

5G Challenges - Spectrum

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European 5G spectrum

- **Primary 5G band is 3400-3800 MHz**
 - Harmonisation decision under adoption before end 18
 - Authorization before end 2020 (Code)
- **Pioneer 5G band is 24.25-27.5 GHz (« 26 GHz »)**
 - Harmonisation decision adopted by CEPT, and planned in March 19 at the EU level
 - 1 GHz to be authorized before end 2020 (Code): in practice, 26.5-27.5 GHz
 - For discussion at WRC-19 (with other mm bands) for international harmonisation. 28 GHz is not for harmonisation
- **All existing bands will become 5G ready**
 - CEPT/EU revised harmonisation (end 2018 – mid 2019)
 - 700 MHz is key: authorization before end 2020 (all EU countries)- intra-EU coordination solved, not yet with non-EU
 - L band (1427-1517 MHz, identified by WRC-15) also for 5G

Availability: Defragmentation/Sharing

3.4-3.8 GHz

- Other services (FS, earth stations): migration/coexistence
- Fixed broadband (4G/5G) : defragmentation needed
- Verticals: see BNetzA for 3.7-3.8 GHz, or NL



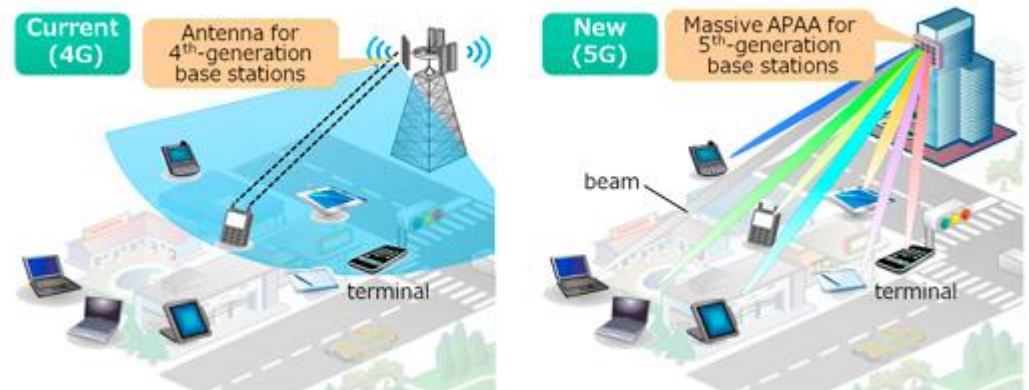
26 GHz

- Higher spectrum means easier sharing
- Fixed service to be migrated or shared with?
- Existing and future earth stations to be shared with

5G active antenna / massive MIMO

What changes with active antenna system (AAS)?

- Power in one direction is higher ... for a more limited time
- Filtering is more challenging with active component in AAS



So what?

- Compatibility with adjacent services is an issue
 - Protection of passive band 23.6-24 GHz claims to require 1.5 GHz of guard band ! Technology will have to improve ...
- Impact on 5G population acceptance: exposure to EMF
 - How to balance higher max. exposure vs lower statistical exposure ?
 - Antenna panel have more "visual" impact

Small cells

- Although not “5G” in itself, multiGbit/s means densification and small cells / heterogeneous networks
- This will take place in all bands – some bands (ie 60 GHz) dedicated to these deployments



- In France, ANFR agreement required for >5 W (and recorded for information for >1 W). Current legislative change to reduce delays related to town information.
- In Europe, ongoing activity for implementing act defining small cell physical and technical characteristics for which individual town planning permits or other individual prior approvals would not be necessary

TDD/Synchronization

Deployment in Europe were FDD... TDD is to be learnt !

- Macro base stations to base stations interference in TDD may require, eg. **20 MHz of guard band** between blocks (3.6 GHz)
- ECC approach based on a **restricted mask** in case of unsynchronized operation: virtually makes necessary the synchronization and the same uplink/downlink ratio
- Ongoing work for relaxing the constraint for other deployments (indoor, micro ...): also semi-synchronization option
- **How to decide u/d ratio ?** Not just a “compromise”, but also a drastic implication on operator strategy (eg. downlink only)
- Specific case of synchronization with 4G: aligning 5G frames on 4G frames reduces 5G performance (latency ...)
- Cross-border coordination challenging with TDD ... and no synchro

5G for verticals

- 5G technology is “network slicing” ... 5G business model is verticals
- 5G technology attracts interest from verticals: transport, utilities, PPDR, media, industry automation, health ...
- ... but many solutions to provide 5G services:
 - Mobile operator networks (network « slices » to be defined)
 - Dedicated band :
 - Future railways ? PPDR ? broadcasting ? 5.9 GHz for ITS ?
 - Dedicated networks in MNO bands :
 - Large area / national use
 - Local / on site (e.g. shared with MNO or with other users - > 3.8 GHz)
- And new players for providing services over dedicated networks ? Or for indoor coverage ?