Best in Filter Designs

Application Note ANAWR103

Fast and Easy

Miniaturized Hairpin Filter Design Using Nuhertz® FilterSolutions® Synthesis Software and AWR ® Axiem® EM

Port tuning was origianlly developed between Nuhertz and Sonnet Software with a thnaks to Sonnet Software's Dr. Jim Rautio

Nuhertz/AWR

www.nuhertz.com www.awrcorp.com

FilterSolutions Synthesis Software

- **Quick and Easy to Use for Novices and Experts, Alike**

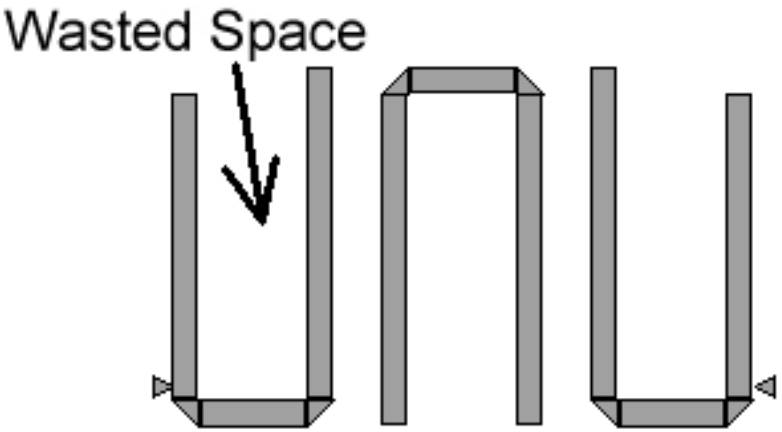
- Generates filter layout geometries from user- entered design requirements
- Many different filter topologies are possible
- Generates AXIEM EM simulation projects directly
- **Easy to use** graphical user interface (GUI)
- Runs on Windows PCs

Tuning and Optimizing

- Synthesized planar filters generally require tuning or optimizing to maximize performance
- Tuning is achieved by repeated manual edits
- Optimizations may be performed with AWR direct AXIEM extraction optimizations
- *Faster optimizations obtainable with Axiem port tuning*

