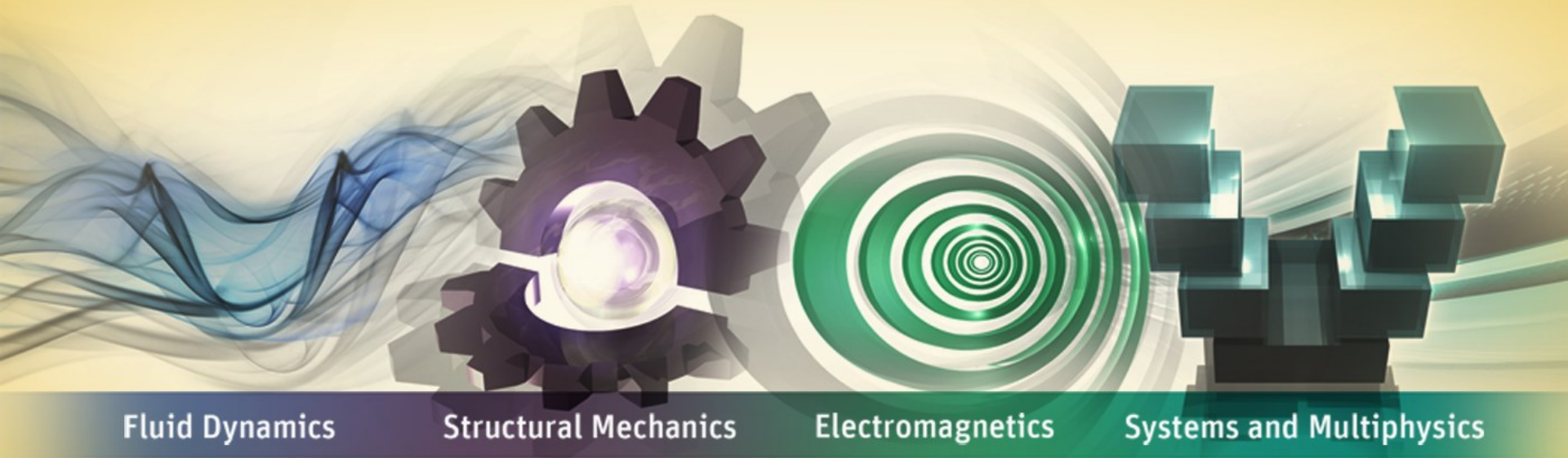


# Simulation of High Speed Interfaces with Ansys Software



Fluid Dynamics

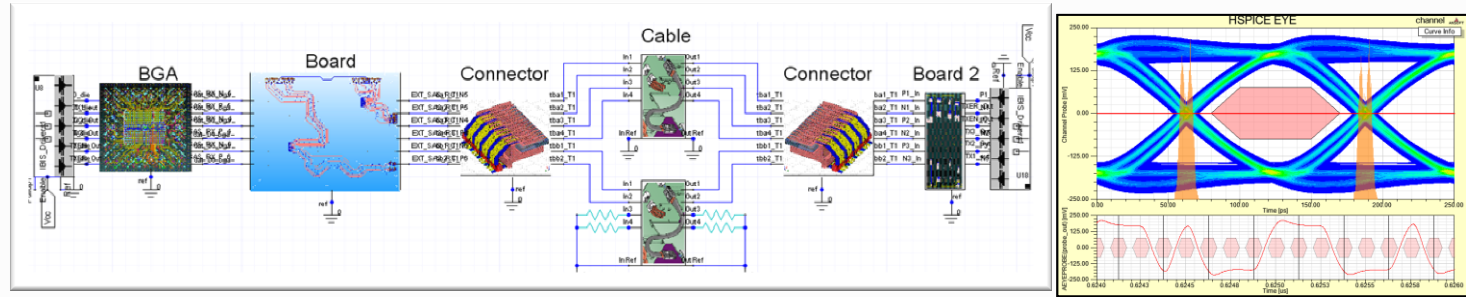
Structural Mechanics

Electromagnetics

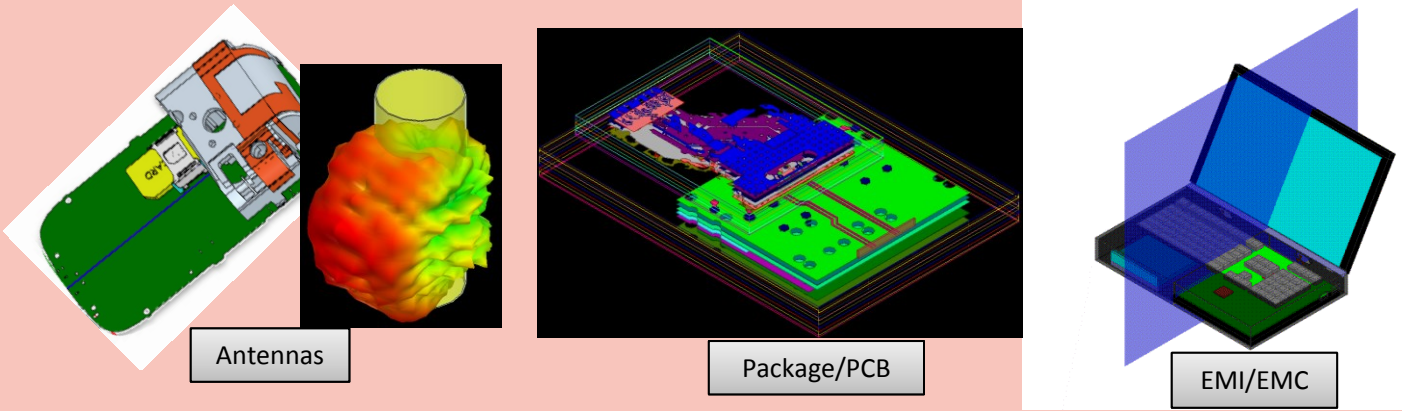
Systems and Multiphysics

