F9 Systems, Inc.
and
North East Systems Associates, Inc.

Tx/Rx Signal*Blade* Signal Integrity Analysis by NESA

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Signal*Blade* Overview

- The Signal*Blade* is an off-the-shelf ATCA Solution that exists ***today.***
  - Designed by NESA (www.nesa.com) and F9 Systems, Inc.
  - Owned, sold and supported by F9 Systems, Inc. (www.f9-systems.com).
- Measurements show that the Signal*Blade* meets both the Gen1 and Gen2 requirements.
- The Signal*Blade* is suitable for measurements up to <u>and</u> including 10Gbps

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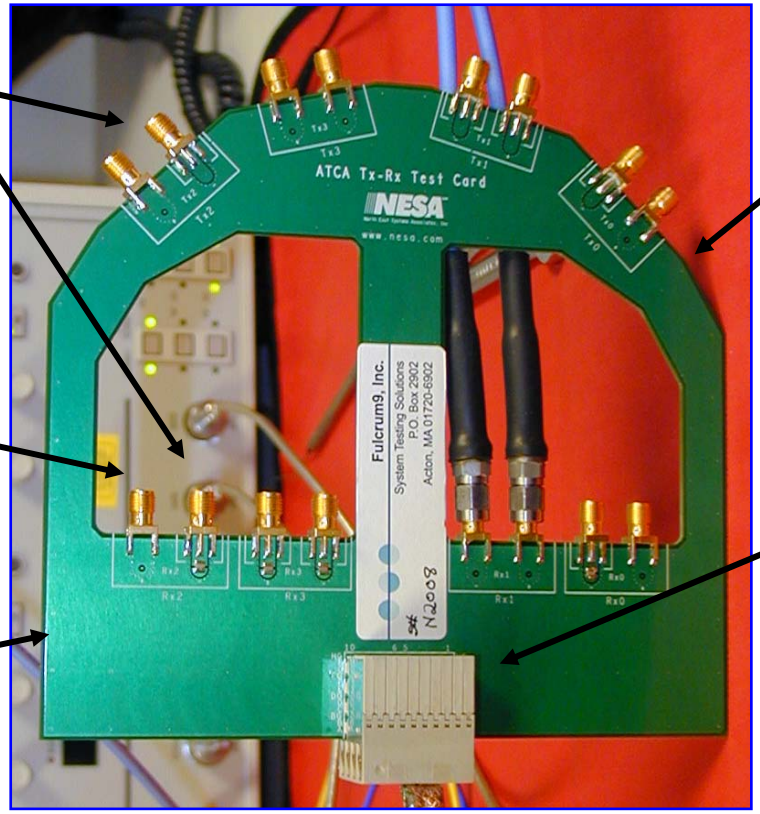
Signal*Blade* Features

Controlled Z_o edge launch SMAs for ease of in-chassis cable management

Low-loss receiver channel SMAs

Card size fits all ATCA chassis locations



Low Loss Nelco 4000-13SI PCB

ATCA ZD Backplane Connector Modified to fit all channel locations

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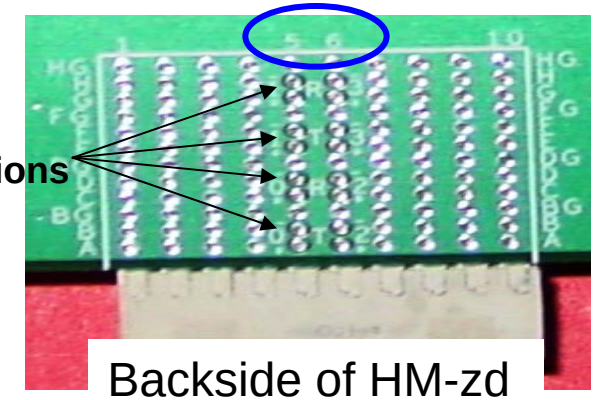
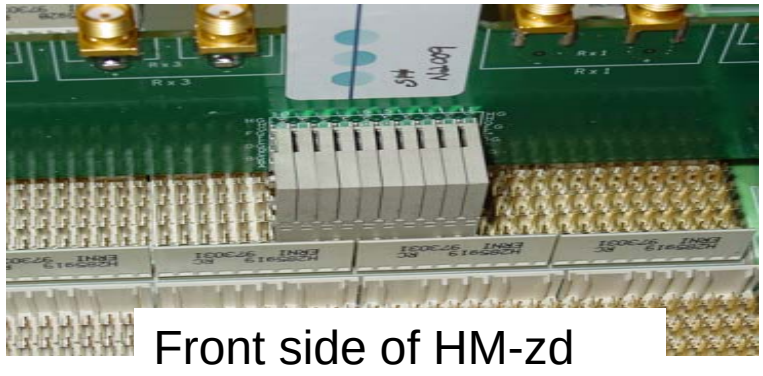
Signal*Blade* and Bench*Blade* HM-zd Access

4 connections



Backside of HM-zd



Front side of HM-zd

- The Signal*Blade* provides access to rows 5 and 6 of the HM-zd.
- The Signal*Blade* can measure 16 signals at one time.
- The connector can be inserted into any location on the mating connector, due to the mounting tabs being removed from the HM-zd.
- ***Every pin*** can be measured due to the insertion flexibility of the modified connector housing.

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Signal*Blade* Usage Examples

- The F9 Signal*Blade* can be used to monitor the active Tx and Rx signals across an ATCA backplane to insure signal quality.
- The F9 Signal Blade can be used to measure ATCA backplane Impedance and coupled Near End Crosstalk (NEXT) – (Open source Destination).
- A pair of F9 Signal Blades allows terminated ATCA backplane measurements of impedance, transmission, skew, propagation delay, coupled NEXT and Far End Crosstalk (FEXT).

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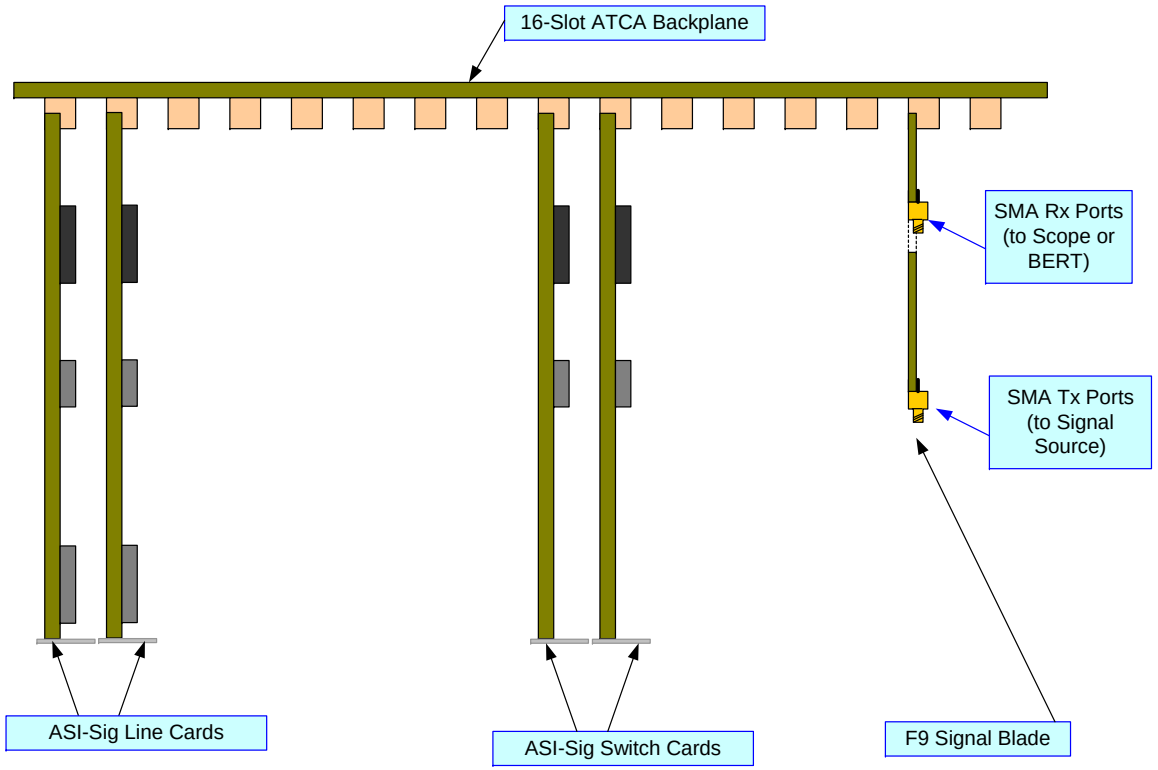
Signal*Blade* Active Signal Measurements



