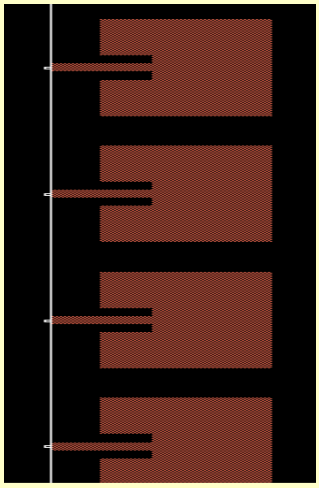
Work Done

RF Circuits / Systems Designed and Fabricated

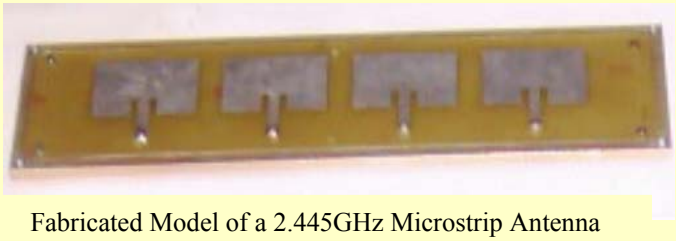
The RF Systems lab has the capability to design any RF subsystem using the specialized softwares like Agilent ADS, Ansoft HFSS, Linmic. The design capability ranges from the design of individual components like antennas, couplers, filters etc. to the design and simulation of an entire RF front end system integrating the individual components.

➢ Antennas

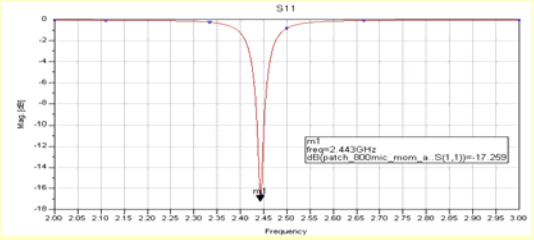
- Planar Antennas



Layout of a 2.4445 GHz Microstrip Antenna Array on glass epoxy substrate simulated using ADS 2002c

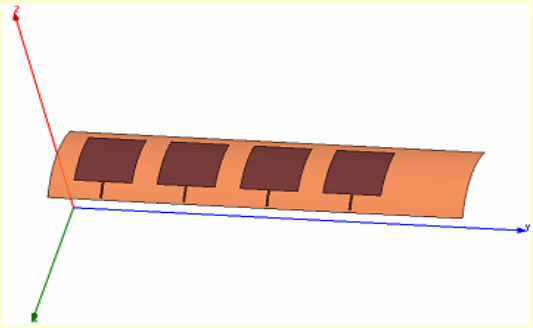


Fabricated Model of a 2.445GHz Microstrip Antenna Array on glass epoxy substrate using Photolithography technique

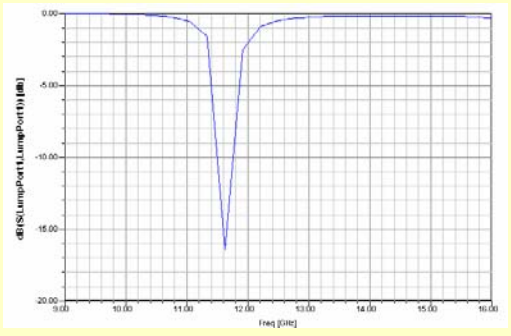


Results of the Microstrip Antenna Array with Center Frequency of 2.445 GHz

- Conformal Antennas

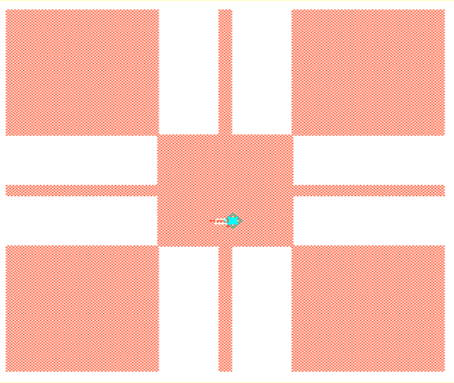


Layout of a 14.125GHz Conformal Microstrip Antenna Array on glass epoxy substrate simulated using HFSS 3D structure simulator

