NULLSPACE®

Enterprise AI-Native Software for Design of Advanced RF Systems

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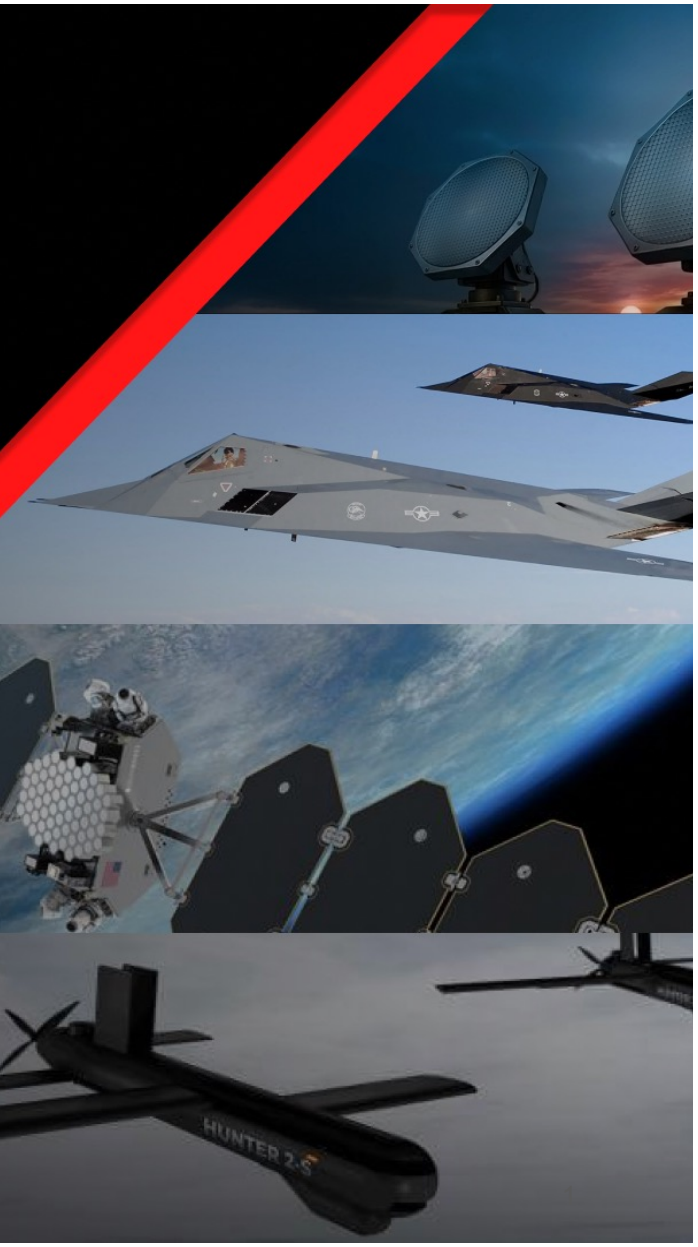

What is Nullspace?

