



Best in Filter Designs

Application Note ANAWR103 (v.2)
Miniaturized Hairpin Filter Design Using
Nuhertz Filter Synthesis Software

www.nuhertz.com

www.awrcorp.com



Nuhertz Filter Design Software

- Generates filter layout geometries from user- entered design requirements
- Many different filter types are possible
- Miniaturized hairpin design used as an example
- Generates AXIEM[®] EM simulation project directly
- Easy to use graphical user interface (GUI)
- Runs on Windows PCs

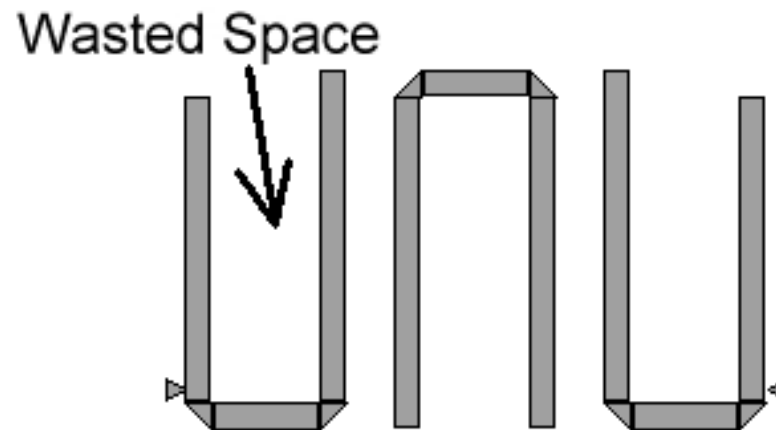


Tuning and Optimizing

- Synthesized planar filters generally require tuning and/or optimizing to maximize performance
- Tuning is achieved by repeat manual edits and AXIEM simulations
- Optimizations are performed with AWR Direct AXIEM Extraction optimizations, or highly efficient Axiem automated port tuning

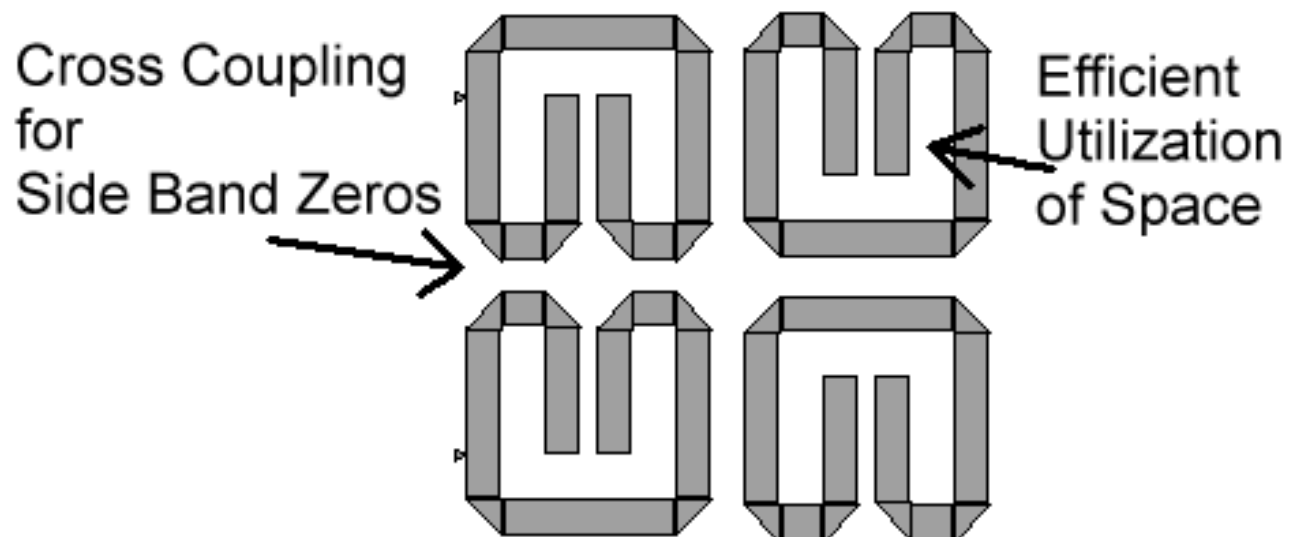
Goal for Miniaturizing the Hairpin

- Traditional hairpin designs are inefficient in space utilization
- Traditional hairpin designs are all-pole, permitting excessive pass band spread