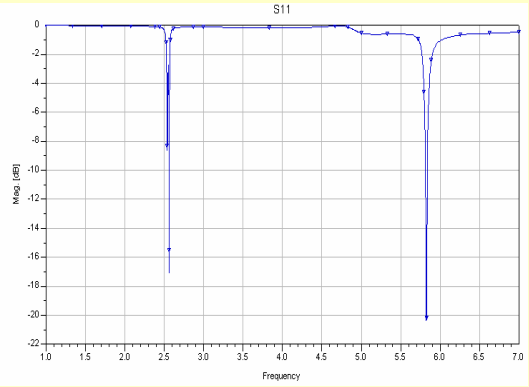


Simulated Results of the Conformal Antenna array on glass epoxy substrate

- Fractal Antennas



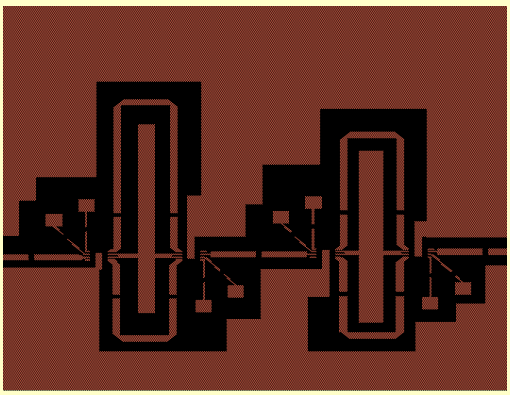
Layout of a Multiband Microstrip Antenna on glass epoxy substrate simulated using ADS 2002c



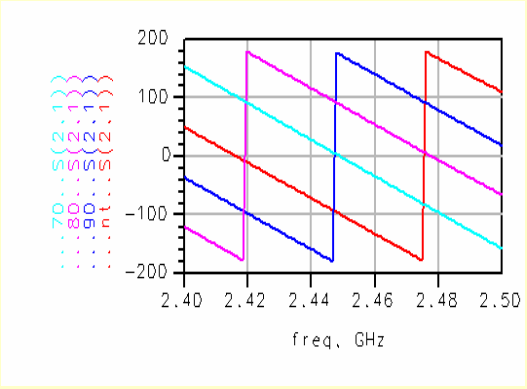
Simulated Results of the Multiband Microstrip Antenna on glass epoxy substrate

➢ Phase Shifter

- Switched Line

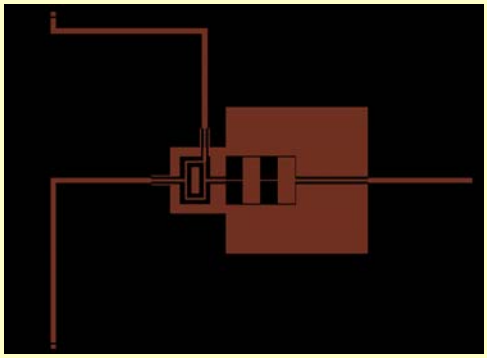


Layout of a switched line Phase Shifter on glass epoxy substrate simulated using ADS 2002c

