

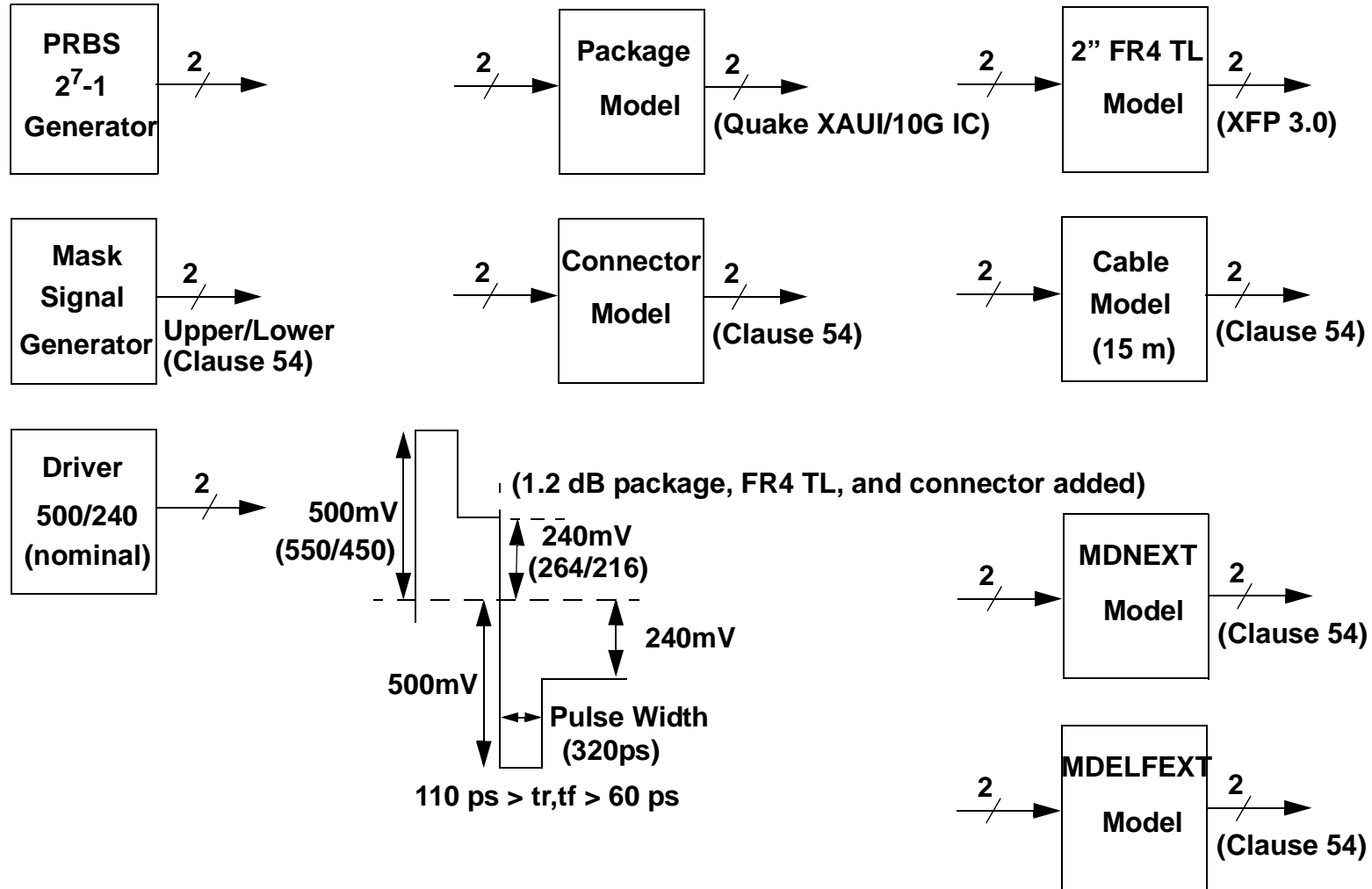
# 10G-CX4 Driver Compliance Mask and System Performance Simulation

## 1. Outline

- Simulation Environment
- Cable Model Frequency Response
- Compliance Mask Simulation Results
- System Performance Simulation
  - Crosstalk Contribution
  - Transmit Jitter Contribution
- Conclusions