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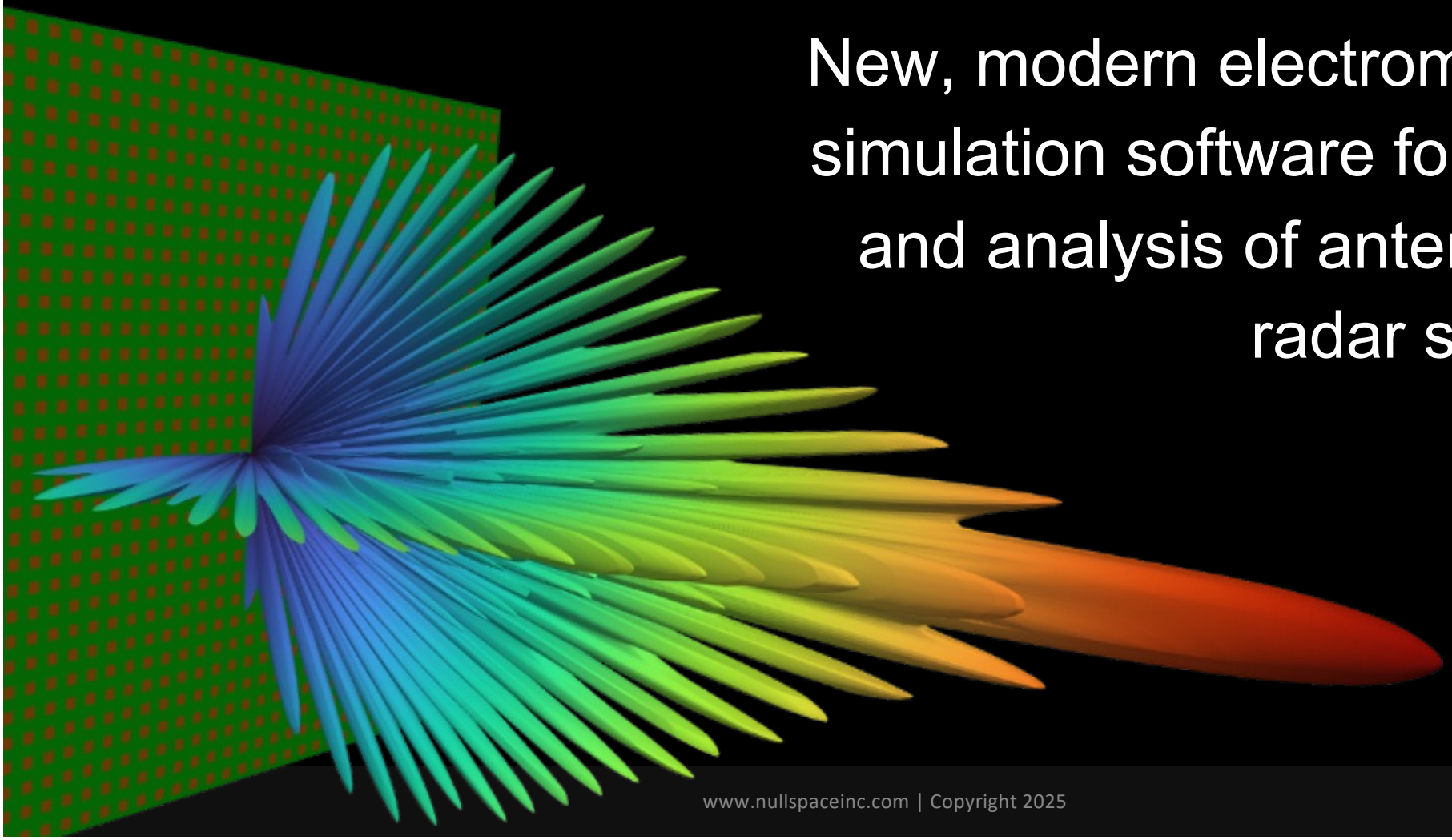

New, modern electromagnetic simulation software for design and analysis of antenna and radar systems.

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Do we really need another simulation software?

