A Study for RCS Broadband Reduction due to Dielectric Constant of Radar Absorbent Material

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In recent years, high electronics technology has caused the radio interference problem between devices using radio waves. It is one of the most important issues to avoid this problem from the point of view about effective use of the limited radio wave resources in modern society. Thus, reducing the radar cross section (RCS) is extremely important. There are some RCS reducing techniques by configuration and by the quality of the material. This study is investigated for RCS reduction technique with radar absorbent material (RAM). A variety of RAM has been produced according to utilization. In this study, we focus on flat layer RAM of which structure is simple. This method is to put flat layer RAM on the metal plate, which the energy of reflected wave is reduced by controlling the amplitude and phase of the wave. It is necessary to specify the combination of RAM thickness and complex dielectric constant for received frequency. We propose the optimal values of the thickness and complex dielectric constant of one flat layer RAM and two flat layers RAM for 3 GHz. Firstly, calculation is carried out by using MATLAB source-code to find the thickness and complex dielectric constant as to the maximum radio wave absorbing amount. Secondly, we design one flat layer RAM and two flat layers RAM according to the calculated results, and calculate RCS of these proposed RAM using the 3D electromagnetic simulation. Finally, we measure the RCS of these RAM in order to compare the simulated results. This study indicates the effectiveness of these proposal RAM at 3 GHz by both calculation and measurement. Moreover, comparing two flat layers RAM and one flat layer RAM of which thickness is same as the two flat layers RAM, the advantages of multilayer is confirmed, as shown in Fig. 1. Radio wave absorbing amount increases by adding RAM layer composed of the different material. Moreover, the frequency range which radio wave is absorbed is also extended by adding the RAM layer.

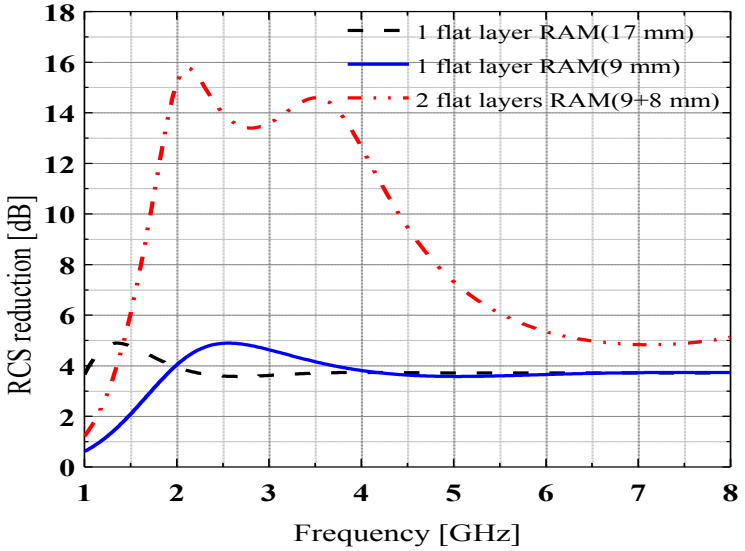

Figure 1. Frequency characteristics of flat layer RAM.