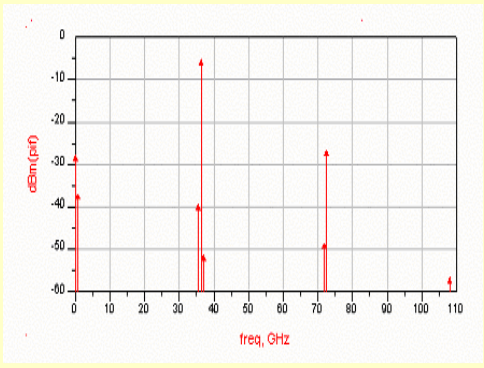


Measured results of a switched line Phase Shifter on glass epoxy substrate

➢ Mixer

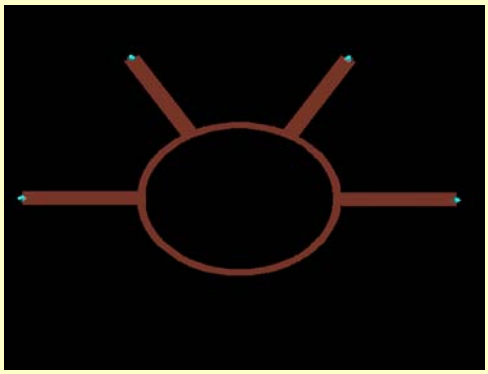


Layout of a mixer on alumina substrate simulated using ADS 2002c

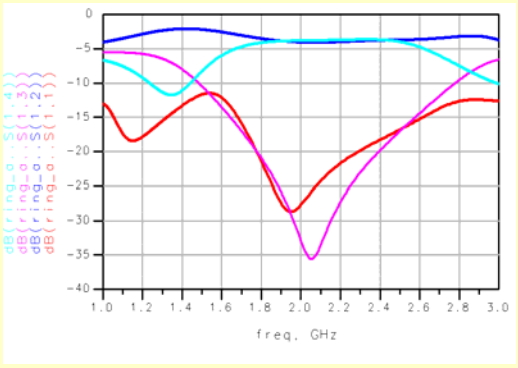


Results of the mixer simulated using ADS 2002c

➢ Coupler

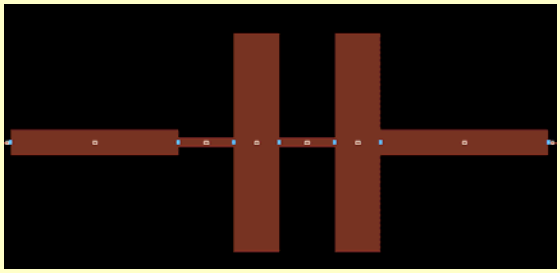


Layout of a Ring Coupler on glass epoxy substrate simulated using ADS 2002c

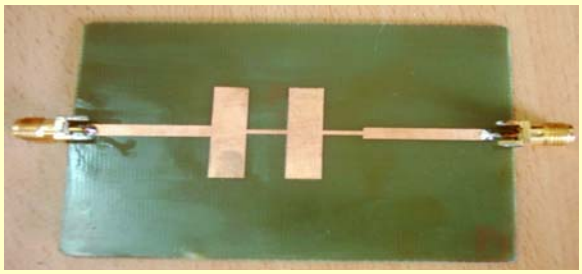


Results of the Ring Coupler on glass epoxy substrate simulated using ADS 2002c

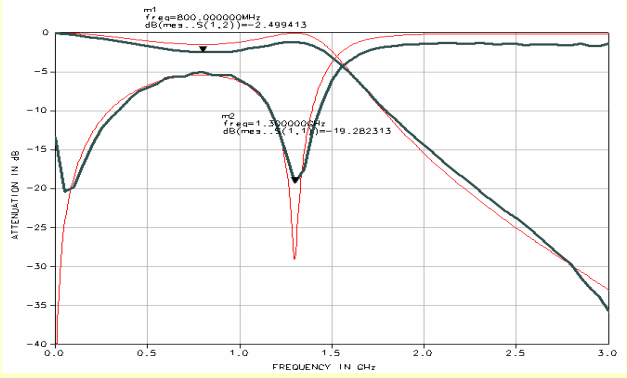
➢ Filter



Layout of a 1.5 GHz Low pass filter on glass epoxy substrate simulated using ADS 2002c



Fabricated Model of a 1.5 GHz Low pass filter on glass epoxy substrate



Simulated and Measured Results of the Lowpass Filter for 1.5 GHz

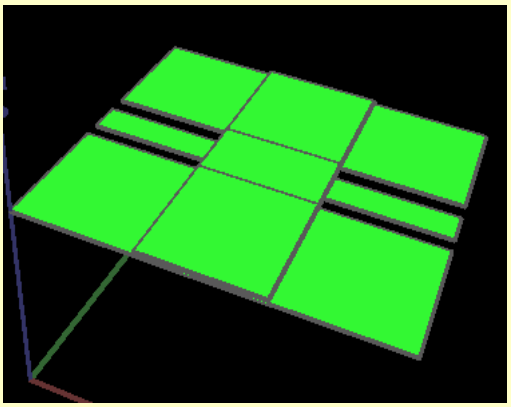
RF-MEMS Components Design and Simulation (Switches, Phase Shifters, Couplers & Filters)

