

Design of 3D Integrated LTCC Antenna Switch Module Using HFSS

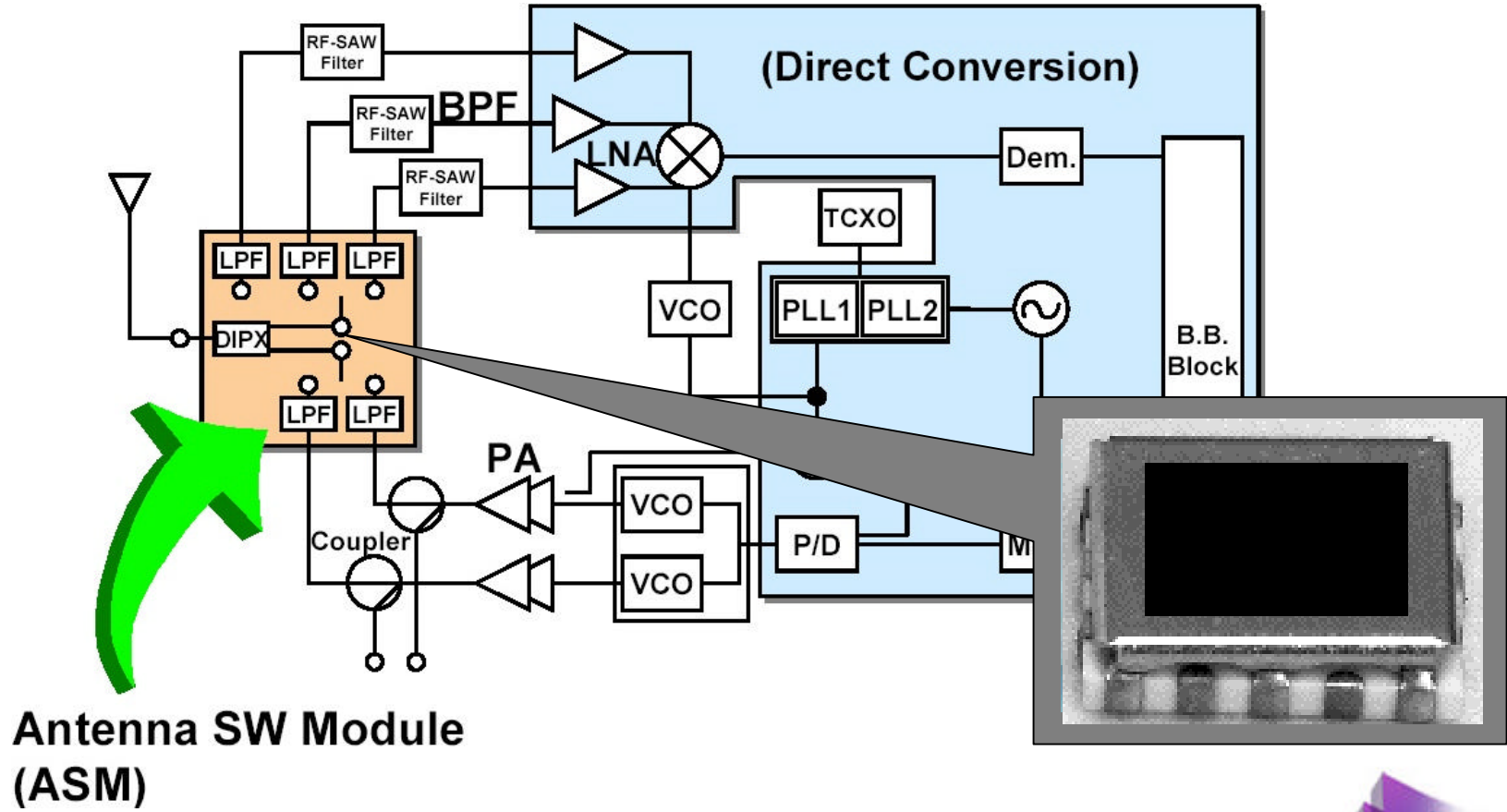


Outline

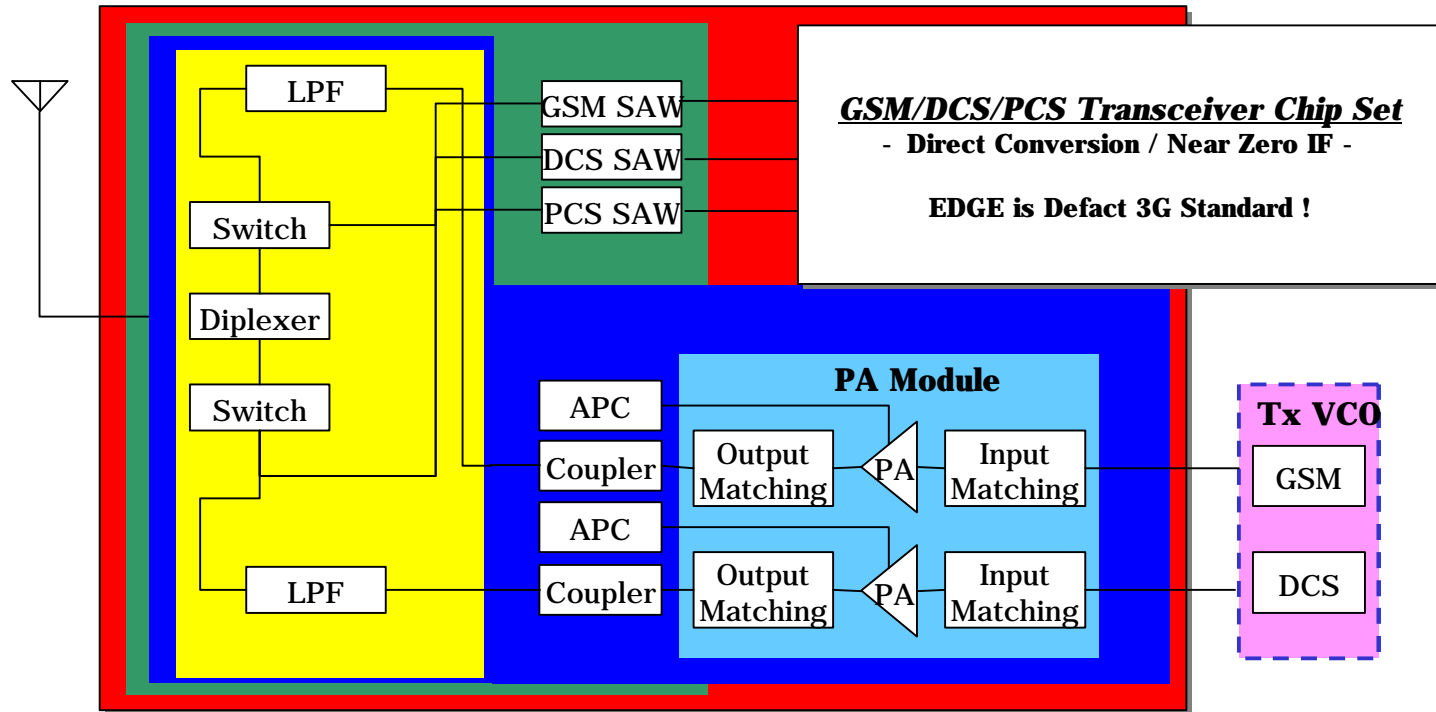
- Introduction
- What is Antenna Switch Module ?
- Simulation Method
- Results
- Summary



