Channel Proposal to IEEE 802.3 Ethernet over the Backplane

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Objectives

- Re-state channel construction assumptions
- Show example backplane data in comparison to parameters for informative channel model
- Indicate general support for proposed channel model

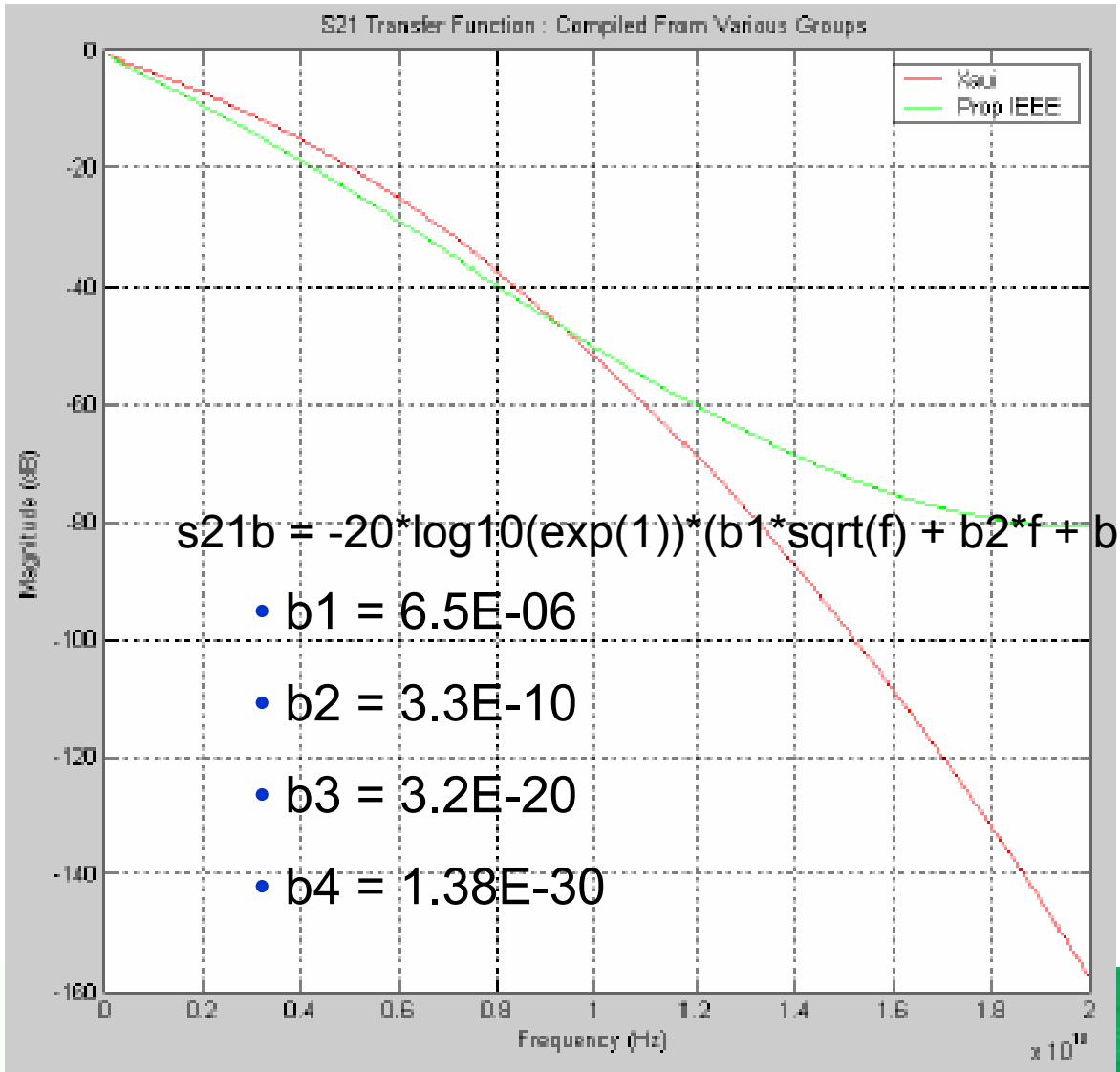
Application Assumptions

- Application target
  - Higher volume / Lower cost than OIF application
  - Decent connectors
  - Benign via and launch characteristics
  - Improved FR4
  - 40 inch maximum distance
  - Project economically justified on high volume sweet spot of ATCA at 31 inches

Channel Development Approach

- Define informative bounding method
- Select informative levels, considering…
  - Channel
  - Signaling
- Select compliance methodologies
  - e.g. Stat Eye

