simDM Simulated PHY Performance in Presence of Environmental Noise

Contribution to 802.3dm Task Force

March 10, 2025

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Introduction

- This presentation summarizes simDM simulated PHY performance in presence of environmental noise
- The simDM simulation has been used to do much more extensive simulations, but only small subset of the simulation results can be shared in this presentation
- More simulation results are shared in separate ZIP file, available on request
- The simDM code used for this simulation is also made available, which allows others to review the validity of the simulation and run additional simulation cases

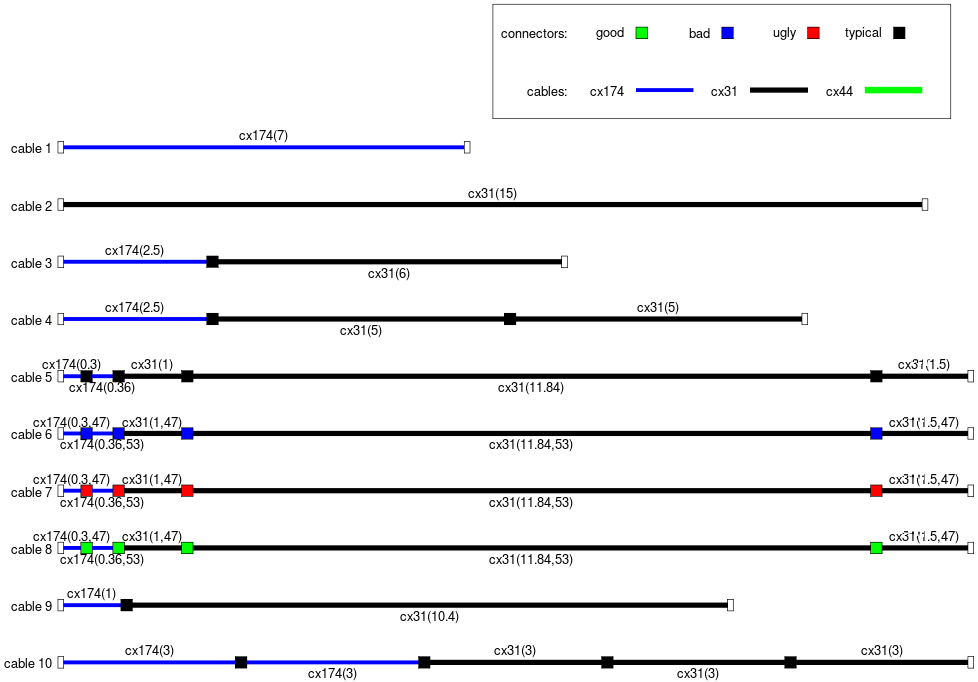
Simulated Cables

The cables used in this simulation are taken from

[jonsson_3dm_01_03_10_25.pdf]

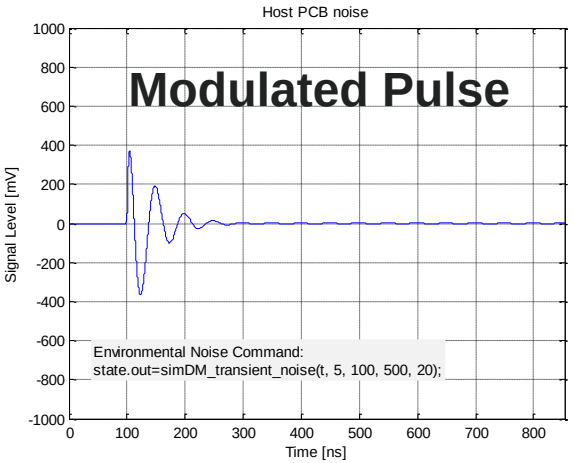
For readability, shorter cable names are used in this presentation than what was used in the source presentation

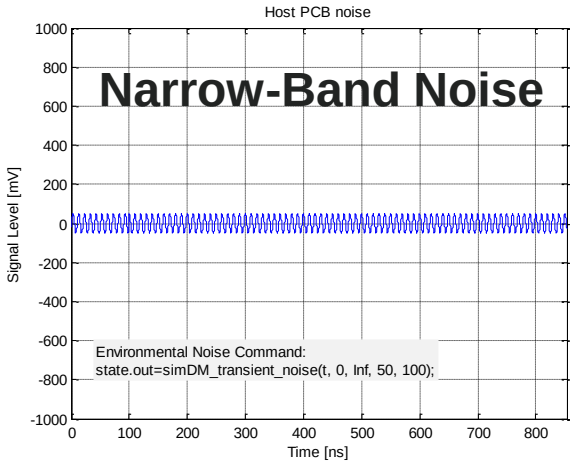
Most of the simulations are done on cable 6, because it is one of the most difficult cables in the set



