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MATERIALS AND STRUCTURES SYMPOSIUM (C2)
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COMPOSITE BASED ELECTROMAGNETIC TRANSPARENT MATERIALS FOR RADOME APPLICATIONS

Abstract

Primary purpose of Radome is used to protect antenna from environment while keeping it operational. Hence an Electromagnetic waves transparent material is required to fulfill these requirements. Apart from Electromagnetic transparency, a Radome must also possess the required mechanical characteristics depending upon the nature of implementation. A Radome may be used for variety of applications incorporating satellite, Radar and telecom communication systems. Inherently, polymer matrix composites having non-conductive fibers are electrically insulating in nature making them transparent for Electromagnetic waves. A very low loss is observed in these materials due to their dielectric properties. Moreover this transparency is observed over the wide range of radio and microwave frequencies. Resin system, Fiber and filler material is factors which influence the electromagnetic properties of composites. This study deals with tailoring the properties of composites in order to achieve Electromagnetic transparent materials having very low loss tangent. Different Fiber-Matrix systems are used in order to achieve optimum performance. These Composites are then applied to Radome structure and subsequently tested in an anechoic chamber for transmitivity and Radar Cross section. Particular attention is given to testing, which must balance adequate performance verification while not exceeding a reasonable fraction of the radome manufacturing cost Various materials were used in different combinations to design low transmission loss radomes. Conventional design process engages curtailing thicknesses of material to reduce transmission loss through the layers while maintaining the specific strength to withstand the environment, be it on a radar or aircraft. Different combinations of materials were manufactured and tested giving encouraging results. This study will further continue on optimization of design scheme and energy absorption analysis. The graphs showed in figure 3 are helpful in selecting the best material for a specific frequency. The lowest transmission loss i.e. <1dB was achieved in C band region with a sample manufactured with glass aramid honeycomb.