Triple-Band Front End Block Diagram



Front End Module Application

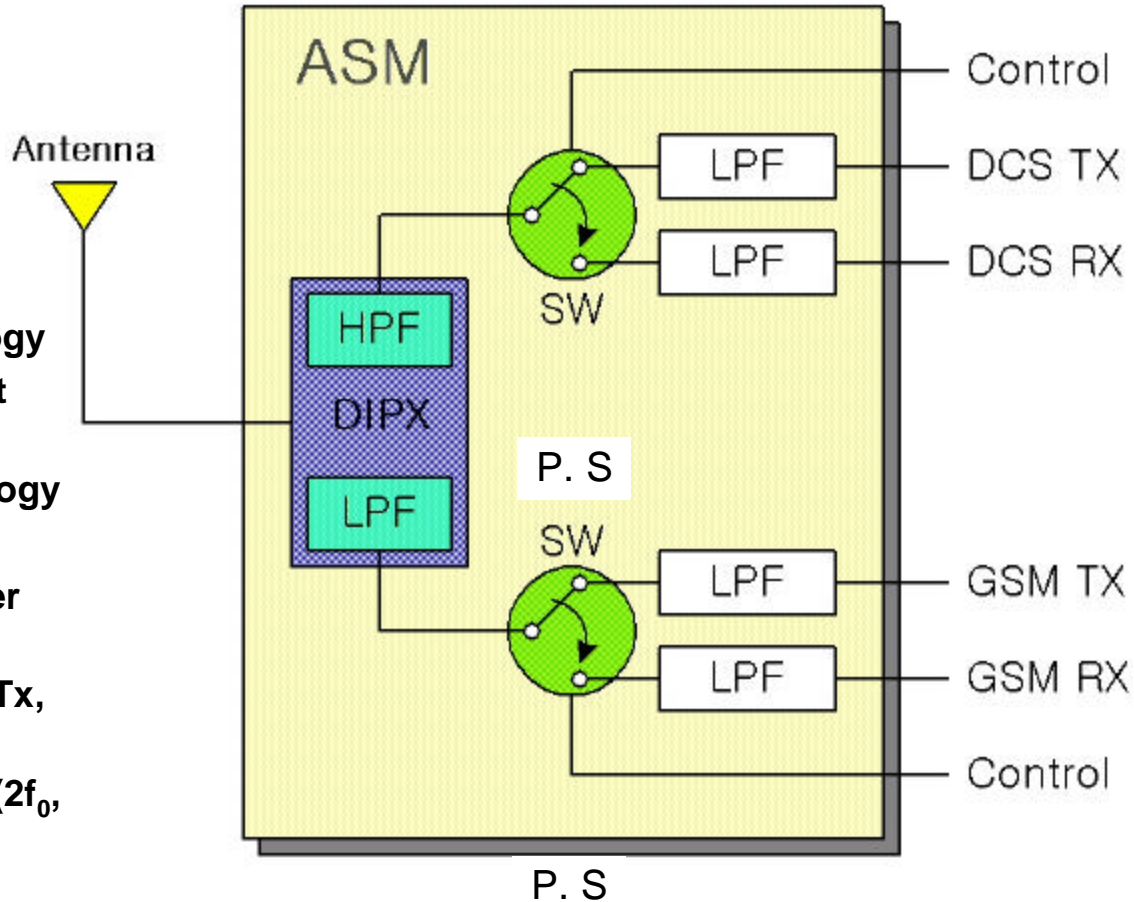


- Present Antenna Switch Module or Switchplexer
- Front End Module(ASM + RF SAW)
- ASM + PA Module, Powerplexer
- ASM + RF SAW +PA Module