More Connected than Ever Before

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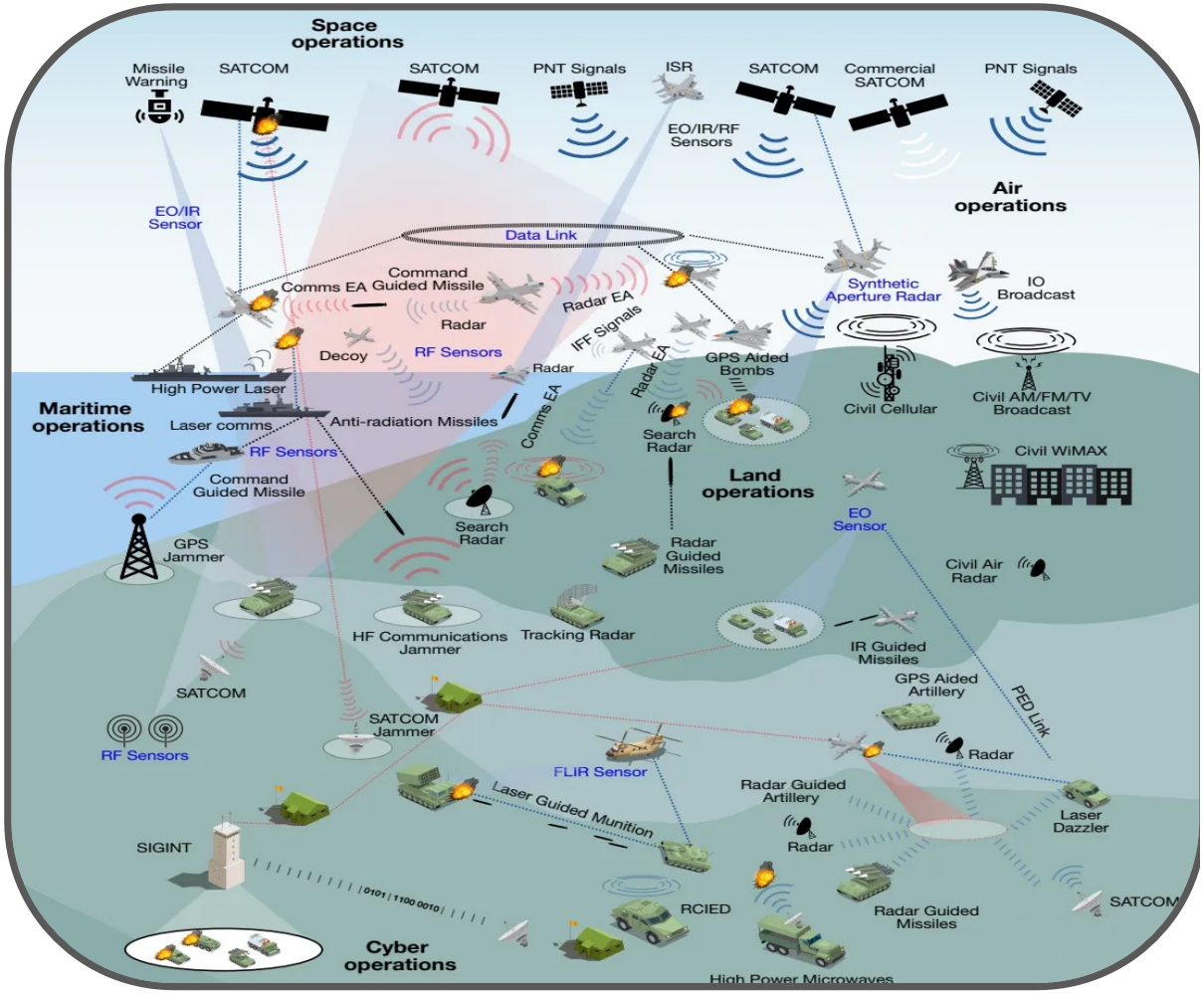
- **RF connectivity examples**: Direct line of sight, multi-orbit satcom, GPS, telemetry, datalinks, 5G/6G…

- **Connectivity** is driving the **need** for better **design efficiency** and better **performance**



Traditional Way of Designing Antennas

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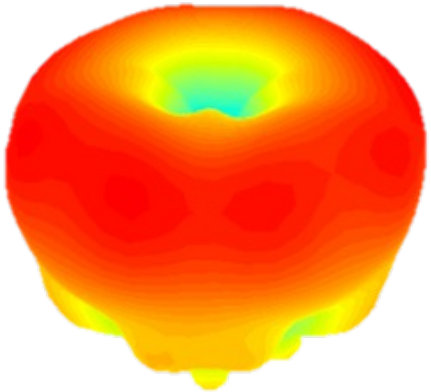
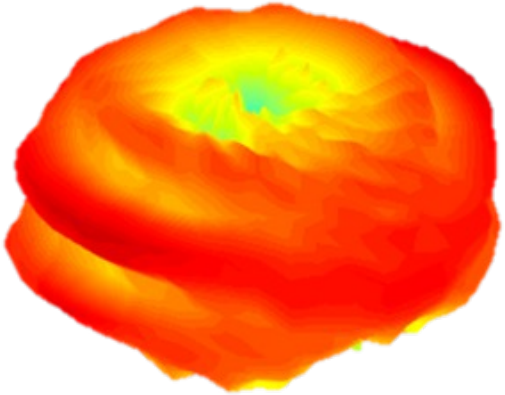
- Legacy EM simulation tools were not designed **to handle these new levels of complexity**
- Traditionally, antenna **elements are designed in isolation** (ignoring platform effects)
- **Platform effects not considered** until fabrication and integration
- Lead to multiple **costly fabrication cycles**



