

# VITESSE

## *05-426r0 SAS-2 Cable Reach Objective and Crosstalk*




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SAS-2 PHY Working Group

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YOUR PARTNER FOR SUCCESS

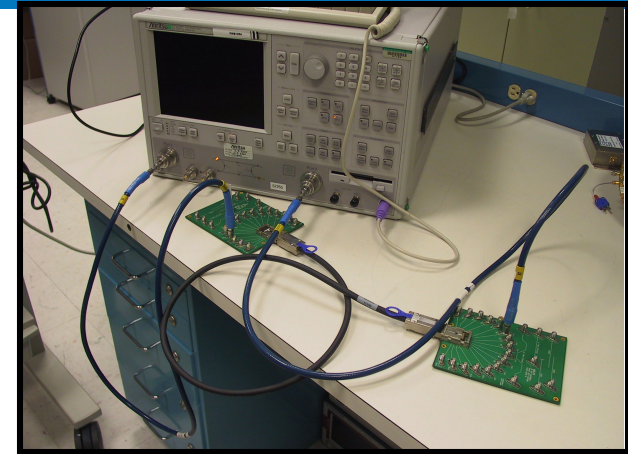
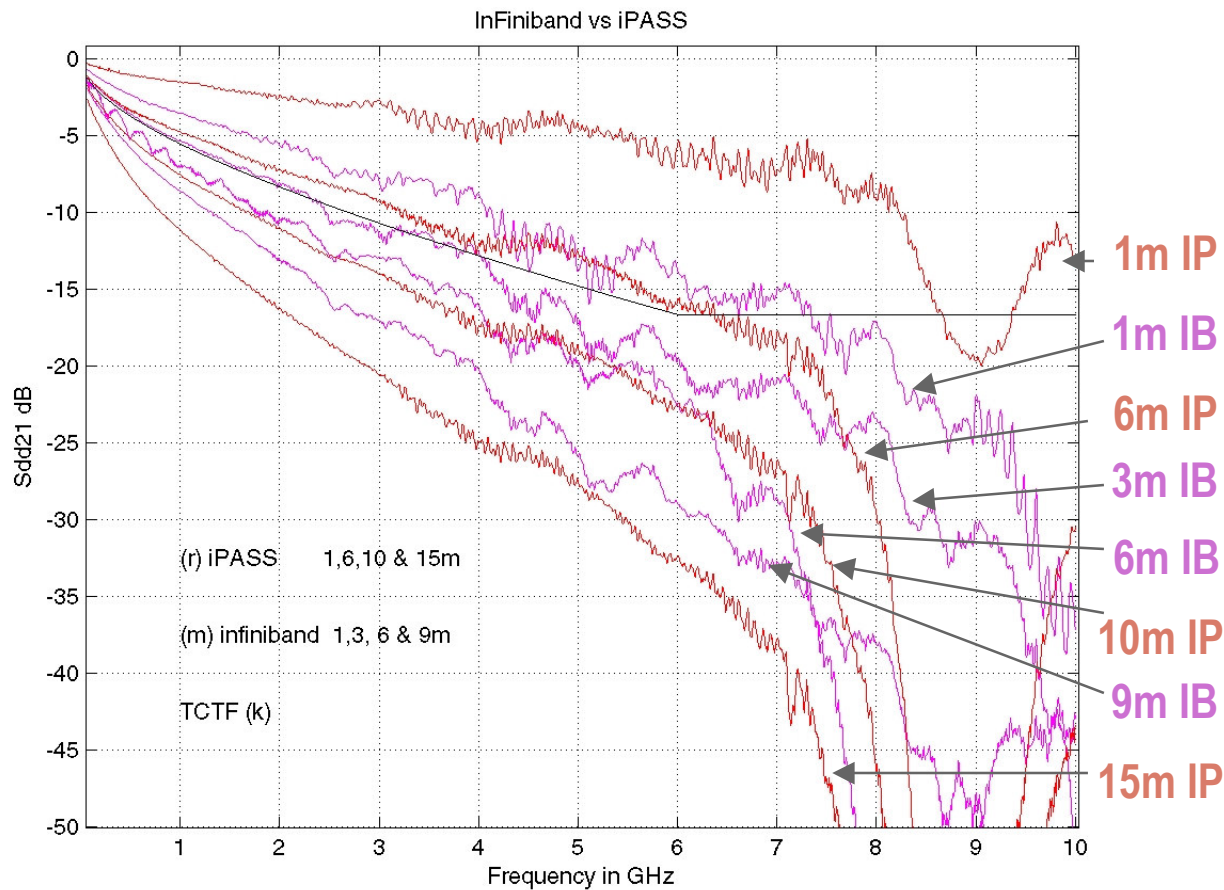
-  SAS-2 Proposal has requested a 10 meter reach objective
  - A reach of 10 meter would enable rack-to-rack interconnect (05-212r0)
  - Feasibility was illustrated in 05-341r1
  
