Improved HVM ATCA Models Update

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intel

Situation

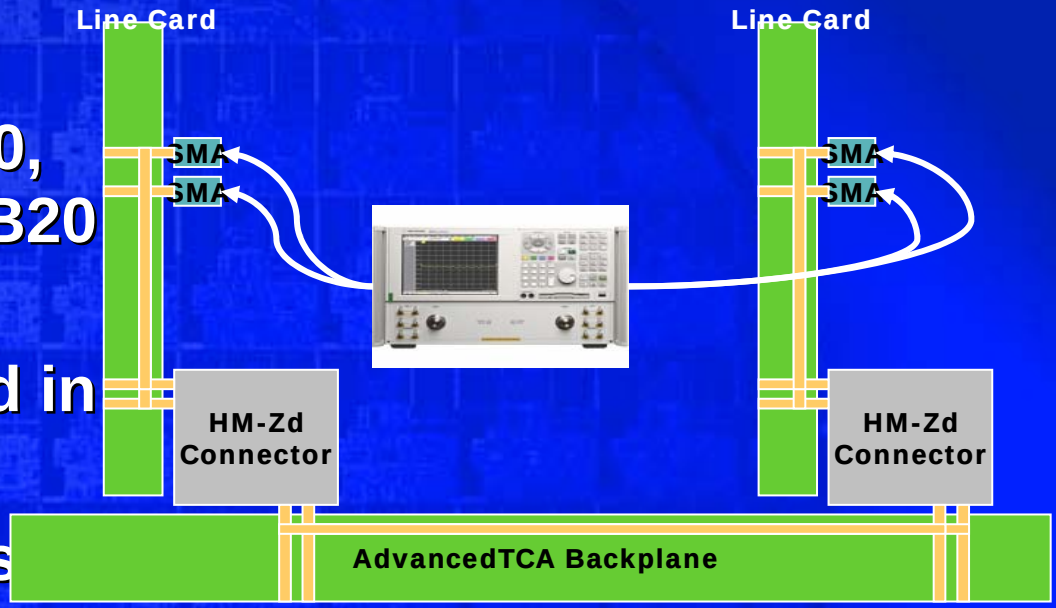
- 8 sets of channel models (peters_01_0904) were submitted to the task force
  - Measurements of a test system without some optimizations
- 'Improved' models of HVM ATCA systems were presented in March that represent the expected performance of these systems.
  - The models' thru response and return loss were correlated to a limited set of measurements of a production backplane with most of the 'improvements' incorporated.
  - The models were used to predict the thru performance of a variety HVM ATCA systems with the design improvements that correspond to the 8 submitted measured channel models.

Objectives

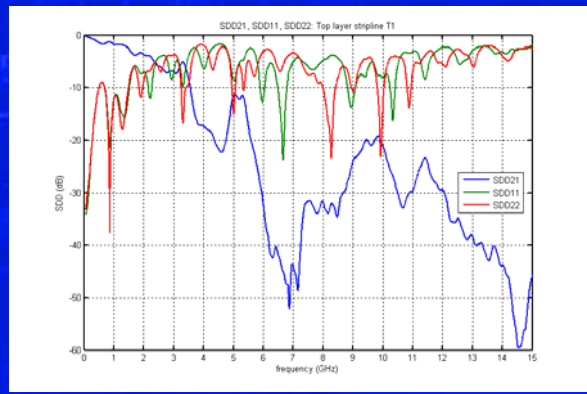
- Validate the predictions of the ‘improved’ models
- Provide new data sets based on the new measurements
  - A new test system has been designed and fabricated which incorporates the design ‘improvements’
  - Some preliminary data is available

Intel Channel Models

- 8 channels T1, T12, T20, M1, M20, B1, B12 and B20
- Original measured channels are described in peters_01_0904
- Channel improvements and synthesized 'improved' models are described in peters_01_0305.