**Ansys Germany****Atte Focho**

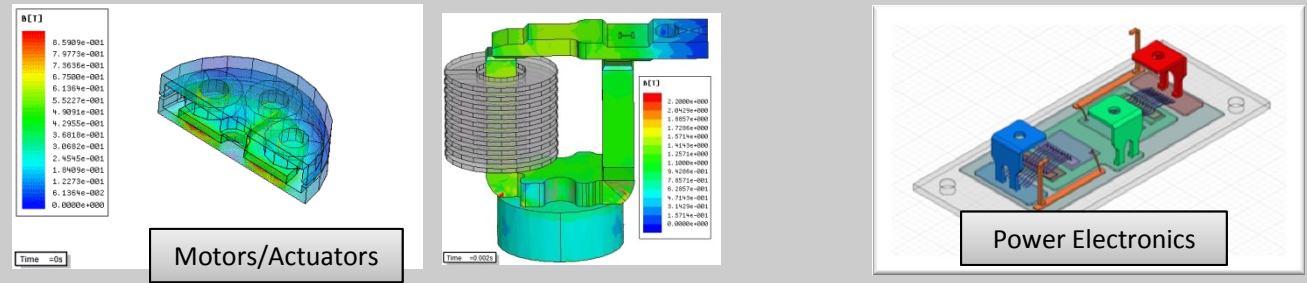
Circuit & System Design



RF and SI Physical Design

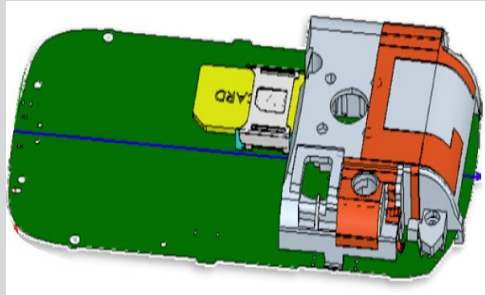


Electromechanical Physical Design



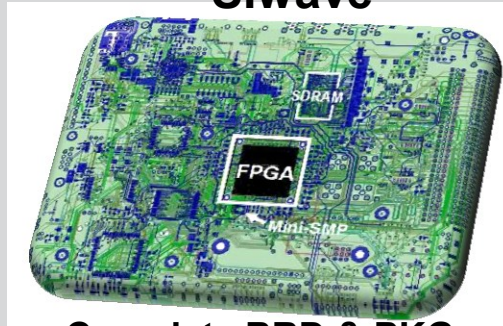
*“Complete Electronics System Solution”*

