



Welcome – CEPT

**GSMA Lunchtime Seminar
Agenda Item 1.13**



Welcome – CEPT

Glyn Carter
Senior Spectrum Advisor
GSMA

Impact of mmWave spectrum in Europe

Luciana Camargos
Senior Director, Future Spectrum
GSMA

5G needs spectrum across three ranges



Sub-1 GHz
1 – 6 GHz
AND ABOVE
6 GHz



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

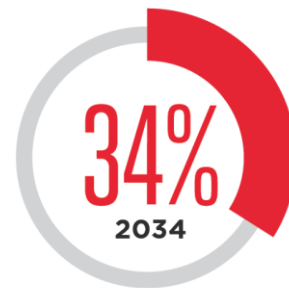
Europe Edition

GDP impact of mmWave spectrum by 2034



\$135 billion

TAX
\$55bn



The share of 5G services using mmWaves



Use cases for mmWave spectrum

5G: reaching it's full potential



**Remote
manipulation**



**Industrial
automation**



**Quick/temp.
deployment**



**High-speed
broadband**



**Virtual reality
and meetings**



**Next-gen
transport
connectivity**



In Summary: A lot at stake – 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 supports the **26 GHz and 40 GHz** bands

The GSMA also supports **66-71 GHz**

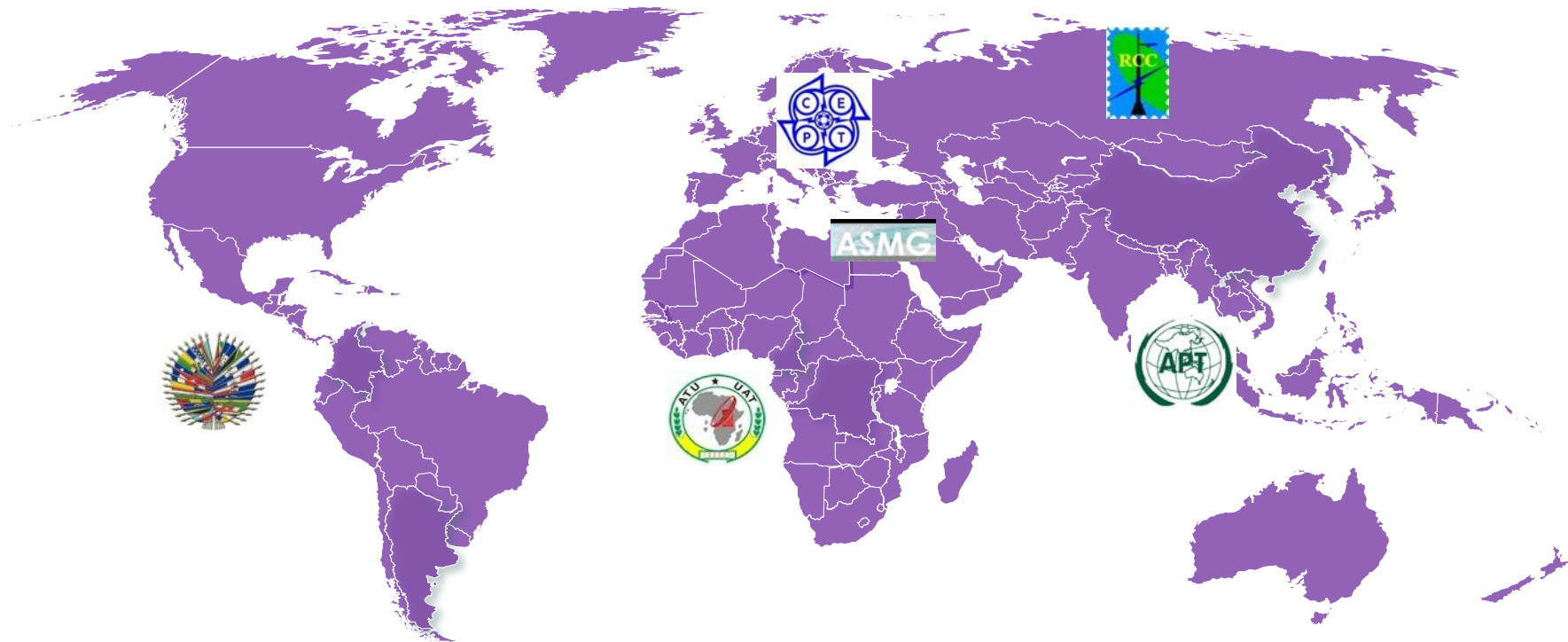
Due to the large amount of spectrum needed for 5G services, the range **45.5-52.6 GHz** also needs to be considered