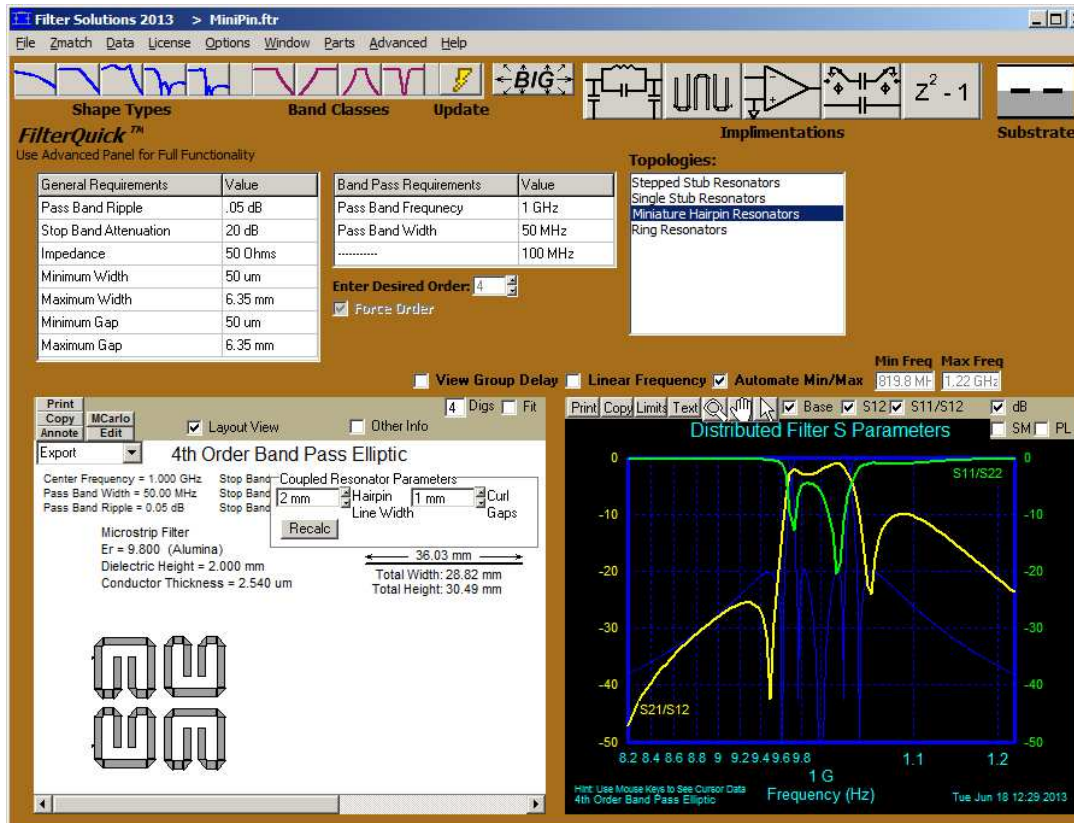
Miniaturized Hairpin Design With Nuhertz

- Efficient use of space provided by folding over hairpin ends
- Cross coupling produces side band zeros for narrow passbands



