Global Spectrum Update -4G/5G deployments

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Spectrum usage overview



A combination low/mid/high bands is key

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The key is to allocate enough harmonized spectrum in low/mid/high bands













Best practices

- Harmonization both in allocations and technical rules for a healthy ecosystem
- Large contiguous spectrum blocks rather than Carrier Aggregation for spectrum efficiency and cost
- Nationwide allocations instead of setting aside spectrum for verticals
 - Verticals can be addressed by leasing or network slicing
- Network synchronization required in TDD midband/high-bands if not enough separation, including TDD patterns
- Technology and service neutral licenses to drive competition, efficiency and innovation

5G device support



- Low bands: most supported band 700 MHz; 600 MHz largely supported
- Mid-bands: most supported band 3.3-4.2 GHz; historically 3G/4G bands (e.g. n1); 4.4-5 GHz;
- High-bands: 24/26/28 GHz, 39 GHz

source: GSA (gsacom.com)

 ⁵G device ecosystem is rapidly growing

Low bands 600/700 MHz

• 700 MHz is a 5G primary band in Europe

- ECC Decision (15)01 on Harmonised technical conditions for mobile/fixed communications networks (MFCN) in the band 694-790 MHz including a paired frequency arrangement (Frequency Division Duplex 2x30 MHz) and an optional unpaired frequency arrangement (Supplemental Downlink)
- Commission Implementing Decision (EU) 2016/687 on on the harmonisation of the 694-790 MHz frequency band for terrestrial systems capable of providing wireless broadband electronic communications services and for flexible national use in the Union



- (617-698 MHz) has been allocated in US, Canada, Mexico
- Interest increasing in Middle East Region (Saudi Arabia as example)
- CEPT is considering 470-694 MHz towards WRC-23





source: GSA (gsacom.com)

3300-4200 MHz, 1(2) 5G ma<u>in initial mid band</u>



Middle East and Africa (within ITU Region 1)





5G primary band in Europe

Europe / CEPT (within ITU Region 1)

Commission Implementing Decision (EU) 2019/235 of 24 January 2019 on amending Decision 2008/411/EC as regards an update of relevant technical conditions applicable to the 3400-3800 MHz frequency band: https://docdb.cept.org/document/8822

ECC Decision of 9 December 2011 on harmonised frequency arrangements and least restrictive technical conditions (LRTC) for mobile/fixed communications networks (MFCN) operating in the band 3400-3800 MHz, amended on 14 March 2014 and amended 26 October 2018 ECC Decision (11)06: https://docdb.cept.org/document/433

source: GSA (gsacom.com)

3300-4200 MHz, 1(2) 5G main initial mid band



Americas (ITU Region 2)

APAC (ITU Region 3)

MHz

3700

3800

3900

4000

3600

• US re-farming FSS above 4GHz to allow 5G In the Cband

4200

4100

Mid-bands expansion

- Depending on 5G current released and national circumstances (with existing ecosystem):
 - 3800 4200 MHz
 - 4400 5000 MHz
- 5925/6425 7125 MHz



6 GHz is key for IMT (WRC-23 AI 1.2)

eMBB



FWA

Smart cities

Industry 4.0

Increased



industrial efficiency

and decarbonize

ITU-R IMT2020 vision Internet to small towns / rural villages Reducing emissions from all sectors (e.g. transport)

5G NR use cases



(*) Source: <u>www.speedtest.net/global-index</u>

(***) Source: Total Fixed BB subscription and revenue forecast: 2020–25 (Sept. '20)

Fixed broadband is the bottleneck for Home Broadband

- Helps to deliver United Nations Sustainable
 Development Goals (1)
- Contributes to reaching the ITU and UNESCO Broadband Commission 2025 targets (2)
- (1) indicator for SDG 9.c is to "Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet [...] by 2020" is the "Proportion of population covered by a mobile network, by technology".
- (2) "By 2025, entry-level broadband services should be made affordable in developing countries, at less than 2% of monthly gross national income per capita."

20%

On average, 20 percent of 5G users claim they have decreased Wi-Fi usage at home and other locations

10%

claim they have stopped using Wi-Fi on smartphones after upgrading to 5G in lead 5G markets

Source: Five Ways to a Better 5G, Ericsson ConsumerLab

5G triggers changes, starts to displace Wi-Fi



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• 5G primary band in Europe (26GHz)

Commission Implementing Decision (EU) 2020/590 of 24 April 2020 amending Decision (EU) 2019/784 as regards an update of relevant technical conditions applicable to the 24.25-27.5 GHz frequency band: https://docdb.cept.org/document/15110

ECC Decision of 6 July 2018 on the harmonised technical conditions for Mobile/Fixed Communications Networks (MFCN) in the band 24.25-27.5 GHz, corrected 26 October 2018: <u>https://docdb.cept.org/document/3361</u>

 Spectrum within the ranges 37-43.5 GHz has been released in some markets: USA, Canada, Japan, Korea, China, CEPT
 source: GSA (gsacom.com)

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5G transport towards 2025



Final remarks

- The key is to allocate enough harmonized spectrum in low/mid/high bands
 Harmonization both in allocation and technical conditions to ensure a healthy ecosystem
- Nationwide allocations are efficient to address both MBB and other use cases
- Network synchronization needs to be considered
- Spectrum for 5G (depending on markets)
 600 and 700 MHz
 - 3.3-4.2 GHz main 5G mid-band; mid-band expansion 3.8-4.2 GHz, 4.4-5 GHz, 6 GHz
 WRC-23 AI1.2 on IMT identification is key!
 - $_{\odot}$ 26/28 GHz main inital 5G first high-bands; 37-43.5 GHz released in some markets
 - \circ 3G/4G spectrum to be re-farmed to 5G

Backhaul for 5G is also key for success