F9 Signal Blade Active Signal Testing of a 16-Slot ATCA Backplane with Switch and Line Cards

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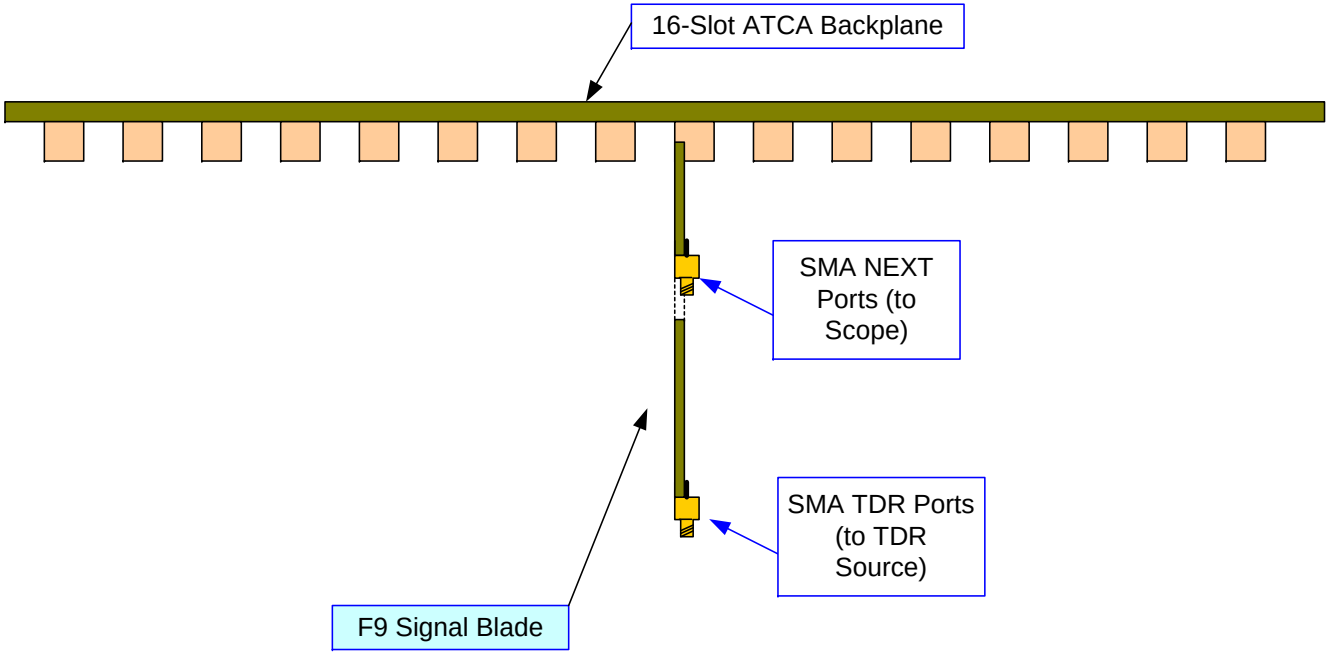
Signal*Blade* Impedance Measurements



F9 Signal Blade Impedance and NEXT Testing of a 16-Slot ATCA Backplane

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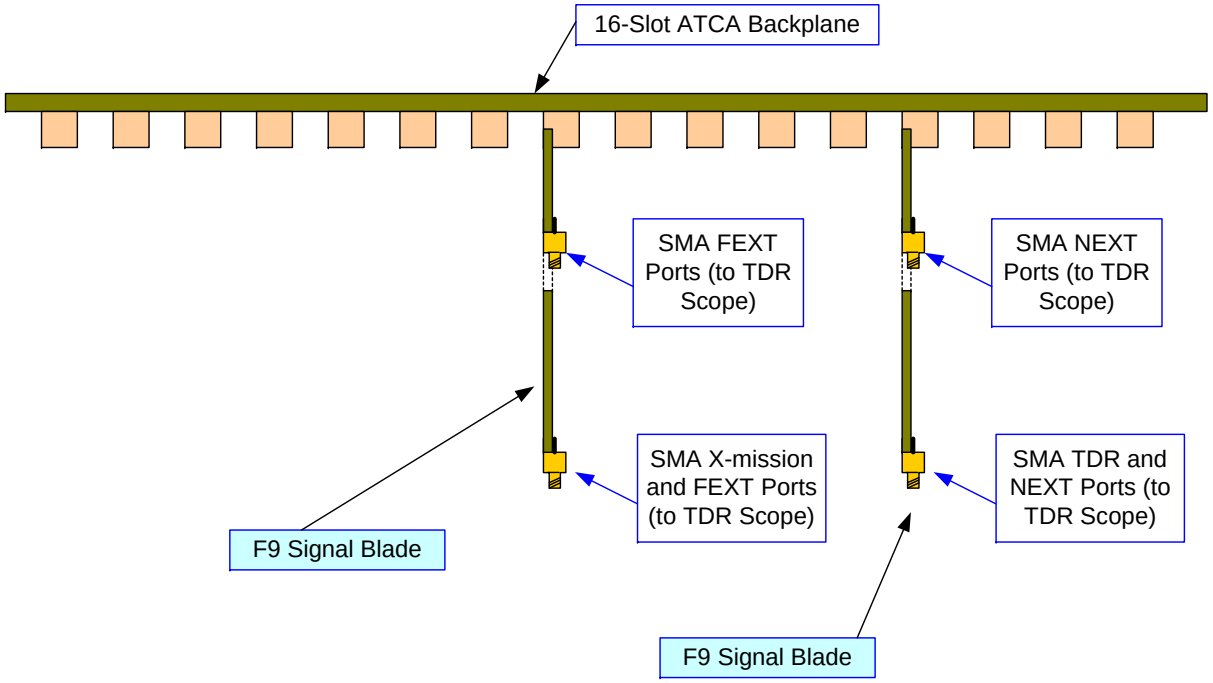
Signal*Blade* Impedance, Transmission, Skew, Propagation Delay, NEXT and FEXT Measurements



F9 Signal Blade Impedance, X-mission, FEXT and NEXT Testing of a 16-Slot ATCA Backplane

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Summary of Measurement Results

- Signal*Blade* eye-diagram measurements were analyzed for the test card contribution to channel insertion loss, jitter gain and eye-width degradation.
  - Eye-diagrams are the best means of performance evaluation since they net-out all signal integrity effects.