Noise Models

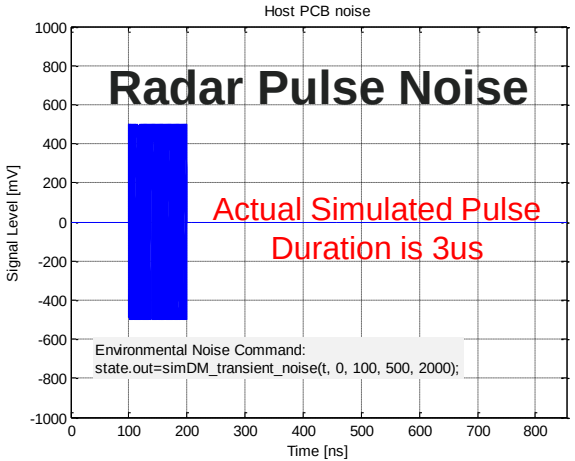
The environmental noise is simulated using the methodology presented in [jonsson_3dm_02a_02_27_25.pdf]





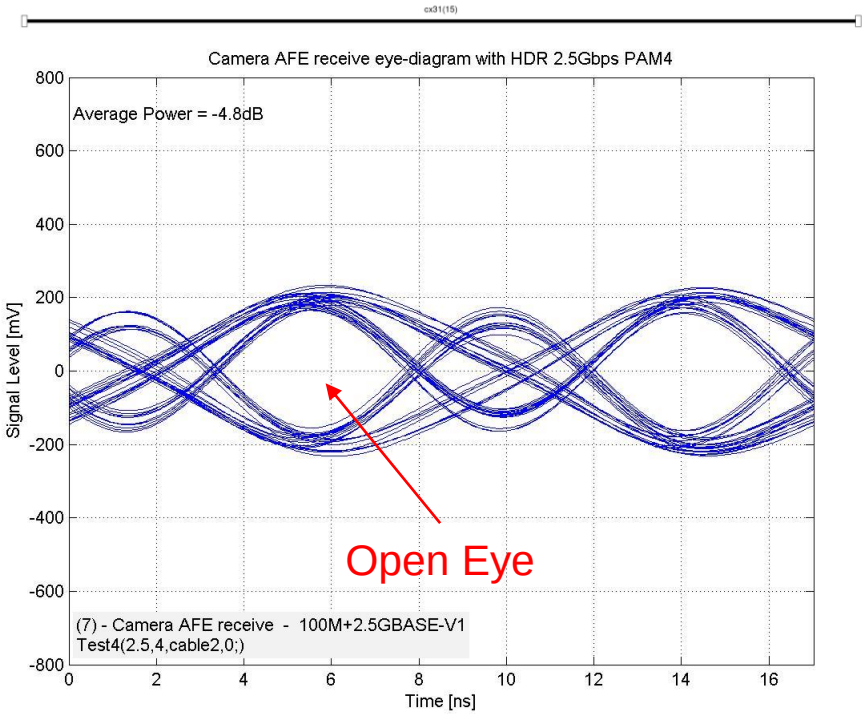
Three different kinds of noise are simulated:

