Mutual Coupling Reduction in Microstrip Patch Antenna

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A new method for mutual coupling reduction in microstrip patch antennas is proposed. It is found that the isolation of more than 40 dB at 5% frequency bandwidth and more than 50 dB at 1% frequency bandwidth can be achieved between two microstrip patch antenna.

Microstrip patch antenna are well known for their performance, robust design, fabrication and their extended usage. In microstrip array antennas, each radiating element will affect the gain of other antennas because of mutual coupling. The effect increases as the distance between the radiating elements is reduced. In application such as array antennas and transceiver modules space is limited and the distance between antennas should be reduced, but this reduction affects the radiation pattern of the antennas.

One technique to reduce mutual coupling is by cutting a slot on the ground plane, referred to as defected ground structure (DGS). Another technique is based on complementary split-ring resonators (CSRRs) to reduce mutual coupling between two microstrip antennas. In this paper combination of DGS and CSRRs is applied. In addition, in order to have better mutual coupling reduction, a new technique of using parasitic element between radiating element has been applied. These parasitic elements have been optimized in order to reduce mutual coupling. Another feature is that the structure includes a single ground plane and it is consequently of low cost and simple to fabricate. In addition the parasitic elements to reduce the mutual coupling do not disturb the radiation pattern and gain. This structure was simulated with both CST and HFSS software, and then fabricated. An excellent agreement between the measured and simulated results was observed. A possible application for this structure includes phased arrays with microstrip patch antennas and compact antennas for application such as altimeters, where the coupling between the receiver and transmitter antenna must be the smallest possible.