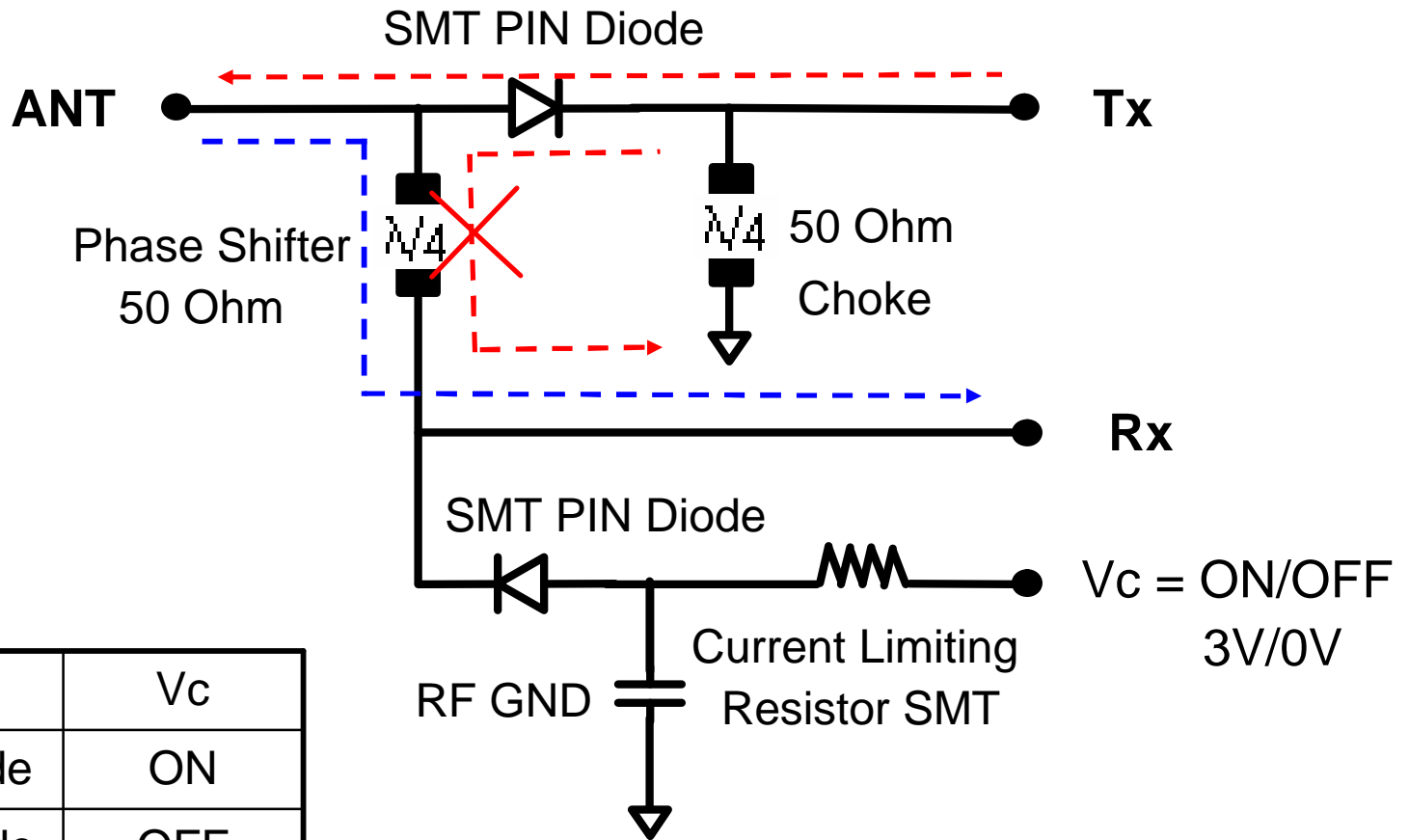


Dual-band Antenna Switch Module

- RF Antenna Switch module(ASM)
 - Separating the Band of Multi-System
- Key Technology
 - LTCC technology
- MLC(Multi-layer Ceramic) Technology
 - Microwave passive component design technology
 - Microwave integration technology
- Constitution of ASM
 - Diplexer : Separating the Lower band & Higher band
 - RF Diode Switch : Separating Tx, Rx Frequency
 - LPF : Harmonic rejection filter($2f_0$, $3f_0, \dots$)



