Emissions Profiles of ACT and TDD PHYs

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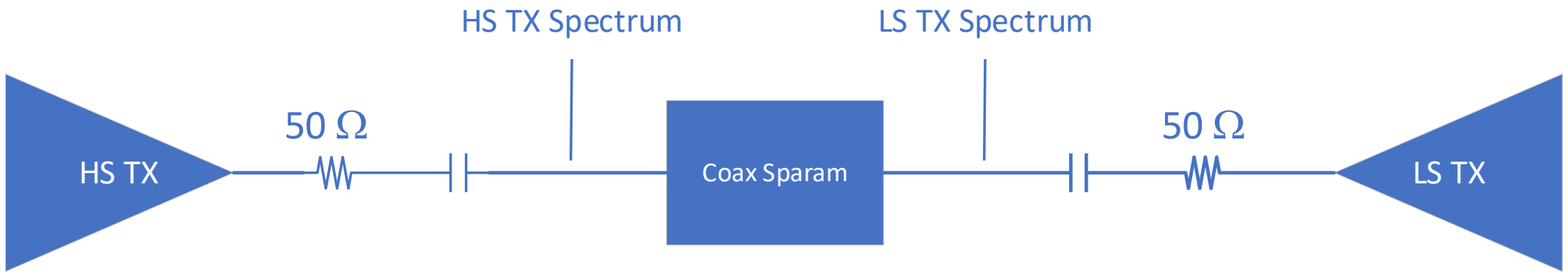
Introduction

- It is highly desirable to minimize RF emission levels for automotive PHYs
- Modulation method can impact these emissions levels
- This contribution takes a look at the emission profiles of TDD and ACT PHYs using simple models. Spectrums are observed for potential emission issues.
- Following slides show
  - Simulation setup
  - Individual High speed (Downstream) and Low speed (Upstream) spectrums
  - System level spectrums at MDI with traffic over Coax