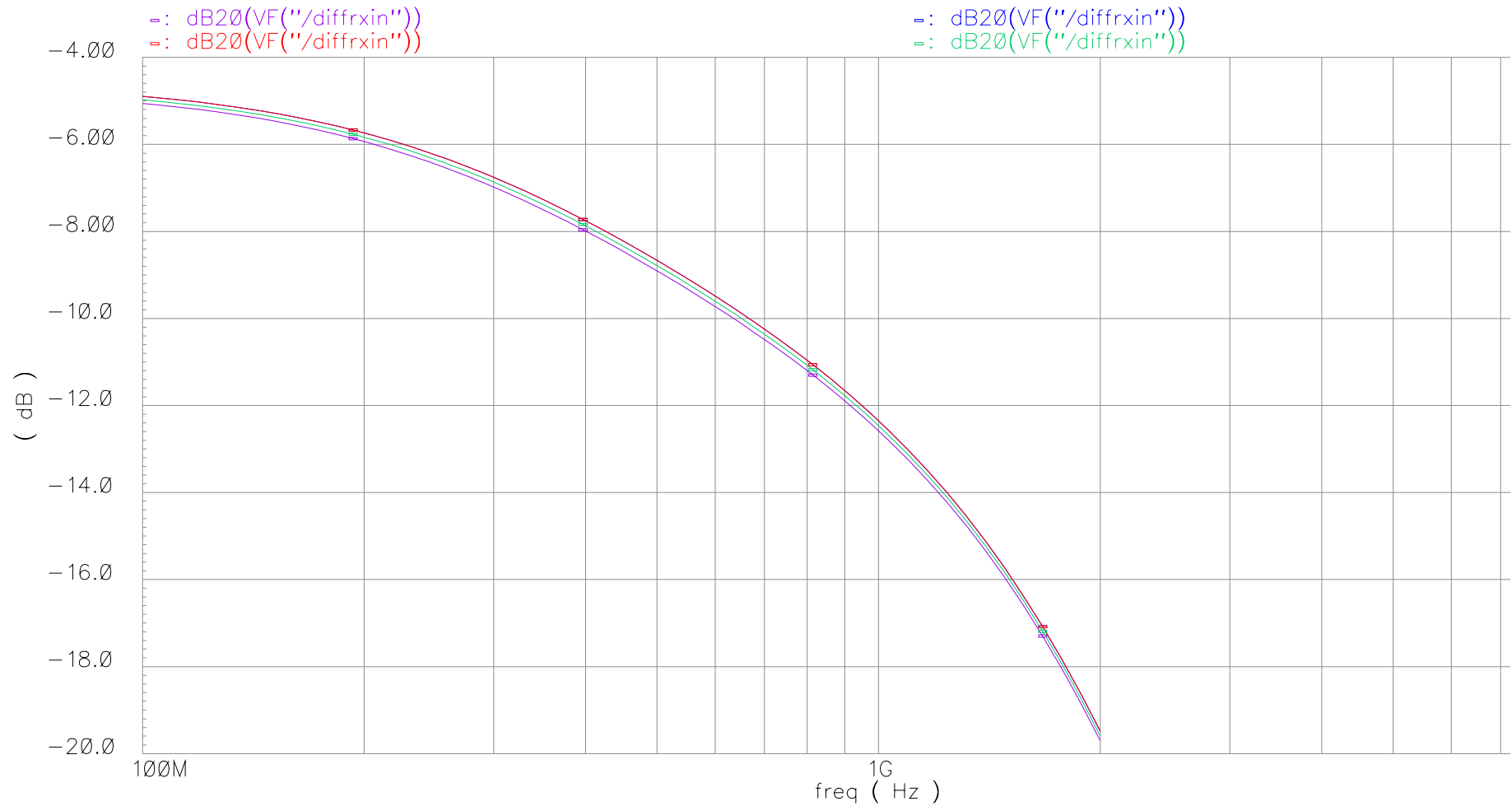
2. Simulation Environment

Figure 1. Simulation Models



### 3. Cable Model Frequency Response

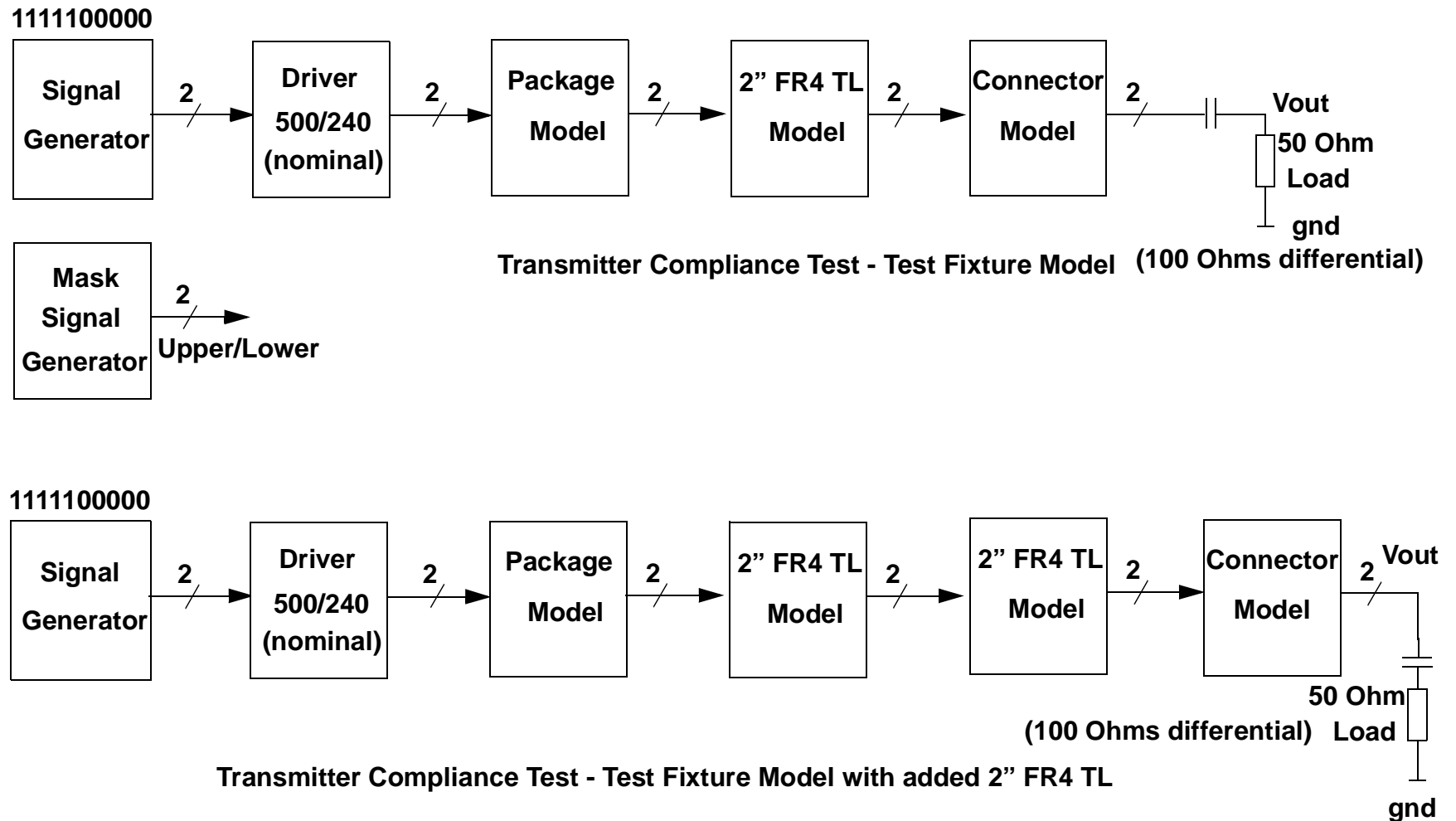
Figure 2. Frequency Response



