High Gain Low Side Lobe Wideband Patch Array with High Forward to Backward Ratio

Dhruva Poduval[(1)] and Mohammod Ali*[(1)]
(1) University of South Carolina, Columbia, SC 29208

Low profile wideband antennas are in great demand for many commercial applications including base stations, vehicular, aerospace, and radar. While spiral and log periodic antennas can provide huge bandwidths especially when not backed by a metal reflector or cavity they are large in size. Microstrip patch antennas are excellent candidates for low profile application yet they suffer from bandwidth limitations. To circumvent that problem several techniques have been proposed, e.g. aperture coupling, stacking, and E or U shaped slotting. The last one indicates the creation of an E shaped or U shaped slot.

Aperture coupling is an inherently superior design concept because it allows the phase shifting or other active devices and circuitry to be placed on a layer separate from the antenna. While designing a single aperture coupled patch element for wideband operation may not be difficult achieving wideband high gain operation for an array is a challenge. This gets compounded if further restrictions are added such as low side lobe level and high Forward to Backward (F/B) ratio. Recently we have reported on a 2.3-3.0 GHz aperture coupled patch array for high gain and low side lobe operation (D. Poduval and M. Ali, Wideband Aperture Coupled Patch Array Antennas — High Gain, Low Side Lobe Design, PIER vol. 160, 71-87, 2017). Both simulation and experimental results were presented.

In this URSI presentation we will present the tradeoffs between mutual coupling, return loss, gain, F/B and side lobe level for a wideband planar patch array for 8-11 GHz operation.