3DEXPERIENCE®

CST Studio Suite 2019
Feature Highlights

CST joins SIMULIA

DASSAULT SYSTEMES | The 3DEXPERIENCE® Company

Outline

How Are Product Design and New Feature Development Related?

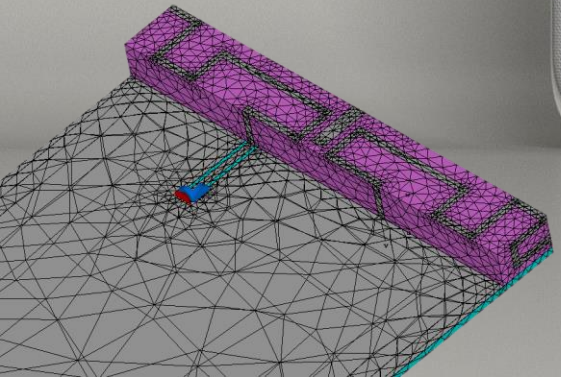
Integrated Antenna Engineering & Certification

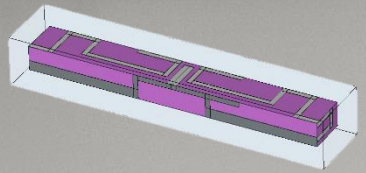
Connected Vehicle Communication Performance

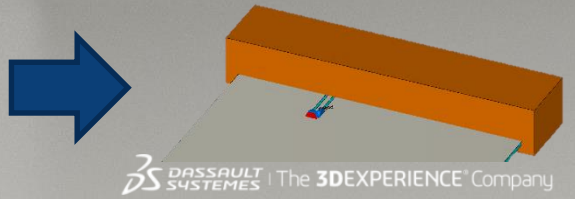
ADAS/AV Sensors Performance

Aircraft Communication & Detection System Performance

How does product design rely on development of new features for CST Studio Suite?







Integrated Antenna Engineering & Certification

INTEGRATED ANTENNA ENGINEERING & CERTIFICATION

“What should the shape and size of the antenna be?”

“Where can I place the antenna?”

“Will the antenna work correctly with the other systems and components in the device?”

“Will the antenna work correctly when the device is placed in a realistic environment”?

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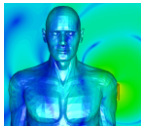
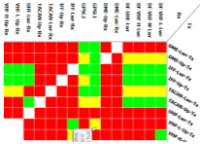
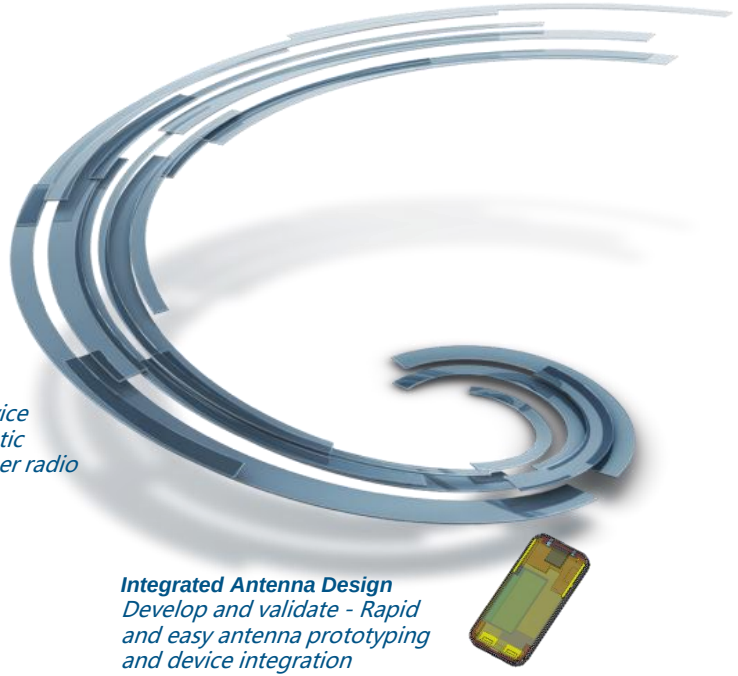
Integrated Antenna Engineering & Certification



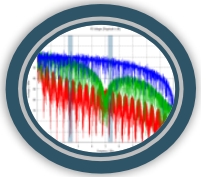
SAR Optimization and Certification
Compliance and safety - Ensure the product fulfills the required human exposure certification standards



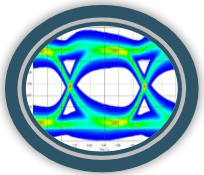
Co-site Interference (RF-Desense)
Reliable operation – Ensure the device works in its intended electromagnetic environment in the presence of other radio systems



Integrated Antenna Design
Develop and validate - Rapid and easy antenna prototyping and device integration



Device EMC/EMI Performance & Certification



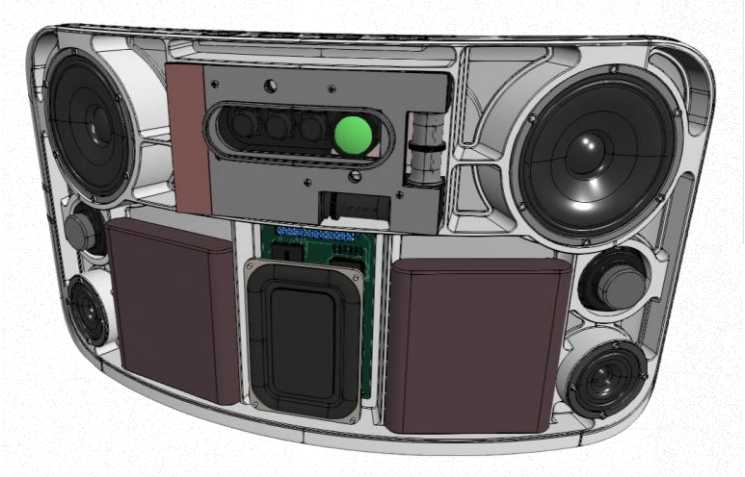
Printed Circuit Board Analysis

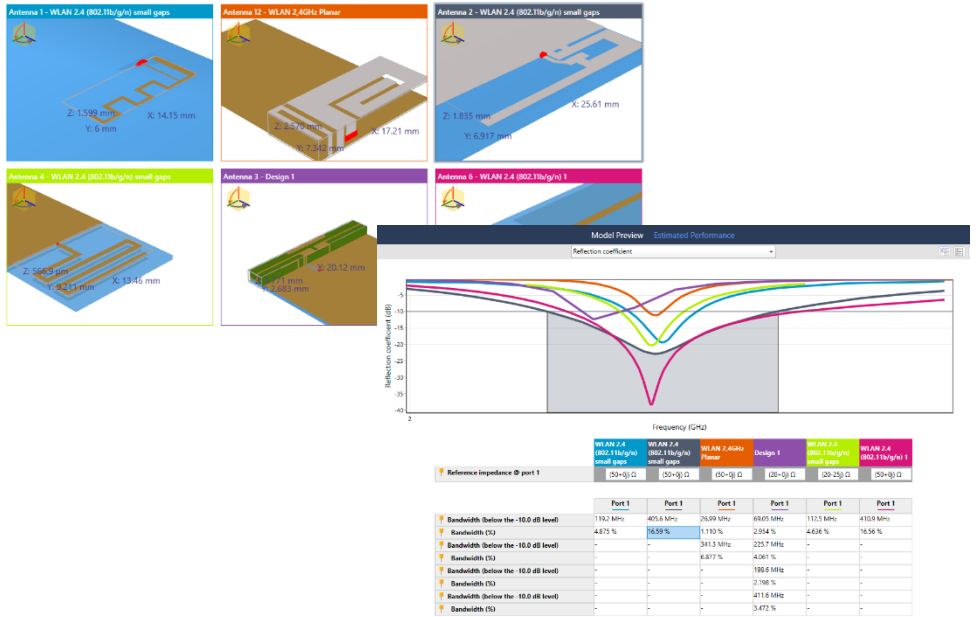
Related Industry Processes

Antenna Design

Required: support for WLAN 2.4 and Bluetooth connectivity

AntennaMagus
Explore.Design.Deliver.

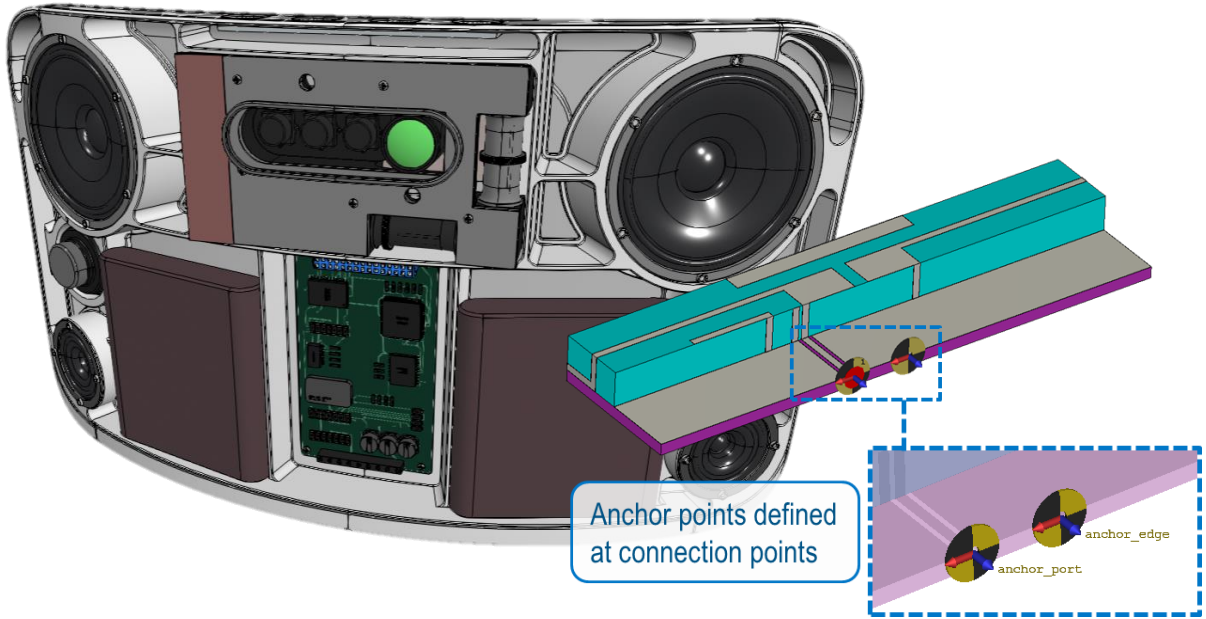




Which antenna?

Encrypted Models

Hide geometry, materials, ports, parameters from prying eyes

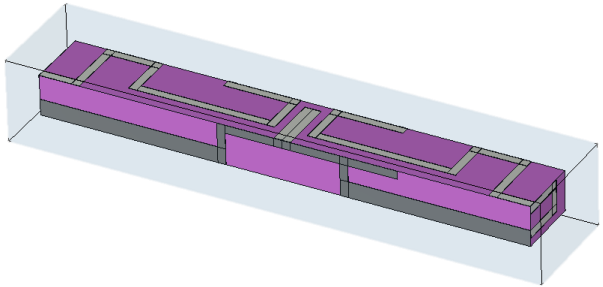


How to make sure sensitive model information does not end up in the wrong hands when sharing model data between partners and suppliers is required?