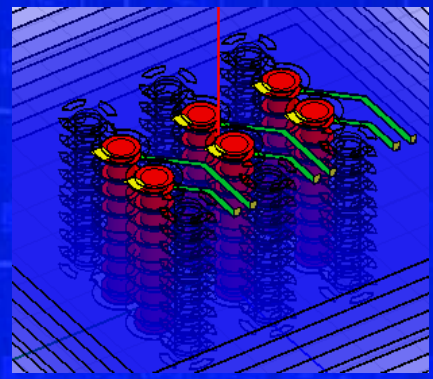
Measurement Setup



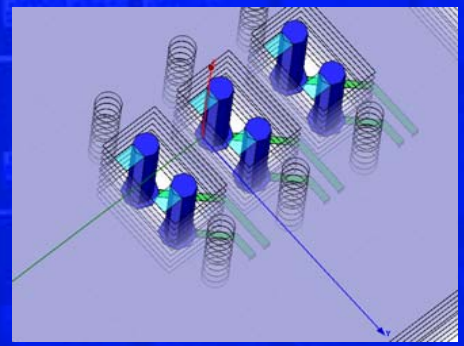
T1 Channel THRU Measurement

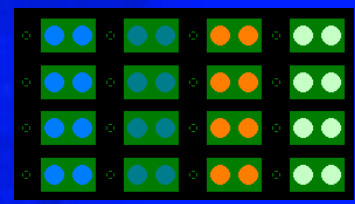
‘Improved’ Via / Pad Design

- The peters_01_0904 channels use default manufacturing techniques for HM-Zd connector footprint via design.
- The improved design features a rectangular anti-pad and removal of non-essential pads.
- The improved design is compatible with HVM design practices and has been implemented in Intel’s production backplane as well as backplanes from other vendors.



Peters_01_0904 channels via design





Improved via design

Differences in the 'improved' design

- Improved HMZD footprint via design
  - Rectangular antipad
  - Remove non-essential pads
- Increased loss on the line cards
  - Lower cost N4000-6 material
  - Increased trace length