Technical studies show coexistence between IMT and other services is possible

The result will have a major impact on the future of 5G



Target bands around the world





Mats Öhman
Senior Spectrum Manager
Telia Company

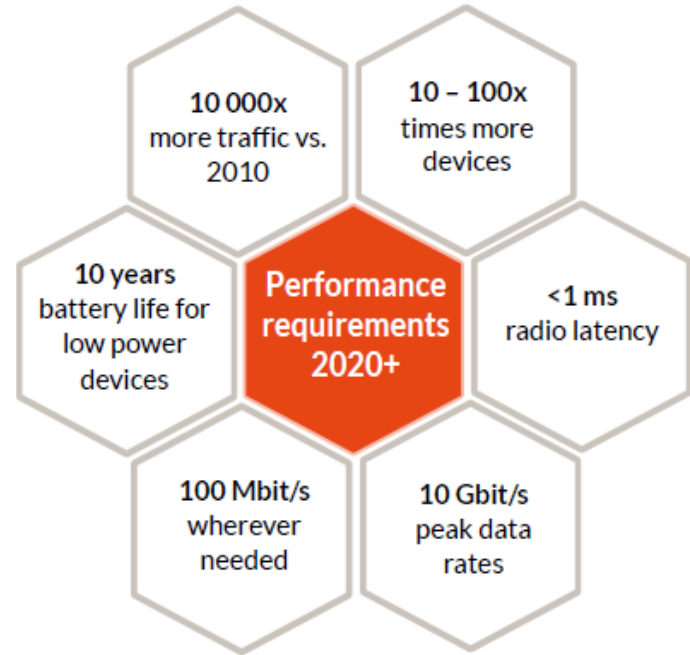
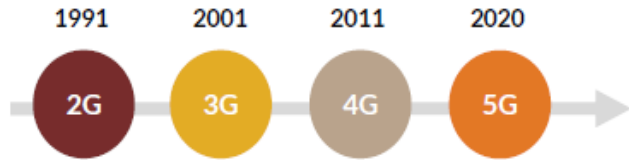
IMT-2020 AND MILLIMETRE WAVE

GSMA Seminar for CEPT
CPM19-2
Geneva 2019-02-25



5G IS THE NEXT MOBILE NETWORK 10 YEAR CYCLE

Evolution of mobile network technology



5G networks are expected to meet increasing performance requirements for capacity, data rates, latency, battery life, in order to support future needs and use cases.

Performance requirements source: Nokia "5G Use Cases and Requirements" 2015



USE CASE CATEGORIES



Massive MTC



Enhanced
Mobile
Broadband



Enterprise and
Industry



Critical
Communication
and MTC



TELIA COMPANY BUSINESS AMBITIONS FOR 5G

ENHANCED MOBILE BROADBAND

STRENGTHEN THE EXISTING BUSINESS



Gigabytes in a second



Immersive HQ 360 video without lag



4K video streaming



Augmented reality for play and work



eHealth



Industry automation



Self-driving vehicles

CREATE NEW OPPORTUNITIES

Smart houses



Complement fiber connectivity.