## HFSS



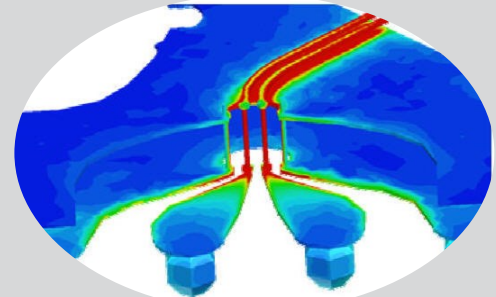
**3D Full-Wave  
Field Solutions**

## SIwave



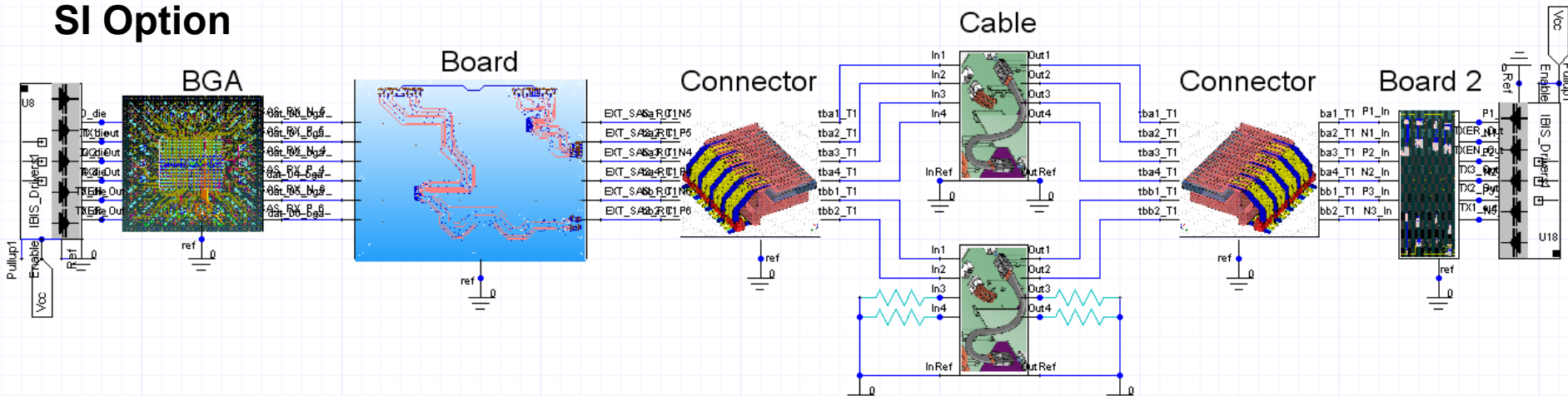
**Complete BRD & PKG  
Analysis**

## Q3D Extractor



**3D Quasi-Static  
Field Solutions**

## SI Option

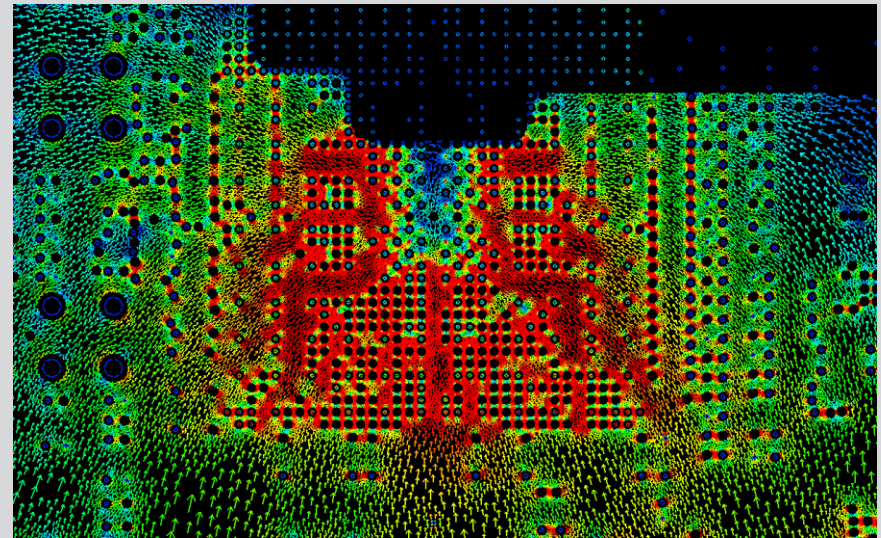


# Signal Integrity, Power Integrity and EMI

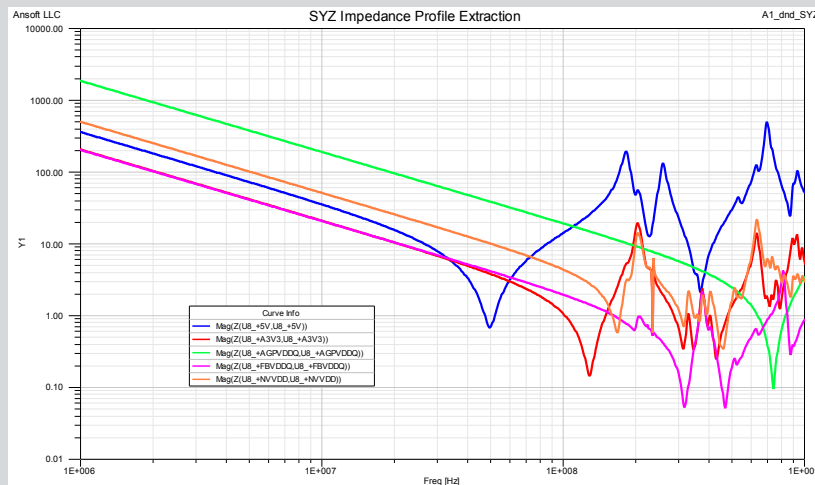
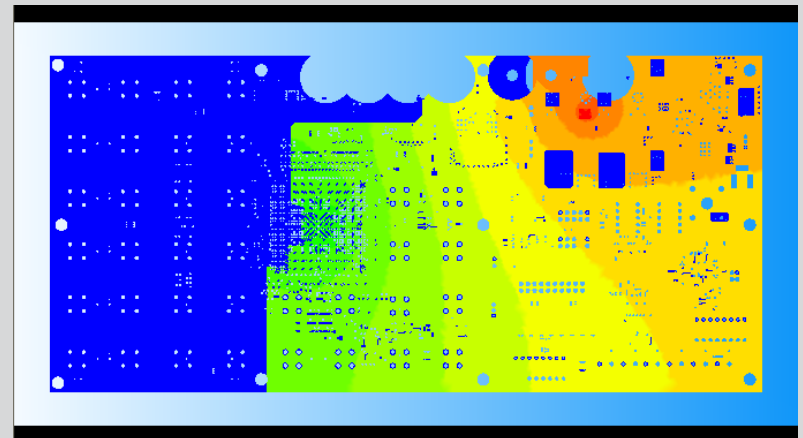
## What is SIwave

- Hybrid 2D full wave EM field solver
- Models layered structures
- Analysis performed
  - Signal Integrity
  - Power Integrity
  - DC IR drop analysis
  - EMI/EMC
  - Decoupling capacitor optimization

