

Millimeter-wave technology for 5G applications An industry view on current issues and challenges

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Abstract - Since the beginning, large antenna arrays have been exploited for radar applications in order to achieve very high spatial resolution, beamforming and null steering. This trend has been recently introduced to communication systems too, in order to provide highly-directive beams as a means to both reduce interference and increase the overall capacity, allowing spectral reuse through spatial diversity. Nowadays the big challenge is not only related to the maximization of the overall system performance – which have been proven to be very effective when considering full-phased/full-digital architectures - but is mainly focused on the economic side: the real goal is to keep cost and energy consumption sufficiently low to obtain affordable products. This work presents an overview of some techniques that can be adopted to design energy- and cost-efficient antenna arrays for millimeter-wave wireless systems (mm-Waves), which - having instantaneous bandwidths of hundreds of MHz to GHz - are seen as promising technology for meeting the exploding capacity requirements of 5G (and beyond) communication networks.

mm-Wave for 5G communication systems

The significant advantages offered by the propagation characteristics in terms of frequency re-usability and large channel bandwidths, make mm-Wave suitable for the very high capacities required by 5G enhanced Mobile BroadBand (10 Gpbs peak throughput and 10 Mbps/m²) both for the Radio Access Network and the Backhaul.

For these reasons in the recent years mm-Wave bands have been elected to be suitably used for the access networks to increase the throughput to the User Equipment and for the backhaul/front-haul of the base stations. At the same time the use of millimeter-wave bands - thanks to very compact antenna size that makes products “blend” in the environment - allows the densification of the cells in dense urban scenarios. Benefits are massive, but there are still several critical points that need to be overcome in terms of costs, power consumption, deployment and implementation.

Presentation focus:

- 5G Application scenarios for mm-Wave and architecture comparison
- Practical deployment and implementation issues and challenges
- Energy- and cost-efficient antenna array design