Parasitic Modifications to the Finite, Foursquare Antenna Array

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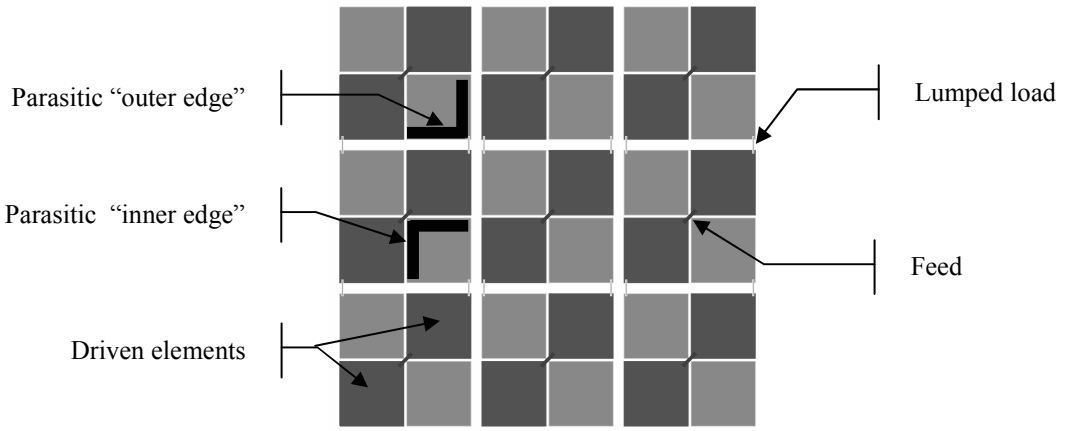
The foursquare antenna array relies on high levels of mutual coupling between elements and requires a self-complementary like structure between driven and parasitic elements. The use of four equivalent squares provides for an easily repetitive pattern, allowing for use of linear or circular polarization. Through high mutual coupling, the foursquare antenna array exhibits lower resonant frequencies than that of an individual element in free space. The literature shows a 1.8:1 bandwidth in an infinite array. Radiation occurs predominantly from the region along the slots adjacent to the driven elements closest to each feed.

Due to the periodic structure of the array, each parasitic square has a driven element adjacent to each of its four sides. (Other parasitic elements are located off the points of the square.) In this configuration, currents along the "inner" two sides of the square nearer to the element feed are much stronger than along the "outer" sides. These outer sides couple with the adjacent elements by their placement parallel to the outer section of the each driven square.

While the slots near the feed are responsible for the higher frequency radiation, the lower frequency radiation is set by the length of the two edges of the driven element. If we limit use to linear polarization, methods appear to increase the lower frequency of the array. We investigate the effects of lumped elements and shorting stubs from the "outer" side of the driven element to the "outer" side of the parasitic square in the adjacent element. Likewise, we consider new forms of the parasitic element to allow for frequency lowering while maintaining the slot radiation from the adjacent array element. Our goal is to reduce the lower operating frequency of the array and increase overall bandwidth.