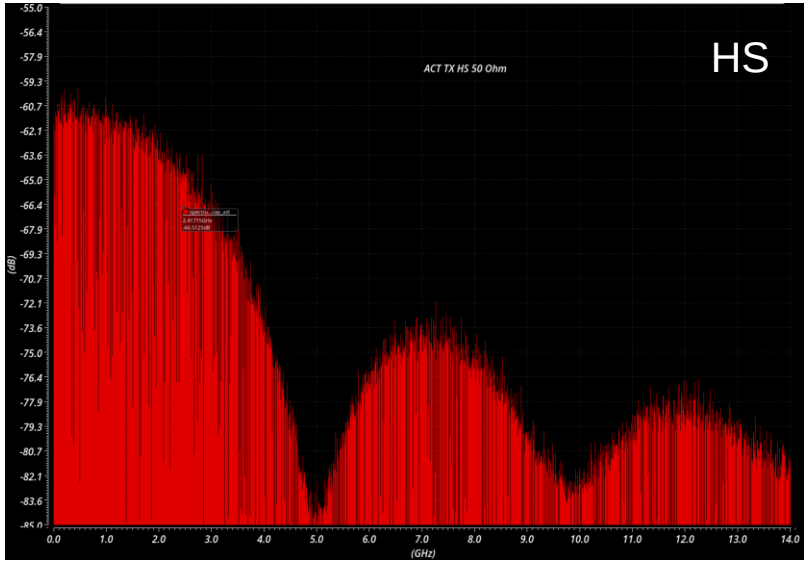
Model Setup

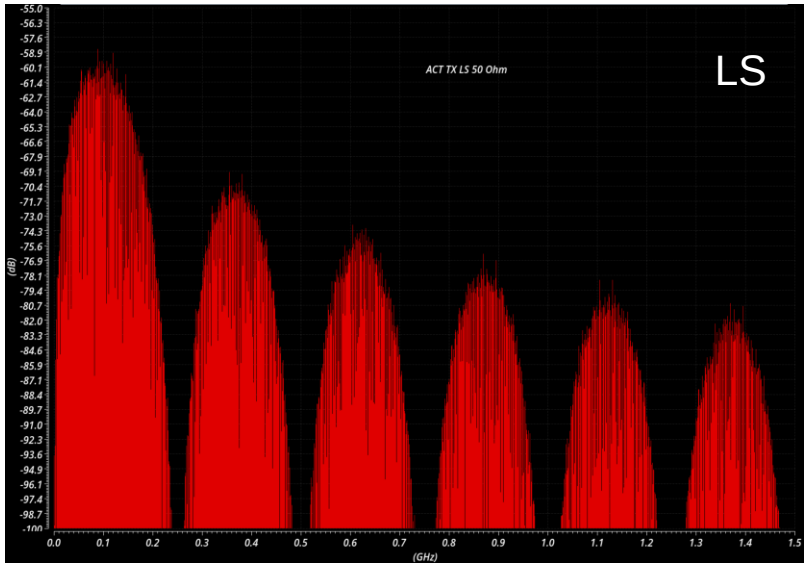
- 1m Coax sparam model
- Ideal 50 Ω drivers, AC coupling capacitors
- Foundry specific transistor models are not used for this analysis
- 0.6Vppse and 0.35Vppse for ASA TDD model (PAM4 6GSps↓ 2GSps↑)
- 0.5Vppse and 0.1Vppse for ACT model (PAM4 5GSps↓ 250MSps↑)



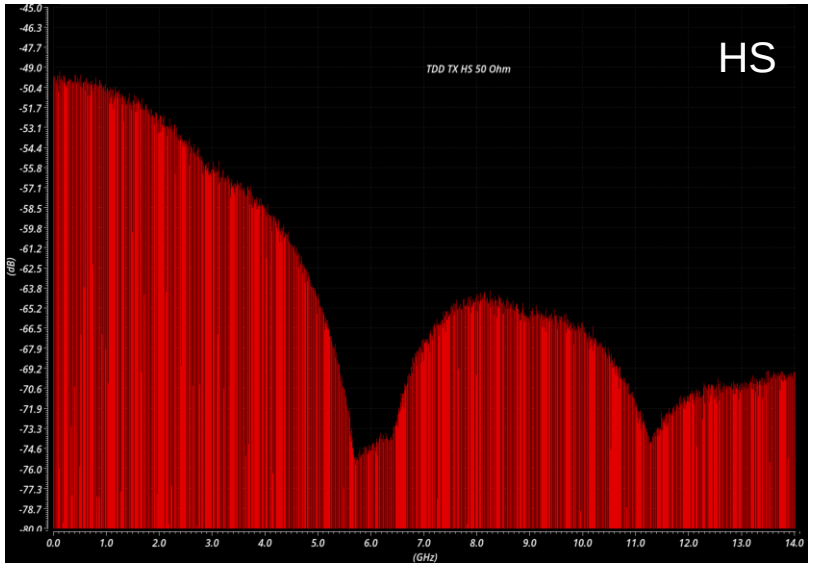
Standalone TX Spectrum (50 Ω load)