Joel's Initial Proposal



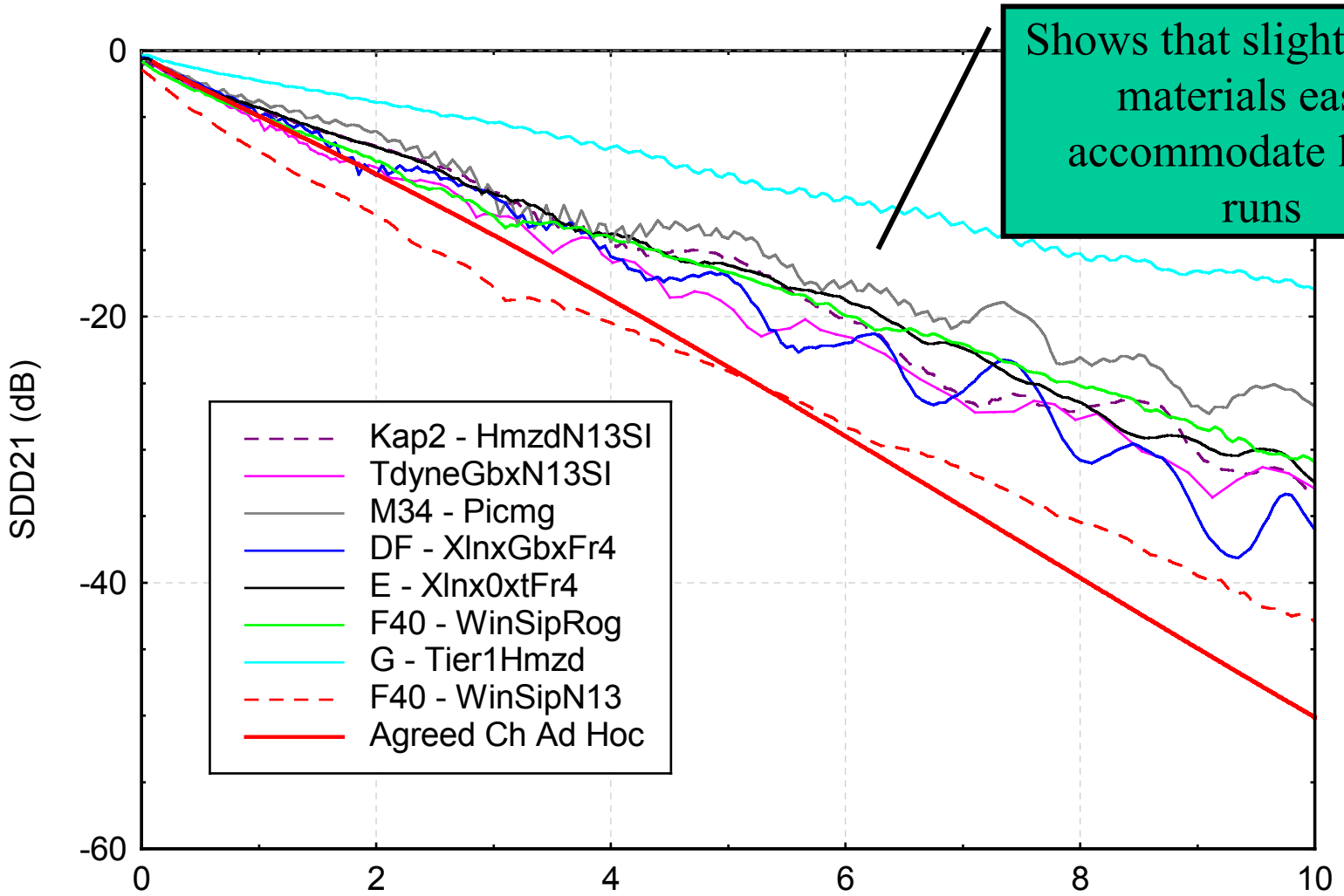
s21b = -20*log10(exp(1))*(b1*sqrt(f) + b2*f + b3*f.^2 - b4*f.^3);

- b1 = 6.5E-06
- b2 = 3.3E-10
- b3 = 3.2E-20
- b4 = 1.38E-30

Channel Model Bounds

- General alignment with Joel's initial proposal
- Use equation methodology
- Seems to fit with reasonable channel construction assumptions and examples
- Propose that Loss applies with maximum crosstalk

Backplanes wrt Proposed SDD21

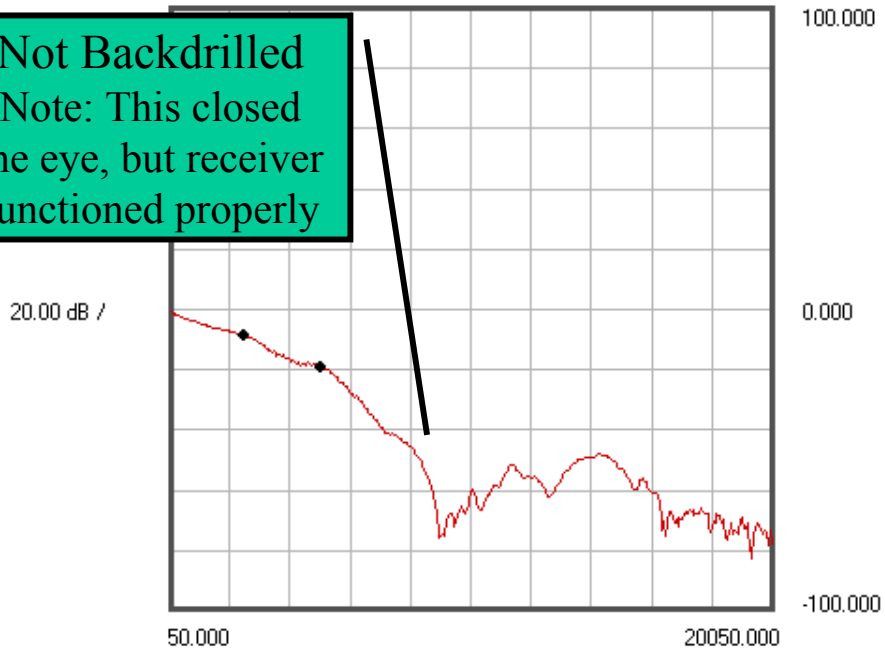


SDD21 ATCA Example

J120-AB5 to J1623-CD3
23.6" total,
(19.6" on Layer 2 + 4" Line Cards)