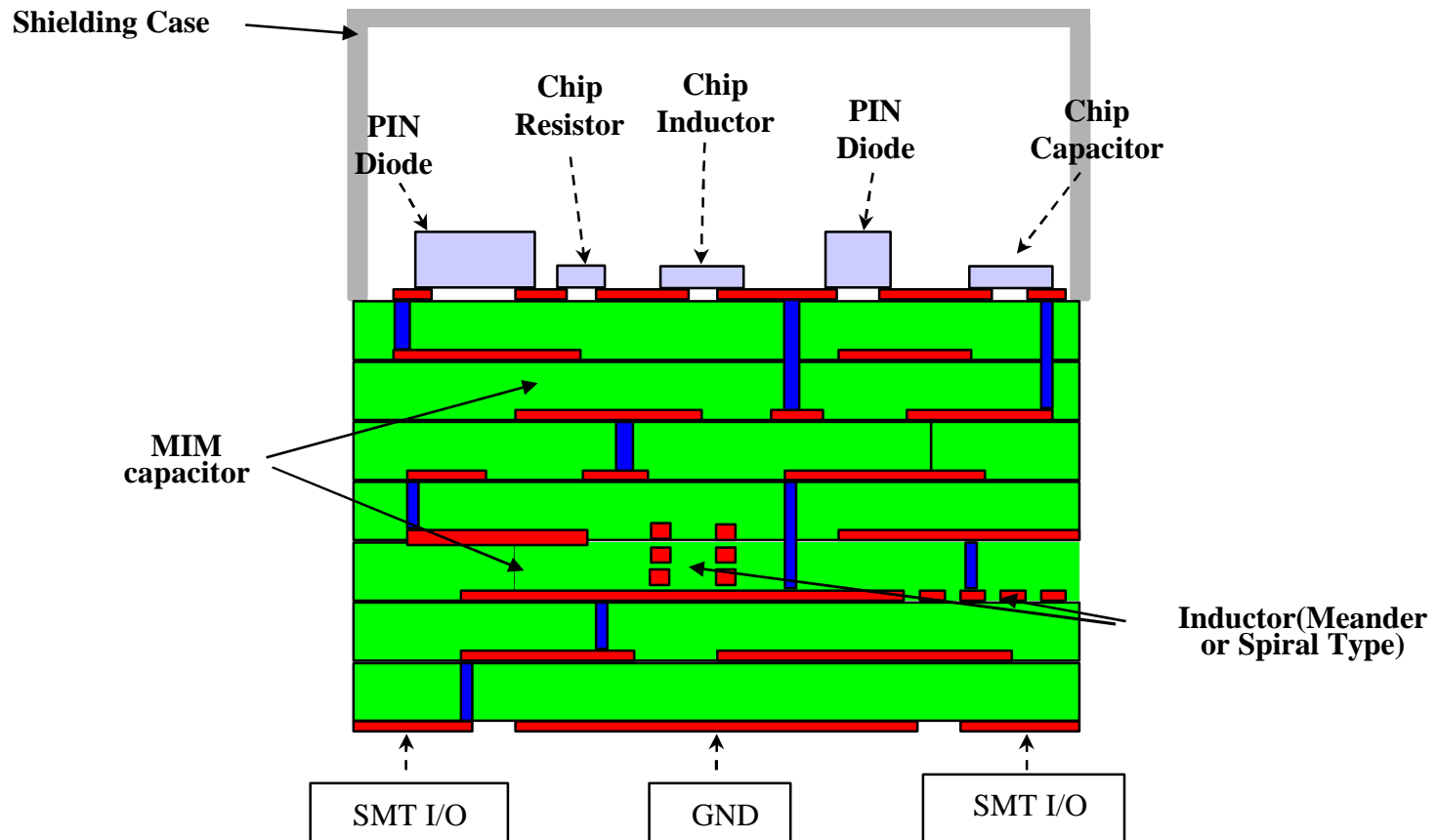
Switch Concept Diagram



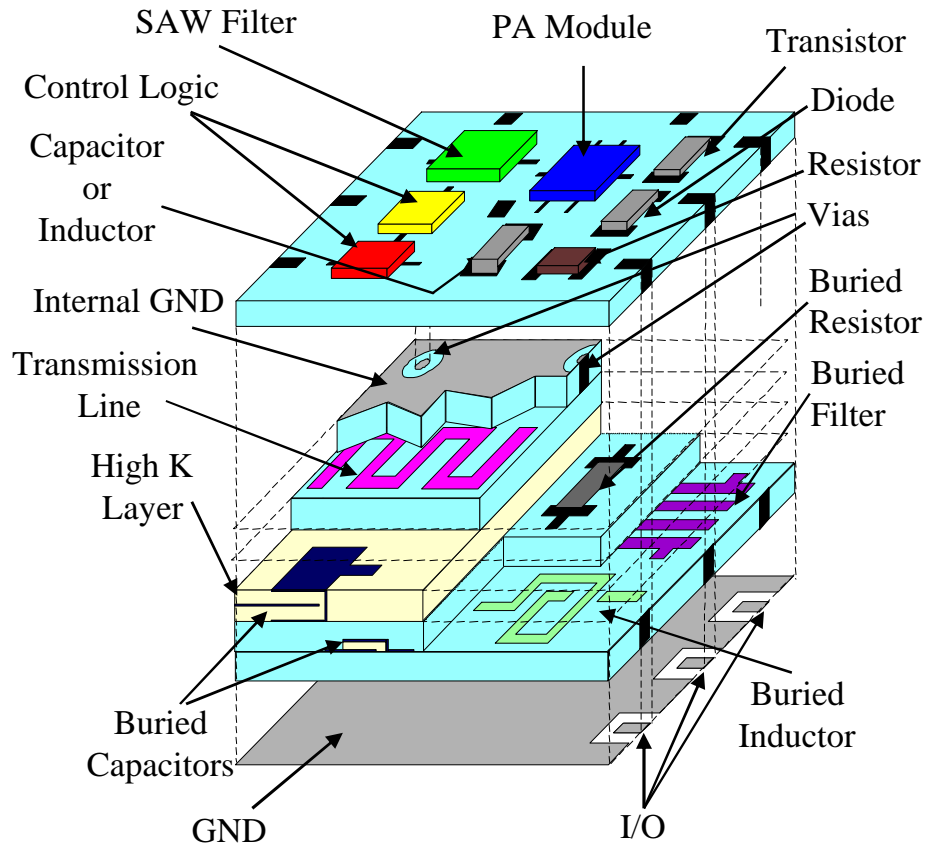
	Vc
Tx Mode	ON
Rx Mode	OFF



Integrated LTCC Stack-Up



Integrated RF Module



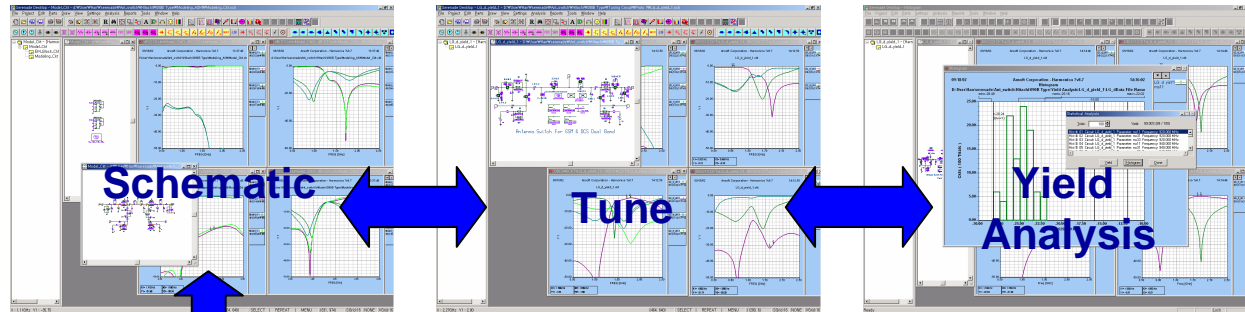
LTCC

- ▶ Integrated Passives
- ▶ 3D Design
- ▶ Controlled Impedance
- ▶ Hi Q
- ▶ Size Reduction
- ▶ Direct Chip Attach
- ▶ Rapid Prototypes

