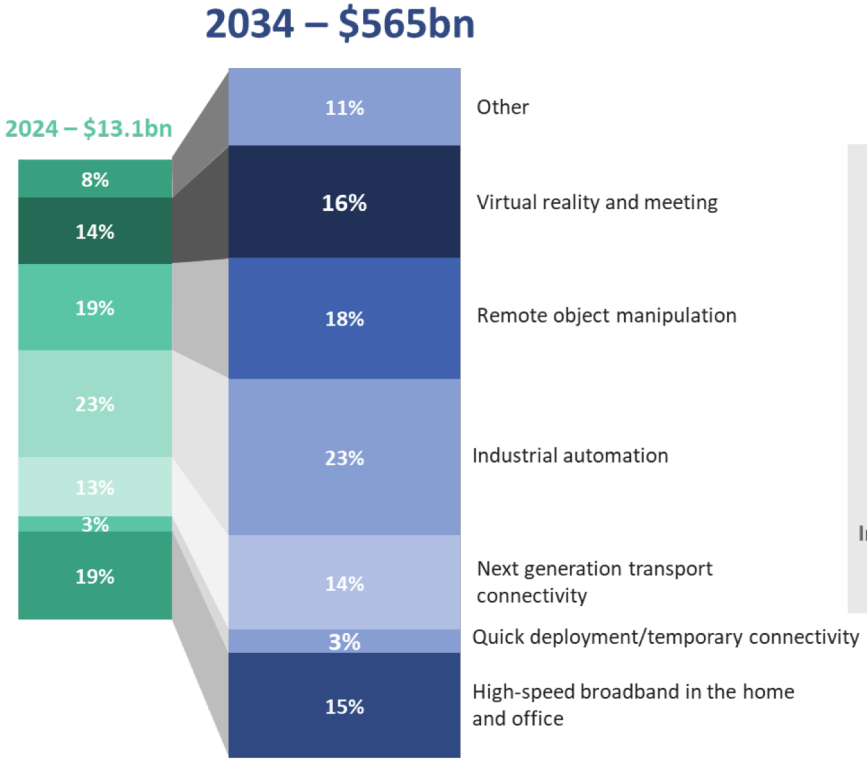
>6 GHz
- Capacity (ultra-high speeds)
- mmWave

Spectrum bands used for global 5G trials



Source: "The 5G Era in the US" (Mar 2018), GSMA; ""5G Spectrum Public Policy Position" (Nov 2016), GSMA

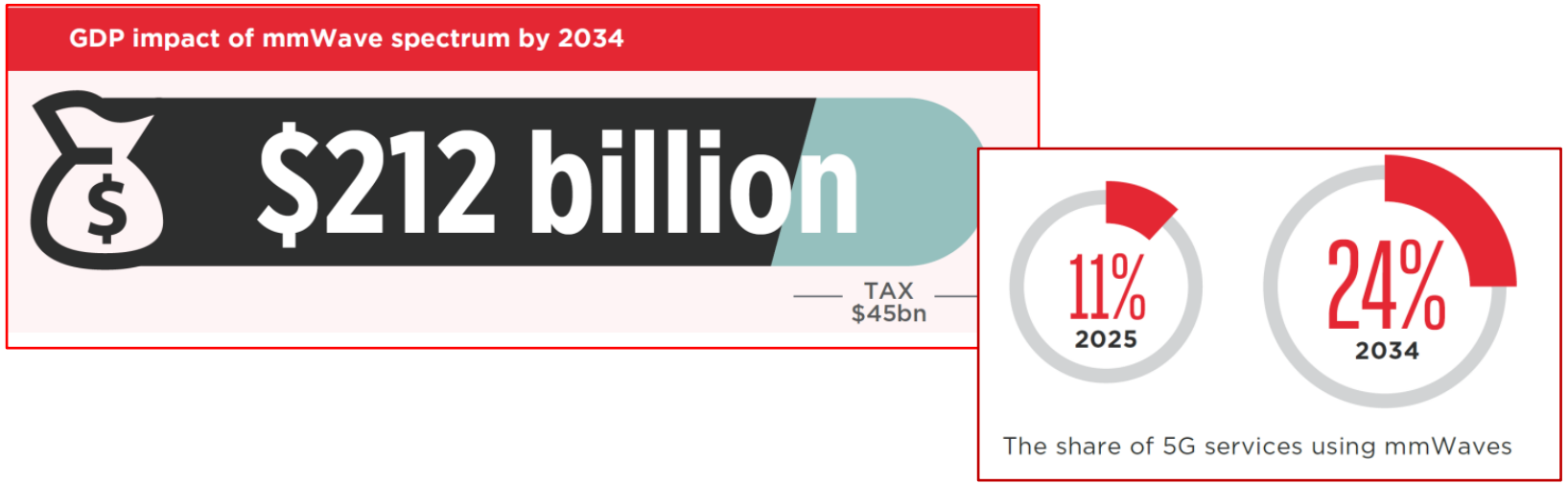
Projected Impact of mmW on GDP by Industry Vertical (Global)