SDD12

Not Backdrilled
Note: This closed the eye, but receiver functioned properly

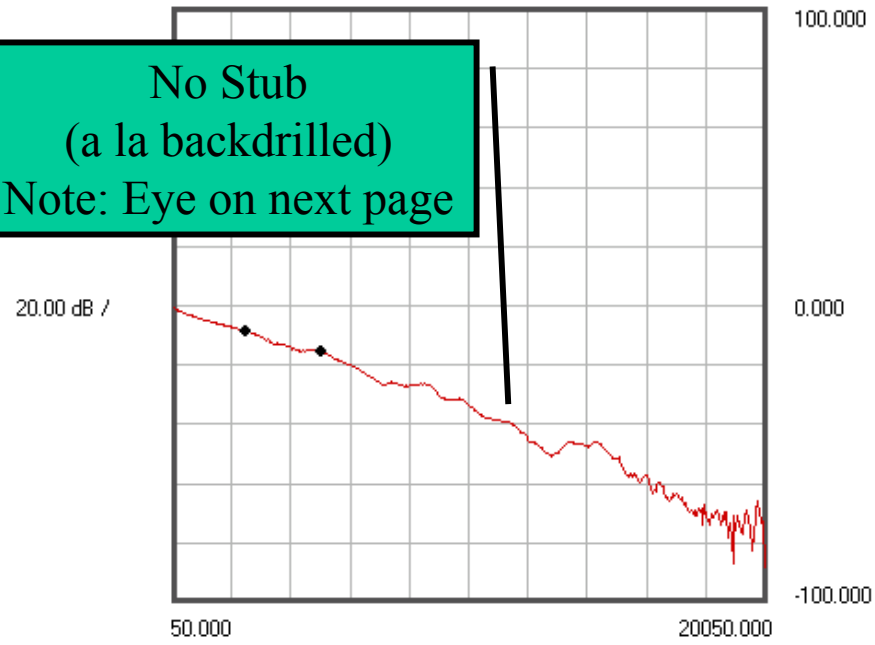


2500.000 -8.787 dB <---
5000.000 -18.996 dB

J220-AB6 to J1623-CD2
24.5" total,
(20.5" on Layer 17 + 4" Line Cards)

