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Dual band Dual-polarized mm-Wave Antenna with Filtering Capability

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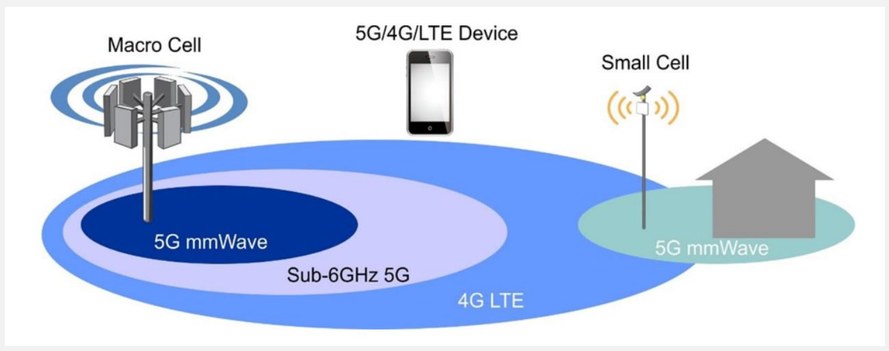
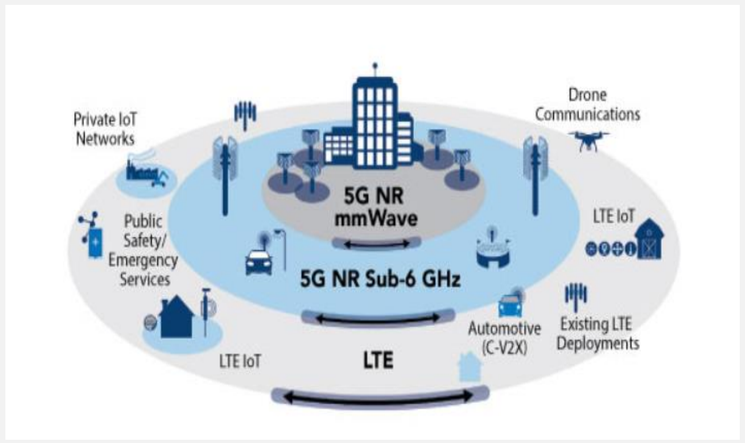
Abstract: Mobile communications are now evolving towards the sixth generation (6G). Data rates in mobile communication networks are increasing dramatically by excessive usage of data traffic and, thus, driving the tendency for use of higher frequencies as 26 GHz, 28 GHz, and 39 GHz bands for wireless communication. Millimeter-wave (mm-Wave) communication is one of the keys enabling technologies in 5G networks.

5G mm-Wave communication scenario :



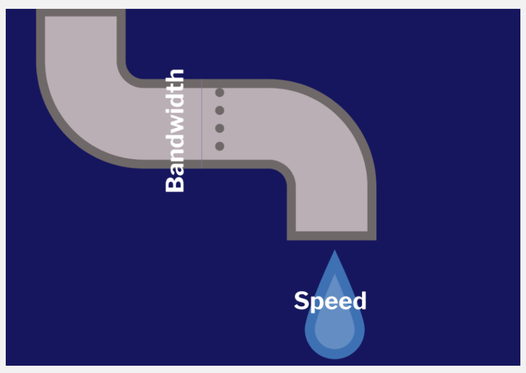


The smaller cell sizes of 5G mmWave not only provides high throughput, but also allows for efficient use of spectrum as frequencies can be reused over relatively small distances. An important part of 5G mmWave performance is therefore dependent on line-of-sight (LOS) and non-line-of-sight (NLOS) propagation of signals and antenna design.

Communication path :

1. Base station antennas deployment
2. Base station to local access points (routers etc.)
3. Access points to communicating devices (vehicles, cctv etc.)

Importance of Bandwidth in mm-Wave.



