



ACT EMC Performance

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Supporter

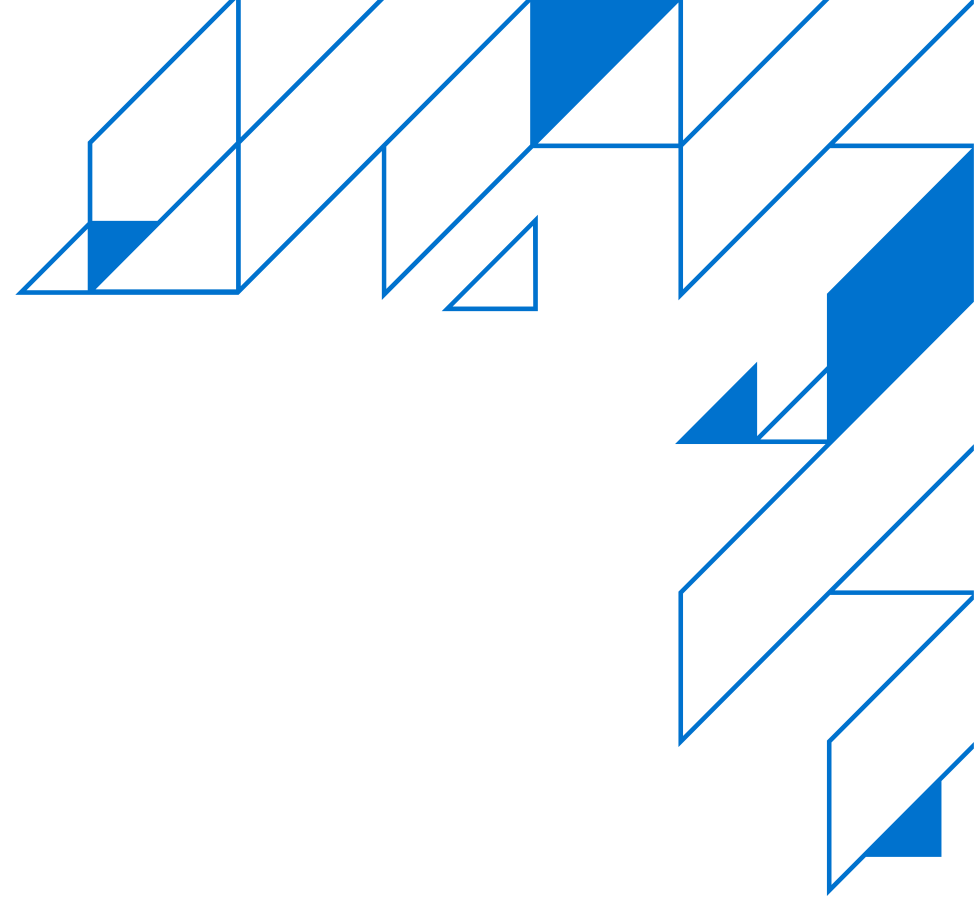
- Rich Boyer - APTIV

Introduction

- This presentation provides the first glimpse into EMC performance of a physical ACT device at 10Gbps downstream with Coaxial cable
- All tests performed according to CISPR 25 (2021) and ISO 11452
- DUT operates in **crystal-less** mode with **Power over Coax**
- **No Metal Enclosure on DUT side and Load Simulator side**
- **No Echo Cancellation and No CMC used**
- **No Spread-Spectrum** Clock in IC
- **Standard PCB design** (no special material / absorber)
- PSD according to proposed ACT definition in IEEE 802.3dm
- ACT devices **PASS** CISPR 25 Class 5 limit with margin, function normally under **600 V/m** RF field, and tolerate BCI $\geq$ **3dB margin**

