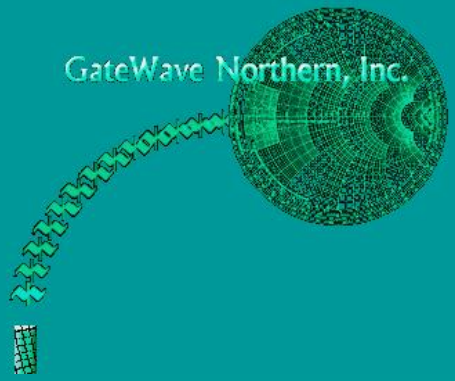
GateWave Northern

Socket/connector to PCB interface optimization



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GateWave Northern, Inc.
6200 Gisholt Dr. Ste. 205
MONONA,WI 53713 USA
608-224-1250
g.hohenwarter@gatewave.com

Objective and approach

- Demonstrate need for proper selection of PCB parameters to achieve optimal socket or connector performance
- HFSS 3D field simulator with model of a PCB section plus socket / connector
- Unoptimized cases plus quick/fully optimized cases

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Why via field optimizations

- Insertion loss (S21) minimization
- Return loss S11 optimization
(perhaps even more important than S21)
- Crosstalk forecast and budgeting
- Effective inductance determination
- Timing and jitter analysis and adjustment
- Waveform/eye diagram improvement