-  Connector technology has improved
  - Lower insertion loss
  - Lower crosstalk
  
-  This presentation continues the investigation in 05-341r1 and evaluates crosstalk and the iPASS connector/cables

# Insertion Loss of Infiniband and iPASS™

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## 📖 SDD21 compared to extended TCTF

- iPASS™ at 10m is comparable to Infiniband at 6m

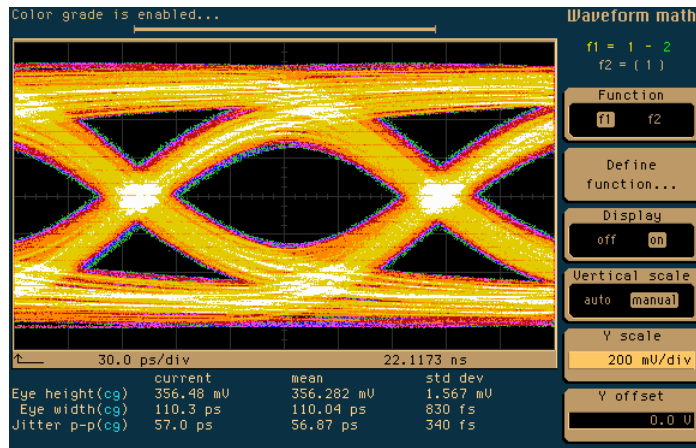


# iPASS™ Links without Tx De-Emphasis

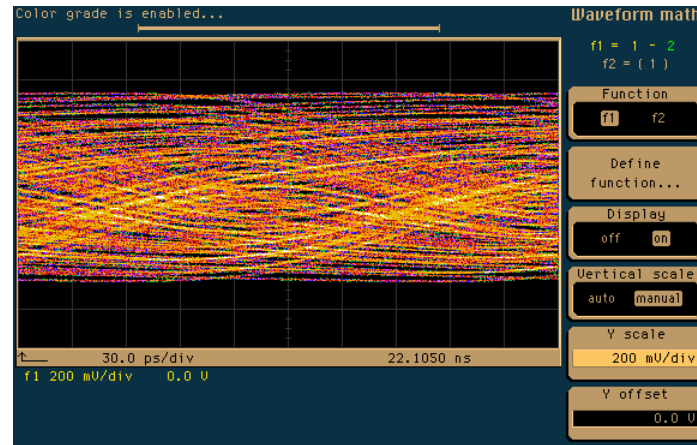
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## Test Results iPASS™ Cable without De-Emphasis (6Gbps)