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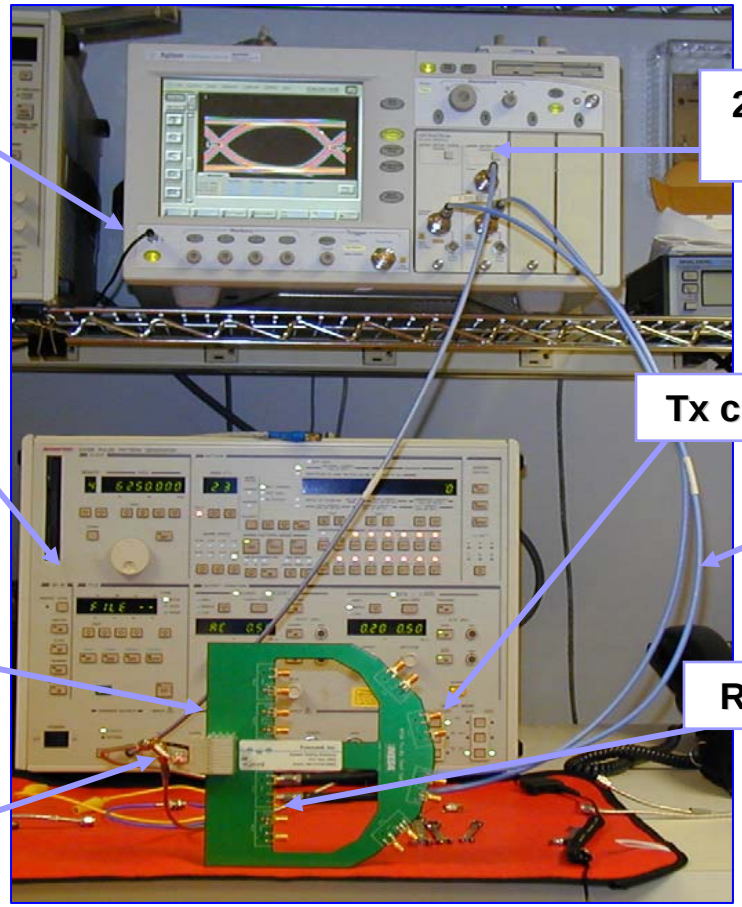
ATCA Signal*Blade* Scope and 10 Gbps Measurement Instrumentation



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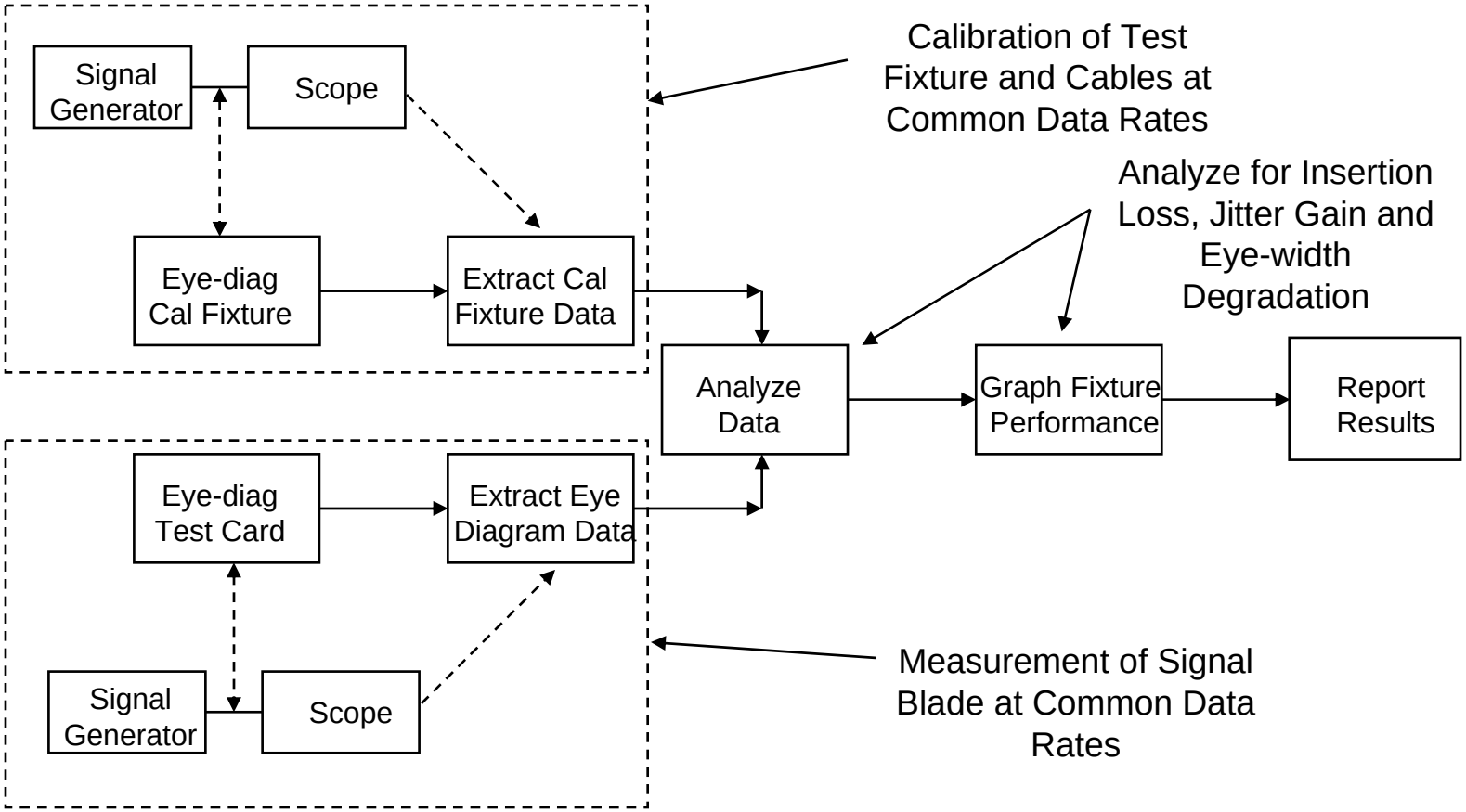
NESA ATCA Signal*Blade* Measurement and Evaluation Procedures



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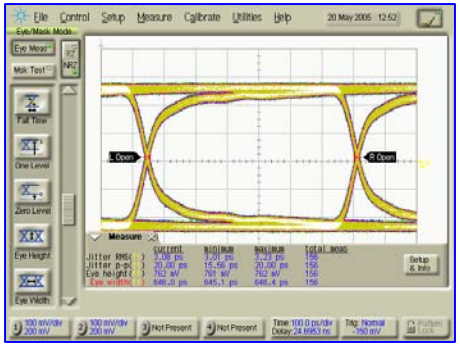
Signal*Blade* Tx-0 Eye Patterns