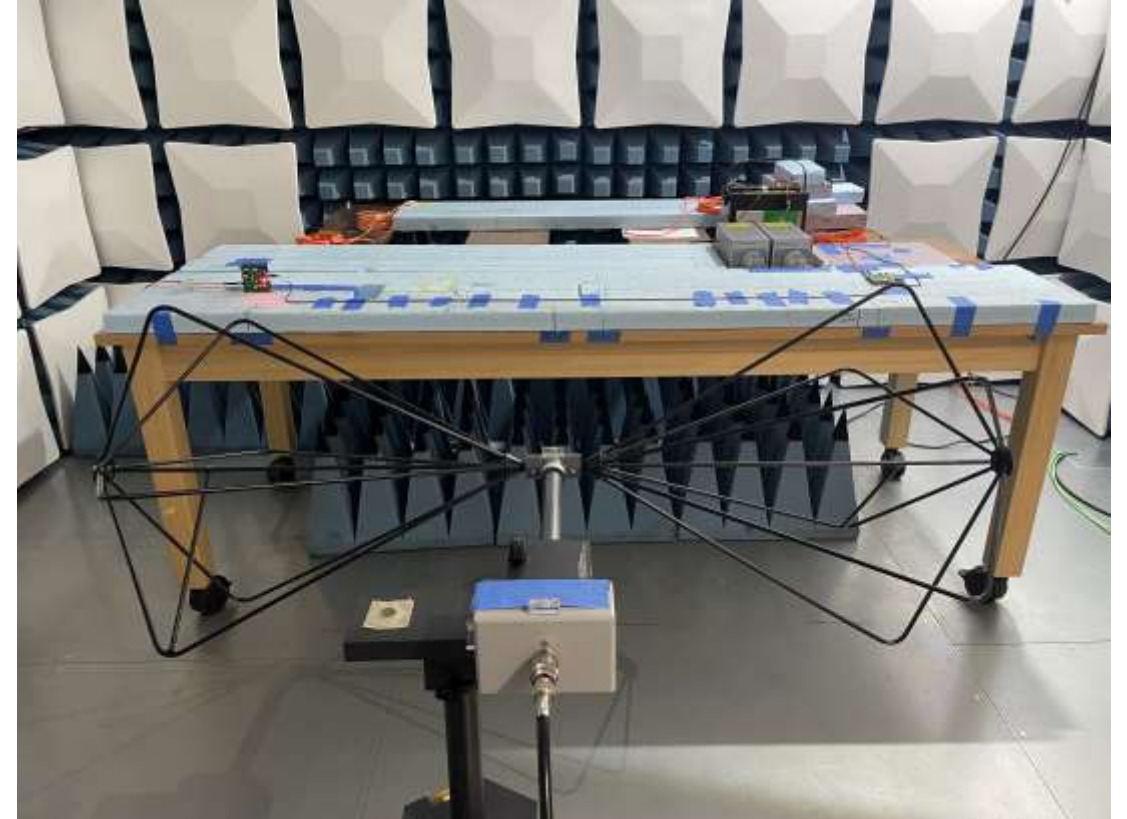
Radiated Emission

CISPR 25

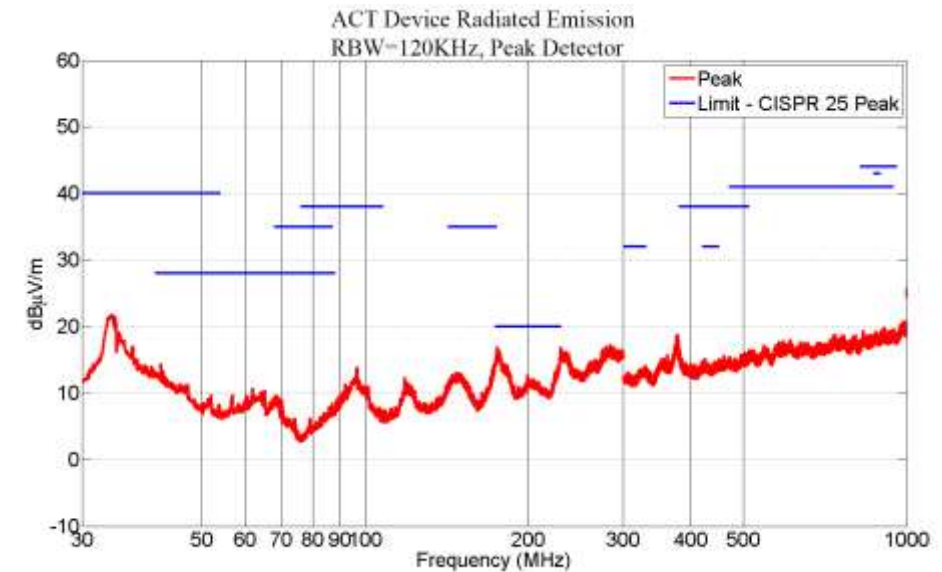
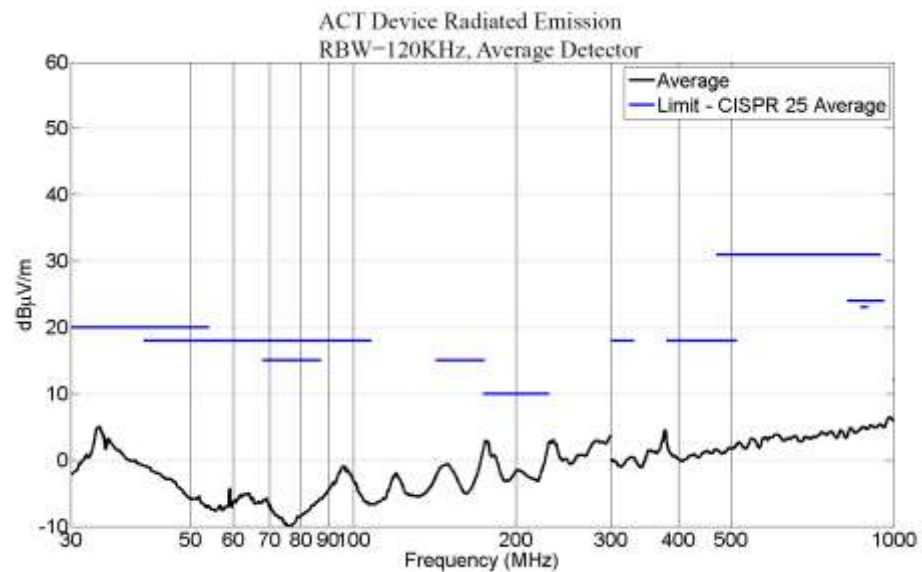