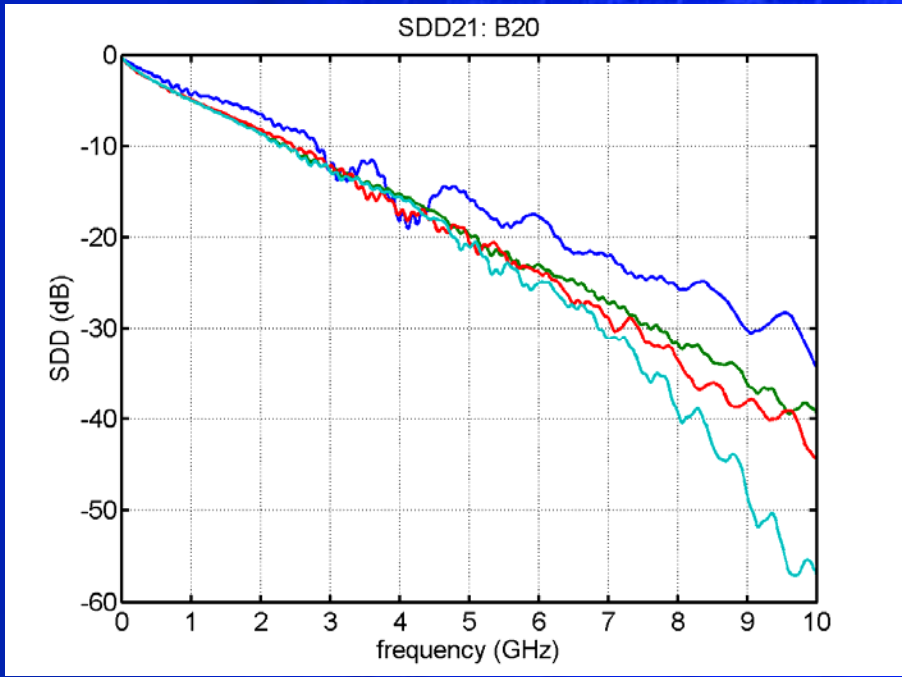
Channel data comparisons

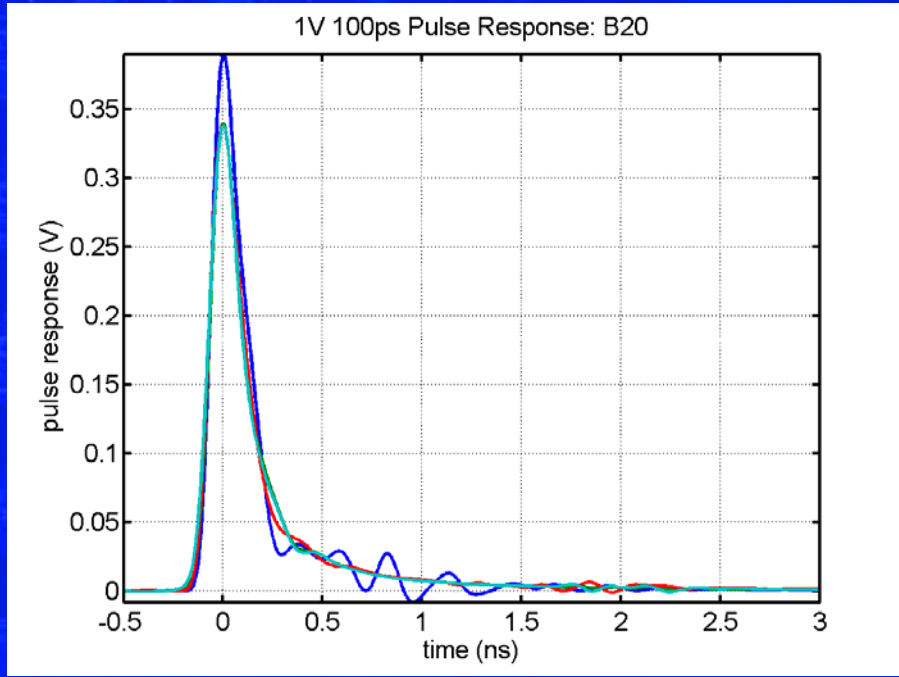
Channel characteristics

	Line card material	Line card trace length	Line card routing layer	HM-Zd footprint
T channels	Nelco 4000-13	2.7”, 3.2”	top, middle	default
M channels	Nelco 4000-13	4.8”, 3.8”	bottom, middle	default
B channels	Nelco 4000-13	2.3”, 3.0”	top, middle	default
‘Improved’ T channels	Nelco 4000-6	5”,5”	top, middle	improved
‘Improved’ M channels	Nelco 4000-6	5”,5”	middle, bottom	improved