As designed



As installed

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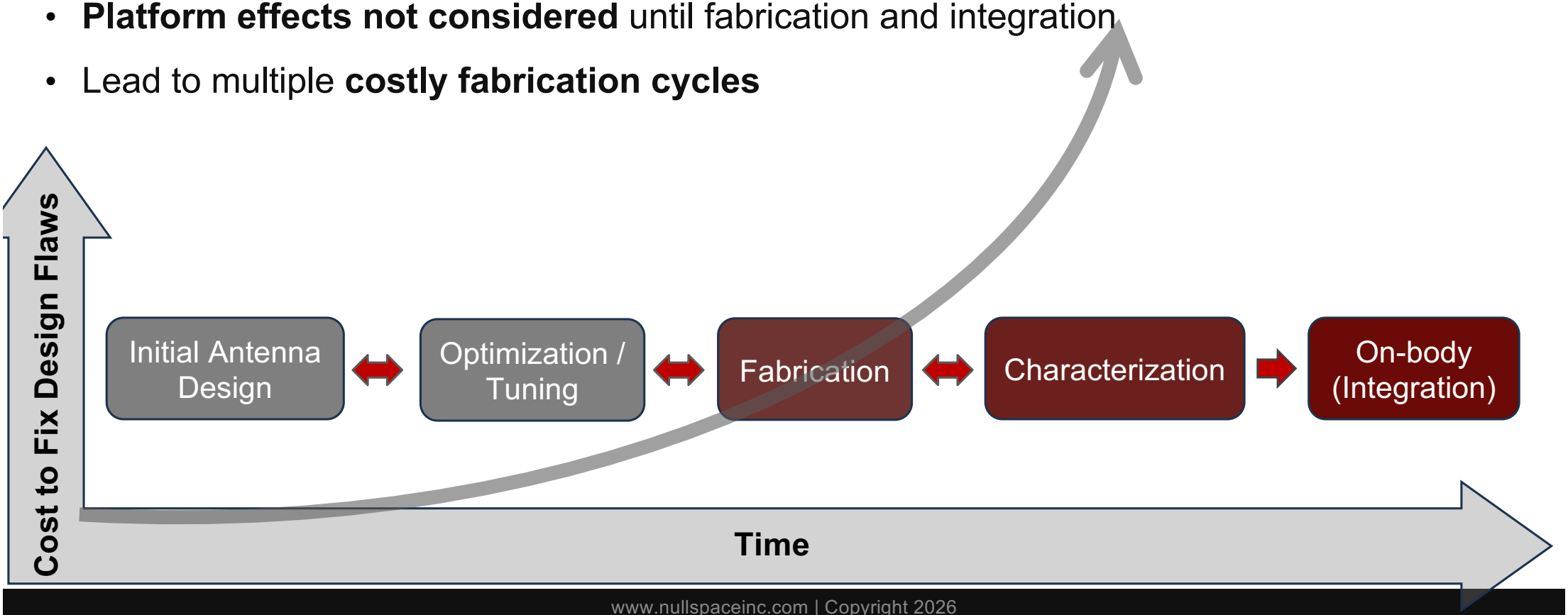

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Simulating real-world Systems

