

The Fifth Generation Mobile Communications Promotion Forum (5GMF)

5GMF activities for 2020 and beyond in Japan



The Fifth Generation Mobile Communications Promotion Forum

Takehiro Nakamura
Acting Chair of
Strategy & Planning Committee, 5GMF
nakamura@nttdocomo.com

5G Workshop between Regional initiatives
Lisbon, Portugal
20 October 2015

Activity of “Spectrum WG” in Technical Committee

- Initial output in June 2015 includes the current usage of 8.4G/14G/28G/40G/48G/70G/80GHz bands in Japan and views from the other countries on 6 - 100GHz band.
- Spectrum WG is studying 6 – 100GHz at the following stages;
 - ◆ Stage 1: Analysis of the band ranges (Low/Middle/High) in terms of 5G use cases and technical characteristics
 - ◆ Stage 2: Analysis of each band in terms of the incumbent systems
 - ◆ Stage 3: Analysis of each band in terms of Radio Regulation and harmonization
- These studies should be ready before WRC-15.

Spectrum Aspects studied in ARIB 2020 and Beyond AH



The Fifth Generation Mobile Communications Promotion Forum

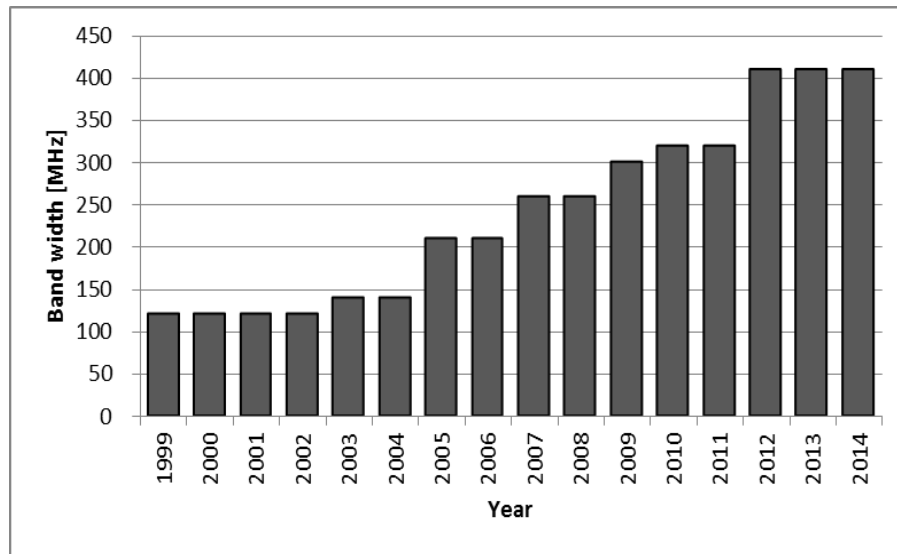
5G Workshop between Regional initiatives

