



IBIS-AMI
Model Correlation Report
Analog Devices Tgen3 V1 TX
SERDES

Revision 1.0

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1 Introduction

This document describes correlation of the IBIS-AMI models generated for the Analog Devices Tgen3.V1 SERDES transmitter.

2 TX Model

This section presents the correlation of the Analog Devices Tgen3.V1 SERDES transmitter model.

2.1 Modeled SERDES IP Features

- PVT corner selection
 - AMI Model parameter name: **TX_Corner**
 - Visible to the user: No
 - Parameter Usage: In
 - Parameter Format: Corner
 - Values:
 - -1 = Slow corner (SS)
 - 0 = Typical corner (TT)
 - 1 = Fast corner (FF)
 - Default setting: 0
 - Description: “TX Corner selection: -1=SS, 0=TT, 1=FF”
- Equalization value select
 - AMI Model parameter name: **TX_Deemph**
 - Visible to the user: Yes
 - Parameter Usage: In
 - Device register name: Unknown
 - Parameter Type: Integer
 - Values:
 - Eight settings (0 to 7):
 - 0
 - 1
 - 2
 - 3
 - 4
 - 5
 - 6
 - 7
 - Default setting: 0
 - Description: “TX De-emphasis control”
- Output Drive Level Adjustment
 - AMI Model parameter name: **TX_Vswing**
 - Visible to the user: Yes
 - Parameter Usage: In
 - Parameter type: Integer
 - Values:
 - 0

- 1
- 2
- 2
- 3
- 4
- 5
- 6
- 7
- Default setting: 7
- Description: “Output Drive Level Adjustment”

2.2 Model Format and Function

This model is supplied as an IBIS-AMI model, which includes both analog and algorithmic components. The **analog model** is used to perform *Network Characterization*, which, under the IBIS-AMI specification, determines the impulse response for the un-equalized analog network. The **algorithmic model** is used to perform **Channel Analysis**, which determines the end-to-end response of the SERDES link including equalization behavior.

2.3 IBISCHK Results

The Analog Devices Tgen3.V1 TX model passes ibischk version 5.1.3 with 0 errors and 0 warnings.

2.4 Correlation Methodology

The final Analog Devices IBIS-AMI transmitter model QCD waveforms/eye diagrams have are correlated to measured waveforms generated by Analog Devices. The QCD time domain waveforms were recorded at the load ends of the Evaluation Board s-parameter generated from TDR information.

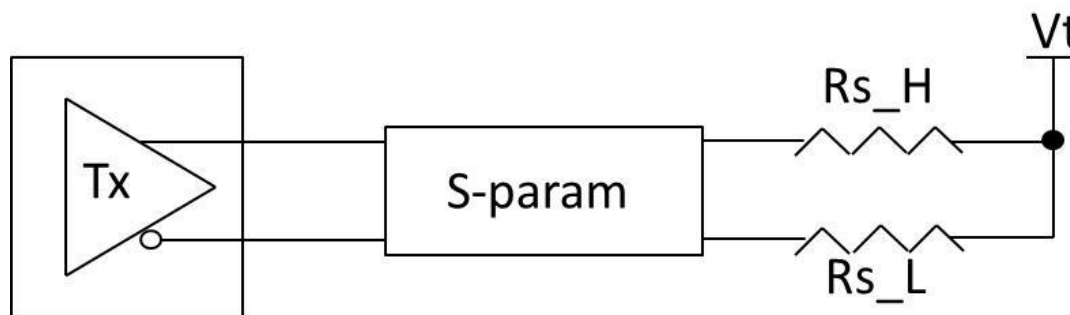


Figure 1: Tx model correlation test fixture

2.4.1 Correlation Criteria

The following criteria have been used when correlating the waveforms and eye diagrams:

- General shape and trend

- General amplitude
- Eye height and eye width
- Target Figure Of Merit (FOM) where applicable: 95+%

FOM is defined by the area between the two curves divided by the area under the reference curve.

