

FORWARD THINKING FOR SPECTRUM

Getting ready for 5G

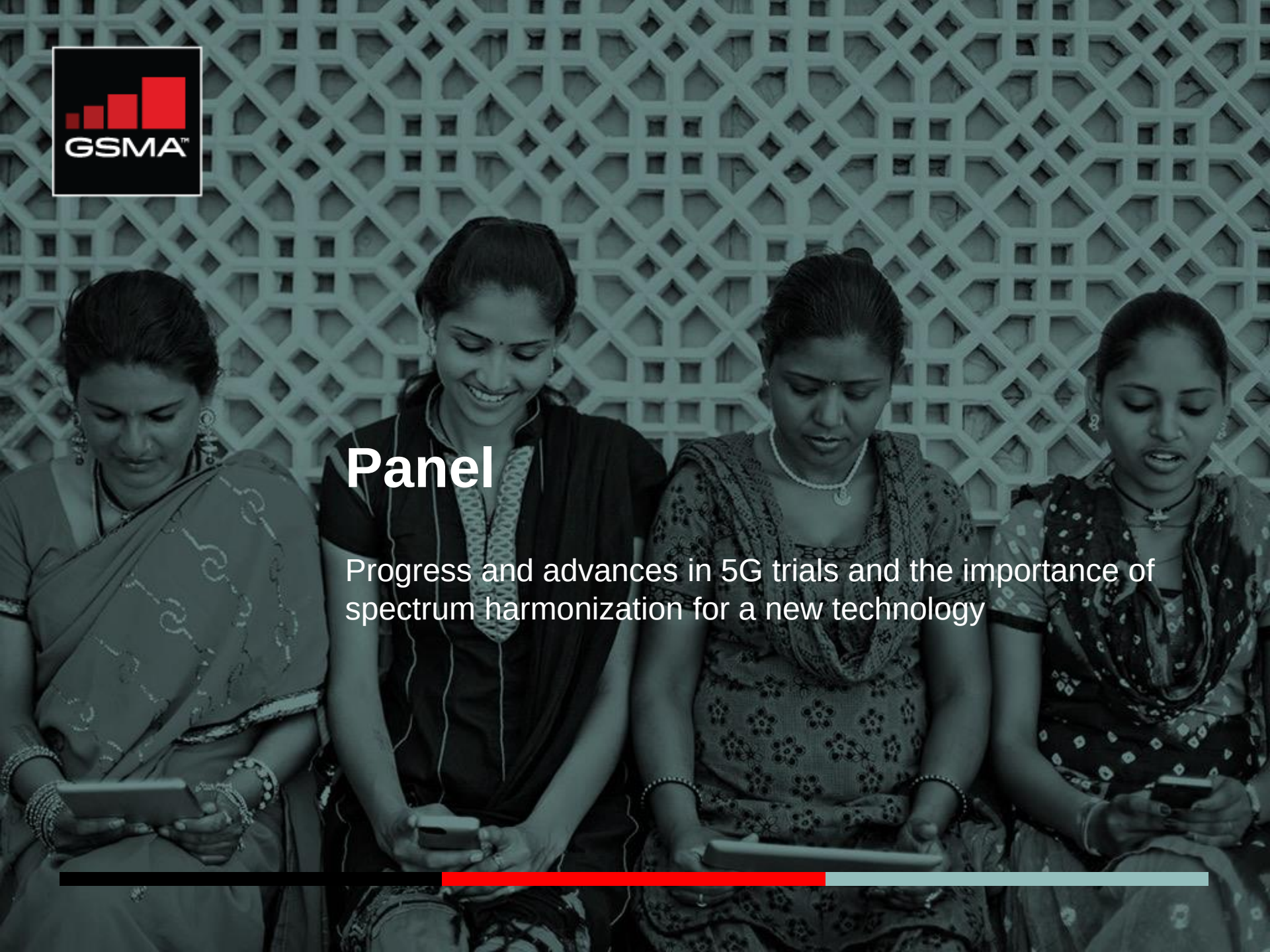
GSMA-GSA seminar, ITU World Telecom

16th November 2016

Co-hosted by







Panel

Progress and advances in 5G trials and the importance of spectrum harmonization for a new technology

