

This paper introduces the concept, theory, and design of 3-D frequency selective rasorbers (FSRs), which have a transmission window transparent to the incident electromagnetic wave with two absorption bands located at both sides of the window. The proposed rasorber consists of a 2-D periodic array of parallel waveguides. The transmission characteristics with high selectivity are produced by lossless resonators implemented using a parallel waveguide with a metallic post in the center. On the other hand, the absorption bands are obtained by lossy resonators constructed by loading of lumped resistors at the entry port of short-circuited waveguides. Physical mechanism of the proposed FSRs is explained with the aid of an equivalent circuit model, and relevant design equations are formulated. Two prototypes of the designed FSRs are fabricated and measured as a proof of concept. The experimental results show that a bandwidth of 50% for the insertion loss less than 3 dB and two absorption bands with a high absorptance of around 90% can be achieved. Moreover, the simulated results also show that the proposed structure exhibits stable performance against the variation of the incident angle of an incoming plane wave.