2.5 Correlation Project

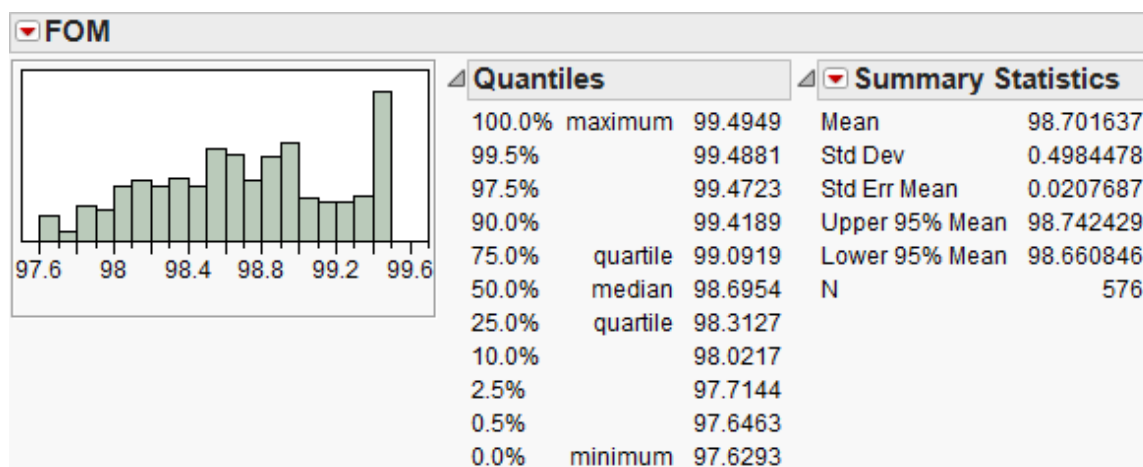
The correlation was performed under the following conditions:

- Corner: -1, 0, 1 (3 settings)
- Three different 10" S-parameter w-line models:
 - 50ohms (Filename: etch_50ohm_10inch.s4p)
 - 100ohms (Filename: etch_100ohm_10inch.s4p)
 - 150ohms (Filename: etch_150ohm_10inch.s4p)
- Data Rate: 12.5Gbps (80ps)
- Sweep of all 8 Amplitude Vswing settings.
- Sweep of the 8 de-emphasis settings.
- Number of simulations: (3 corners)*(8 de-emphasis)*(8 Vswing) *(3 channels) = 576
- PRBS7 pattern.
- Typical loading (100 Ohm).

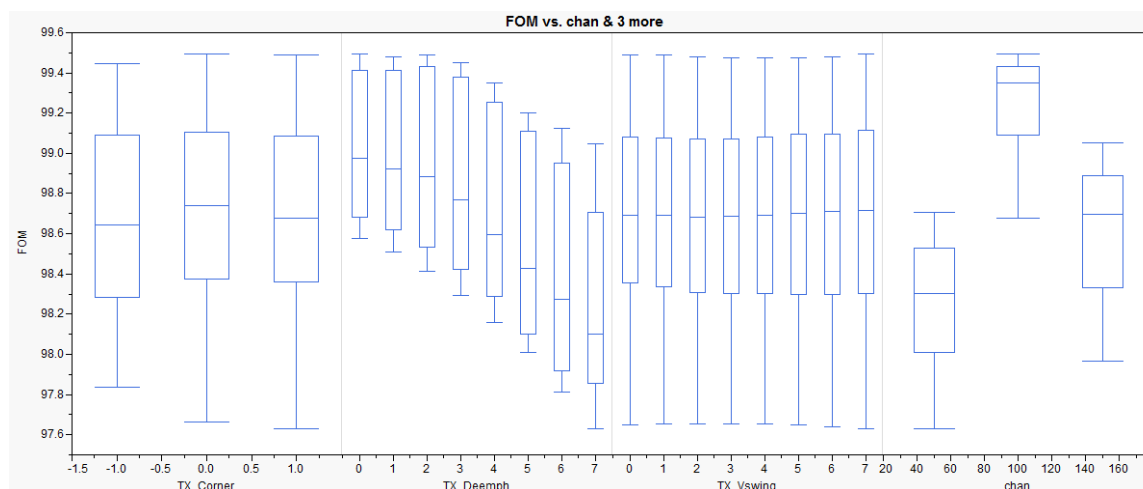
The total number of cases compare is 576.