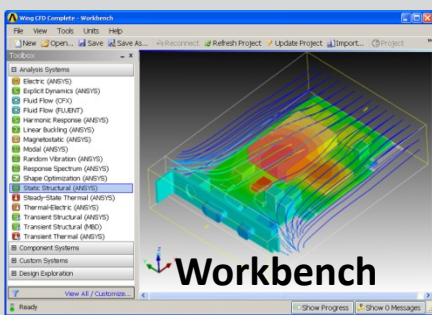
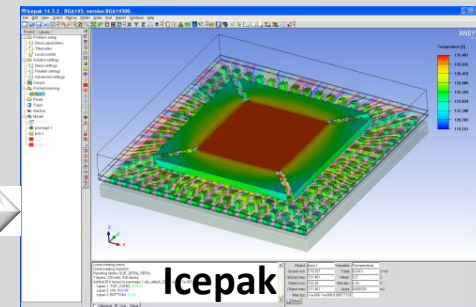
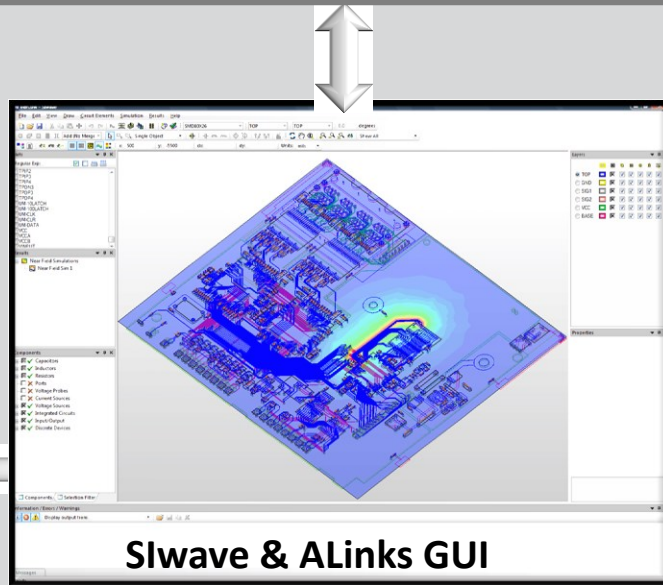
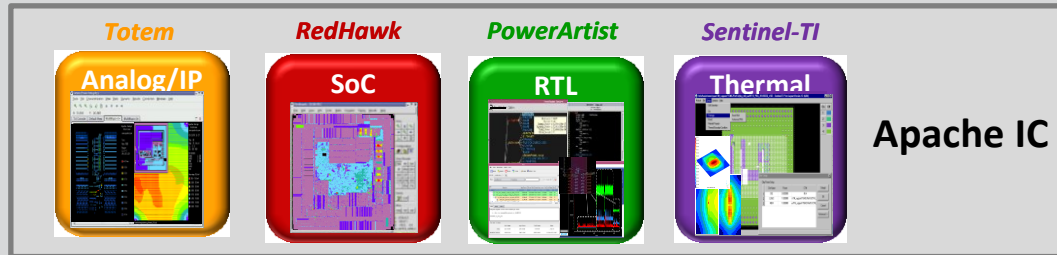
### Current Density Distribution



### Voltage Loss Distribution



# Slwave Multiphysics Platform



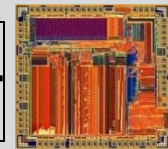
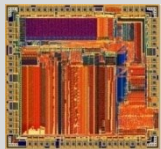
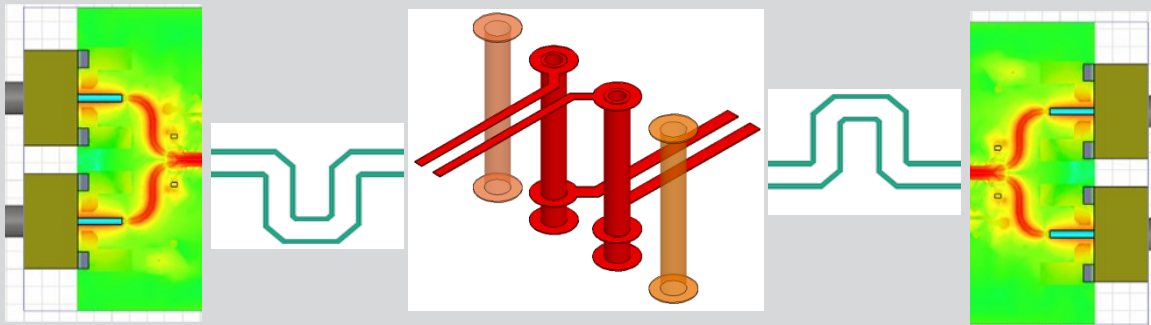
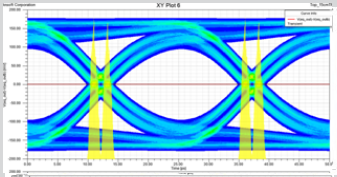
HFSS