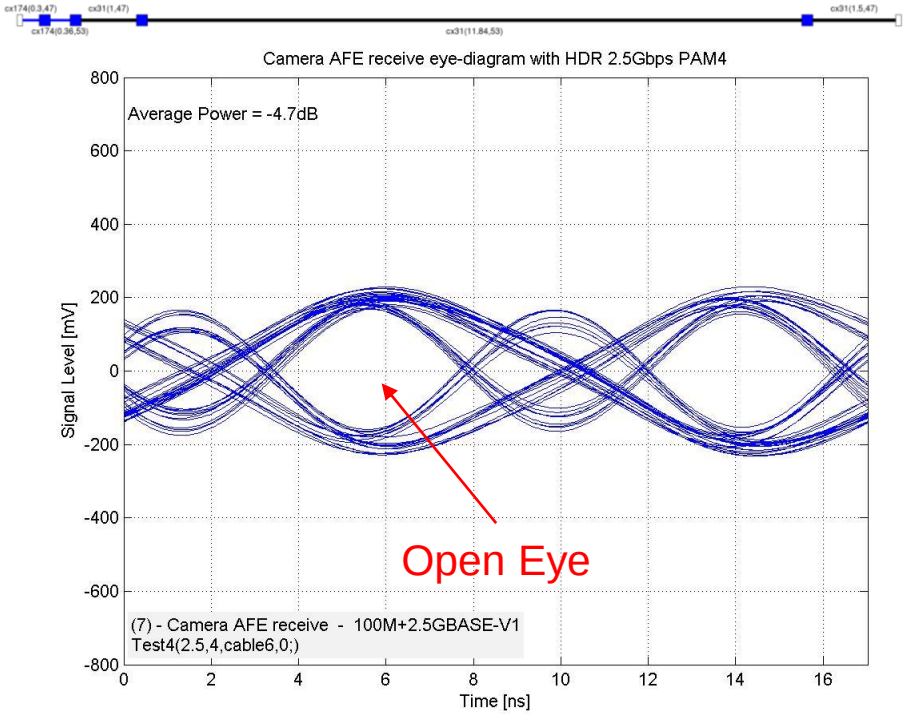
- Modulated Pulse (MP)
- Narrow-Band RF Noise (NB)
- Radar Pulse Noise (RP)



Low Data Rate (LDR) Environmental Noise Performance

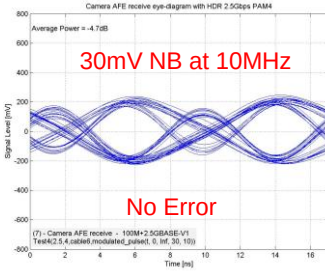
LDR Eye for Low and High Echo Cables

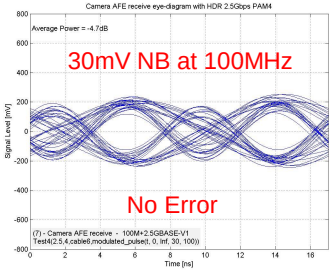


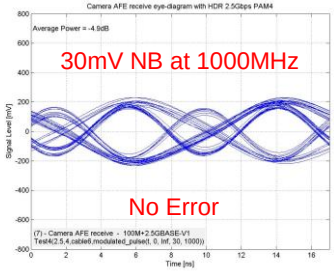


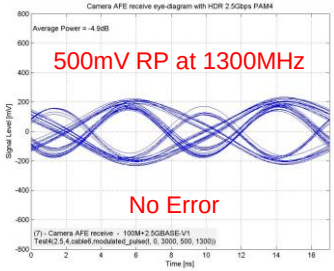
The LDR direction performs well on all simulated cables

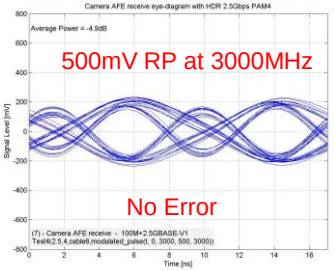
LDR Eye for Environmental Noise (Cable 6)

