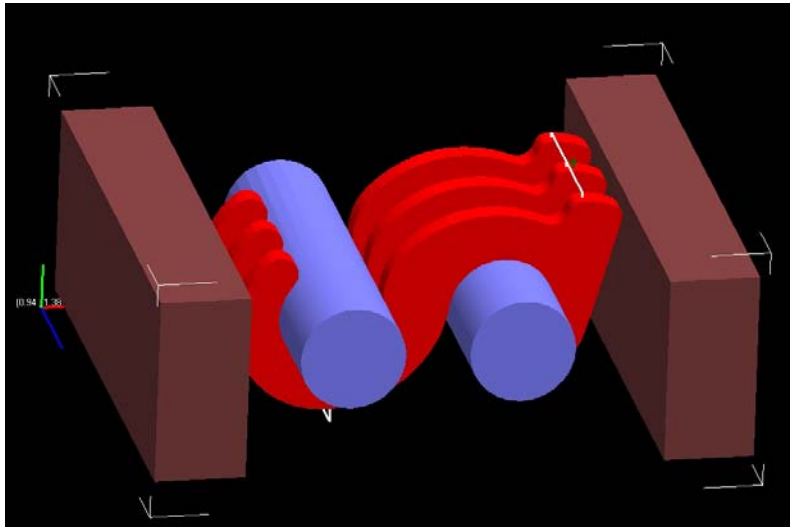
# EM Insights Series



## Episode #4:
Contactor Design In High Volume RF Test Fixtures

Agilent EEsof EDA
October 2008

# Highlights of This Episode

## Typical situation

The contactor is central to the design of high volume RF test fixtures. It acts as the final link connecting the RF test system to the RFIC package. Applications of contactors include high-volume test, characterization in the lab or burn-in test. In the past, high volume contactors were used primarily for testing digital ICs. However, with clock speeds exceeding 1GHz and higher operating frequencies of ICs, the performance degradation due to the contactors can be no longer ignored. IC manufacturers either design their contactors in-house or purchase them from commercial vendors. Developing contactors in house ensures they will suit the need, since universal contactors are virtually impossible because of the number of package sizes, styles and pad configurations available.

## Potential users and targeted market

- IC Test engineers
- RF board engineers in RF labs
- IC companies, RF loadboard sub-contractors

## EM product used

- Electromagnetic Professional (EMPro): http://www.agilent.com/find/eesof-empro

# Design Challenge

## Design challenge

The design of contactors impacts the product's cost, its manufacturing time, and eventually product success. Designing a contactor requires a combination of several disciplines — mechanical, electrical, thermal and functionality. The best contactors can be evaluated in terms of their mechanical construction, RF capabilities, and high-volume RF testing. Since the contactors are designed for a specific test fixture application, it is very important for test engineers to quickly analyze and understand the impact of the contactors to the overall test performance, consequently the production yield.

