

Report on the R&D and standardization situation of mobile communication system in Europe (Summary)

First part : the R&D tendencies of mobile communication system in Europe

- IoT is one of the most important requirements for the European Commission's 5G vision. So, all Horizon 2020 5G projects will contribute to realize a convergence between mobile communication and IoT.
- Is WiFi a part of European 5G vision ? The answer depends on researchers. 3G LTE or NB-IoT will be included in 5G, because they are 3GPP technologies, but WiFi is developing by IEEE.
- Horizon 2020 Fantastic-5G project develops an air-interface for below 6 GHz bands, which allows networks' heterogeneous characteristics (Period : July 2015 – June 2017, Total budget/EU part : 7 986 858 euro/7 986 858 euro, coordinator : Nokia).
- The objectives of Horizon 2020 Sasame project are to realize 1) multi-tenancy in small cell networks, 2) virtualization of small cell networks, and 3) the creation of new business models (Period : July 2015 – December 2017, Total budget/EU part : 8 266 933 euro/7 48 843 euro, coordinator : Hellenic Telecommunication Organization).
- Horizon 2020 mmMagic project studies the use of mm-wave (6-100 GHz) for 5G (Period : July 2015 – June 2017, Total budget/EU part : 8 165 085 euro/8 165 084 euro, coordinator : Samsung).

Second part : The tendencies of radio spectrum policy and standardization for 5G in Europe

- ITU identified EMB (Enhanced Mobile Broadband), MMC (Massive Machine type Communications) and URLLC (Ultra-Reliable Low latency Communication) as main IMT-2020 (5G) use cases.
- The standardization of 5G in ITU has four phases (2012~2015, 2015~2016, 2017~2018, 2019~2020). After 2018, IMT-2020 specifications will be released.
- WRC-15 of ITU (World Radio Conference in November 2015) decided to study the use of several radio spectrum above 6 GHz for IMT-2020 up to WRC-19.
- Radio spectrum to study for IMT-2020 : 24.25-27.5GHz, 31.8-33.4GHz, 37-40.5GHz, 40.5-42.5GHz, 42.5-43.5GHz, 45.5-47GHz, 47-47.2GHz, 47.2-50.2GHz, 50.4-52.6GHz, 66-76GHz, 81-86GHz.
- WRC-15 also decided to study spectrum sharing in these bands.
- ITU is examining the use of satellite communications for IMT-2020.
- Many people emphasize the importance of global spectrum harmonization for 5G. But, it is regarded as difficult (ex. a researcher of Boston Consultation group in IEEE 5G Lisbon summit in January 2017).

- In 3GPP, Release 13 was frozen in June 2016. Release 14 will be frozen in July 2017.
- Release 13 defined IoT mobile communications technologies like NB-IoT, EC-GSM-IoT and LTE-M for IoT market. Mobile communication operators plan to use these technologies, while rising IoT network companies like Sigfox and LoRa's communication operators have already developed their networks for LPWA (Low Power Wide Area). The relationship between mobile communication operators and new IoT network companies is not simple. Not only, is there a competition between them, but they are also collaborating for some use cases. It depends on mobile communication operator's business strategies.
- The standardization of 5G architecture in 3GPP has two phases : the Release 15 (second term of 2016 – third term of 2018) and Release 16 (third term of 2017 – first term of 2020). Release 15 will define the first part of 5G specifications necessary for commercialization in 2020, and the Release 16 will define 5G specifications for every use cases and requirements.