2.6 TX Correlation Results

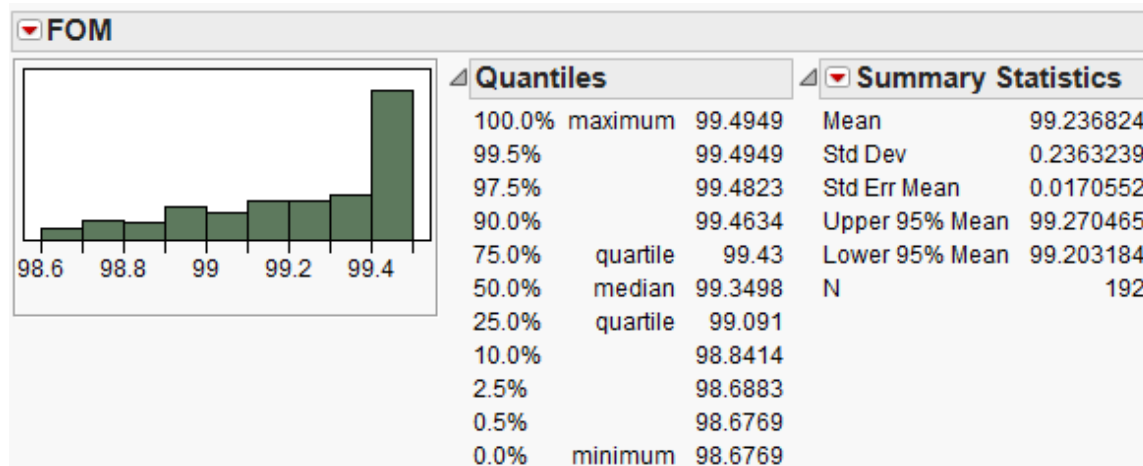
The Correlation Figure of Merit (FOM) is summarized in the following chart for all 60 cases. It shows that all of the FOMs fall between 97.6% and 99.5%.