Panel:

Progress and advances in 5G trials and the importance of spectrum harmonization for a new technology

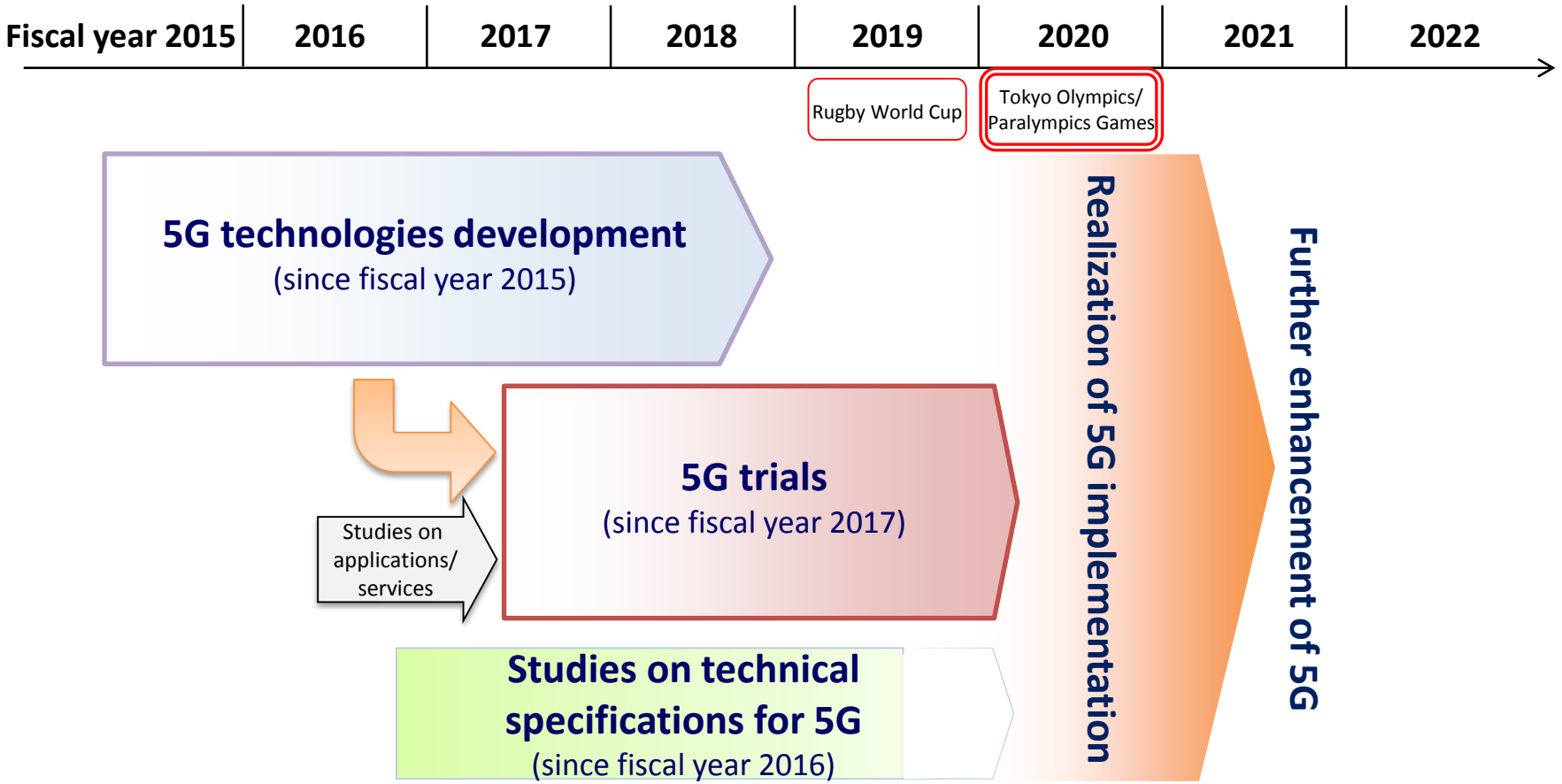
- **Moderator**
  - Peng Zhao, Regional Spectrum Policy Director, GSMA
- **Panellist**:
  - Rob Middlehurst, Vice President International Regulatory Affairs, Etisalat
  - Hiroyuki Atarashi, Director, NTT Docomo
  - Julie Garcia Welch, Senior Director and Head of Government Affairs, Southeast Asia & Pacific, Qualcomm Incorporated
  - Hakan Ohlsen, Director of the Spectrum and Radio Technology Strategy, Ericsson