The Nullspace Solution

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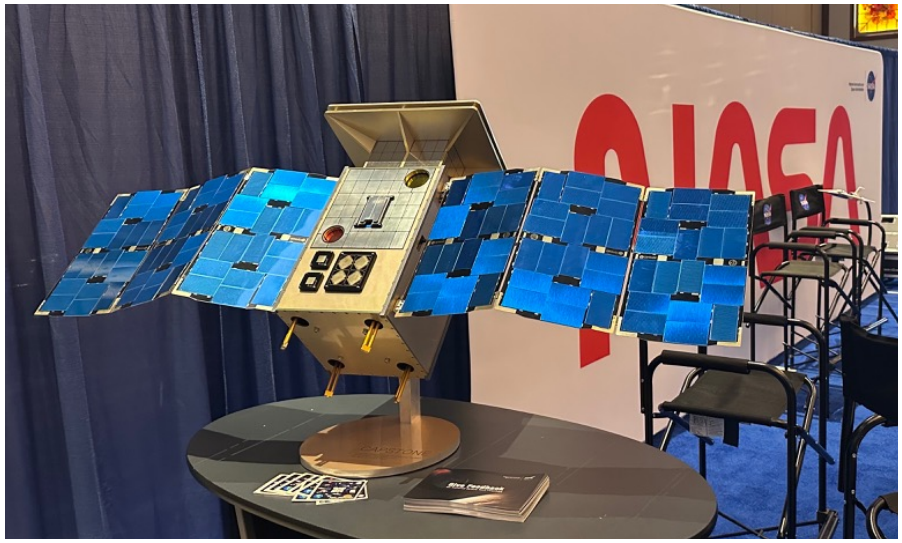
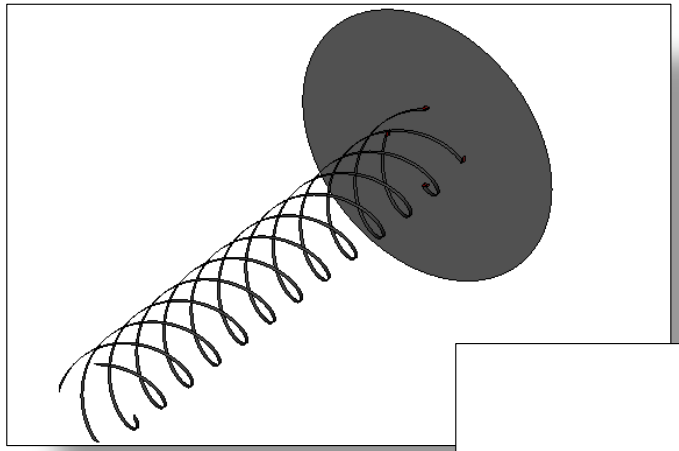
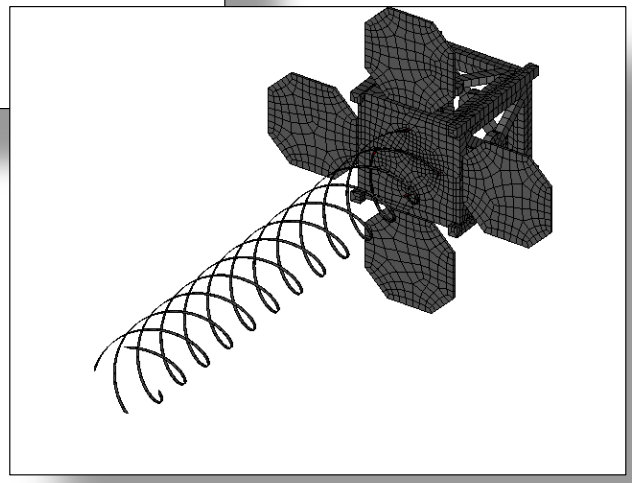


To “**get it right the first time”** you need to simulate the antenna **on the body**



