

Simulation of Radar Profiles for Satellites Using Mercury Method of Moments

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Abstract

A brief survey of characterizing the three dimensional radar cross section of satellites.

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1 Overview

1.1 About

(A) Build a CAD model of the satellite (*.cad)

- (B) Seal the CAD mesh
- (C) Create geometry file (*.geo)
- (D) Irradiate object with Mercury MoM
- (E) Harvest backscatter
- (F) Construct RCS
- (G) Resolve RCS measurements into spherical harmonics

2 Overview

[topa20200303] Working with CAF files, producing output, compressing data. [topa-4-20-2024]
[topa-4-20-2024] The goal is to be able to resolve the workings of an executable file exploiting the ELF structure show in figures ???. The next figure, ??, shows the relationship between source files, header files, shared objects, and the executable program.

3 Mercury Method of Moments

3.1 Copyright Statement by the Author

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MATRIX COMPRESSION TECHNOLOGIES, LLC
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3.2 Legal Statement

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NASA ITAR notice:

Note: The enclosed software falls under the purview of the U.S. Munitions List (USML), as defined in the International Traffic in Arms Regulations (ITAR), 22 CFR 120-130, and is export controlled. It shall not be taken out of the U.S. nor transferred to foreign nationals in the U.S. or abroad, without specific approval of a knowledgeable export control official, and/or unless an export license/license exemption is obtained/available from the United States Department of State. Violation of these regulations is punishable by fine, imprisonment, or both.

3.3 Obtaining Software and Documentation

Figure 1: Contact information to request Mercury MoM Software and Documentations

3.4 Distribution Contents

3.4.1 Executables

1. Linux 64-bit
2. Windows 64-bit

3.4.2 Documentation

The distribution includes four documents in PDF:

1. User's Guide
2. Pill Tutorial
3. Code Validation Report
4. Benchmark Tests

3.5 YouTube Videos

One can find useful didactic presentations and simulations on YouTube.

1. The Radar cross-section of backscattering objects
2. Basic Concepts of Radar Cross Section (RCS)
3. Mie scattering
4. Mie theory (BME51 Lecture 5)
5. Mie Scattering

4 Command Examples

5 Further Reading

Radar rudiments

1. [peebles2007radar]
2. [Handbook]
3. [kolosov1987]

Radar cross section

1. [yuan2009efficient]
2. [fuhs1982radar]
3. [knott2004radar]
4. [crispin2013methods]
5. [madheswaran2012estimation]

Method of Moments

1. [harrington1987method]
2. [gibson2021method]
3. [lu2003comparison]
4. [yuan2009efficient]

Mercury MoM

1. [Topa-2020-07-07]
2. [lu2003comparison]
3. [yuan2009efficient]