Smart cities



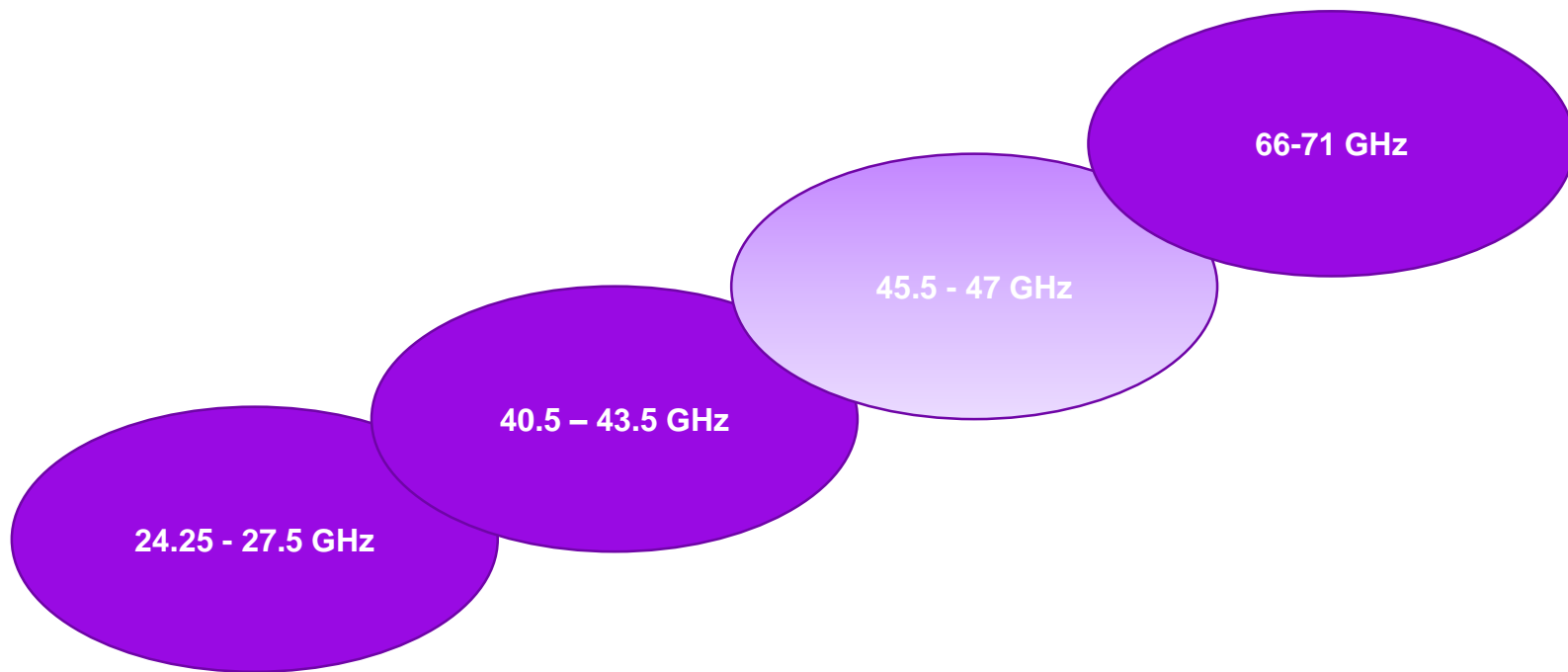
Pervasive connectivity, collection and analysis of data to shape solutions that can help improve citizens' lives.

**MASSIVE IOT –
MACHINE
COMMUNICATIONS**

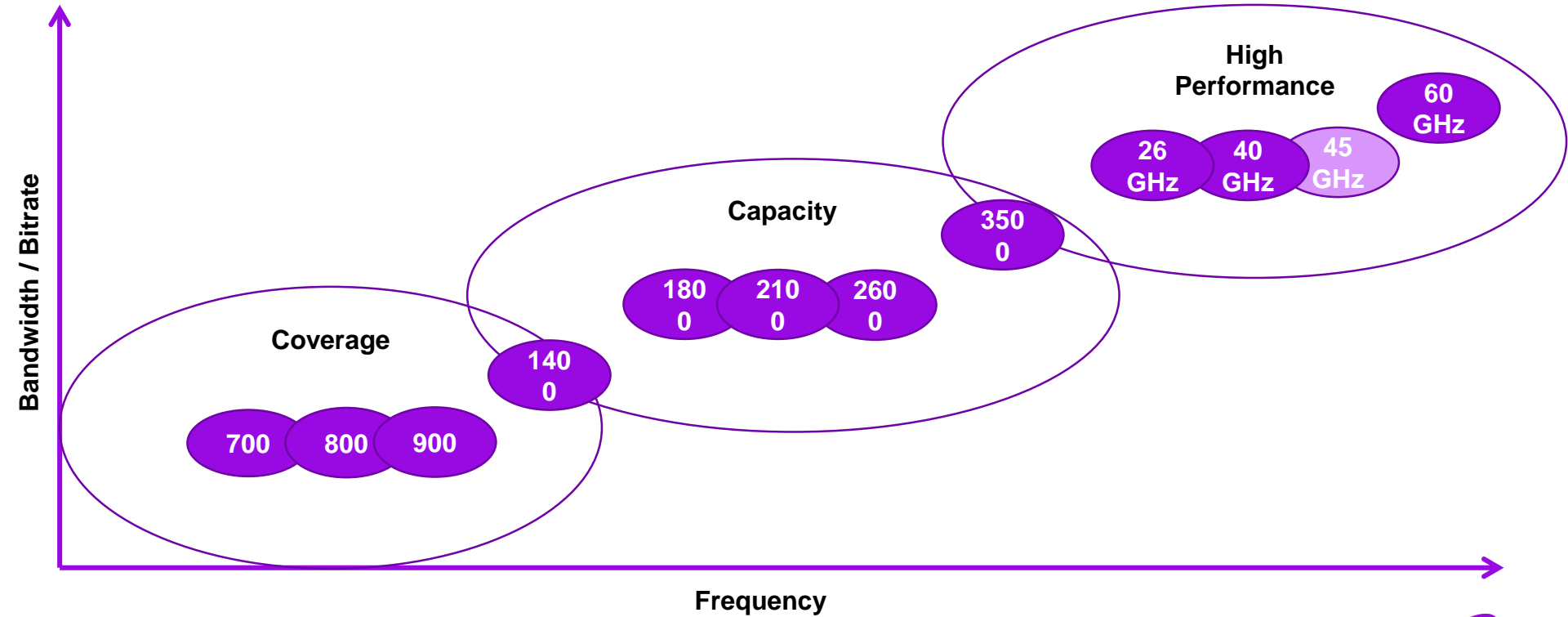
**CRITICAL IOT
ULTRA-RELIABLE & LOW
LATENCY**