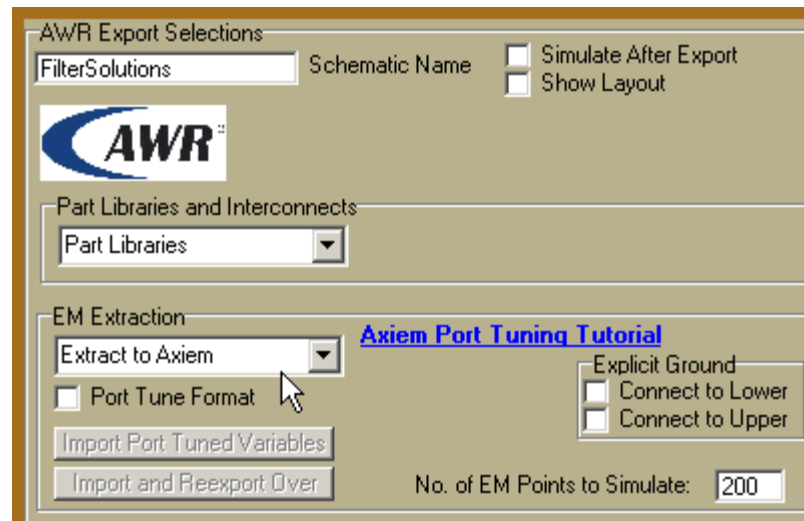
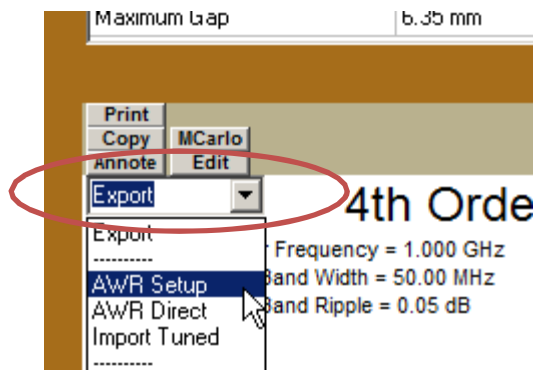
Miniaturized Hairpin Issues

Closed-form circuit level analyses of folded hairpin filters are generally poor because they don't capture coupling of the folded elements



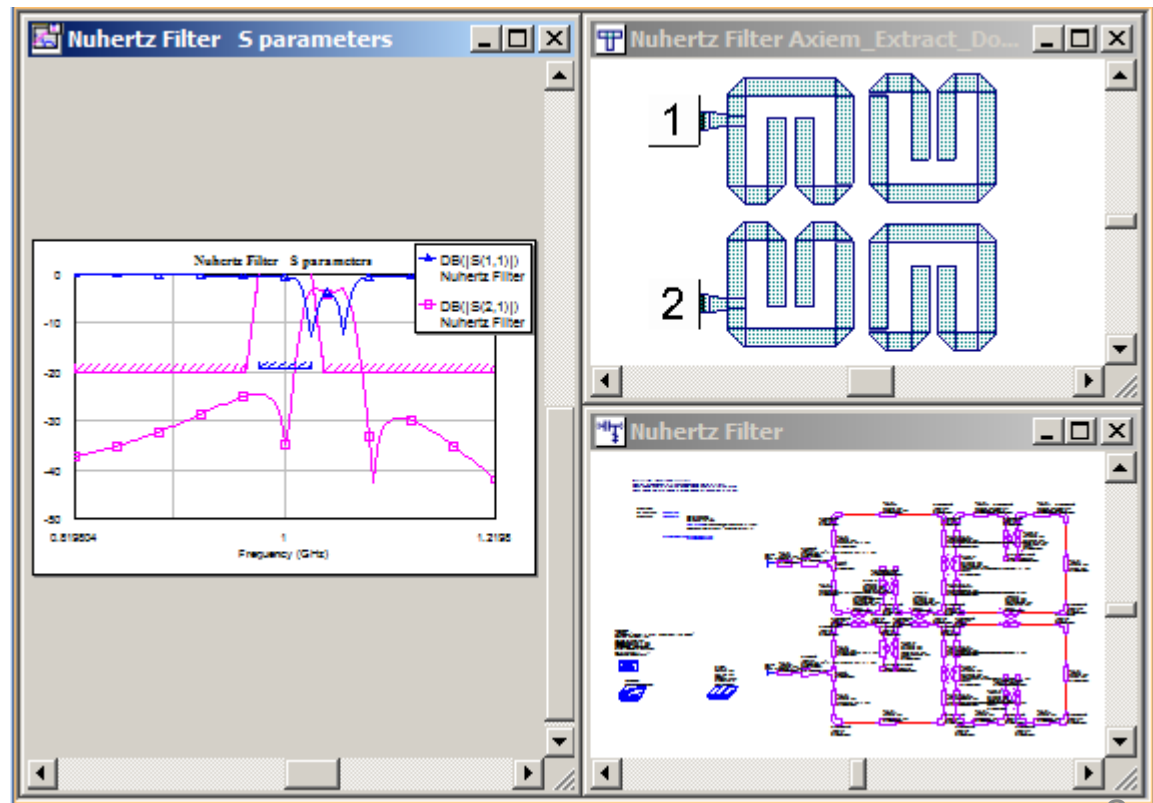
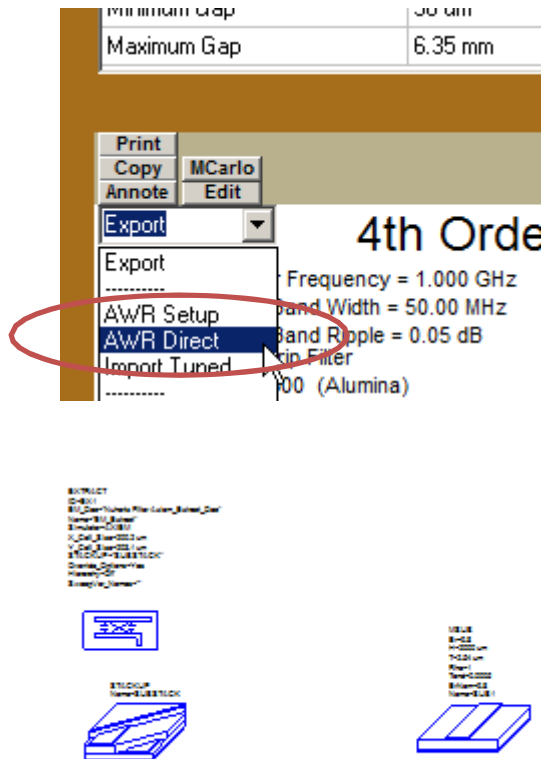
Manual EM Tuning With NI-AWR Export Control Panel