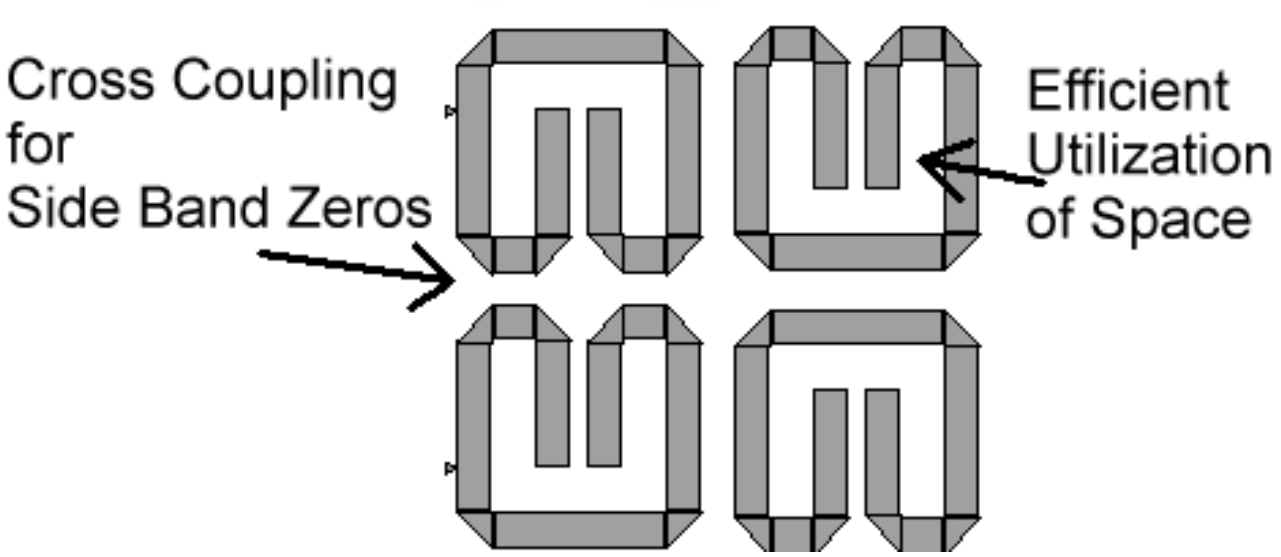
Goal for Miniaturizing the Hairpin

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



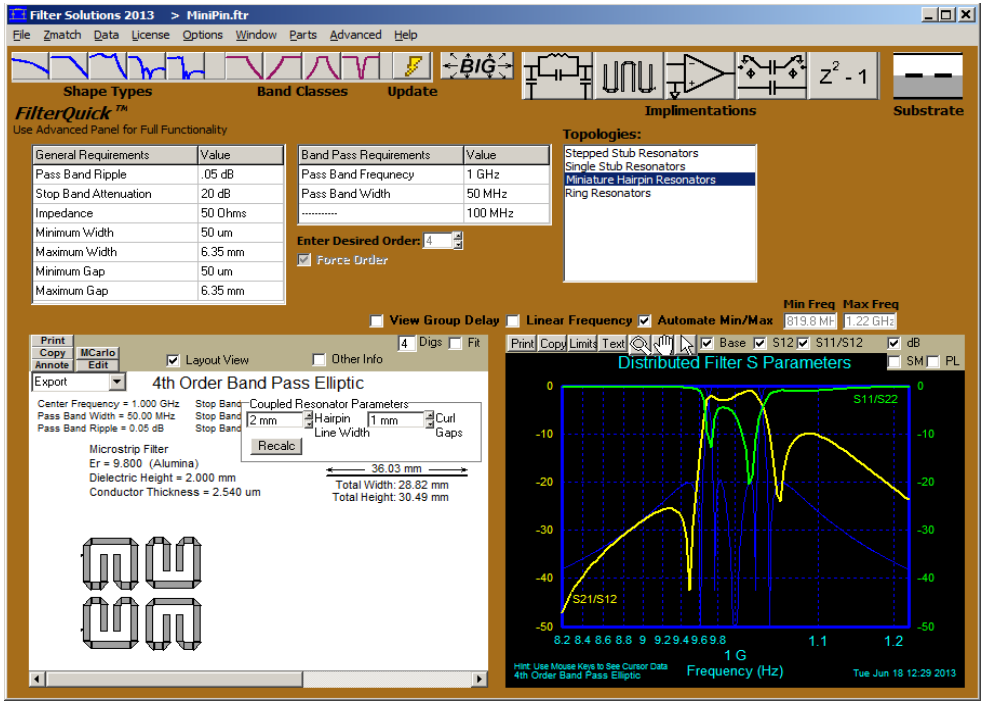
Miniaturized Hairpin Design With FilterSolutions

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



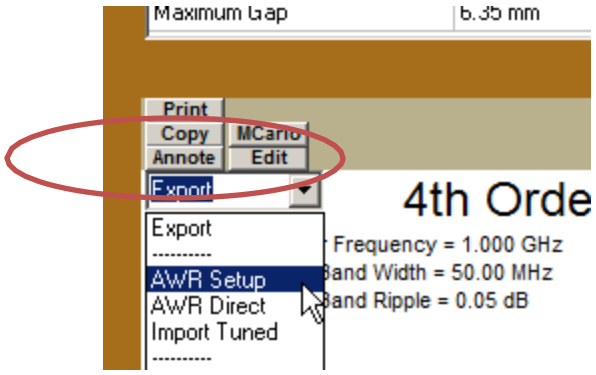
Miniaturized Hairpin Issues

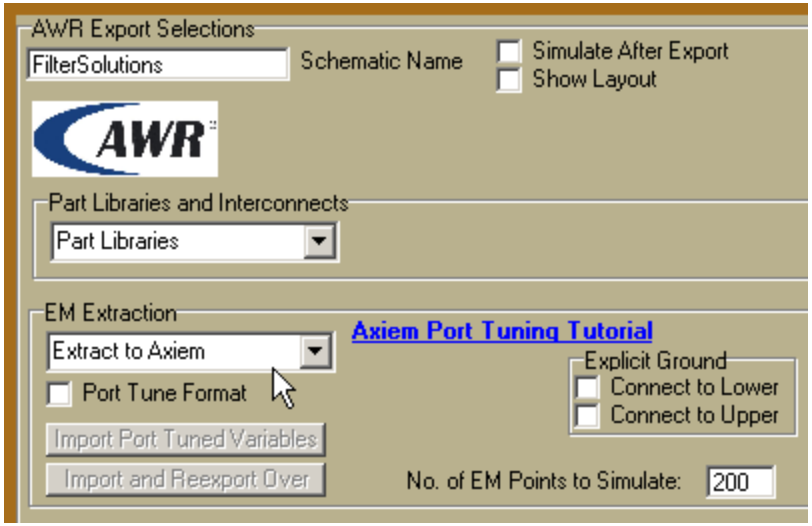
Closed-form circuit level analyses of folded hairpin filters are generally poor because they do not capture coupling of the folded elements