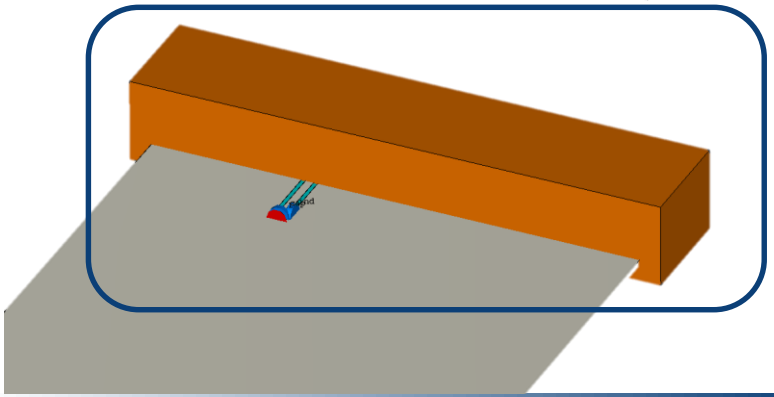
Encrypted Models

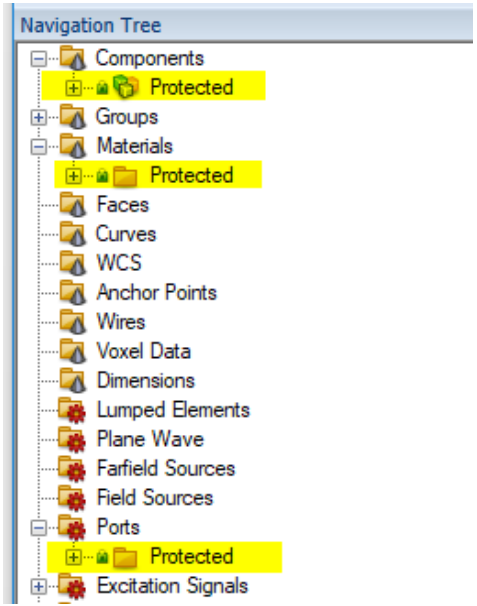
Hide geometry, materials, ports, parameters etc. from prying eyes

Original antenna model



Encrypted antenna model imported to another project

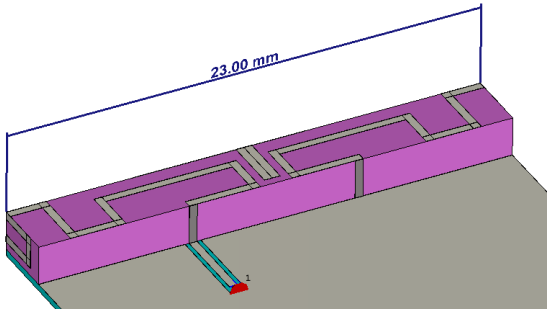




Integrated Antenna Engineering & Certification

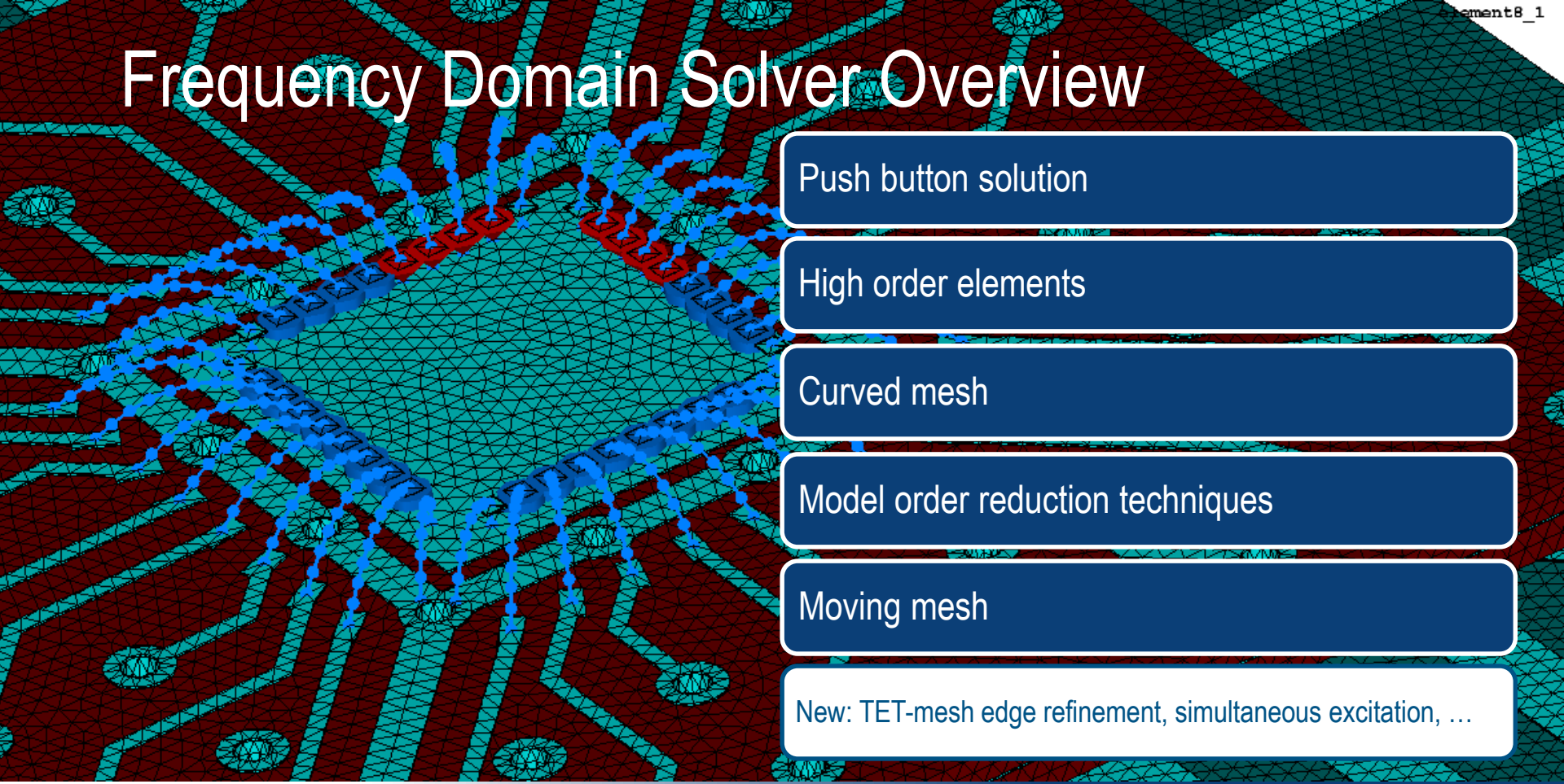
Electrical Size = Enviroment Dimension normalize to Wavelength

El. Length	F	I	T	I	A
1λ					
10λ					
100λ					
1000λ					
10000λ					



WLAN 2.4 GHz

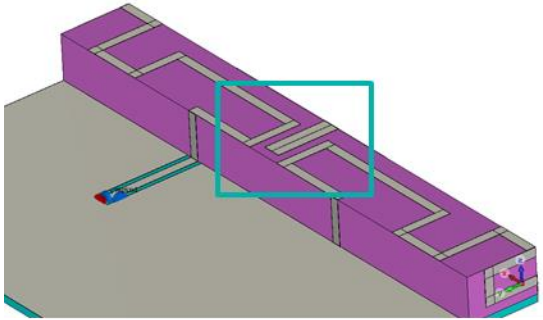
Frequency Domain Solver Overview

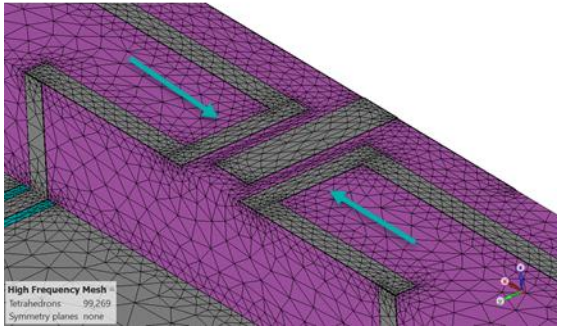


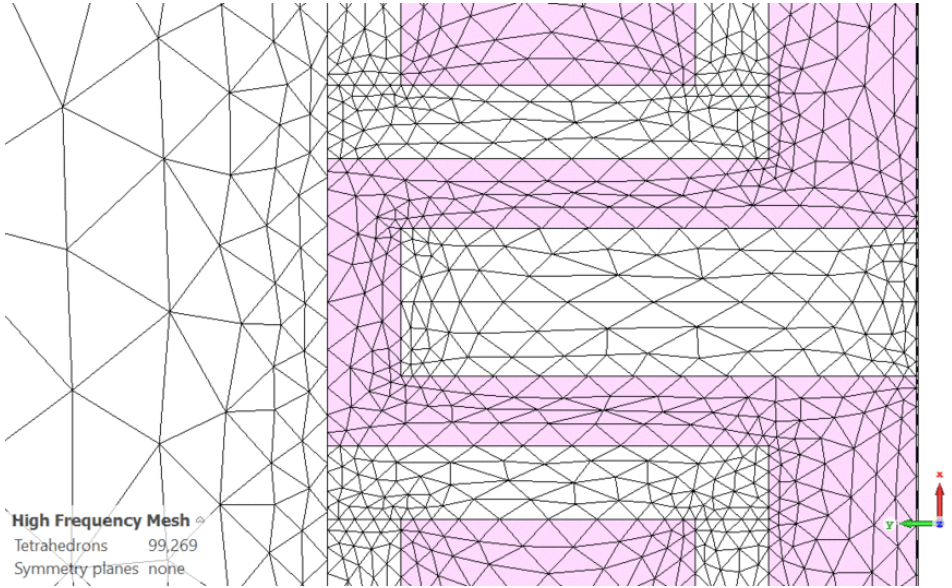
- Push button solution
- High order elements
- Curved mesh
- Model order reduction techniques
- Moving mesh
- New: TET-mesh edge refinement, simultaneous excitation, …

Tetrahedral Meshing (FEM)

Moving mesh reduces mesh noise

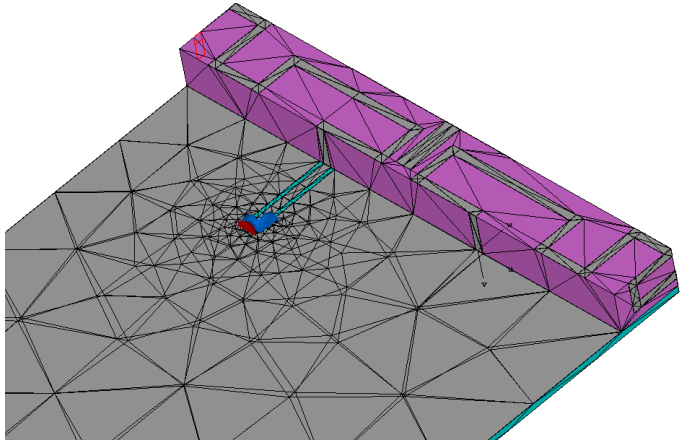




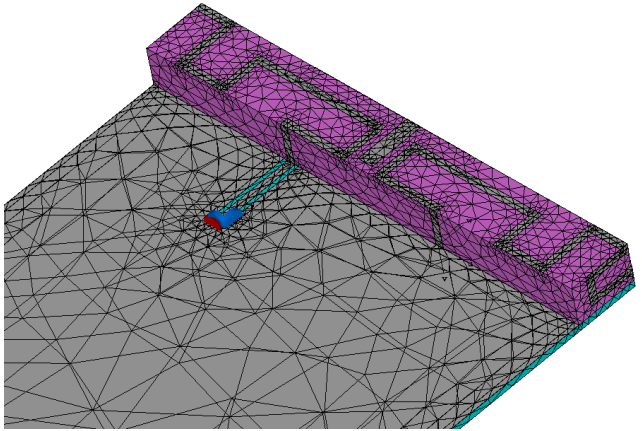


TET-Meshing Metallic Edge Refinement

- Refine metallic edges automatically without mesh adaptation
- Save simulation time (less mesh adaptation steps)
- Increase accuracy