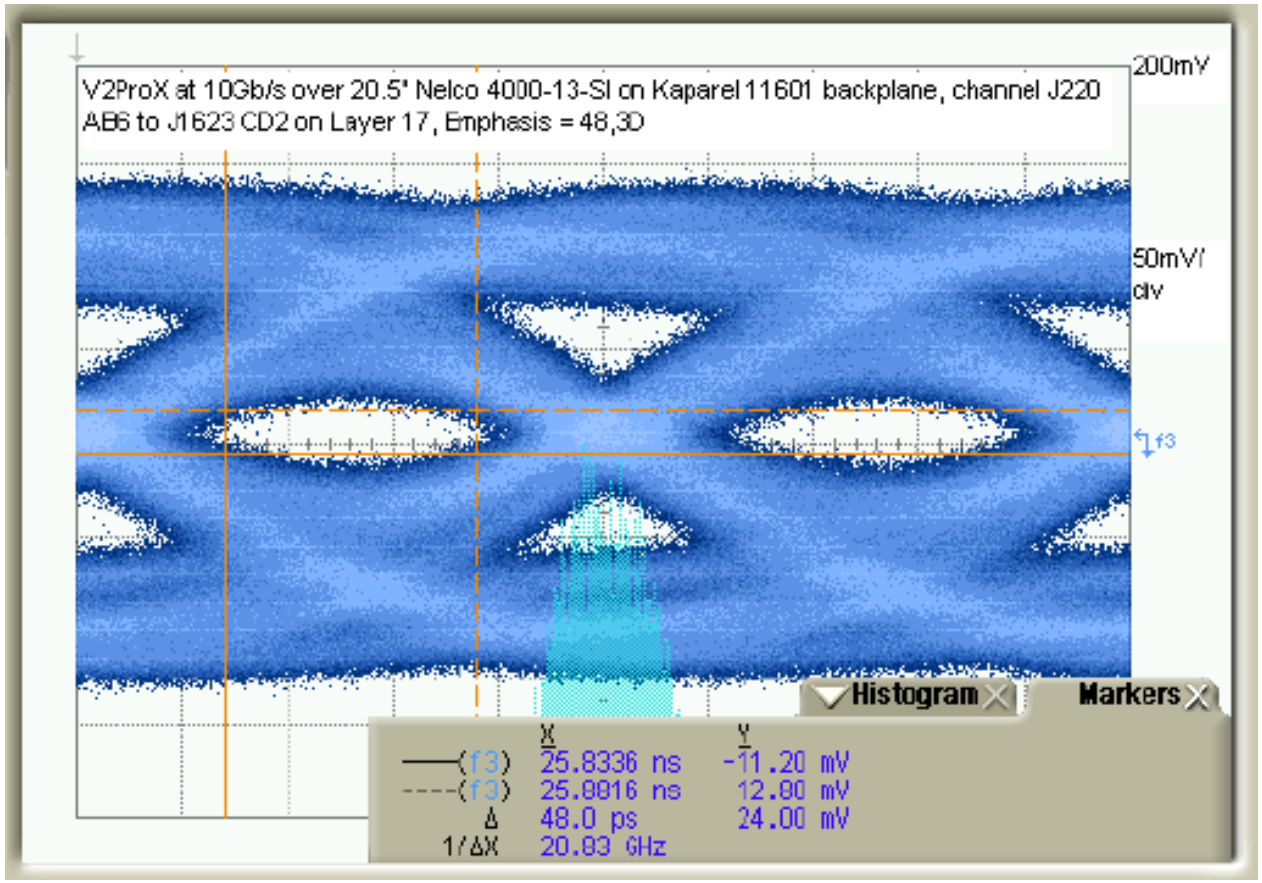
SDD12

No Stub
(a la backdrilled)
Note: Eye on next page



2500.000 -8.669 dB <---
5000.000 -15.549 dB

10Gbps Silicon over ATCA

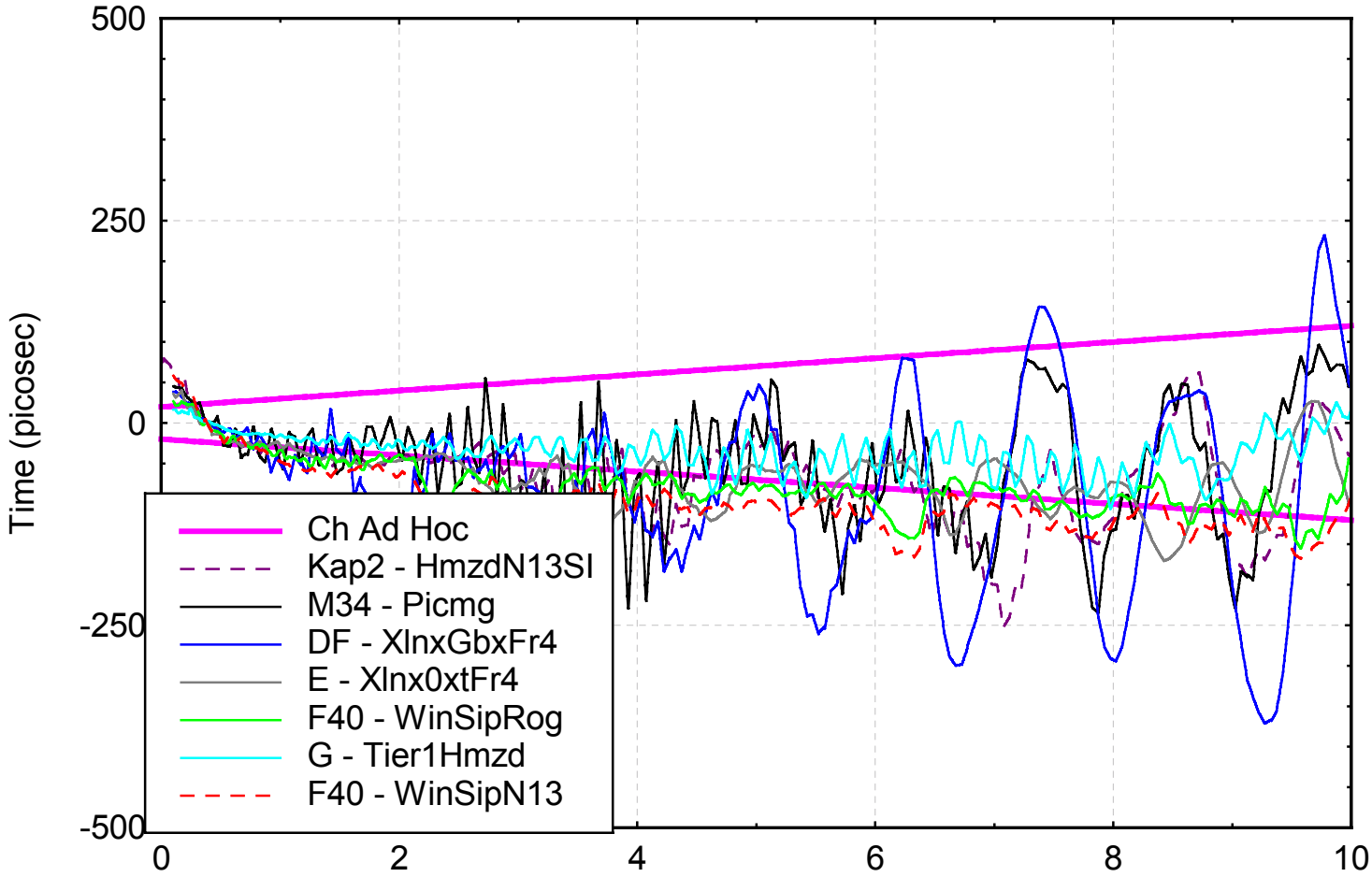


Slot 1-15 on
Full Mesh ATCA
20.5” BP
+2x2” Probe Card
+2x3” Si Board
=30.5 inches
Non-optimal
Probe card
BER<10^12
Xtalk yet to test