The cable assembly attenuation variation with the characteristic impedance (80 to 120 Ohms) is +/- 0.5 dB.

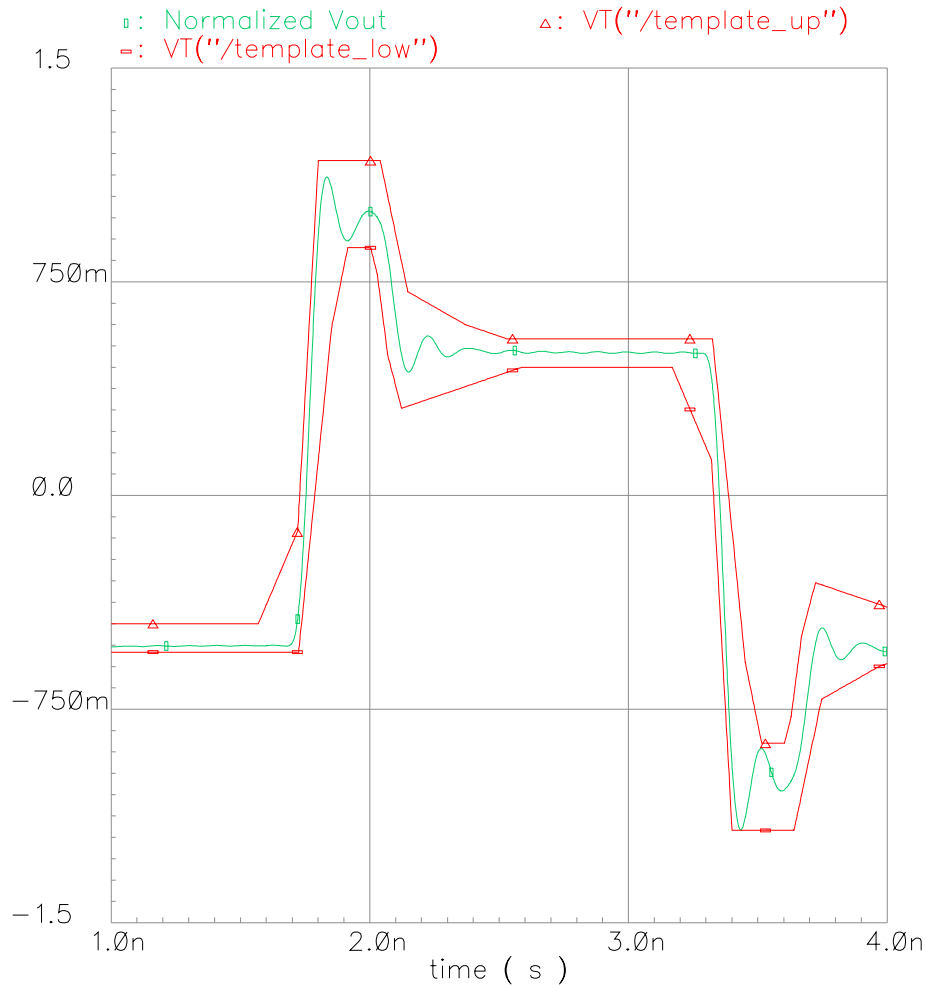
#### 4. Compliance Mask Simulation Results