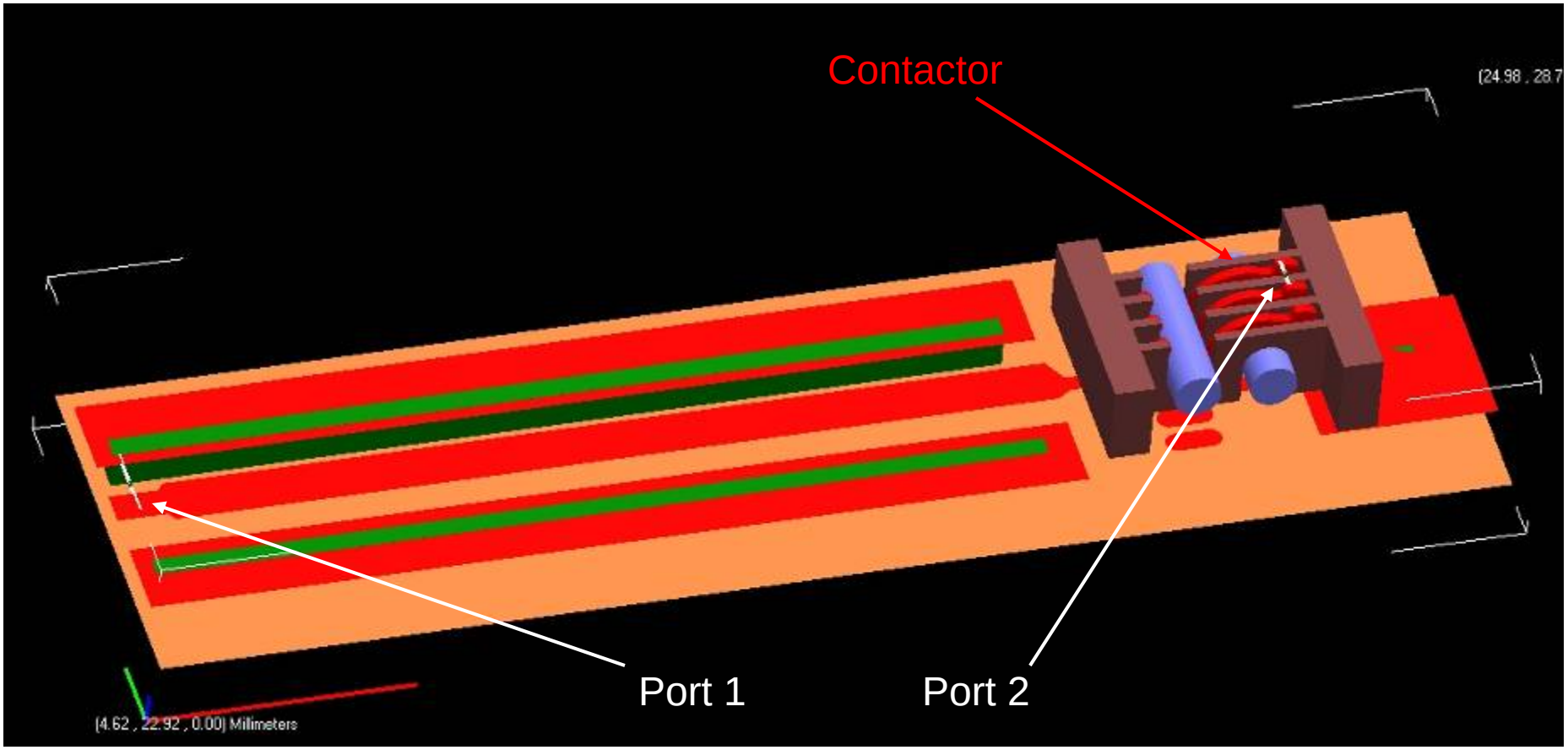
## Problem solved

EM simulations greatly reduce the cycle time of contactor designs. Either Finite Element Method (FEM) or Finite-difference time-domain (FDTD) field solvers can be used, however FDTD is preferable (since it is much faster and efficient for complex and larger structures) EM technology for contactors compared to FEM.

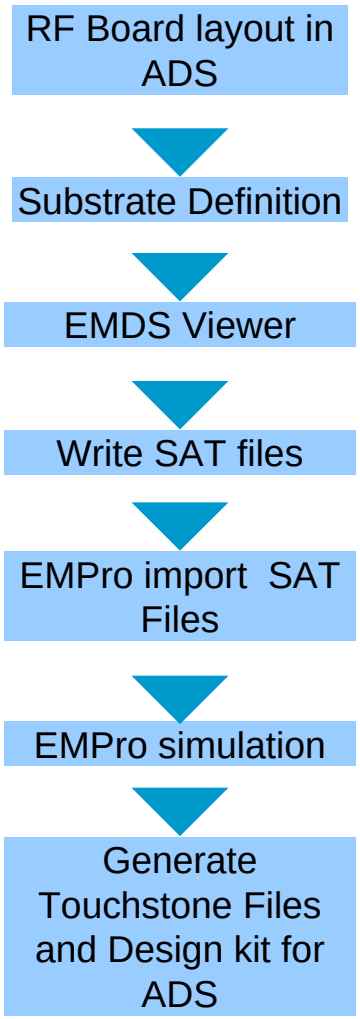