Lisbon, Portugal

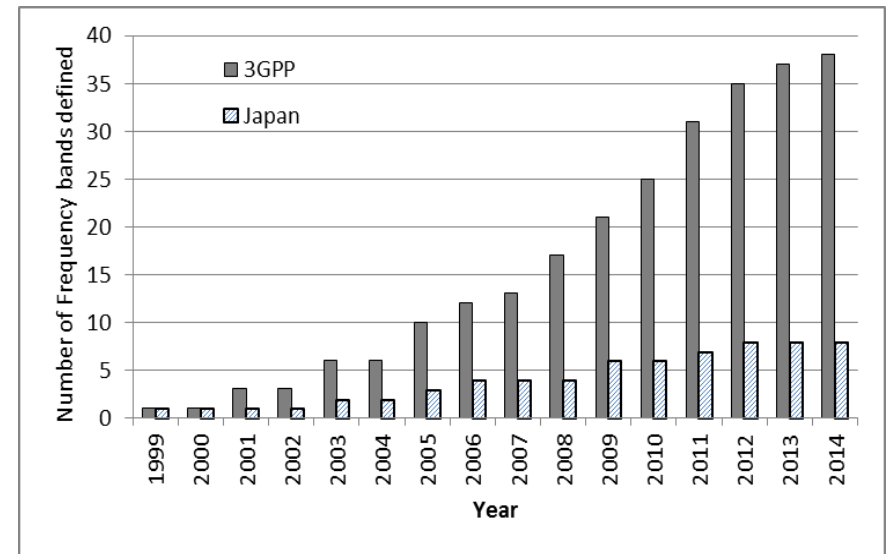
20 October 2015

Total spectrum bandwidth expansion

- Total radio spectrum bandwidth for UMTS/LTE has been expanding which reflects rapid growth of traffic over the mobile communication systems and the results of every effort to satisfy the market demand.



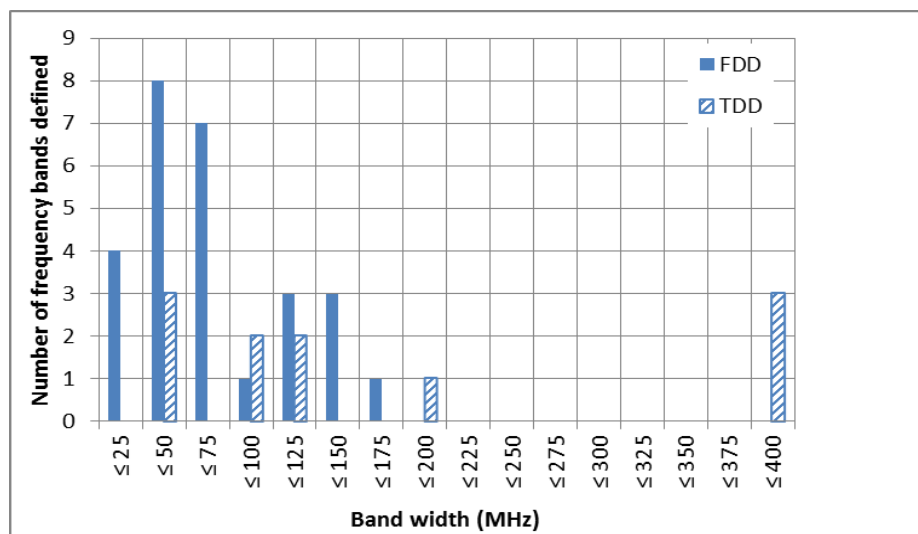
Radio spectrum bandwidth of UMTS/LTE (FDD) used in Japan



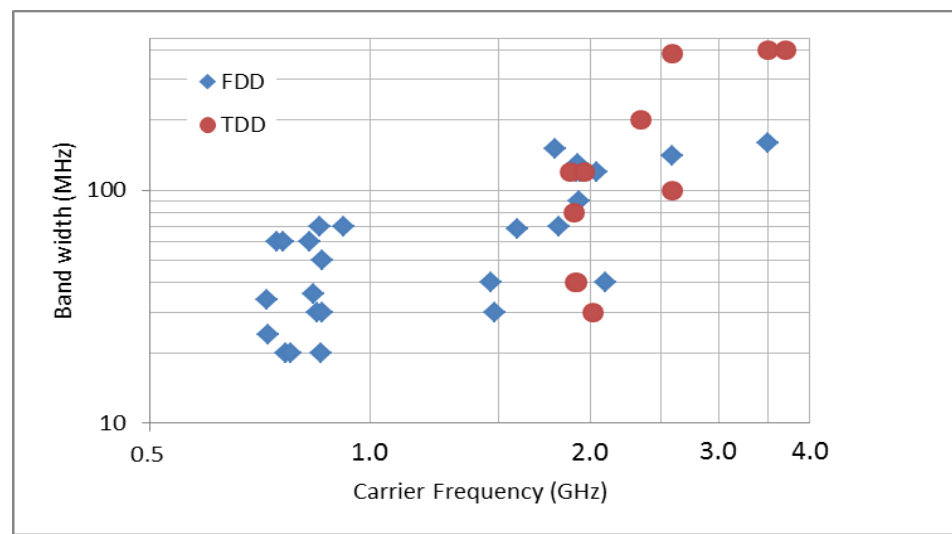
The number of logical frequency bands specified in 3GPP

Frequency bandwidth

- Most of the frequency bandwidth of one logical frequency band of UMTS (or LTE) are at around a few 10MHz, now.
- It can be observed that the higher the carrier frequency, the wider bandwidth is available.