Quad-helix GPS antenna on a simple ground plane



Quad-helix GPS antenna on the body of a Cubesat

Solving Unsolvable Problems

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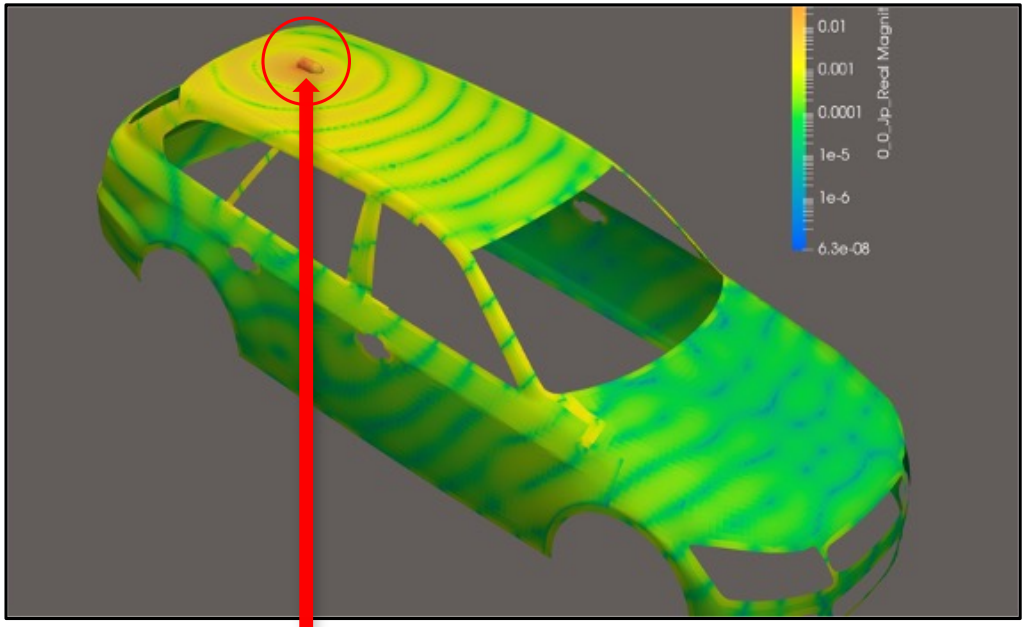
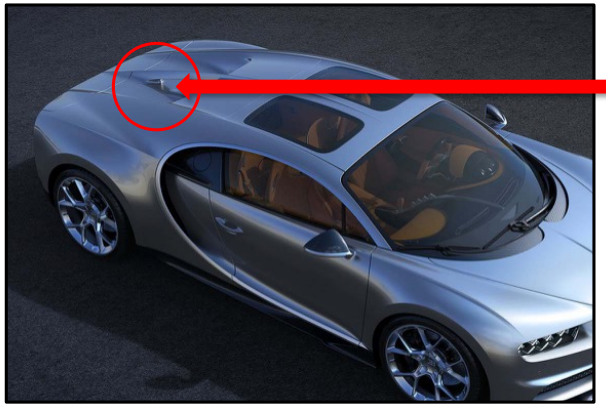


Accurately simulating **fin antenna** installed on a car – an electrically LARGE problem that cannot be handled with legacy tools.

But what happens when the roof is made of **glass?**



Or when it is a different **shape**?

Nullspace is Designed for Real-World Simulations

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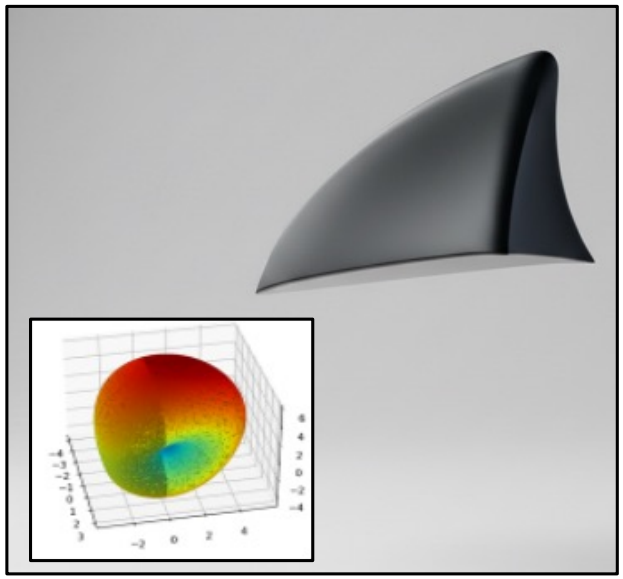
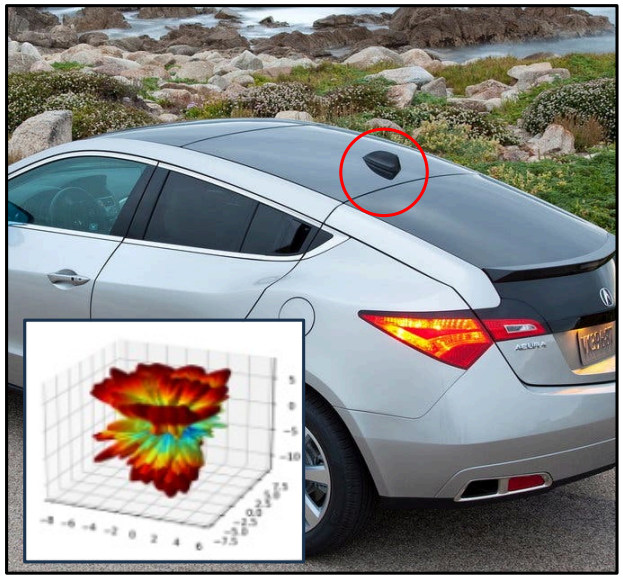