Potential spectrum for early “5G” development

Country	Below 6GHz	Above 6GHz	Source
Japan 	• 3.6-4.2GHz • 4.4-4.9GHz	• 27.5-29.5GHz	Report on “Spectrum policy initiative towards 2020” by MIC
China 	*Steps 2 trial in 2016 and onwards* • 3.4-3.6GHz *Step 3 trial in 2017 and onwards* • 3.4-3.6GHz • Other frequency bands including 3.3-3.4GHz & 4.4-4.5GHz (TBD)	*Step 3 trial in 2017 and onwards* • Frequency bands in 6-100GHz (TBD)	“Spectrum consideration on 5G R&D trial” by IMT-2020 (5G) PG
Korea 		*For 5G trials in 2018* • 26.5-29.5GHz	Presentation at 5G workshop in MWCS

Timeline of 5G development in Japan

- **Timeline of 5G development has been presented by MIC.**
  (Ministry of Internal Affairs and Communications)



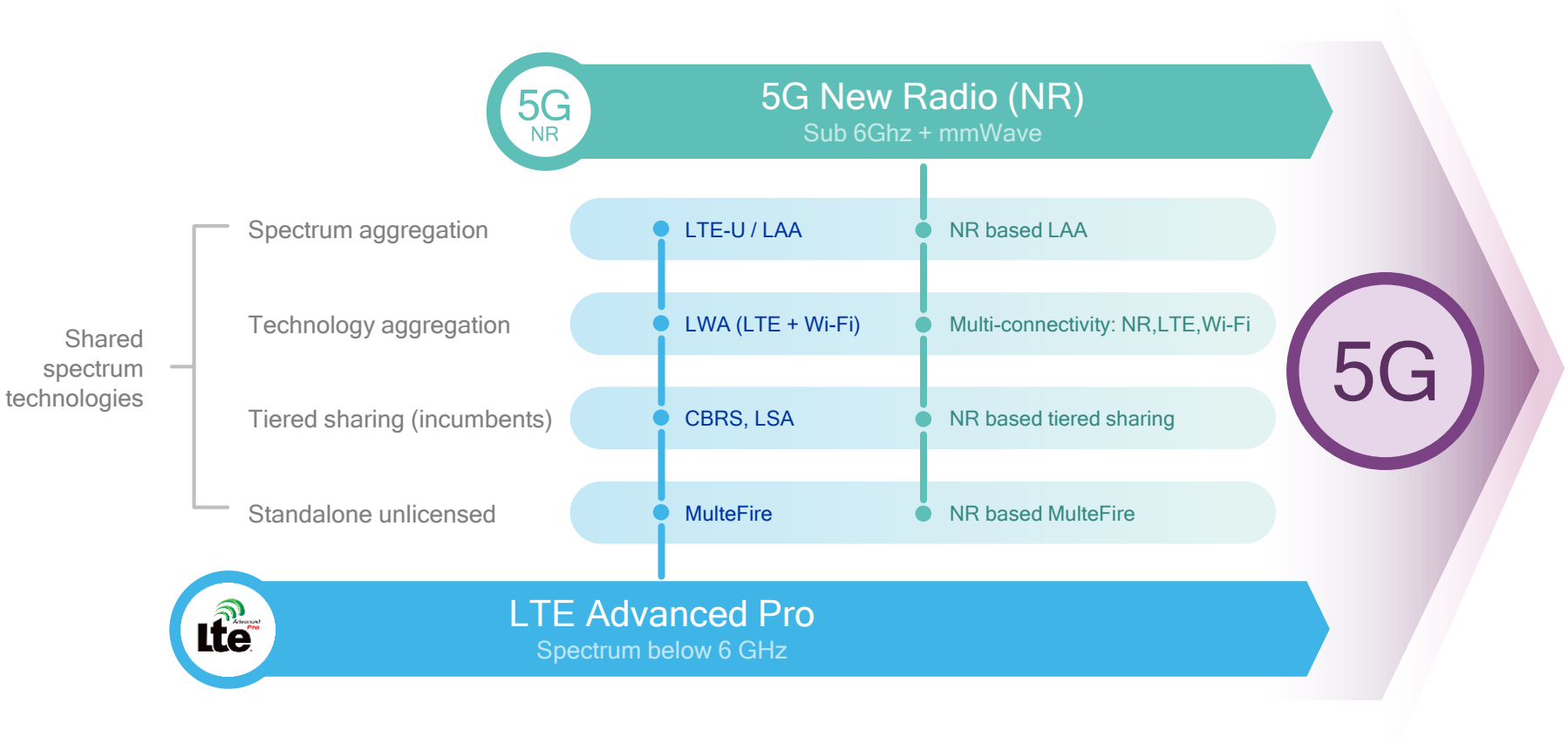
Forward Thinking For Spectrum