## Value delivered

Quickly simulate and evaluate contactors as well as the fixture board to include all 3D effects, to give you an understanding of the impact of the contactors to the overall test performance.

# Board + Contactor + Socket Drawing in EMPro



# Suggested Design Flow and Methodology for Contactor Designs




Simulate RF board only in EMPro

Simulate RF contactor only with EMPro

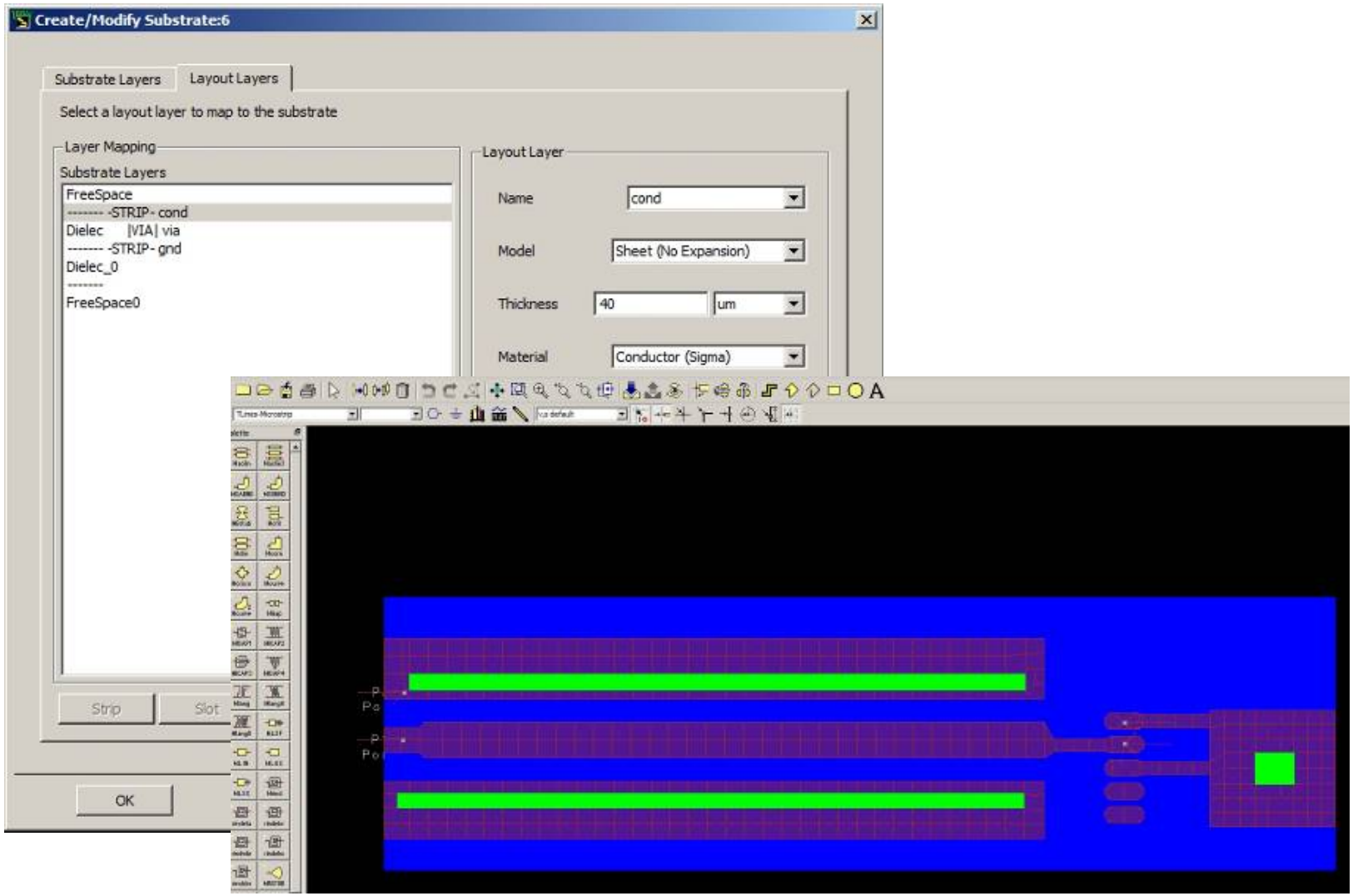
Simulate RF board + contactor with EMPro