Additional benefits of mmWave 5G

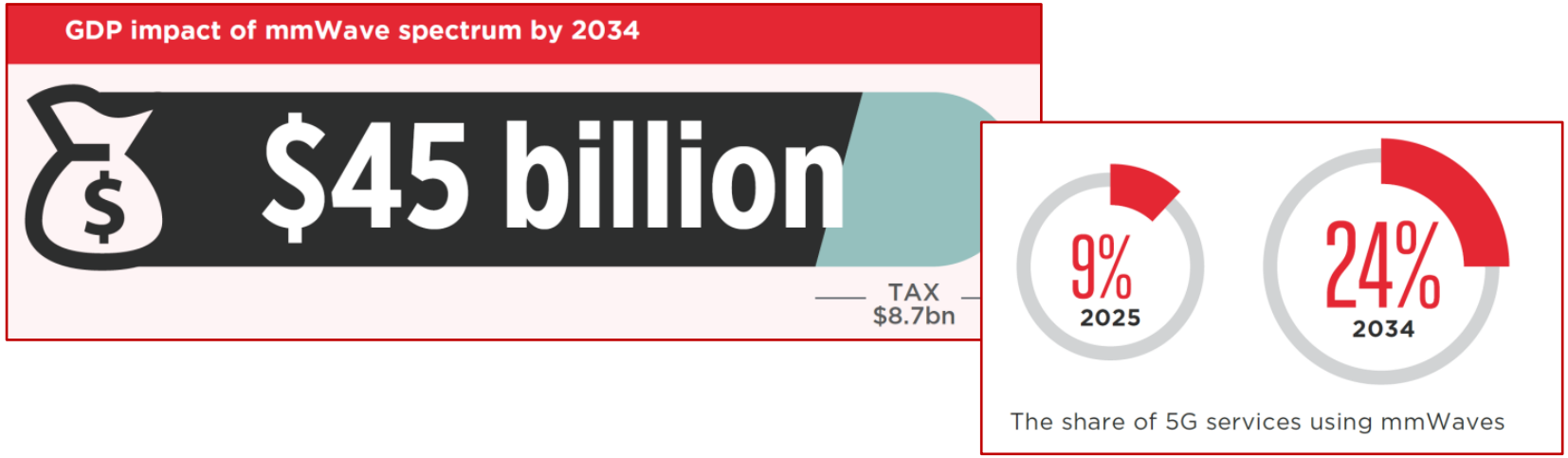
The socio-economic benefits of mmWave 5G (2020-2034)

