5G Spectrum above 6GHz in Korea

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5G Forum

Agenda

- R&D activities from industry, academy and national R&D projects on 5G systems using bands above 6 GHz
- The comprehensive analysis report by MSIP/RRA addresses possible/potential frequency ranges above 6 GHz for 5G mobile communication
- Sharing Studies between fixed service and mobile service at 27-29.5GHz frequency band

Above 6GHz Field Test Trial Status in Korea

- Samsung
  - conducts channel measurement of 28 & 38GHz
  - Feasibility test on indoor/outdoor unban environment with penetration loss of building
  - Demonstration of 7.5Gbps transmission rate at fixed environment and 1.2Gbps at 110km/h mobile environment.
- KT
  - Deploy 5G testbed to support up to 7.55Gbps transmission@28GHz with Samsung
  - Demonstrate the 5G Multi-point transmission with distributed MIMO@28GHz with Ericsson
  - Complete 28GHz channel measurement and modeling@2018 Olympic Venues(PyeongChang)
- SKT
  - Demonstrate 5G transmission at 28GHz with Samsung
  - Develop 5G New RAT testbed using above 6GHz band with Ericsson & Nokia
  - Demonstrate anchor-booster cell via combination of LTE & WiGig(60GHz) with Intel
  - Conduct channel modeling of 28GHz using channel sounder with Rohde & Schwarz
- ETRI(QK)/Giga Korea (GK)
  - Build up the testbed for Mobile hotspot Network at 31.5 ~ 31.75GHz

Analysis of Possible Frequency Ranges for 5G (above 6GHz)

- Review frequency ranges from 6 GHz to 100 GHz based on following criteria
- Criteria
  - Frequency bands that are commonly allocated to Mobile Service on a primary basis in 3 regions including possible additional allocation to mobile service on a primary basis
  - Avoid frequency ranges/bands allocated to passive services and designated for protection by footnotes in Radio Regulations (RR)
  - Avoid planned bands for some services specified in the RR as well as its Appendices (e.g. EESS and Radio Astronomy Service, etc.)
  - Consider the possibility to secure wide contiguous bandwidths as noted in Recommendation ITU-R M.2083 (more than 750 MHz BW)
  - Consider the internal allocation and usage status

Required minimum bandwidth

- ITU 5G Vision Recommendation (M.2083)
  - 8 Key capabilities user experience data rate (100Mbps-1Gbps) and spectral efficiency 3-5 times over current 4G
  - The Recommendation addresses wide contiguous bandwidth of several hundred MHz to up to at least 1 GHz to support various usage scenarios
    - From this, assumed minimum bandwidth: 250 MHz/operator * 3 Operators = 750MHz

- Detail Estimation
  - Consider expected 5G usage scenarios and services (eg. Virtual reality with low latency, various Tele-experience services, etc.), which require more spectrum to make them realize.
  - The detailed spectrum estimations need to be studied by ITU-R from the next study period. (e.g. new methodology to estimate spectrum requirements)

Candidate Frequency Bands for 5G (Korea)

Frequency Band (Bandwidth)	Note	Necessity for withdraw/reallocation of freq.
27-29.5㎓(2500㎒)	-	No
31.8-33.4㎓(1600㎒)	Need additional allocation to mobile service in Radio Regulation	No
37-42.5㎓(5500㎒)	Need to upgrade to mobile service on a primary basis in bands 40.5-42.5 GHz	No (41.91㎓-44.31㎓: Currently used for radio astronomy service)
45.5-50.2㎓ (4500/4700㎒)	Need additional allocation to mobile service in 47-47.2㎓ bands in Radio Regulation Exclude 48.94-49.04 ㎓ band (prohibit radio transmission to protect radio astronomy service)	No
50.4-52.6㎓(2200㎒)	-	No
66-74㎓(8000㎒)	-	△

Sharing studies between fixed service and mobile service at 27-29.5 GHz

- The frequency band 27-29.5 GHz is allocated to the Fixed Service (FS) as a primary (ITU-R Recommendation F. 748)

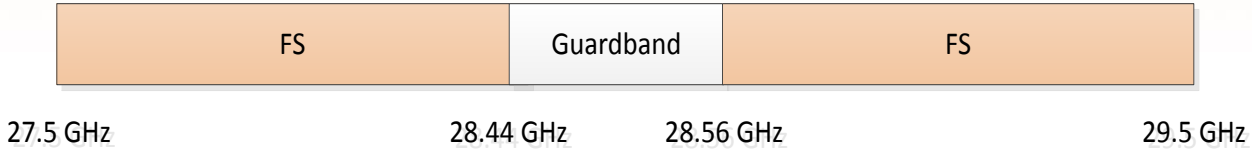


Fig. 1. Current spectrum deployment at 27-29.5 GHz band for FS

- Typically, the FS is expected to cover the area that a wired backhaul network cannot cover.
- If a Mobile service (hereinafter addressed as "Mobile") is allocated in 27-29.5GHz, the Mobile can be deployed at the area without the FS, or a part of the FS band can be allocated