Julie Garcia Welch
Senior Director and Head of Government Affairs
Southeast Asia & Pacific
Qualcomm Incorporated

GSMA and GSA Panel at ITU World Telecoms 2016

Shared spectrum will be important for 5G

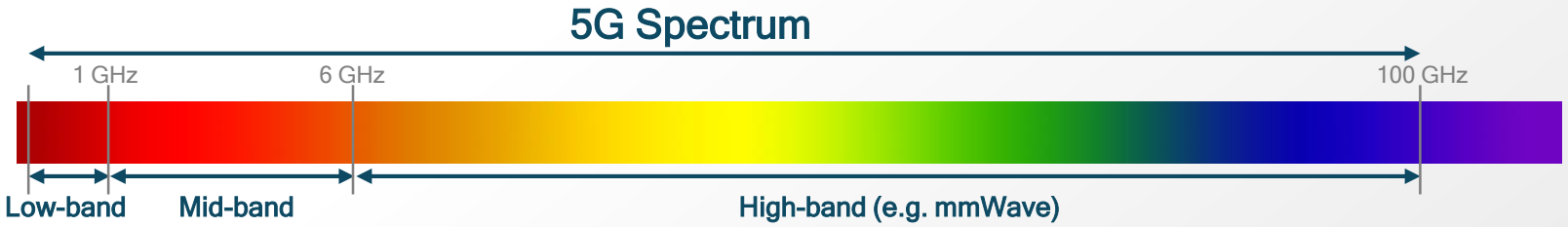
Building on LTE-U/LAA, LWA, CBRS/LSA and MulteFire[1]



1 Licensed-Assisted Access (LAA), LTE Wi-Fi Link Aggregation (LWA), Citizen Broadband Radio Service (CBRS), Licensed Shared Access (LSA)

The FCC is driving key spectrum initiatives to enable 5G

Across low-band, mid-band, and high-band including mmWave



Low-band
Broadcast Incentive Auction

- First stage auction opened up 126 MHz in 600 MHz band, auction failed to close with clearing cost set at $88.4B
- Third stage auction underway for 108 MHz,
- Spectrum availability timing aligns with 5G

