

Radar Cross Section (RCS) Benchmark on Simple Shapes

Introduction

This document presents simulation results from CAPITOLE-RCS on simple shapes. The monostatic RCS is calculated and compared to measured data publish in the following article : A.C. Woo, H.T.G. Wang, M.J Schuh and M.L Sanders « Benchmark Radar Targets for the Validation of Computational Electromagnetics Programs » IEEE Antennas and Propagation Magazine, Vol. 35, No. 1, February 1993. Theses models are intended for validation and benchmarking of Electromagnetic Simulation softwares. All simulations with CAPITOLE-RCS software was made on a Windows 10 laptop with Intel core i7 CPU and 16 Gb of RAM memory

1. NASA Metallic Almond

- Model :
The NASA almond is actually not a simple shape. It is defined by mathematical equations to form a surface with almond shape. This model is very interesting to study RCS because it highlights a large dynamic on RCS value. The mesh should be refined on the tip and the bottom to keep a good accuray on the results.
The total length is 0.25 m (9.936 inches)
- Simulation parameters :
The Monostatic RCS is computed at 3 frequencies : 1.19, 7 and 9.92 GHz
For both Vertical and Horizontal polarization
The RCS is plotted in dBm^2 as function of azimuth angle from 0 to 180° . Zero degrees azimuth corresponds to incidence on the tip. The elevation angle is zero.
- Solver :
Method of Moment method was used with MSCBD solver and EFIE equations.

	1.19 GHz	7 GHz	9.92 GHz
Mesh size	Lambda/40	Lambda/15	Lambda/15
Number of unknowns	3 546	17 262	34 692
Total time	2 seconds	17 seconds	57 seconds