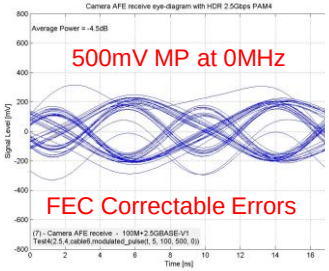


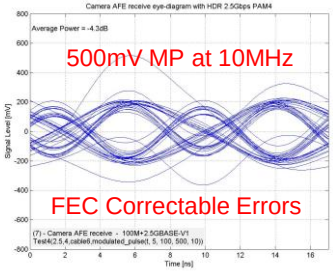


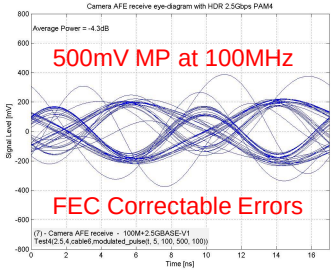


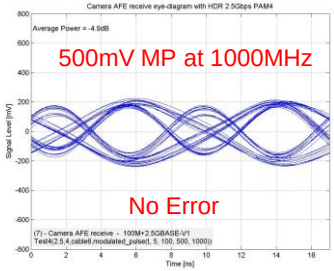








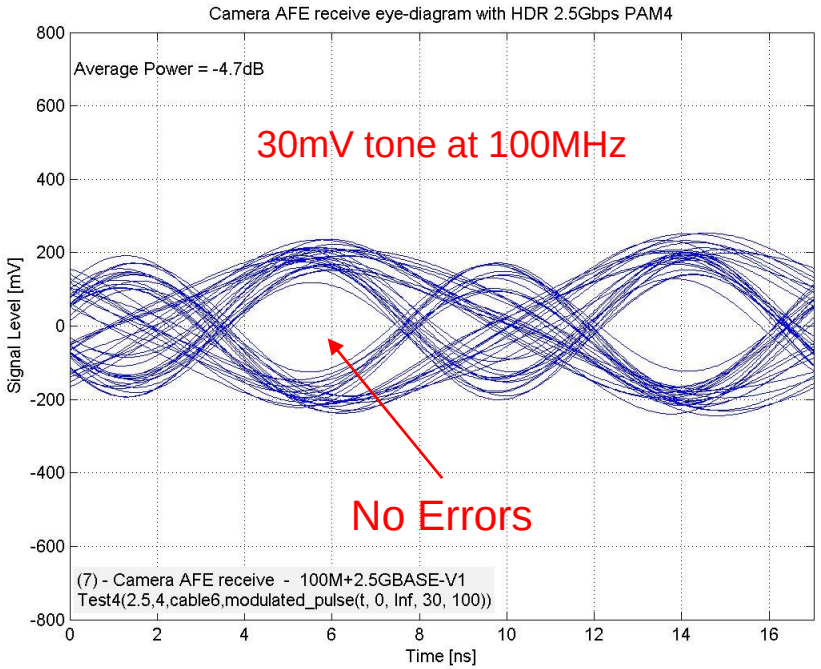


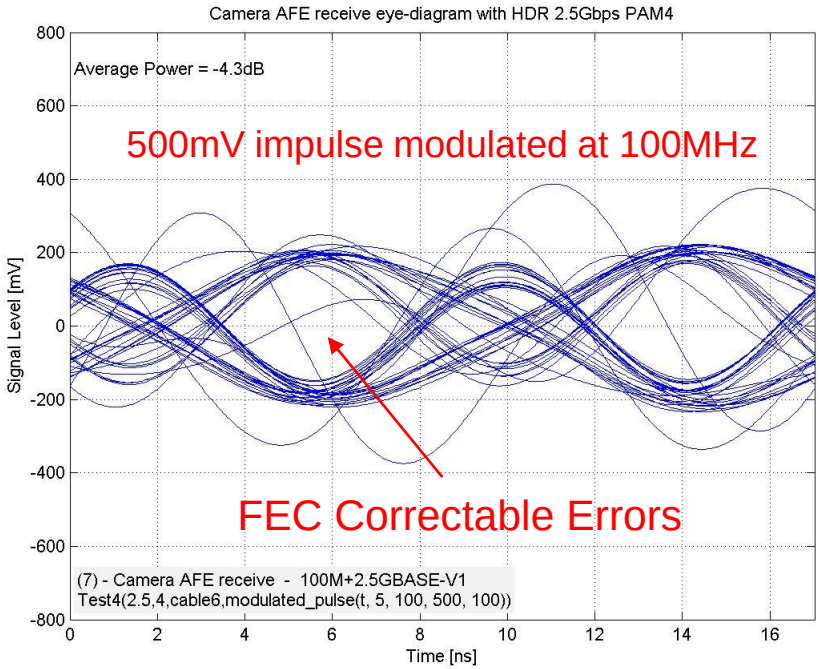


NB – Narrow Band RFI
RP – Radar Pulse
MP – Modulated Pulse

