

Radar Cross-Section Modelling of Simple Shape of Radar Target through HFSS and MATLAB Simulations

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Abstract

This study presents a comparative analysis of radar cross section (RCS) simulations using Ansys High-Frequency Simulation Software (HFSS) and MATLAB. The primary objective is to evaluate the accuracy and consistency of RCS calculations performed by these two software tools for metallic cylinders. Metallic cylinders are selected as radar targets due to their well-defined and standardized shapes, which enable easier modeling and comparative analysis. To validate the RCS simulations, actual RCS measurements were conducted on an airport runway. The measurements took place at Kuala Lumpur International Airport (KLIA) using an FOD detection system operating at 93.1 GHz. By comparing the measured RCS data with the simulations results, the agreement and reliability of the simulation techniques were assessed, considering metallic cylinders of six different sizes. The findings indicate that the RCS values obtained from measurements align with the simulation results, exhibiting a similar RCS pattern. Both simulations exhibit minimal discrepancies, ranging between 0.01 to 0.1 dBsm. Through the analysis of the simulation results and measurements, valuable insight were gained regarding the performance and effectiveness of HFSS and MATLAB in predicting RCS values. Consequently, this study contributes to the understanding and validation of RCS simulation techniques and their practical applicability in real-world scenarios.

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