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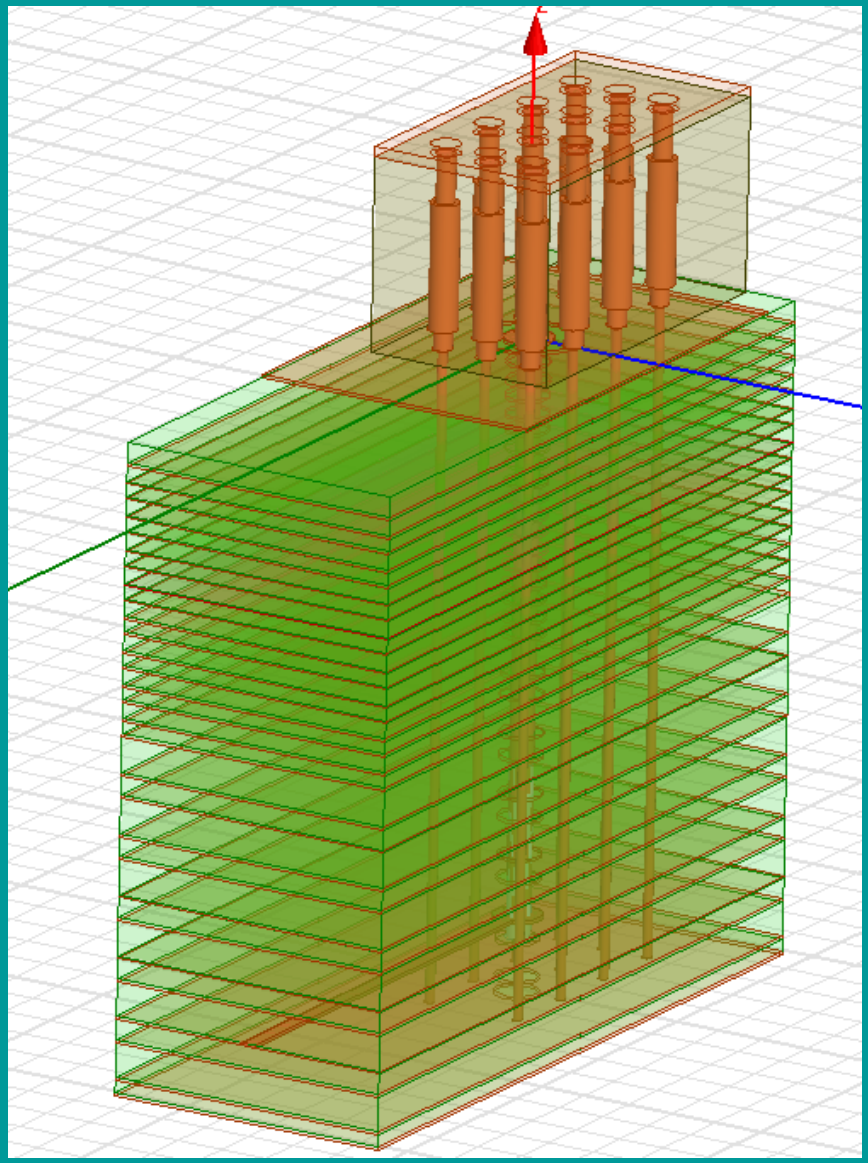
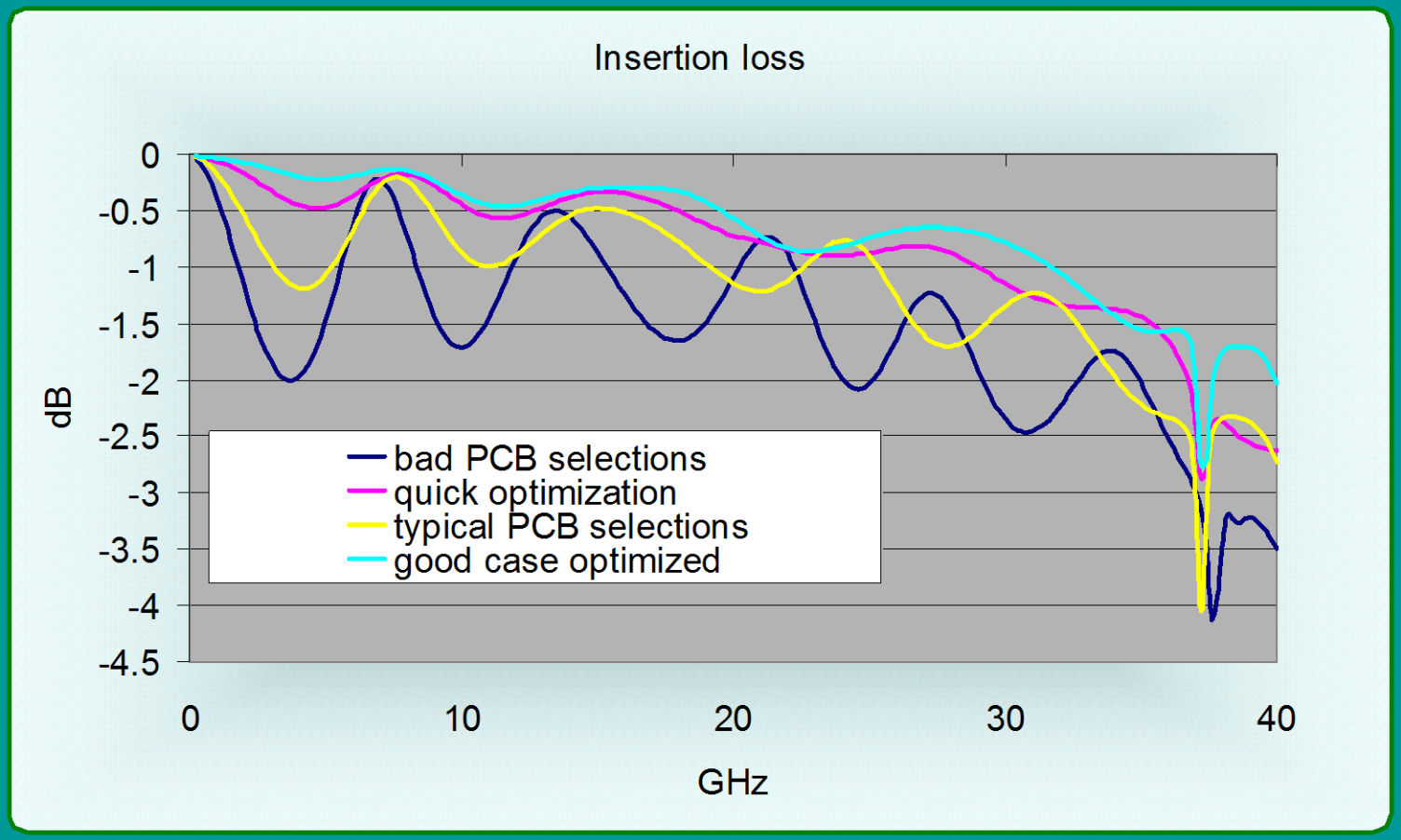
Setup

Multi-layer PCB with a basic pogo pin socket example.