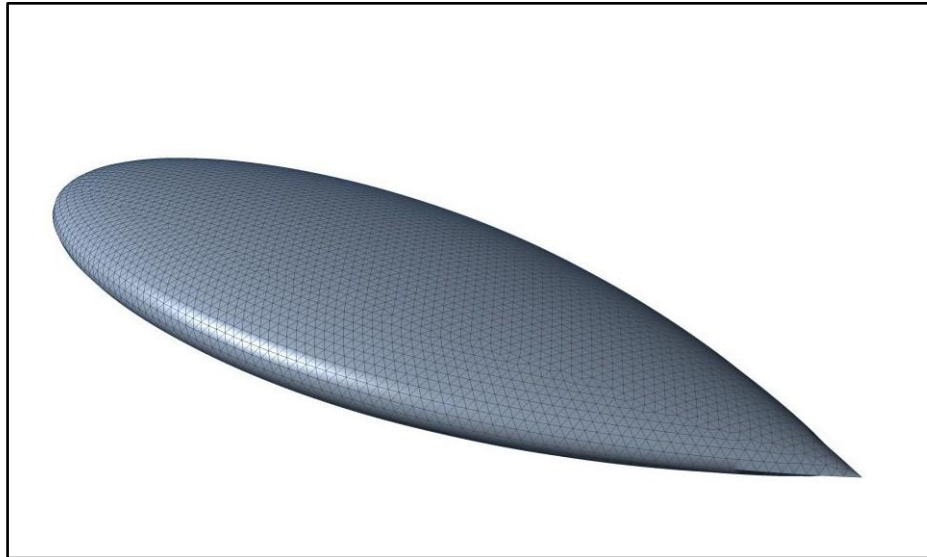


Figure 1 - NASA Almond mesh model

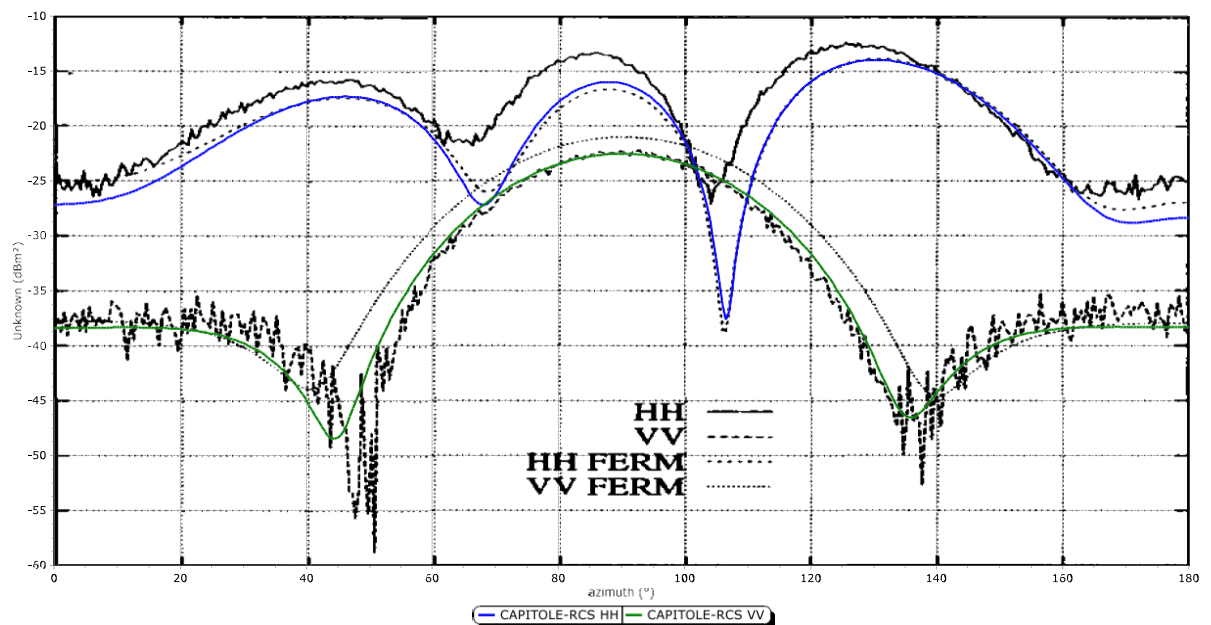


Figure 2 NASA Almond RCS @1.19GHz CAPITOLE-RCS vs measurement

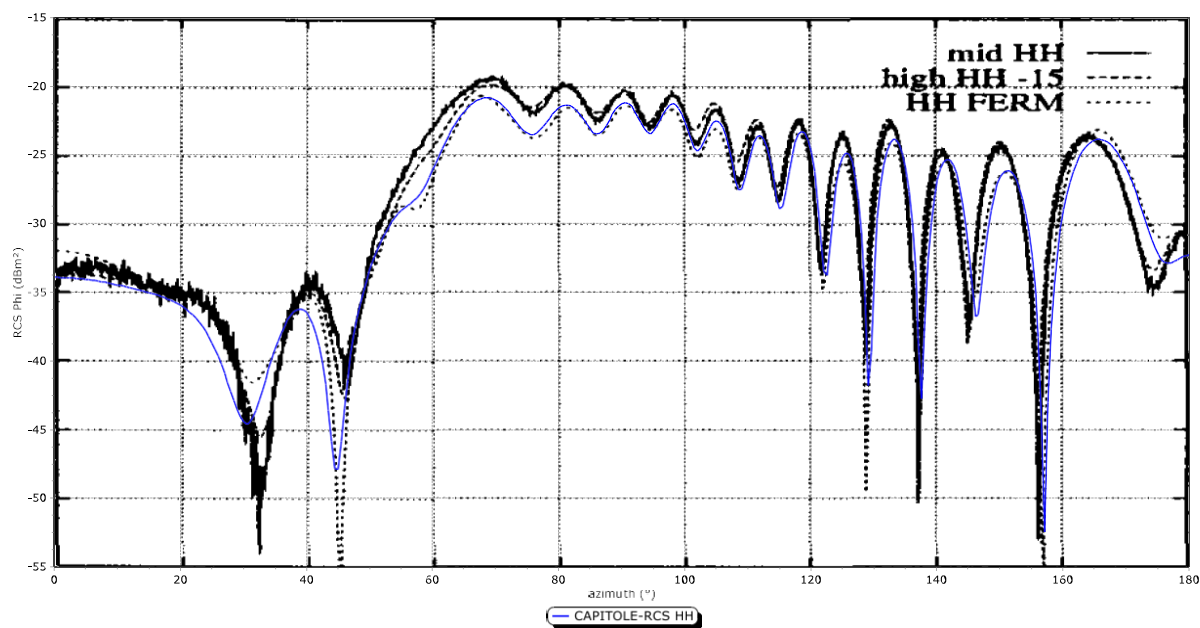