- Select, “Extract to Axiem”, desired “Points to Simulate” and other selections, and Export



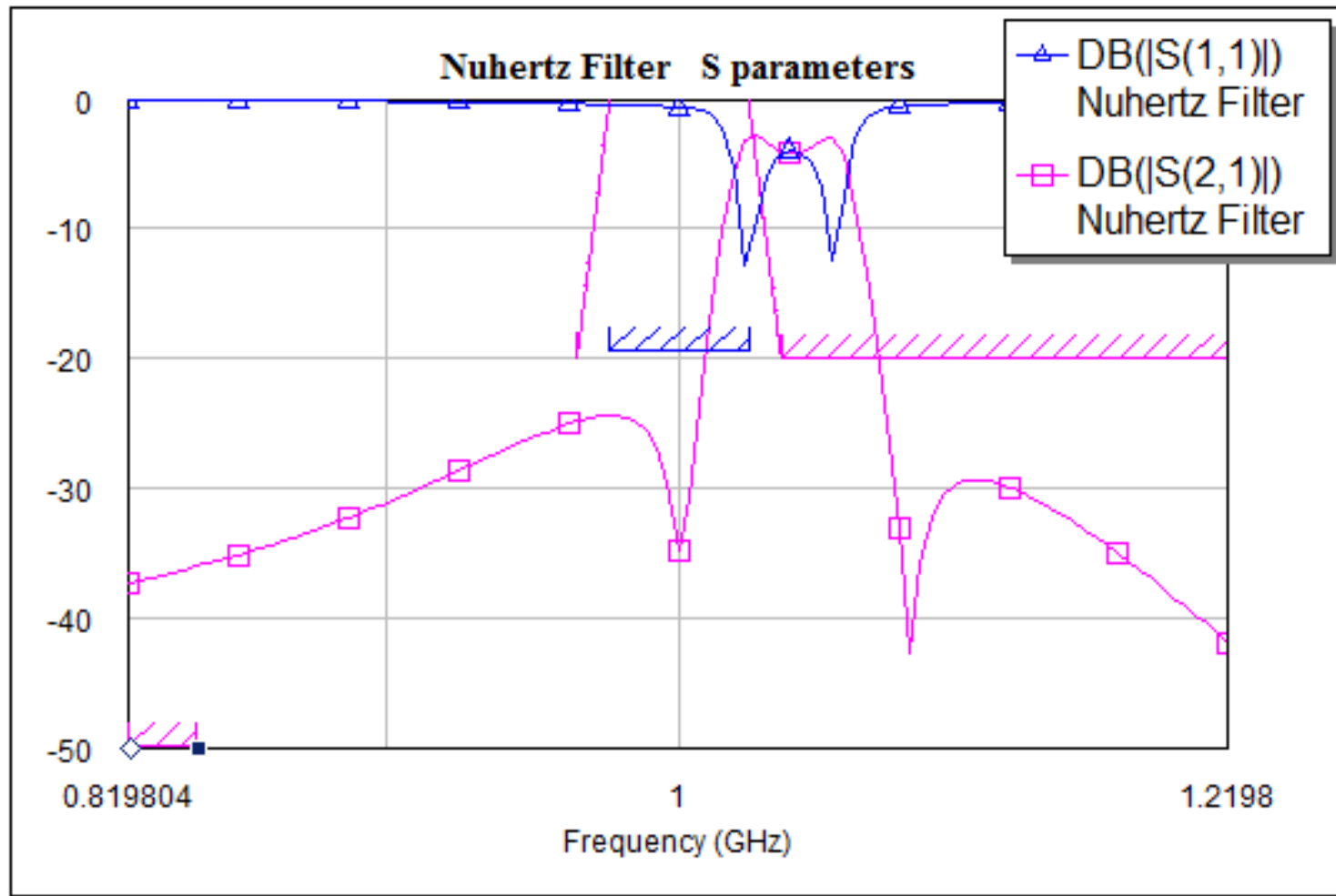
Export to AWR Using Saved Settings, with NI-AWR Direct