Feed via stripline near bottom layer.



Insertion loss S21



Insertion loss varies greatly depending on PCB parameter selections (pad and antipad sizes)

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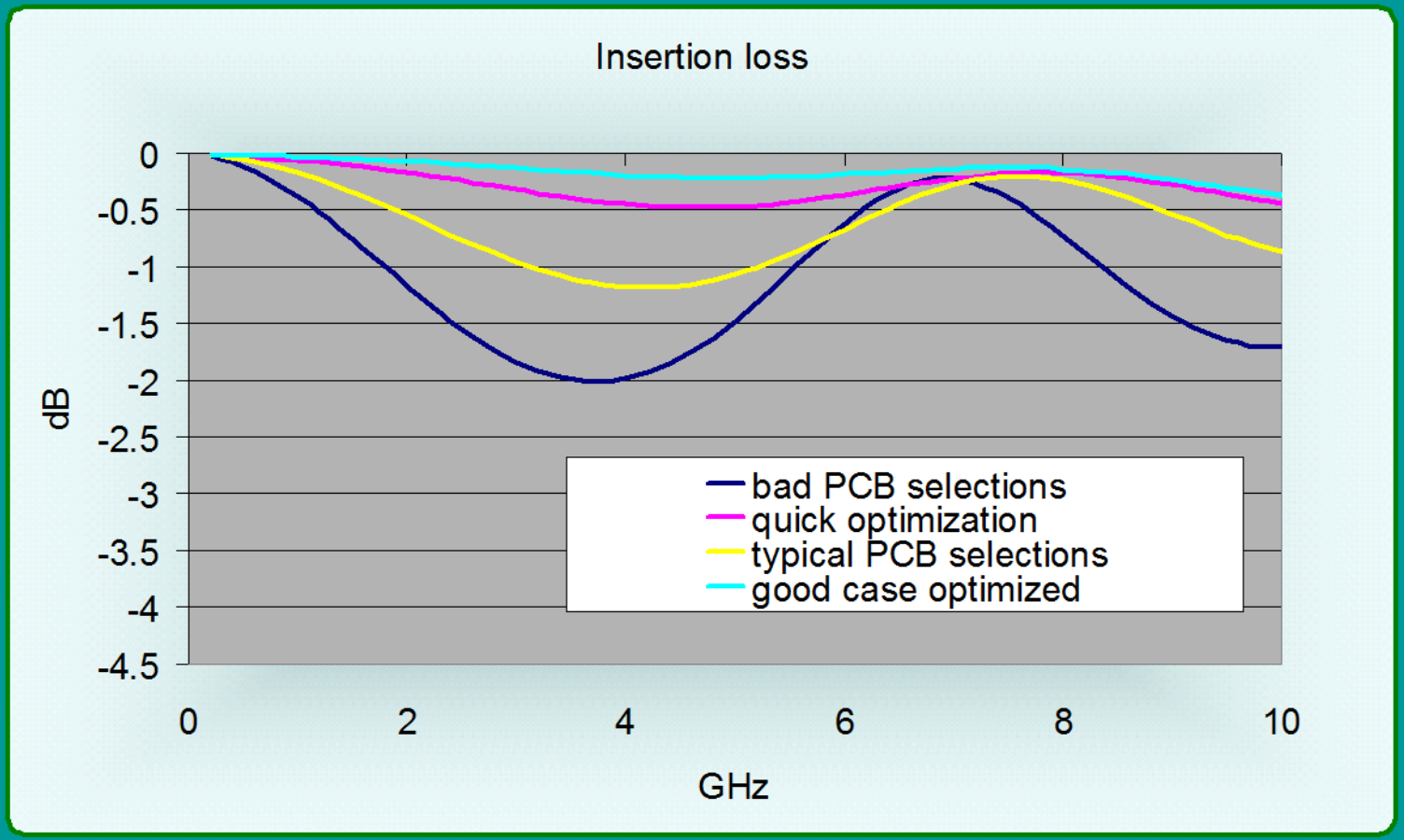
Insertion loss S21