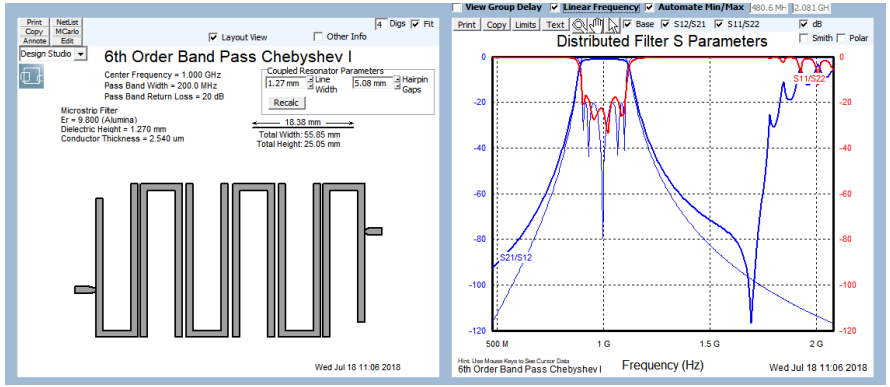
Default mesh without edge refinement

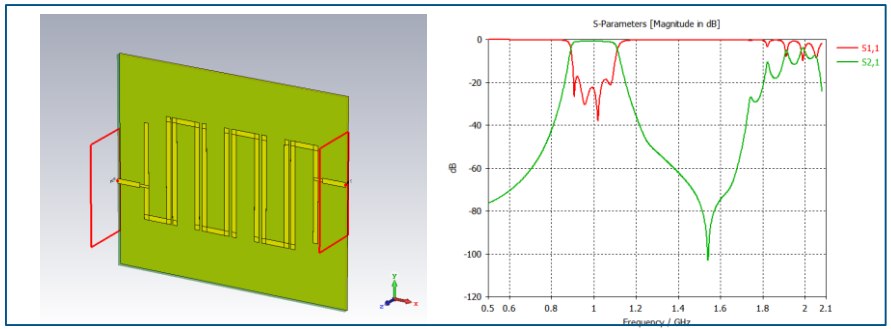


Default mesh with edge refinement step = 0.2 mm

Filter Designer 2D – Improved accuracy

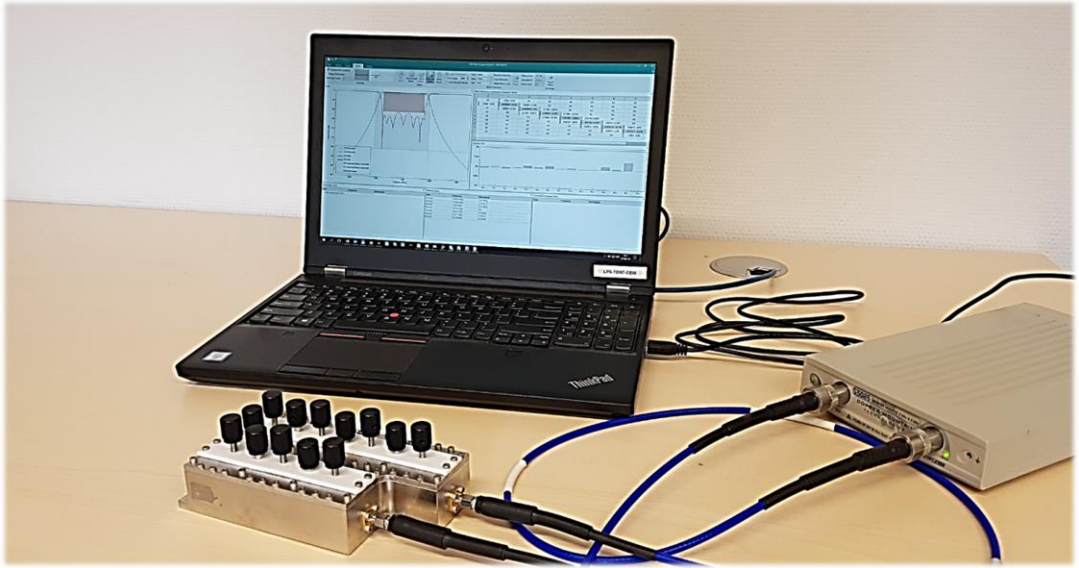
- Distributed models are synthesized with higher accuracy
- Good comparison between FD2D and 3D EM simulation results
- Other new features
  - Layout view for distributed filters.
  - Series quadruplet coupling matrix and implementation with LC resonators.
  - Support for substrate material definition to include material name and Er.
  - Option to position untapped Interdigital and combline ports on side walls.





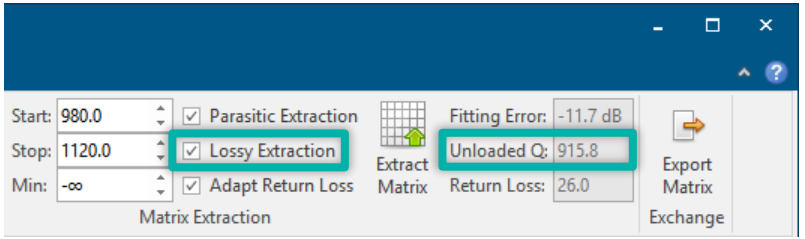
Filter Designer 3D – VNA based filter tuning

- Connect VNA with computer where FD3D is installed.
- FD3D extracts coupling matrix from real-time measured S-parameters.
- Supports various VNA instruments from both Rohde & Schwarz and Copper Mountain Technologies.

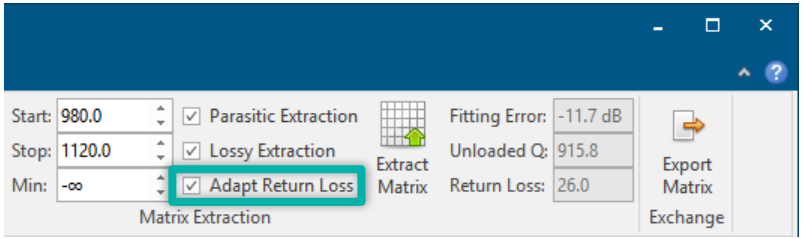


Filter Designer 3D – Other New Features

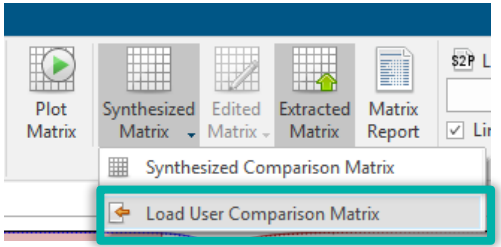
- Lossy Extraction



- Adapt Return Loss

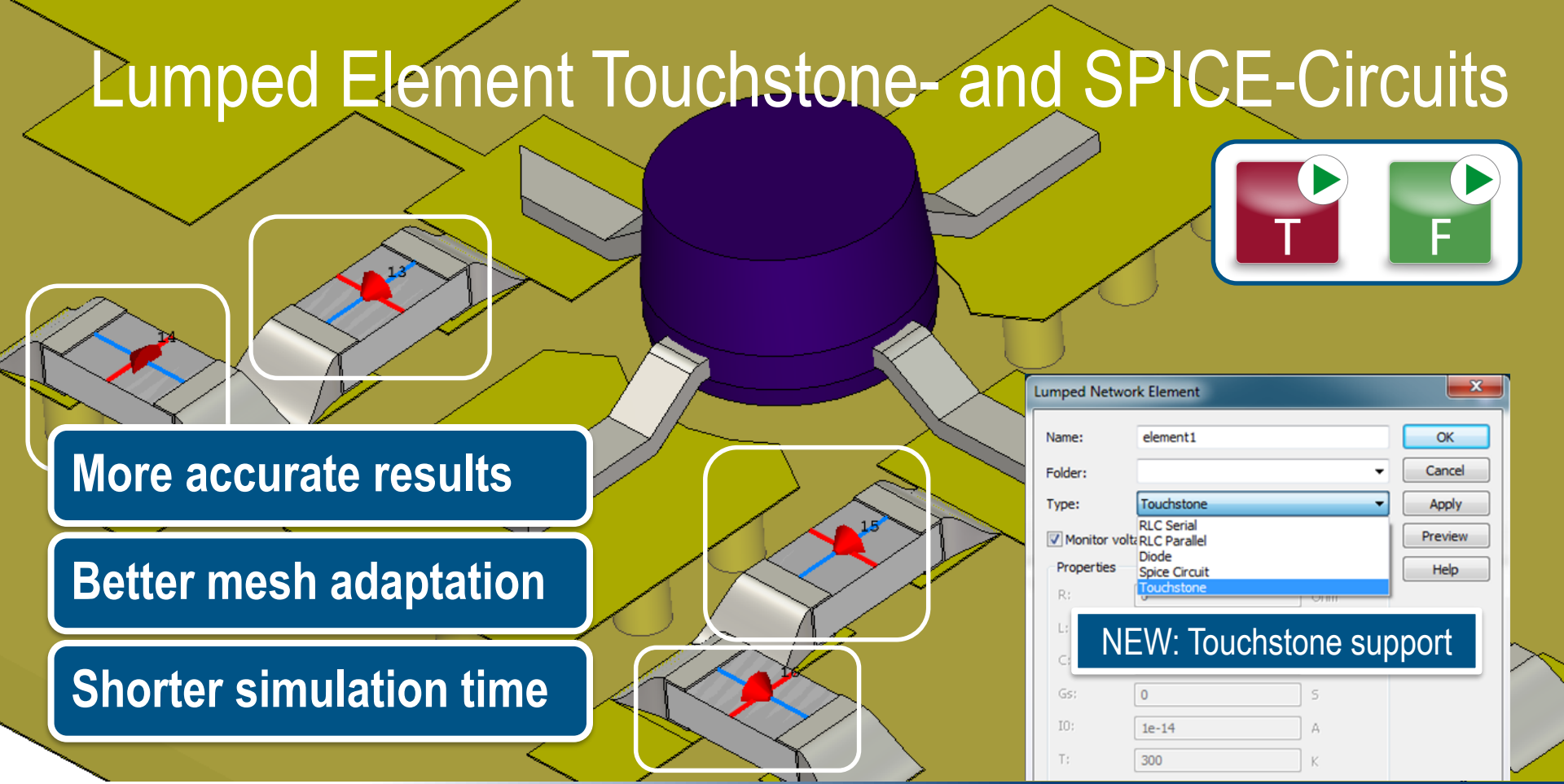


- User Comparison Matrix*



*need to be a supported topology

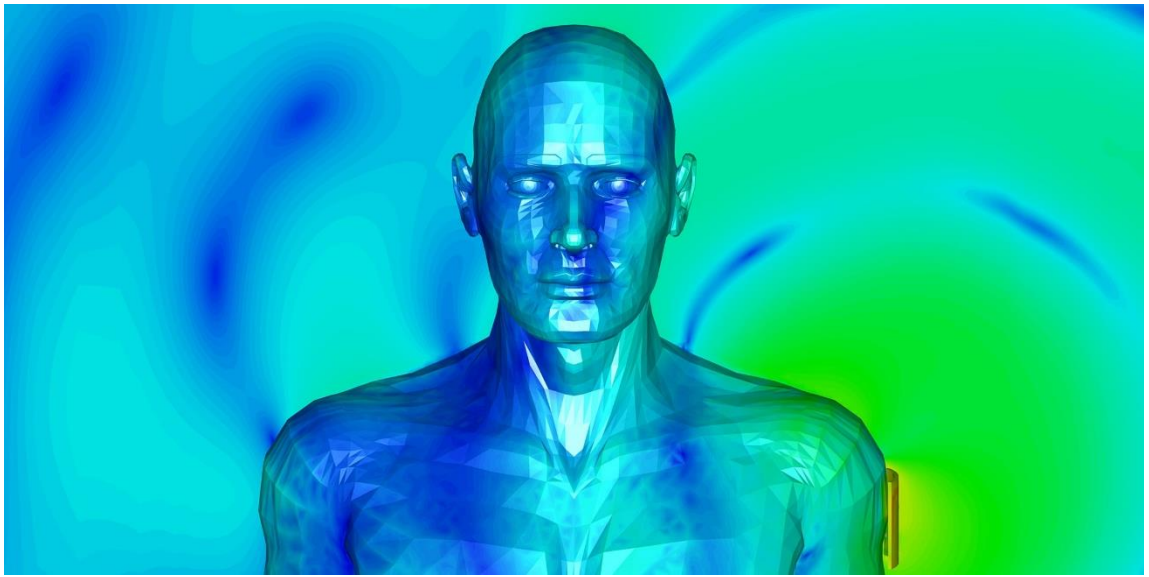
Lumped Element Touchstone- and SPICE-Circuits

