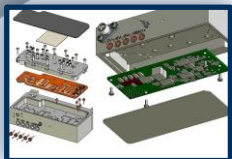
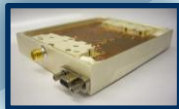
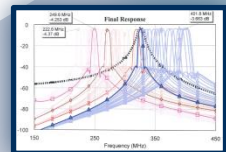
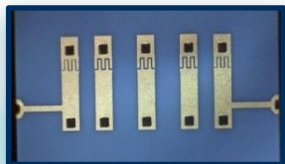
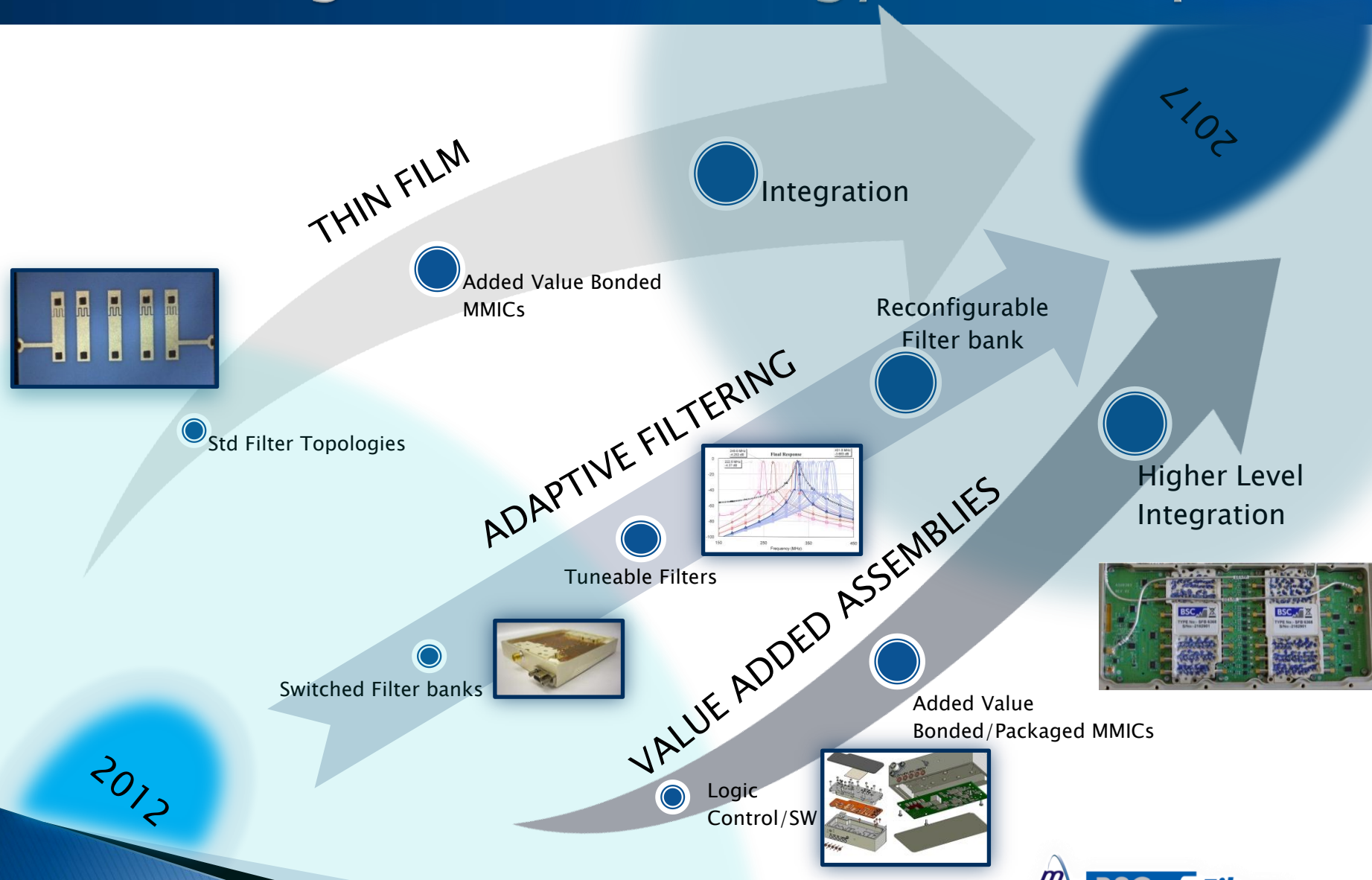


Miniature Ceramic Filters

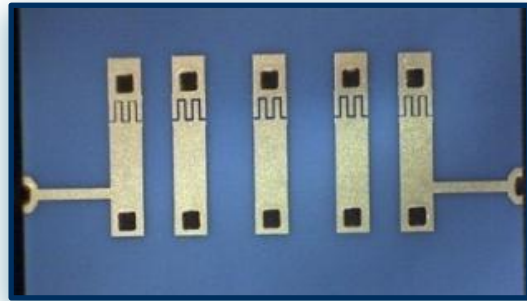
The design and manufacture of surface mount
miniaturized thin film filters