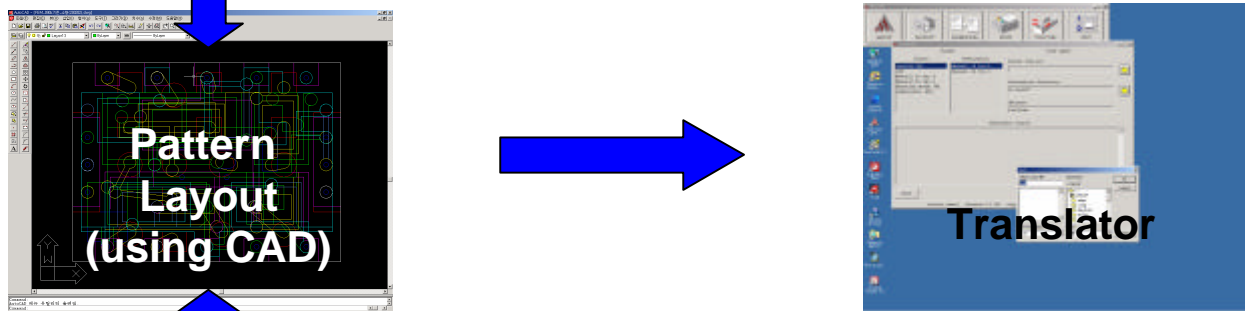


Analysis and Implementation Levels

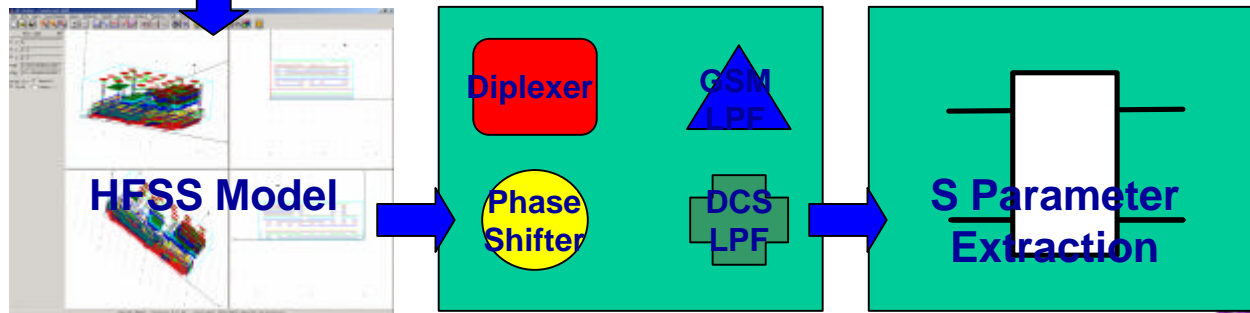
Schematic Level



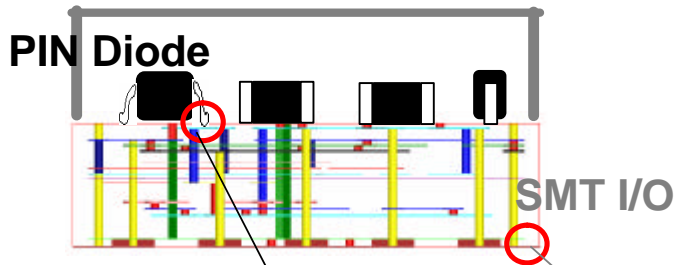
Layout



EM Simulation

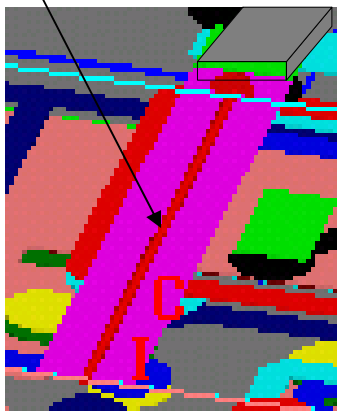
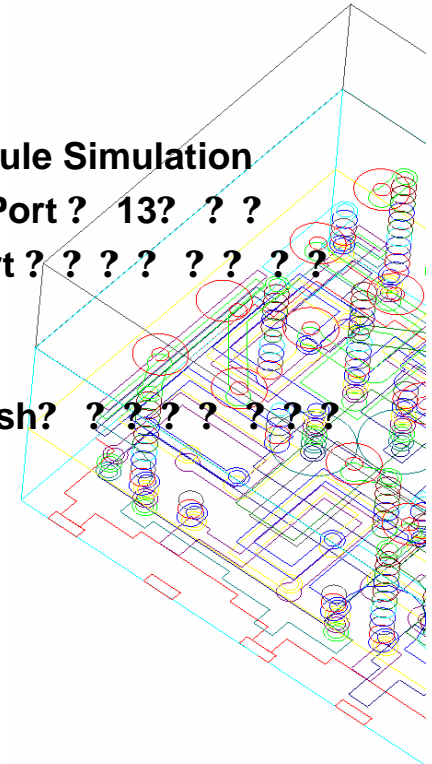


Integrated LTCC Module Simulation

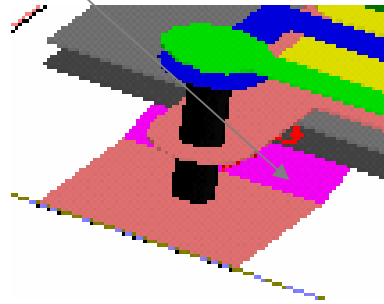


- ▶ Fully Integrated LTCC Module Simulation

- ▶ Lumped Gap Source Port ? 13? ? ?
- ▶ Port Setup ? ? ? , Port ? ? ? ? ? ? ? ? ? ? ? ? ?
- ▶ ? ? ? ? ? ? ? .
- ▶ ? ? 50? ? ? ? ? Mesh? ? ? ? ? ? ? ? ? ? ? ? ?