Asia-Pacific Edition

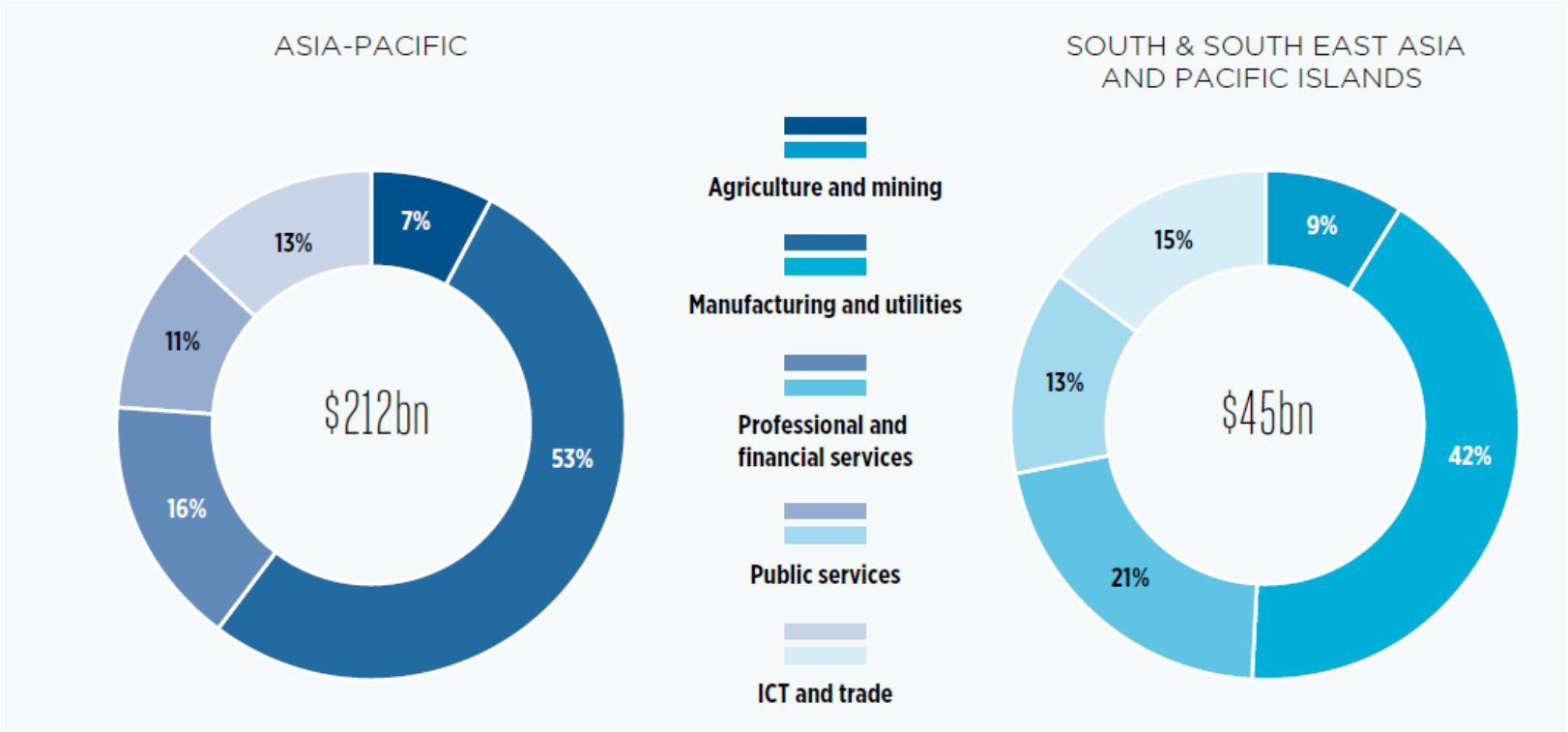


The socio-economic benefits of mmWave 5G (2020-2034)