Compare results

Decide to create 3D component model based on S-parameter files

Generate 3D component library or continue analysis with EMPro

# Substrate Definition in ADS Layout



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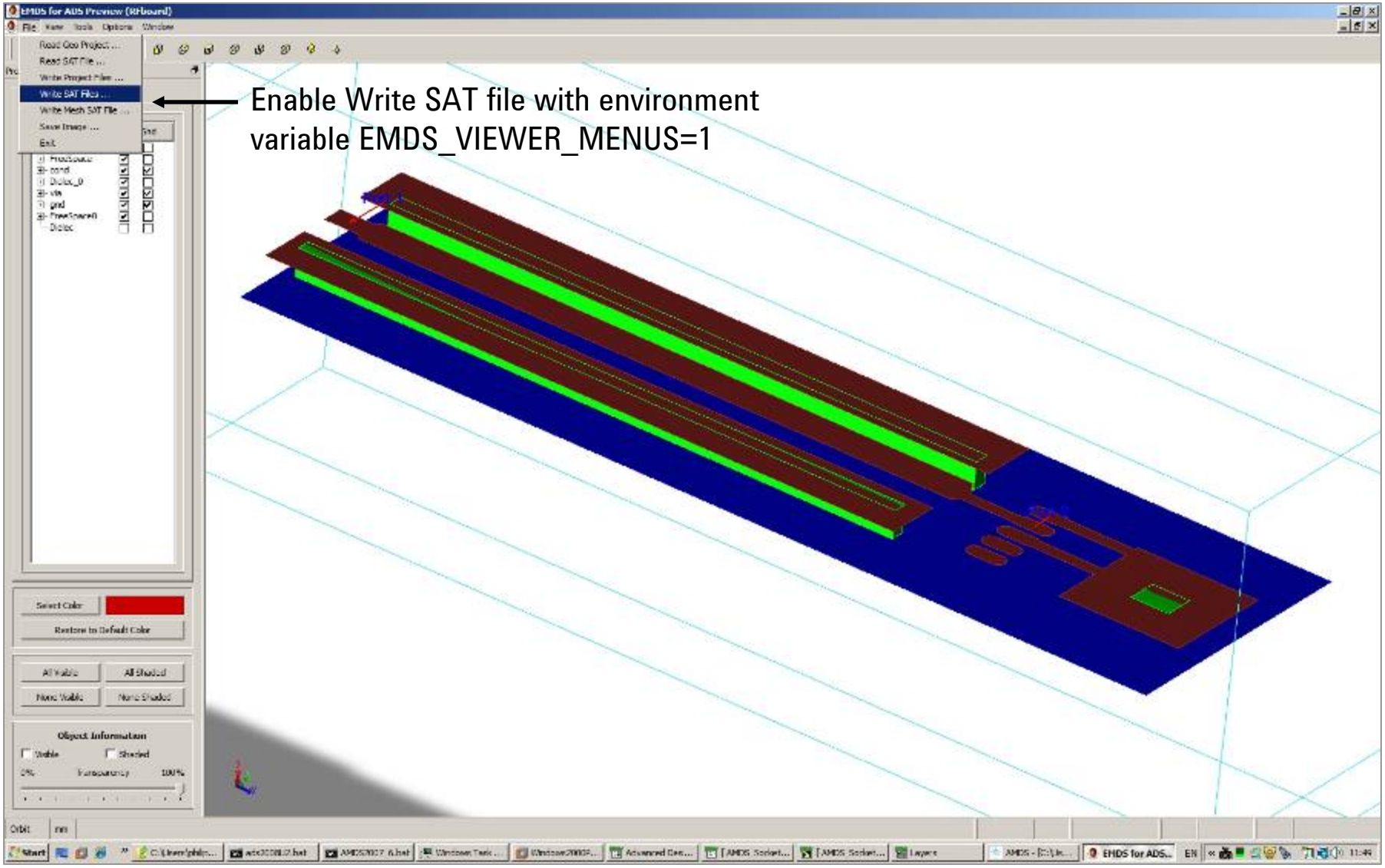
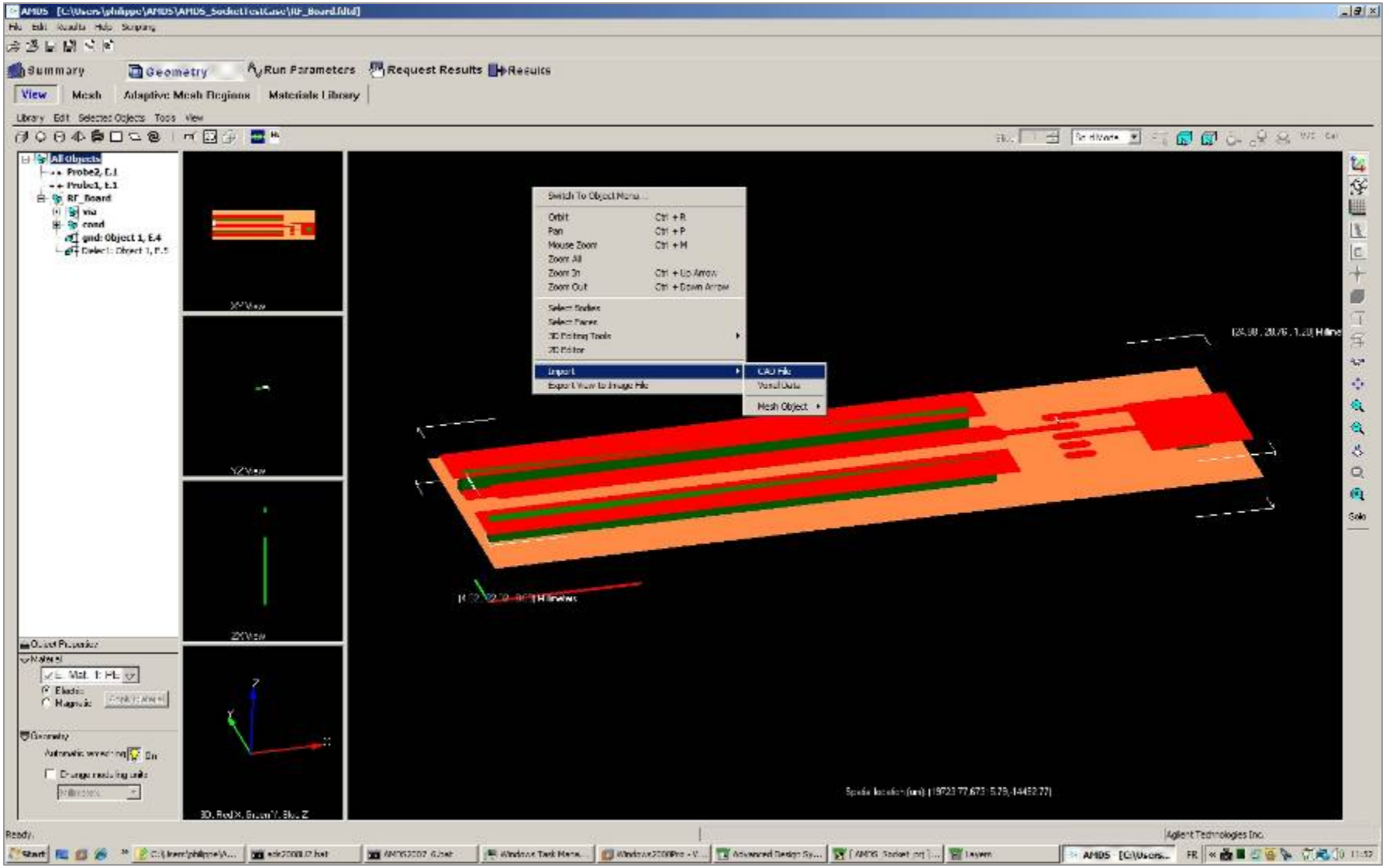
# EMDS Viewer – Write SAT files