Figure 3. Transmitter Compliance Mask Simulation Environment

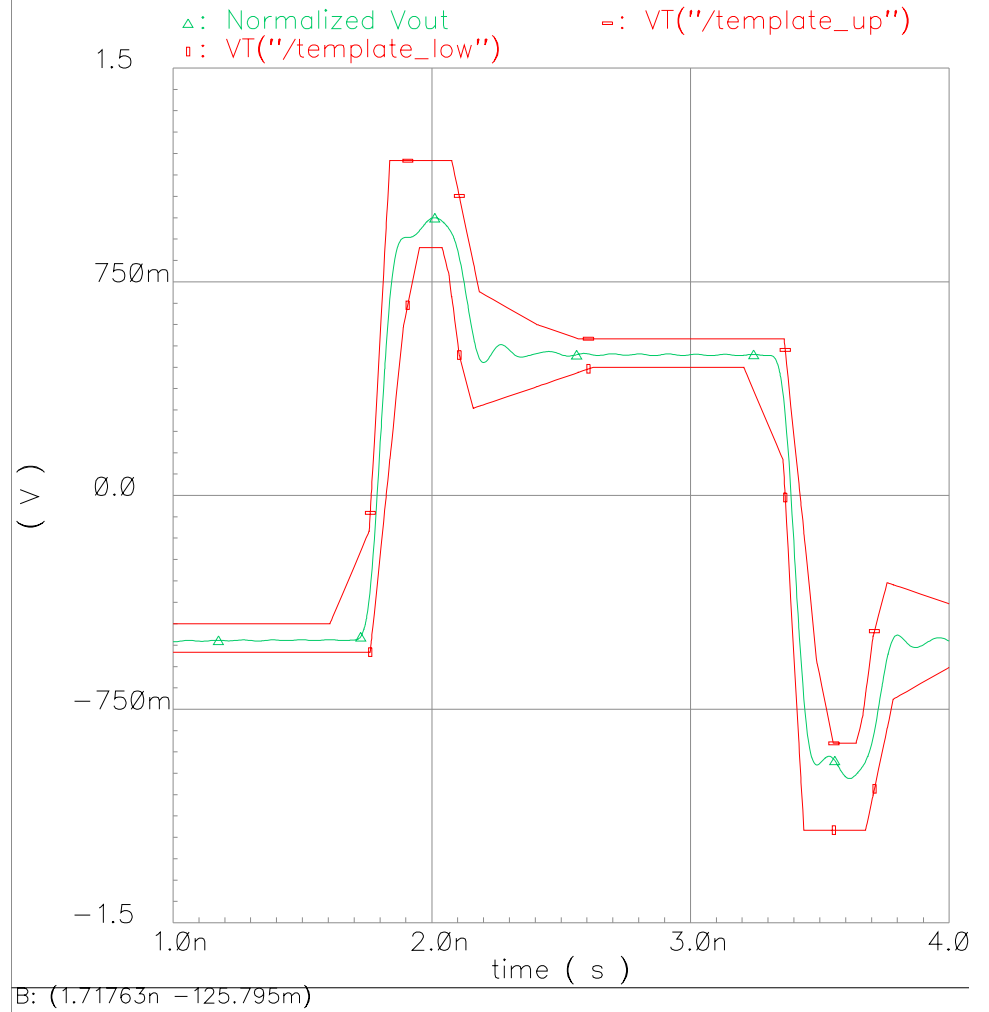


# Quake Technologies, 10G CX4 Driver Compliance Mask and System Performance Simulation

## Figure 4. Test Fixture Model Simulation Results



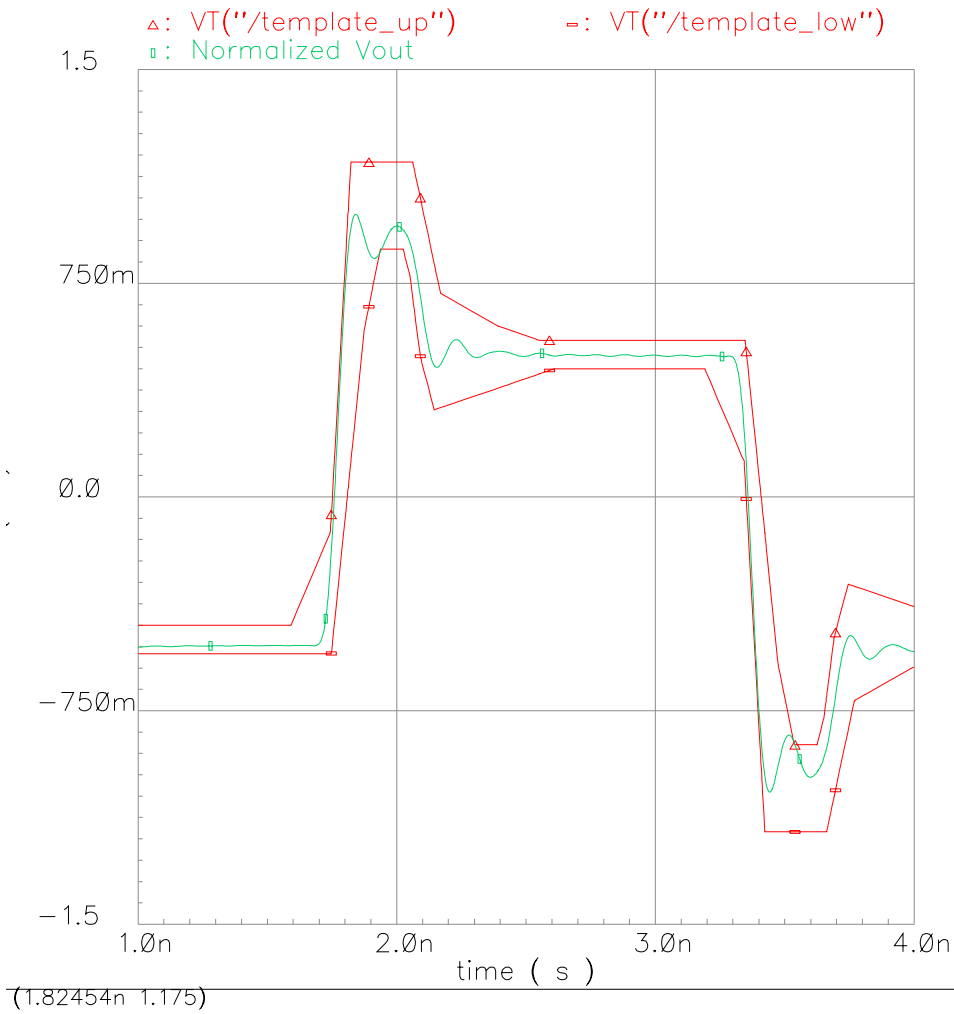
**Fast (ff) process, supply voltage +5%, 0 deg. C**