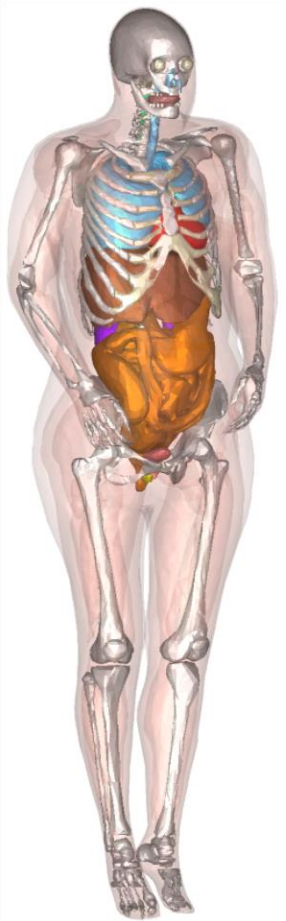


- More accurate results
- Better mesh adaptation
- Shorter simulation time

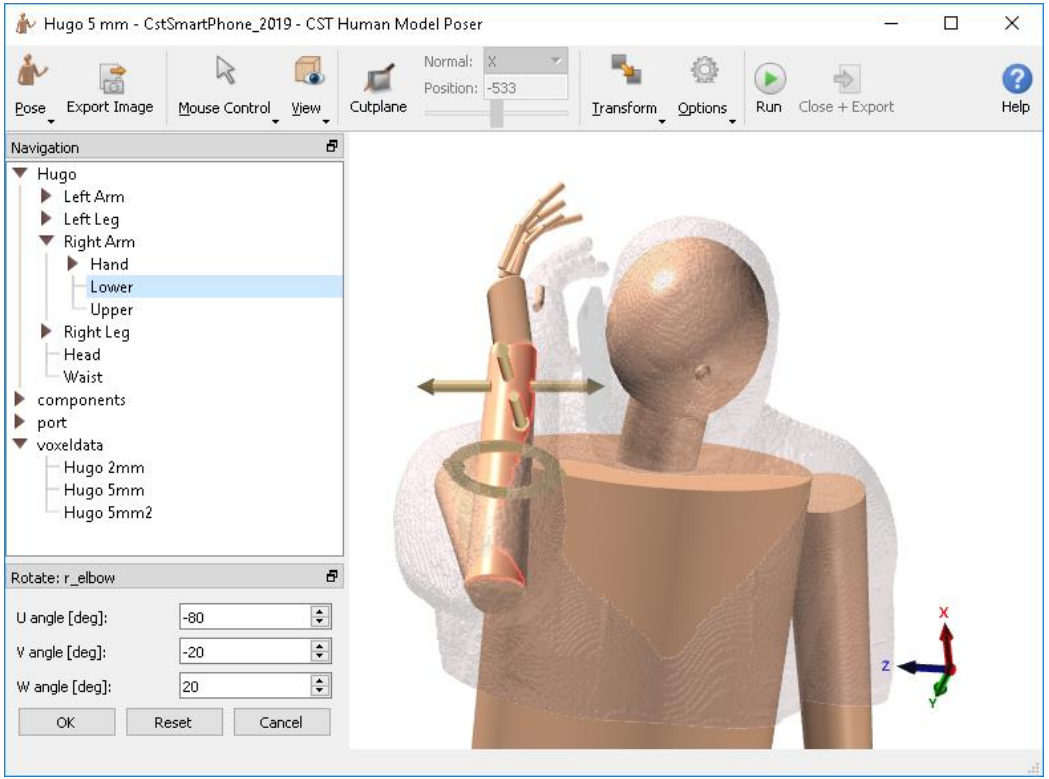
TET-Meshable Female Visible Human

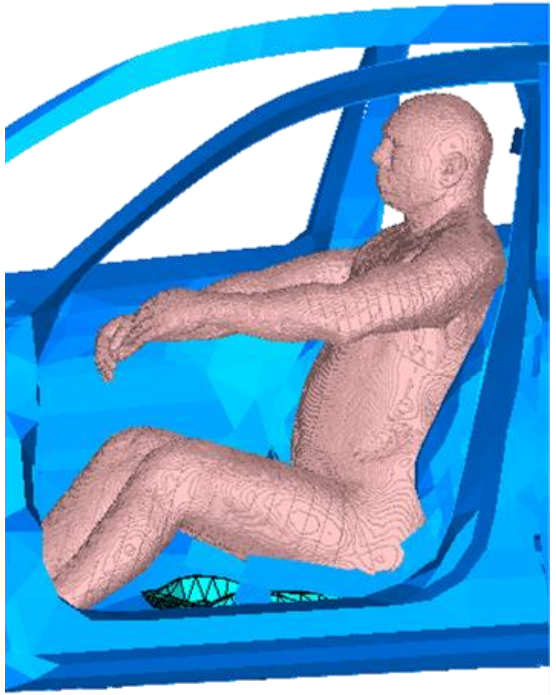
Coarse model to easily allow full body simulations with <1M tetrahedral elements





Human Model Poser Integrated in CST Studio Suite



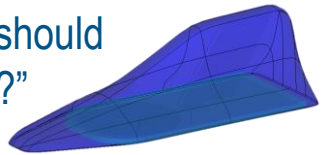


CONNECTED VEHICLE COMMUNICATION PERFORMANCE

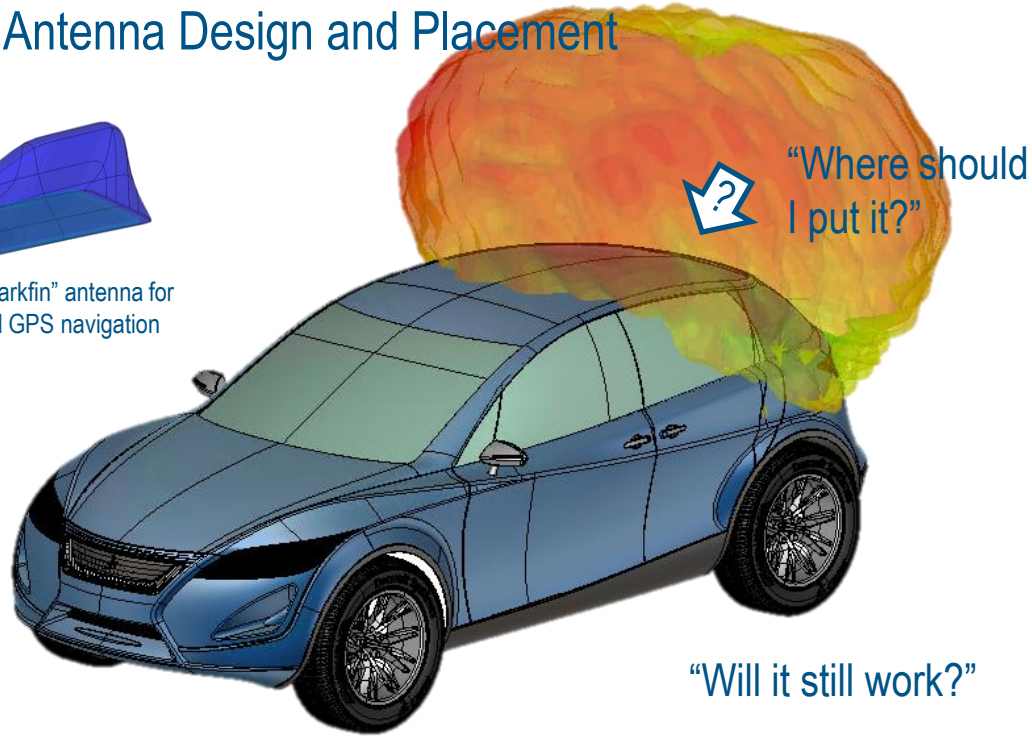
Connected Vehicle Communication Performance

Simulation for Antenna Design and Placement

"How should it look?"



Rooftop "sharkfin" antenna for phone and GPS navigation



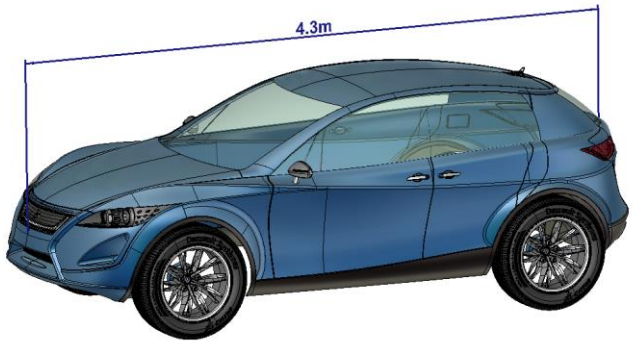
"Where should I put it?"

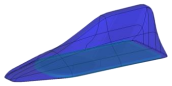
"Will it still work?"

Connected Vehicle Communication Performance

Electrical Size = Enviroment Dimension normalize to Wavelength

El. Length	F	I	T	I	A
1λ	↓	↓	↓		
10λ			↓	↓	
100λ					↓
1000λ					
10000λ					

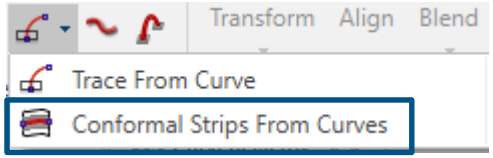


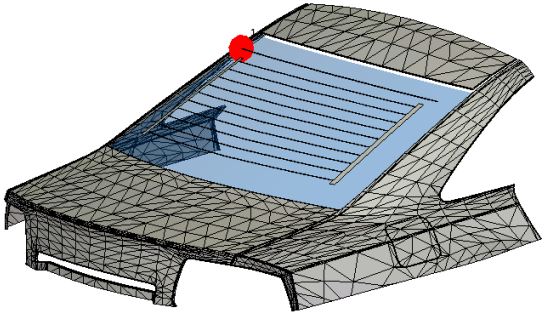


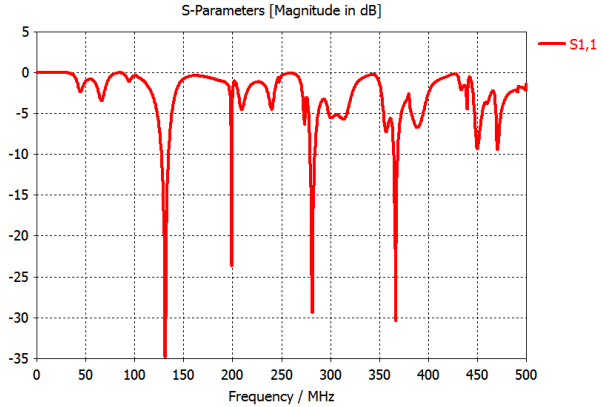
GSM/GPS 1.5 – 1.9 GHz

Improved windscreen antenna modeling

- The new modeling feature greatly improves the workflow for creating windscreen antennas from imported curves.
- Lesser modeling steps; Improved mesh quality which results in improved solver performance.