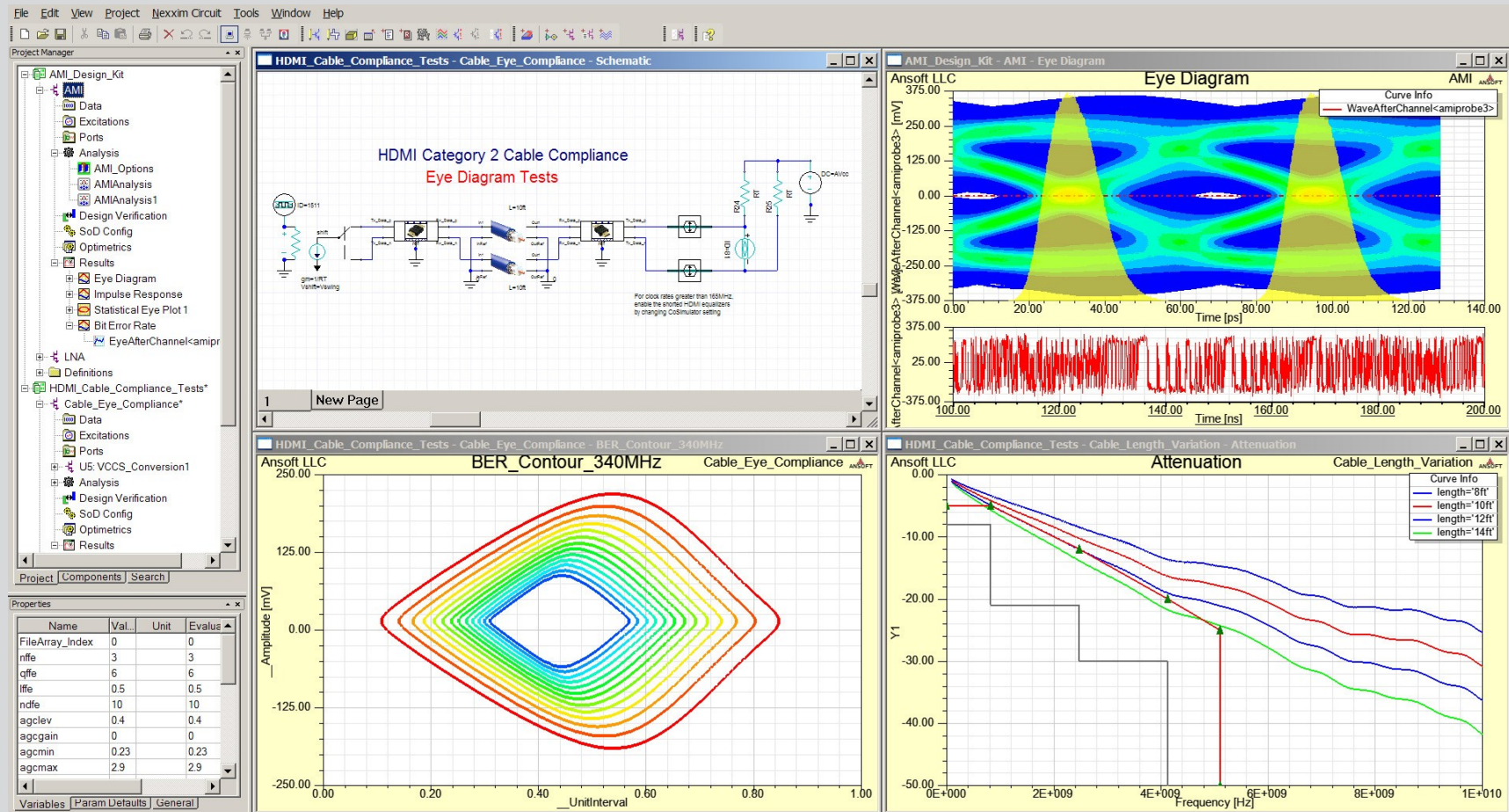
SI Option

Slwave

Q3D Extractor

- Signal will see many discontinuities in its path
- Discontinuities will distort signal quality and reduce overall bandwidth of the system





- Circuit Simulator- Nexxim Engine (transient, fast convolution, statistical and IBIS-AMI circuit simulation)
- Integrated Schematic capture and layout tool
- Design management front-end linking EM simulation products (HFSS, Q3D, Slwave, ..)
- 2D quasi-static field solver
- HFSS Solver on Demand

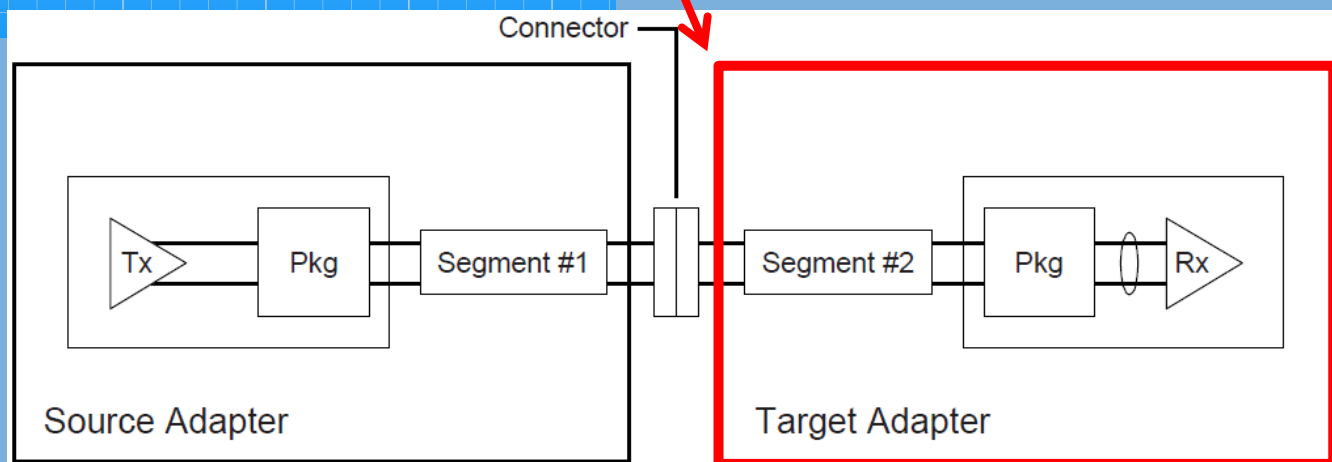
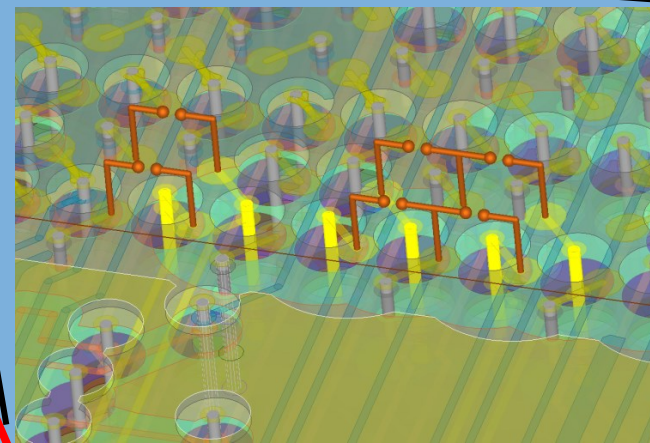


**Test Case:**

**PCIe 8GT/s channel**

# PCI Express 8 GT/s channel test case -SIwave

Three diff pairs on the target Adapter for the edge connector to pads.