Gavin Ripley 3/2014

BSC Integrated Technology Road Map



BSC Thin Film Technology Road Map



Formal Launch
2014 Q2

Handling
and
Inspection
Processes

Labelling
& Lidding
Process

MMIC Switches
Amplifiers, Mixers
VWAs, etc

Single Layer
capacitors,
Varactors, etc

Higher Level
Integration

Simple Bonding
Capability

2014
Production
Readiness

2013
Concept Proving



2015+

2015

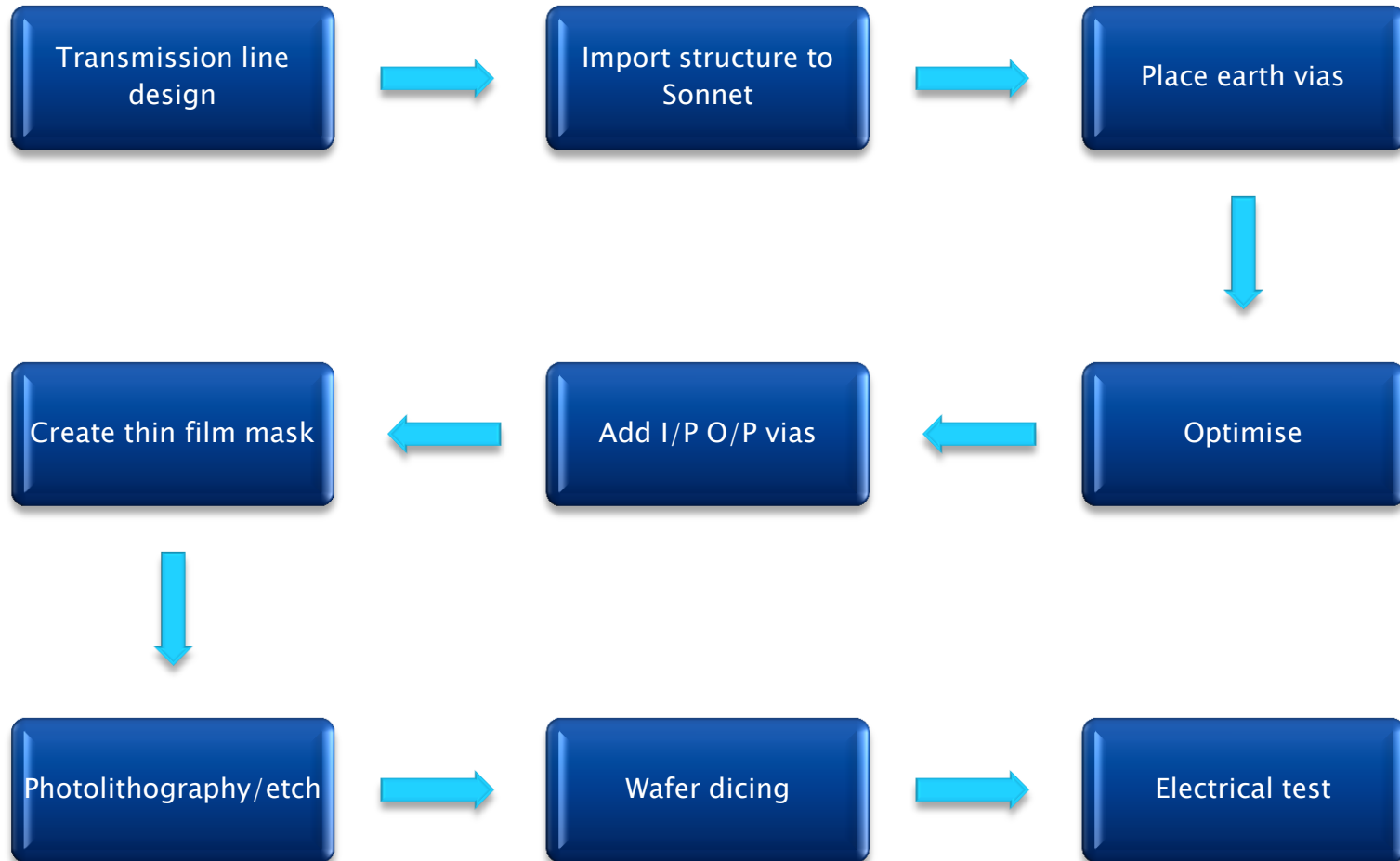
Test
Processes

Design
Rules

Cost
Models

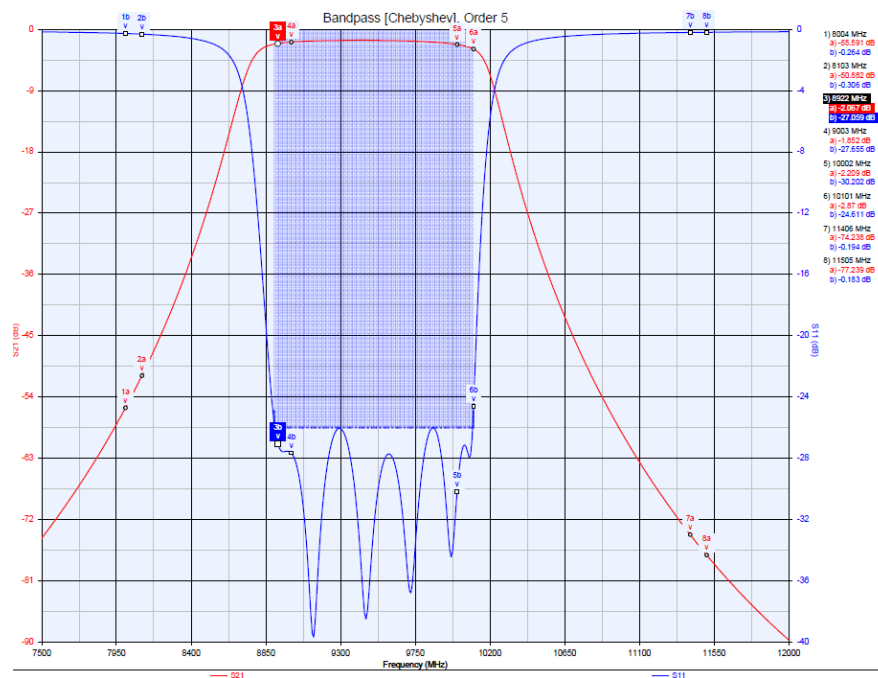
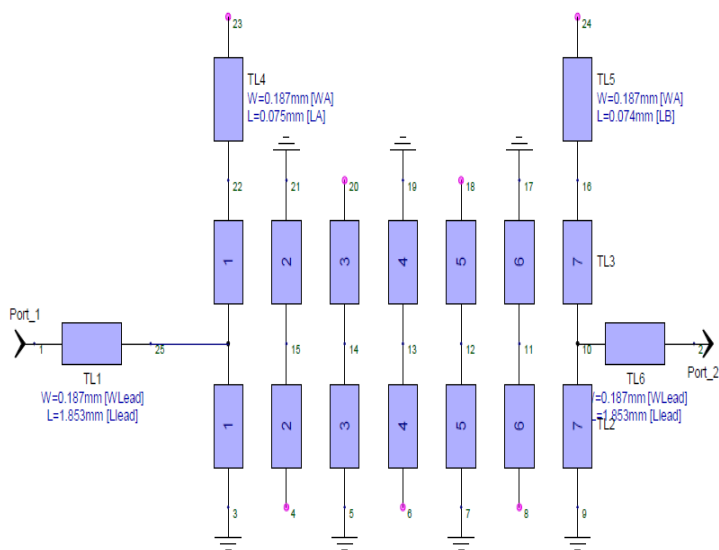
BSC Filters Thin Film Technology

Key stages in implementation of thin film filters



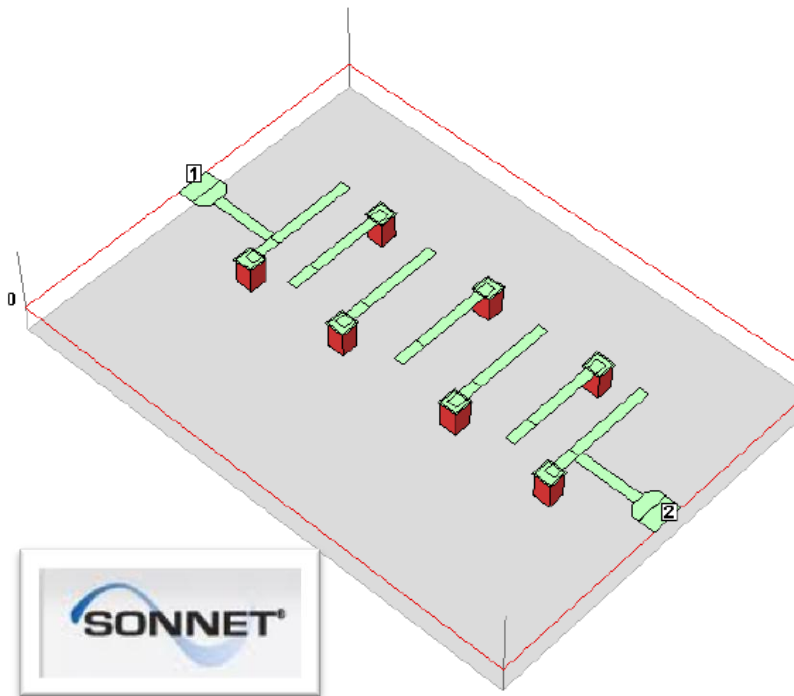
BSC Filters Thin Film Technology

- ▶ Preliminary design using M-filt (Genesys) transmission line prototypes



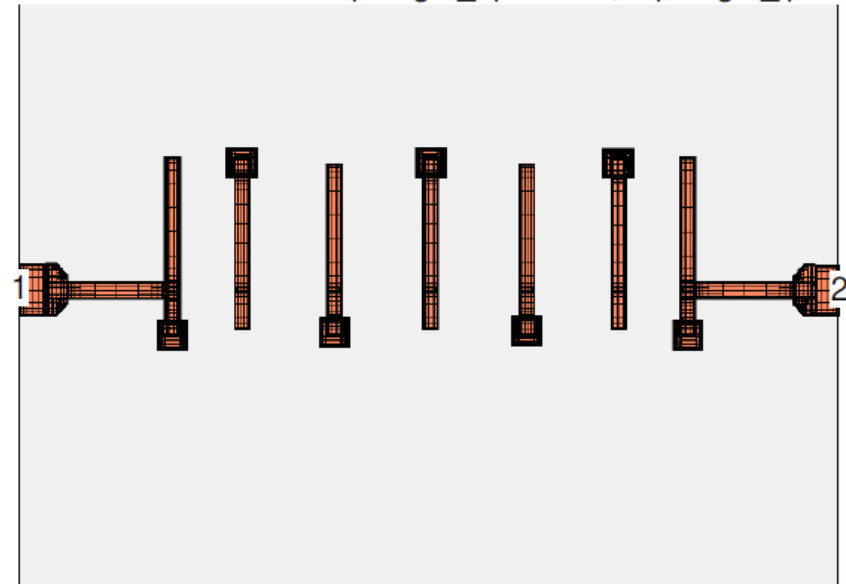
BSC Filters Thin Film Technology

- ▶ Importing structure in Sonnet using measured values of dielectric constant in x,y and z
- ▶ Placement of earth vias