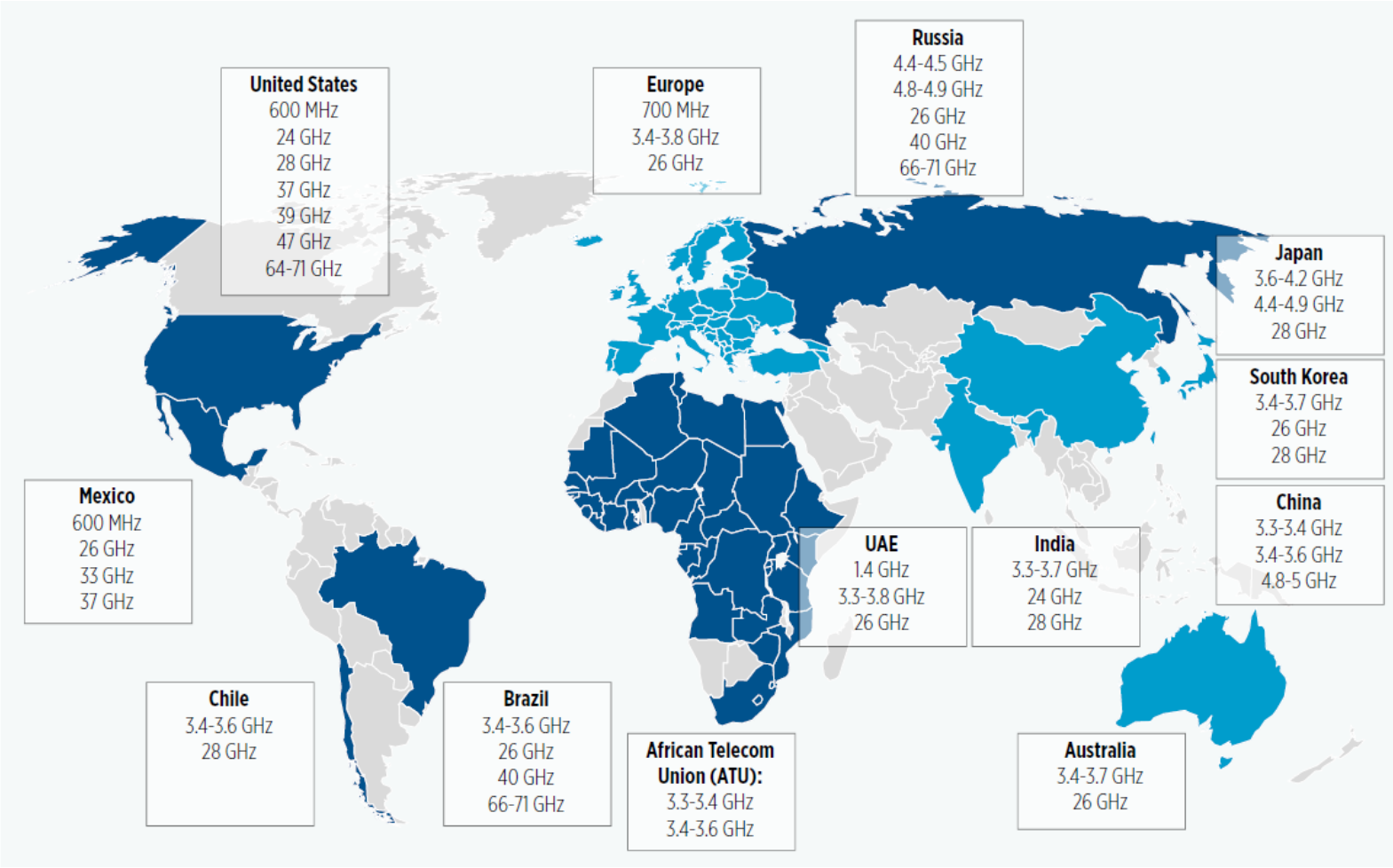
South and South East Asia and the Pacific Islands