Antenna signal simulated alone



Antenna signal simulated on glass roof car

Antenna signal simulated on metal roof car

What legacy tools can simulate accurately

What Only Nullspace can simulate accurately

Designed for Complex RF Systems

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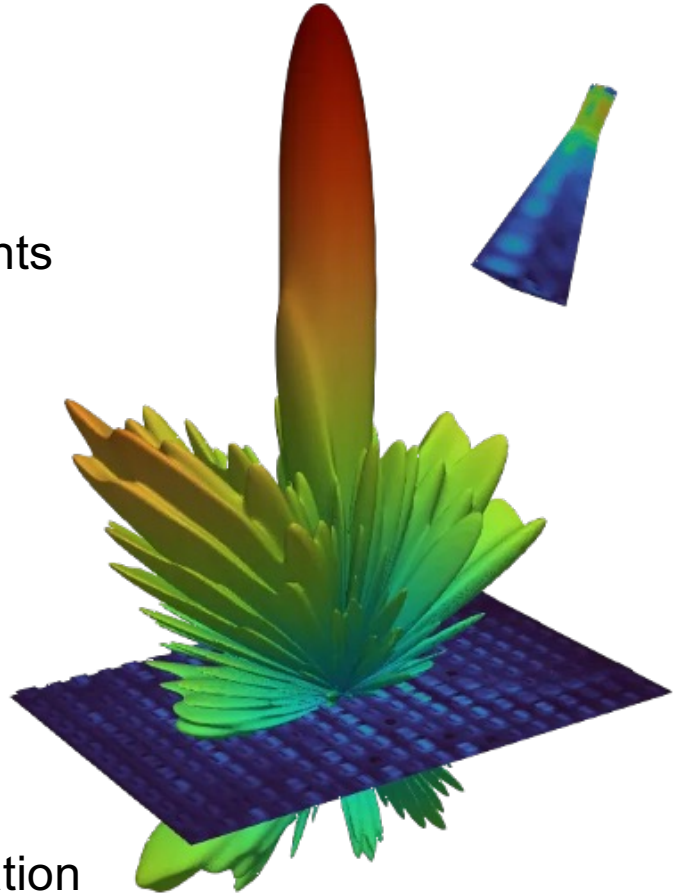
Nullspace EM®

- **Full-wave 3D EM solver**
- **Modern implementation** of frequency-domain Method of Moments (MoM) solver
- Proprietary large scale matrix **compression algorithm**
- **High-order basis function**s and **High-order geometry** representation
- **Fast direct solver** technology
- **Multi-CPU** and **Multi-GPU** acceleration
- **Powerful and flexible Python API** for customization and integration