The LDR direction performs well under all noise conditions

LDR Eye for Worst Environmental Noise

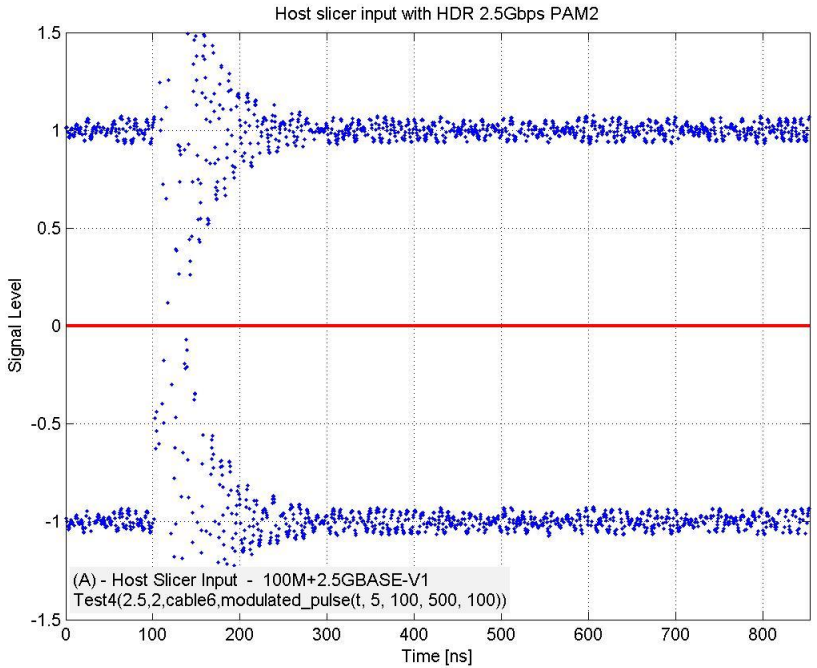


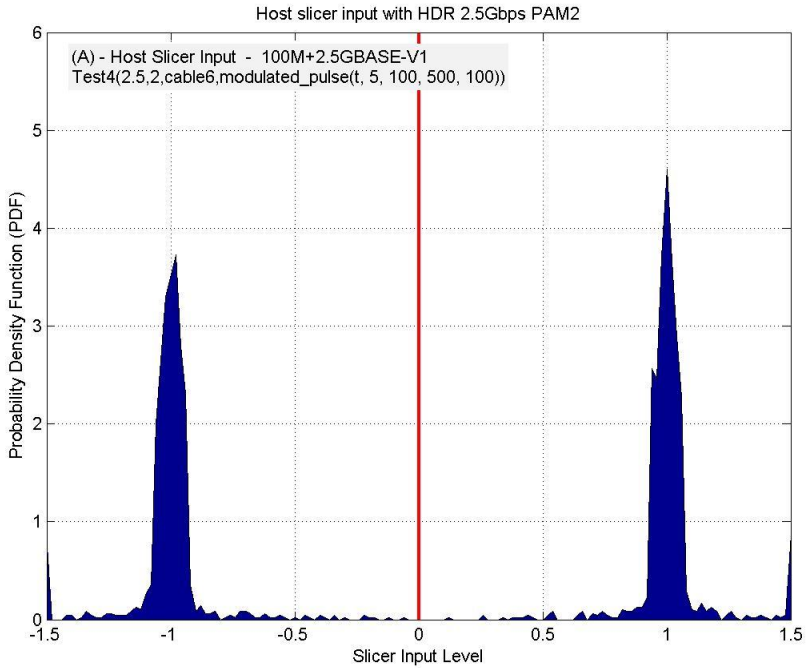


LDR direction needs FEC to correct impulse noise

High Data Rate (HDR) Environmental Noise Performance

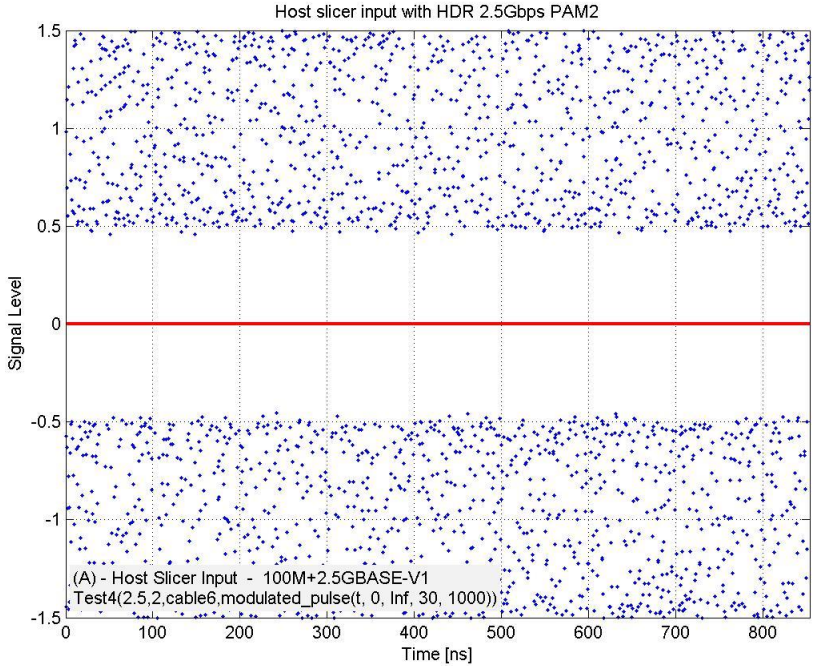
2.5Gbps PAM2 – 100MHz Modulated Pulse @ 500mV