Substantial differences exist even at lower frequencies

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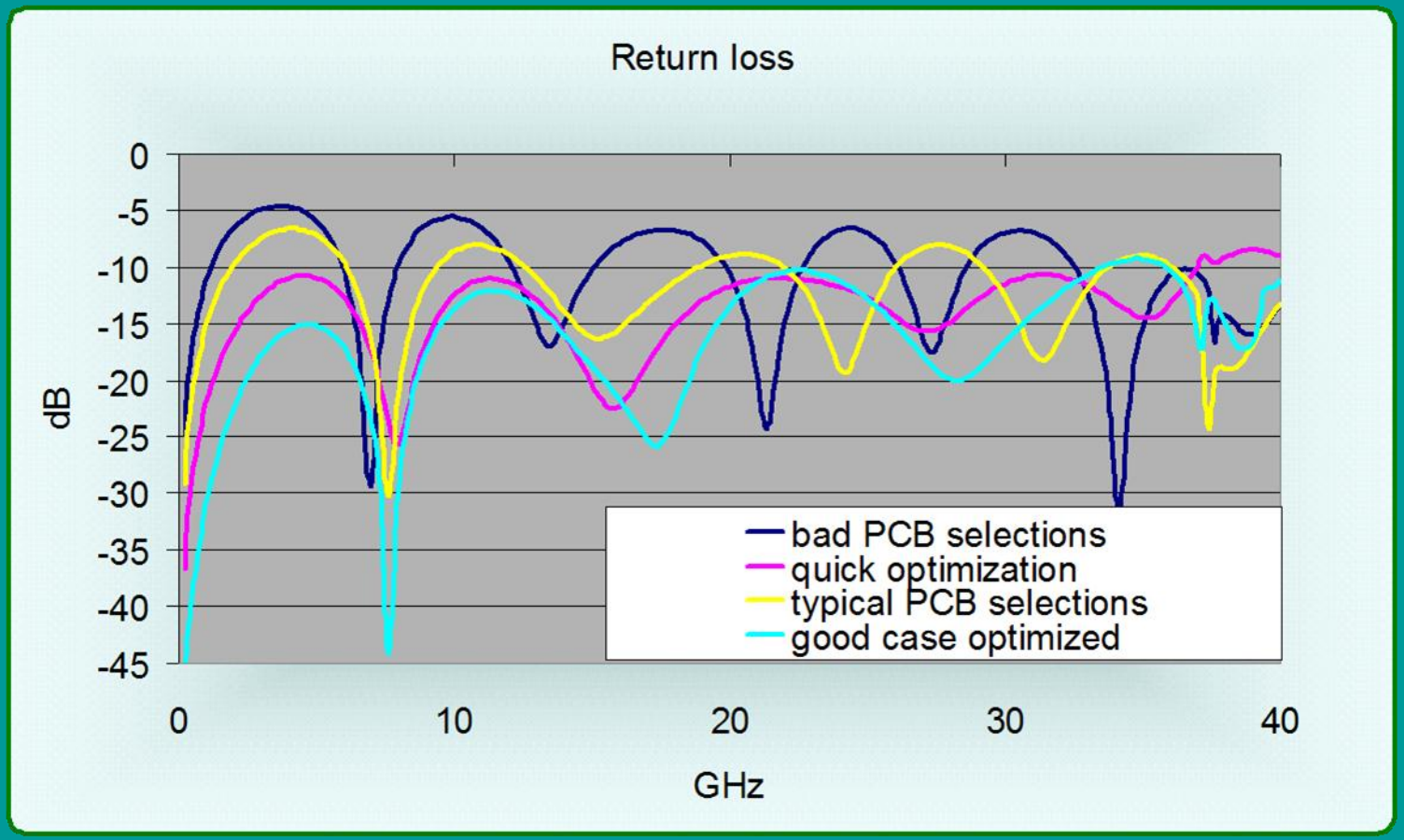