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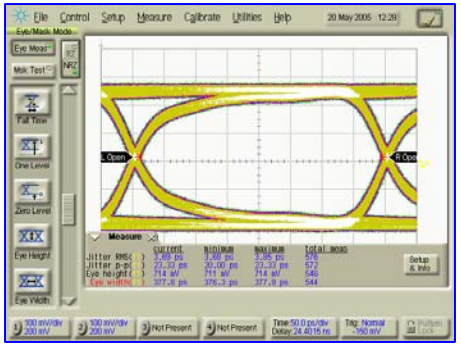

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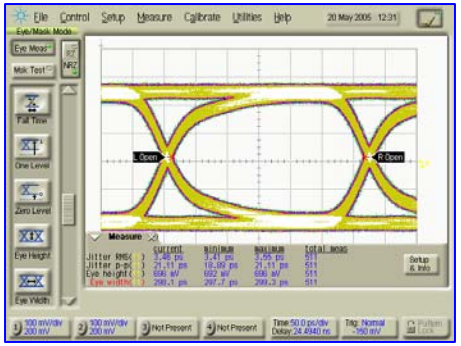

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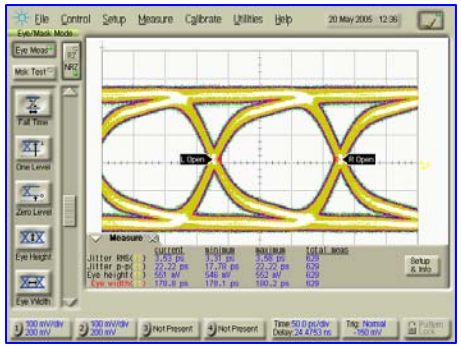

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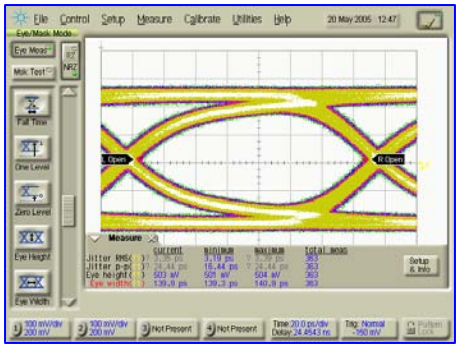

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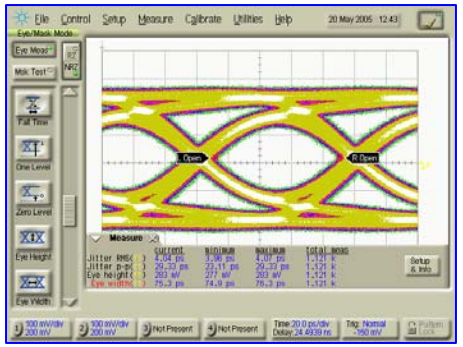

10.0 Gbps

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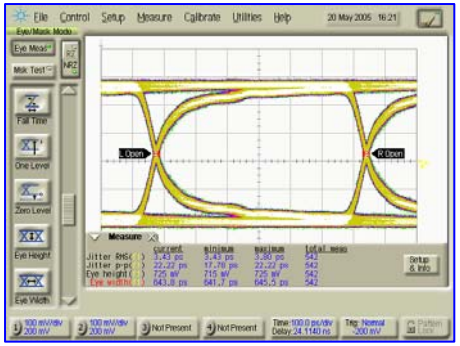
Signal*Blade* Tx-1 Eye Patterns



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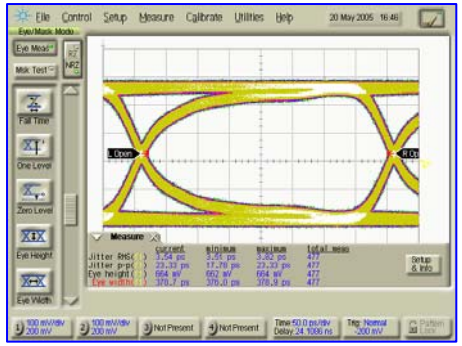

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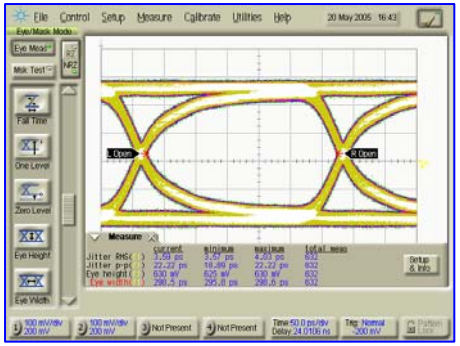

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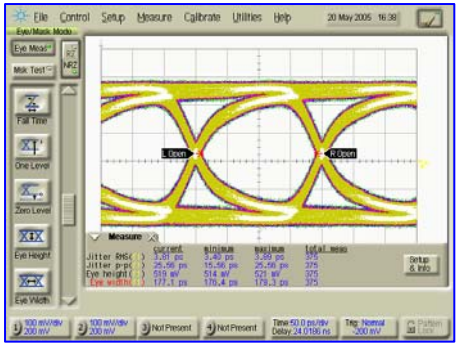

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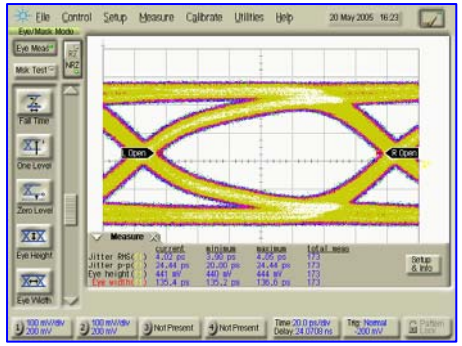

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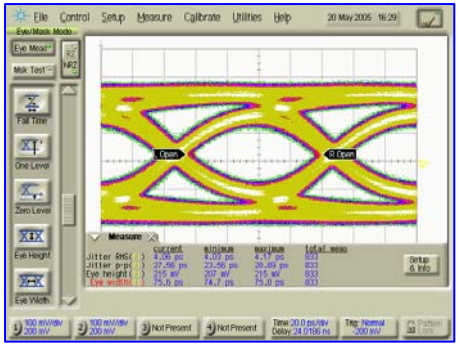

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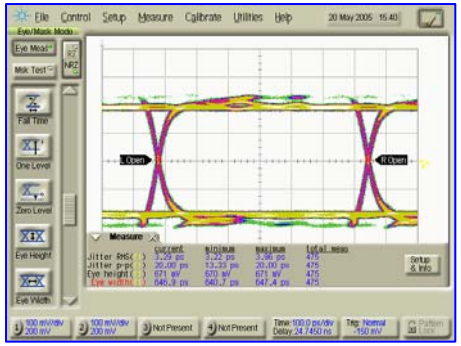
Signal*Blade* Rx-1 Eye Patterns



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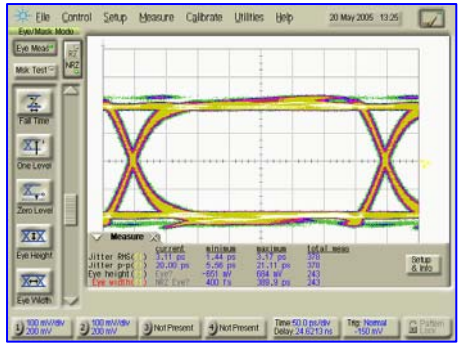