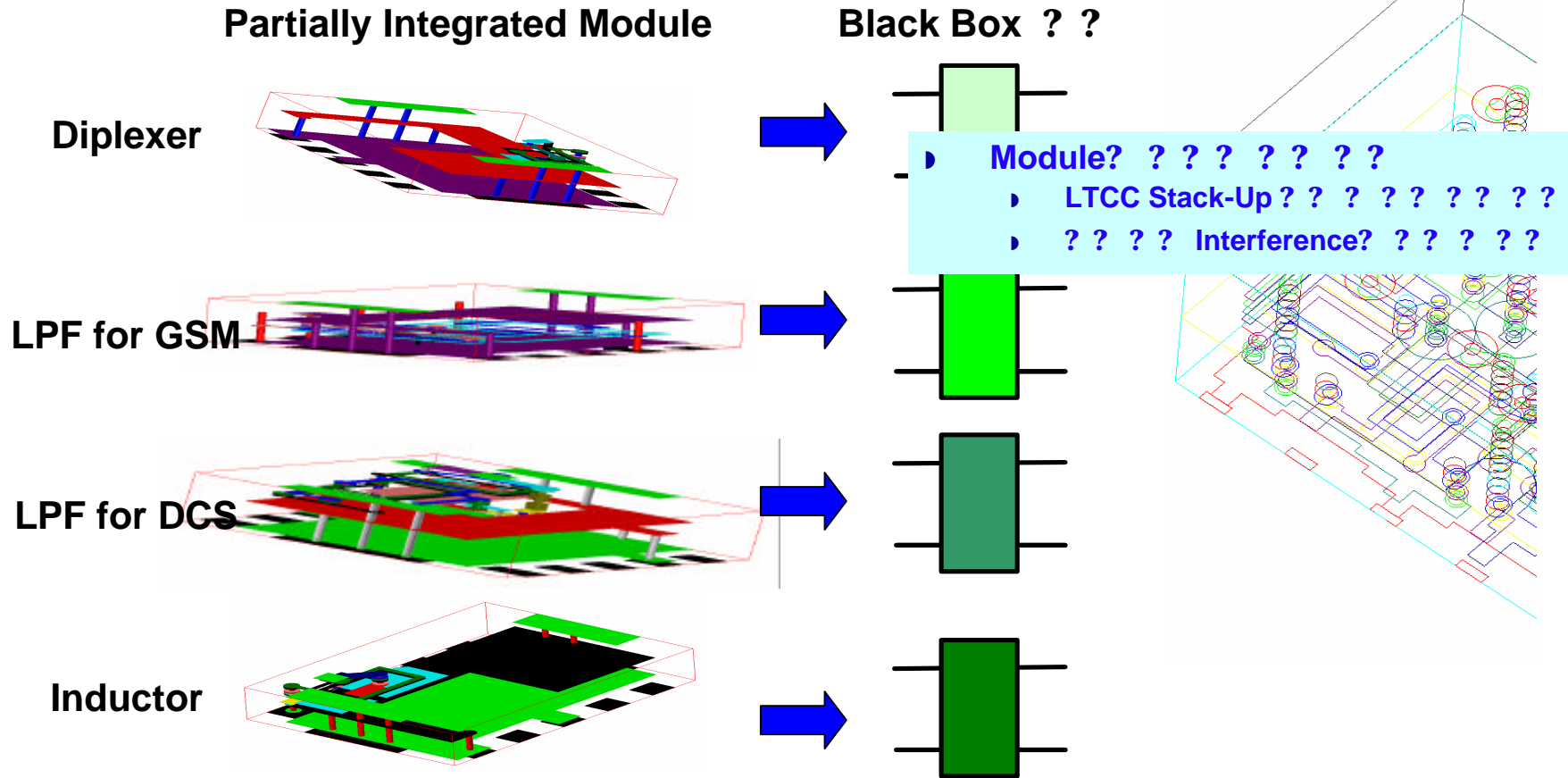
Case 1



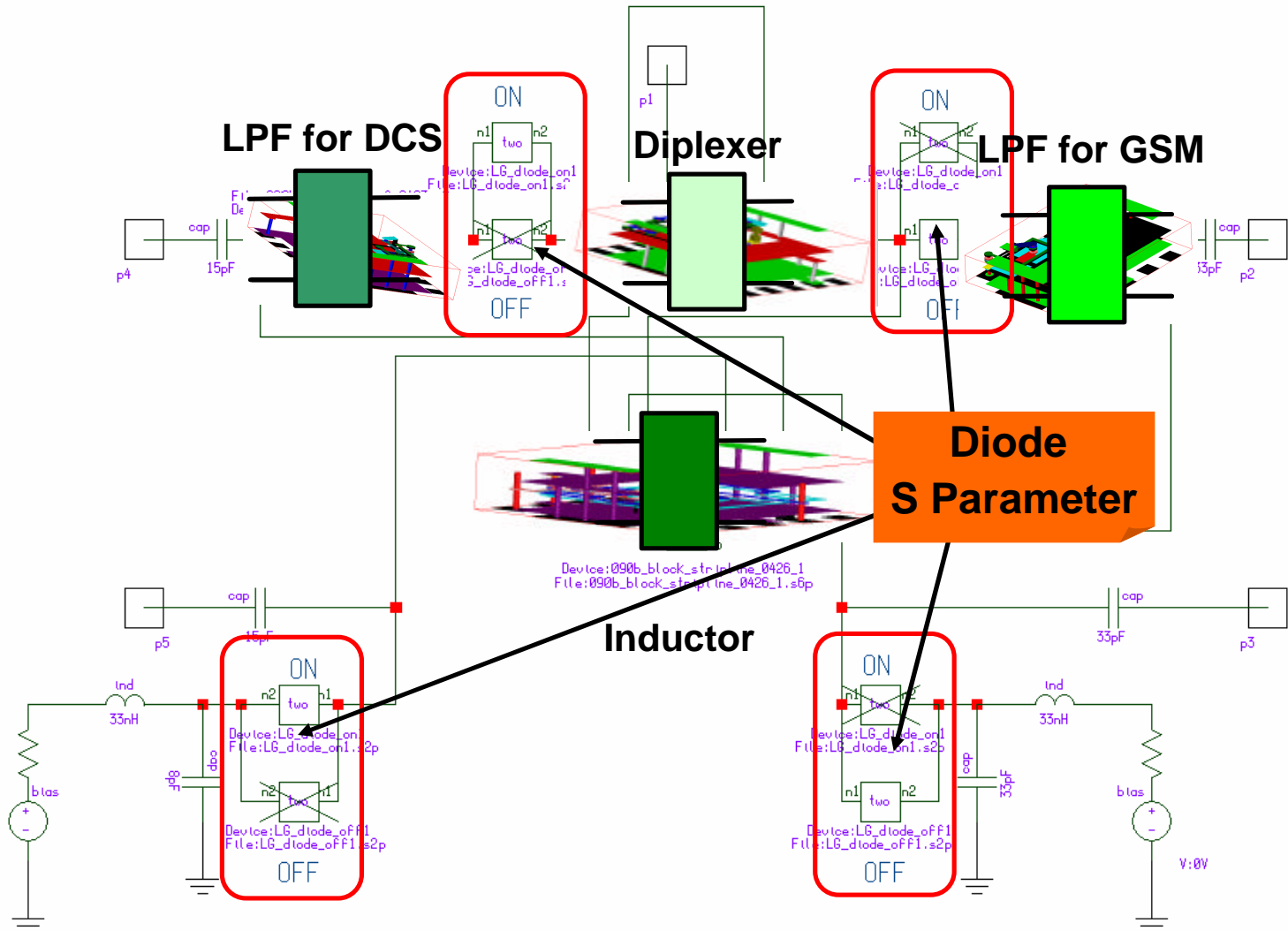
Case 2



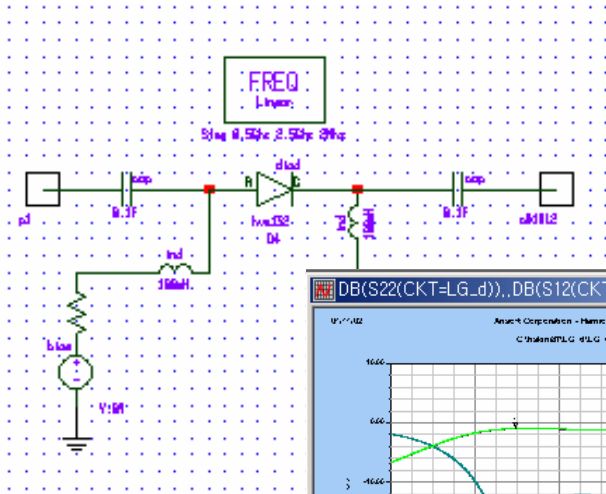
