Medicon Engineering Themes
Volume 2 Issue 5 May 2022
Editorial Note

An overview on 5G mobile network antennas: Trends and Challenges

Moutaouakil Abdelhakim*

Modelisation of Complex Systems Laboratory, Cadi Ayyad University, Morocco

***Corresponding Author:** Moutaouakil Abdelhakim, Modelisation of Complex Systems Laboratory, Cadi Ayyad University, Marrakech, Morocco.

Received: March 29, 2022; **Published:** April 06, 2022

To deploy the 5G mobile network, operators must install tens of thousands of new antennas. They are one of the major technological developments of 5G. For 5G, as for all other generations of mobile networks, antennas are an essential support. They are the ones that relay and transmit the signal. Without antennas, there are no waves, and therefore no 5G network. In order for the new 5G mobile network to work, operators must deploy tens of thousands of new antennas. Indeed, 5G antennas are totally different from 4G antennas. And, they contain some of the major technological innovations of 5G, which give the new mobile network its uniqueness. They are called Massive Mimo, beamforming, Small cells [1].

Today, relay antennas, usually high points (towers in rural areas and building roofs in urban areas), work like a street lamp. That is to say that they emit in all directions. Thanks to beamforming technology, the signal processing by 5G antennas is different. Beamforming allows the waves emitted by an antenna to converge on a particular smartphone. And no longer to spray indiscriminately the whole environment. The macro antennas of 5G are therefore directional antennas that act like a directional beacon. The signal is directed in a specific direction rather than being directed in all directions, as is the case today with 4G antennas. Even better, 5G antennas work like this even when users are in motion.

The advantage of beamforming then, is that it allows the base stations to transmit only, when necessary, not all the time. This represents a considerable energy saving.

As we have just seen, with 5G antennas, the delivered signal is directed in a specific direction. And as the emitted waves converge on a particular device, this allows the antennas to emit a personalized signal, tailored to the needs of the users. This is called data slicing.

Data slicing is the virtualization of networks. That is, the 5G network is sliced. And each slice is configurable according to the use it supports. This allows for real-time, à la carte network management. This will also allow prioritization of uses. This means that a telemedicine operation will come before a streaming series. With 4G+, we discovered MIMO(Multiple Input Multiple Output) antennas, which means higher speeds and range than with 4G. With the 5G network we discover Massive MIMO antennas, which means the same effects, but multiplied The difference between the two is the number of connectors (miniature antennas). There are 128 on the Massive MIMO antennas of 5G, compared to only a dozen on the MIMO antennas of 4G+. Eventually, Massive MIMO antennas will have up to 256 connectors [2].

The other difference between MIMO antennas and Massive MIMO antennas is Full Duplex. On MIMO antennas there are not only fewer connectors (eight transmit and four receive). But in addition, on the same frequency, MIMO antennas alternate between transmit and receive. They are not able to do both simultaneously. Massive MIMO antennas, on the other hand, have many more connectors which are able to send and receive data at the same time. So Massive MIMO antennas allow for data rates and capacity that are unattainable today with 4G. This technology will also allow to accommodate a larger number of users and increase mobile coverage.

Eventually, the 5G network will use high frequencies, in the 26 GHz band (24.25 - 27.5 GHz). This is the so-called millimeter wave band. They will allow to find bandwidth, essential to meet the exponential growth in the number of connected objects, and to achieve

speeds comparable to fiber optics.

But, as their name indicates, millimeter waves have a notable flaw: a range of only a few hundred meters and difficulty in crossing obstacles. Millimeter waves are perfectly suited for very dense areas (in cities), but they will require the installation of miniature relay antennas, in addition to macro antennas. They are called Small Cells and will have to be installed every 300 meters or so. Small in size, they can be perfectly integrated into urban furniture, such as a street lamp, a bus shelter or a billboard. The small cells will allow millimeter waves to be perfectly efficient when used by 5G, with very high speeds. But they will also give capacity to the 5G network while avoiding saturation problems. A better quality of service, therefore.

References

1. Zhihan L, Jaime L and Houbing S. 5G for mobile augmented reality". 35.5 (2022).
2. Moutaouakil A, Jabrane Y, Reha A and Koumina A. "The Spread of the Corona Virus Disease (Covid-19) and the Launch of 5G Technology in China: What Relationship". In: Motahhir S., Bossoufi B. (eds) Digital Technologies and Applications. ICDTA. Lecture Notes in Networks and Systems 211 (2021).

Volume 2 Issue 5 May 2022