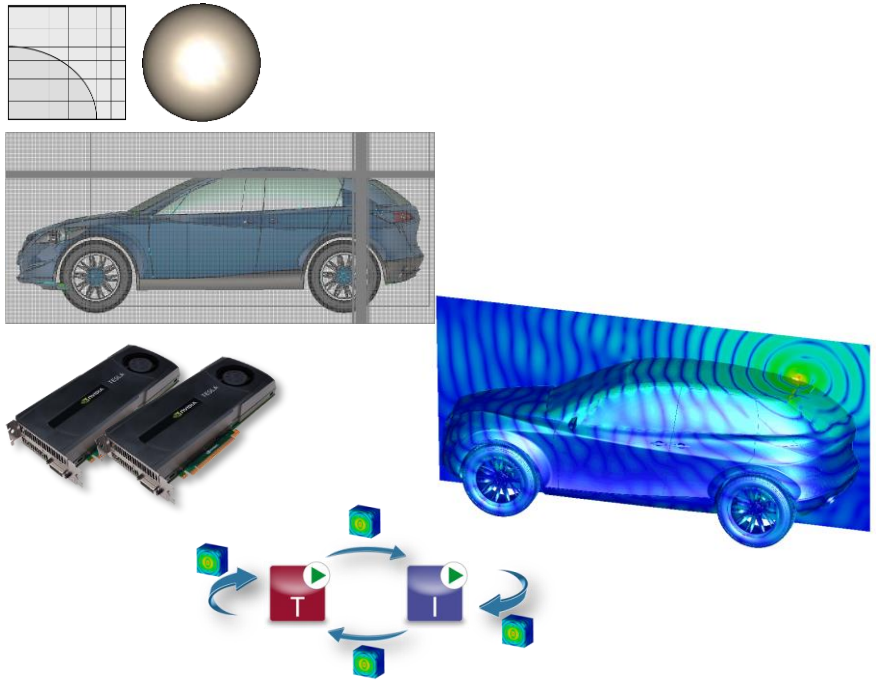






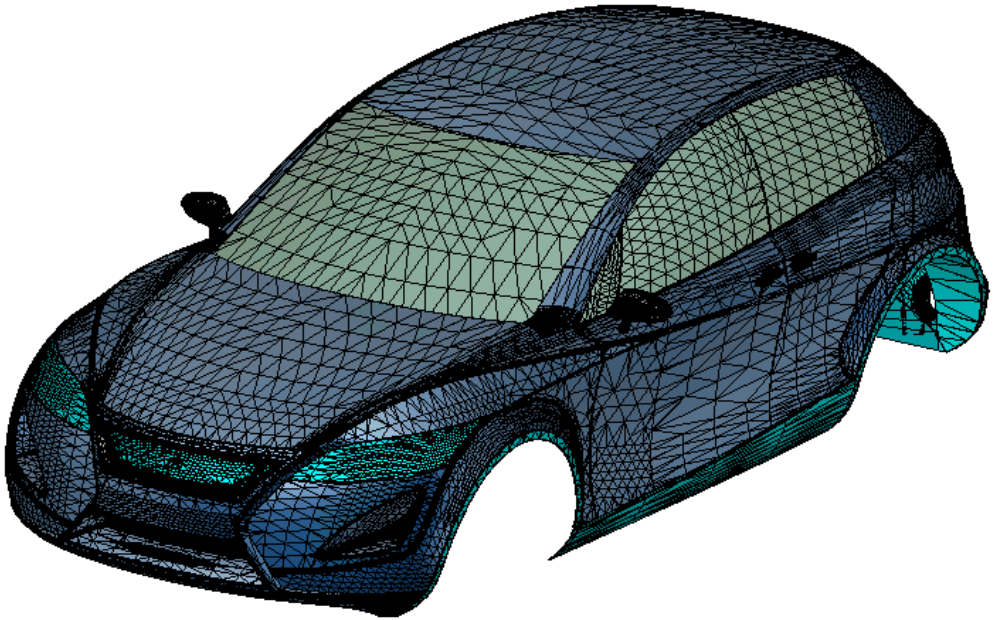
Time Domain Solver Overview

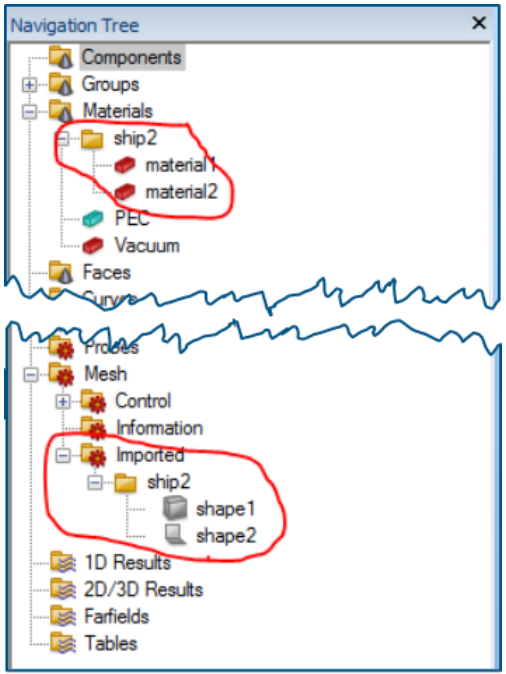
- Perfect Boundary Approximation - PBA®
- Robust meshing of complex CAD-models
- Fast and efficient – possible to run large simulations with very limited hardware…
- …and possible to use GPUs to run massive simulations without massive hardware
- Hybrid solutions available for even larger simulations
- New: Next generation PBA, various performance improvements, field sources on GPU…



Surface Mesh Import

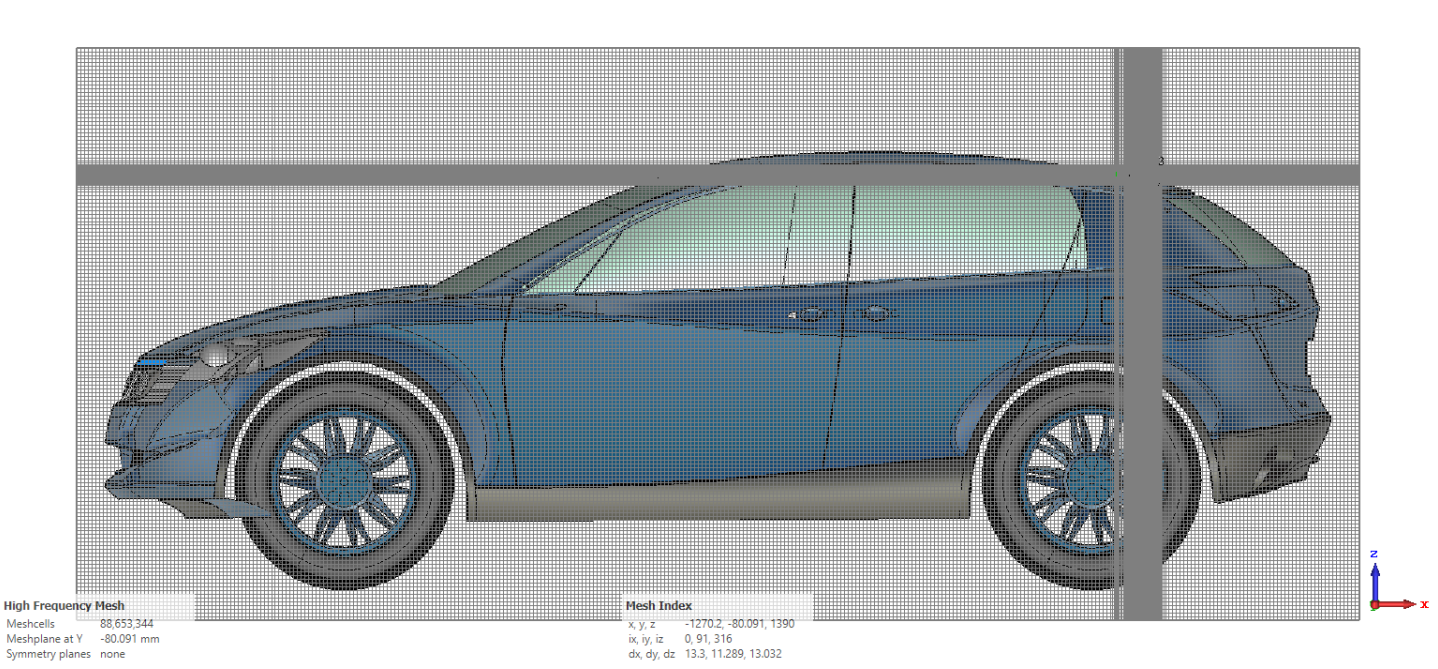
NASTRAN- and NVH-mesh import





Next Generation PBA Meshing

More robust connectivity handling, even for extremely complex CAD models



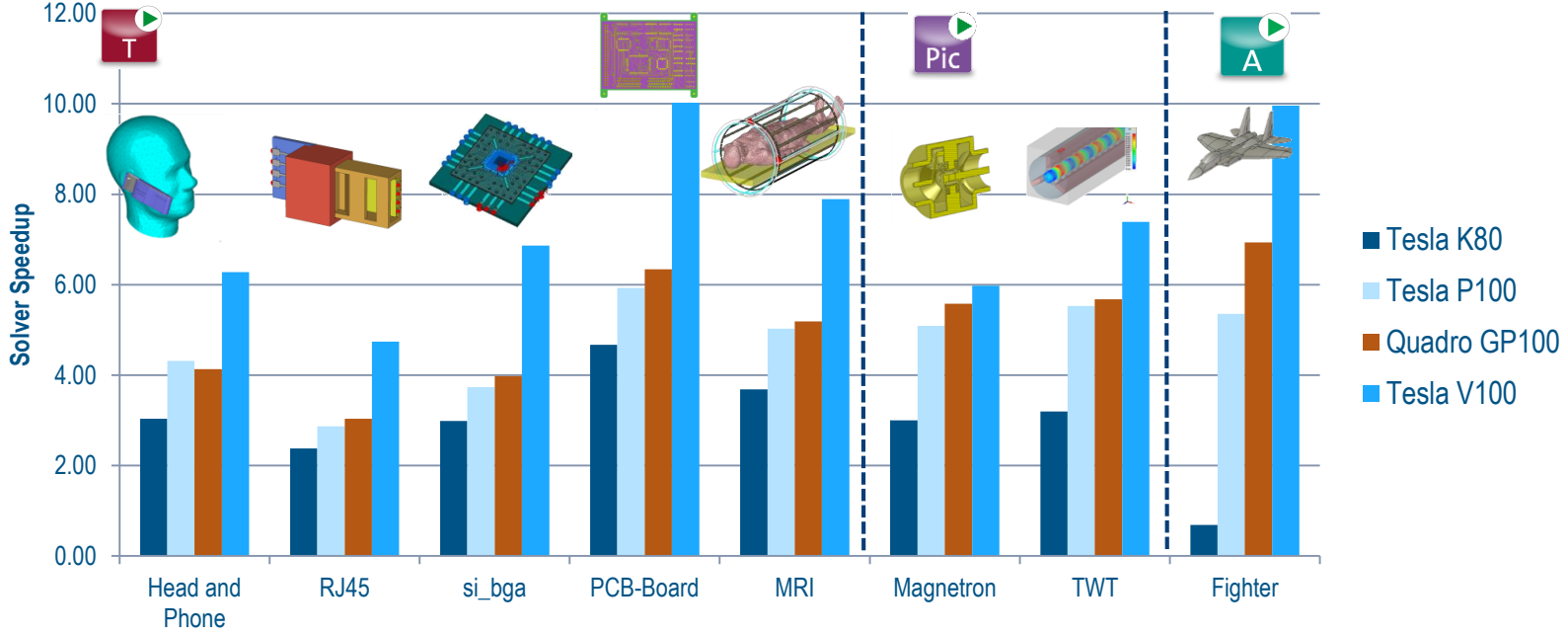
New GPU Devices Supported

Device Name	Quadro P6000 *	Tesla P100	Quadro GP100	Tesla V100	Quadro GV100
Platform	Workstations	Servers	Workstations	Servers	Workstations
RAM per Board	24 GB	12 GB/16 GB	16 GB	16GB/32GB	32GB
Memory Bandwidth per Board	432 GB/s	732 GB/s	717 GB/s	900 GB/s	870 GB/s
Single Precision Performance	12 TFLOPS	9.3 TFLOPS	10.3 TFLOPS	14 TFLOPS	14.8 TFLOPS
Double Precision Performance	0.3 TFLOPS	4.7 TFLOPS	5.2 TFLOPS	7.0 TFLOPS	7.4 TFLOPS

* Quadro P6000 has a very low double precision performance and, thus, can't be recommended for PIC-solver, A-solver, and I-solver workloads.

Hardware Acceleration – GPU Performance

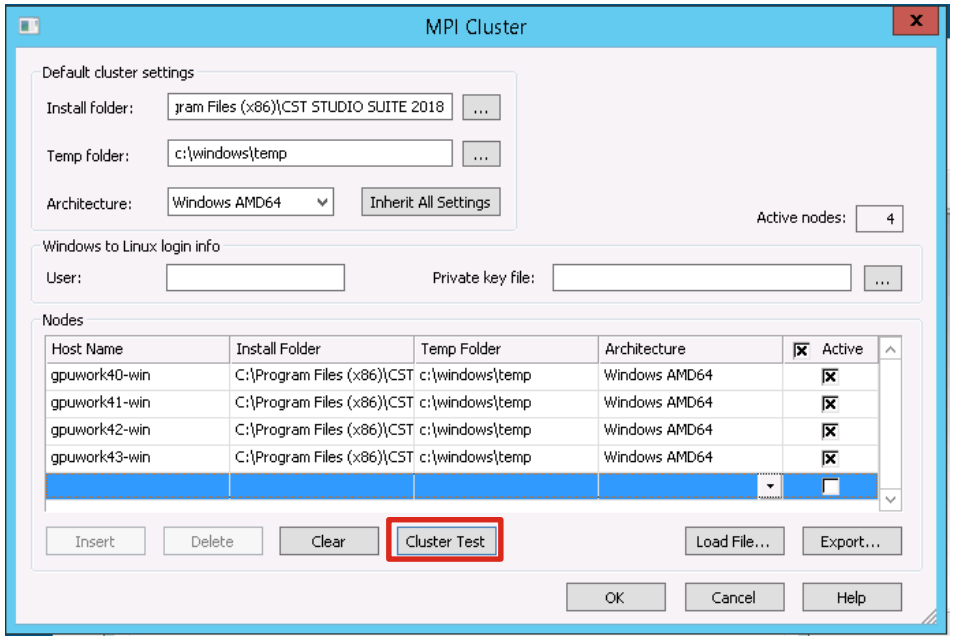
Performance comparison of the latest NVIDIA accelerator cards (single card) for various solvers



Benchmarks performed with CST STUDIO SUITE 2018. Reference system for speedup calculation: dual Xeon Gold 6148 (2x20 cores, 2.4 GHz).

HPC Robustness - System Check Tool

The System Check tool is an **extensible framework of system tests** mainly for cluster systems. It's meant to detect setup issues such as network configuration problems and hardware issues often causing problems for simulations using HPC features such as GPU Computing, MPI Computing, and Distributed Computing. Currently it contains checks for MPI.