Axiem Extraction Setup With AWR Export Control Panel

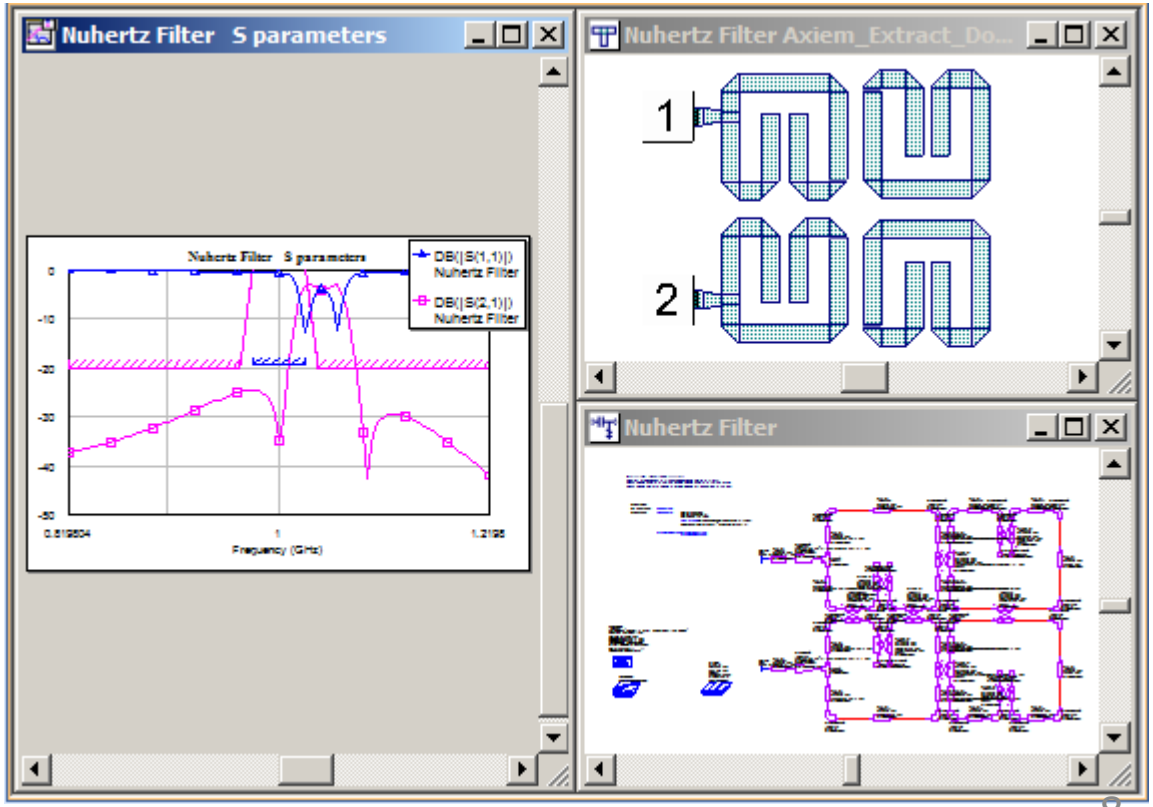
- Select, “Extract to Axiem”, desired “Points to Simulate” and other selections, and Export