# PCI Express 8 GT/s channel test case - HFSS

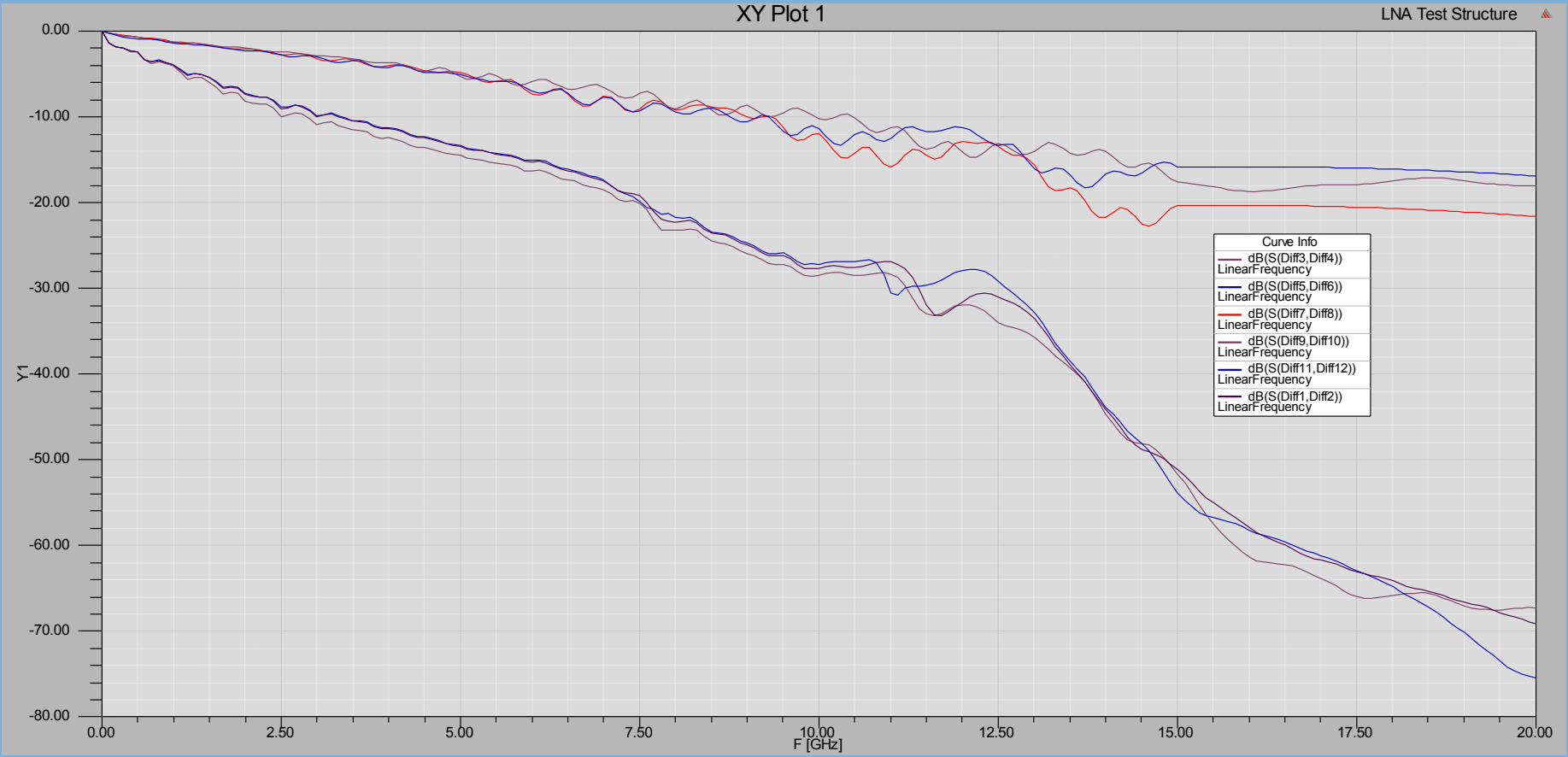
The screenshot displays the ANSYS HFSS software interface. The main window shows a 3D model of a PCB layout with a blue grid. A 'Simulation Setup' dialog box is open in the foreground, with the 'General' tab selected. The dialog box contains the following information:

- General Tab:**
  - Setup Name: HFSS
  - Solution Frequency: 20 GHz
  - Adaptive Solutions:
    - Maximum Number of Passes: 10
    - Maximum Delta S: 0.02
    - Save currents for last adaptive pass
  - Start simulation after export
  - Invoke HFSS for ECAD in non-graphical mode.
  - Create Ports for Pwr/Gnd
  - Component List:
    - DUMMY
    - GND
    - VCC\_1V5
    - VCC\_2V5
    - VCC\_3V3
    - 12V
    - MGT\_AVCC
    - MGT\_AVTT