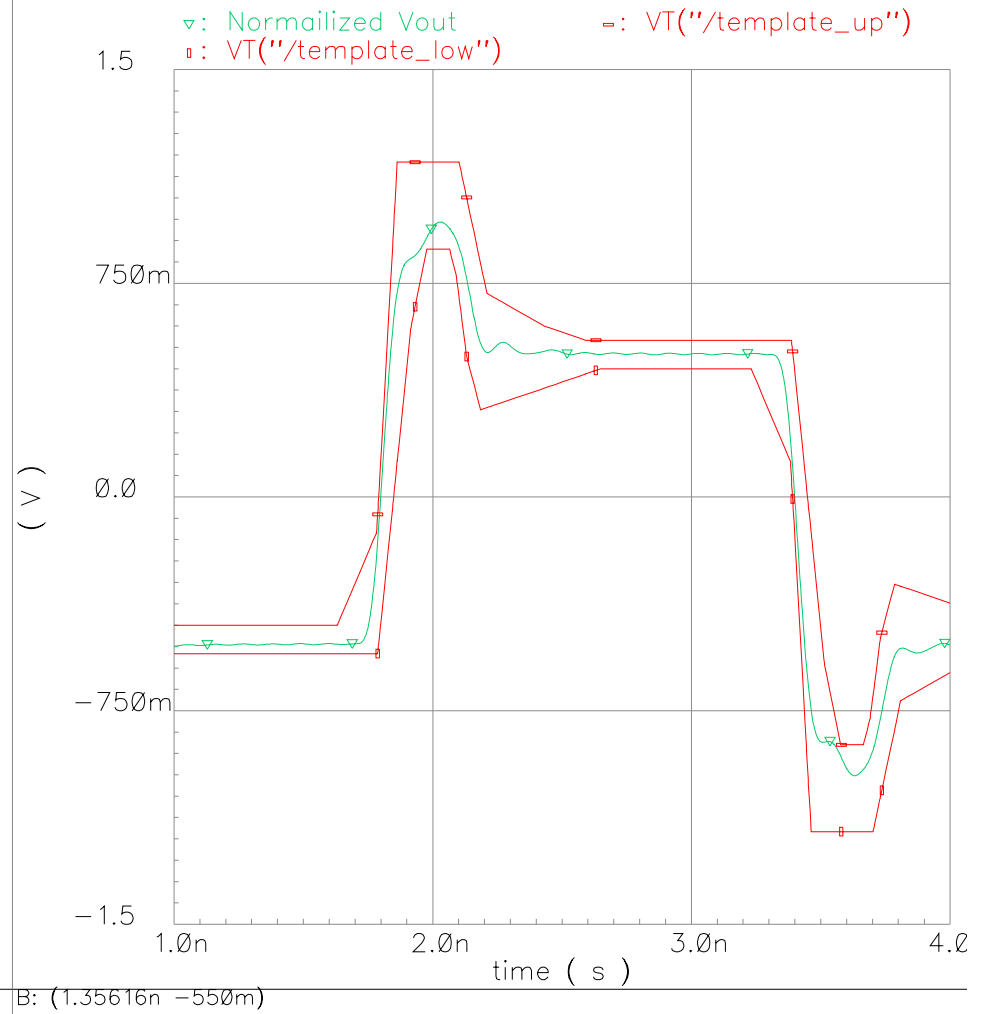
**Slow (ss) process, supply voltage -5%, 125 deg. C**