Mid-band
Citizens Broadband Radio Service

- Opening up 150 MHz in 3.5 GHz band
- 3-tier spectrum sharing with incumbents, PAL[1], and GAA[2]
- CBRS Alliance formally launched to drive an LTE-based ecosystem

High-band
Spectrum Frontiers Ruling[3]

- Opening up 11 GHz in multiple mmWave bands
- 70% of newly opened spectrum is shared or unlicensed
- Unanimously approved by FCC with additional candidate bands identified for IMT-2020

1 Priority Access Licenses to be auctioned; 2 General Authorized Access; 3 FCC ruling FCC 16-89 on 7/14/2016 allocated 3.25 MHz of licensed spectrum and 7.6 MHz of shared/unlicensed spectrum.

United States FCC Spectrum Frontiers ruling for 5G mmWave

Shared and unlicensed spectrum will also be needed

Licensed access

- 27.5 - 28.35 GHz: 850 MHz (2x425 MHz)
- 37.6 - 38.6 GHz: 1 GHz (5x200 MHz)
- 38.6 - 40 GHz: 1.4 GHz (7x200 MHz)

Shared and unlicensed access

- 37 - 37.6 GHz: 600 MHz (3x200 MHz)
- 64 - 71 GHz: 7 GHz expansion of existing 60 GHz band

Total spectrum = ~11 GHz

Additional candidate bands that the FCC indicated it would study

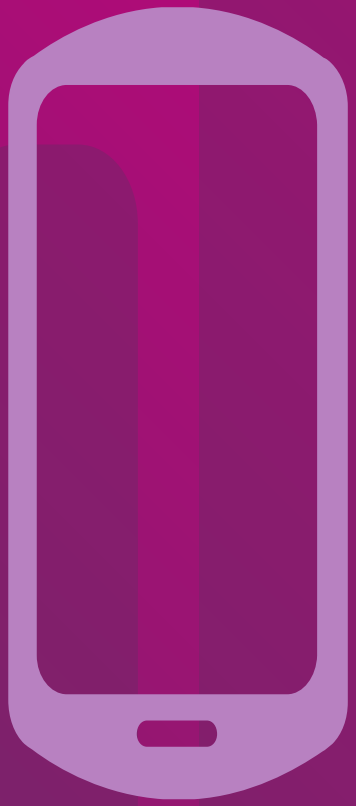
Include 24.25-24.35, 24.75-25.25, 31.8-33.4, 42-42.5, 47.2-50.2, 50.4-52.6, 71-76 GHz

The FCC's July 14th Spectrum Frontiers ruling is
" the final piece in the spectrum trifecta of low-band, mid-band, and high-band airwaves that will open up unprecedented amounts of spectrum, speed the rollout of next-generation wireless networks and re-define network connectivity for years to come."

- FCC Chairman Tom Wheeler, June 20, 2016

"While recognizing that there is no consensus definition of 5G, most agree that it will integrate current and future infrastructure, along with low-, mid-, and high-band spectrum to achieve the connectivity we seek."

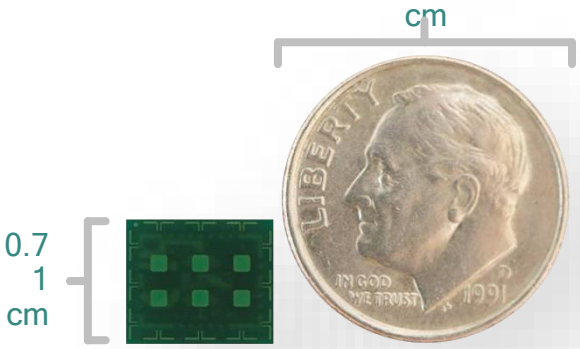
- FCC Commissioner Michael O'Rielly, June 27, 2016