Partially Integrated LTCC Module Simulation



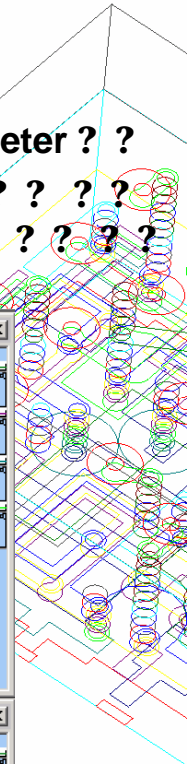
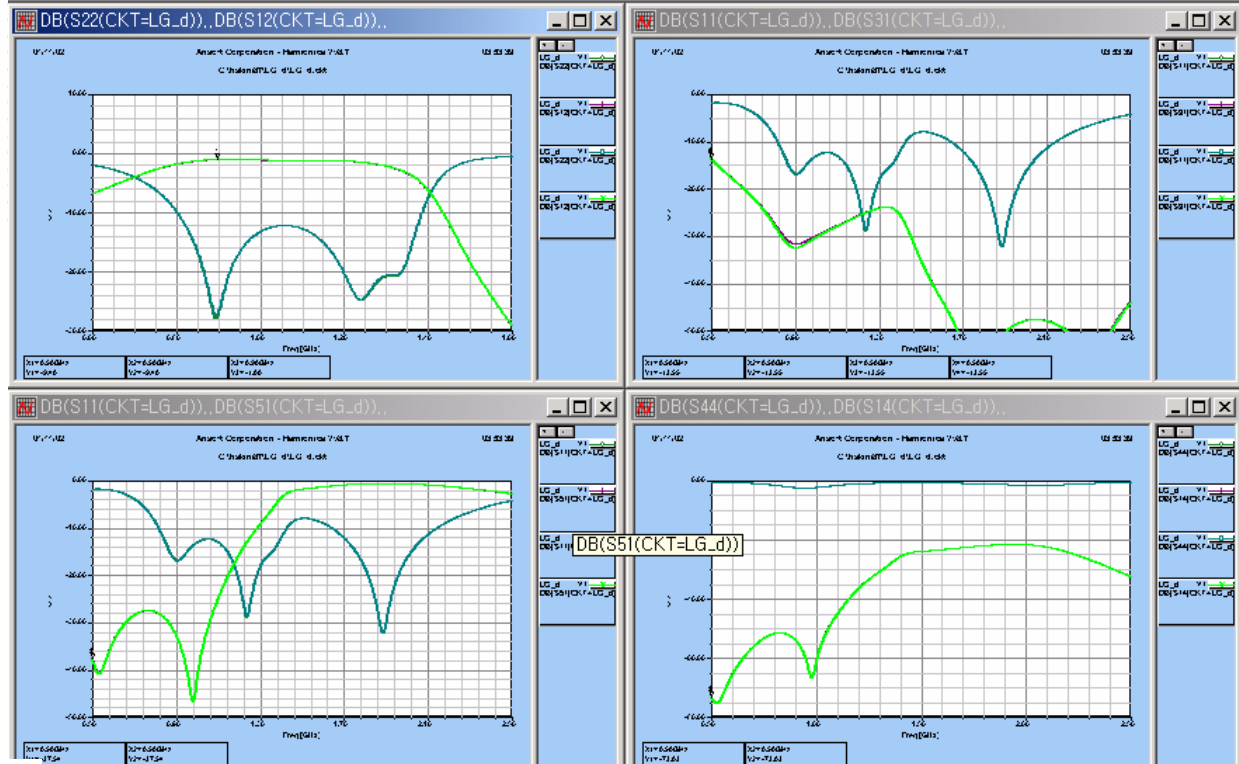
Analysis of Circuit(HFSS + Serenade)