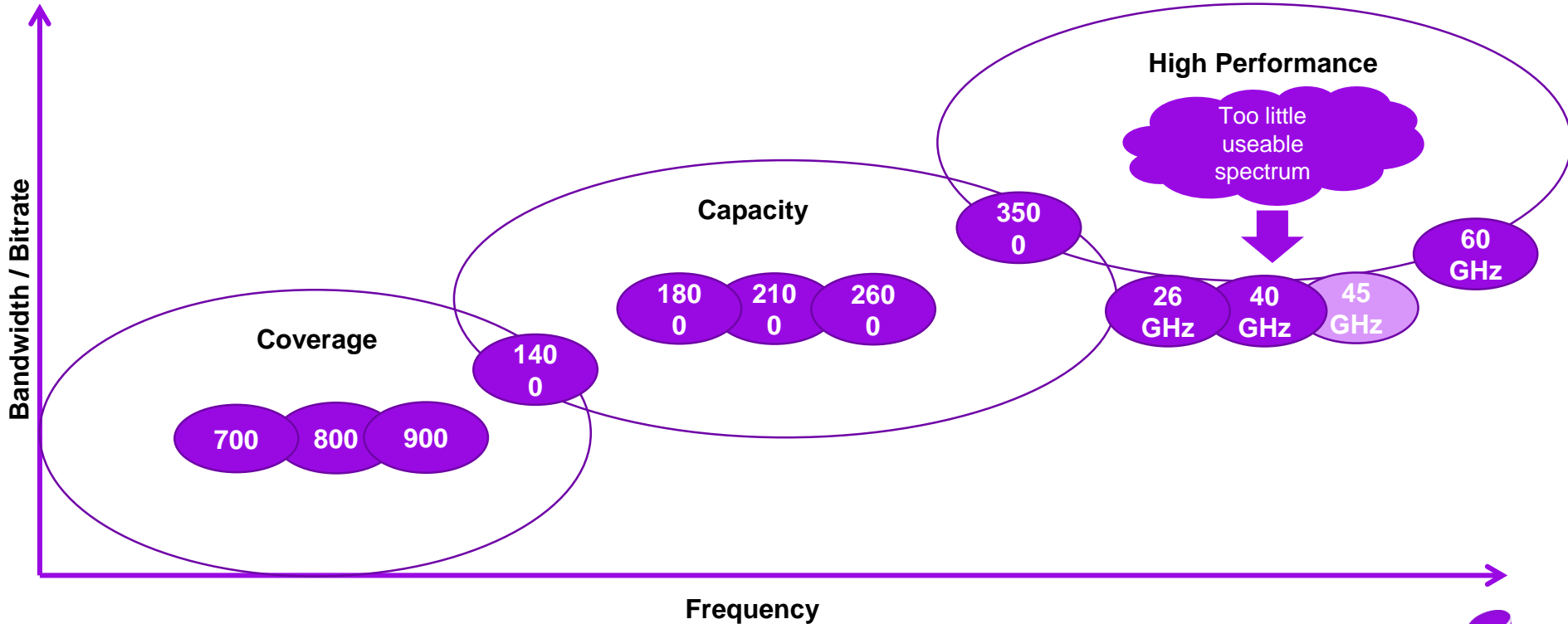
TELIA COMPANY PRIORITY BANDS FOR WRC-19



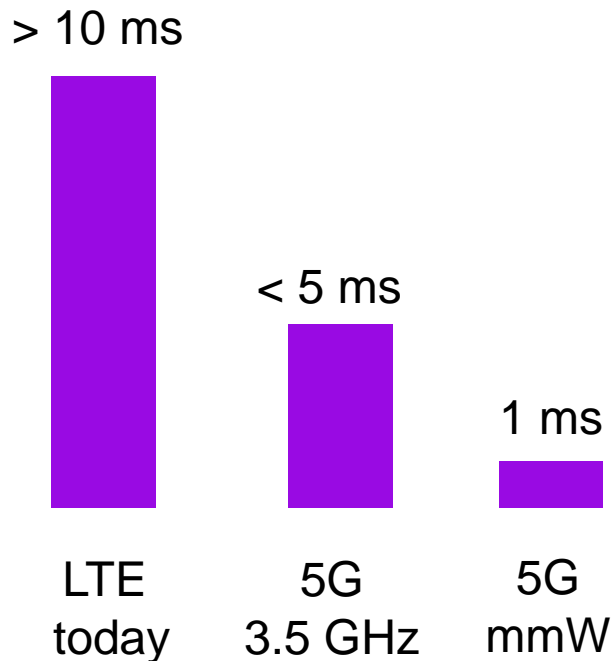
MAPPING OF MOBILE BANDS



MAPPING OF BANDS



TOTAL LATENCY



- 3.5 GHz TDD can provide nice latency (< 5 ms), but not ultra-low latency.
- Network synchronization impacts on latency, but is needed for 3.5 GHz.
- 3.5 GHz TDD expected to use 1:3 UL:DL ratio, 30 kHz SCS.
- Local content needed for ultra-low latency, 100 km adds 1 ms.



TRIALS AND PARTNER PROGRAMS

- Telia has active 5G partner programs – Several companies have already joined to develop future services and new business models together. Open for more!
- Several 5G trials – mm-wave trials for testing very high speed and low latency.



eSports – low latency



VR – low latency,
high speed

Real time quality analytics in
remote data center – high
speed, low latency



Cruise ship at and near port
– high speed and capacity



WRC-19 STUDIES

- The results concluding,
 - good possibilities to share between IMT and incumbent services in most cases (e.g. with FSS, ISS)
 - in some cases coordination may be needed, but feasible to accomplish on a national basis (e.g. with FS, EESS s-e, RAS)
 - in one case (EESS passive in 26 GHz) some general limitations may be needed to find a way forward for both concerned services
- Better sharing possibilities between IMT and incumbent services than in lower bands
 - Higher attenuation
 - Higher clutter losses
 - Higher antenna isolation due to the beamforming, in particular for aggregated cases
 - More similar to the sharing situation between FS and other services



WHY IMPORTANT

- Demand for increased mobile capacity and bandwidths are driven by changed user behavior and new use cases.
- The frequency bands >24 GHz will be very important for new use cases and areas with very high data demand which cannot be supported in lower bands due to limited bandwidth.
 - Without sufficient amount of new spectrum, 5G in dense areas may be experienced as 3G/4G
 - New mobile services will demand the capacity, bandwidth and performance that only the bands above 24 GHz can support, e.g. high definition 360 video, industrial applications and FWA as a complement to fiber
- Besides high bandwidth and capacity, the low latency and ultra reliability of IMT-2020/5G open many new possibilities.
 - IoT – IMT-2020/5G capabilities offer many new opportunities for IoT and M2M applications
 - Other industries – possibilities to support specific industry applications, both as dedicated deployments/applications but also as a part of the public network
- Our vision - A future multi-purpose network that could be used for many versatile applications.