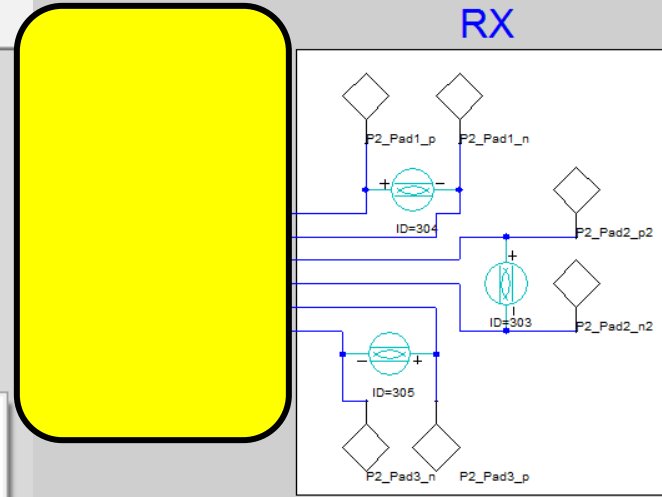
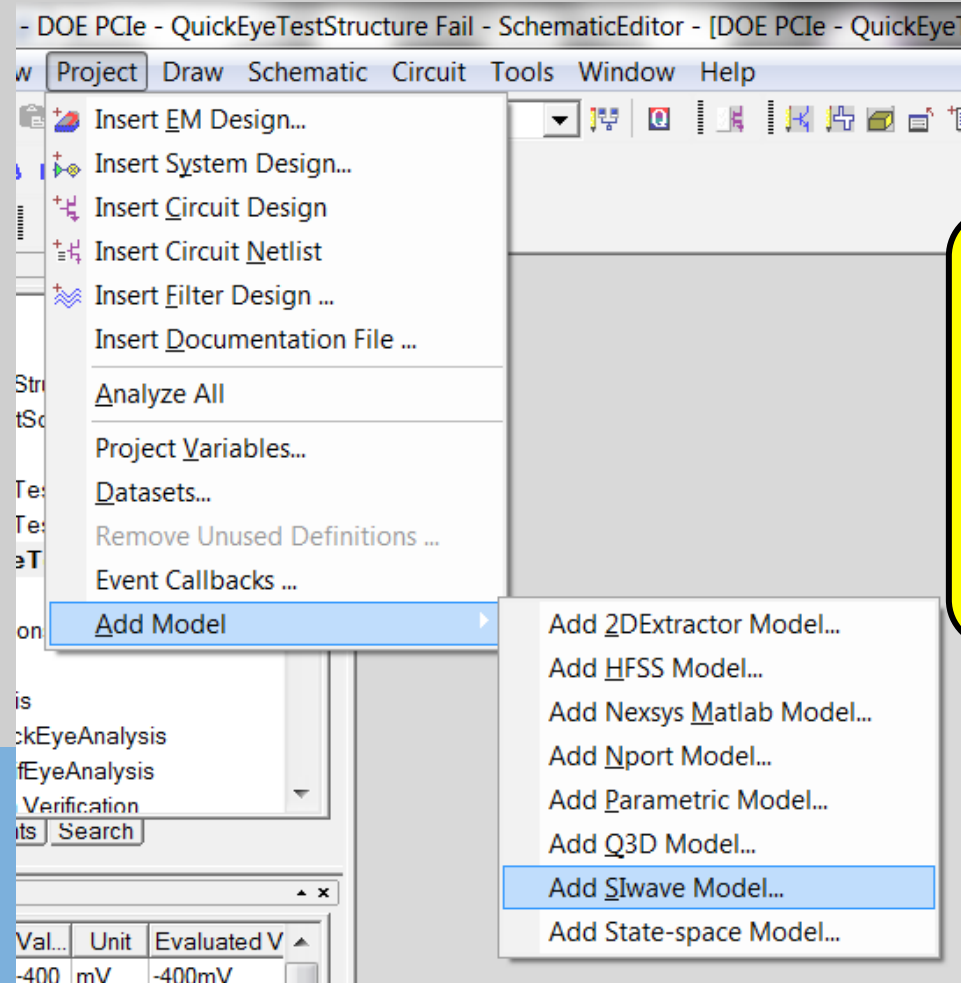
At the bottom of the interface, a progress bar shows 'Setup: 100%' and 'Simulation: 0%'. A yellow oval highlights a button in the bottom-left corner of the software interface.