‘Improved’ B channels	Nelco 4000-6	5”,5”	top, middle	improved
Synthesized channels	High Tg FR-4	5”,5”	bottom, bottom	improved
Alternate synthesized channels	High Tg FR-4	5”,5”	top, top	improved

B20 Thru Response

Peters_01_0904 measurement models
Peters_01_0305 synthesized models
'Improved' system measurements
Alternate synthesized models





B20 Return Loss

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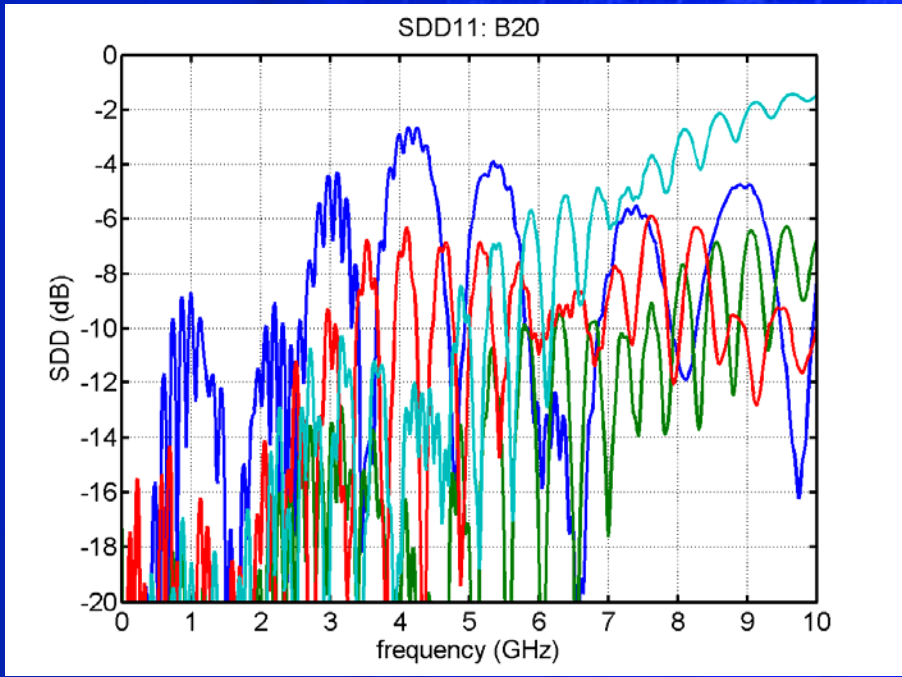