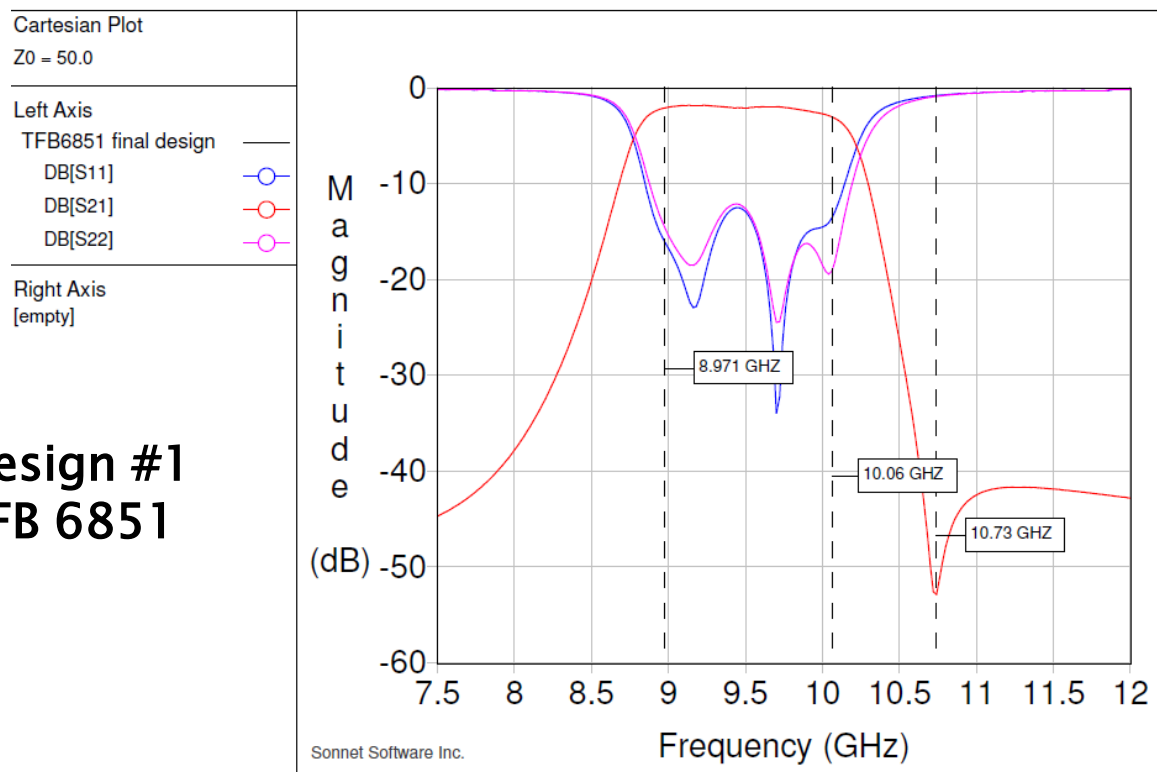
Design #1 TFB 6851

actions: 12627 of 13134 taplength_op=1.134, taplength_ip=1.134



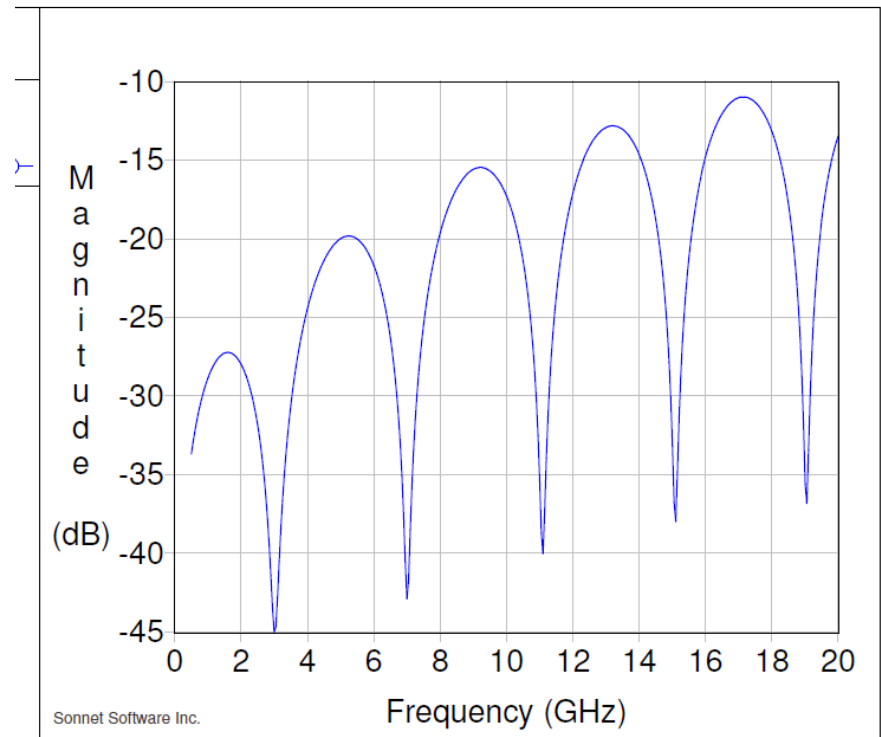
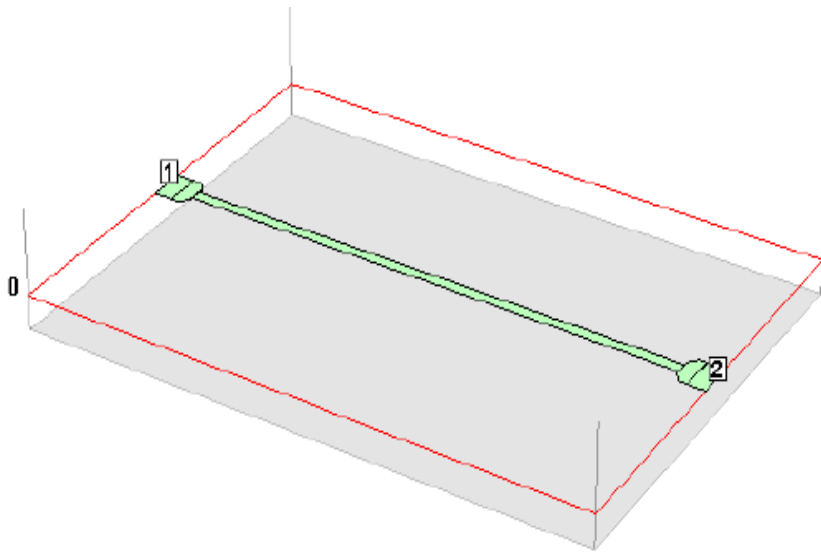
BSC Filters Thin Film Technology

- ▶ Optimisation including non adjacent couplings and Optimisation of I/P O/P vias