A variety of RF MEMS components like Switches, Filters, Phase Shifters, Antennas and Couplers can be designed using some of the world's most sophisticated soft wares in the world. The RF characterization of the structures can done using Agilent ADS and Ansoft HFSS. The mechanical and other electromechanical characteristics could be done using Intellisuite and Coventorware. The fabrication and foundry issues are also incorporated in to such designs.

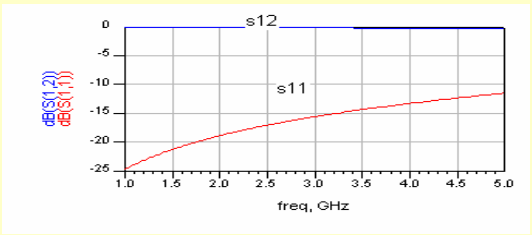
➢ Antenna

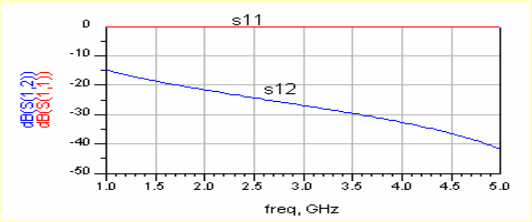
- Phased Array Antenna

➢ Switches



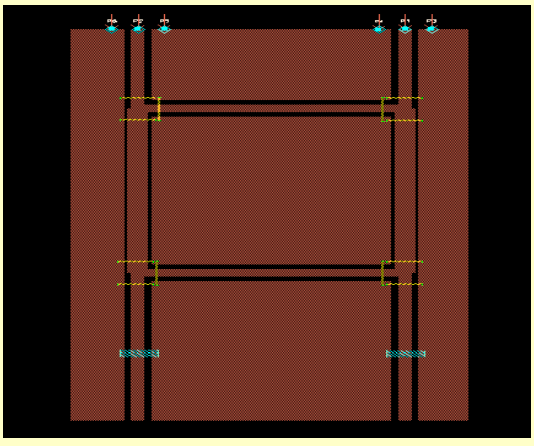
A MEMS Shunt Switch on Silicon Substrate