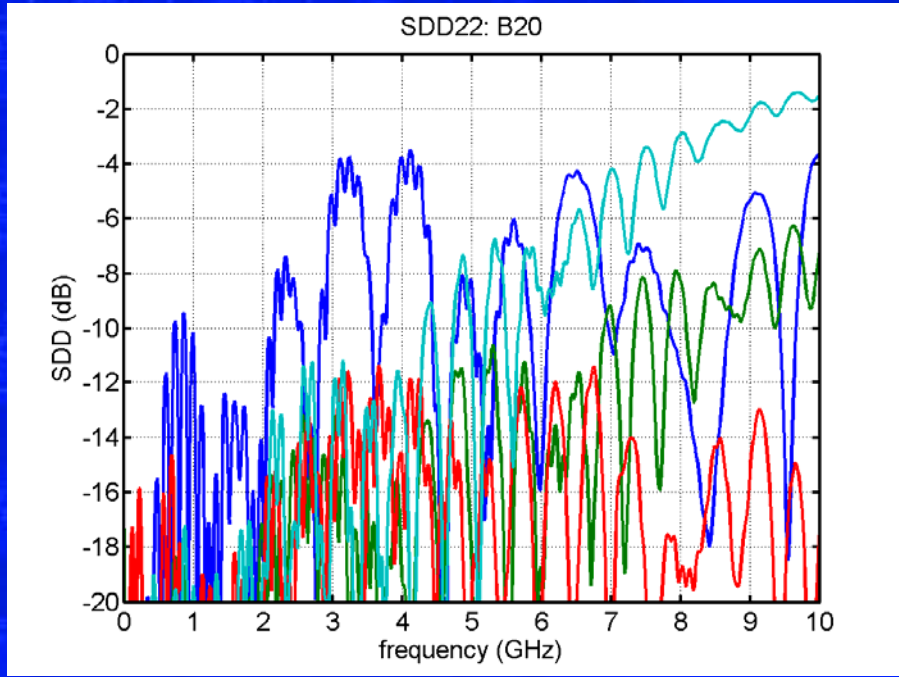

T20 Thru Response

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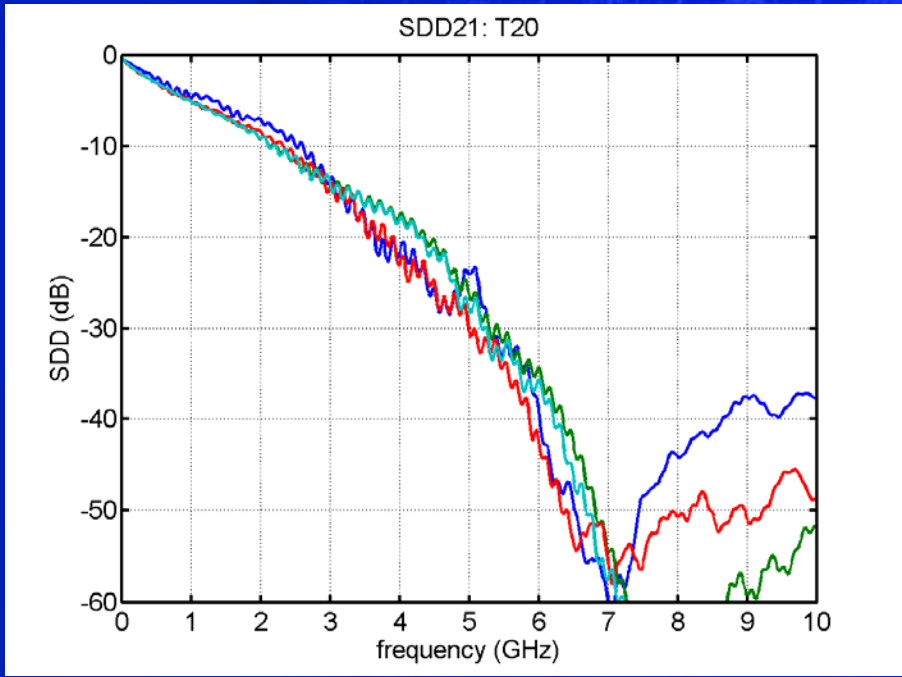