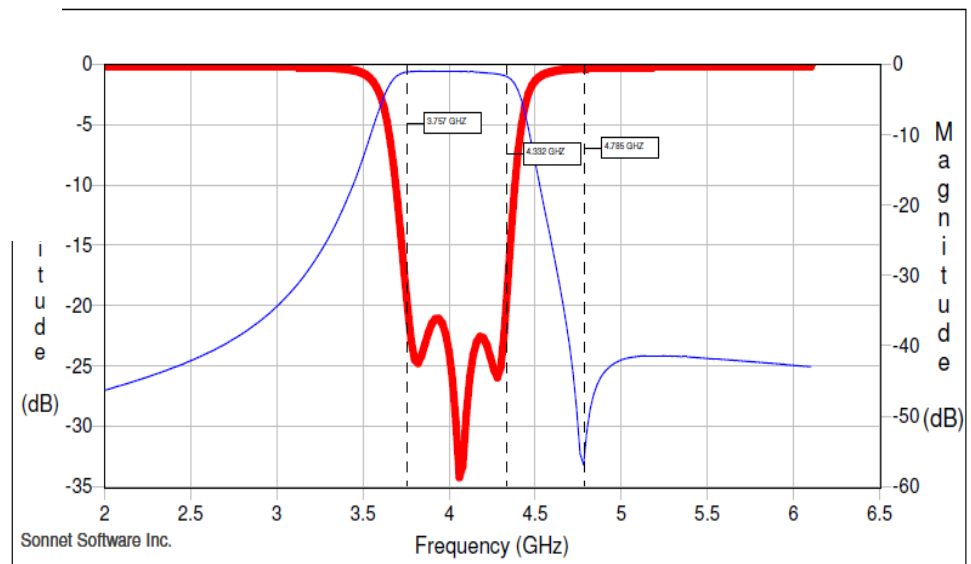
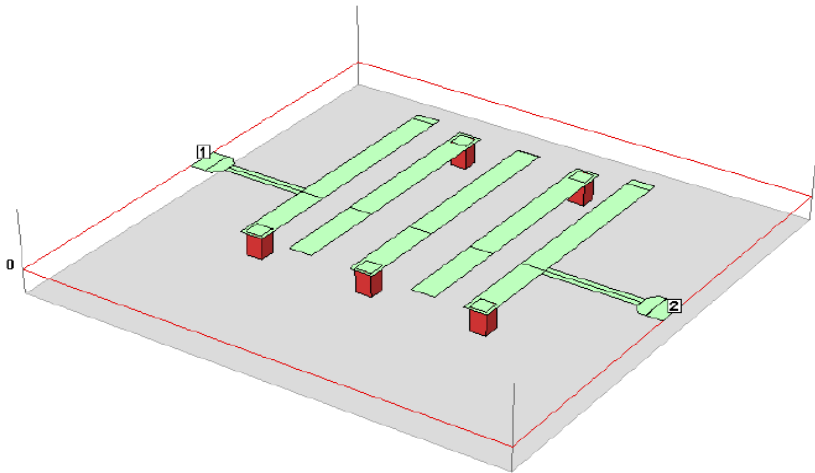
BSC Filters Thin Film Technology

- ▶ Simulated 50Ω line and edge vias



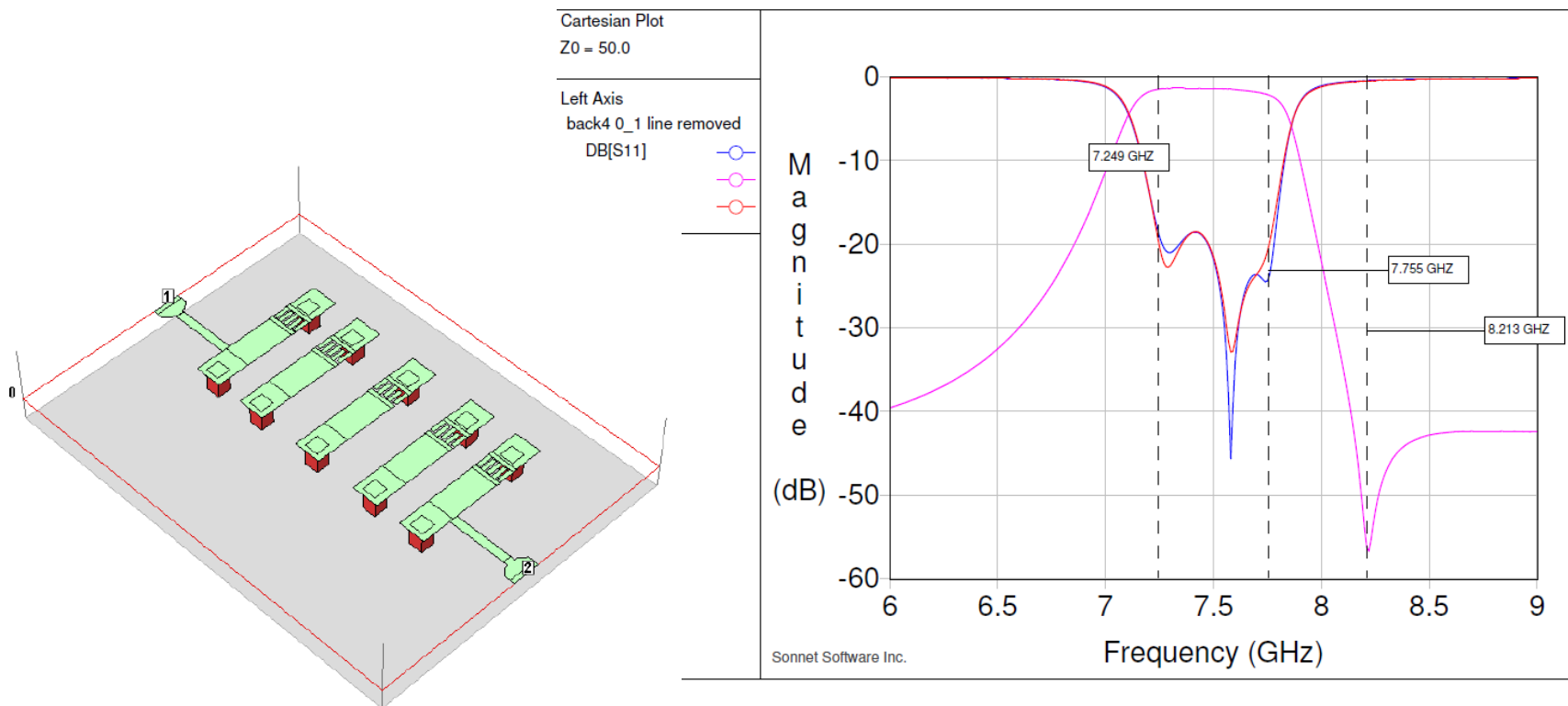
BSC Thin Film Technology

► Design #2 TFB 6853 (Prototype)



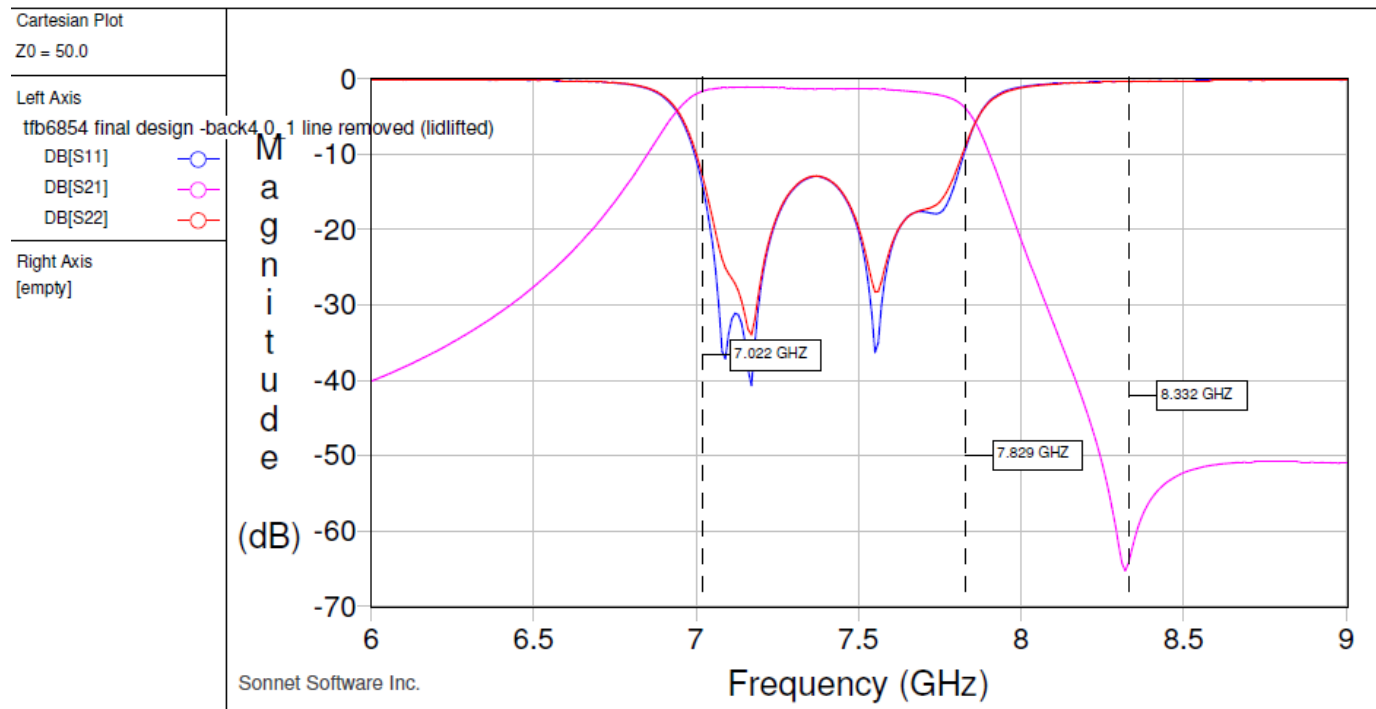
BSC Thin Film Technology

► Design #3 TFB6854 (Prototype)