Phased Array Antenna: Defense Customer Benchmark

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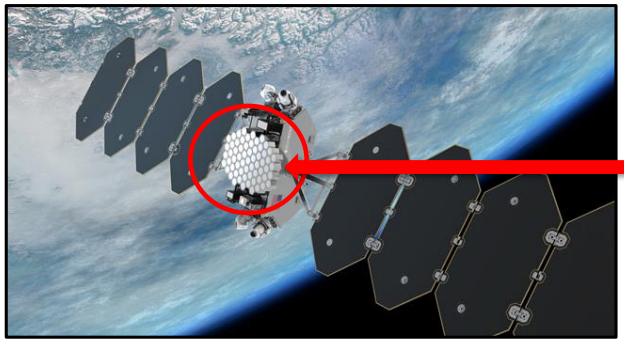
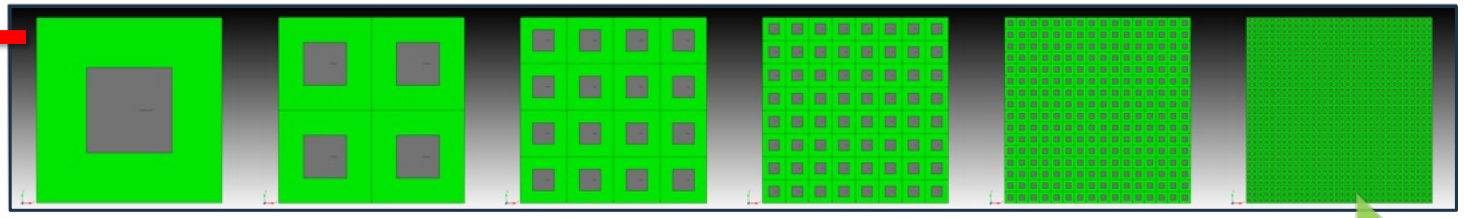


Simulation Time and Memory as array antenna grows more complex

Both tested on: Engineering laptop: Intel Core i7-12800H @ 2.8 GHz, 14 cores, 64 GB RAM



NULLSPACE®	**0.02 mins** 0.12 Gig	**0.15 mins** 0.15 Gig	**2.5 mins** 0.4 Gig	**1 hour** 5.3 Gig	**1.7 hours** 20 Gig	**5.7 hours** 170 Gig
DASSAULT SYSTEMES	**0.3 mins** 0.35 Gig	**2 mins** 1.26 Gig	**16 mins** 5.8 Gig	**3 hours** 55 Gig	**Simulation FAILED**	**Simulation FAILED**

Nullspace Applications

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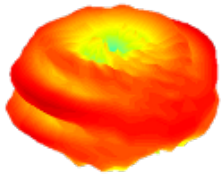
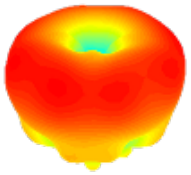
Antenna Design and Analysis

- Complex, multi-band antennas
- Antenna placement and co-site analysis
- Phased Arrays with complex structures
- Multi-layered radomes
- Beam Steering analysis
- Reflector design
- GRIN Lenses
- Leaky wave antennas



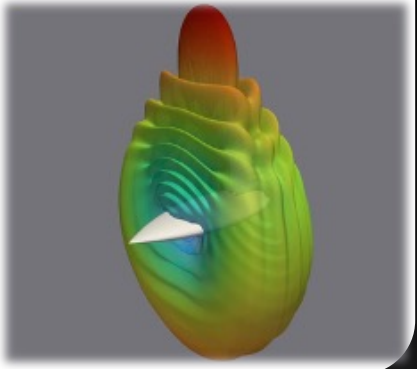
As installed



As designed

Radar Design and Analysis

- Monostatic and bistatic analysis
- Electrically large scatterers (e.g. simulations of aircraft, ships, ground vehicles)
- Scattering from objects with PEC, magnetics, and dielectric coatings frequency selective surfaces (FSS)
- Cavities



Optimization & Uncertainty Analysis

- Design optimization
- Generative design
- Parametric analysis
- Uncertainty analysis
- Generate data for AI training

Generatively Designed SATCOM antenna using Nullspace EM+AI optimization tool integrated via Python API

To Schedule a Demo:

www.Nullspaceinc.com