# Import SAT file to EMPro



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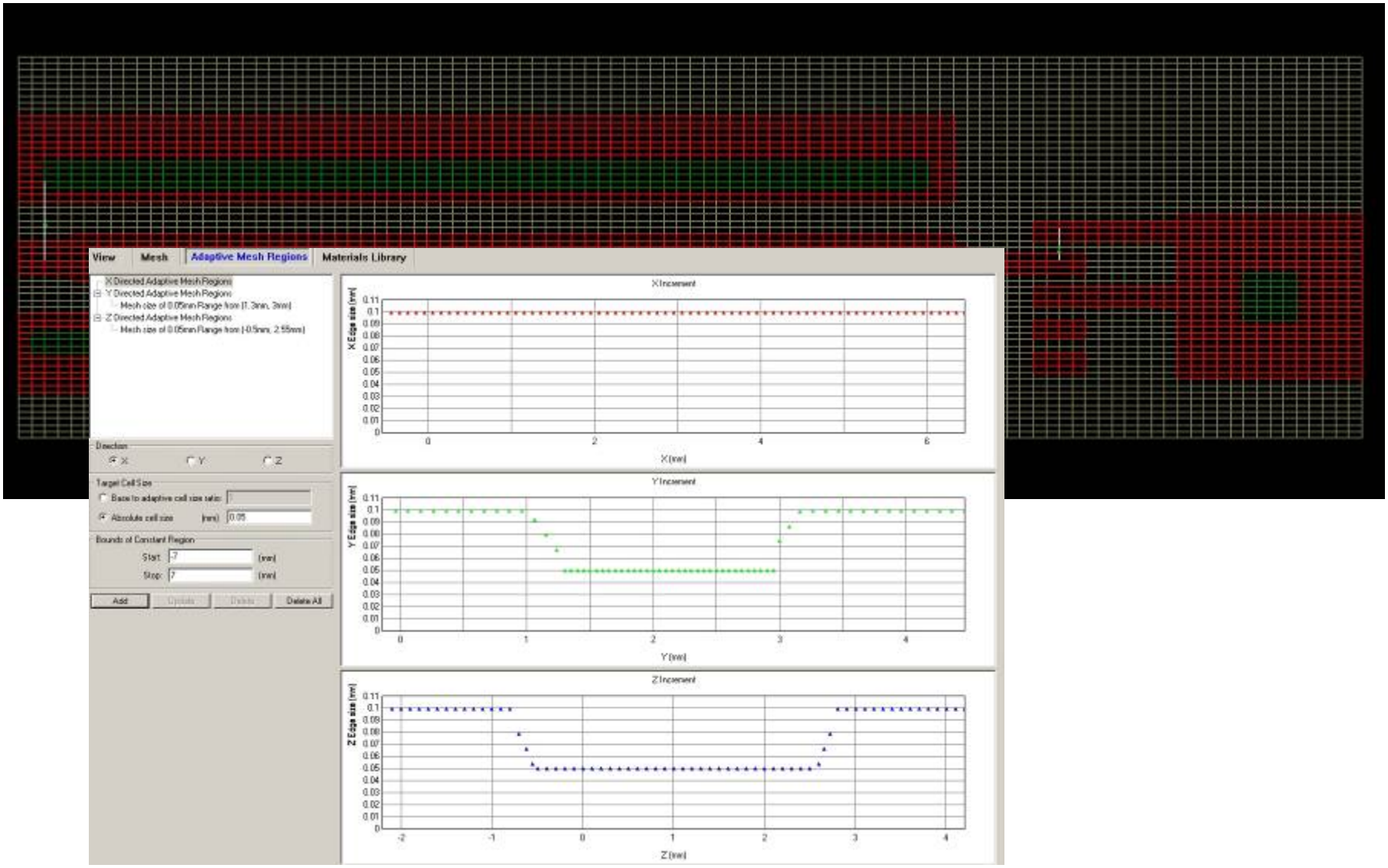
# EMPro Meshing with different X, Y, Z cells size



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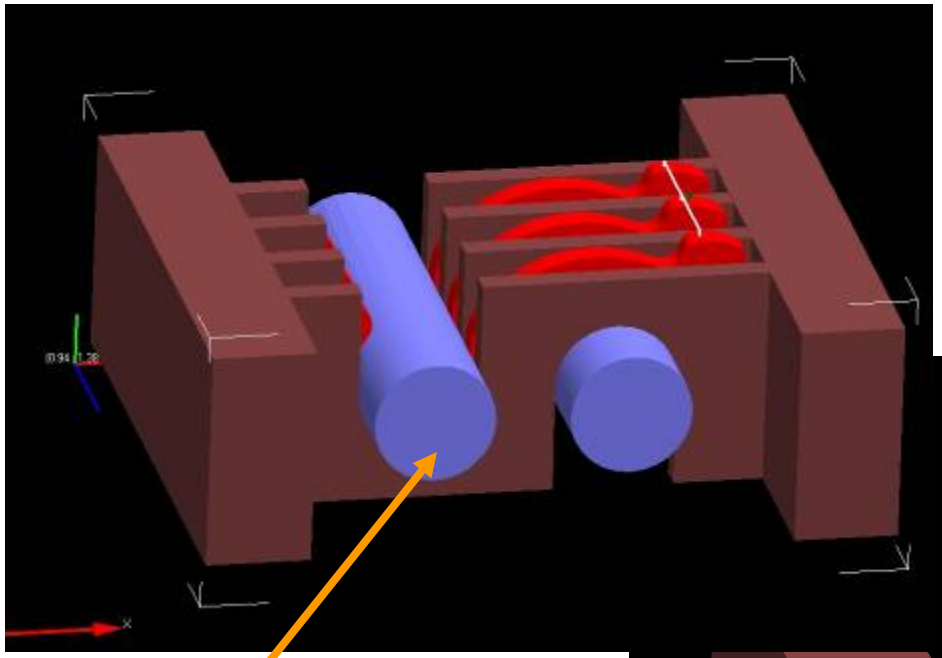
# RF Contactor and Socket in EMPro