BSC Thin Film Technology

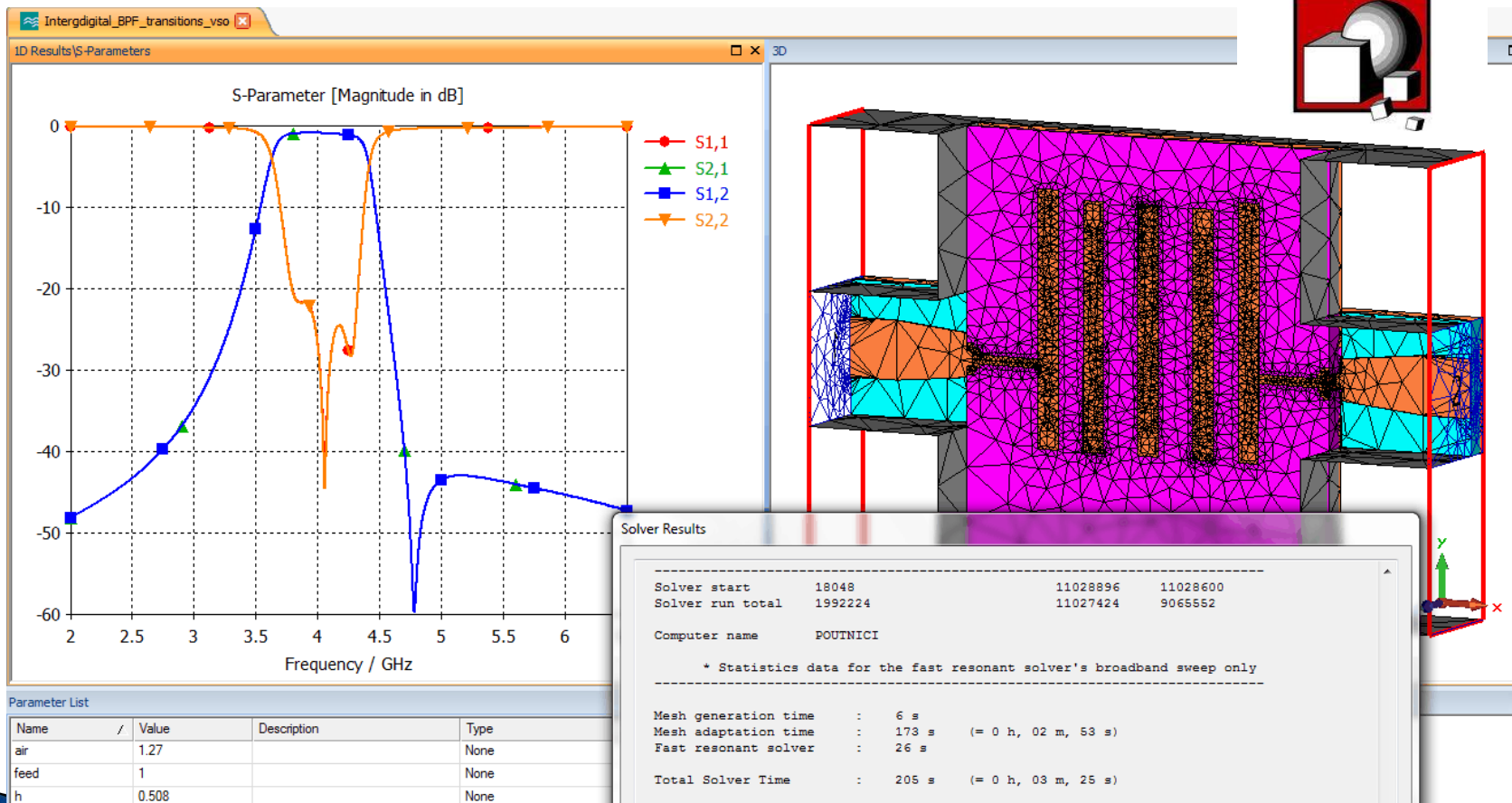
► Effects of de-lidding (channelisation)



BSC Filters Thin Film Technology

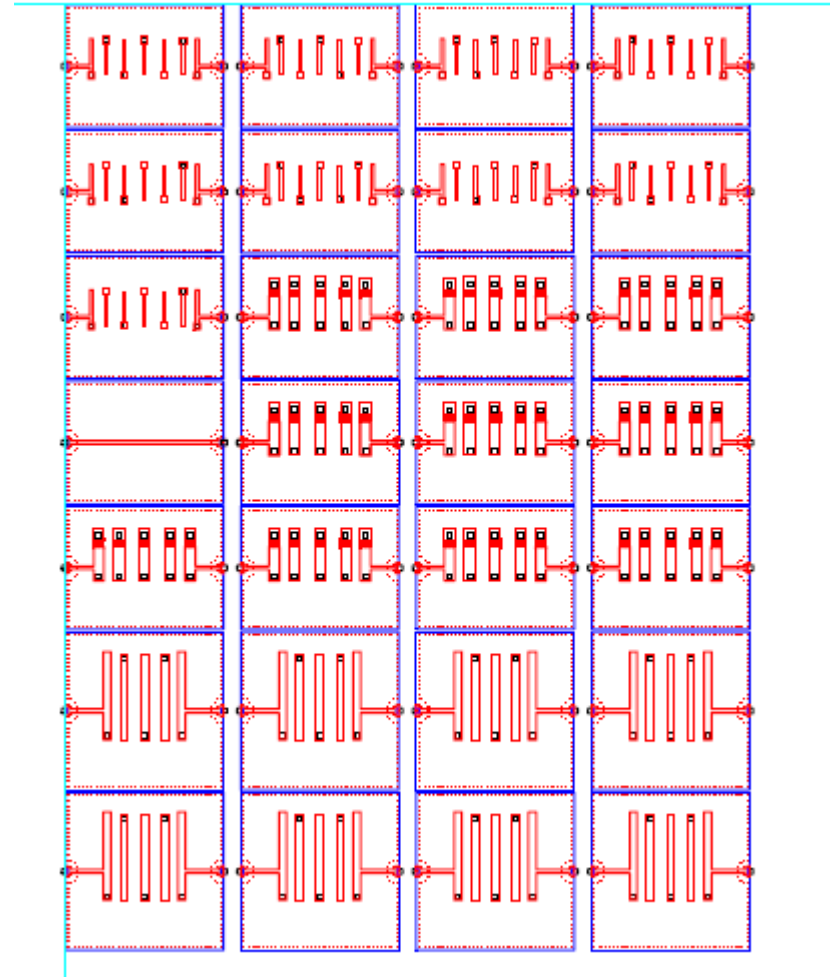
▶ CST comparisons

CST
COMPUTER SIMULATION
TECHNOLOGY



BSC Filters Thin Film Technology

- ▶ Layout for Photolithography
With edge vias for I/P O/P and dicing
Saw spacing