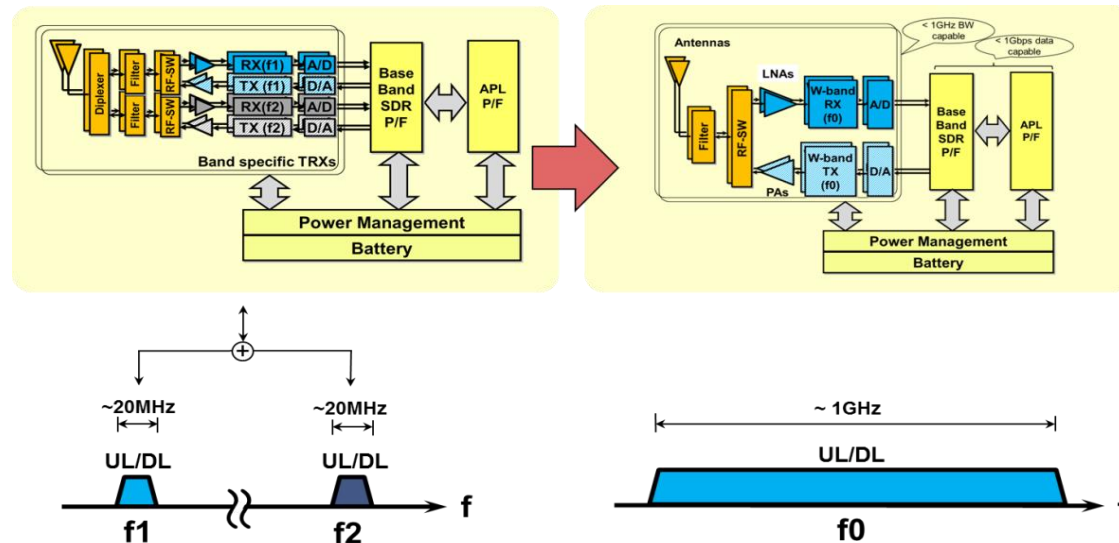


Band widths of logical frequency bands specified in 3GPP



Band widths and Carrier frequency of logical frequency bands

- Carrier Aggregation capable UE utilizes wider spectrum bandwidth by introducing a duplexer. This configuration results in excess signal losses both in its transmitter chain and receiver chain.
- If wider spectrum bandwidth is available, it would provide simpler UE architecture and more attractive attributes in terms of performance as well as physical dimensions.



UE configuration example: CA capable UE and wider single band UE

Use of mmWave

- To achieve even higher network capacity is to take advantage of higher frequency bands
- The millimeter waves including centimeter waves are attracting increasing attention by the industry simply because mmWave has several advantages in terms of
 - 1) system densification due to shorter range with less interference
 - 2) bandwidth due to overwhelmingly broader bands
 - 3) spectral efficiency enabled by advanced beam steering and massive MIMO.
- In the mmWave bands, on the other hand, further significant attenuation loss factors come into play, such as absorption losses by molecules of oxygen, water vapor and other gaseous atmospheric constituents.
- The radio system design for mmWave should take into account these propagation characteristics.

- Considering the required capacity towards 5G, the current frequency spectrum is not sufficient
- Wider range of frequency spectrum should be efficiently utilized in the 5G era, from lower to higher frequency bands, e.g., up to millimeter waves
- Refarming of the existing spectrum allocations should be considered in order to enable utilization of wider contiguous spectrum
- Higher frequency bands, e.g., beyond 6GHz, also need to be investigated for 5G to utilize much wider contiguous frequency spectrum
- New spectrum bands in higher frequency should be globally harmonized in order to avoid market fragmentation and implementation complexity
- In order to use unpaired frequency bands efficiently, new duplex schemes beyond the conventional ones are also of interest.

**Thank you
for your kind attention!**

<http://5gmf.jp/en/>