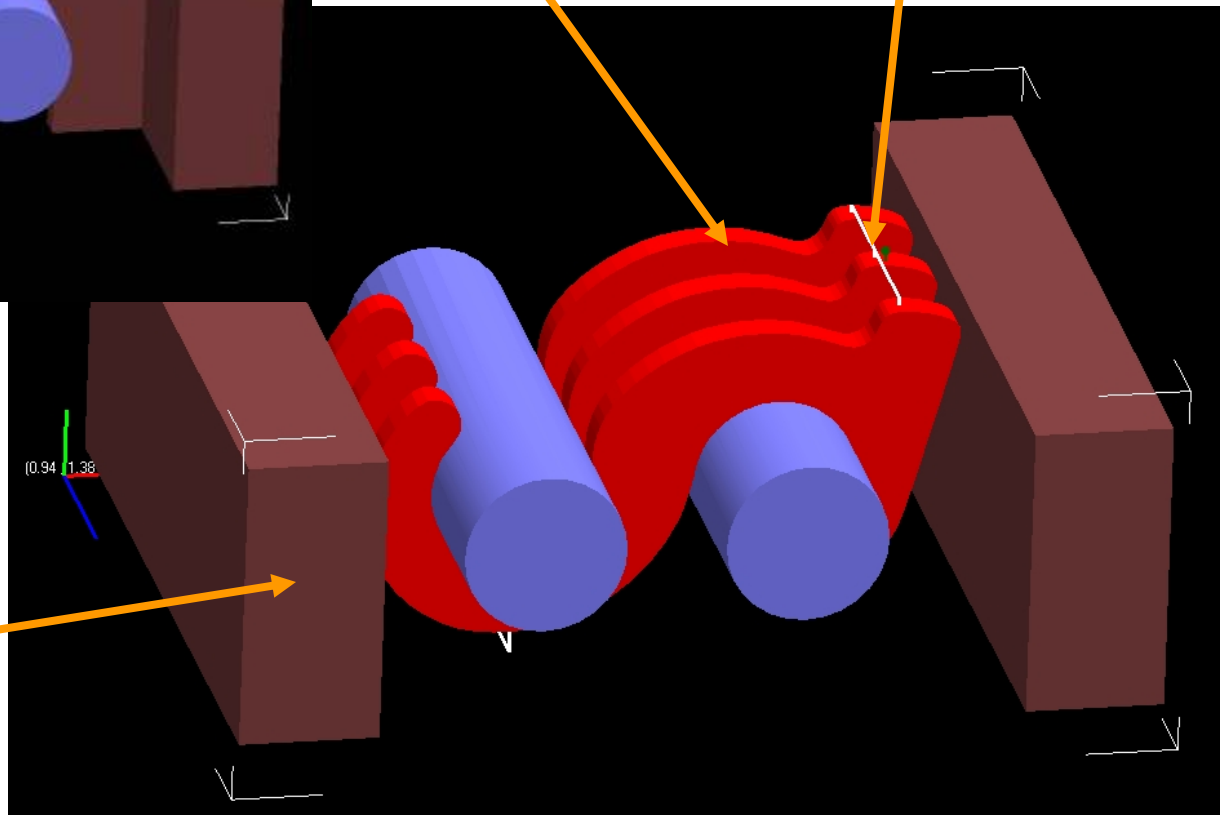


3D drawing in EMPro

Contactor

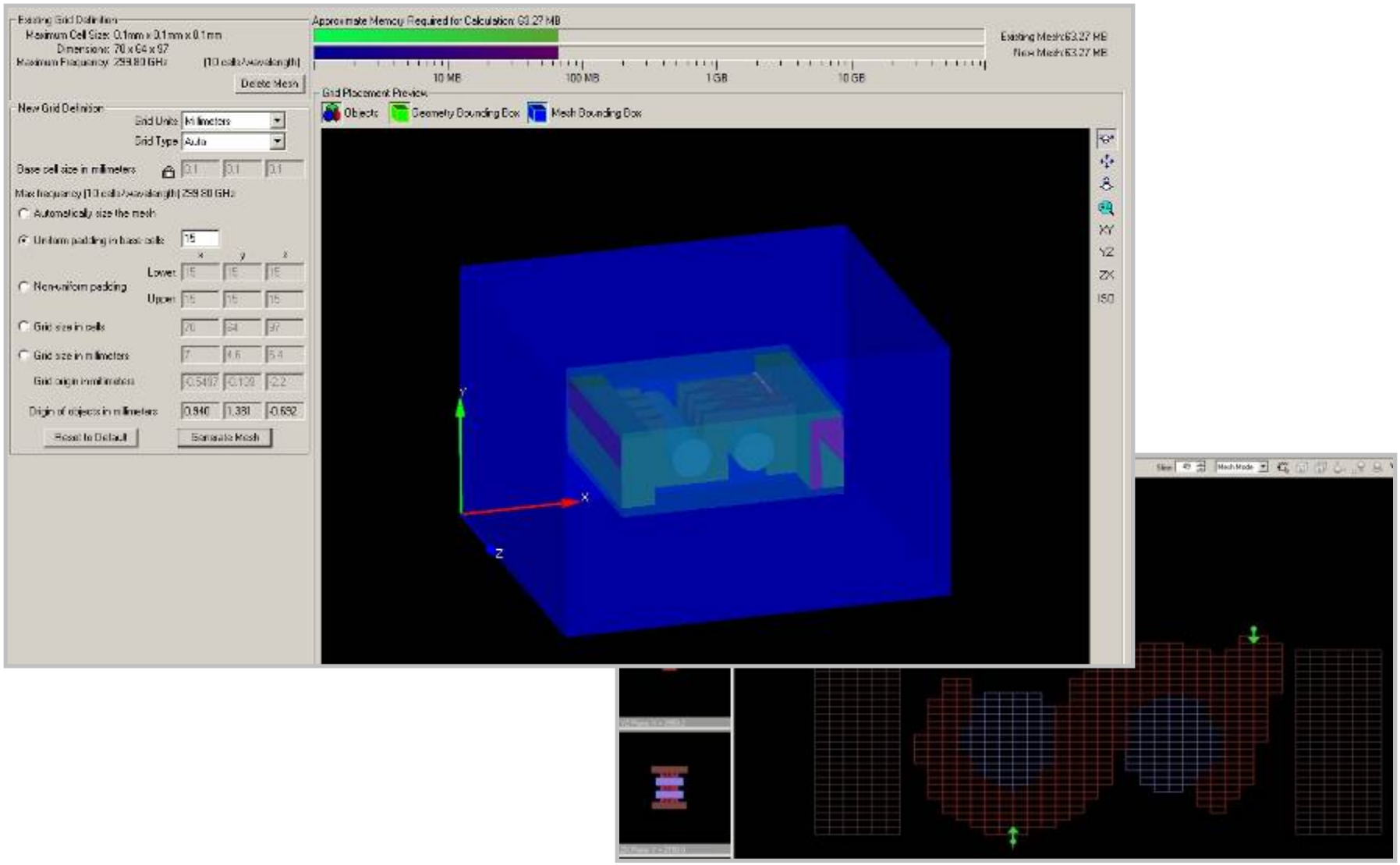
Port

Elastomer



Housing material

# EMPro RF Contactor Meshing