Sverker Magnusson
Director, Spectrum Standardization
Ericsson

GLOBAL HARMONISATION OF MILLIMETER WAVE SPECTRUM FOR IMT-2020

February 2019

Global mobile Suppliers Association

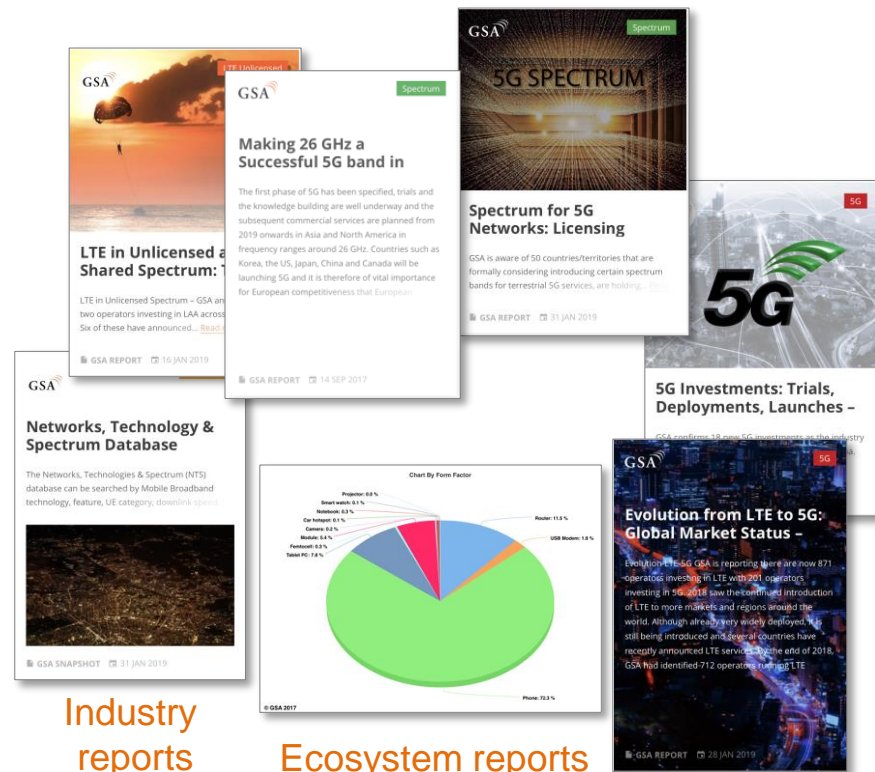


ABOUT GSA

See <https://gsacom.com/>

- GSA (the Global mobile Suppliers Association) is the *Voice of the Global Mobile Ecosystem* and has been supporting the industry since 1998
- GSA actively promotes the 3GPP technology and spectrum road-map – 3G; 4G; 5G – and is a single source of information resource for industry reports and market intelligence
- GSA reports are free to download and are based on our leading industry database – **GAMBoD**
- Regulators can access specific reports and consultation responses at <https://gsacom.com/regulators/>
- Regulator members have access to GAMBoD

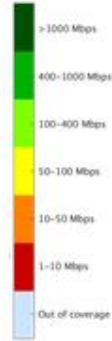
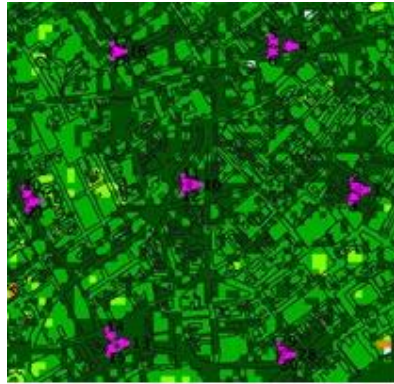
Spectrum reports