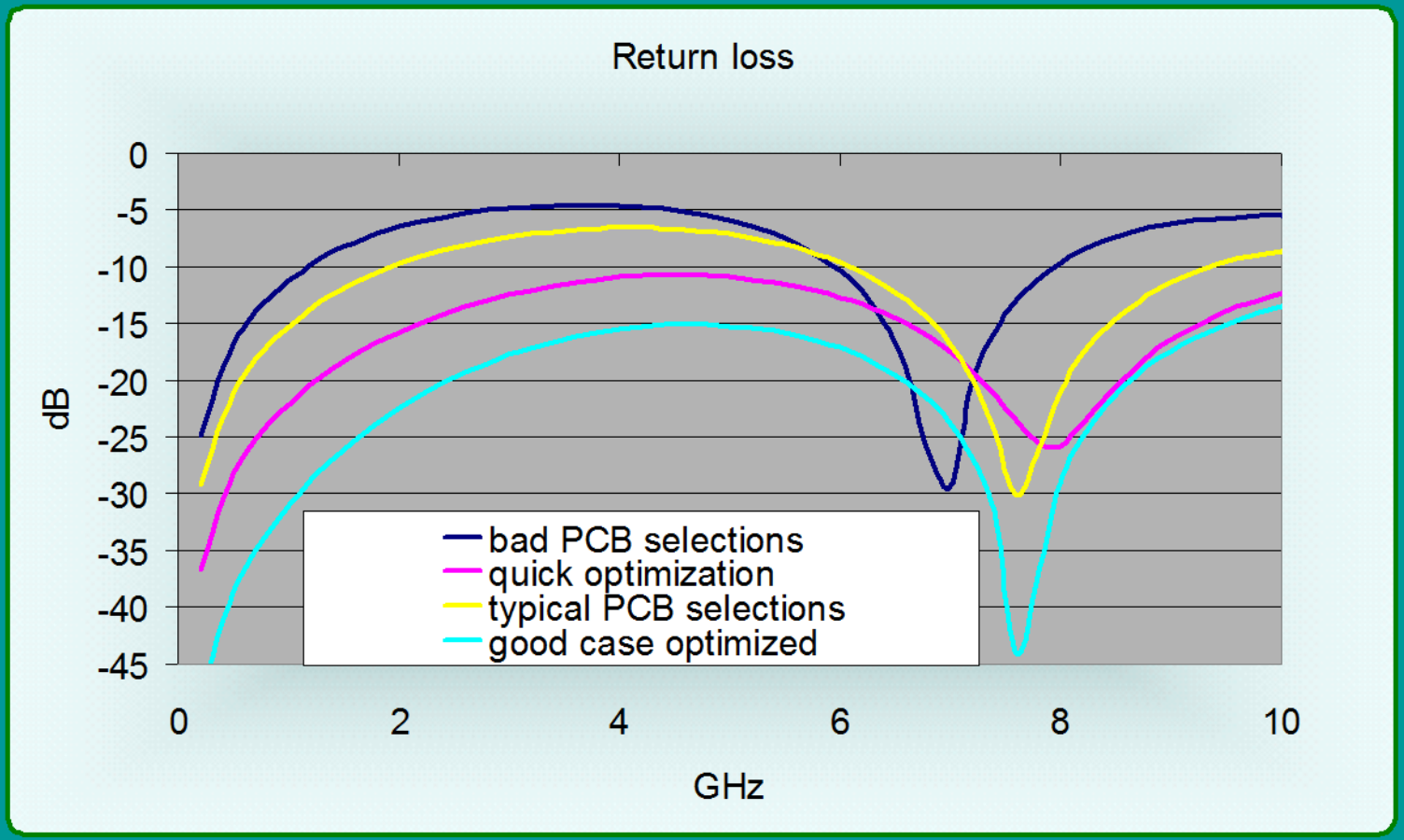
Return loss S11



Return loss varies greatly depending on PCB parameter selections (pad and antipad sizes)