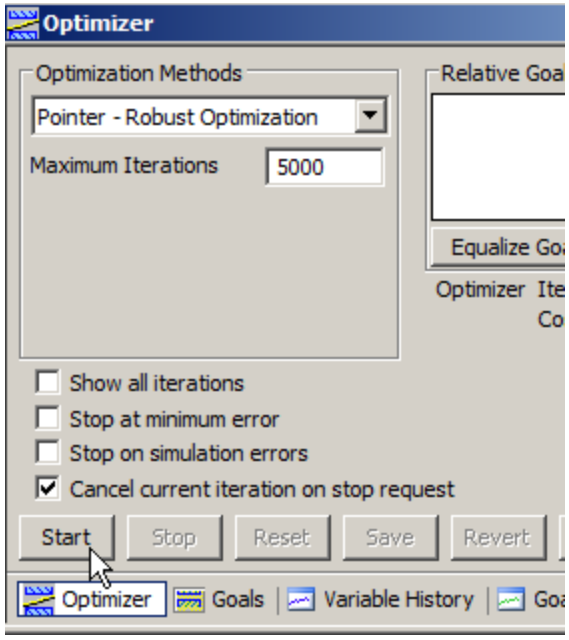
Export to AWR Using Saved Settings with AWR Direct

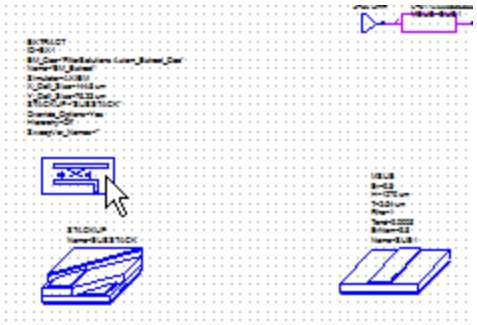
- Stackup and extract blocks are automatically set



Extraction Optimizations

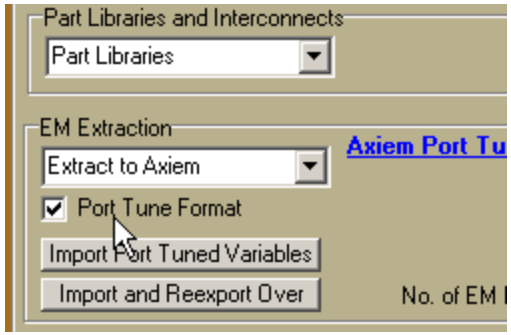
- Easy to Use Microwave Office Optimization Selection with Extraction Block Enabled
- May Require Excessive Amount of Time