5G Reports

<https://gsacom.com/gambod/>

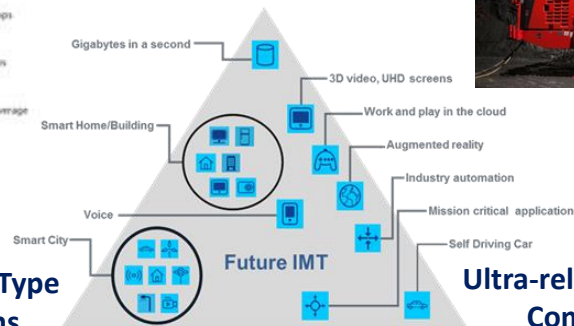
ENABLE A VARIETY OF USE CASES



Enhanced Mobile Broadband



Massive Machine Type Communications

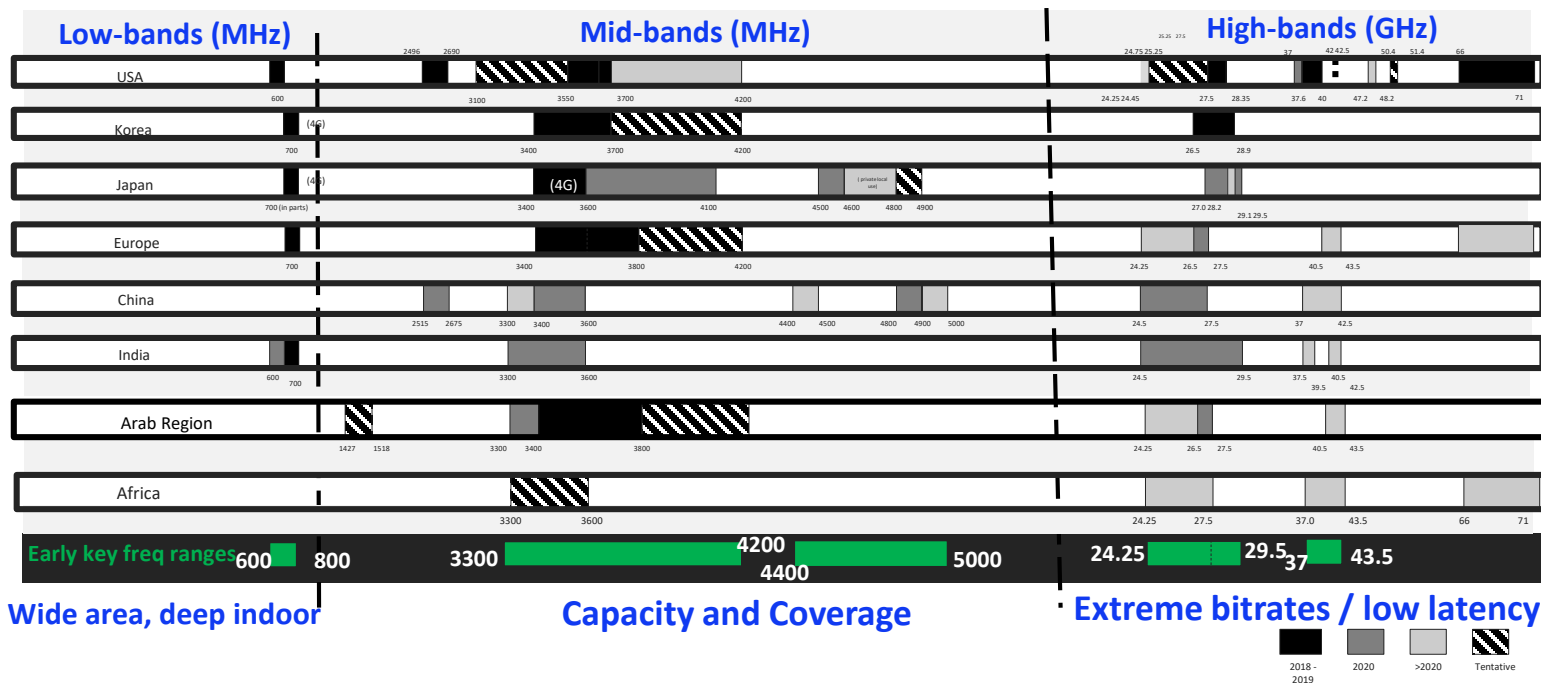


Ultra-reliable, Low-latency Communications

ITU-R M.2083

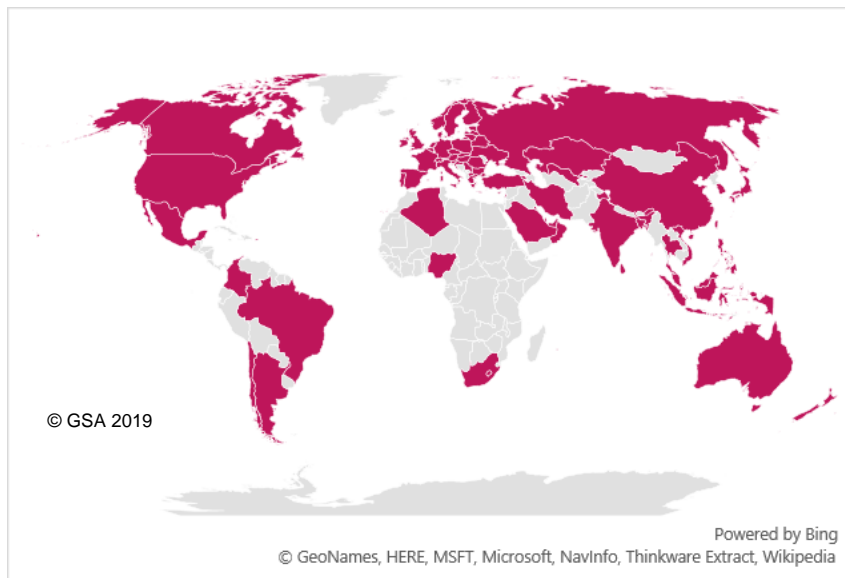


ENABLE A VARIETY OF FREQUENCY BANDS - EXAMPLES

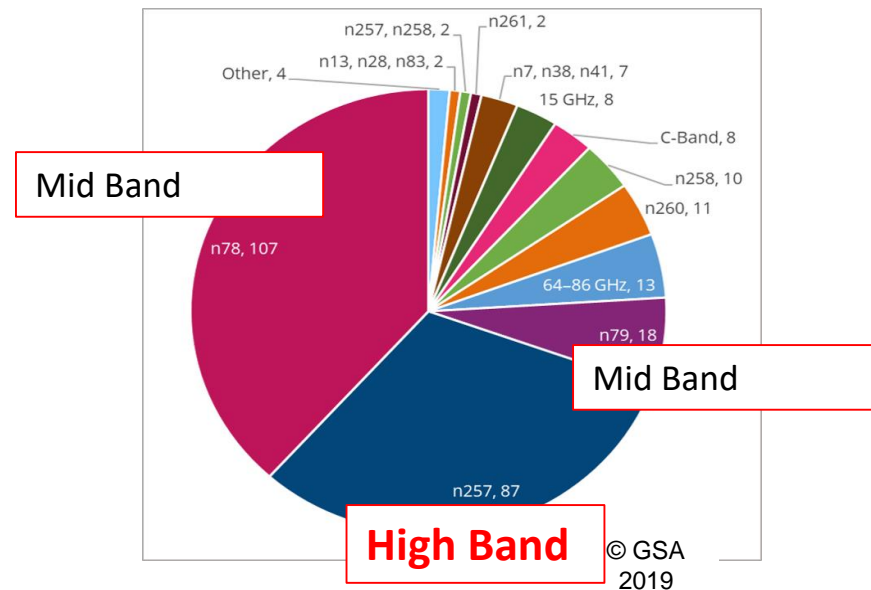


Key frequency ranges for early 5G NR deployments globally:
600/700 MHz, 3.3-5 GHz, 26/28 GHz and 37-43.5 GHz

*Tests/trials/launches:
201 operators, 83 countries*



*Spectrum bands used in IMT-2020 / 5G trials, mapped to
3GPP 5G spectrum band allocations (November 2018)*



3GPP

- Initial 3GPP standard (Rel 15) completed
- Work started on release 16
- mmWave frequency bands specified, in addition to mid and low bands

| NR – mmWave | | | |
|-------------|-----------------|----------|-------------|
| Band | Frequencies GHz | BW MHz | Duplex mode |
| n257 | 26.5 – 29.5 | 50 – 400 | TDD |
| n258 | 24.25 – 27.5 | 50 – 400 | TDD |
| n259 | [40.5] – 43.5 | 50 - 400 | TDD |
| n260 | 37.0 – 40.0 | 50 - 400 | TDD |