Driving technology innovations to mobilize mmWave

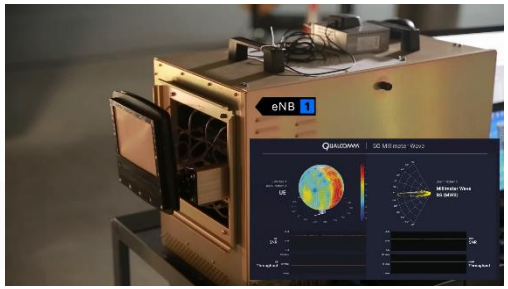
Operator trials & early deployments expected to start late 2017/early 2018[1]

802.11ad 60 GHz chipset commercial for mobile devices



Qualcomm® 802.11ad 60 GHz technology with a 32-antenna array

5G mmWave prototype system and trial platform



End-to-end system operating at 28 GHz demonstrating NLOS operation and robust mobility

Qualcomm Technologies' First 5G Modem

Qualcomm® Snapdragon™

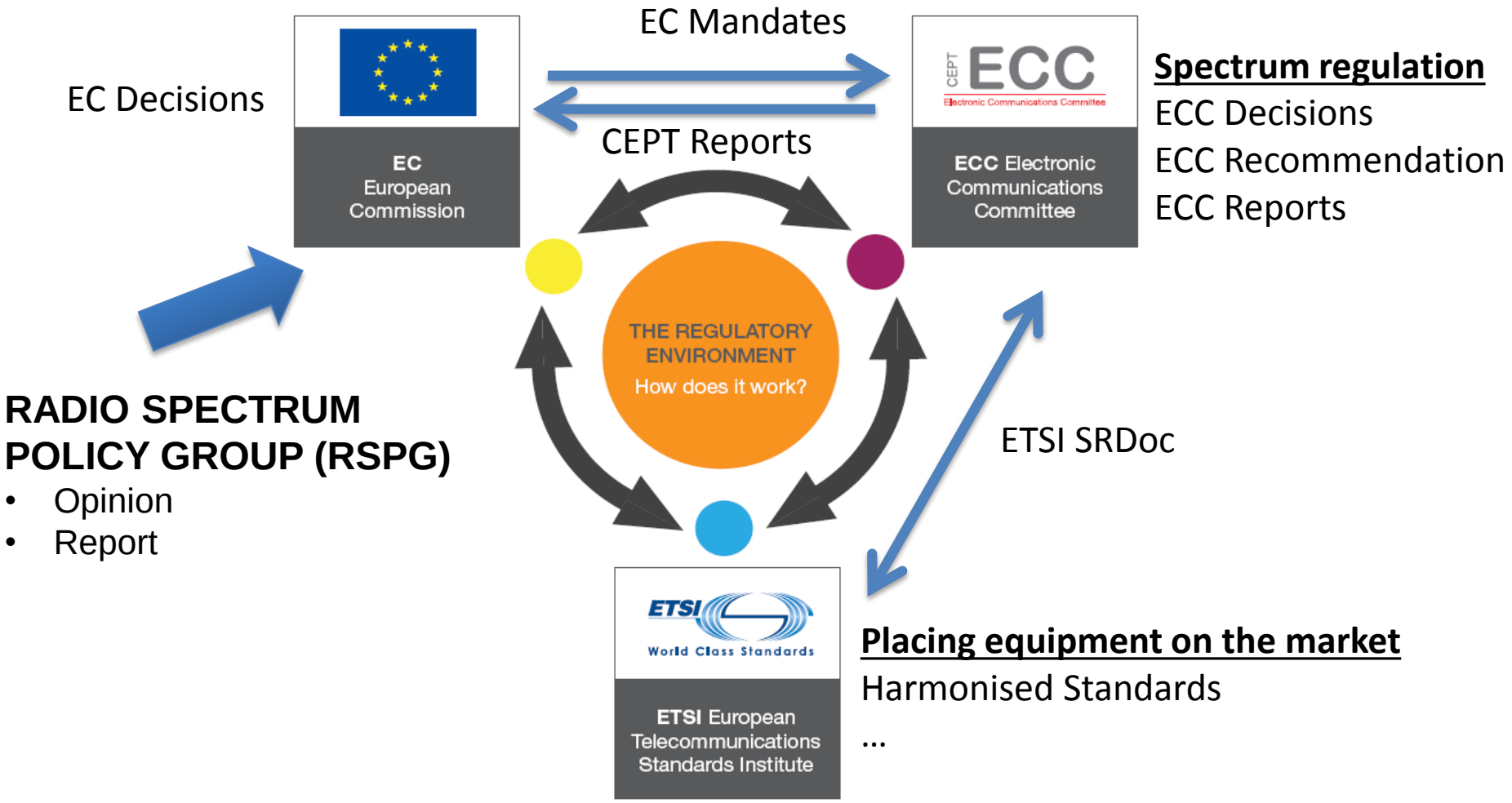
X50

28 GHz support, 4G/5G Multi-mode with dual connectivity, up to 5 Gbps download speed

Snapdragon™ is a trademark of Qualcomm Technologies, Inc. X50 sampling expected 2H 2017 Commercial devices expected in 1H 2018

1 For limited regional fixed wireless deployments, e.g. Korea and US (VZ 5GTF and KT 5G-SIG) operating at 28 and 39 GHz; also will be utilized for mobile wireless access trials to drive 5G NR standardization

EUROPEAN SPECTRUM POLICY AND HARMONISATION



RADIO SPECTRUM POLICY GROUP (RSPG)

- Opinion
- Report

Spectrum regulation

ECC Decisions
ECC Recommendation
ECC Reports

Placing equipment on the market

Harmonised Standards
...

European Commission 5G Action Plan

"Keeping EU in the head of the race"

- ✓ A common roadmap for the deployment of 5G with coordinated national action plans across Europe for commercial launch

"A 5G-ready Europe"

- ✓ *Availability of Spectrum*
- ✓ *Availability of fiber connectivity and capacity for backhaul*
- ✓ *Availability of base station sites for dense deployment*

"5G in support of economic growth"