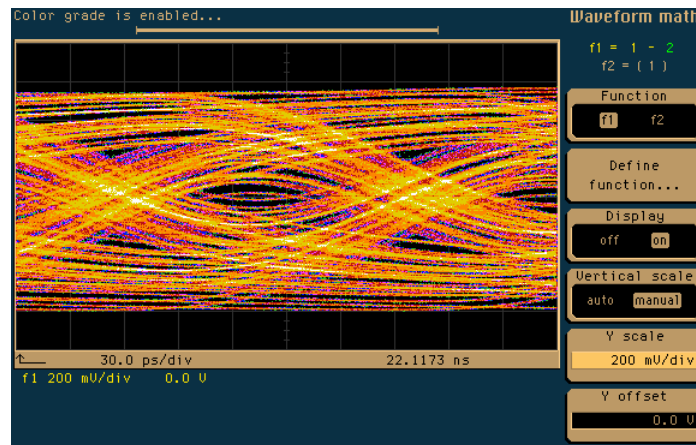
1m



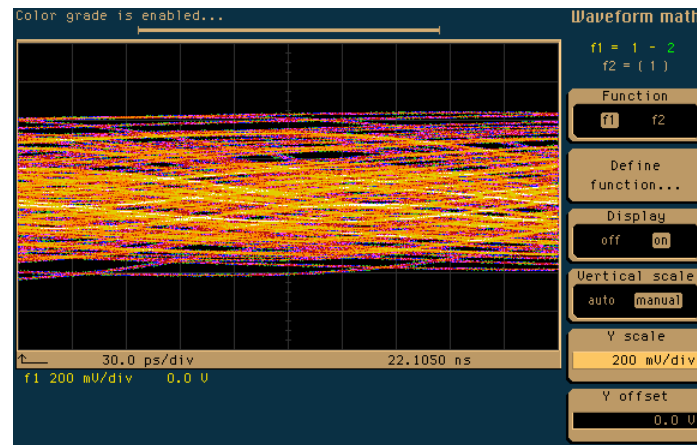
10m



6m



15m



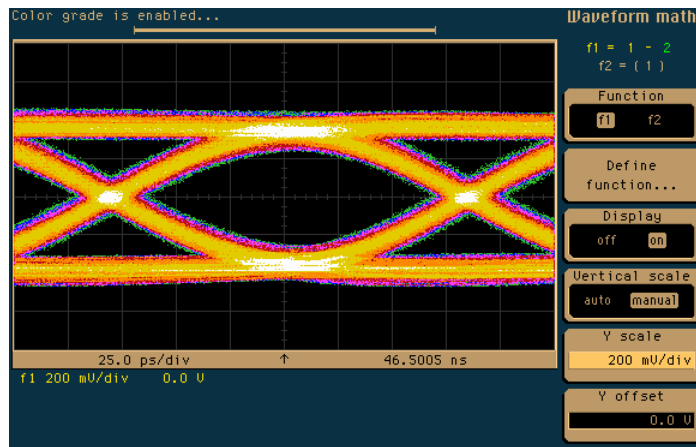


# iPASS™ Links with Tx De-Emphasis

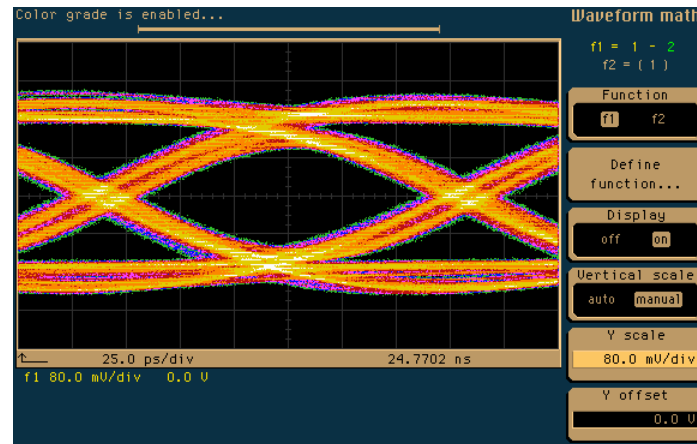
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Test Results iPASS™ Cable with De-Emphasis (6Gbps)