The huge demand for bandwidth is a challenge and an opportunity for communications service providers. Millimeter wave, or mm-Wave, wireless technology delivers multi-gigabit speeds needed for virtual office applications, video conferencing and online collaboration.

"Higher the bandwidth, Higher the data rate".

Antenna design specifications:

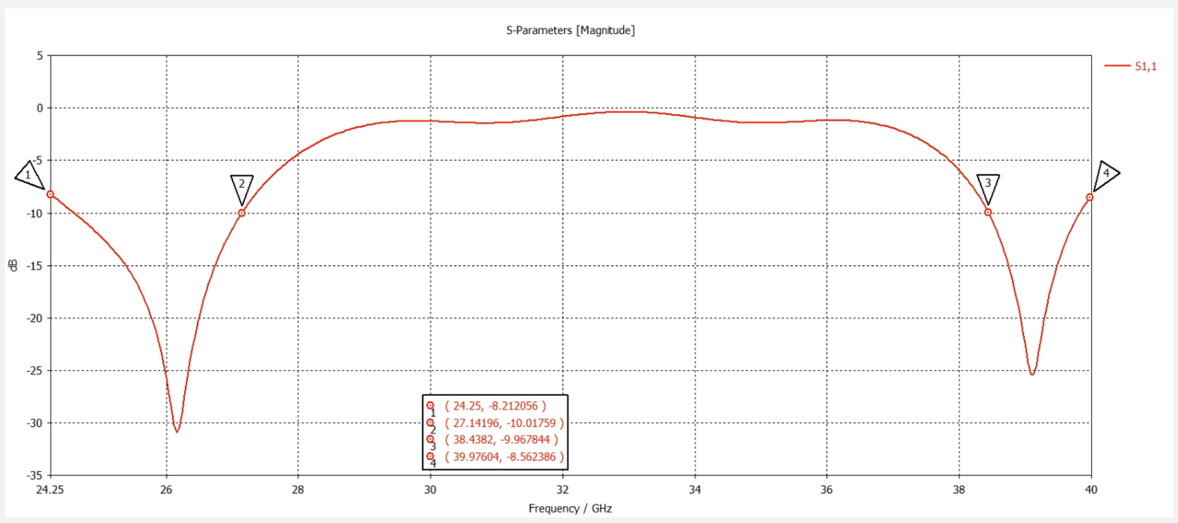
Frequency range required : 24.25 GHz – 27.2 GHz & 38.4 GHz-40 GHz