STRUCTURE OF GDP CONTRIBUTIONS BY VERTICAL IN THE ASIA-PACIFIC REGION, 2034

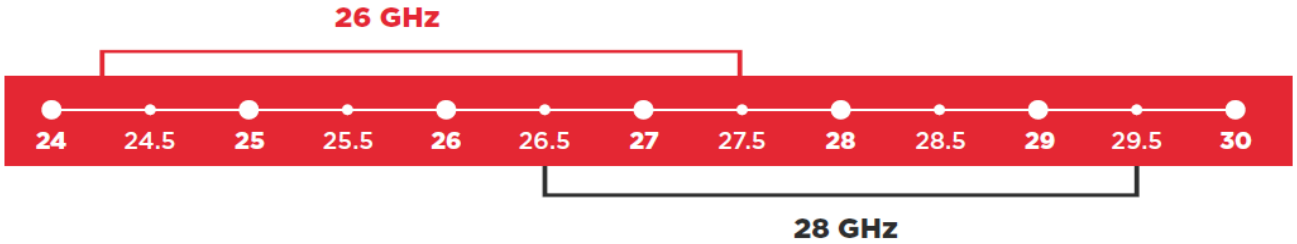


Summary of 5G priority bands in selected countries



The introduction of 5G pioneers a new level of mobile performance with ultra-high speeds and low latencies. What makes this possible is millimetre wave spectrum. In this range, 26 GHz and 28 GHz have emerged as two of the most important bands. These may offer the widest harmonisation with minimised user equipment complexity.

The availability of much larger amounts of spectrum in the millimetre wave bands will allow for ultra-high-speed mobile broadband services.



3GPP band n258 refers to the range between 24.25-27.5 GHz and is commonly called 26 GHz. And 3GPP band n257 refers to 26.5-29.5 GHz. It is commonly called 28 GHz.

The whole range between 24.25 GHz and 29.5 GHz is important. It will enable operators to meet the speed, latency, reliability and capacity requirements of 5G. The appropriate regulation, licensing and spectrum policies related to this range and other spectrum bands will encourage 5G investments and innovation. This includes usage conditions that don't hamper operators from making the most of it.

Preparing for 5G at WRC-19

A successful identification of spectrum for IMT under Agenda Item 1.13 is vital to realise the full potential of 5G networks

The GSMA also supports 66-71 GHz

The GSMA supports the 26 GHz and 40 GHz bands

Due to the large amount of spectrum needed for 5G services, the range 45.5-52.6 GHz also needs to be considered

Technical studies show that coexistence between IMT and other services is possible

Issues being addressed: OOB emissions

23.6-24	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340	
24-24.05	AMATEUR AMATEUR-SATELLITE 5.150	
24.05-24.25	RADIOLOCATION Amateur Earth exploration-satellite (active) 5.150	
24.25-24.45 FIXED	**24.25-24.45** RADIONAVIGATION	**24.25-24.45** RADIONAVIGATION FIXED MOBILE
24.45-24.65 FIXED INTER-SATELLITE	**24.45-24.65** INTER-SATELLITE RADIONAVIGATION 5.533	**24.45-24.65** FIXED INTER-SATELLITE MOBILE RADIONAVIGATION 5.533
24.65-24.75 FIXED FIXED-SATELLITE (Earth-to-space) 5.532B INTER-SATELLITE	**24.65-24.75** INTER-SATELLITE RADIOLOCATION- SATELLITE (Earth-to-space)	**24.65-24.75** FIXED FIXED-SATELLITE (Earth-to-space) 5.532B INTER-SATELLITE MOBILE 5.533

Region 1 Region 2 Region 3

- Working on achieving appropriate protection instead of overprotection
- Administrations wishing to identify the 26 GHz band for IMT should not be penalized
- Effects of overprotection: much higher costs for IMT deployment, impractical use
- Mobile industry is well placed to quantify OOB requirements (extensive standardization work over the years)
- Mobile industry track record in spectrum management practice
- Standardization work of EESS?

Issues being addressed: OOB emissions

Allocation to services		
Region 1	**Region 2**	**Region 3**
24.75-25.25 FIXED FIXED-SATELLITE (Earth-to-space) 5.532B	**24.75-25.25** FIXED-SATELLITE (Earth-to-space) 5.535	**24.75-25.25** FIXED FIXED-SATELLITE (Earth-to-space) 5.535 MOBILE
25.25-25.5	FIXED INTER-SATELLITE 5.536 MOBILE Standard frequency and time signal-satellite (Earth-to-space)	
25.5-27	EARTH EXPLORATION-SATELLITE (space-to Earth) 5.536B FIXED INTER-SATELLITE 5.536 MOBILE SPACE RESEARCH (space-to-Earth) 5.536C Standard frequency and time signal-satellite (Earth-to-space) 5.536A	
27-27.5 FIXED INTER-SATELLITE 5.536 MOBILE	**27-27.5** FIXED FIXED-SATELLITE (Earth-to-space) INTER-SATELLITE 5.536 5.537 MOBILE	