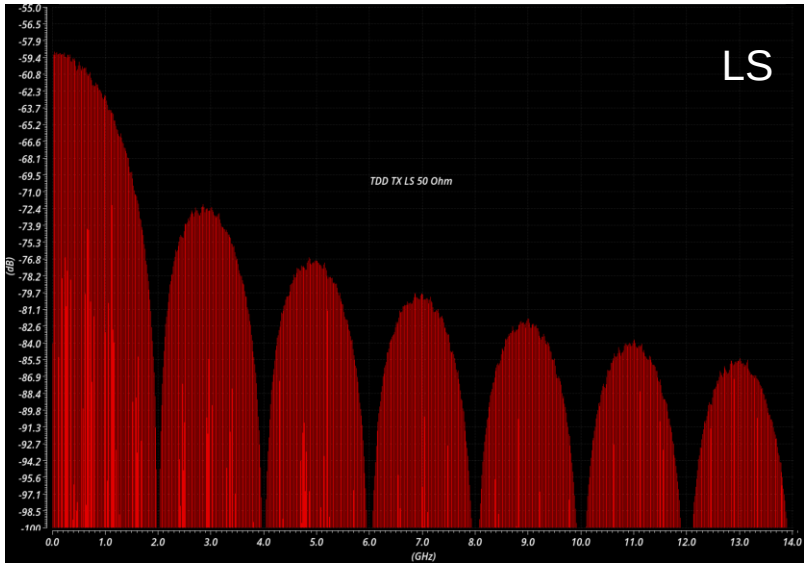
- ACT





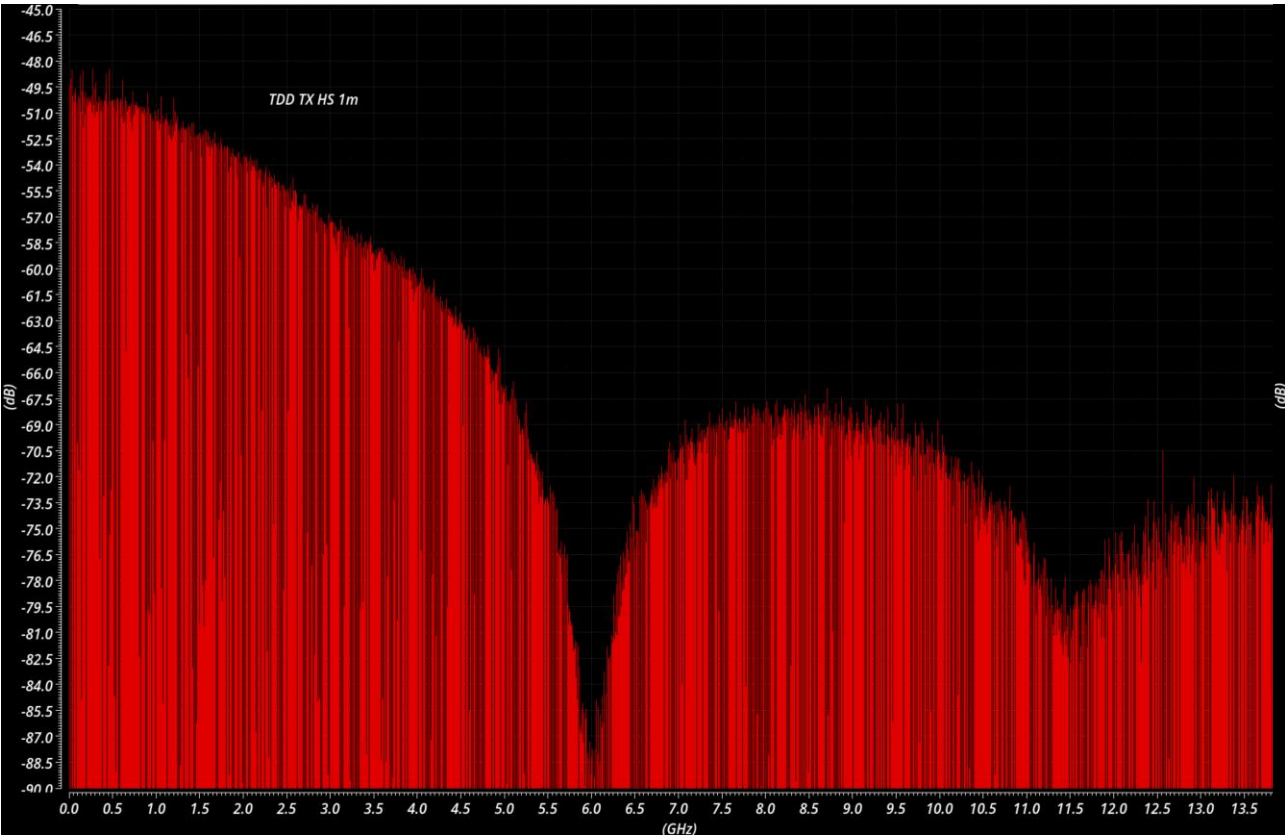
- TDD



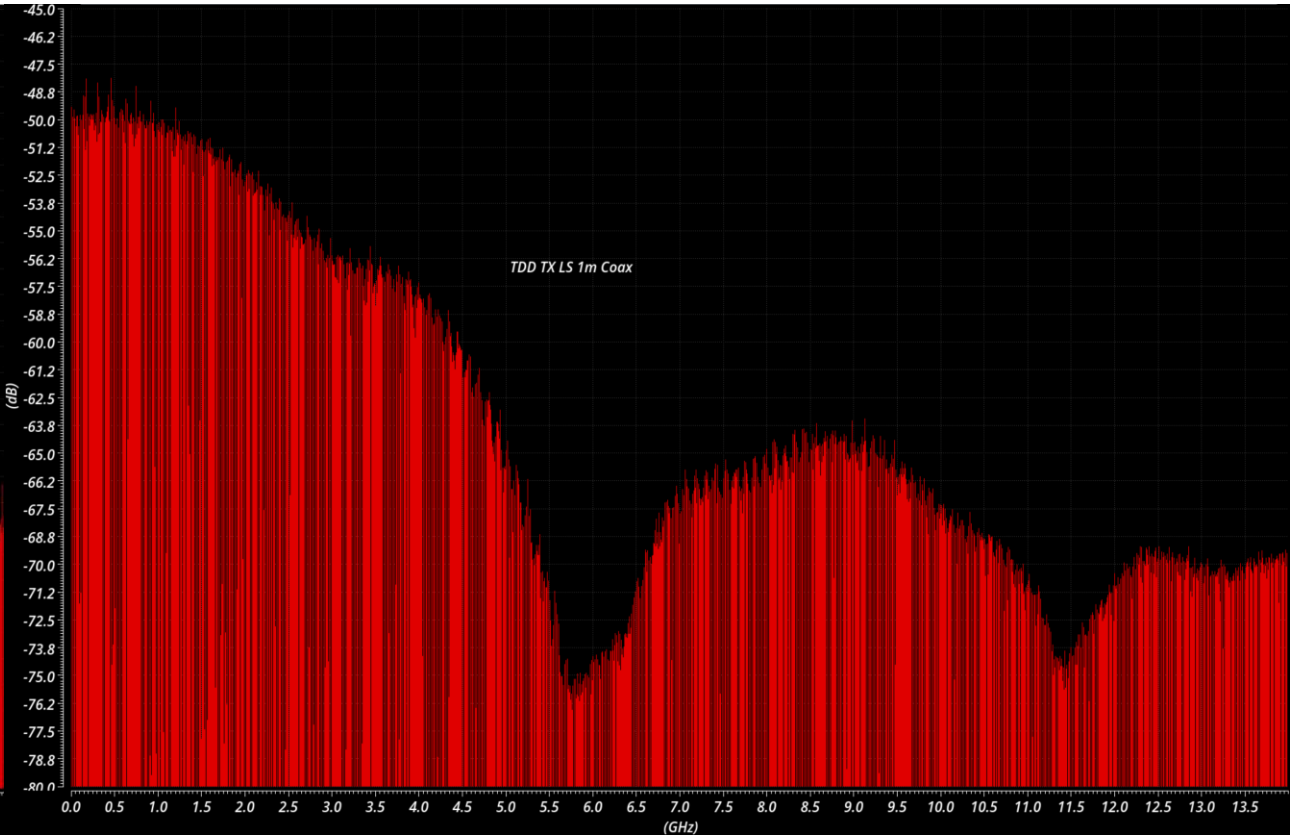


1m Coax TDD Spectrum