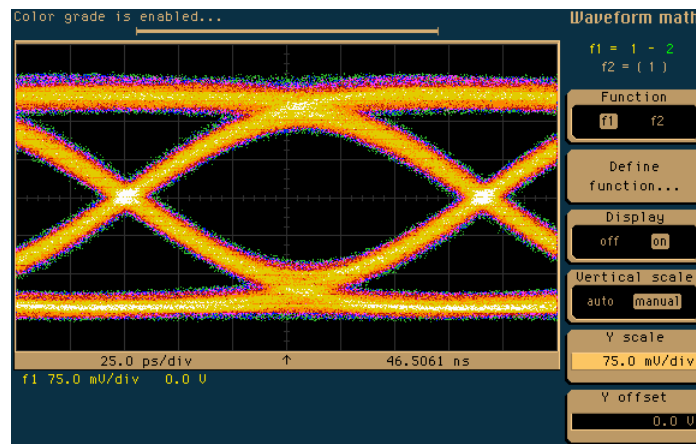
1m



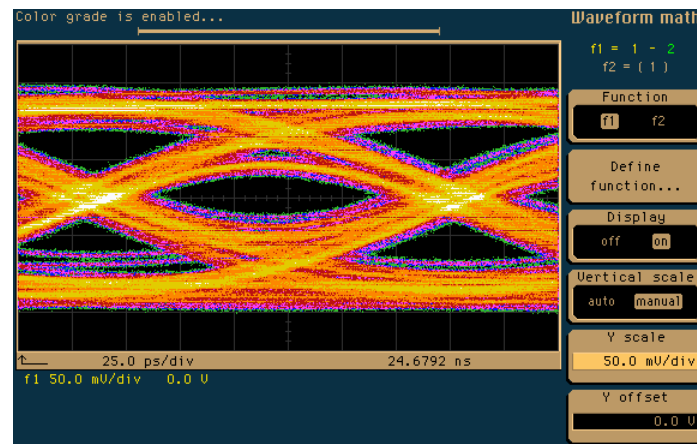
10m



6m



15m



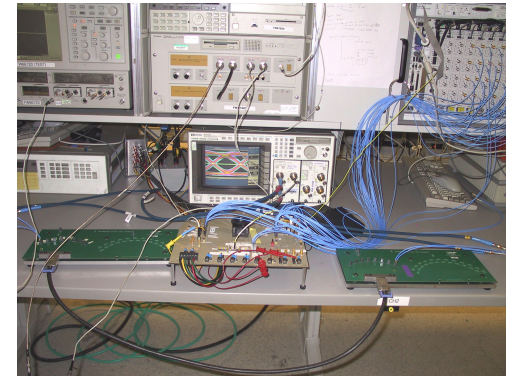
iPASS™ and Tx De-Emphasis Enable 10m Operation

# 2 dB Power Penalty with Tx De-Emphasis and Finite length DFE

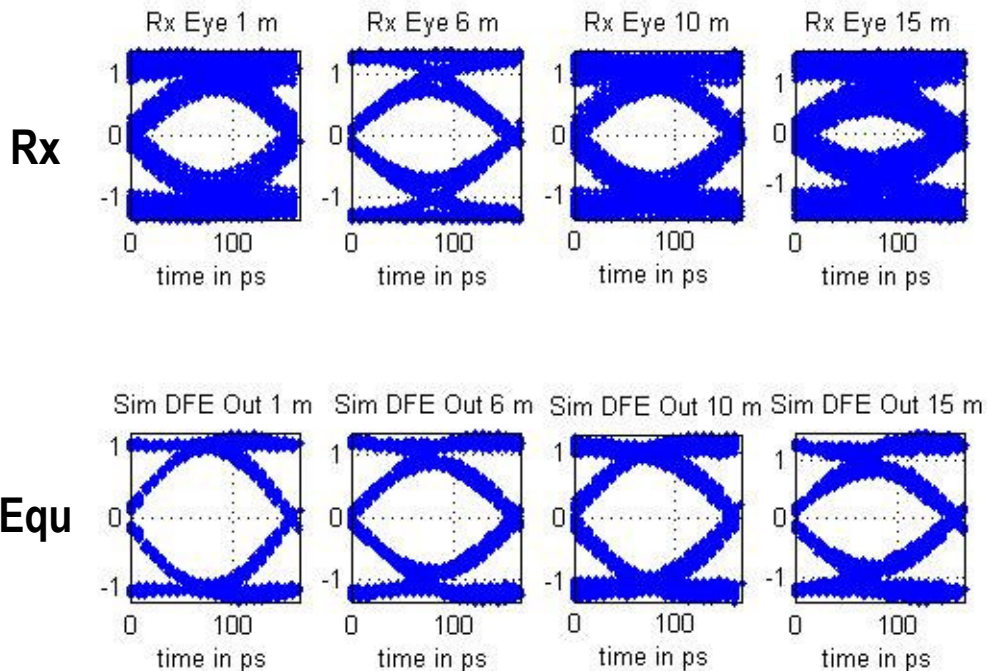
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## External Molex iPASS™ Cable Example at 6Gbps