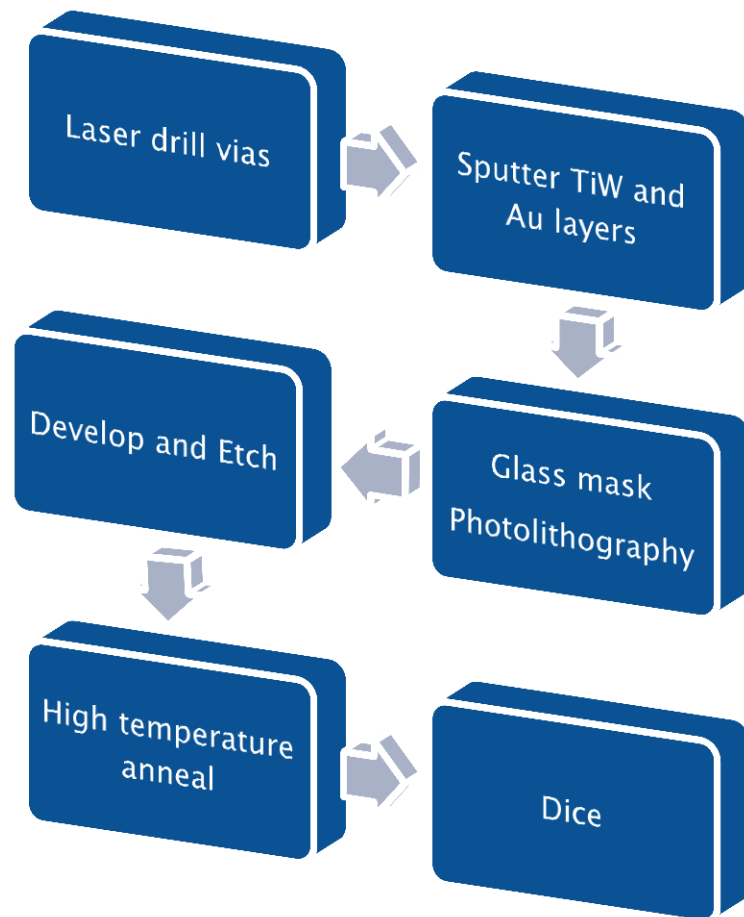


BSC Filters Thin Film Technology

Process flow for sub contract manufacture

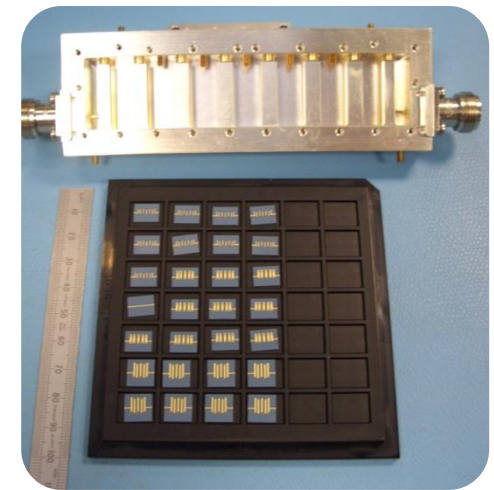
Gold Technology

Gold, Conduction Layer	3±1, 5±1, 10±2 µm
TiW, Adhesion Layer	0.1 µm
TaN, Resistance Layer	20, 50, 100 Ohm
Substrate, Al ₂ O ₃ , AlN, Ferrit, Quartz, CaMgTiO ₃	5, 10, 15, 25, 40 mil
TaN, Resistance Layer	20, 50, 100 Ohm
TiW, Adhesion Layer	0.1 µm
Gold, Conduction Layer	3, 5, 10 µm



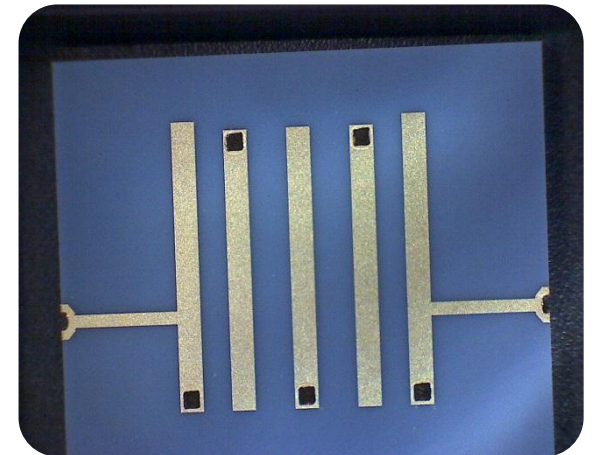
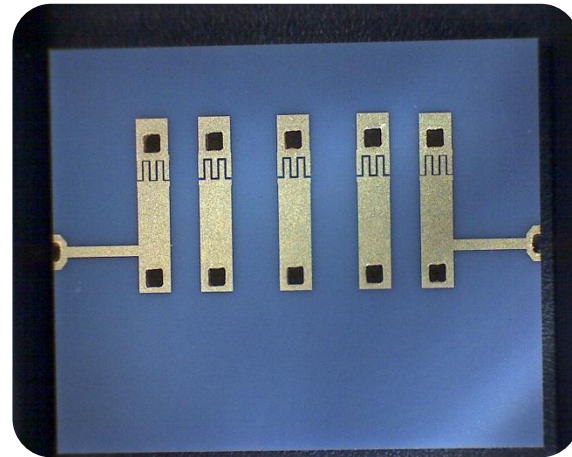
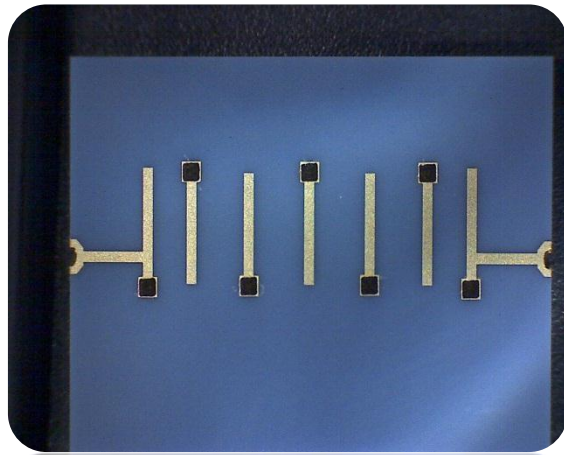
BSC Filters Thin Film Technology