- Stackup and extract blocks are automatically set



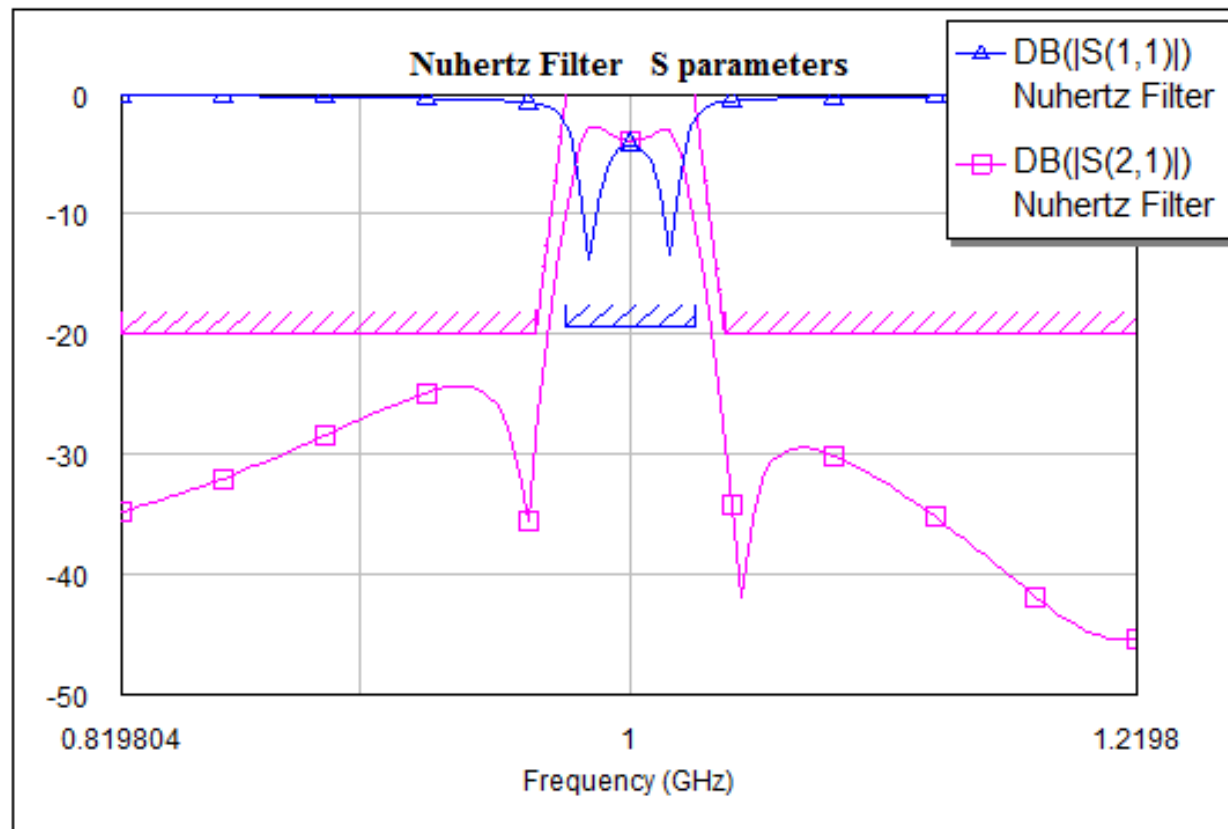


View and Measure Axiem EM Response