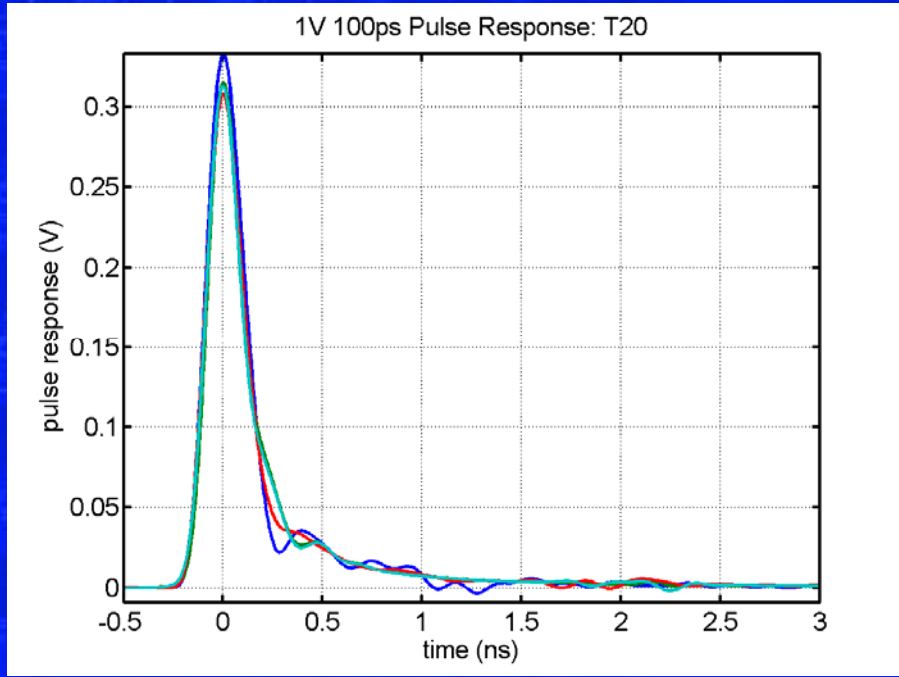

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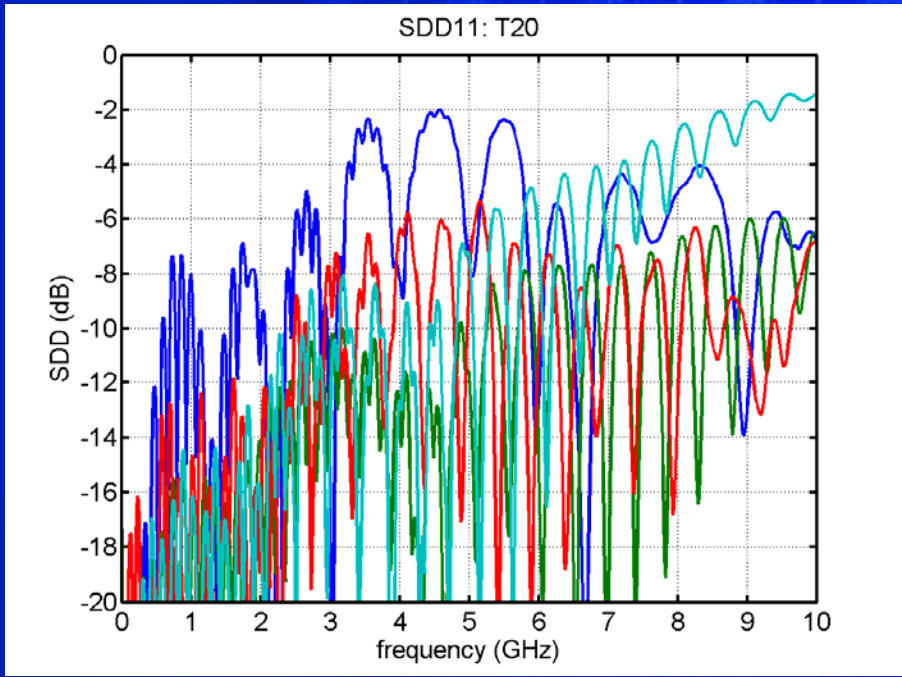

