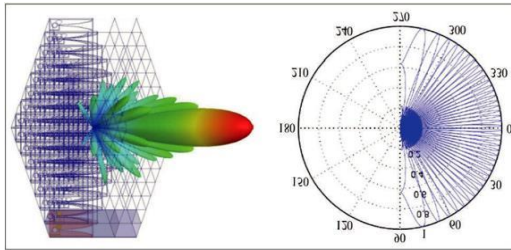


The Present Situation of Massive MIMO Technology Research

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MIMO technology have four-dimensional space (time, frequency, code, and airspace) which greatly improve the data transfer rate. MIMO technology not only evolved from 2×2 MIMO to 8×8 MIMO but also from single-user MIMO to cooperative MIMO with processor chip's capacity enhancement. However, MIMO technology has been unable to meet the exponential growth of data for mobile broadband services and cloud computing. Therefore, the researchers proposed Massive MIMO technology. The advances in MIMO technology developing include three aspects: firstly, from passive to active; Secondly, from two-dimensional (2D) to three-dimensional (3D); the last is from MIMO to massive MIMO arrays. Massive MIMO provides more orientation capabilities and beam-forming capabilities. The direction of the antenna diagram shown in Figure. Multi- dimensional massive MIMO technology will markedly increase spectral efficiency and reduce transmitting power to realizing green energy saving.



Millimeter Wave Directed Graph of massive MIMO system

Massive MIMO antennas can be divided in two kinds of structure. First type of antennas is upgrading based on traditional antenna which include an array module, a reflection module and a lens module. The second type of antennas is based on a new concept design which has micro-strip module, polarization module and traveling wave module. In the future 5G mobile communication system, array module is focus on base station side deployment. The number of vibrators can reach a few hundreds in massive MIMO system. Hundreds of vibrators can be divided into multiple-antenna clusters. Each cluster as an independent array provides diversity gain to terminal devices. The massive MIMO antenna consists circular array form and linear array form. The circular array is constituting by 128 antenna ports which on a cylindrical carrier.