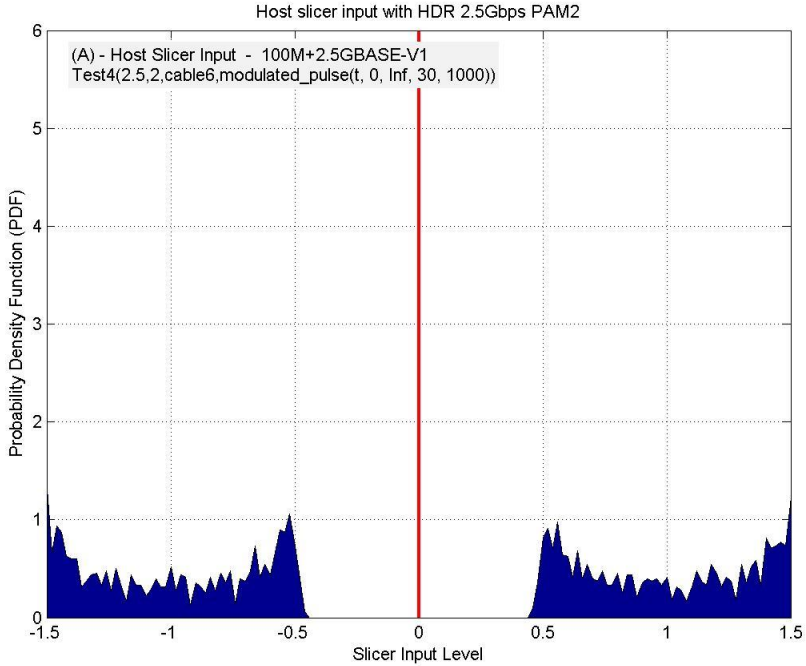




HDR direction needs FEC to correct impulse noise

2.5Gbps PAM2 – 1000MHz Tone @ 30mV

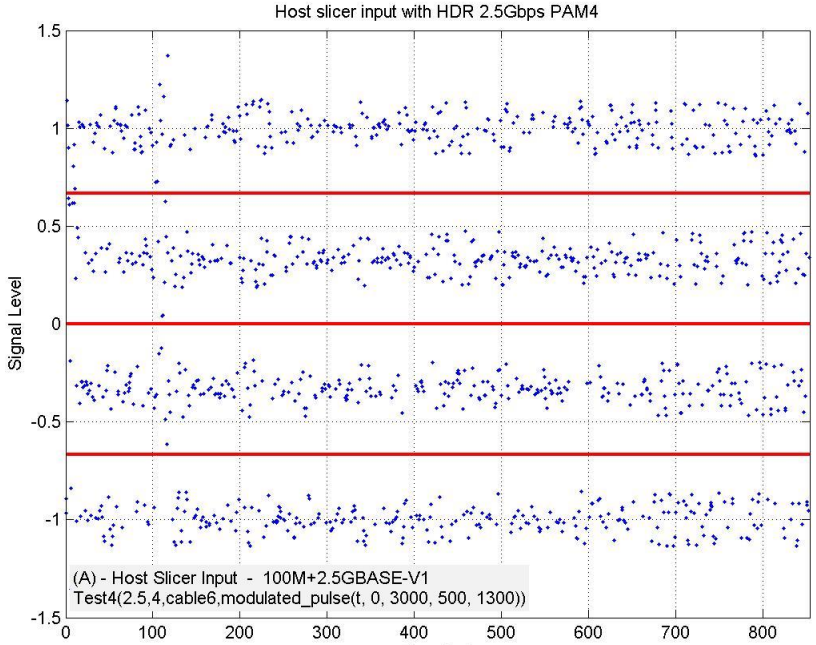


