A new technique for designing wideband dual-polarized cavity-backed slot antennas is presented. The structure is in the form of a double-resonant, dual-polarized slot antenna backed by a shallow substrate integrated cavity with a depth of approximately one tenth the free space wavelength. The presence of the cavity behind the slot enhances the antenna's directivity and reduces the possibility of surface wave propagation in the antenna substrate when the element is used in an array environment. Moreover, the dual-polarized nature of this radiating element may be exploited to synthesize any desired polarization (vertical, horizontal, RHCP, or LHCP). The double-resonant behavior observed in this substrate-integrated cavity-backed slot antenna (SICBSA) is utilized to enhance its bandwidth compared to a typical cavity-backed slot antenna. A prototype of the proposed antenna is fabricated and tested. Measurement results indicate that a bandwidth of 19%, an average gain of 5.3 dB, and a wideband differential isolation of 30 dB can be achieved using this technique. The principles of operation along with the measurement results of the fabricated prototype are presented and discussed in this dissertation.

The SICBSA is investigated as a candidate for use as an array element. A uniform two element phased array is demonstrated to locate the main beam from boresight to thirty degrees. The potential effects of mutual coupling and surface wave propagation are considered and analyzed.

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The public is welcome to attend.