# Quake Technologies, 10G CX4 Driver Compliance Mask and System Performance Simulation

## Figure 5. 4" FR4 TL Test Fixture Model Simulation Results

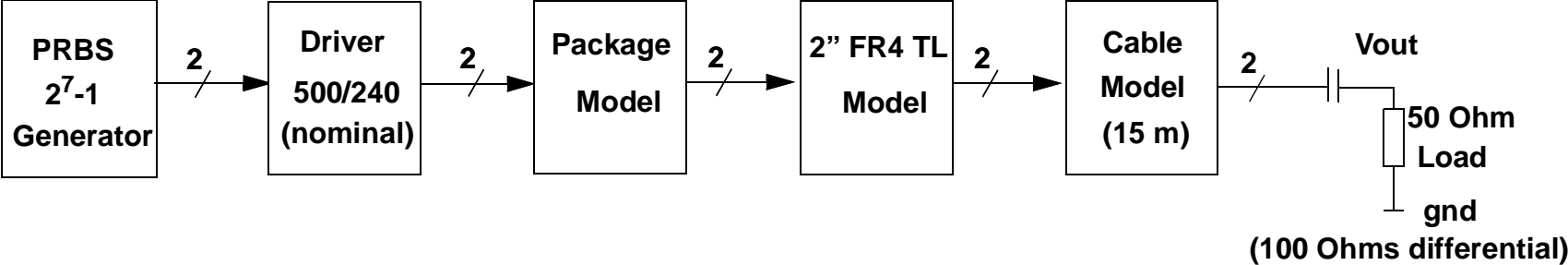


**Fast (ff) process, supply voltage +5%, 0 deg. C**

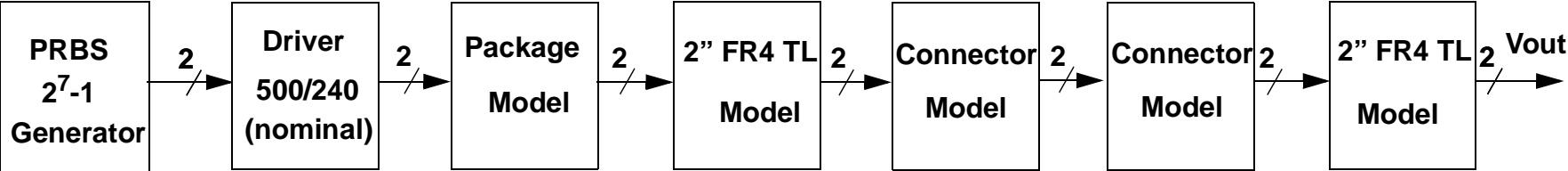


**Slow (ss) process, supply voltage -5%, 125 deg. C**

Figure 6. System Performance Simulation Environment



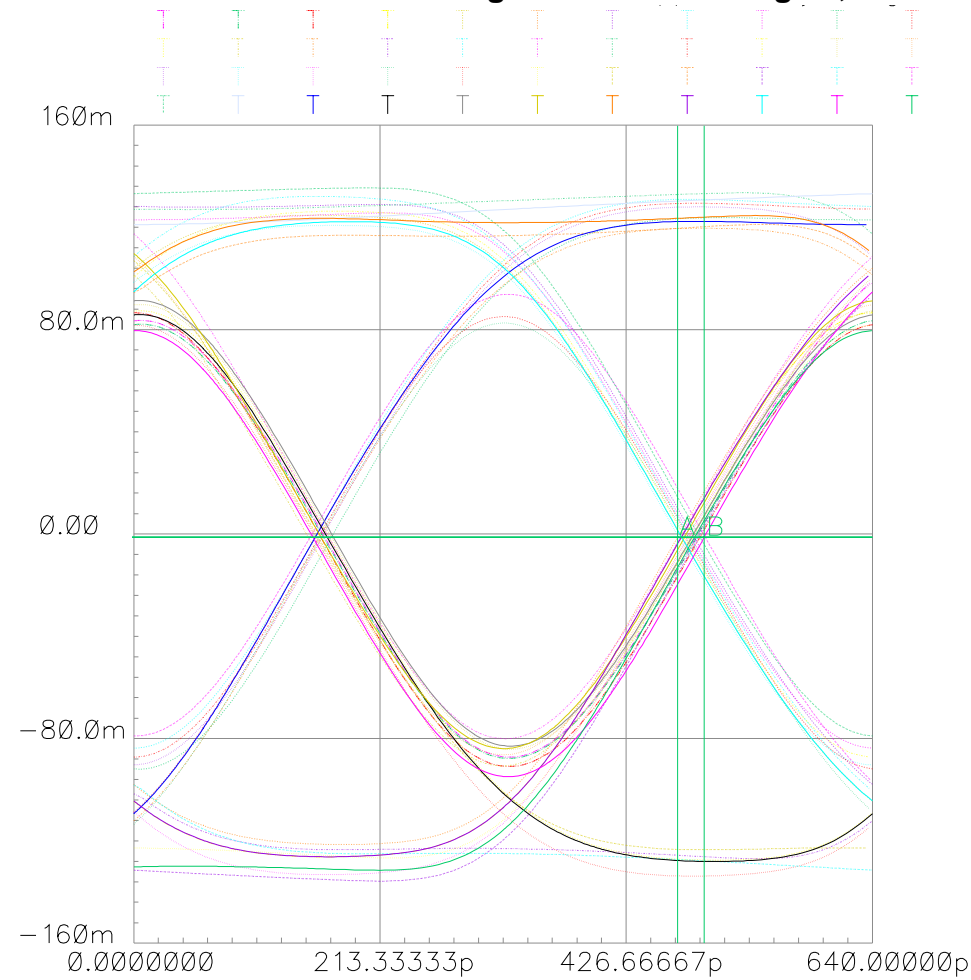
System performance simulation, 15 m worst case cable assembly model



System performance "0" m cable, simulation model

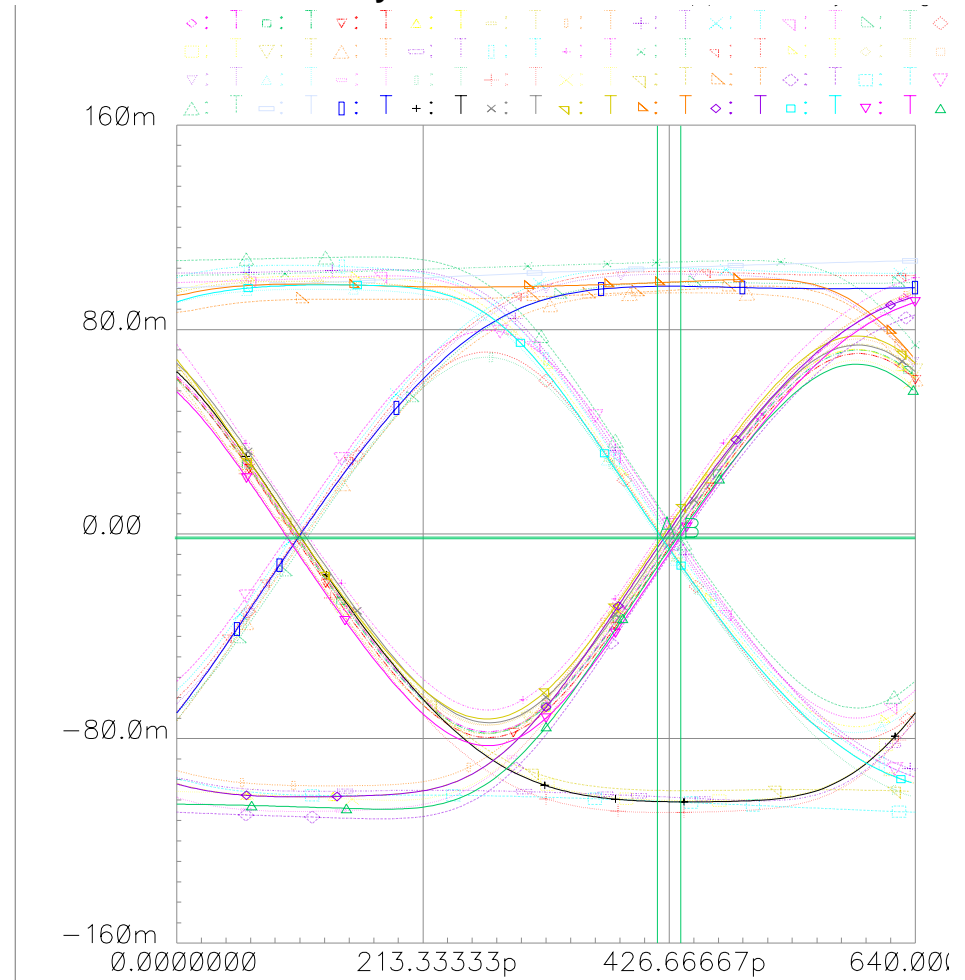
# Quake Technologies, 10G CX4 Driver Compliance Mask and System Performance Simulation