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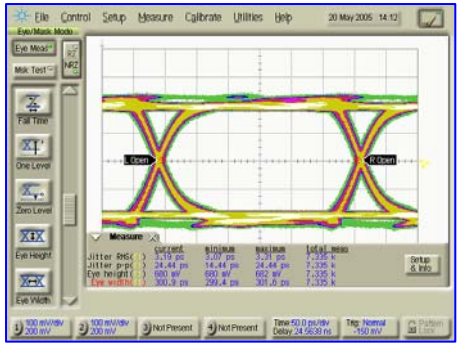

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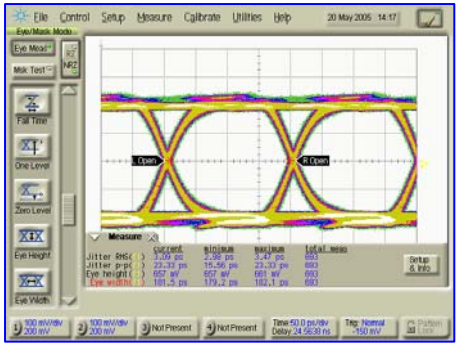

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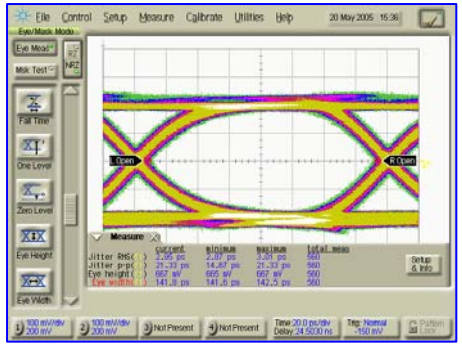

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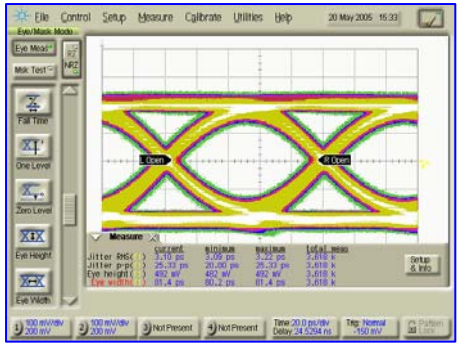

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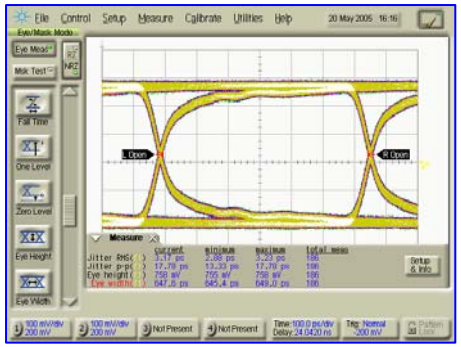
Signal Blade Tx-2 Eye Patterns



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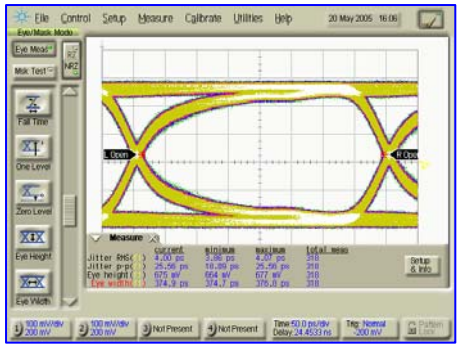

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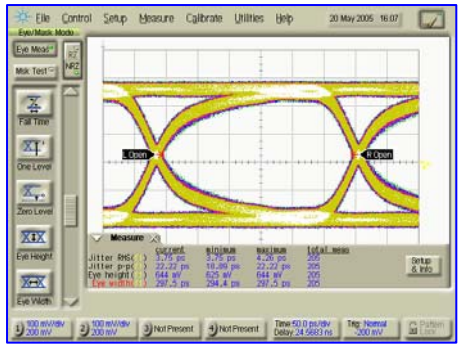

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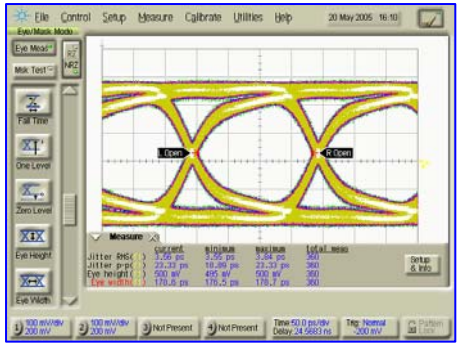

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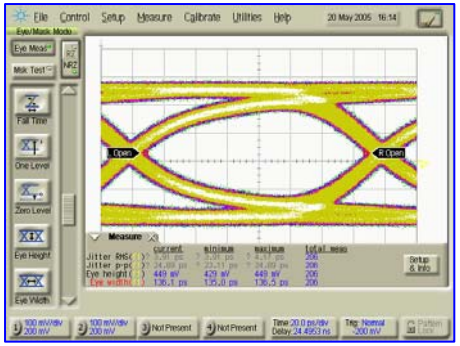

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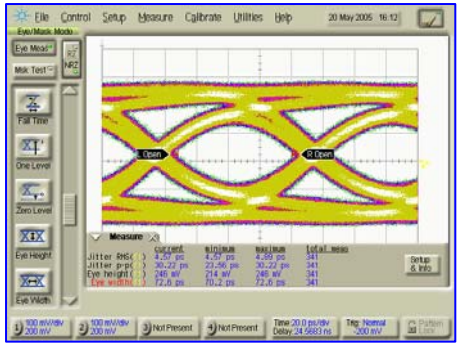

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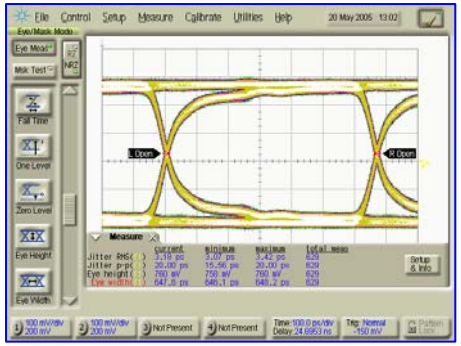
Signal Blade Tx-3 Eye Patterns



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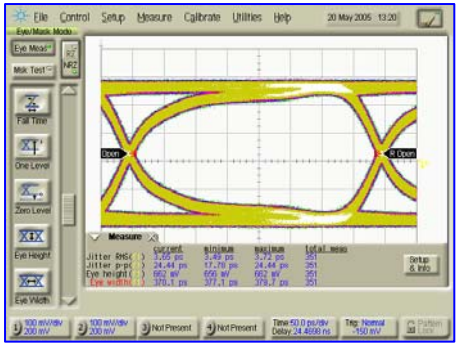

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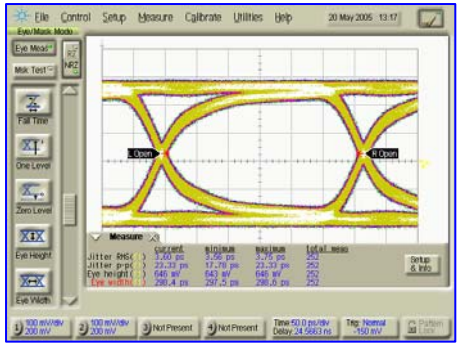