- ✓ Commission as facilitator of cross-sectoral business synergies
- ✓ Innovative ecosystems and collaboration
- ✓ Pan-European 5G trials / pilot projects

"5G Global Interoperability for consumers"

- ✓ Promote common global standards



European Commission 8 Actions on 5G

1. **Member state trials, launch and deployment of 5G**
2. **Pioneer spectrum**
3. **Spectrum bands and approach for authorization**
4. **Fiber and cell deployment**
5. **Standardisation**
6. **Testing of terminals and applications through 5G PPP**
7. **5G for public safety and security**
8. **Trigger 5G innovation eco-system by venture financing**

RSPG OPINION (November 9, 2016); "STRATEGIC ROADMAP TOWARDS 5G FOR EUROPE"

Pioneer bands for 5G;

- **700 MHz**
- **3400-3800 MHz**
- **24.25-27.5 GHz**

RSPG Current work on DRAFT opinions

- A Spectrum Roadmap for IoT
- Spectrum Aspects of Intelligent Transport Systems

CEPT WORKSHOP November 4-5, Mainz "5G mobile communications"

- CEPT should review as a matter of urgency the suitability of 3.4-3.8 GHz ECC decision for 5G
- CEPT should be ready to help administrations in solutions for defragmenting the 3.4-3.8 GHz band
- CEPT should develop a harmonisation decision for 26 GHz
- CEPT should review ECC decisions in existing MFCN bands to ensure they are "5G compatible"
- CEPT should consider the impact of future "flexible duplex" on the management of existing FDD bands

EC mandate to CEPT

- Draft Mandate to CEPT to develop harmonised technical conditions in the Union for next-generation (5G) terrestrial wireless systems in EU-harmonised frequency bands and in frequency bands above 24 GHz