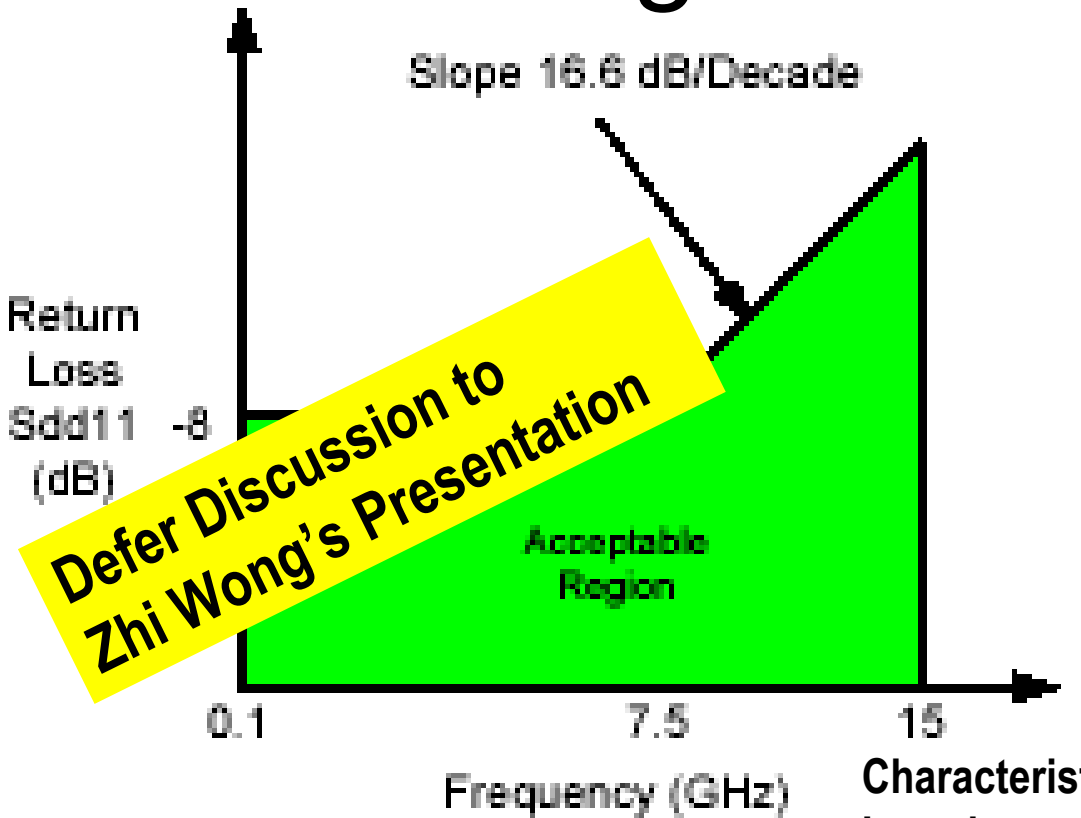
SDD21 Phase

- Well-behaved, well-designed channels will generally have well-behaved phase
- Possibly not a 1st order spec driver