Pre-tune Center Frequency in AWR (Option)

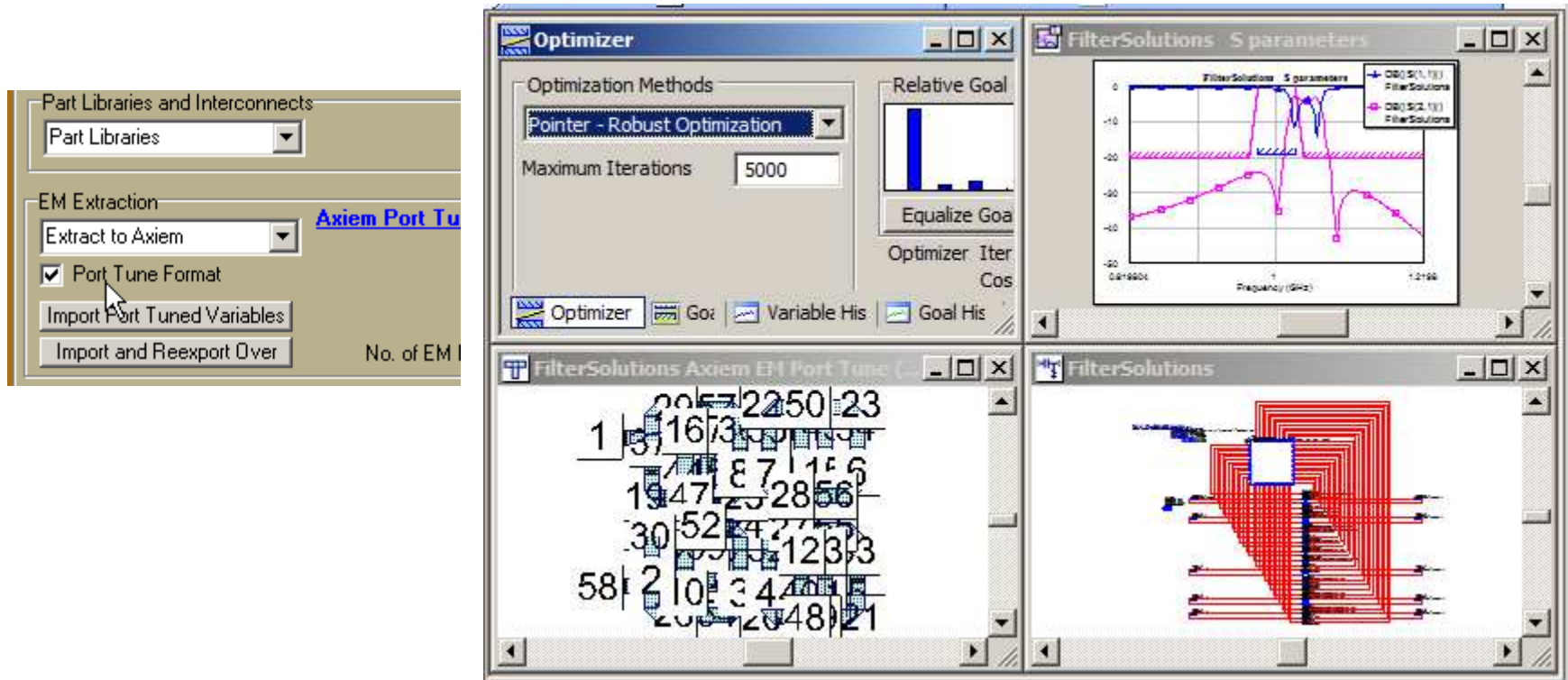
- May aid the extraction optimization process