- Existing inefficient receiver filtering should not determine the practicable spurious emissions domain of efficient IMT spectrum use
- Certainly, inefficient receiver filtering should not impose unnecessary constraints on mobile use
- Should stringent overprotection be applied across the entire 26 GHz band????
- De-facto guard bands should be minimized to guarantee efficiency
- Aggregate mobile levels will not be significant during initial phases (i.e. indoor use)
- Effects of overprotection: much higher costs for IMT deployment, impractical use

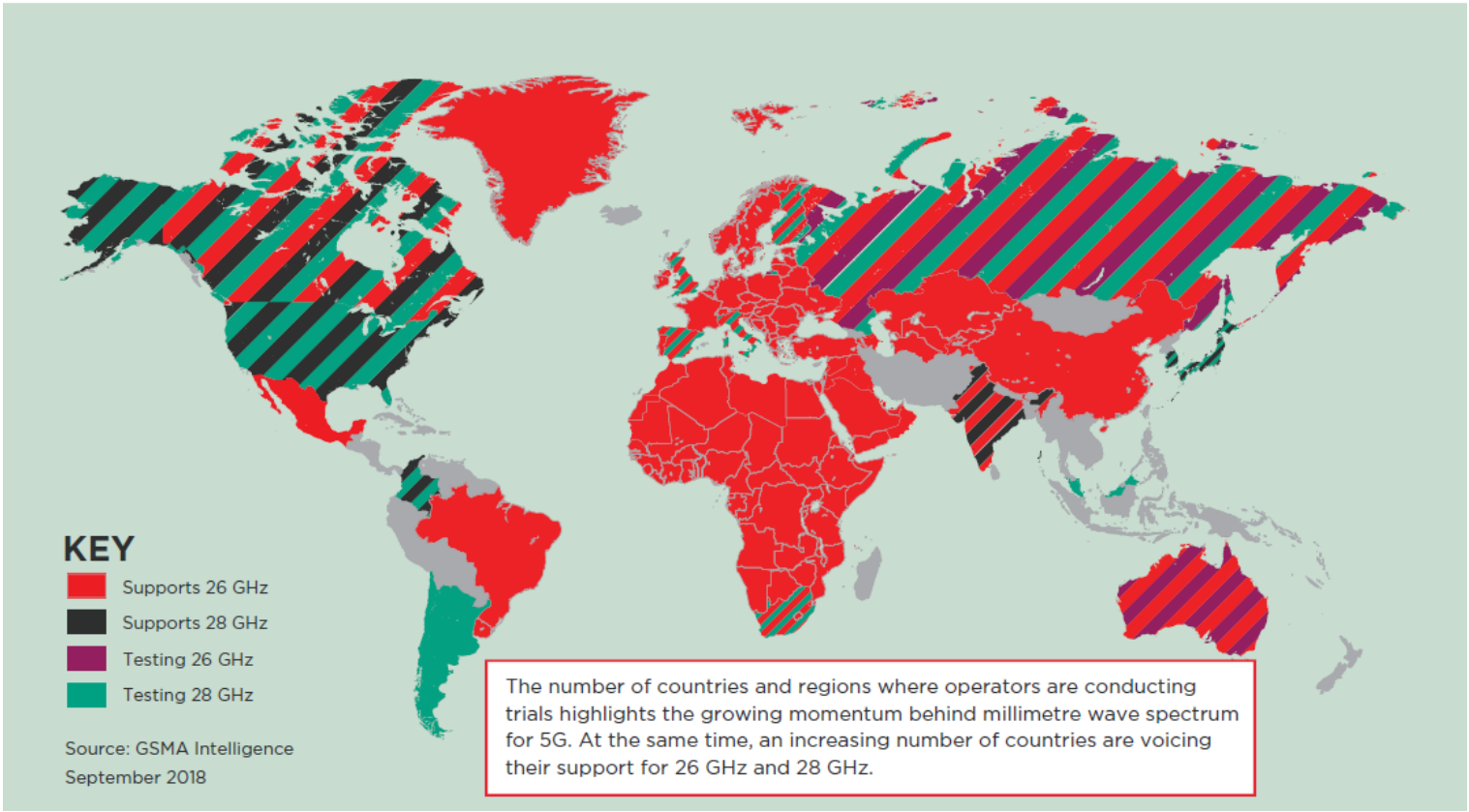
Working on achieving appropriate protection instead of overprotection