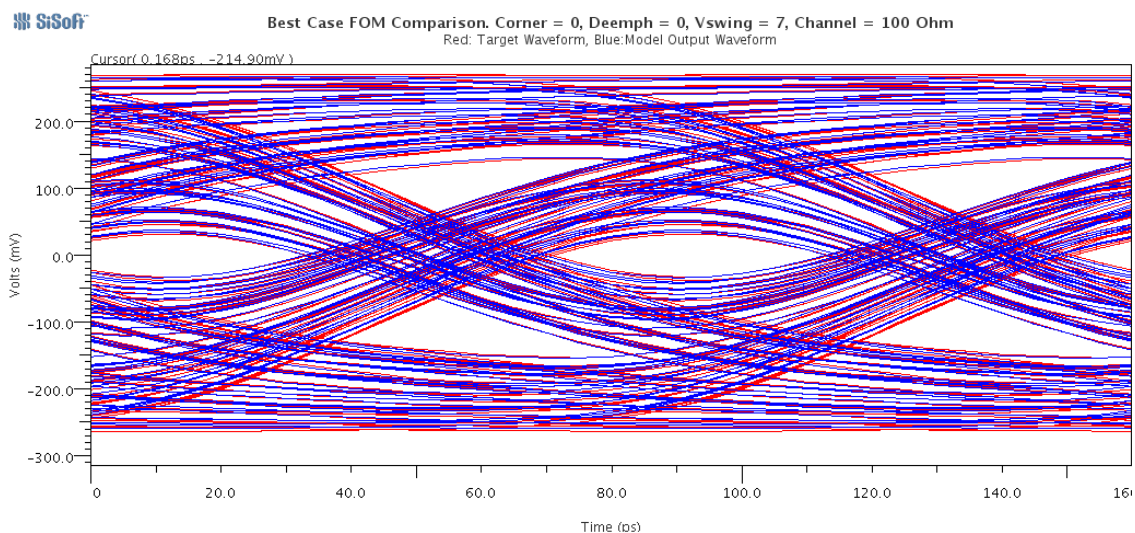
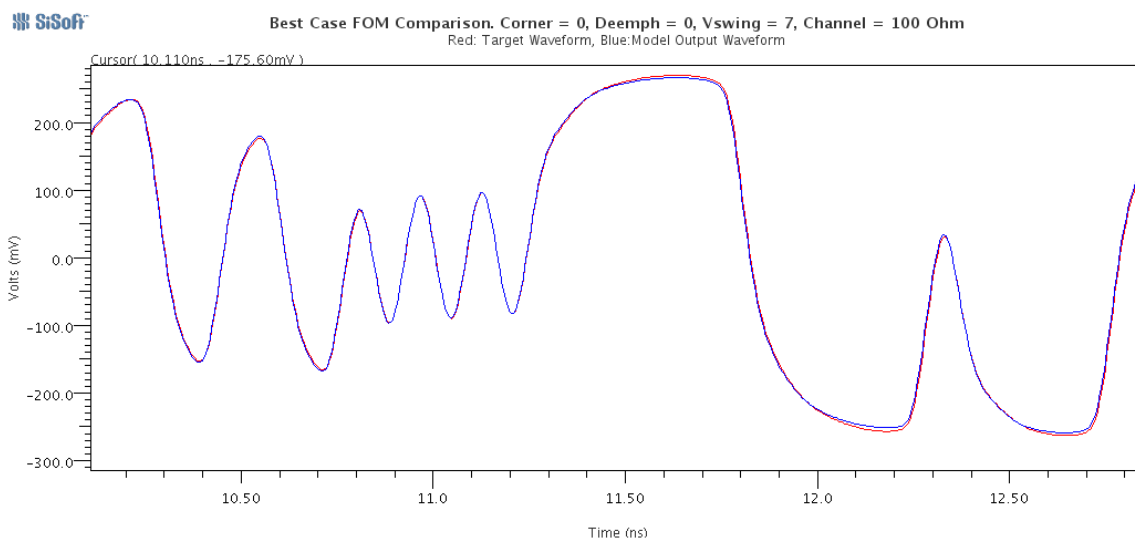
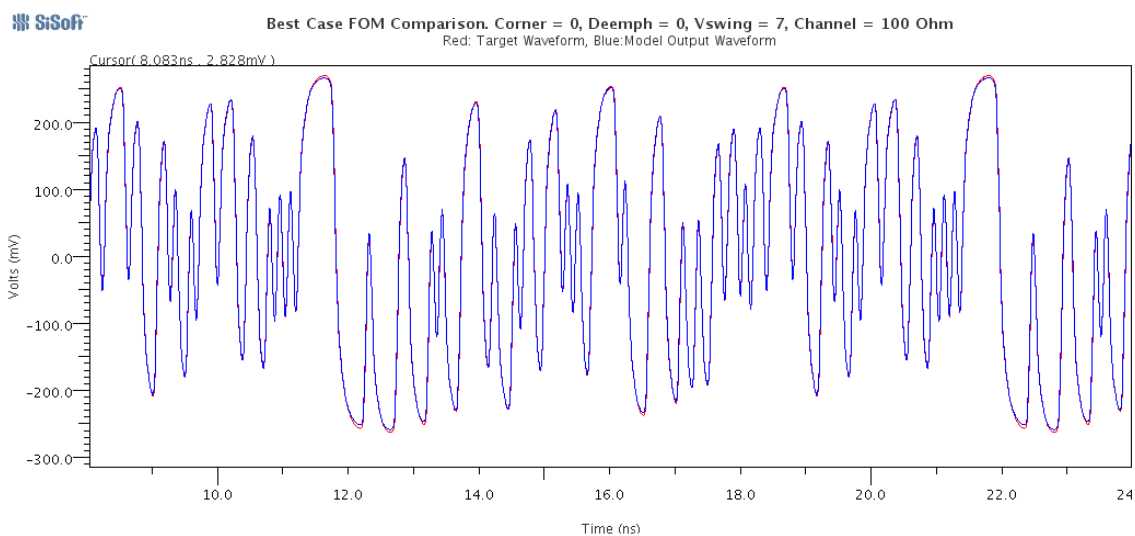
The figure below shows the relationship of FOM vs. Corner, Deemph, Vswing and correlation channel. We see that Corner and Vswing have fairly uniform FOM across the settings but De-emphasis a has slightly higher FOM at lower settings. Additionally, the 100 ohm channel displayed the best FOM which is expected since it was with nearly matched loads that the transmitter was characterized.



If we look at the FOM for the 100 ohm channel only then the average FOM is greater than 99%.



Below the best case FOM waveforms are visualized. Red is the Target waveform and blue the model out waveform.



Below the worst case FOM waveforms are visualized. Red is the Target waveform and blue the model out waveform.