- ▶ Prototype production parts



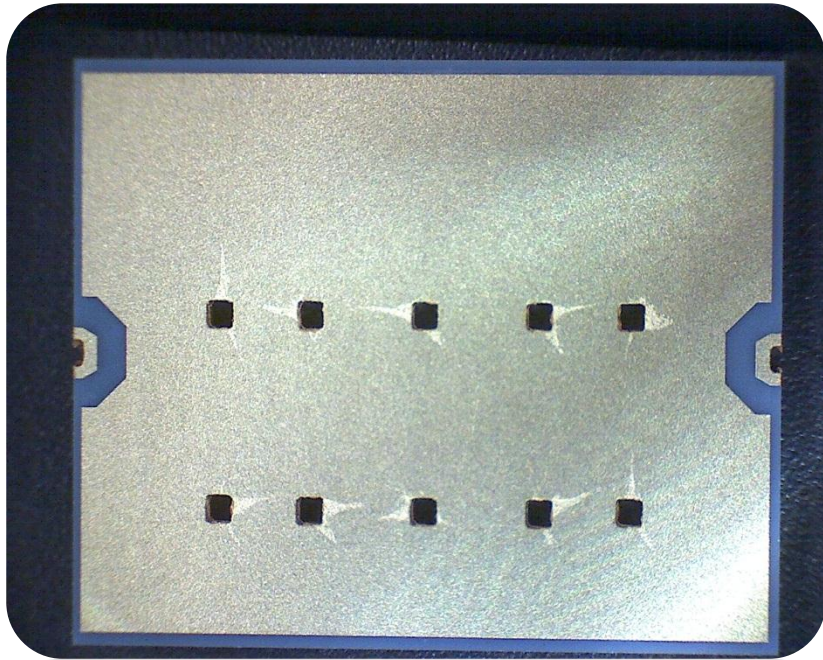
BSC Thin Film Technology

Finished designs on ceramic substrates



BSC Thin Film Technology

Finished design back metalisation and edge via

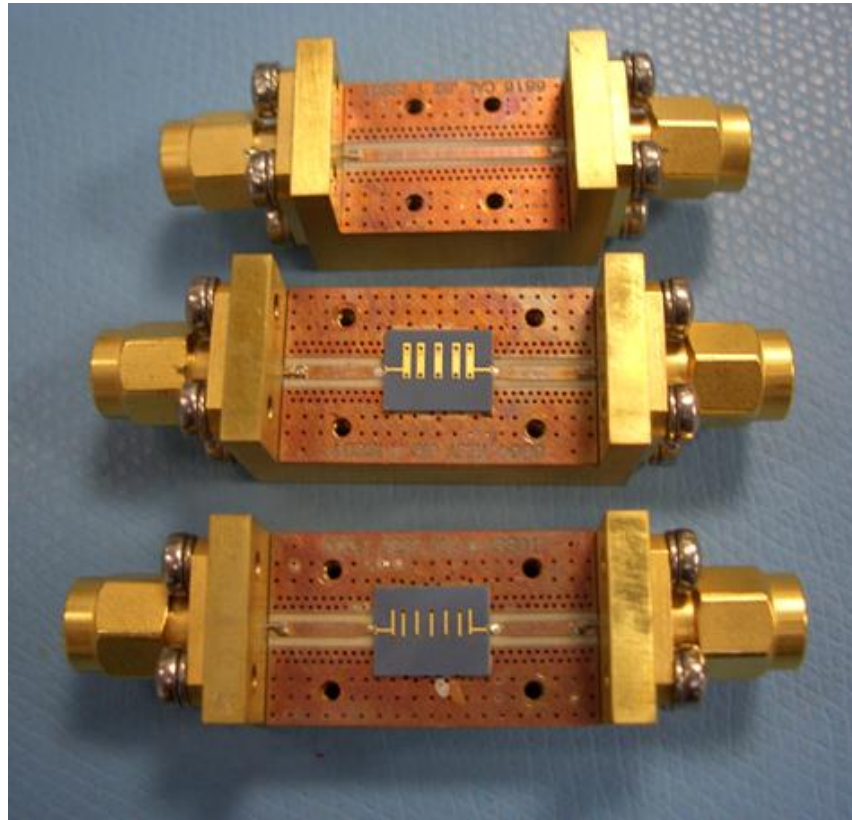


50Ω test line



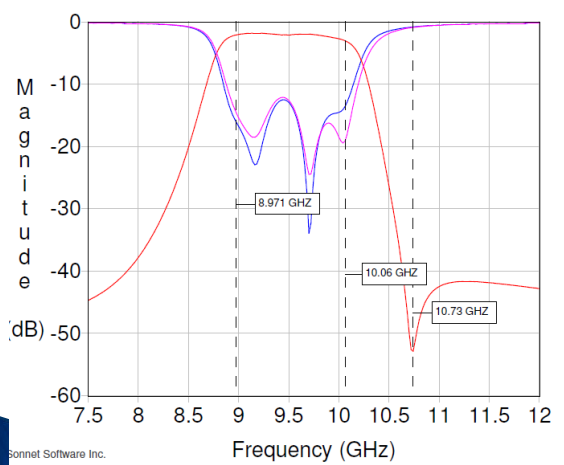
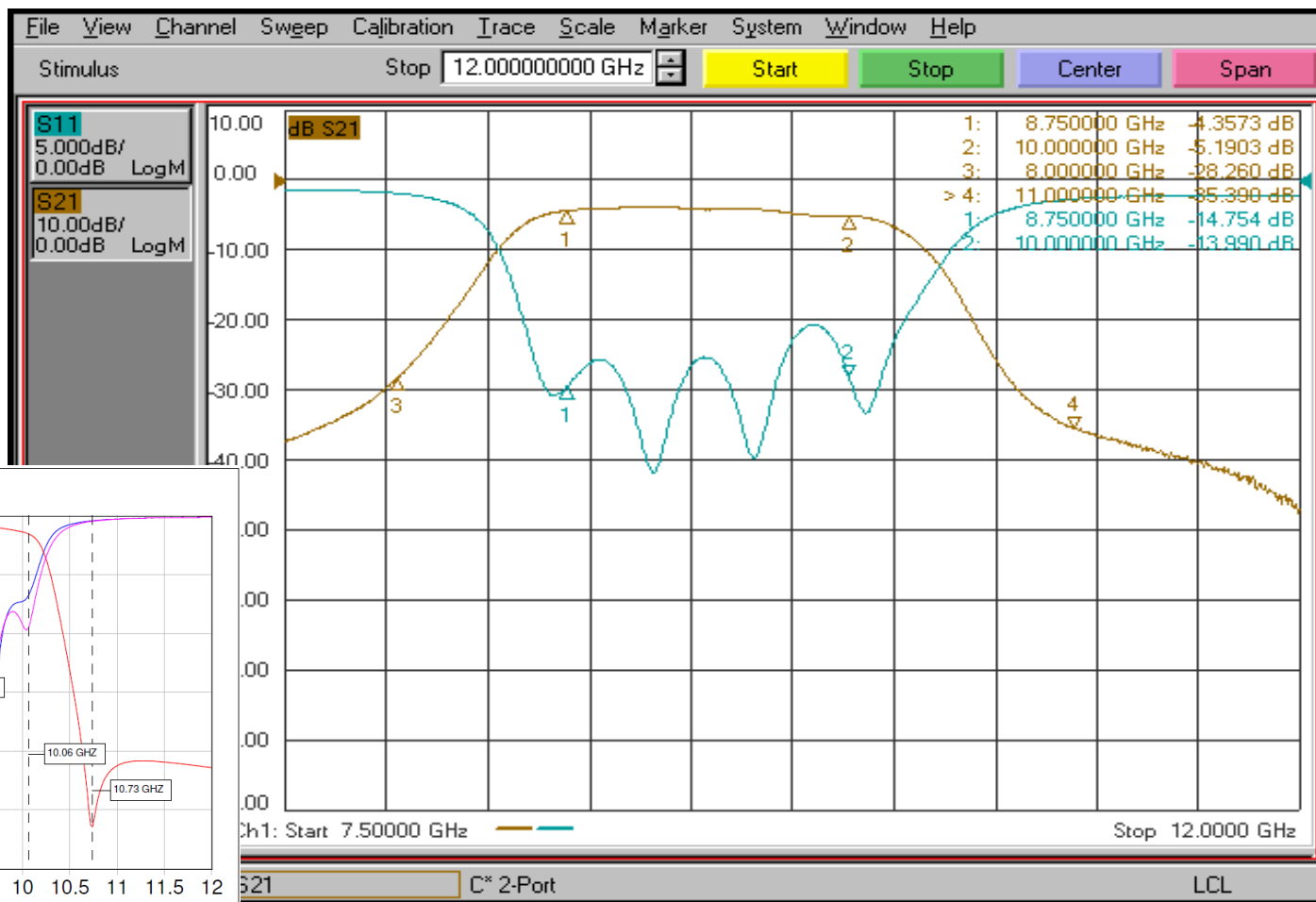
BSC Filters Thin Film Technology