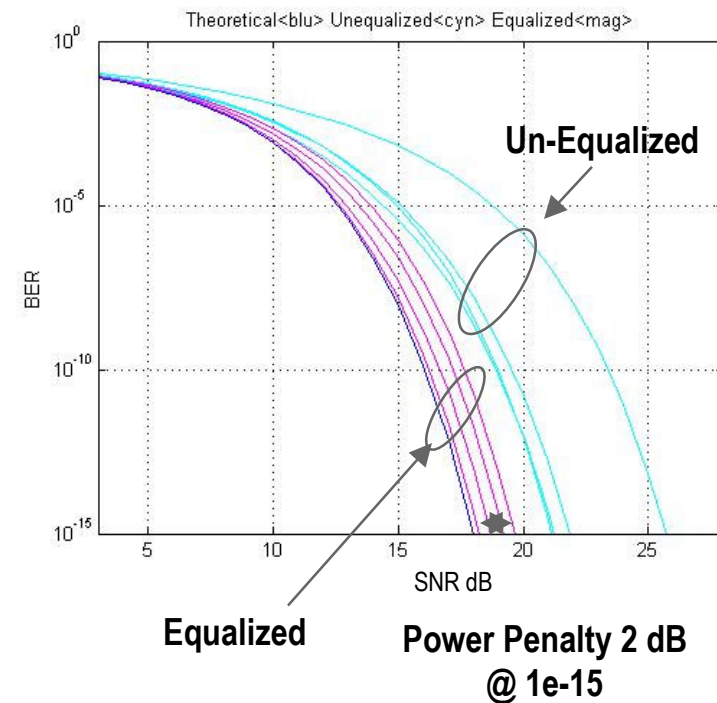
- 10 meters for Rack to Rack interconnect will required equalization with SFF8088
- Open Rx eye @ 15m with Tx De-emphasis



## iPASS™ Eyes 1->15 meter (Test Chip w/ De-Emphasis)

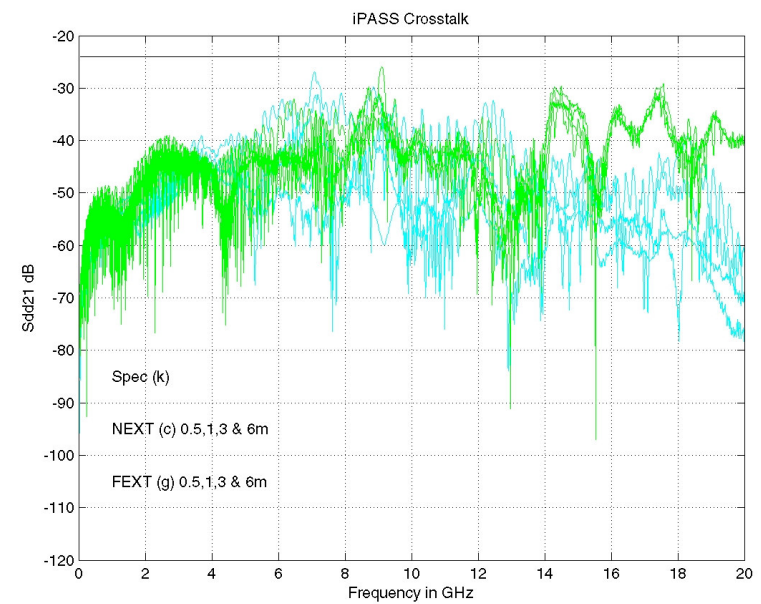
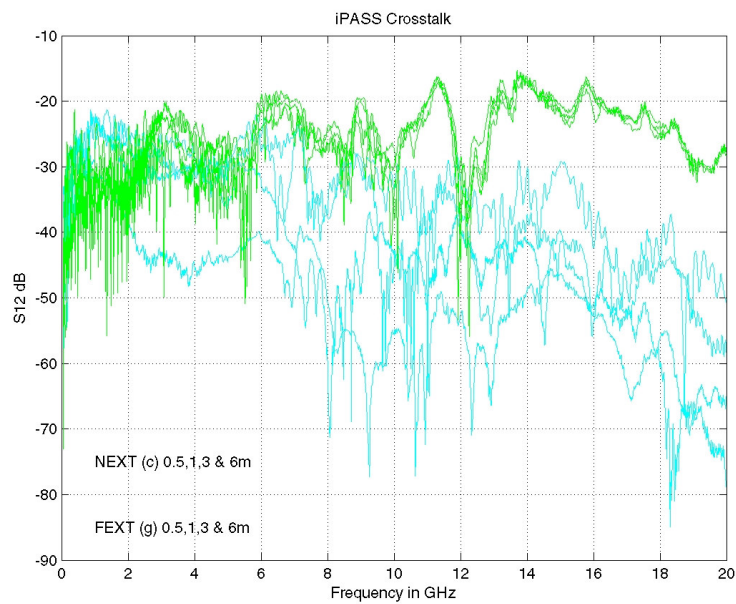