| n261 | 27.5 – 28.35 | 50 – 400 | TDD |

Commercial equipment

- 5G Infrastructure base stations, chipsets, 5G/Wi-Fi routers and phones available 2018 – 2020 to support frequency bands available
- 5G Operator commercial deployments commenced



Key frequency ranges for early 5G NR deployments globally:
600/700 MHz, 3.3-5 GHz, 26/28 GHz and 37-43.5 GHz



The Industry Voice of the Global Mobile Ecosystem

<https://gsacom.com>



Closing remarks

Luciana Camargos
Senior Director, Future Spectrum
GSMA



How will the industry prepare for 5G?

26 GHz

24.25-27.5 GHz

EESS (passive)
-32 to -35
dB(W/200MHz)

FSS / ISS sharing
studies show
significant
protection margin

40 GHz

37-43.5 GHz

EESS (passive)
Res 752 applies
Active band

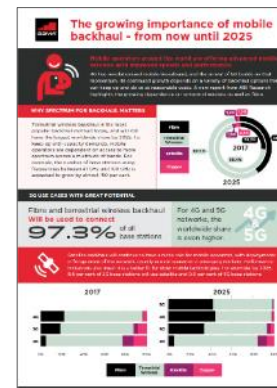
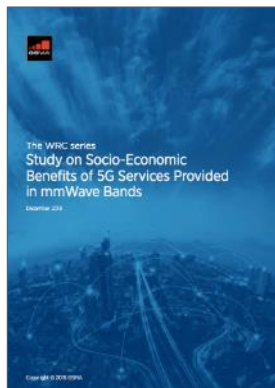
FSS sharing is a
national issue

66 GHz

66-71 GHz

Flexible use by 5G
systems

Enabling both IMT
and non-IMT
technologies



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

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



MOBILE CHANGES EVERYTHING

mmWaves: unlock the full potential of 5G