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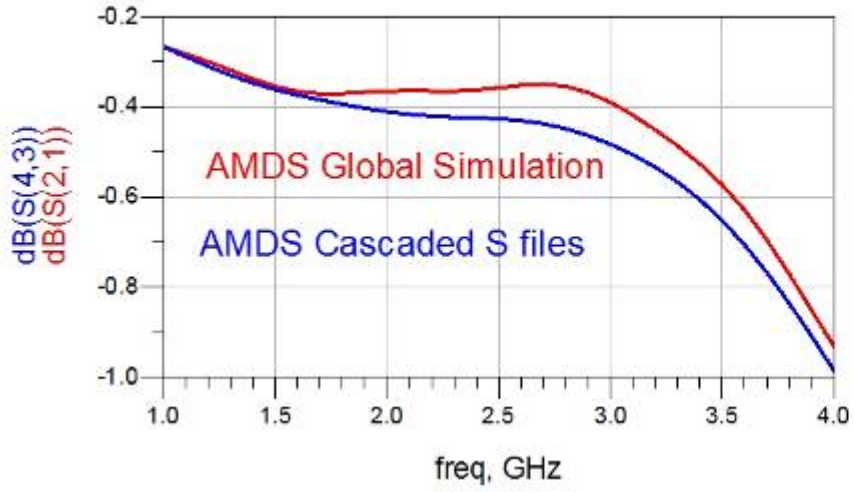
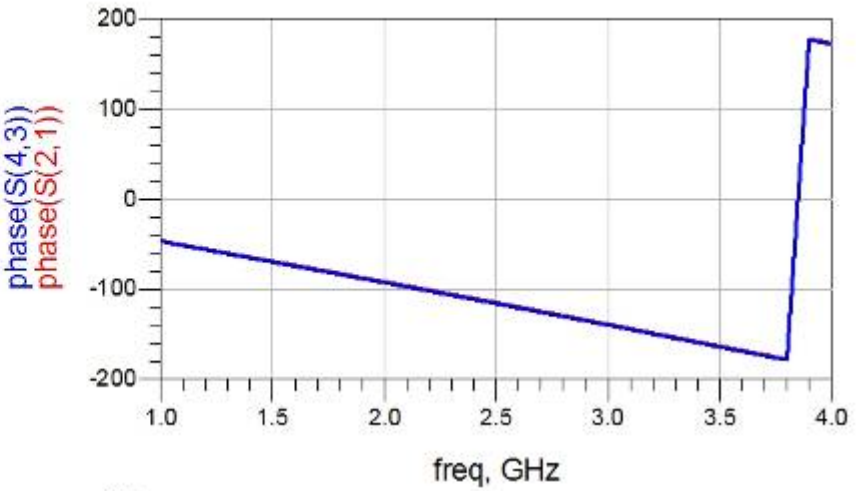
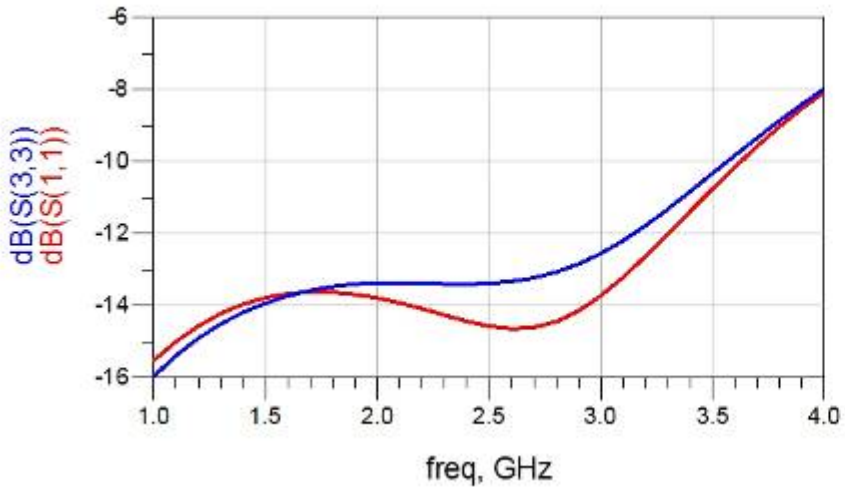
# Compare Results in ADS