Gain (dBi): 6.79 & 7.8

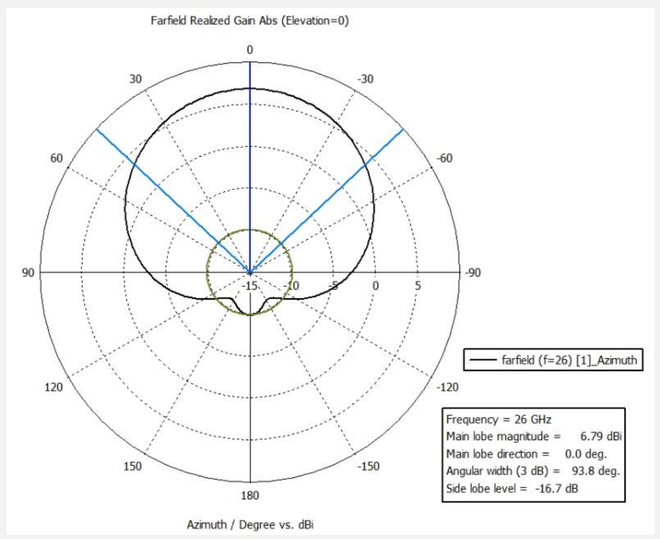
Polarisation: Linear Vertical

Antenna dimension: 10mm x 10mm x 1.85 mm

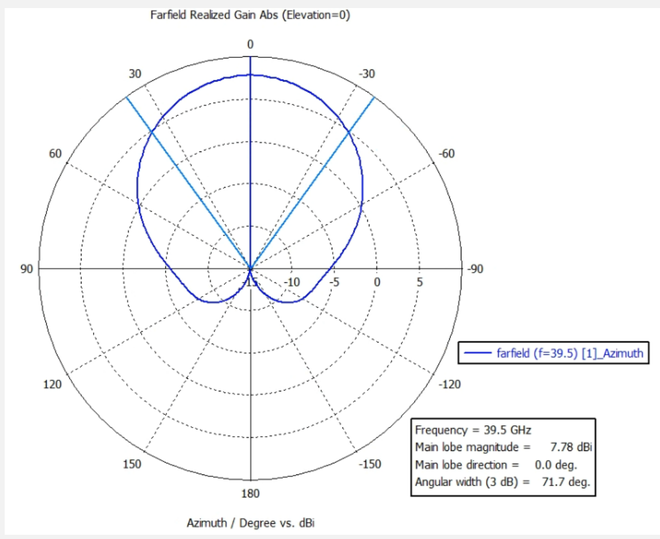
Simulation results:



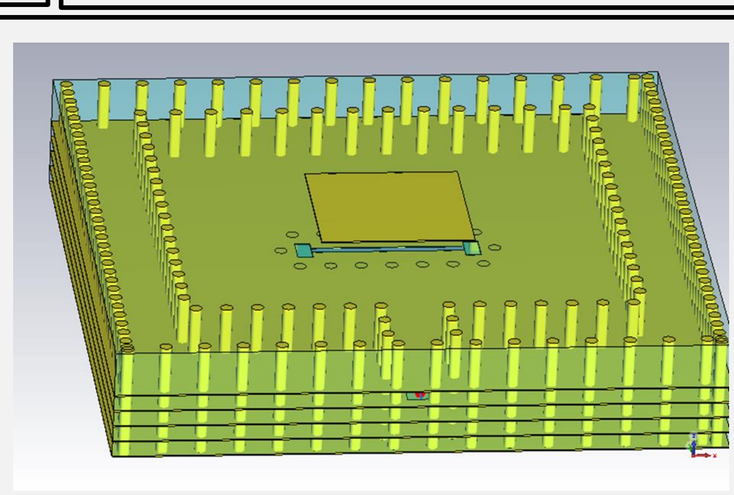
c) S-Parameters



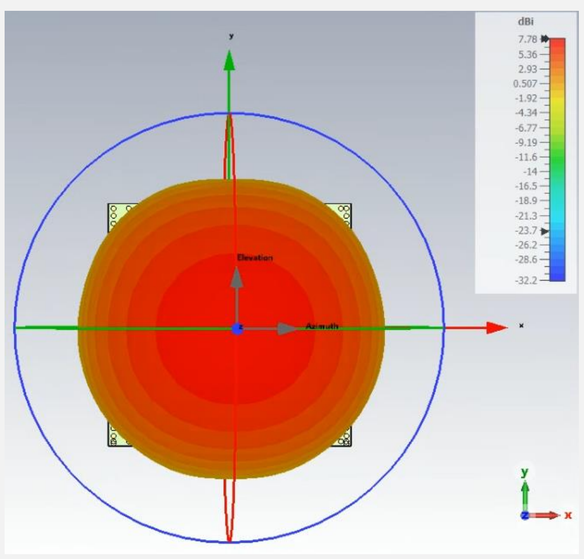
d) Azimuth Gain plot (26GHz)



e)Azimuth Gain plot (39.5GHz)



a) Antenna design overview



b) 3D radiation pattern

- The shown antenna design is currently in progress to meet the desired frequency range from 24.25GHz to 29.5GHz & 37GHz to 40GHz which covers all 5G FR2 band up to 40 GHz available for commercial use.
- Further work includes dual polarisation and array capability.

References: Review of Aperture Coupled Microstrip Antennas: History, Operation, Development, and Applications, David M.Pozar

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