## Figure 7. Receiver Signal, 15 m Worst Case Cable Assembly



(471.684p -851.437u) delta: (23.0939p 375.537n)  
 (494.778p -851.061u) slope: 16.2613K

**Slow (ss) process, supply voltage -5%, 125 deg. C**



A: (416.875p -1.02445m) delta: (19.9506p -790.841u)  
 B: (436.825p -1.81529m) slope: -39.64M

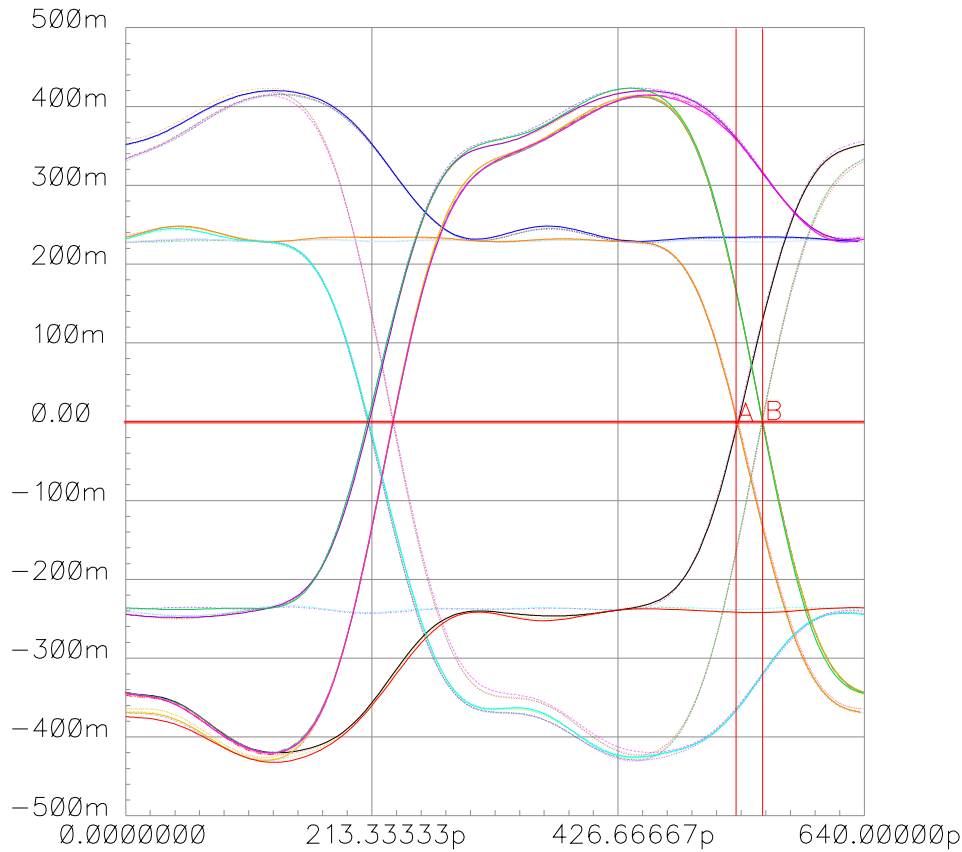
**Fast (ff) process, supply voltage +5%, 0 deg. C**





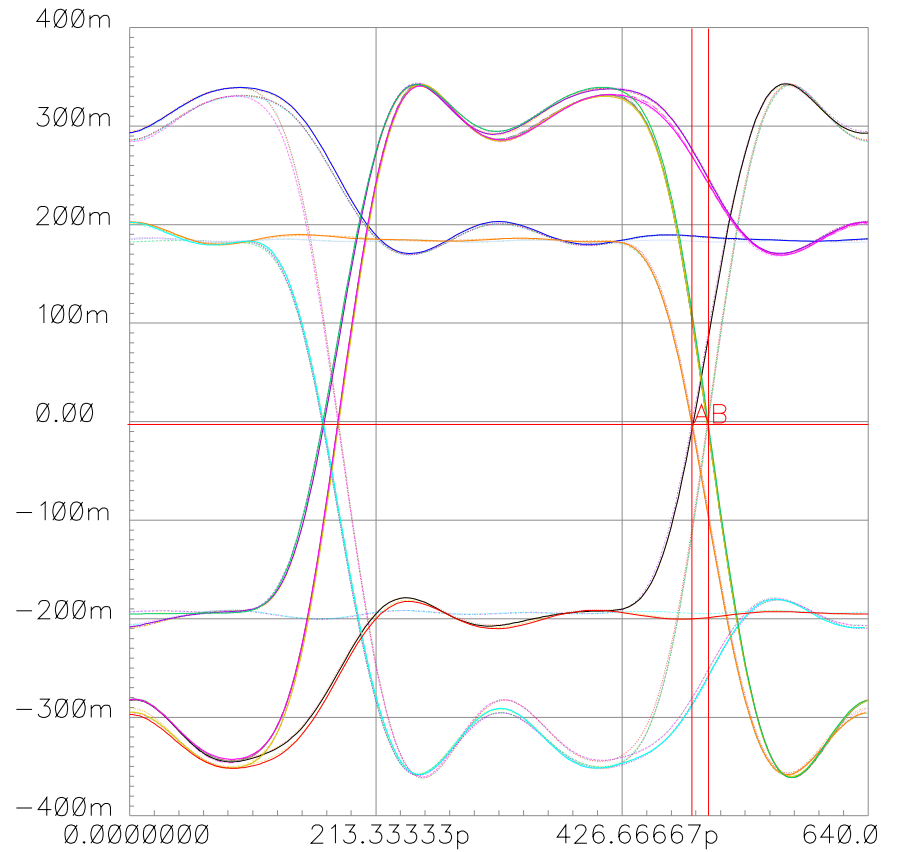
# Quake Technologies, 10G CX4 Driver Compliance Mask and System Performance Simulation