Backplanes wrt Proposed SDD21 Phase



SDD11 magnitude

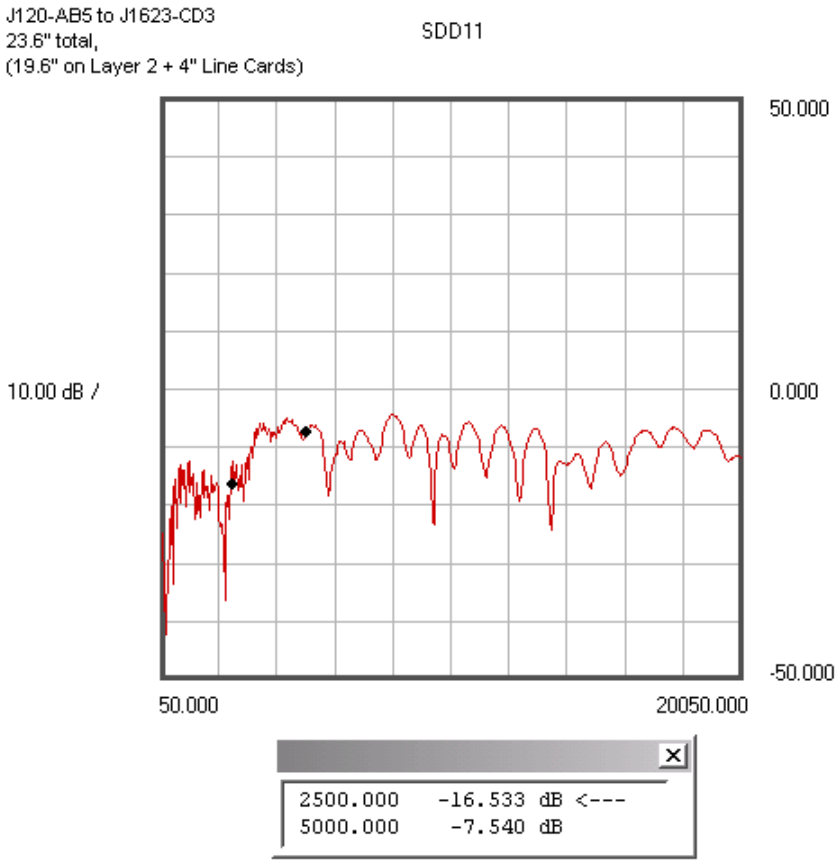


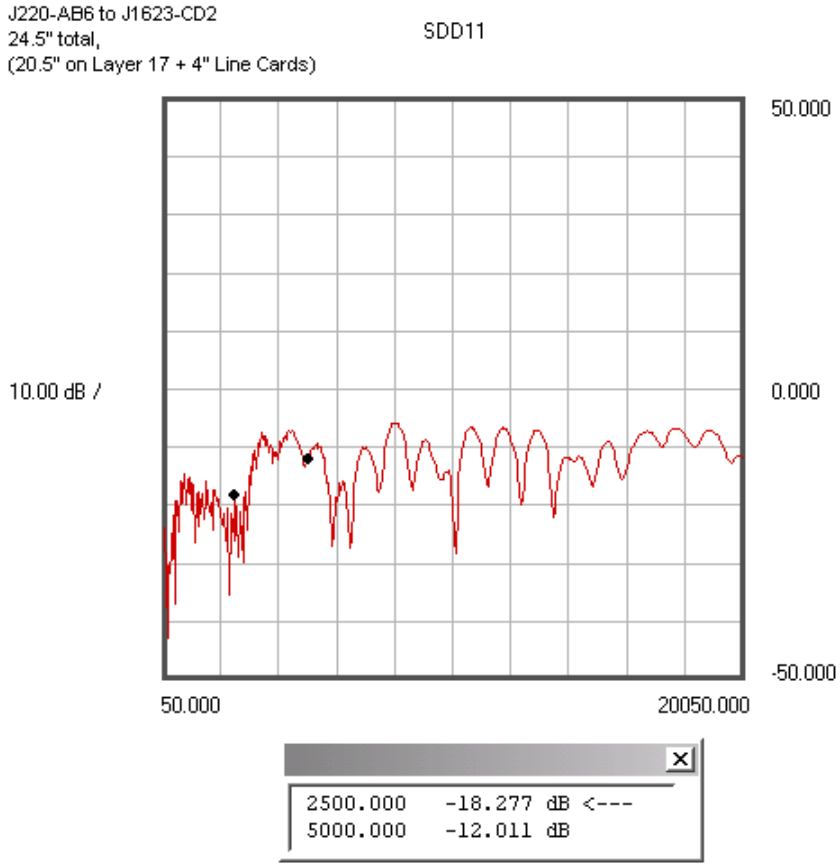
Defer Discussion to Zhi Wong's Presentation

Characteristic Reference Impedance = 100ohm differential

- Acceptable Differential Return Loss (Tx and Rx)