- At Serializer I/O

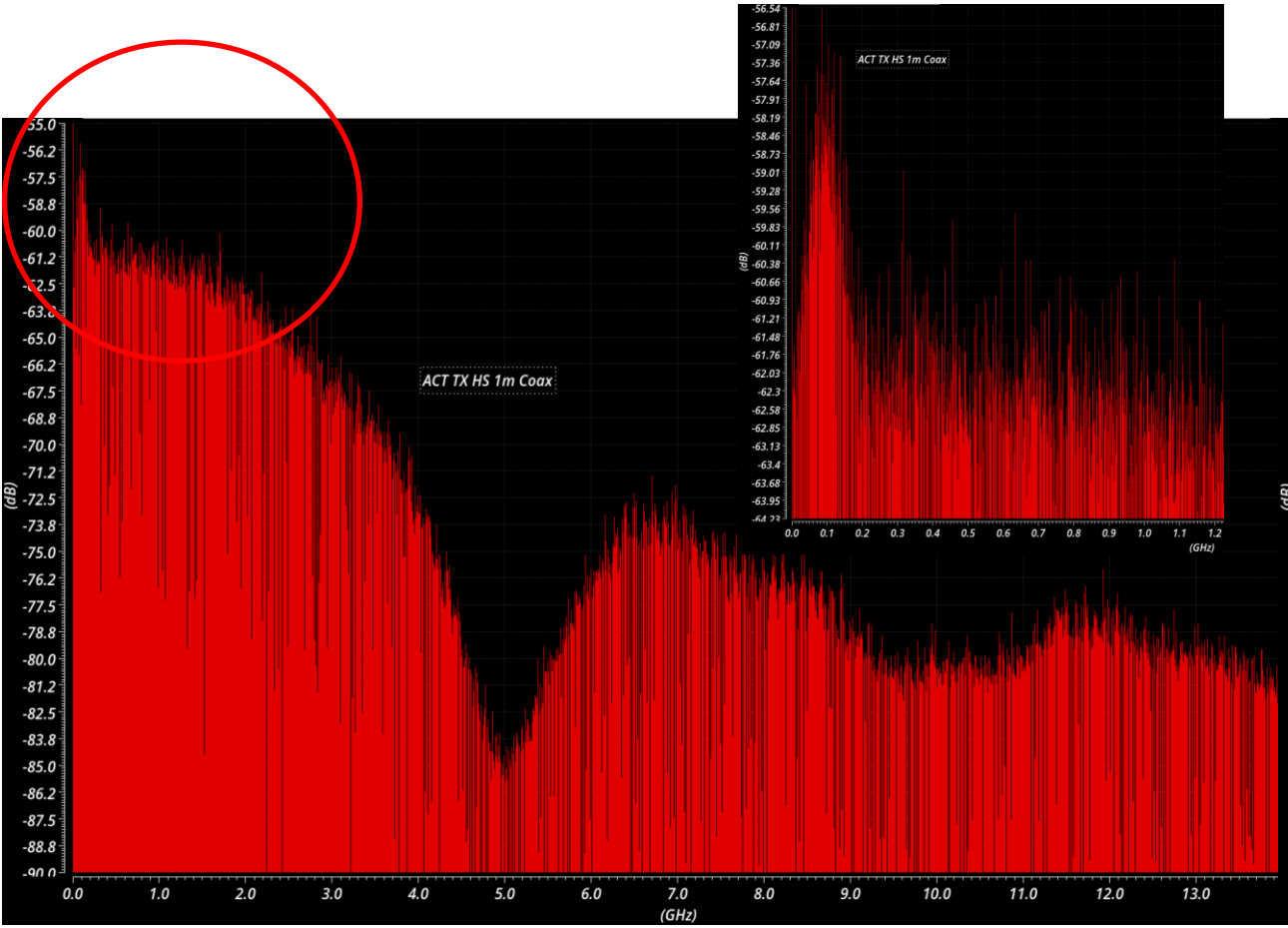


- At Deserializer I/O

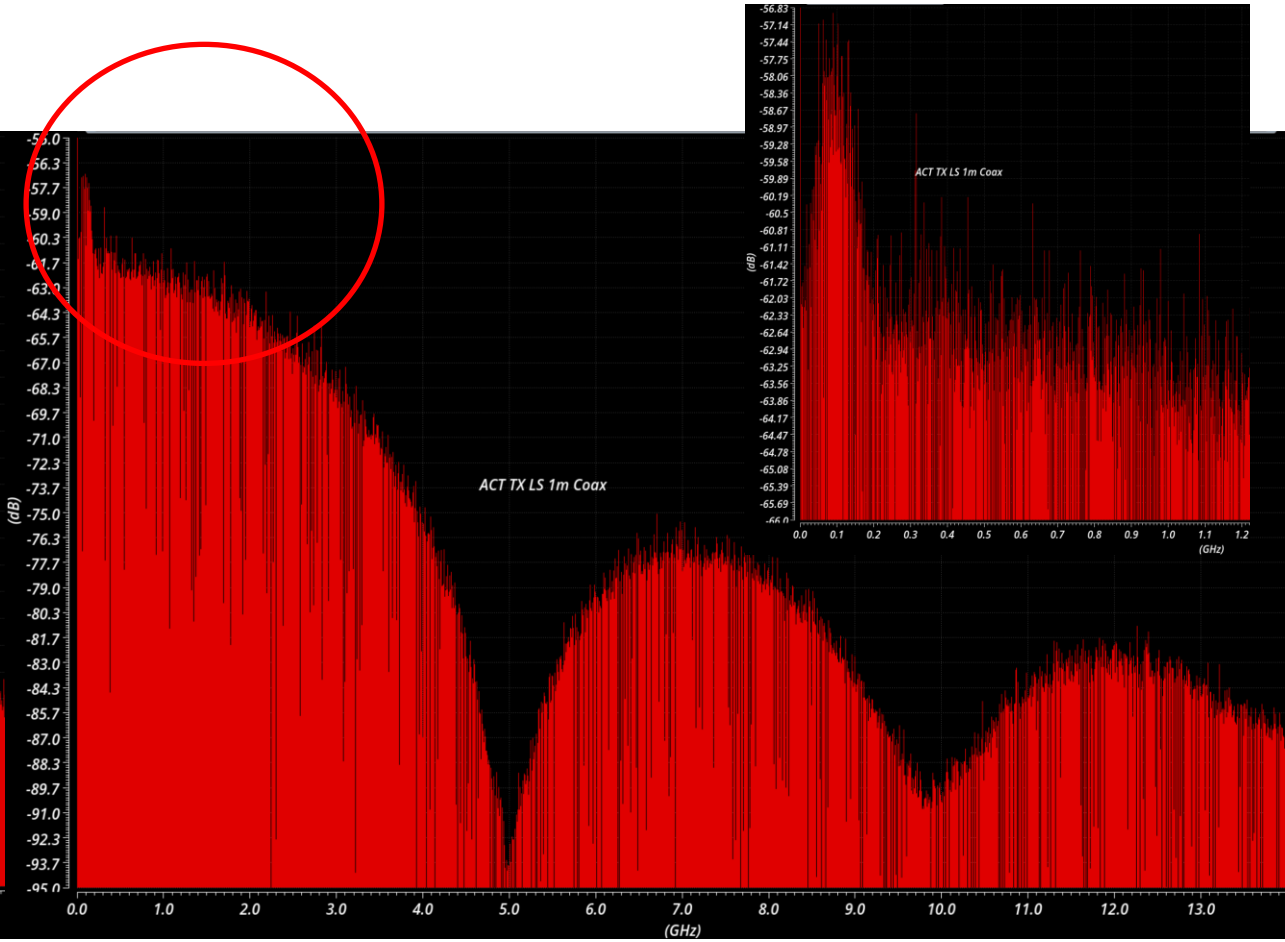


1m Coax ACT Spectrum

- At Serializer I/O