## iPASS™ Sensitivity



## Molex Near End and Far End Cross Talk (05-398r0)

- 0.5, 1, 1.5 and 3m iPASS Cable



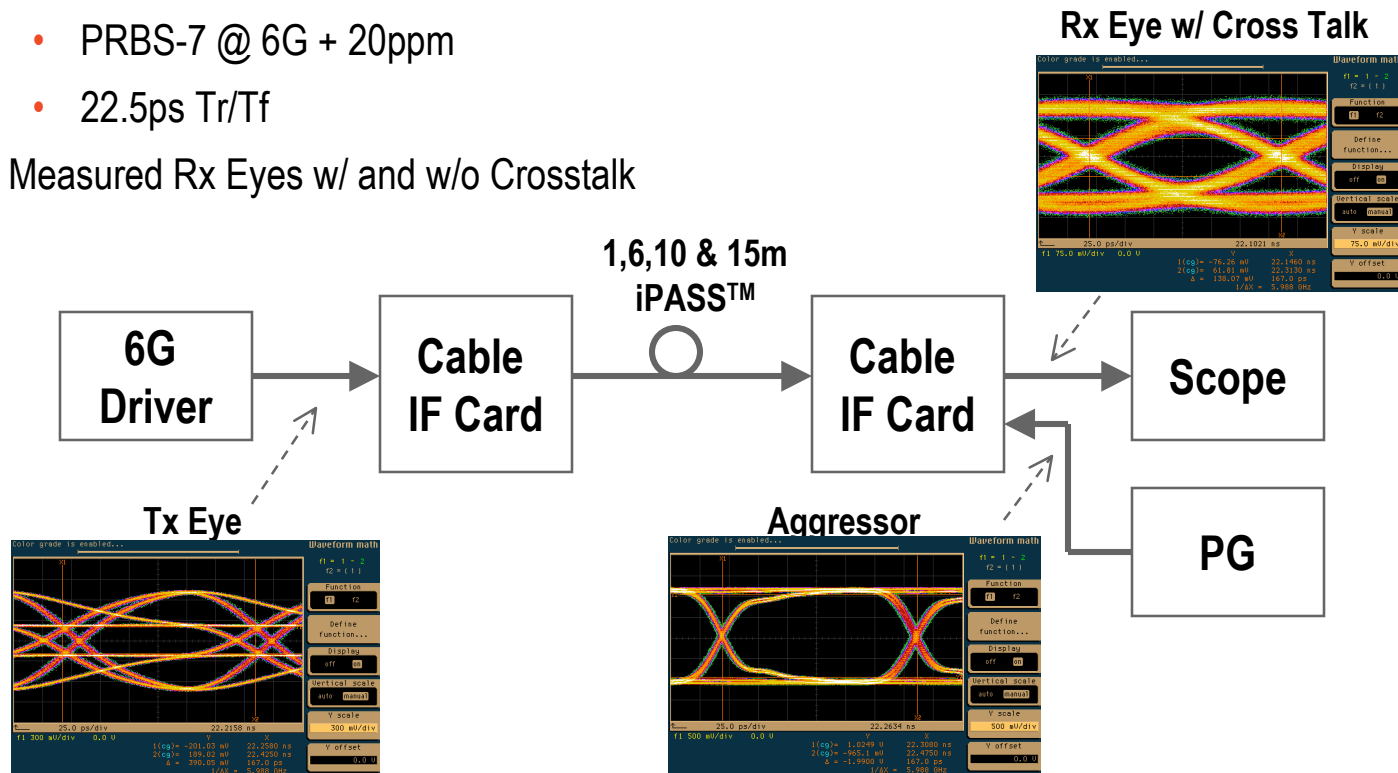
# iPASS™ Cross Talk Measurement

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## iPASS™ Crosstalk and Measurements

- Determined channel with highest coupling
  - Tx1 & Rx1
- Used 12G PG as the aggressor
  - 4000mV swing (approximate 4 aggressor)
  - PRBS-7 @ 6G + 20ppm
  - 22.5ps Tr/Tf
- Measured Rx Eyes w/ and w/o Crosstalk