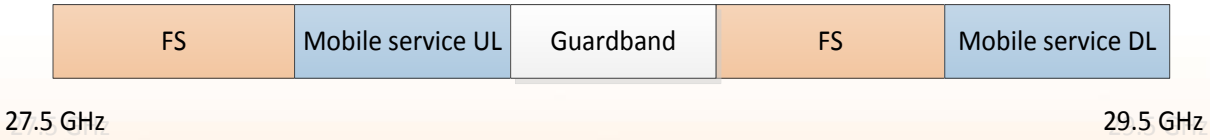
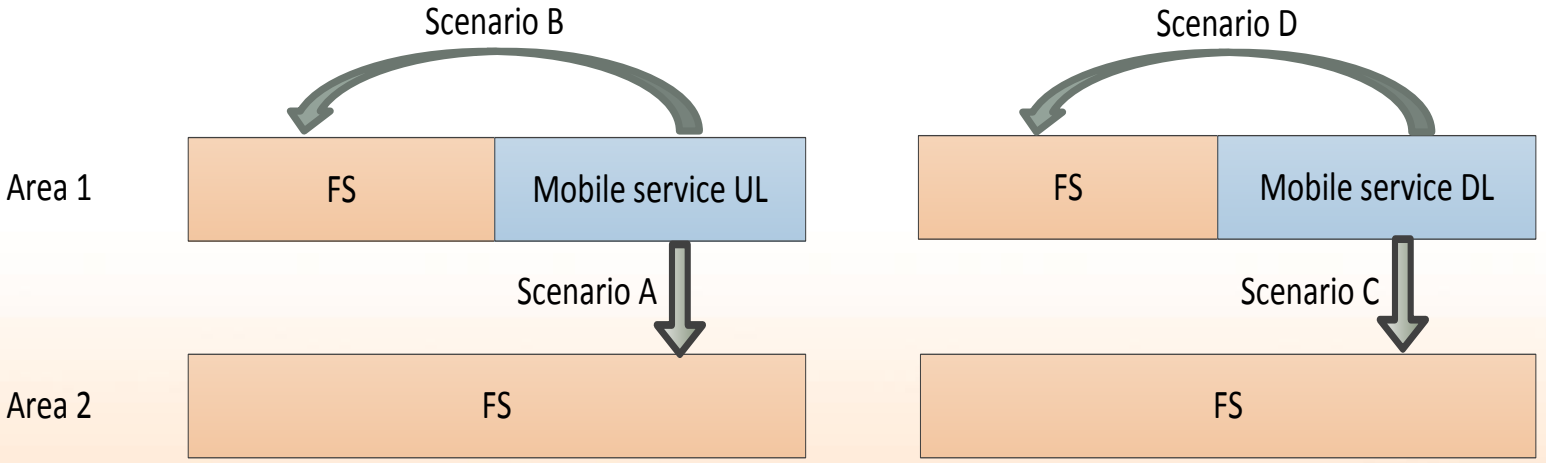


Fig. 2. Possible frequency allocation for FS and Mobile service in 27-29.5GHz

Sharing studies between fixed service and mobile service at 27-29.5 GHz

- Interference Analysis for 27-29.5 GHz
  - Coexistence study between a potential mobile service and the existing Fixed Service (FS) at 27-29.5 GHz
  - Simulation and Deterministic analysis on how the existing FS is affected by a potential mobile service
  - Several scenarios are considered
    - Same geographical location but neighboring frequency band
    - Same frequency band but geographically separated
- Interference Scenario



Summary on 27-29.5 GHz

- Interference Analysis for 27-29.5 GHz
  - Coexistence study between a potential mobile service and the existing Fixed Service (FS) at 27-29.5 GHz
  - Simulation and Deterministic analysis on how the existing FS is affected by a potential mobile service
  - Several scenarios are considered
    - Same geographical location but neighboring frequency band
    - Same frequency band but geographically separated
- Conclusion
  - When the FS-victim scenarios are considered, Interference from mobile services to the existing FS is acceptable.

ThankYou!

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