

EFFECT OF ENVELOPE CORRELATION OF VECTOR ANTENNAS CONSISTING CO-LOCATED LOOPS AND DIPOLES ON MIMO CHANNEL CAPACITY

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Vector antennas are antennas realized by means of co-located and possibly co-polarized antennas, which have been shown to be capable of increasing the capacity of a wireless communication channel in proportion to the number of elements in the vector antenna itself. The capacity of systems employing these antennas is comparable to that of a spatially separated array with the same number of elements. Since the elements of the vector antenna are co-located, it is of interest to assess the actual orthogonality of the individual radiation patterns of the vector antenna elements as this can affect the power efficiency of the communication system and influence the actual power requirement at the transmitter for a given receiver power. In fact, capacity results will be affected by the coupling between vector antenna elements. The envelope correlation between the radiation patterns of the individual elements of the vector antenna is a measure of this orthogonality. In addition, it also allows for an estimation of the distortion of the individual element radiation patterns due to their proximity to other elements.

In this work, we use a method based on the measured S parameters of the antenna system to compute the envelope correlation between individual elements of three and four element vector antennas realized by means of two dipoles and a loop placed in a planar configuration and three orthogonal dipoles and a loop, respectively.

Preliminary results show that the pairwise envelope correlation is below 0.015 at the design frequency of 2.25 GHz for both the three and four element antenna systems, indicating that the radiation patterns of the elements of the considered vector antennas are actually orthogonal, thus ensuring negligible cross-coupling between elements. This indicates that the designed vector antennas can function efficiently in a MIMO communication system.

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