Issues being addressed: OOB emissions

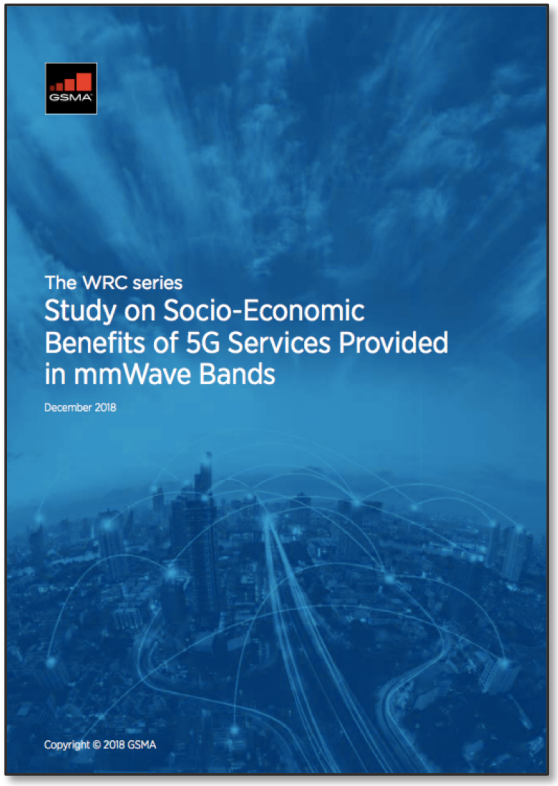
- ✓ In the 26 GHz range, a lot of work has focused on the co-existence with passive services in the band 23.6-24 GHz.
- ✓ While it is important to protect passive services, it should be done with the right limit. Otherwise, an overly onerous limit will severely restrict the use of IMT in the 26 GHz band.
- ✓ The GSMA's study on OOBE limits for base stations supports the values -32 to -35 dB(W/200 MHz). This falls within the range supported by other regional groups ASMG and ATU, as well as preliminarily by CITEL.

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

MOMENTUM IS PICKING UP



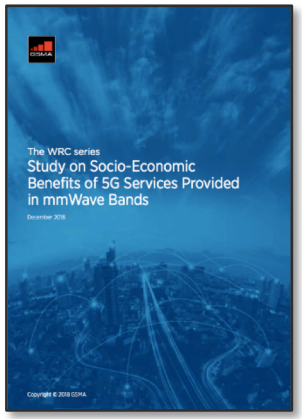
Mobile mmW Set to Deliver Socio-Economic Benefits



- 5G is predicted to provide important social and economic benefits globally
- mmWave spectrum will grow to become a significant piece of this impact over time, and
- Although economic benefits are greater in the early adopting economies over the period studies (2020-34), the rate of contribution of mmWave in later adopting economies outpaces that of early adopters in the later years of the study

Assigning mmW bands: key considerations

- Small coverage footprint, large bandwidths: heavy investment in network densification
- High spectrum pricing across hundreds of MHz of bandwidth will distort investment
- Predictability of spectrum release: a clear and collaborative spectrum roadmap benefits both government and mobile investments
- Timely spectrum release and reasonable prices will benefit 5G rollouts in APAC



GSMA Supporting Materials for WRC-19

THE GSMA WRC SERIES

https://www.gsma.com/spectrum/wrc-series

https://www.gsma.com/spectrum/5g-spectrum-guide/