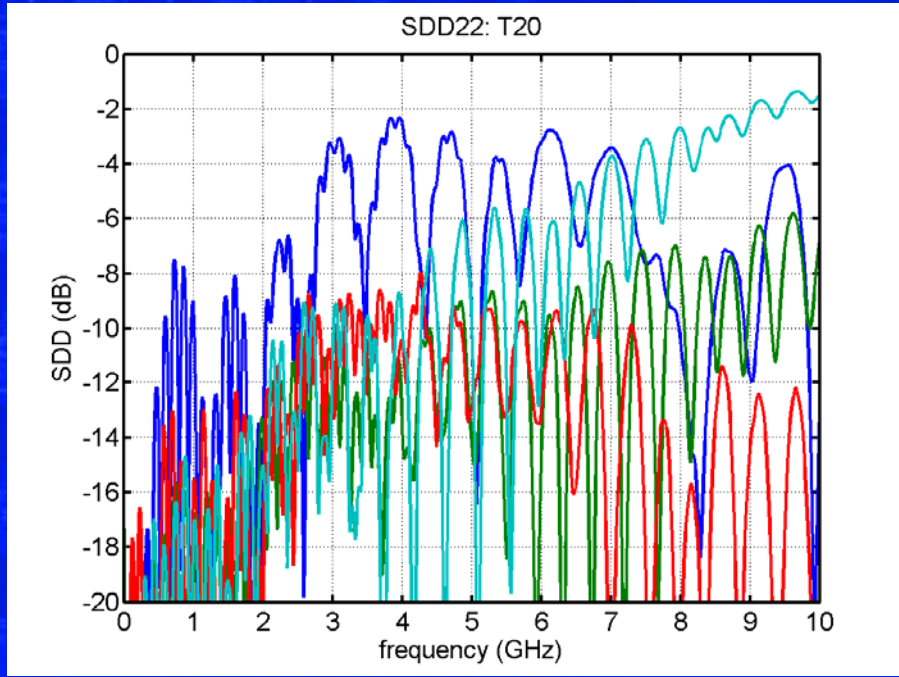

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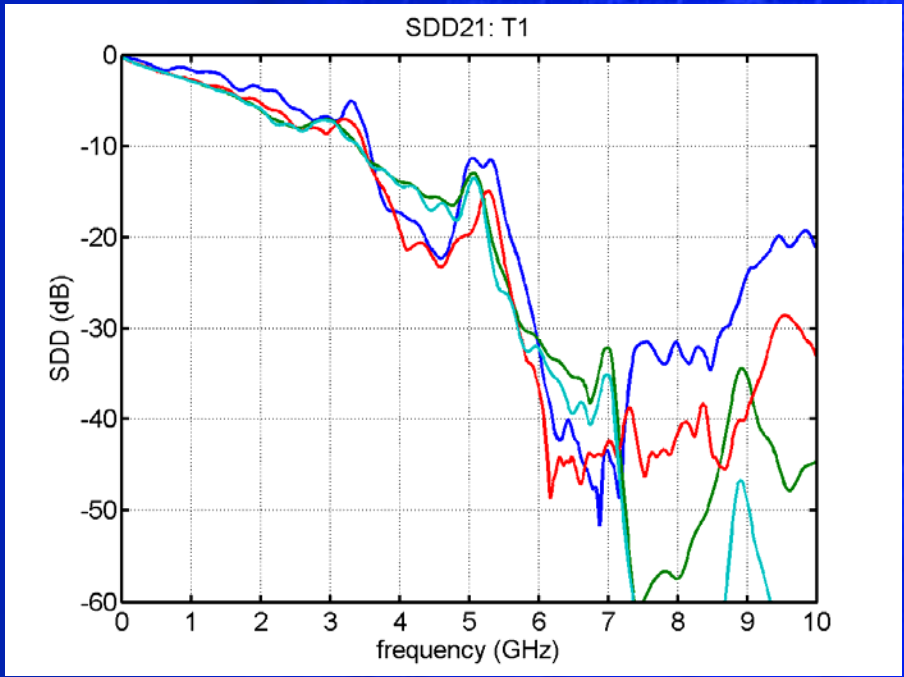