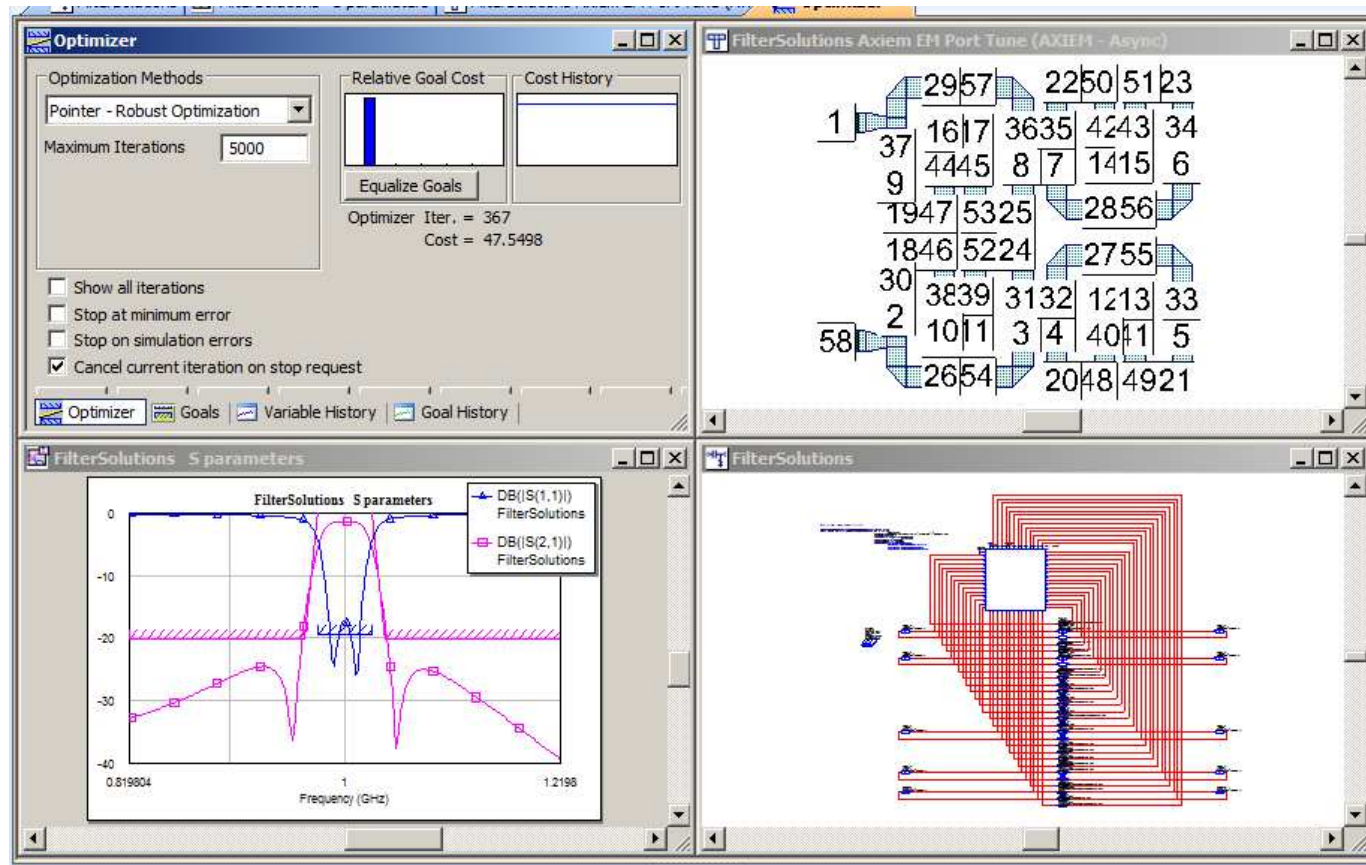
Optimize With Highly Efficient Axitem EM Port Tuning

- Accurate EM Optimization obtainable in **five minutes**, or less



Port Tuning Optimization

- Optimize and Re-export as needed.
- Accurate results obtainable after one to two port tuning cycles



Final Axiem Design

