

MOLEX AND 5G TECHNOLOGIES

PLANNING FOR RF SUCCESS

Evolving wireless applications are demanding faster data rates at higher frequencies and are requiring quicker total throughput times for data. 5G networks incorporate frequencies more than 10 times higher than 4G, supporting a wider range of devices and applications.



DRIVING 5G NETWORKS

Industries, including consumer electronics, automotive, industrial and medical, are driving the demand for 5G technology. Implementation will happen in phases as it is estimated that up to 10 times the number of cell sites existing with 4G will be necessary for 5G roll-out. Carriers that are in the process of deploying 5G technology are currently re-designing their networks, converting switches, and upgrading and deploying new cell sites.

FORMING A 5G FOUNDATION

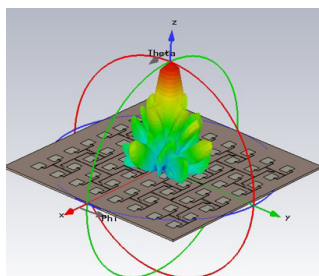
The 4G infrastructure now being upgraded and expanded to support 5G will include new switching technology to support ultra-low latency. These networks are being significantly expanded to incorporate the ultra-high-frequency mm-Wave spectrum being added. The combination of these two additions is the foundation for enabling the benefits provided by 5G - rapid transmission and high-speed data rates.

To overcome multiple challenges with higher frequencies (over 10GHz), there are various strategies to more effectively propagate the higher frequency 5G signals, including the use of micro-cells, repeaters and transmission technologies, like beamforming and beam-steering. Despite these approaches, there will still be locations and times when the high-frequency signals will be unreliable or unavailable. In these cases, the smart 5G network will seamlessly redirect the transmission to alternate frequencies and bands.

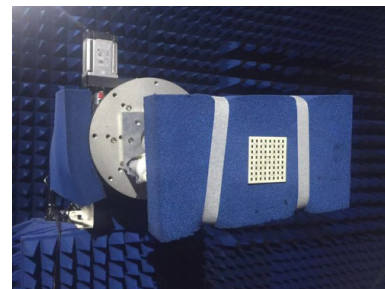
PREPARING FOR 5G TECHNOLOGY: ANTENNAS

5G devices that will use the new expanded frequencies will require redesigned and highly optimized antennas. 5G transmissions can leverage Massive MIMO beamforming, and many 5G devices will incorporate a vast number of antennas compared to the quantity of antennas used to date with 4G.

5G networks use beamforming to maximize signal transmissions by presenting a “shaped-directed” signal from the transmitter pointing to the receiver, and from the receiver pointing back to the transmitter. This process also frees up space in other areas for re-use of additional transmissions at similar frequencies, delivering an optimized signal and making the network more efficient.



*RF Analysis of Beam Pattern
in 5G Antenna Array*



Chamber Testing of 5G Antennas

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PREPARING FOR 5G TECHNOLOGY: DEVICES

Device manufacturers are exploring new form factors and technologies that will enable them to take advantage of the new 5G infrastructure. New materials, design concepts and manufacturing technologies will be necessary, including improvements to RF test chambers and transmission enhancements.

PREPARING FOR 5G TECHNOLOGY: MICROCELLS

Micro-cells will be used to penetrate increasingly dense urban infrastructure. These small-scale transmitters will extend the higher frequencies used by 5G to reach devices inside buildings that could not otherwise be reached.

RF ANTENNA CHALLENGES IN 5G

All 5G components, ranging from the transmission infrastructure to the end-use devices, will face challenges that were not as pressing with 4G. Specifically for transmission and antennas, designers will face the following challenges:

- Incorporating arrays of high-frequency antennas into product design
- Finding the best connector and interconnect approaches for the high frequencies typical in 5G
- Knowing the best materials and packaging strategies for optimal RF and antenna performance in 5G devices
- Determining antenna placement best practices for 5G antennas

APPLICATIONS

Automotive

Connected Home

Industrial and Automation

Data Center Solutions

Consumer

Medical

**Telecommunication/
Networking**



Infotainment



Devices



5G

THE MOLEX ADVANTAGE >

Molex offers both product and RF system manufacturing expertise that enables designers to create 5G products suitable for mass production. The Molex goal is to produce high-yield, cost-effective products in form factors useful to the communications industry, IOT and automotive markets.

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www.molex.com/capabilities/5gtech.html

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