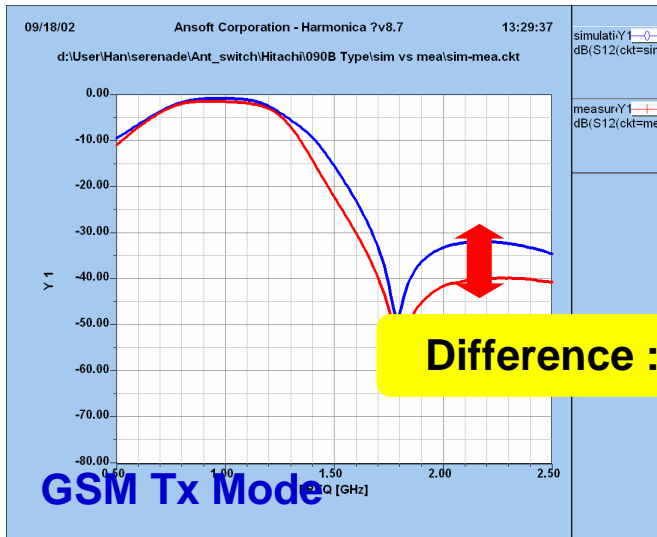
Diode Small Signal Equivalent Circuit Extraction



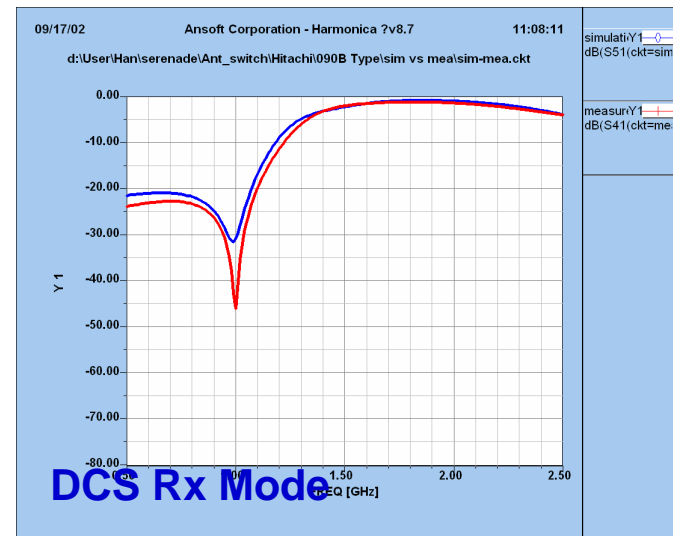
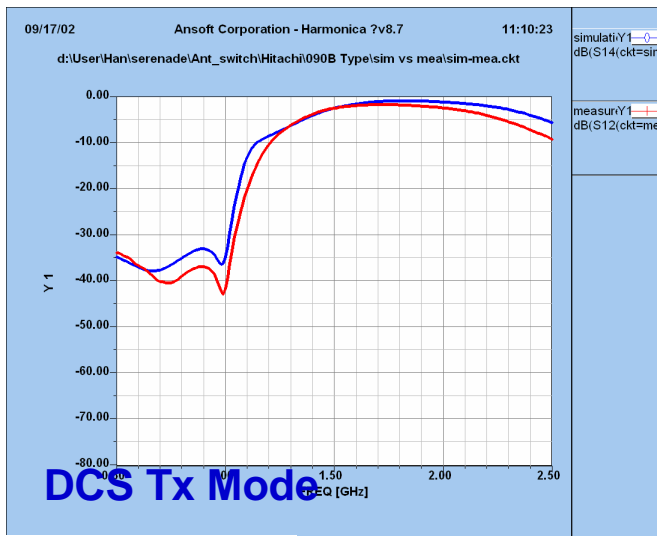
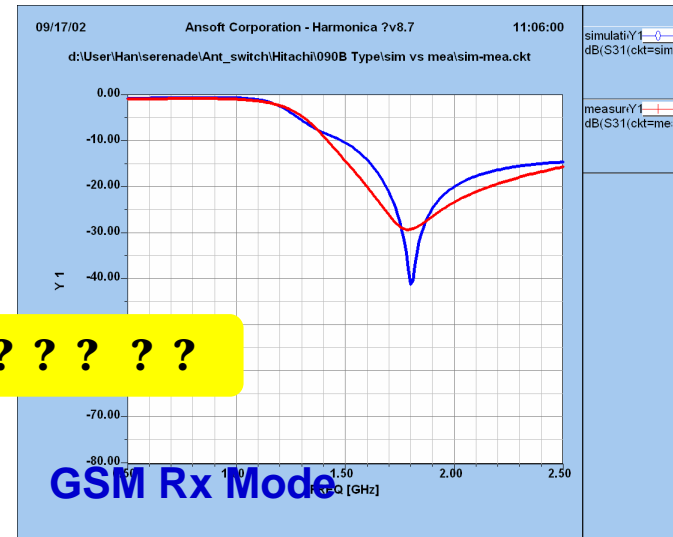
- ▶ Diode? On/Off ? ? ? ? ? S-parameter ? ?
- ▶ ? ? ? ? S-parameter? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? .



Simulation vs. Measurement



Difference : PCB ? ? ? ? ? ? ? ?



Summary

- Analysis of partially integrated LTCC module is useful
 - 1) Saving simulation time
 - 2) Rapid redesign
 - 3) Best design cycle performance
- Simulation agree with measured data
- HFSS & Serenade is well suited for Integrated LTCC Module Analysis