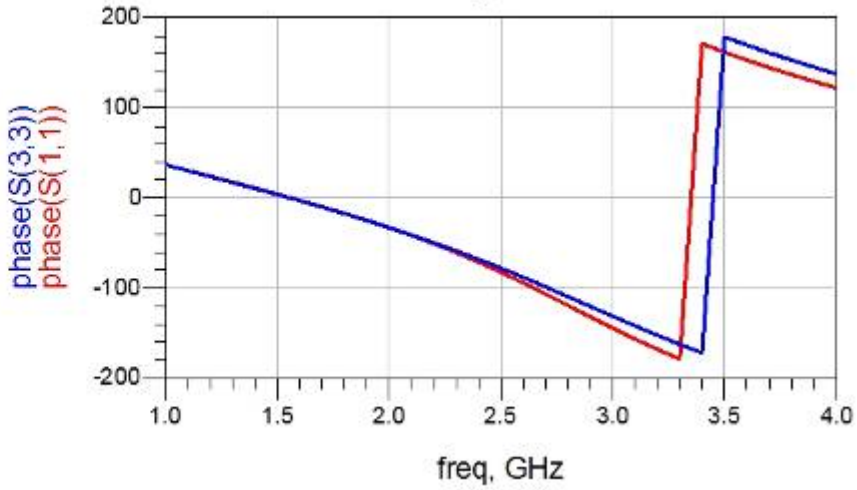
Red: Full EMPro simulation

Blue: Cascaded S-para simulation in ADS

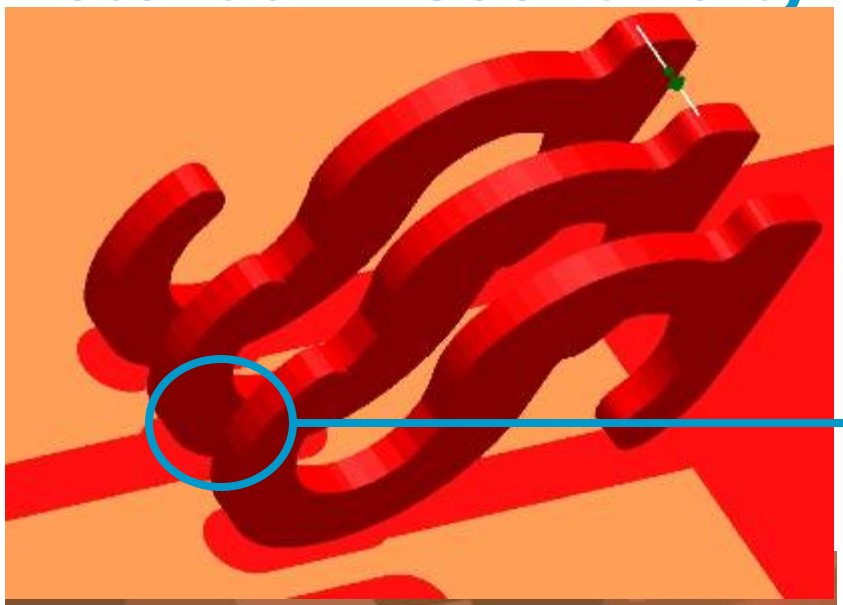


# Potential Discontinuity Effects



Trace and contactor width are different.

The housing material of socket in contact with the microstrip trace may affect the line charateristics such as impedance.

# EM Insights Series

## Episode #4: Contactor Design Summary

EMPro (FDTD EM Field Solver) provides the easiest and quickest way to evaluate and validate RF contactor designs so that test engineers can quickly analyze the impact of the contactors to the overall test performance, consequently improve the production yield.

## Interested in learning more about this application?

- Request an evaluation copy of EMPro

  http://www.agilent.com/find/eesof-empro-evaluation
- Request a demo of EMPro

  http://www.agilent.com/find/eesof-contact

www.agilent.com

**For more information about Agilent EEsof EDA, visit:**

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www.agilent.com/find/contactus

Product specifications and descriptions in this document subject to change without notice.


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