# PCI Express 8 GT/s channel test case



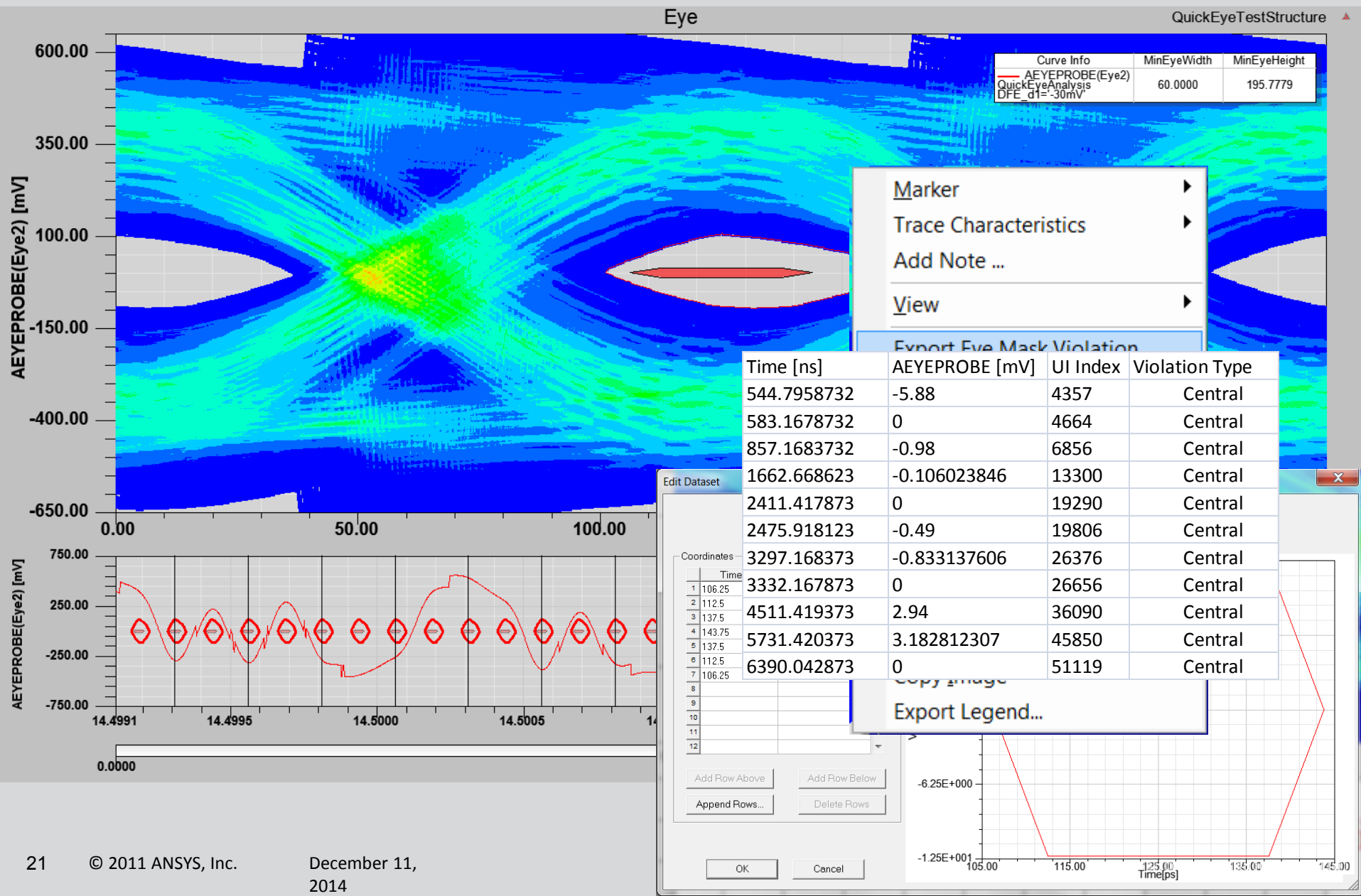
## Channel Simulation



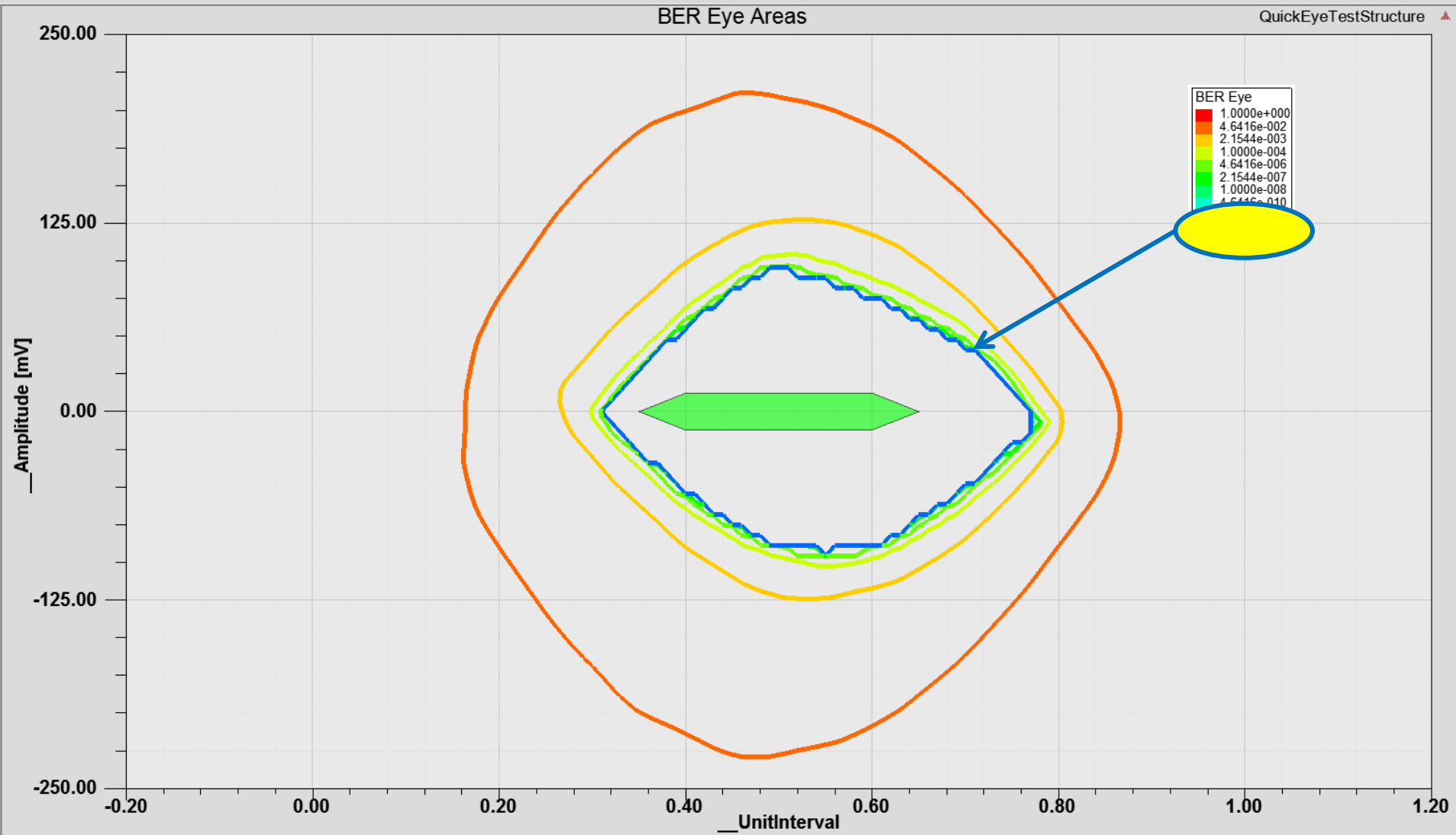
Rx:

- 1 tap DFE
- 1<sup>st</sup> Order CTLE

# HFSS SI – Time domain specification



# HFSS SI – Time domain specification



# HFSS SI – Time domain specification