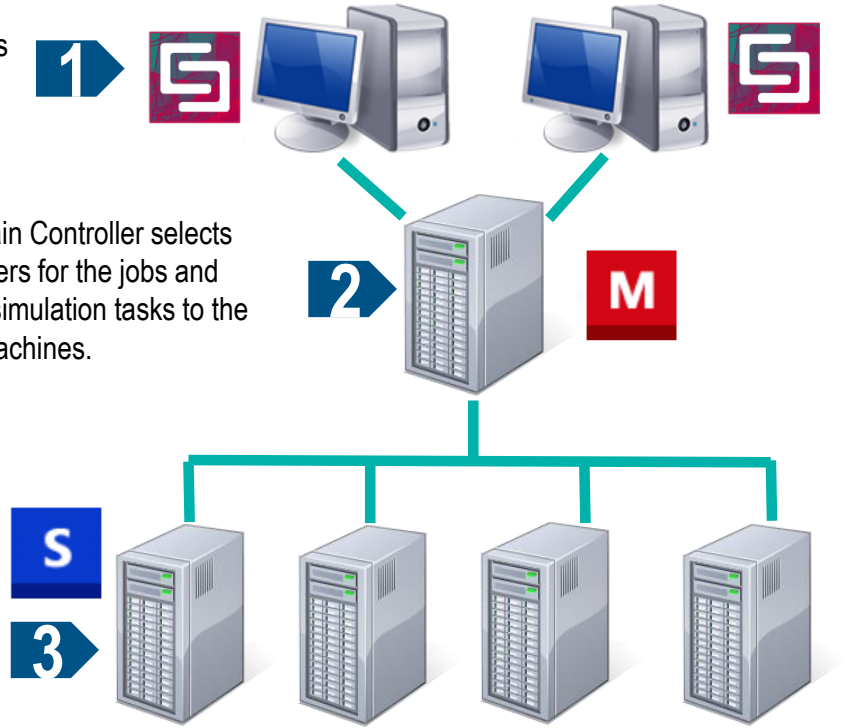
Automatic system tests in advance of MPI start.

Distributed Computing Merge Time Improvements

Users send simulation jobs to the DC Main Controller.

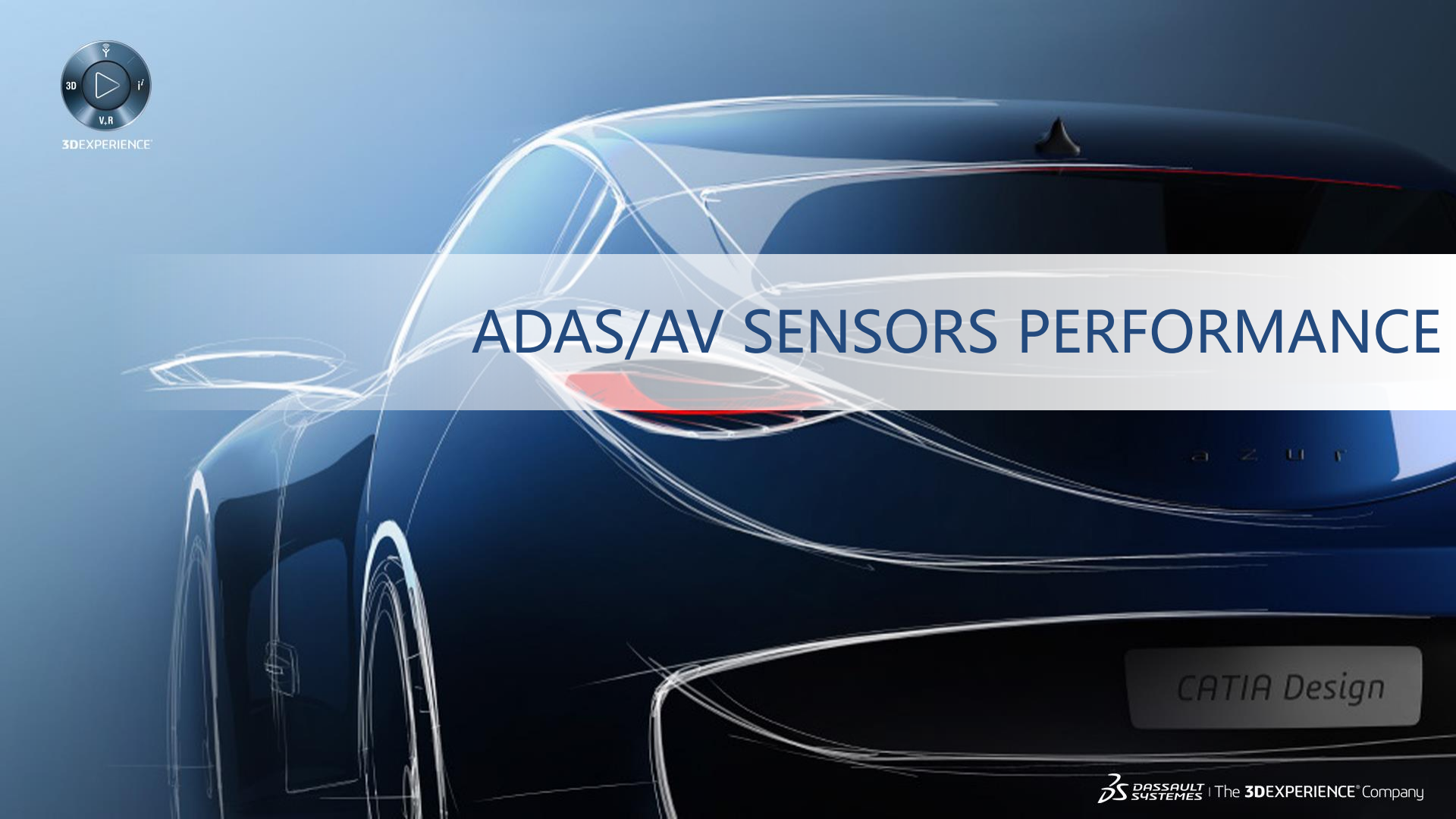
The DC Main Controller selects solver servers for the jobs and sends the simulation tasks to the selected machines.

The DC Solver Servers run the simulations and return the results to the main controller.



Results merge time with e.g. models that have many ports has been improved and is much faster than previously.

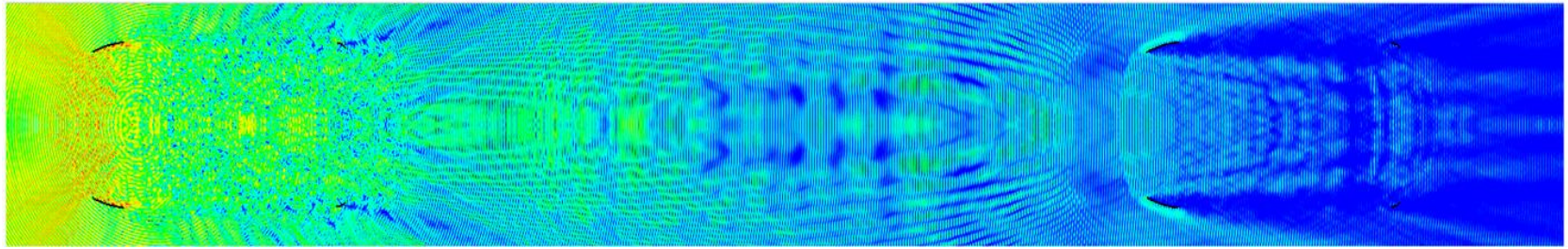
Frontend M Main Controller S Solver Server

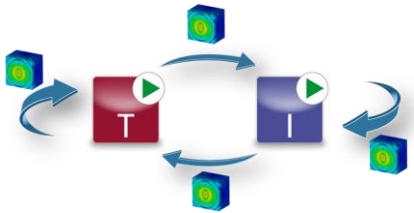


ADAS/AV SENSORS PERFORMANCE

ADAS/AV Sensors Performance

Vehicle safety, driving assistance, autonomous driving



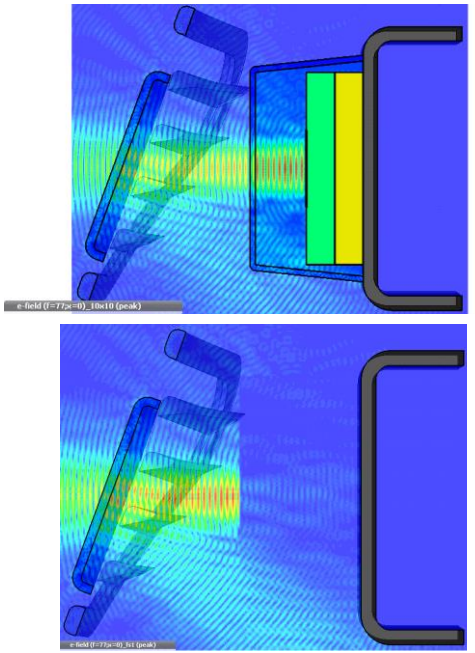


EMAG near and far field sources can be used as surrogate models

Hybrid Solver Task (Bi-Directional)

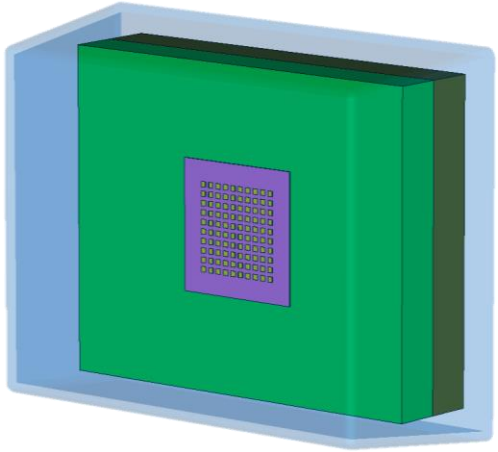
EMAG near and far field sources can be used as surrogate models

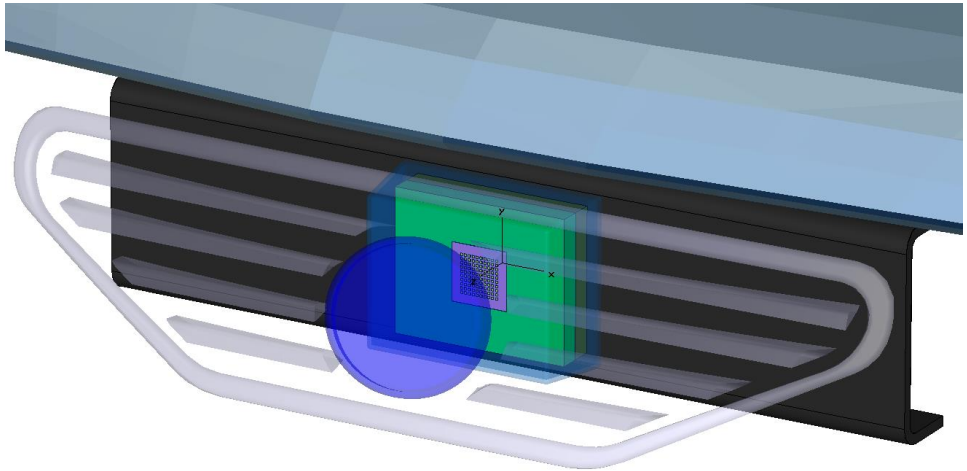
NEW: All general purpose HF-solvers now supported



ADAS/AV Sensors Performance

Electrical size (λ @77GHz) : 113 λ × 36 λ × 28.5 λ

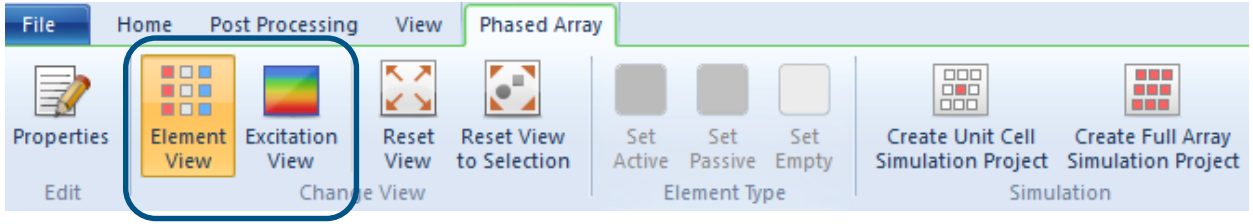




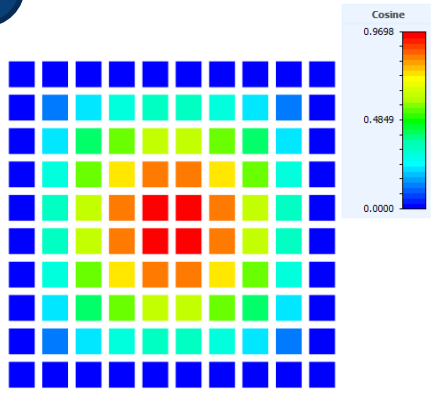
Antenna array is required for high directivity beam