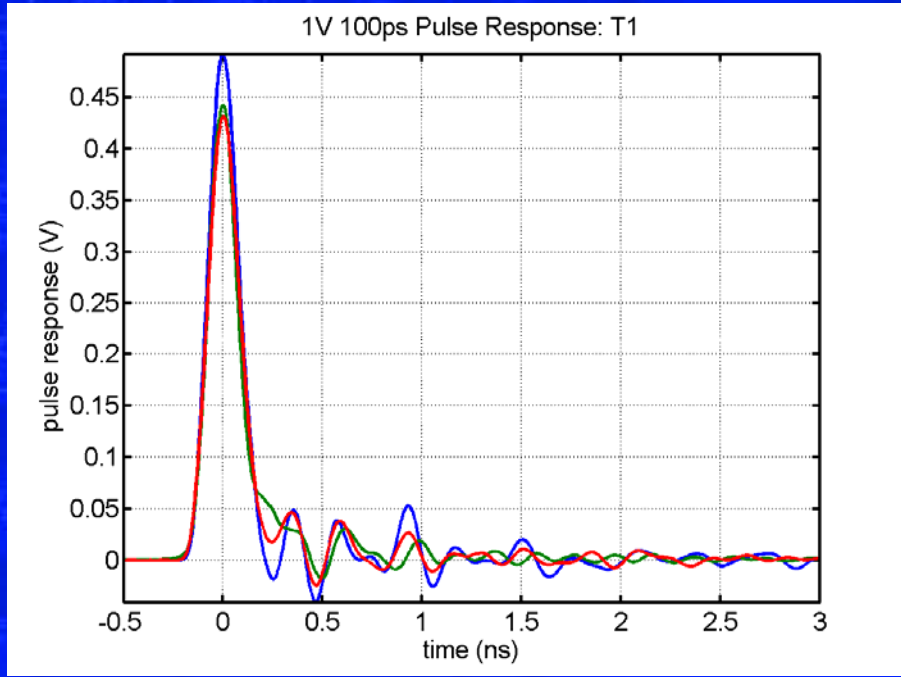

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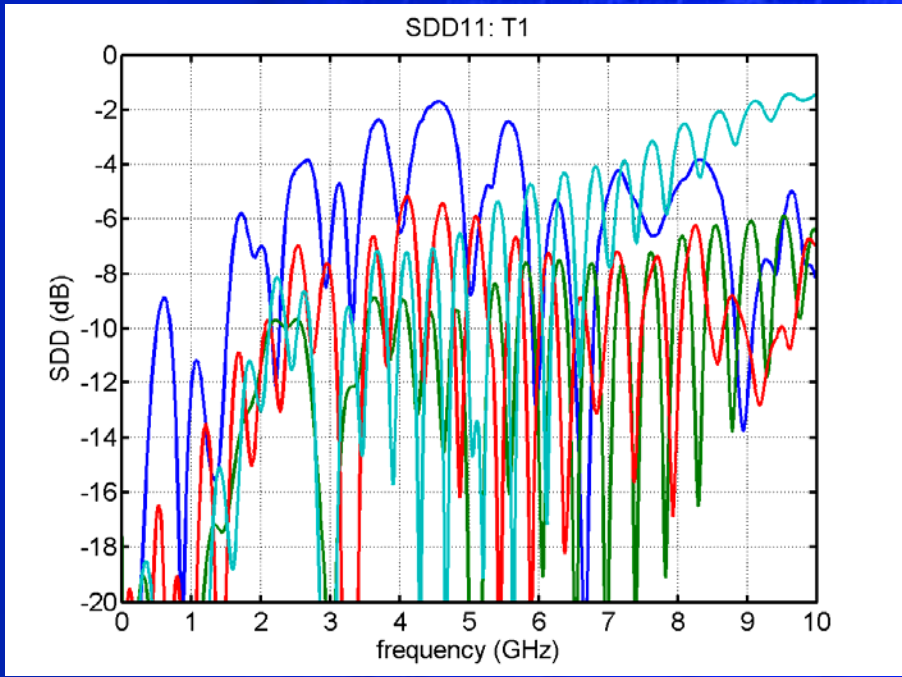

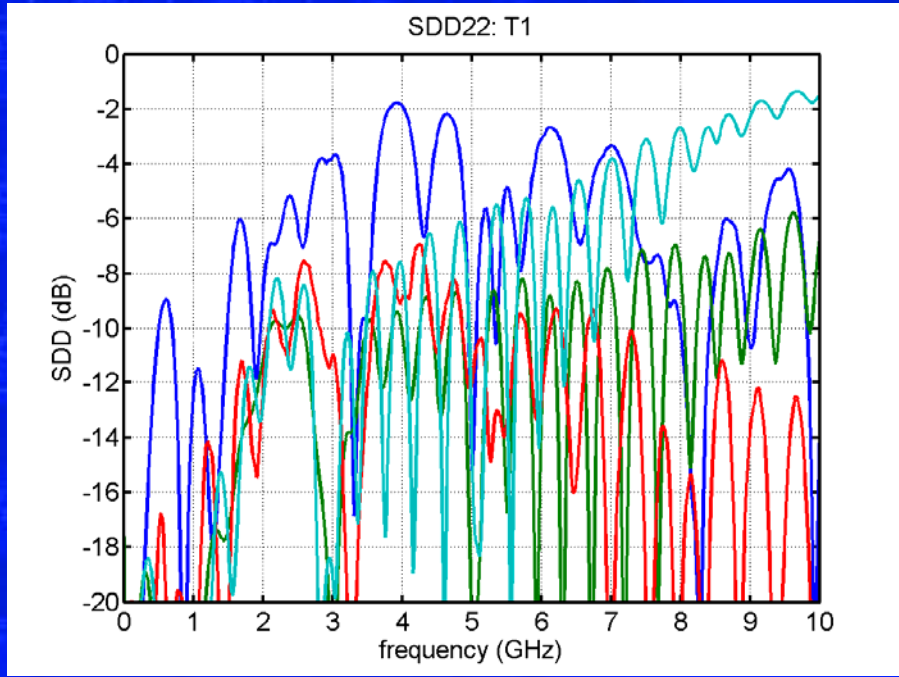

Conclusions

- The ‘improved’ channel system demonstrates a marked channel performance improvement over the original measured system.
- The synthesized ‘improved’ models predicted the performance of the real physical system reasonably well.
  - Synthesized model data is slightly optimistic with respect to the measured ‘improved’ system.
  - The match for the thru response is better in the time domain than the frequency domain.
- Full data from the new test system is not yet available