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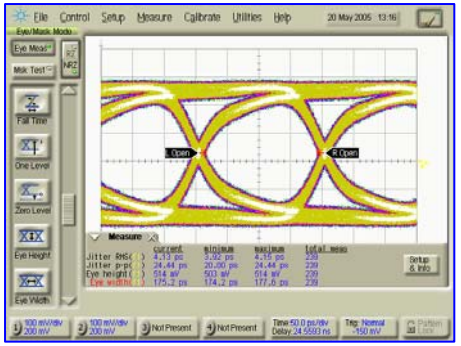

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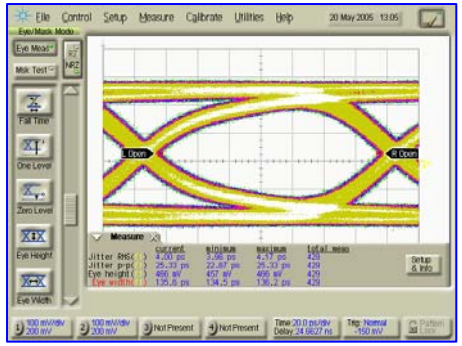

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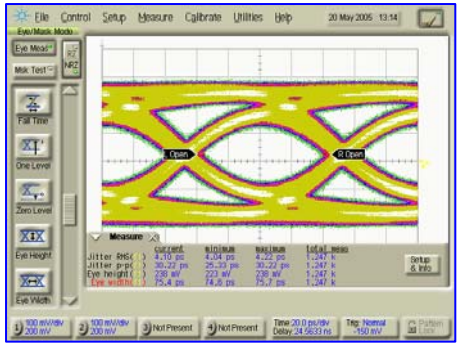

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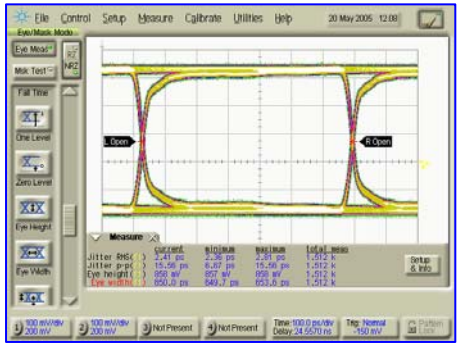
Cable & Test Fixture Eye Patterns



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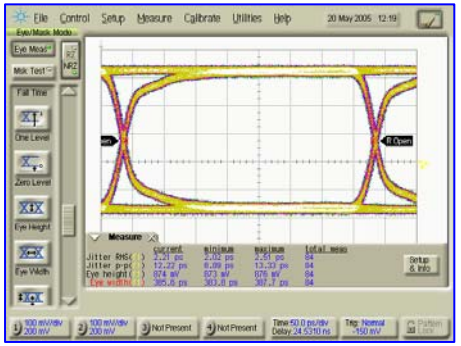

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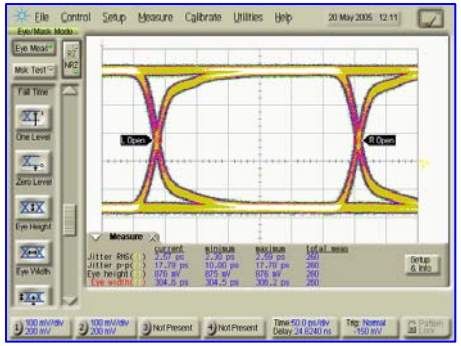

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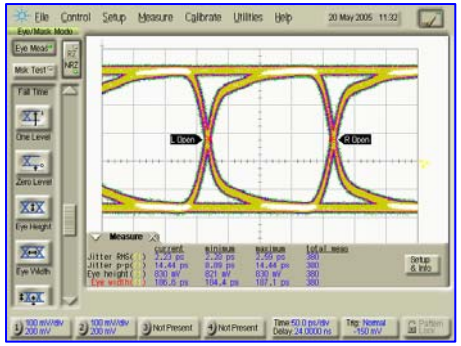

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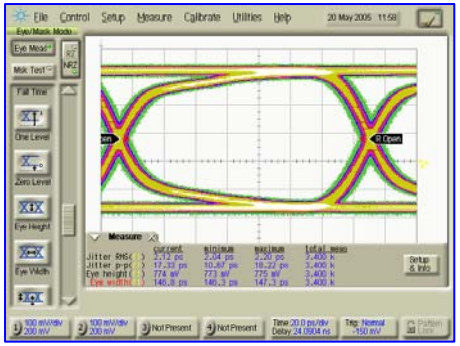

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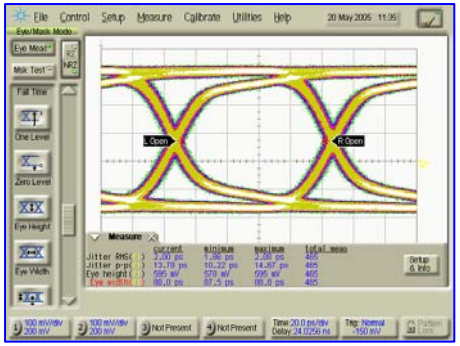

10.0 Gbps

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Signal*Blade* Measurement Results

- Insertion Loss results
  - Receiver channel Insertion Loss < 2.5dB, all data rates
  - Transmit channel Insertion Loss:
    - < 3dB @ 1.5, 2,5 and 3.126 Gbps,
    - < 5dB @ 5.0 and 6.25 Gbps and
    - < 9 dB @ 10 Gbps