Return loss S11



Substantial differences exist even at lower frequencies

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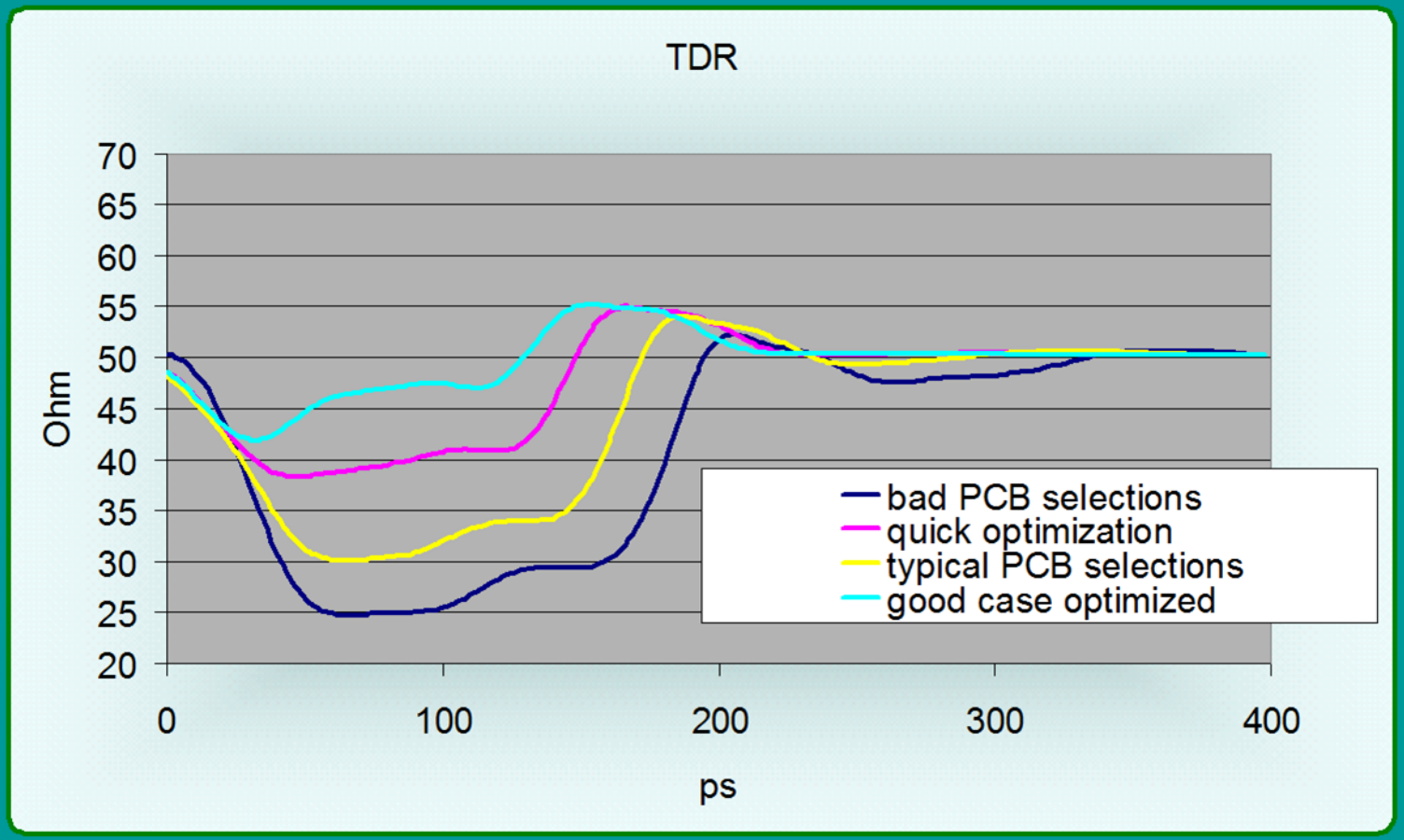
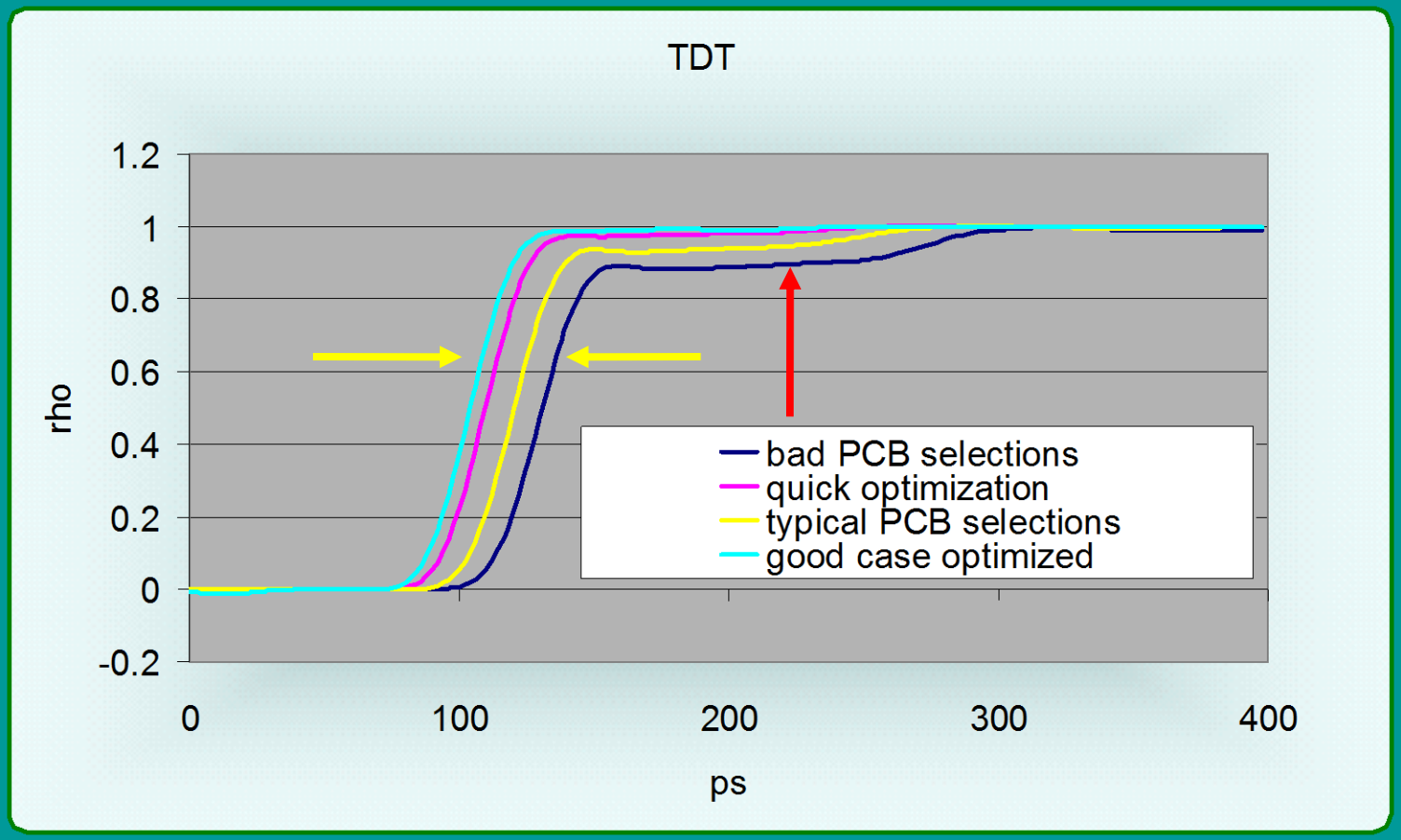
TDR



Impedance levels can vary greatly depending on parameter selection

TDT



Flat in rise can seriously degrade performance and perhaps even inhibit operation (red arrow)
Timing differences can exist between paths of different levels of performance and optimization

Summary

- Optimization of the PCB design offers substantial performance improvements
- This is generally true for all configurations from stripline to micro-strip lines
- Material choices, pad and anti-pad sizes are examples of parameters available for optimization
- Improperly designed transitions into a PCB can eliminate any advantage of a high performance socket/connector
- Interface must be optimized together with a specific socket or connector