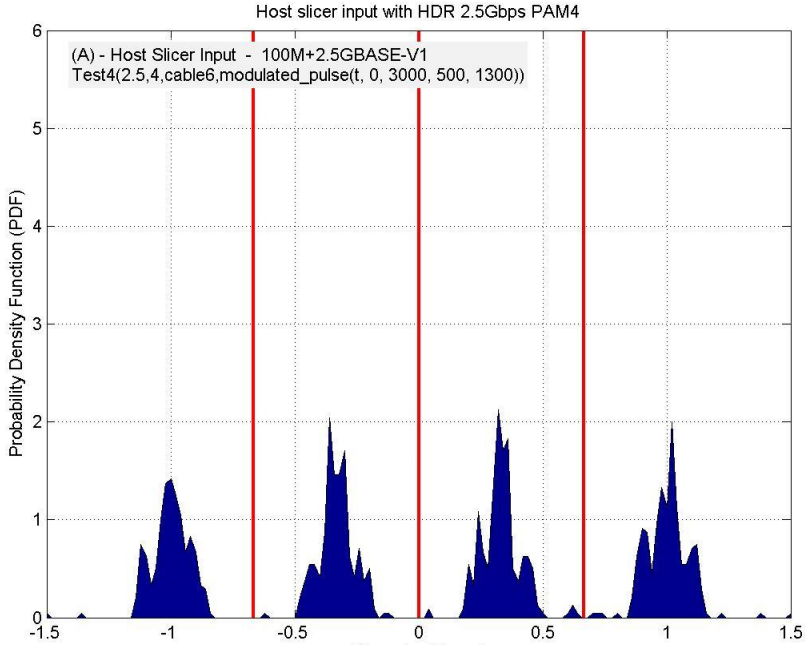


HDR direction can handle considerable tonal interference

PAM2 vs PAM4 for Radar Pulse

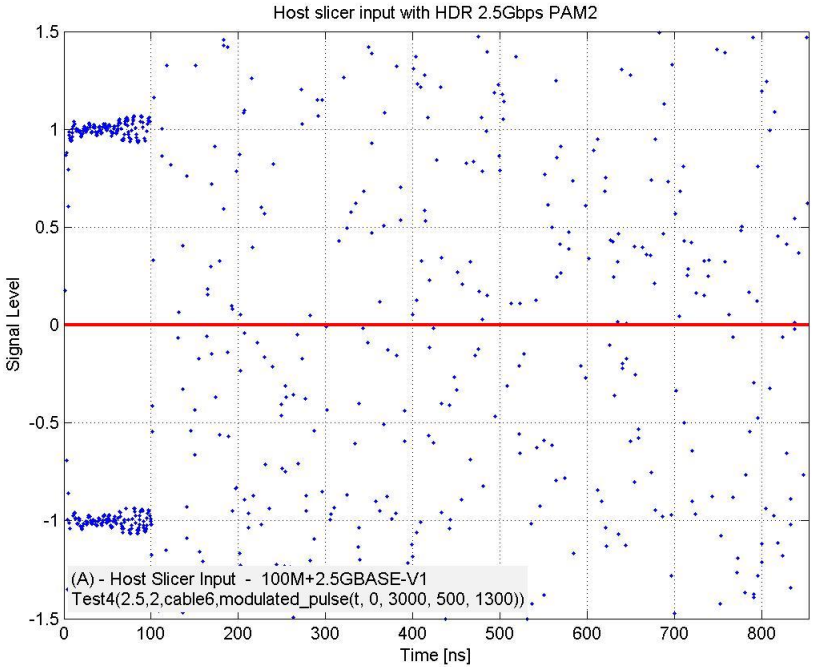
2.5Gbps PAM4 – 1300MHz Radar Pulse @ 500mV