Figure 3 - NASA Almond RCS HH polarization @7GHz CAPITOLE-RCS vs measurement

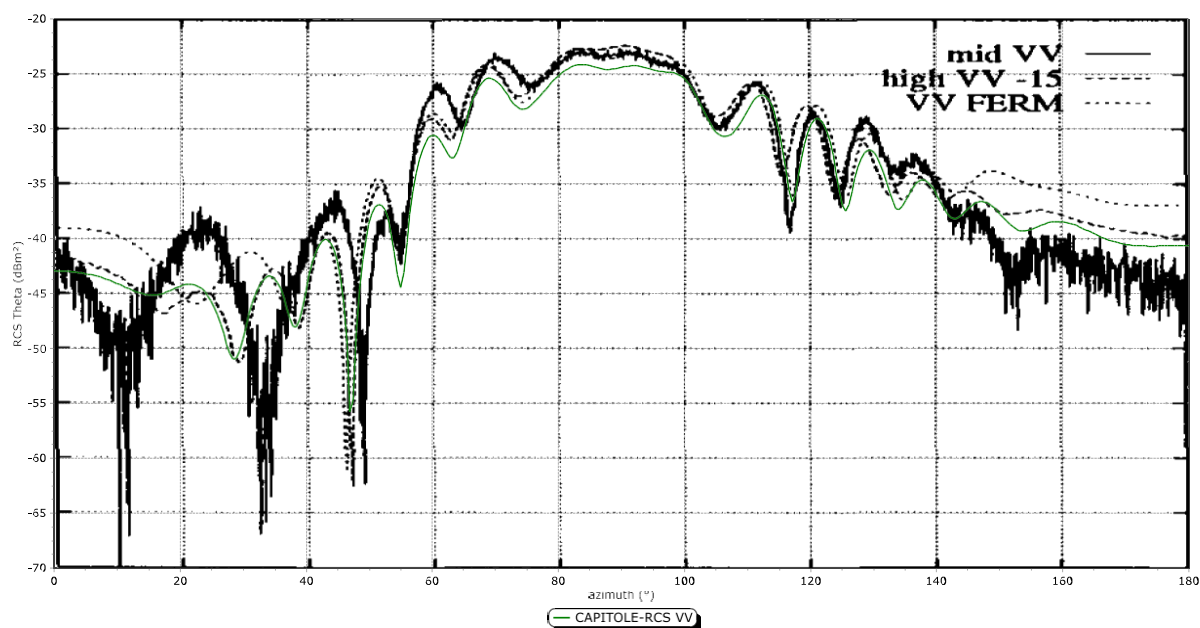


Figure 4 - NASA Almond RCS VV polarization @7GHz CAPITOLE-RCS vs measurement

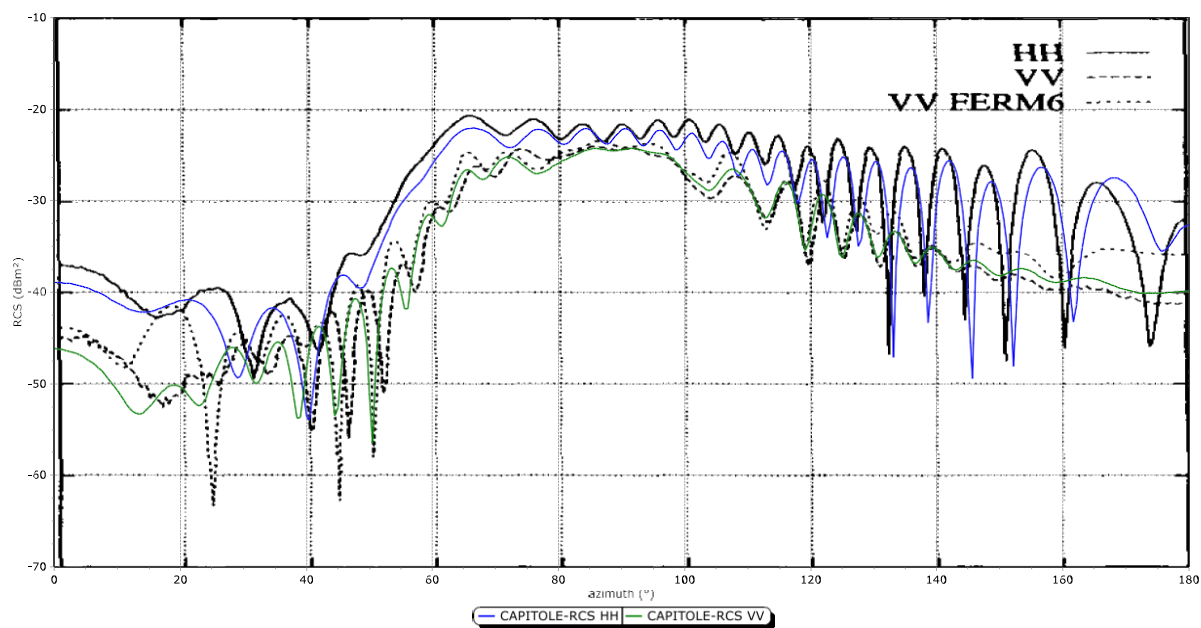


Figure 5 - NASA Almond RCS @9.92GHz CAPITOLE-RCS vs measurement