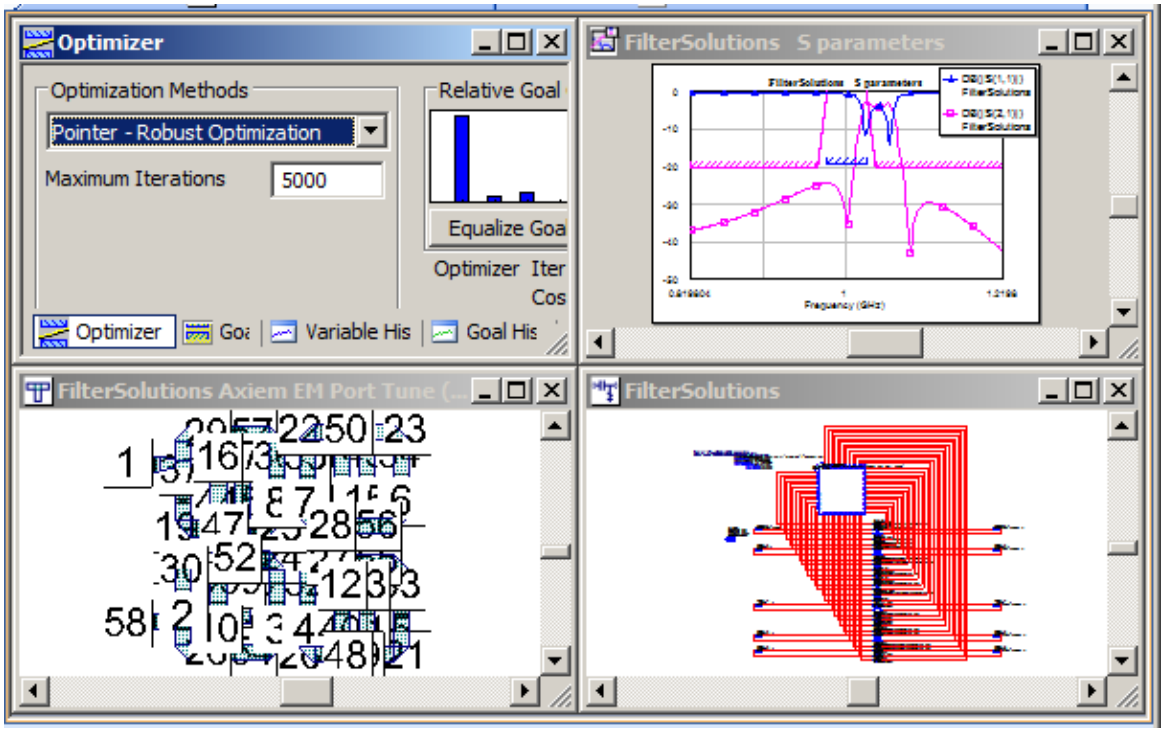




Optimize With Highly Efficient Axiem EM Port Tuning

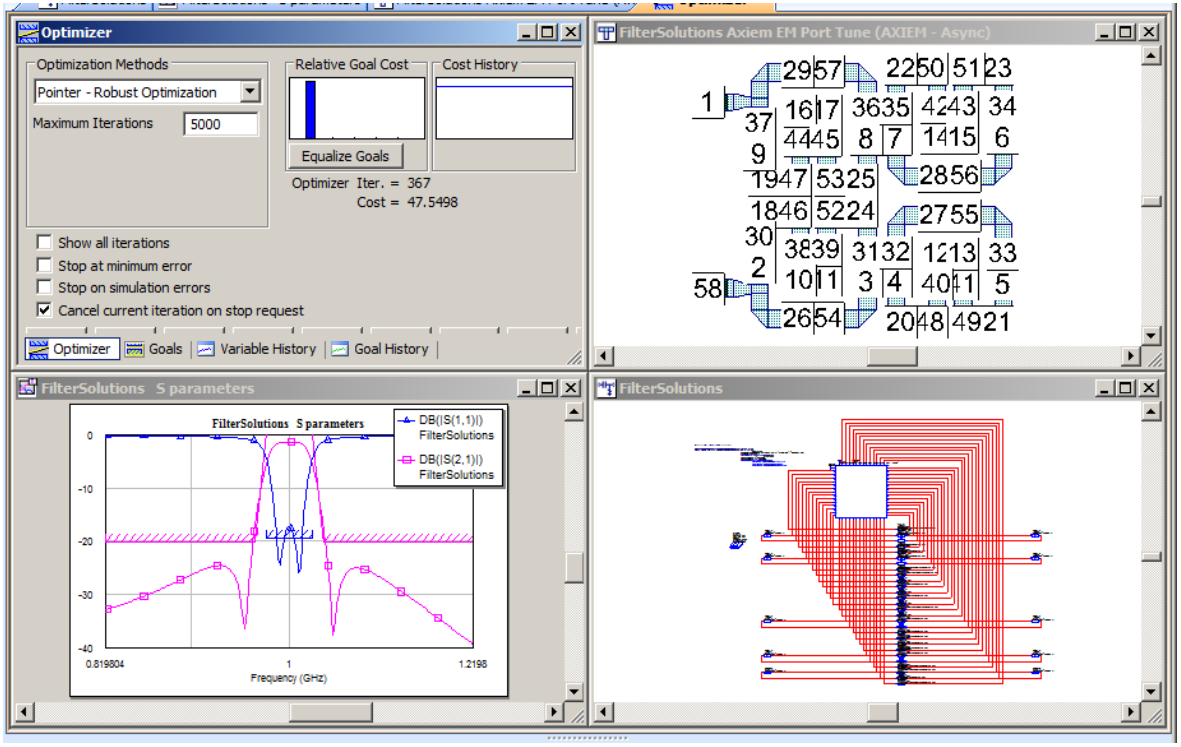
- Accurate EM Optimization Obtainable in **five minutes**, or less
- Single Mouse Click Required to Export in Port Tuning Format





Port Tuning Optimization

- Optimize and Re-export as Needed.
- Single Mouse Click to Import or Re-export With Tuned Variables
- Accurate Results Obtainable After One to Two Port Tuning Cycles
- Manufacturer Geometry Limits are Maintained and Enforced



Final Axiem Design