Aggressor	Xtalk	dB
0	20.2mV	-39.9
1	47.8mV	-32.4
2	19.4mV	-40.3
3	15.4mV	-42.3



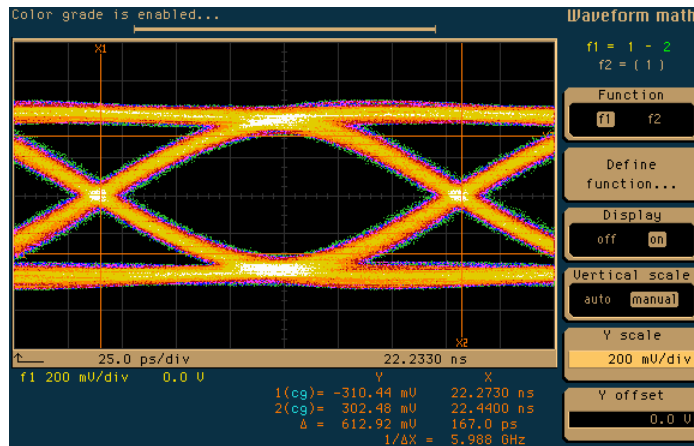


# iPASS™ Eyes without Crosstalk

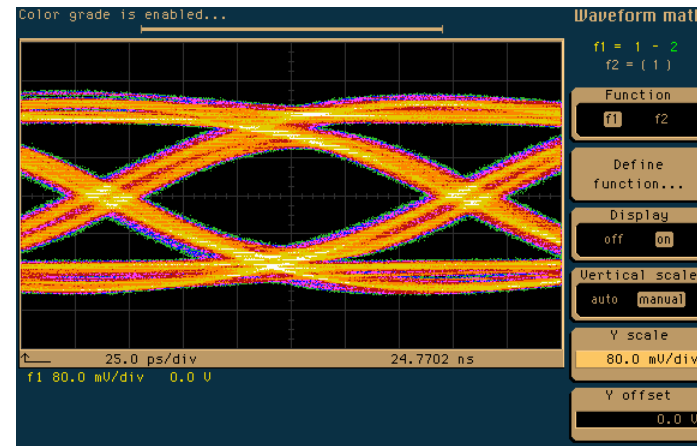
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## 6G Eyes De-Emphasis Enabled

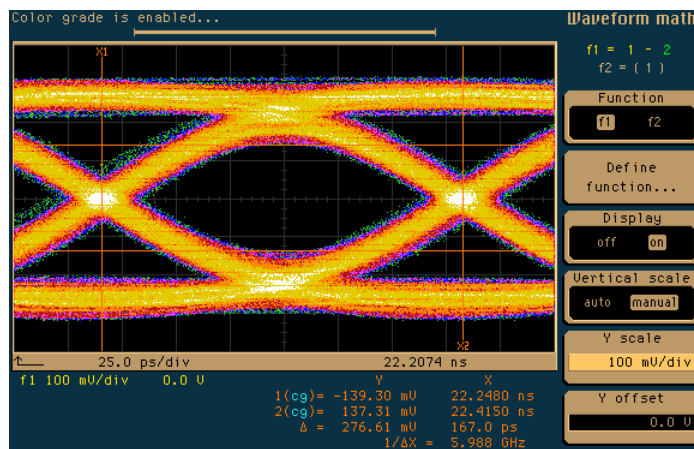
1m (612mV)



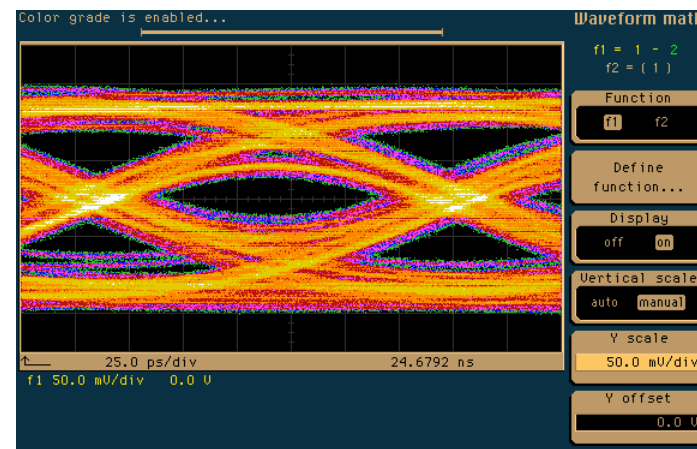
10m (210mV)



6m (276mV)



15m (48mV)