Multi-dimensional problems
Plastic grid and emblem, steel support

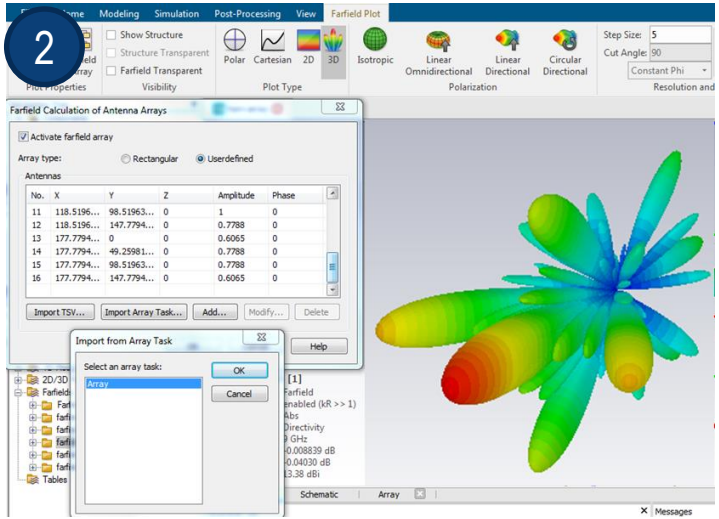
Antenna Array Task



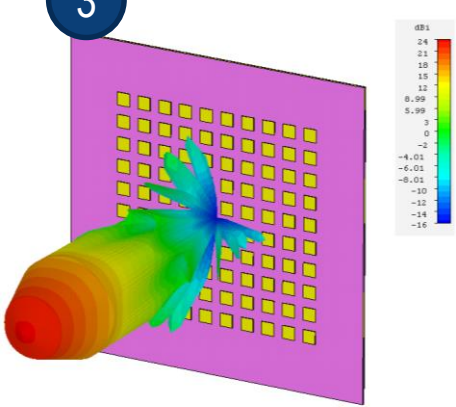
1



2



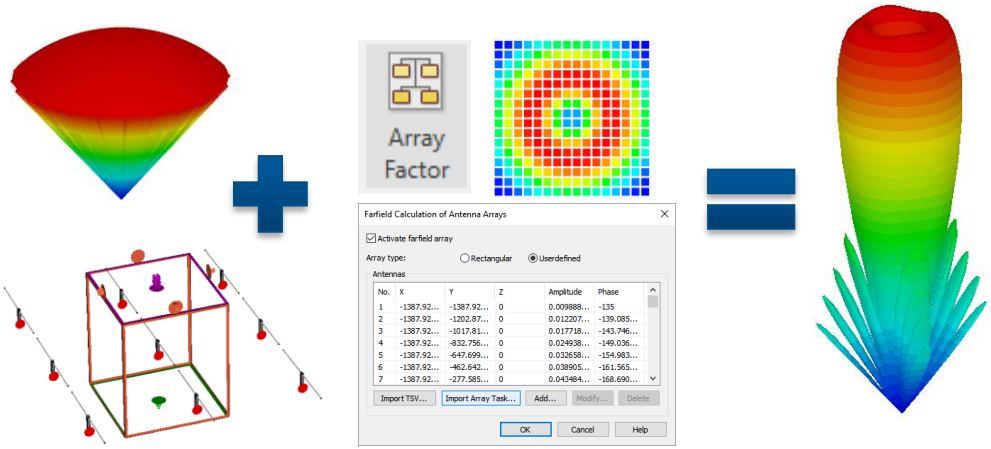
3

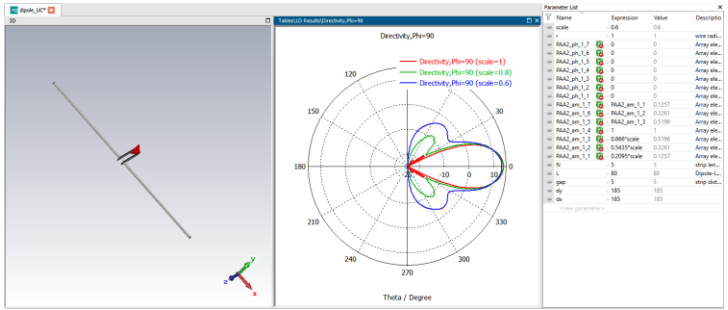


Antenna Array Task

Parameterization and post-processing

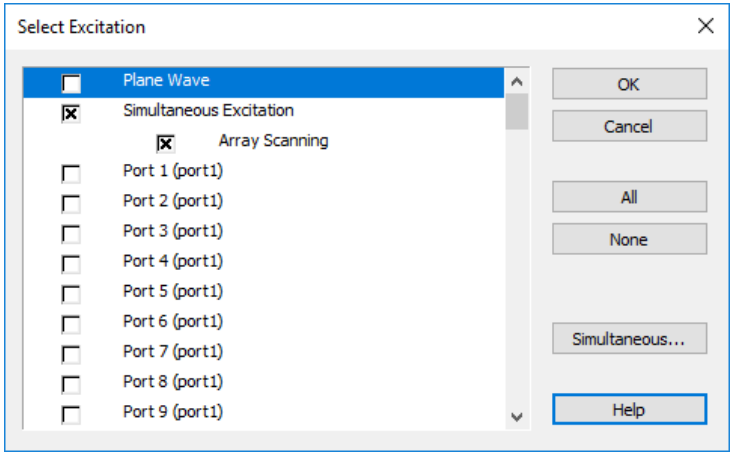
- Compute array pattern from active element pattern and array factor
- Sweep of excitation parameters in post-processing

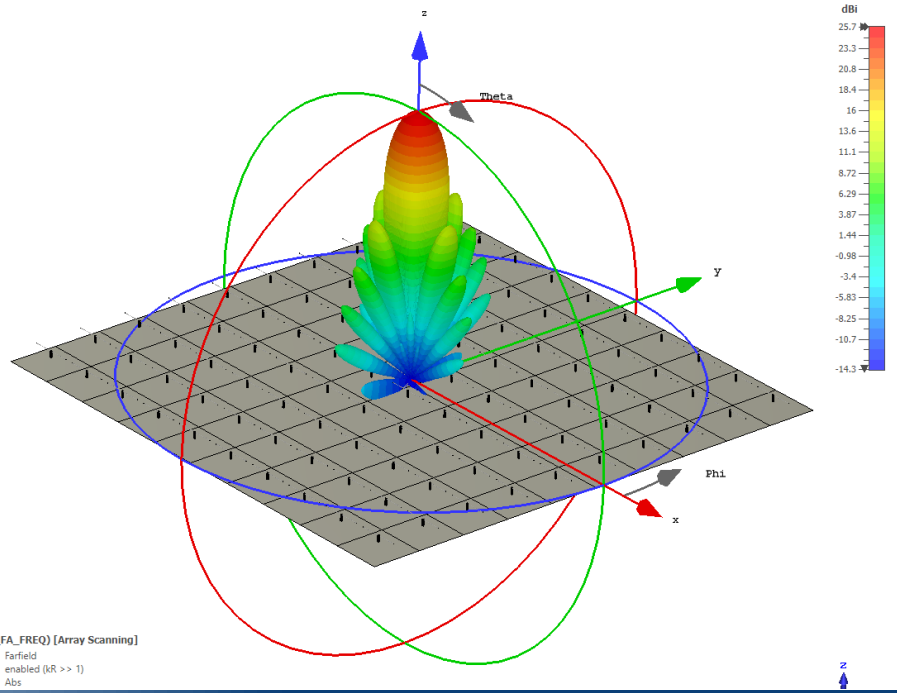




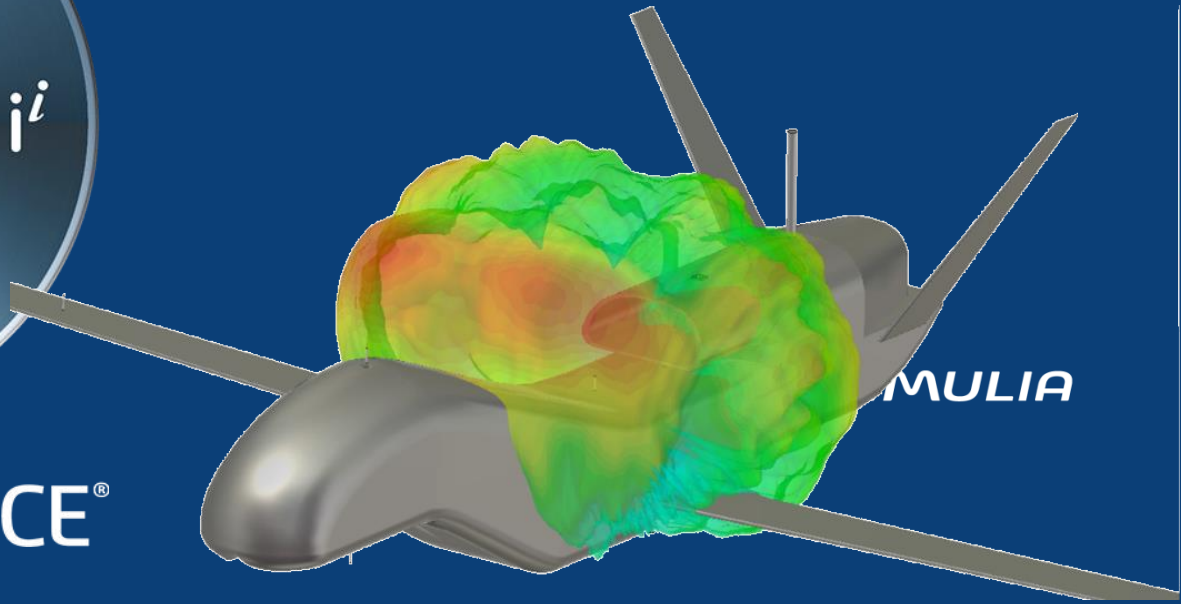
FD- and I-Solver Simultaneous Excitation

- Simultaneous excitation FD-solver general purpose and fast resonant sweep
- Antenna array scanning
- Faster multiport-simulations





Aircraft Communication & Detection System Performance

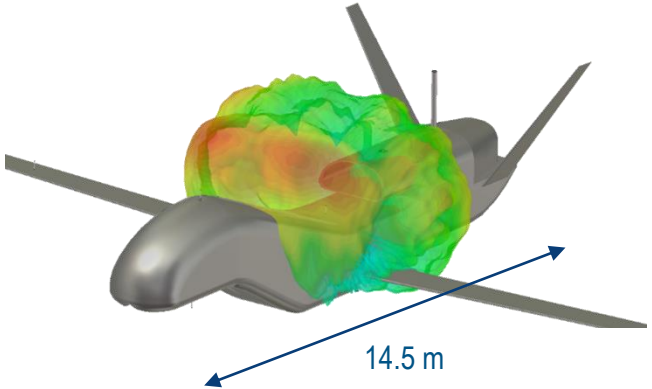


3DEXPERIENCE®

Aircraft Communication & Detection System Performance

Electrical Size = Enviroment Dimension normalize to Wavelength

El. Length	F	I	T	I	A
1λ	↓	↓	↓		
10λ	↓	↓	↓	↓	
100λ			↓	↓	↓
1000λ				↓	↓
10000λ					↓

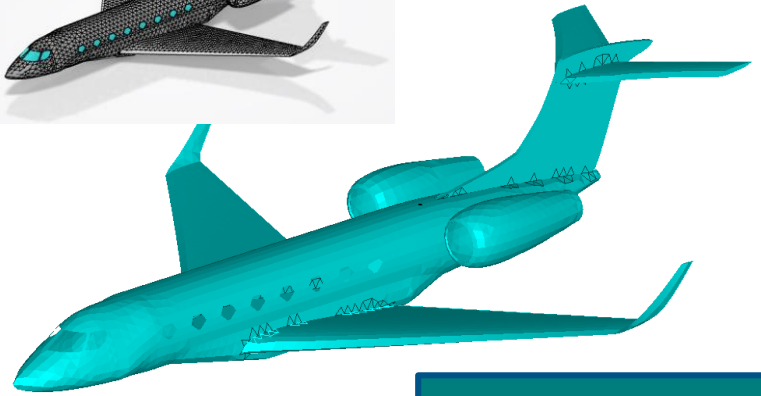


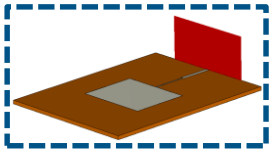
GPS @ 1575 MHz

Integral Equation Solver

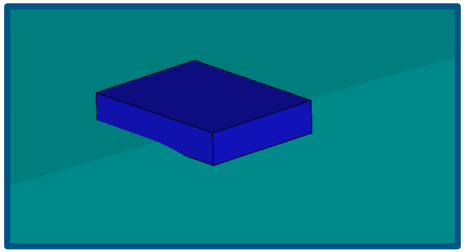
- Triangular and Quadrilateral Mesh
- Curved Mesh with High Order Elements
- Near- and far field sources with antenna-to-antenna coupling
- NVH Mesh Connections
- Imported Surface Mesh and Field Source Intersection
- Simultaneous excitation, windscreen antenna simulation improved setup,…

Meshed on the 3DX platform and imported in CST MWS.