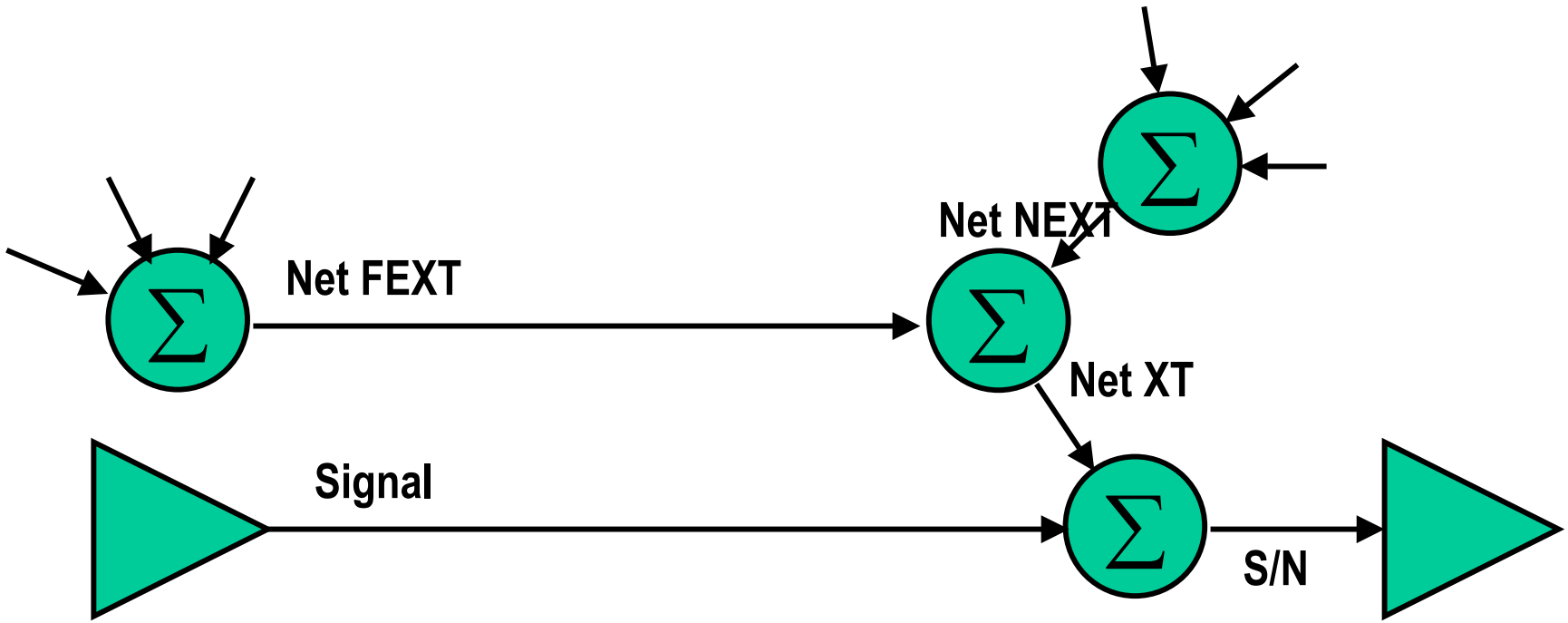
SDD11 ATCA Example





Crosstalk Net Effect

Multi-Input / Single Output

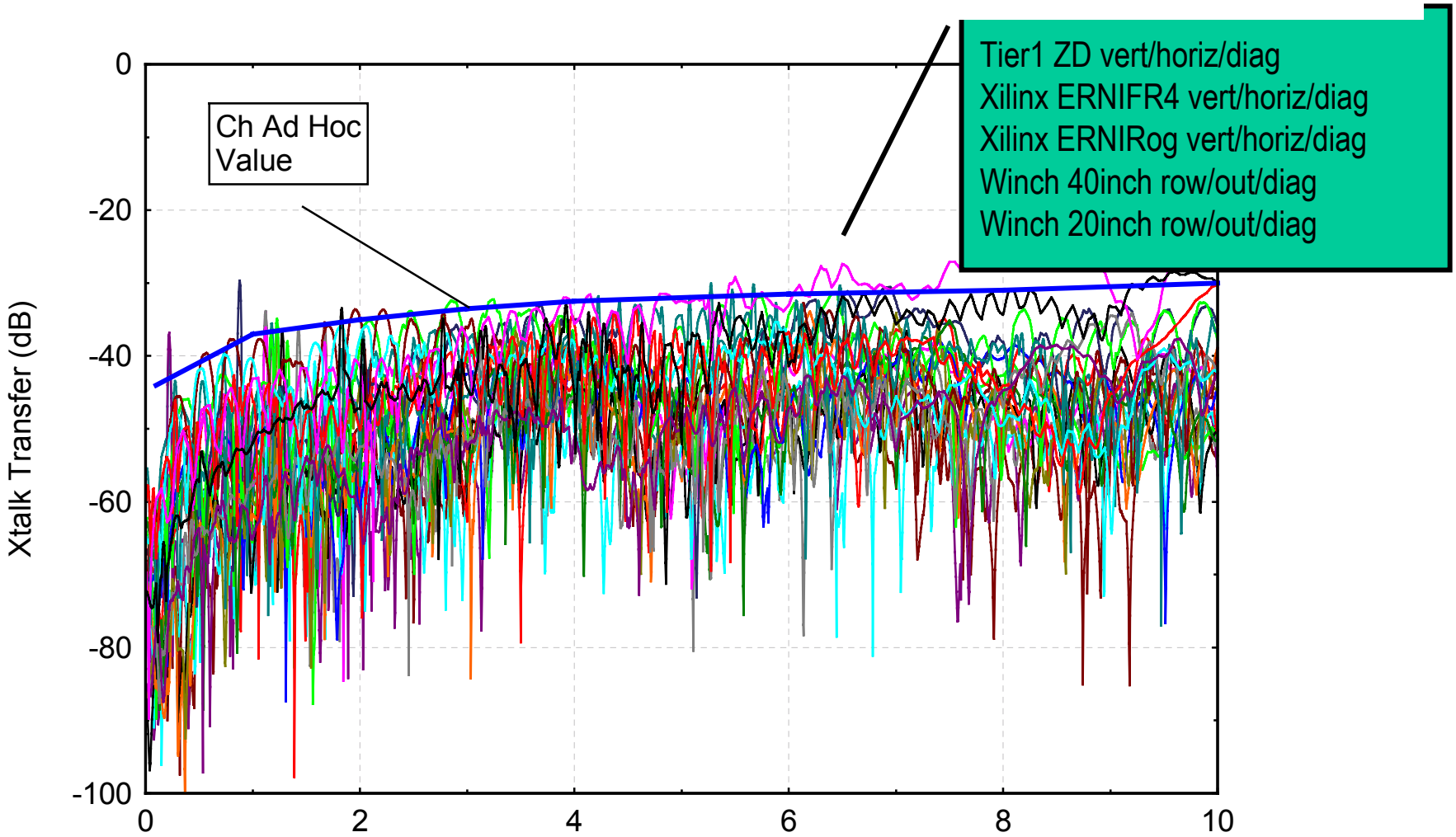


This is what the Rx really has to deal with

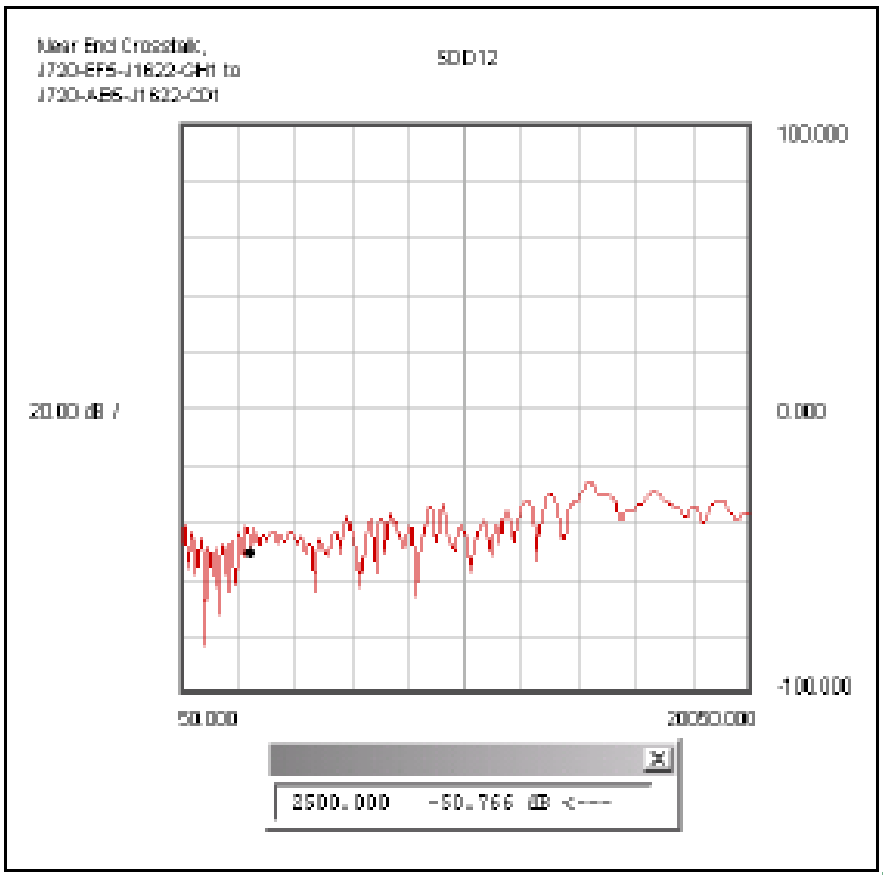
Crosstalk

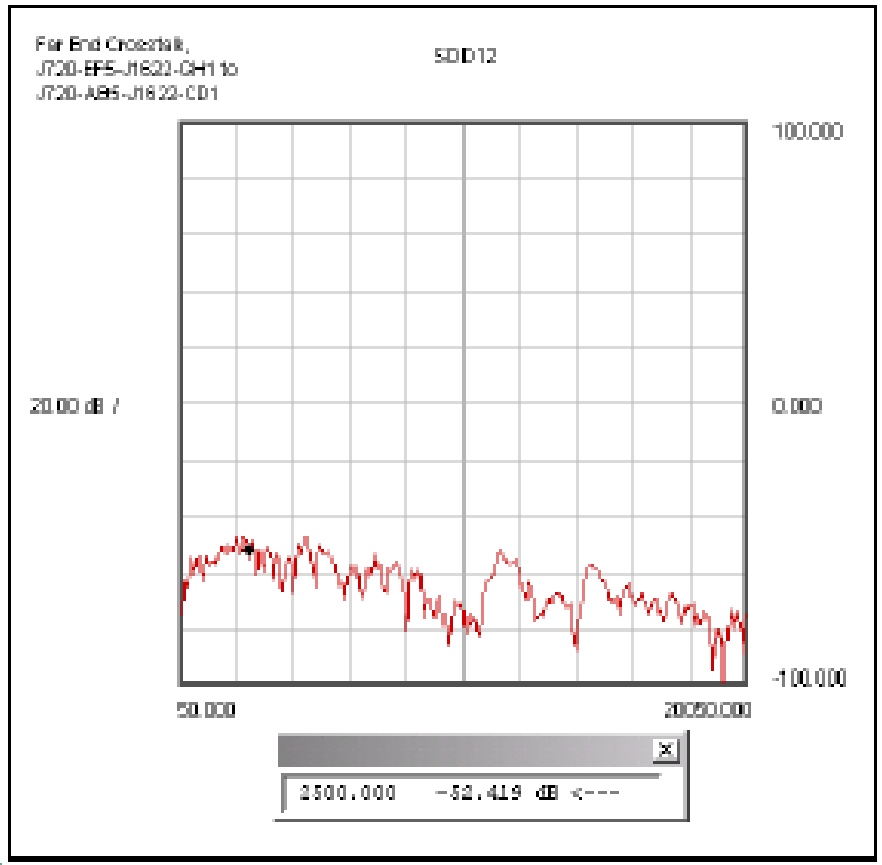
- Output of channel does not need to know where crosstalk came from…
  - Multi-input / Single output situation
  - Don’t need to specify NEXT and FEXT separately
- Lower loss channels can suffer more crosstalk, so…
- Specify SNR
  - Channel output after loss - Net crosstalk energy > 10dB
  - Maybe not an issue if only worst case loss channel is where this applies

Backplanes wrt Proposed Crosstalk



Crosstalk ATCA Example





Conclusions

- Lines proposed by Joel Goergen set at a reasonable lower compliance bound
- Existence proofs exist to support this
  - Numerous example backplanes
  - ATCA Full Mesh example from manufacturer
    - ATCA volume was used as the project justification
- Recommend/support adopting the informative channel model as proposed and proceeding to next steps

Reference Slides

Transmitter Electrical Specs

Parameter	Value	Suggested Deltas
Baud Rate	10.0Gps	
Xmt Level Vdiff	800mvpp – 1200mvpp	
Vcm		Must show relationship to Rx Power Supply voltage
VcmAC		
Diff Impedance	100ohms	Use same graph as Sdd11
Diff Impedance Tolerance	+/- 20ohms	
Xmt Template	See spec	
Xmt Rise and Fall	30pS	
Xmt DJ	0.17 UI pp	Track CEI
Xmt RJ	0.27 UI pp	
Xmt RL	-10 db @ 312-625 MHz -10+10log(f/625) @ >625MHz	-8 dB

Receiver Electrical Specs

Parameter	Value	Justification
Baud Rate	10.0Gps	
Diff Input Level	1200mvpp	
Vcm		
VcmAC		
Diff Impedance	100ohms	Use same graph as Sdd11
Diff Impedance Tolerance	+/- 20ohms	
Rcv RL	-10 db @ 312-625 MHz -10+10log(f/625) @ >625MHz	-8dB
Receiver Coupling	AC	DC Coupling Normative
BER	1E-12	