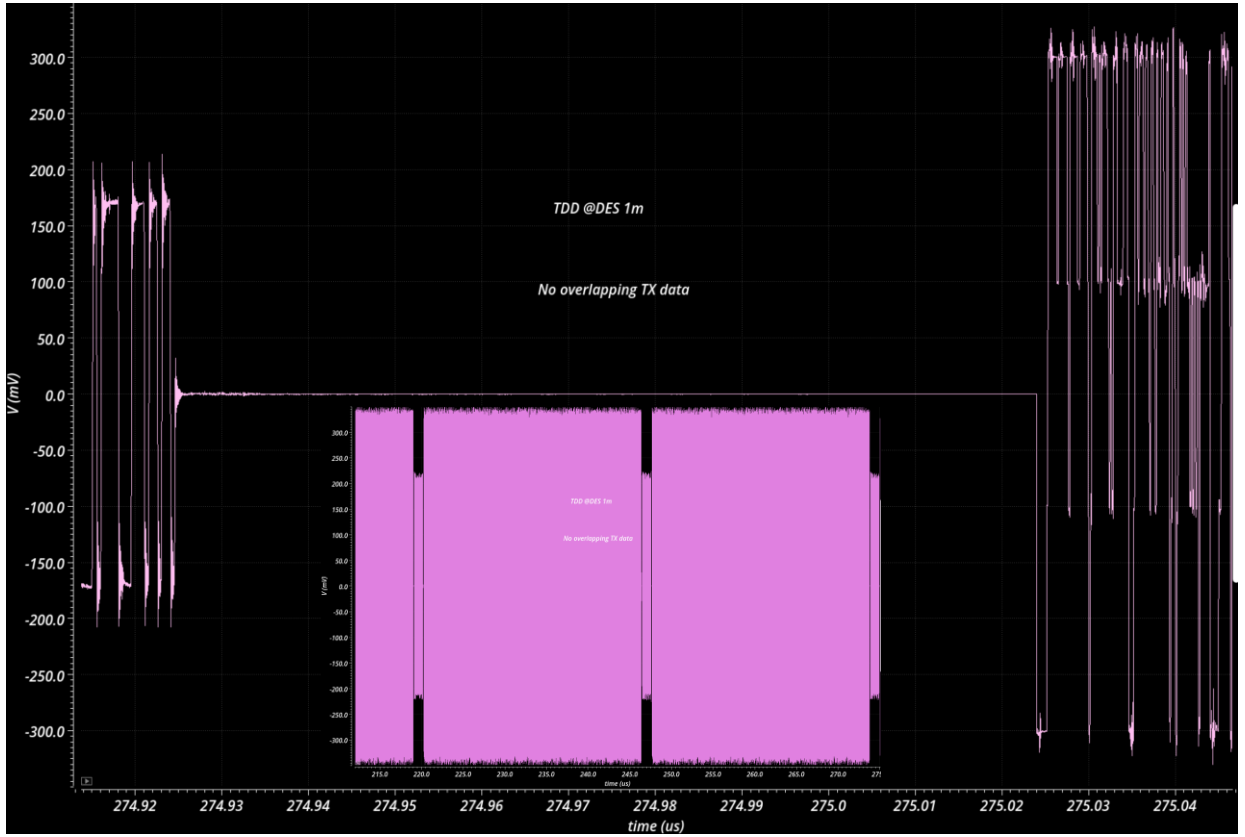


- At Deserializer I/O

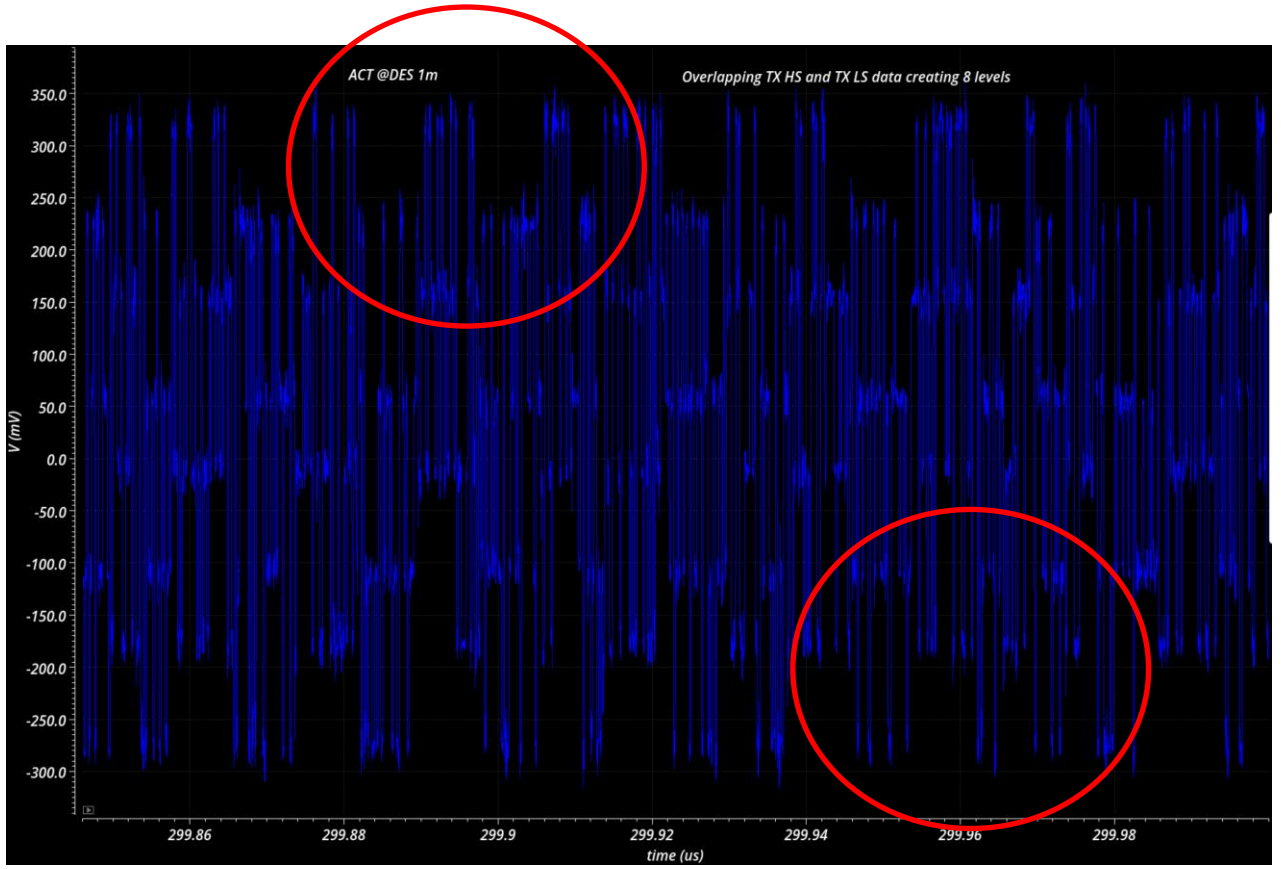


Sample Transient Waveforms

- At TDD Deserializer I/O



- At ACT Deserializer I/O



Summary

- Spectrums from ACT and TDD systems are compared (1m Coax)
  - Lossier channels affect the low frequency portion of spectrums only slightly
- Transmit levels are not normalized between ACT and TDD
- DFT of sums is the same as sum of DFTs …
  - ACT: Summation of HS and 0.1Vppse LS TX exhibits a low frequency lobe
  - TDD: Summation of HS and 0.35Vppse LS TX does not exhibit a low frequency lobe

- **This ACT low frequency lobe may contribute to RF Emissions issues**

Thank You!