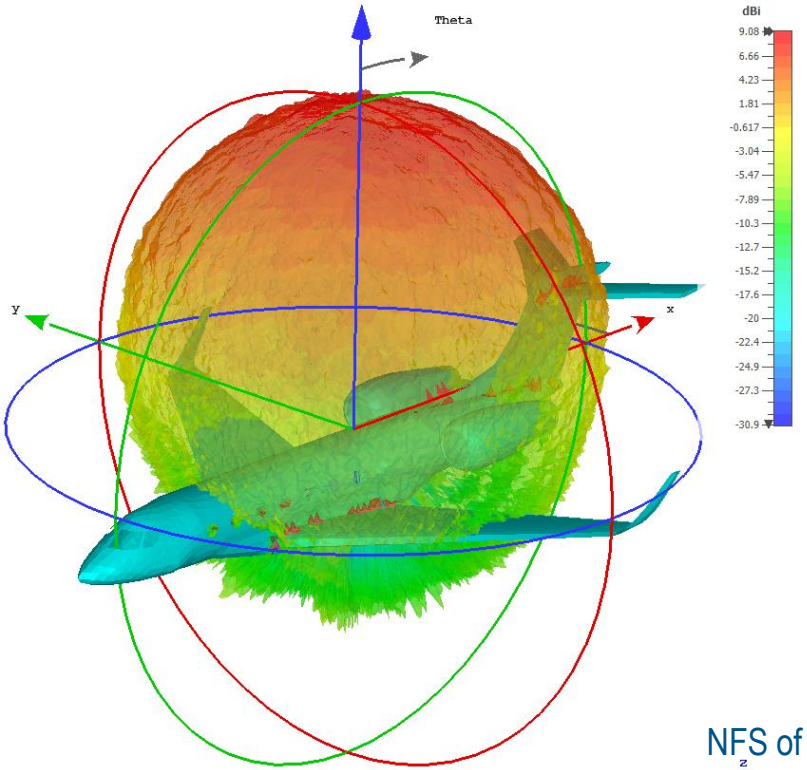




NFS of a patch antenna at 2.45 GHz

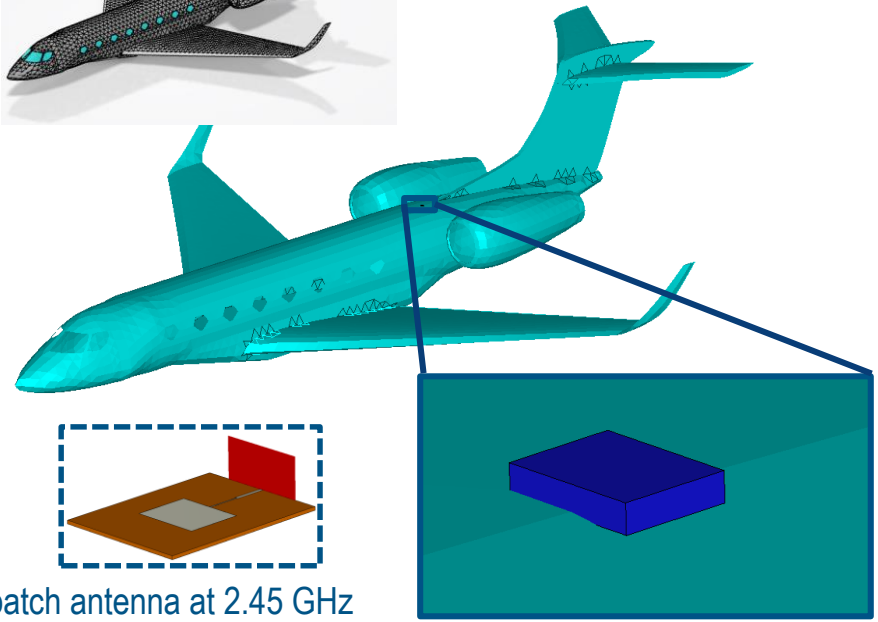


Intersection of NFS with imported Mesh

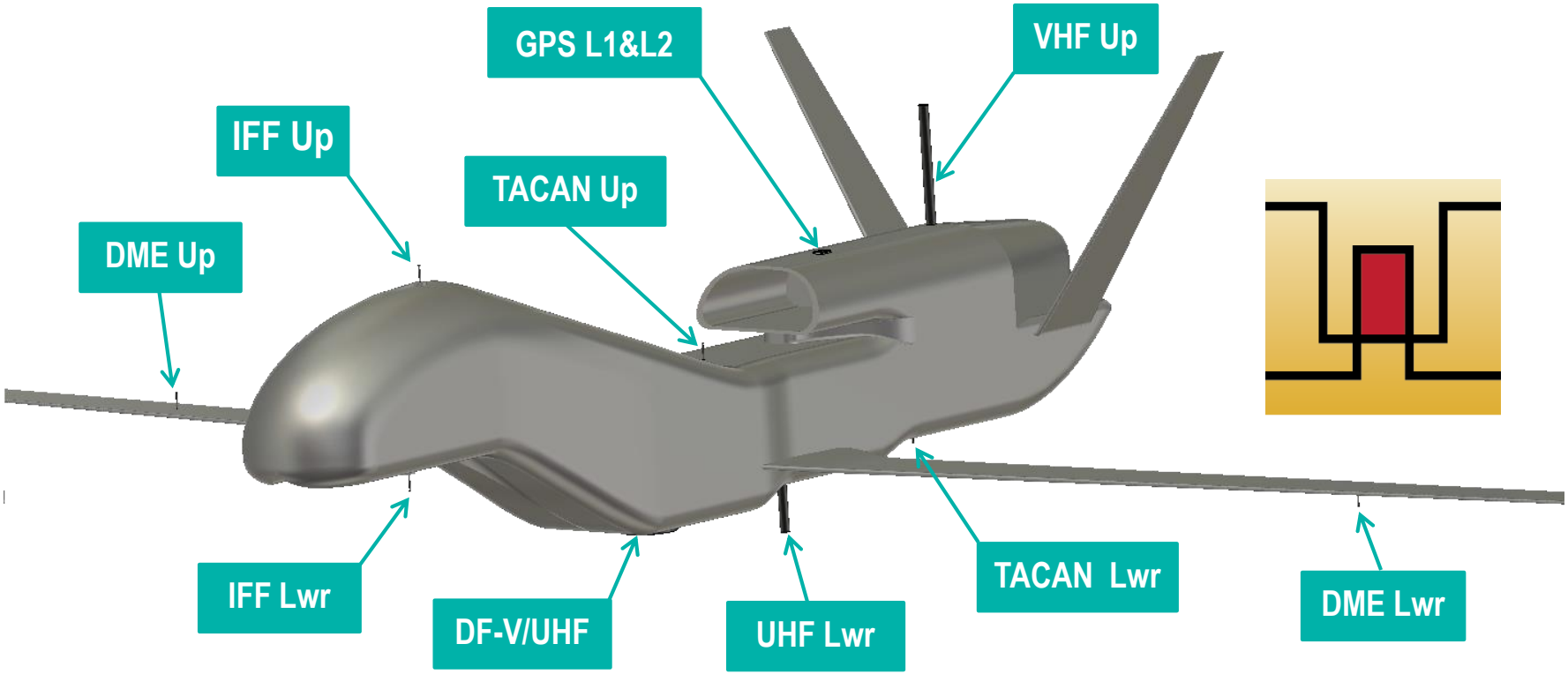


NFS of a patch antenna at 2.45 GHz

Meshed on the 3DX platform and imported in CST MWS.



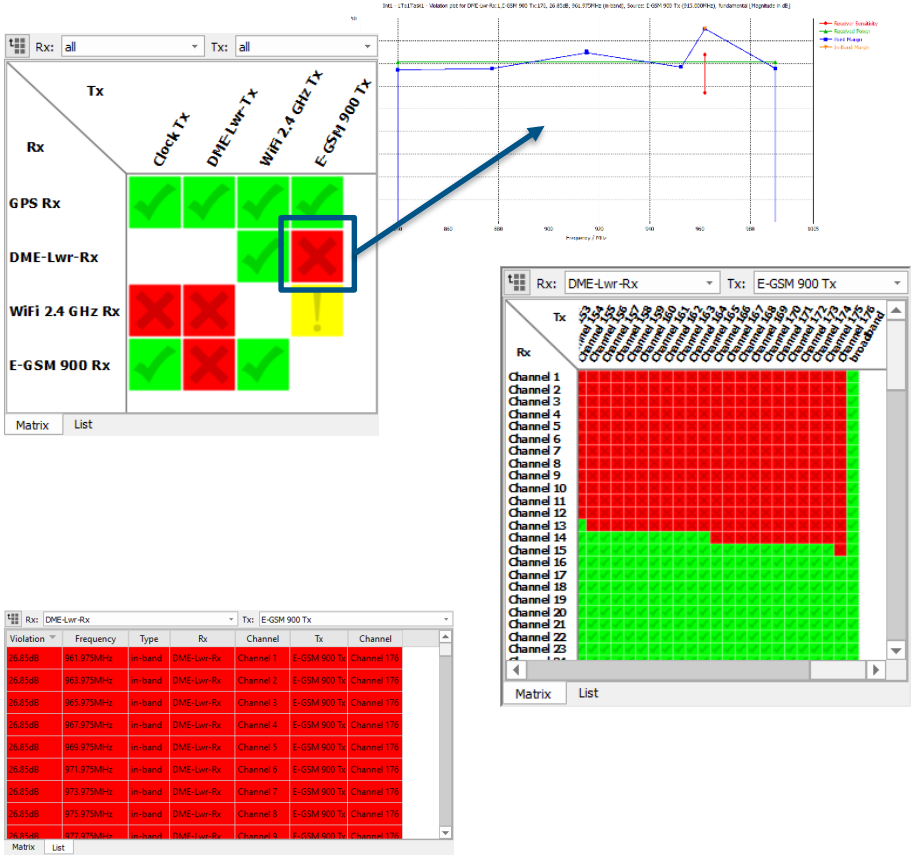
Interference Task



Interference Task

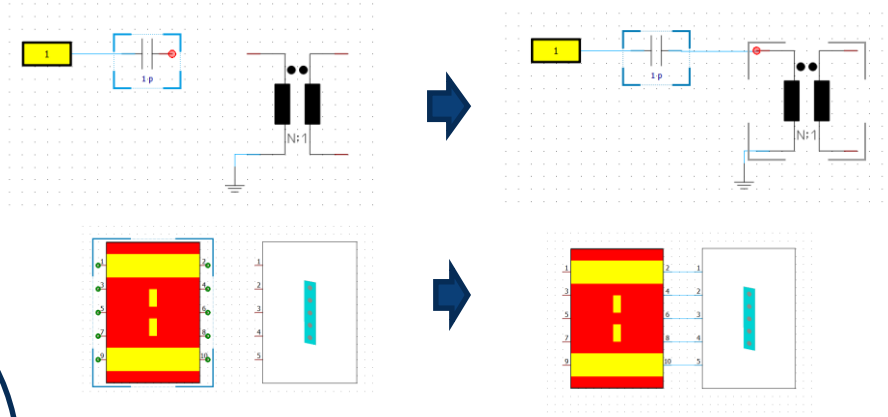
Improved usability

- Interactive violation matrix: click to show the EMI margin plots
- Sub-matrices for detailed view of the channels and violations
- Violation matrix list view: Sort by violation value, type, frequency, etc

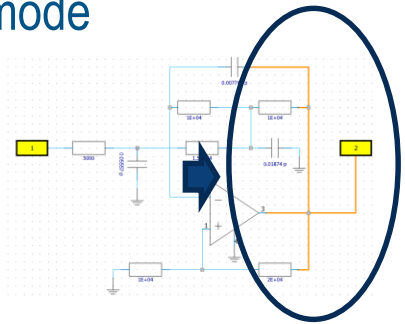


New Schematic Editor

- Create connections by simply selecting the nodes

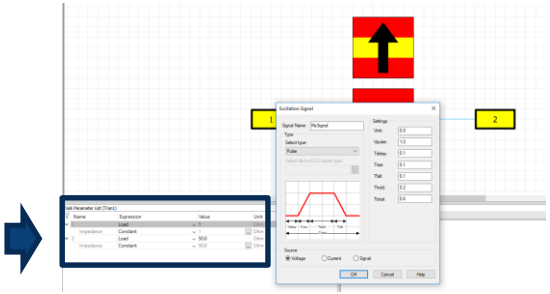


- Auto connection mode



- Net selection

- Excitation settings in task parameter list



Summary

- CST Studio Suite and **3D**EXPERIENCE
- Encrypted models
- Imported NASTRAN- and NVH-mesh support
- Hybrid solver supports all high frequency solvers

CST Studio Suite 2019 will be available for download in the last week of November.