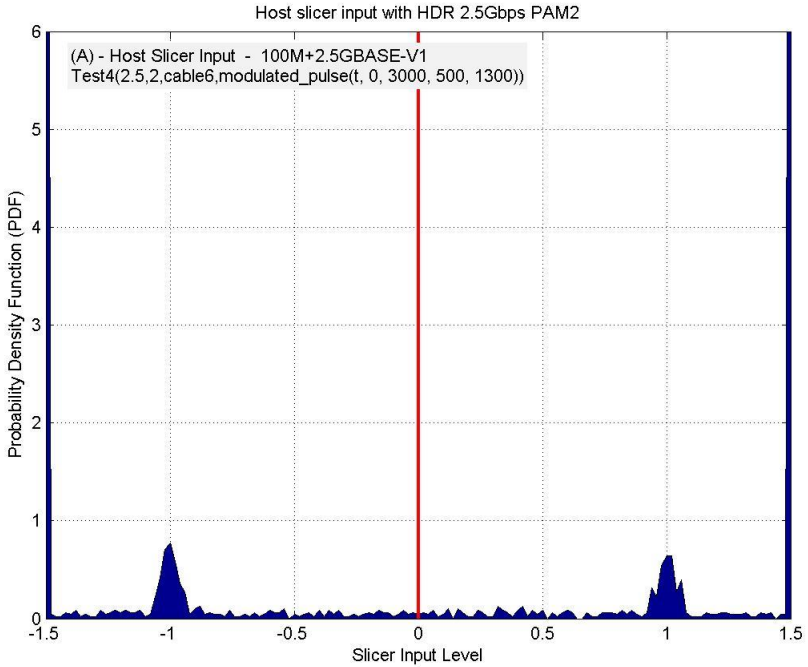




1300MHz Radar Pulse is out of band for PAM4 2.5Gbps

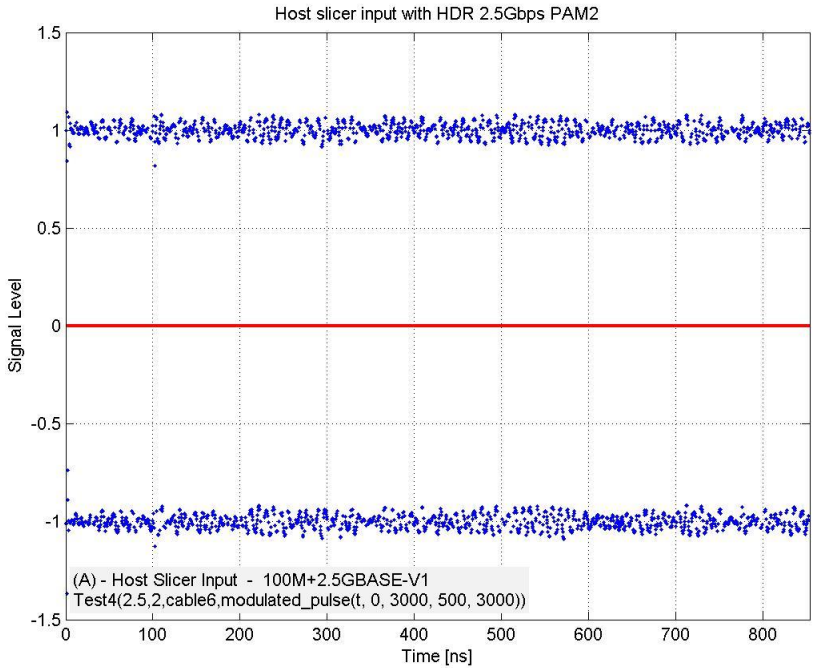
2.5Gbps PAM2 – 1300MHz Radar Pulse @ 500mV

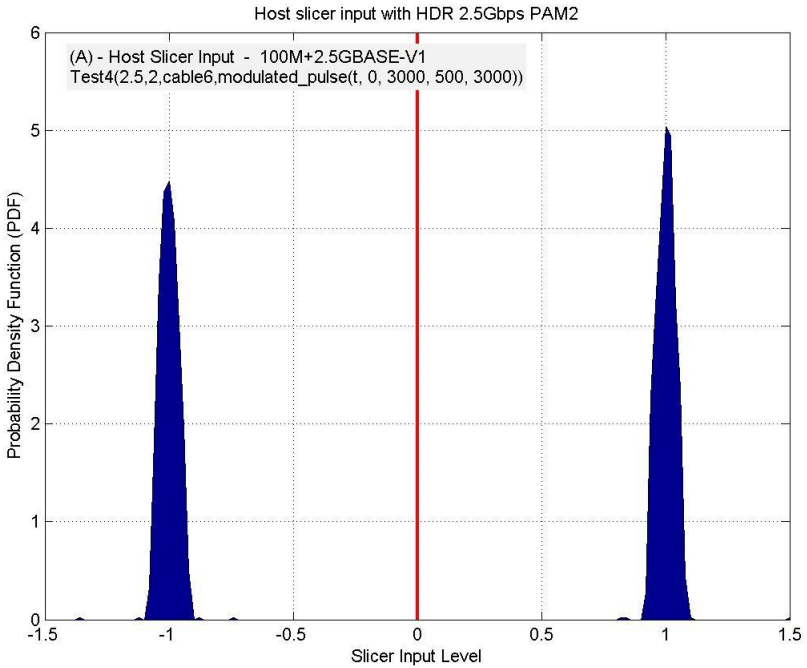




1300MHz Radar Pulse is in band for PAM2 2.5Gbps

2.5Gbps PAM4 – 3000MHz Radar Pulse @ 500mV





3000MHz Radar Pulse is out of band for PAM2 2.5Gbps

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