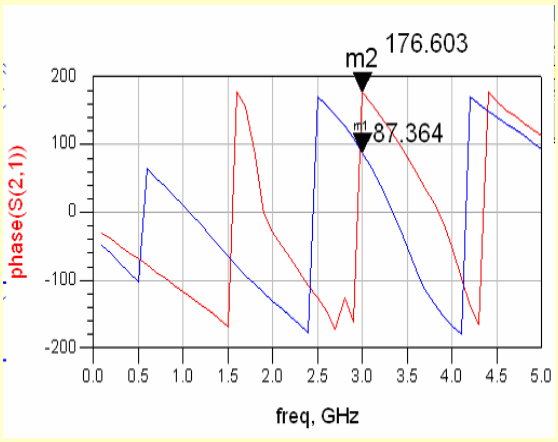


Results of the MEMS Shunt Switch in ON and OFF Conditions

➢ Phase Shifter

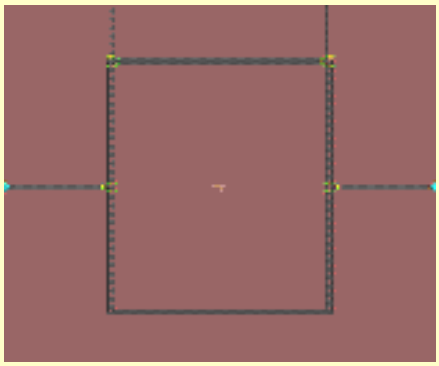


A MEMS based Reflection type Phase shifter on Silicon Substrate

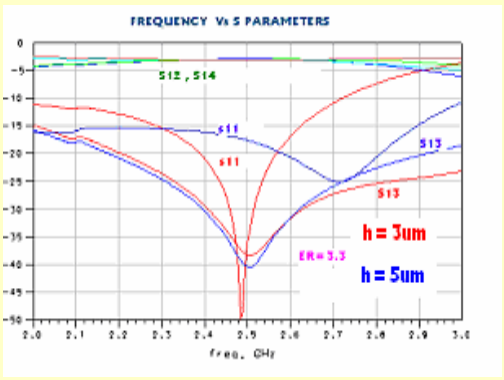


Results of the MEMS based Reflection type Phase shifter

➢ Coupler

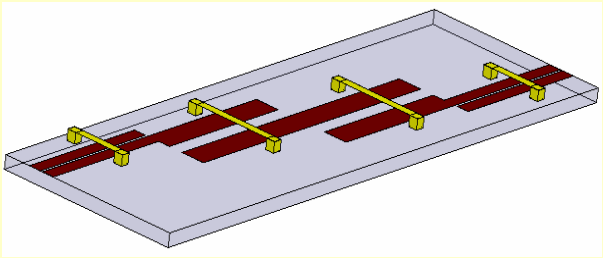


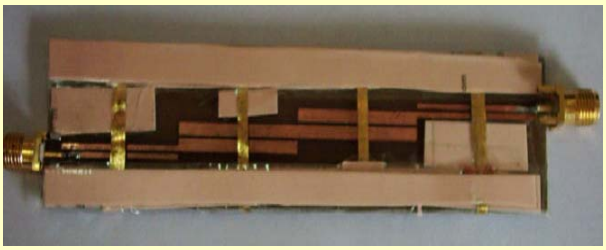
A MEMS based Rectangular Rat race Coupler at 2.5 GHz



Results of the MEMS Rat race Coupler at 2.5 GHz

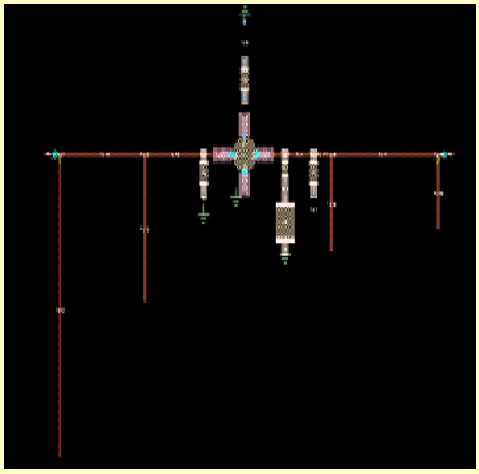
➢ Filter



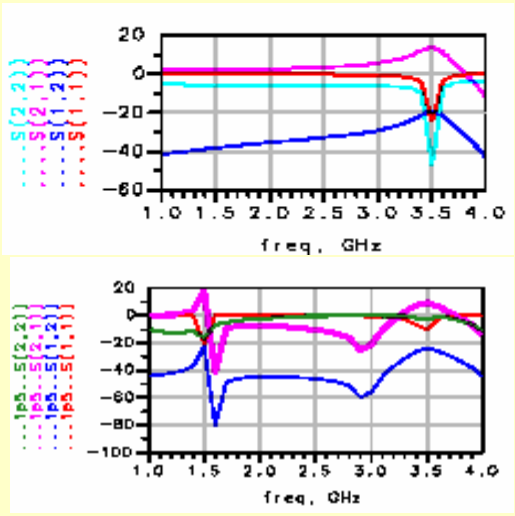


Simulated and Concept Model of a MEMS based Tunable Filter for wireless applications