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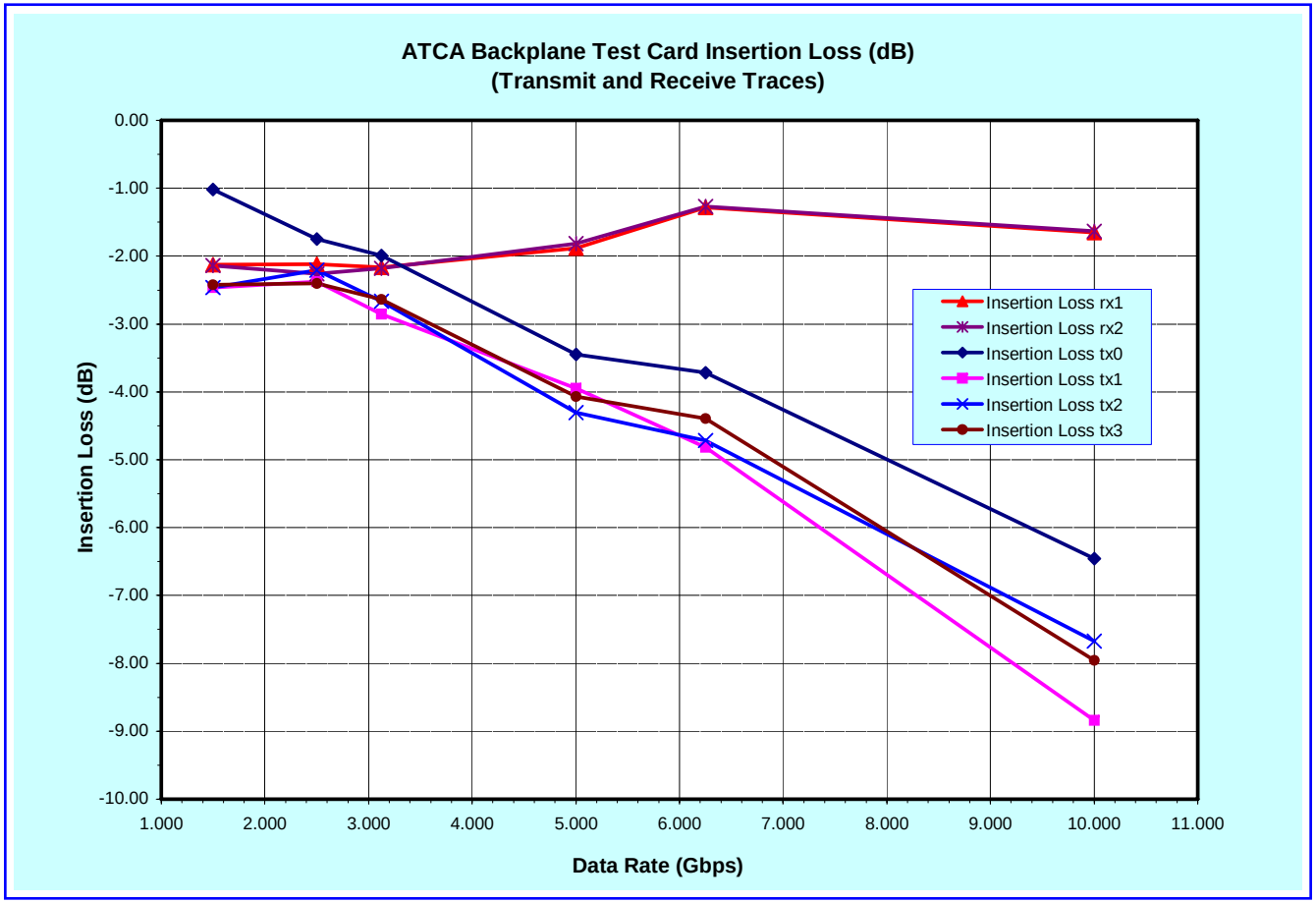
ATCA Signal*Blade* Insertion Loss (dB) at Measured Data Rates



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Signal*Blade* Measurement Results

- Jitter Gain results
  - Jitter Gain < 2.5% [RMS] at all data rates and channels

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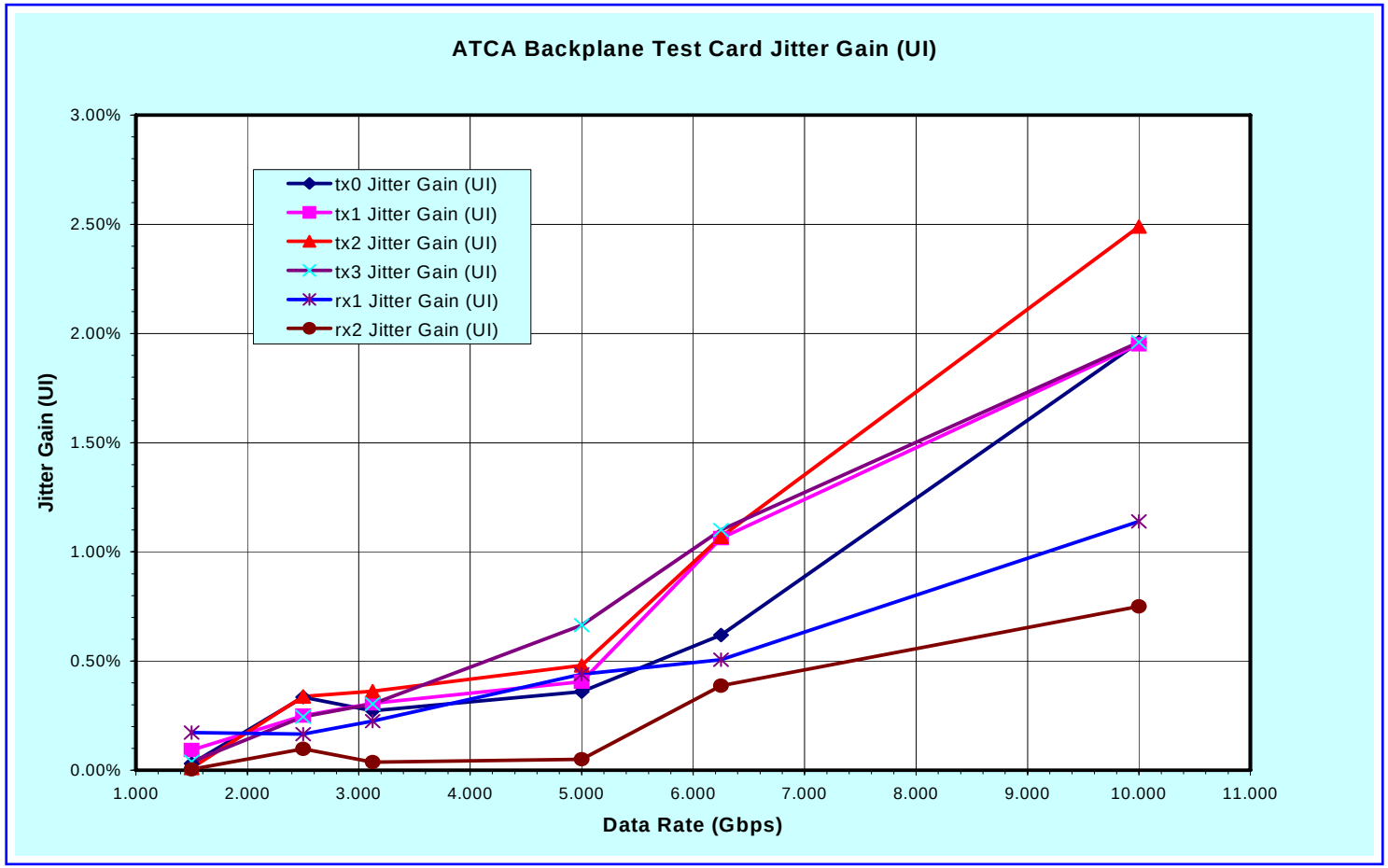
Jitter Gain (UI) at Measured Data Rates



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Signal*Blade* Measurement Results

- Eye-Width Degradation
  - Receiver channel eye-width degradation < 8% for all data rates
  - Transmit channel eye-width degradation:
    - < 8% for all data rates ≤ 6.25 Gbps and
    - < 15% transmit channels except for one channel < 19% @ 10 Gbps.