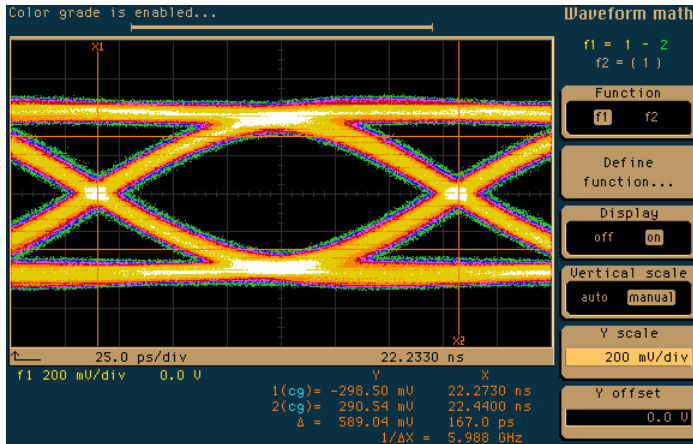


# iPASS™ Eyes with Crosstalk

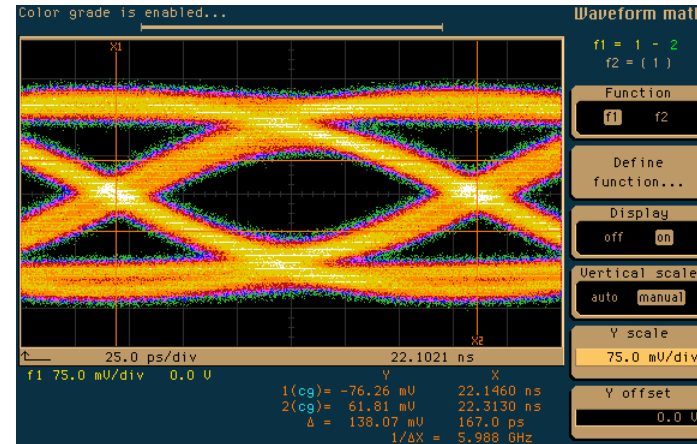
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📖 6G Eyes w/ Crosstalk De-Emphasis Enabled

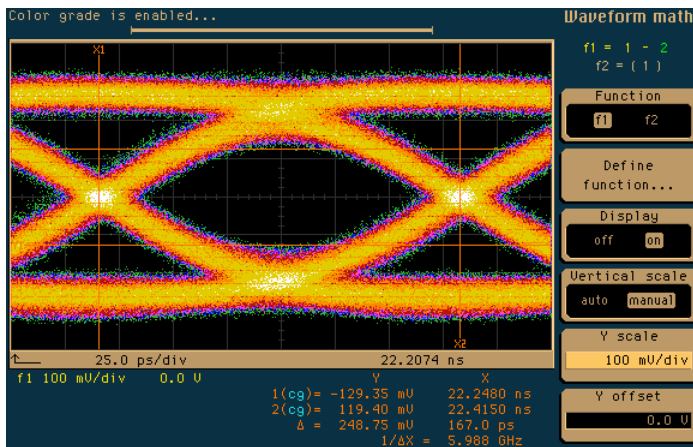
1m (598mV)



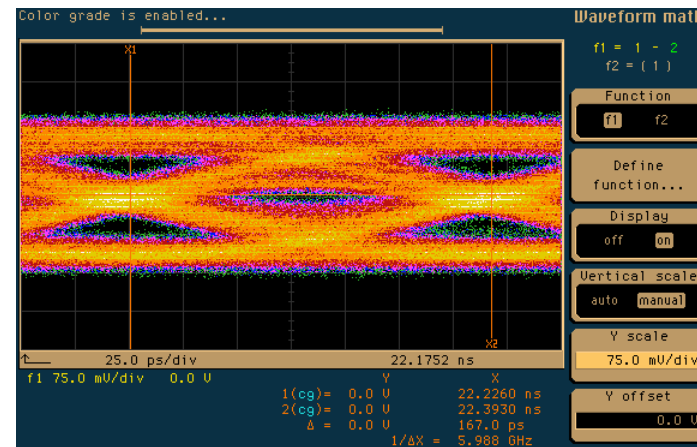
10m (138mV)







6m (241mV)



15m (?mV)



-  Robust 10m reach for SAS-2 is feasible with iPASS™ connectors, Tx De-Emphasis and Rx Equalization.
-  Using De-Emphasis and a DFE receiver the theoretical equalized power penalty is ~2dB
-  Crosstalk with iPASS connector is not a significant issue at 10 meters
-  SAS-2 Electrical Specification will need modifications for a External Cable Specification.
  - Specify Tx Equalization (De-Emphasis)
  - Crosstalk Specification
  - Insertion loss / channel Specification
  - Sensitivity / Eye Opening Specification