Simple connectorised test fixtures with filters soldered in place



BSC Filters Thin Film Technology

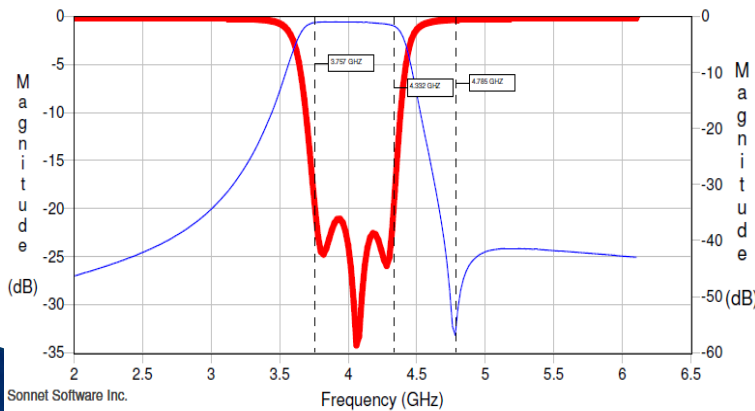
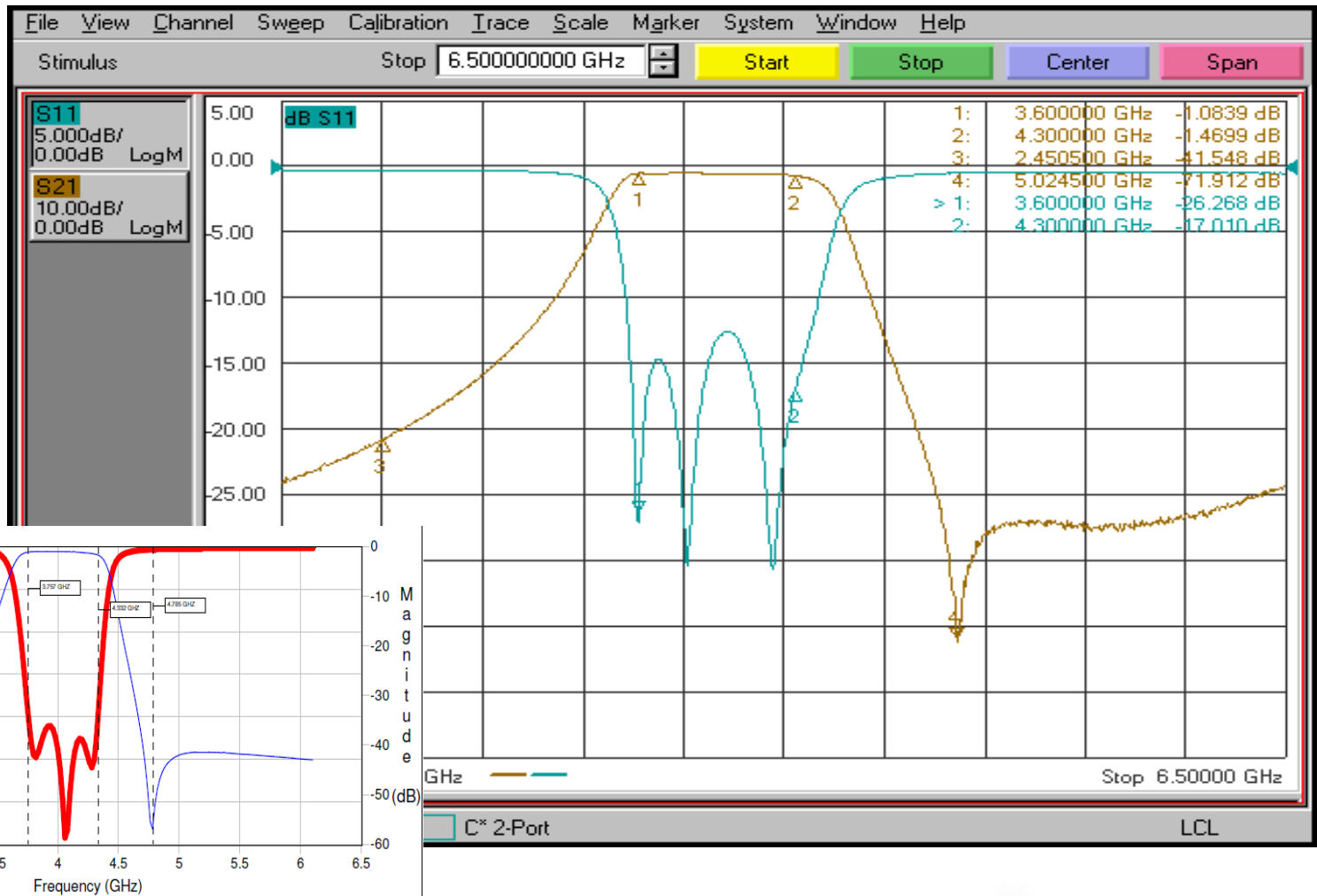
TFB 6851 Prototype Test Data



Sonnent Software Inc.

BSC Thin Film Technology

TFB 6853 Protoype Test Data

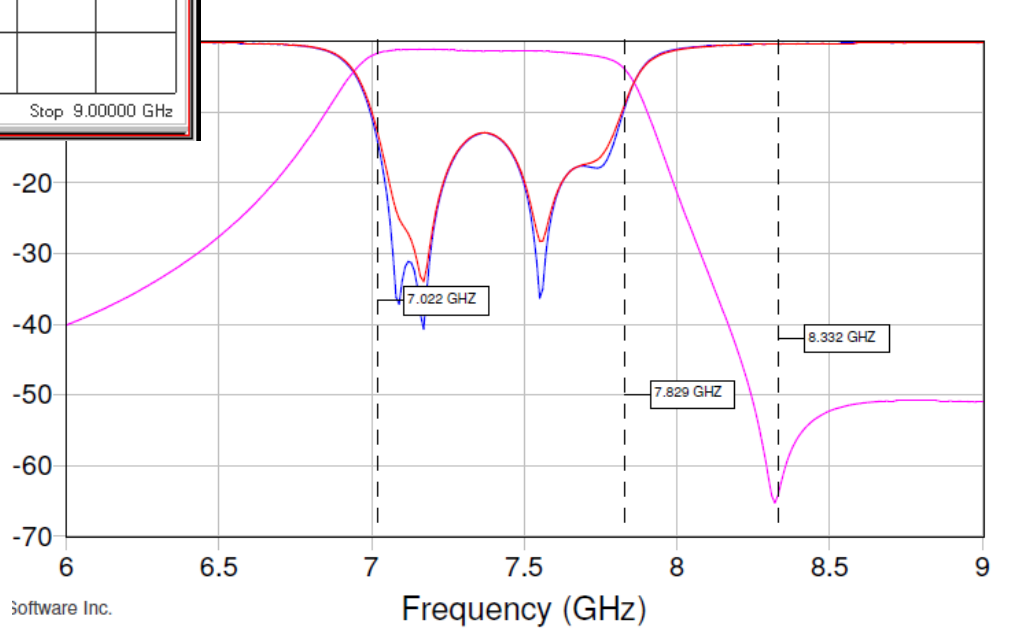
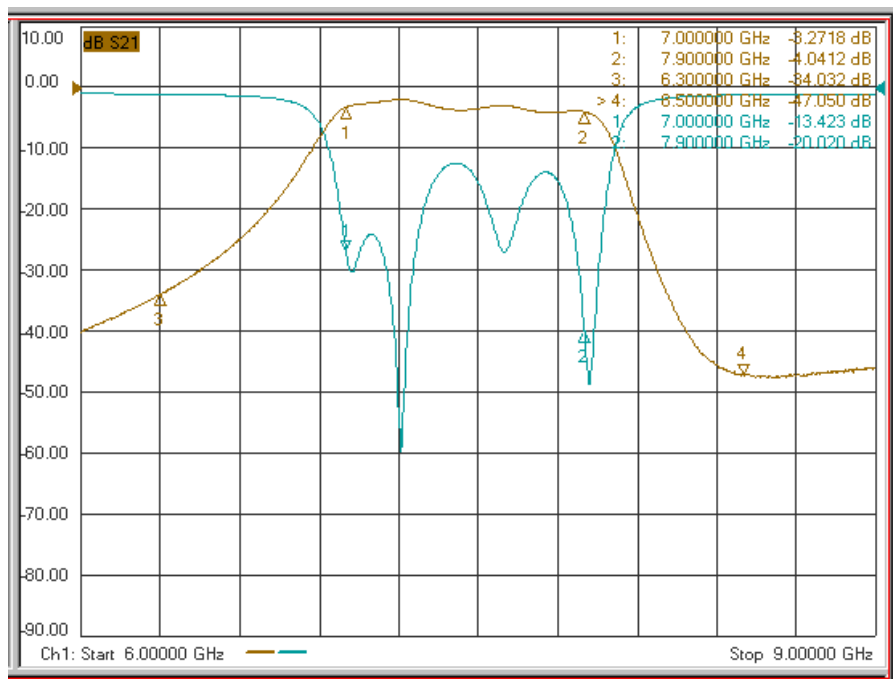


Sonnet Software Inc.

BSC Filters Thin Film Technology

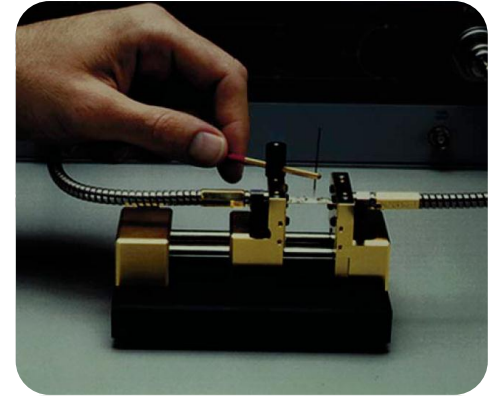
TFB 6854 prototype Test Data

Comparison between actual and Simulated data (no lid)



BSC Filters Thin Film Technology

- ▶ Next stages
- ▶ Test fixture development
- ▶ Develop Clean room facility
- ▶ Pick and place machine for lids



BSC Filters Thin Film Technology

▶ Question and answer session

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