Experimental Realization of a Low Profile Metallic Bull's-Eye Antenna

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The very promising results, reported at optical wavelengths, of enhanced transmission phenomena through subwavelength apertures in corrugated metallic films and in hole arrays have stimulated the interest in this emergent research topic [1, 2]. For the case of optical wavelengths, one-dimensional arrays of very narrow slits have been theoretically analyzed and two types of transmission resonances were predicted [3, 4], coupled surface plasmon polariton (SPP) resonances and slit waveguide modes. Corrugated planes are well known for antenna engineers, but it has been recently demonstrated that the enhanced optical transmission phenomenon can be fully described by means of the excitation of a leaky mode, being in this case a leaky plasmon mode [5, 6]. This leaky mode enhances the aperture field at the entrance face, and also creates a narrow-beam pattern at the output region. By using reciprocity principle, it is shown that the two enhancement effects are equal. A microwave scaled version of these experiments can drive to new potential applications. In this work, a further step of these concepts that opens potential applications for very low profile feeder antennas is presented. Simulation as well as experimental results of a low profile metallic Bull's-Eye antenna are shown envisaging their potential application in communication systems. These structures can be considered as a kind of metamaterial where enhanced transmission and beaming is possible.