The Design of a Transparent and Flexible Polarization-Independent Microwave Broadband Absorber

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In many civilian and military applications, the reduction of the radar cross section (RCS) from the scattering object is required. The electromagnetic absorber is a structure to absorb the electromagnetic energy over the desired frequency band. One of the classical electromagnetic absorbers is a Salisbury screen that consists of a resistive sheet placed at a quarter wavelength above the ground plane. However, its bandwidth is narrow and the thickness is quite thick. Other classical absorber is a Jaumann absorber which uses a multi-layer structure to enhance the bandwidth. Although the bandwidth of multi-layered absorber structure is increased by employing a multiple resistive sheets and spacers, the structure becomes quite thick and bulky. Moreover, the conventional absorbers are fabricated by using the materials that are optically opaque and inflexible. However, if the absorber can be optically transparent and flexible, those properties provide more flexibility for absorber placement.

In this paper, an optically transparent and flexible polarization-independent broadband microwave absorber is presented. The proposed structure is designed to have two resonances resulted from symmetric bow-tie structures and the coupling between the neighboring bow-tie structures. Thus, these resonant frequencies can be adjusted by changing the width and length of bow-tie structure respectively. To enhance the absorption bandwidth, the selected two absorption bands are merged. Therefore, a merged -10 dB bandwidth (i.e. frequency range which the absorption is more than 90%) is increased by up to 48%. In addition, by using symmetric patterned structures, the absorber is independent to the polarizations of the incident wave. The proposed structure is realized by using transparent and flexible material and structure. Thus, the design space can be readily extended to include applications such as window glass and curved surfaces.