## Figure 8. Receiver Signal "0" m Cable Assembly



529.716p -937.265u) delta: (22.2477p 1.92641m)  
 551.964p 989.145u) slope: 86.5891M

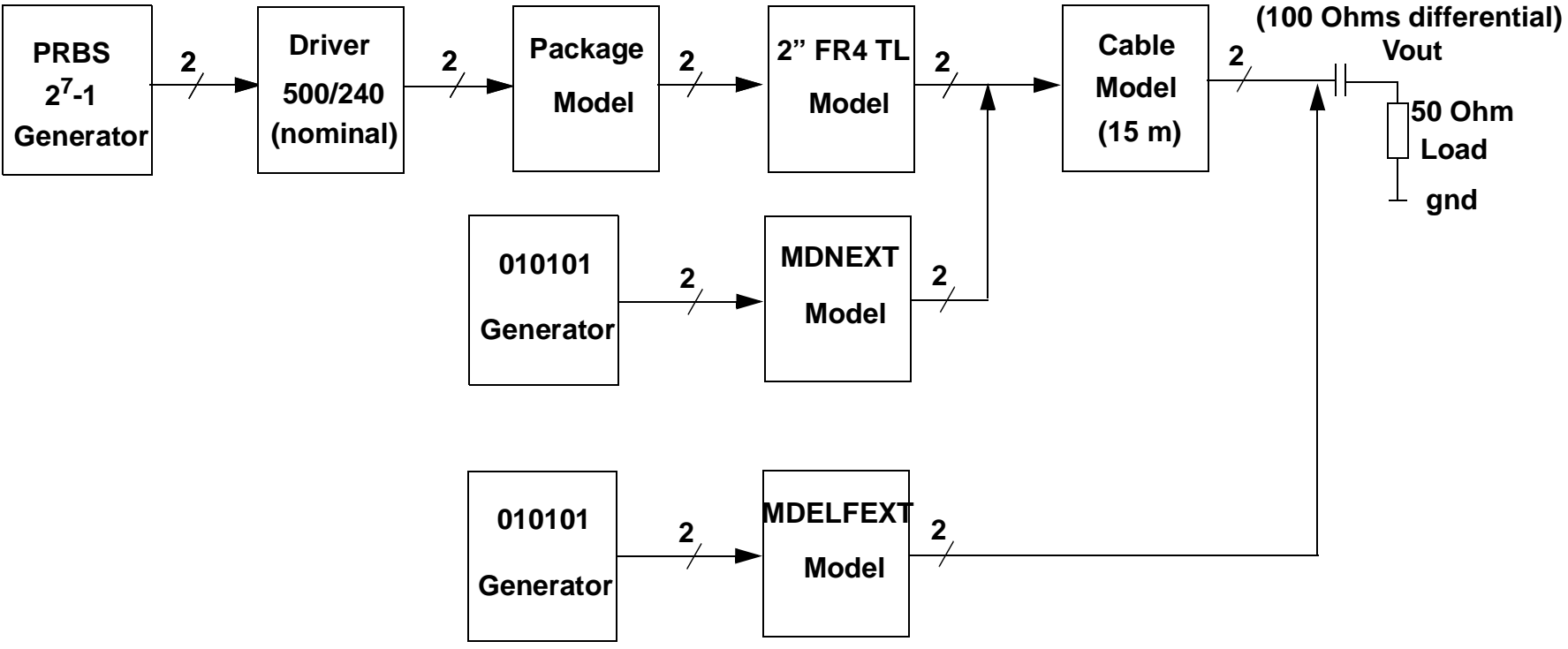
**Slow (ss) process, supply voltage -5%, 125 deg. C**



A: (486.996p -2.11951m) delta: (14.3324p 25.5489u)  
 B: (501.328p -2.09396m) slope: 1.7826M

**Fast (ff) process, supply voltage +5%, 0 deg. C**

Figure 9. Simulation Environment for Crosstalk Impact



System performance simulation, 15 m worst case cable assembly model

## 5. Conclusions

- Models have be generated for connectors, cable assembly, and FR4 transmission lines.
- The cable assembly attenuation variation with the characteristic impedance is +/- 0.5 dB.
- The transmitter mask compliance test has small sensitivity to the length of transmission line (between 2" and 4").
- The minimum receiver input amplitude is 140 mV pp, not including crosstalk, and 94 mV pp including MDNEXT.
- The model for MDELNEXT needs more work.
- Summary of signal degradation

Source	Worst Case Signal Amplitude [mV pp]	Worst Case Jitter [ps-pp]	Worst Case Jitter [UI]
Transmitter	450/216	112*	0.35*
Cable Assembly Attenuation and TL	140	20	0.07
MDNEXT	94	12	0.04
MDELNEXT			
Total	94	144	0.45

\*Worst case total jitter at the driver input.