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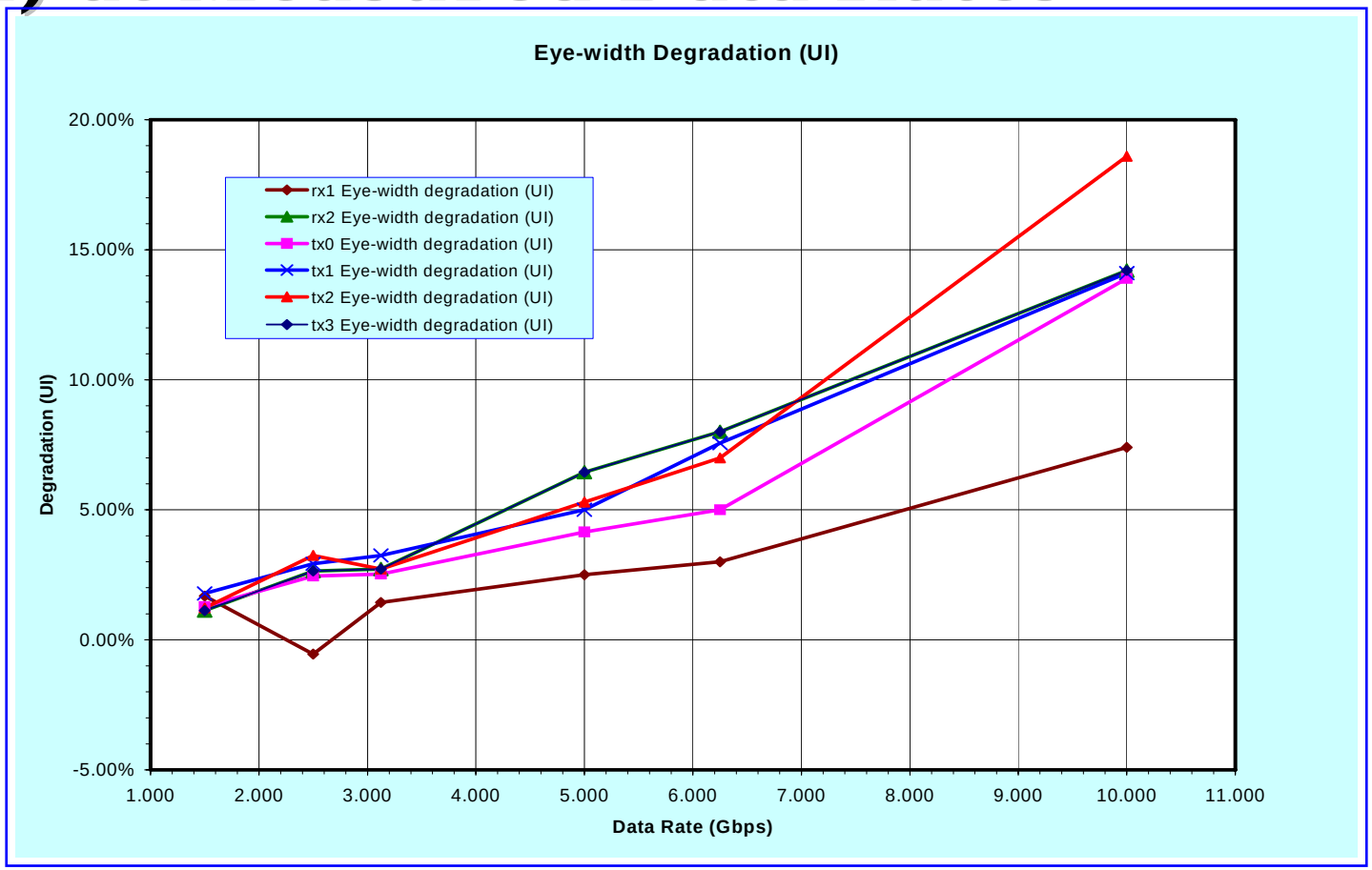
RMS Eye-Performance Degradation (UI) at Measured Data Rates



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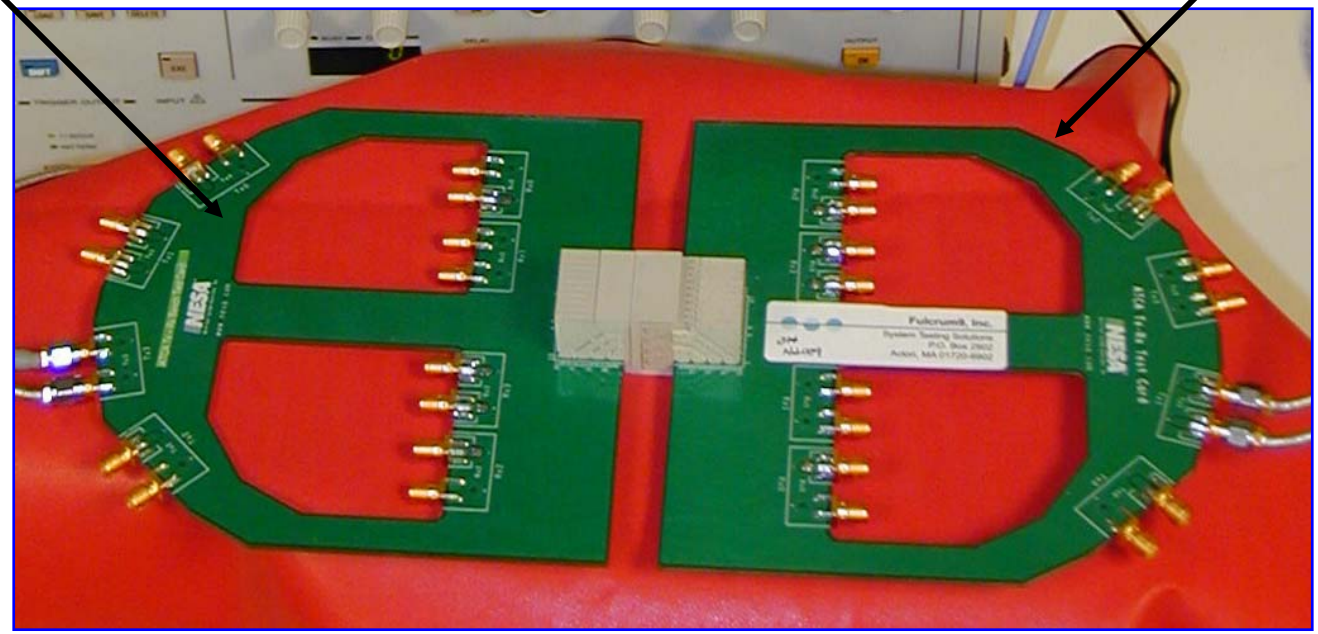
F9 Systems Test Fixture Options
(Bench*Blade* Back-to-Back with Signal*Blade*)

F9 Systems Bench*Blade*

F9 SystemsSignal*Blade*



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F9 Systems Tx/Rx Bench*Blade* Features

- Built on the same PCB platform as the SignalBlade.
  - Nelco-4000-13SI low loss PCB material.
  - Designed with controlled impedance differential routing used for multi-Gigabit Gen1 and Gen2 performance.
  - Precision 50 Ω edge launch SMAs used for enhanced cable management and performance.
  - Uses a modified Tyco male (plug) ZD connector that can be installed in any channel location, which is used to mate with female (jack) ZD connectors used on ATCA active cards.

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Summary and Conclusions

- The F9 Systems Signal*Blade* is an excellent tool for diagnostic and validation of AdvancedTCA fabric and base channels.
- The Signal*Blade* is suitable for measurements Gen1 and Gen2 performance systems.
- Using the Signal*Blade* solid design decisions can be made to verify signal integrity and ATCA compliance.
- The Signal*Blade* together with the F9 Systems Bench*Blade* are a cost effective evaluation solution for ATCA chassis switch and node (line) cards.
- The Signal*Blade* and Bench*Blade* are available for shipment immediately.

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