➢ Amplifier



A MEMS based Dual band Amplifier at 2.5 and 3.5 GHz



Results of the MEMS based Dual band Amplifier at ON and OFF Condition

RF Test and Measurement

RF Propagation Measurements

Building Loss measurements

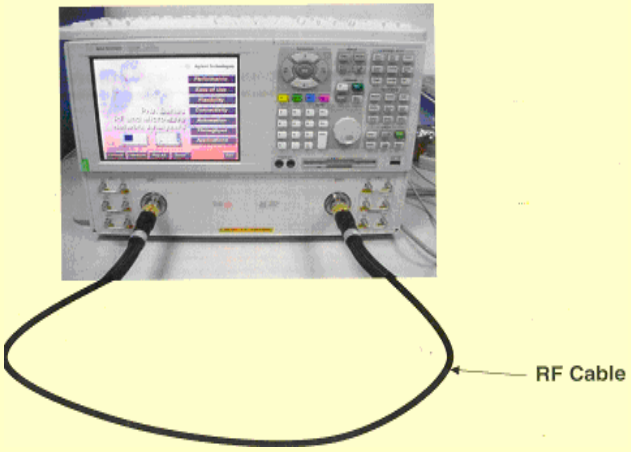
Penetration loss from inside to outside through a single wall for representative types of building materials could be measured. Additionally, penetration loss from inside to outside can be measured for cases when the signal will have to penetrate more than one wall. This will be necessary for interior rooms. Measurements of penetration loss should be made at several different locations within a room, through the same wall or walls. The measurements were carried out using Agilent network analyzer and Spectrum analyzer and other accessories.

Path Loss Measurements

Penetration loss needs to be characterized when multiple buildings (or dwellings) are near proximity. The cluster may consist of multiple, closely spaced buildings separate buildings (or dwellings), or may consist of a cluster of buildings (or dwellings) that contain common walls.

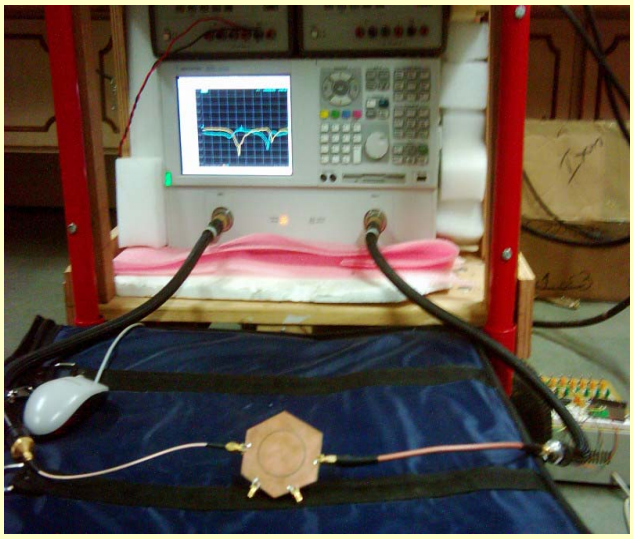
This can be accomplished by placing the transmitter in one of the units of the cluster, and the receiver in another unit of the cluster. The transmitter receiver pair should be moved about within the cluster to allow for the various paths that can occur within the cluster.

RF Cable Testing



The losses in all types of RF cables can be measured using the available network and spectrum analyzers. The lab also has the capability of measuring intermodulation distortions in the RF cables using the RF Signal Sources from Agilent Vector Signal generators and Network analyzer.

RF Component Testing



The Testing of all microwave and RF components for their performance can be done using the Network Analyzer. The components can be tested for the return loss, insertion loss, phase and other characteristics. The Network analyzer gives the capability of even virtual measurement where the component may be connected to the equipment in the laboratory and the results can be seen at a different place through internet.

DSP

Algorithms Developed

- Optimal Whitening approach based Multi-user Detection in Fixed Wireless Communication Networks
- Signal Detection Algorithm using Wavelet Transform and Radon Transform
- Kalman filtering based chaotic system for secure communication
- Space Time Adaptive Processing for DS CDMA UWB Systems
- Direction of Arrival Estimation using Adaptive Digital Beamformer (Smart Antenna)
- Improved Multiuser Detection using Antenna arrays at Base Station
- Performance Analysis of DS-CDMA system with space-time Multiuser detection
- Decision Directed Autocorrelation Receiver for Space Time Coding
- Chaos based UWB Systems

Simulation of Standards

- IEEE 802.11 g Physical layer of Wireless Area Network
- ECMA 368 Physical Layer of UWB System, High data Rate wireless Personal Area Networks