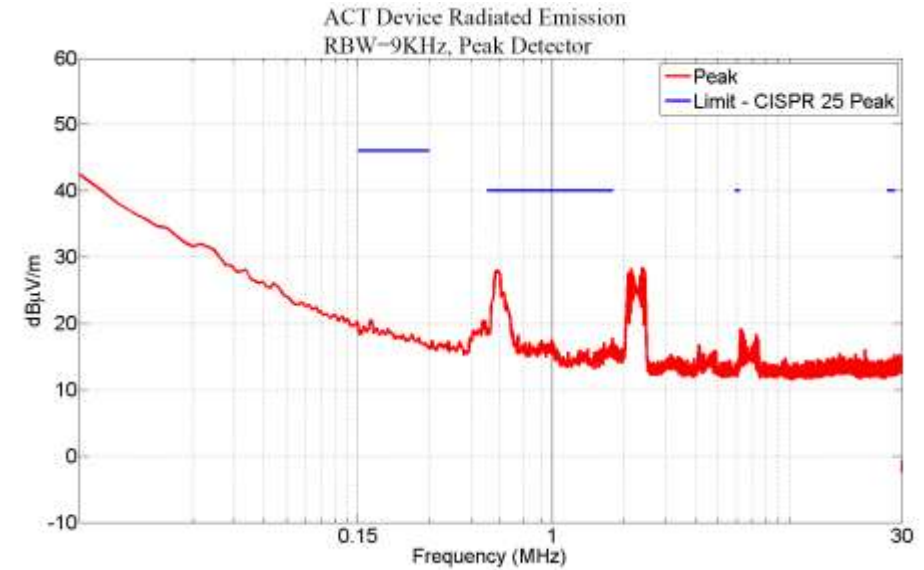
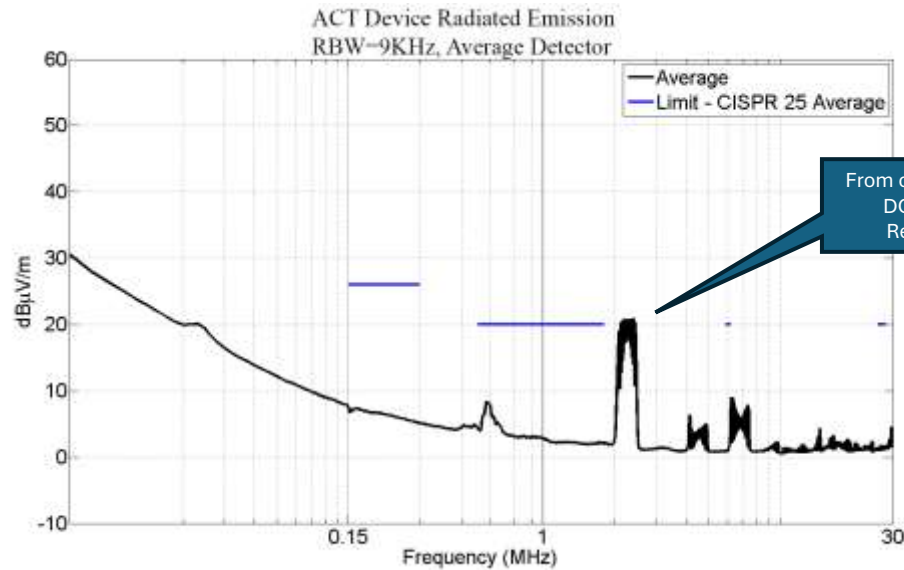


Radiated Emission Measurement Setup

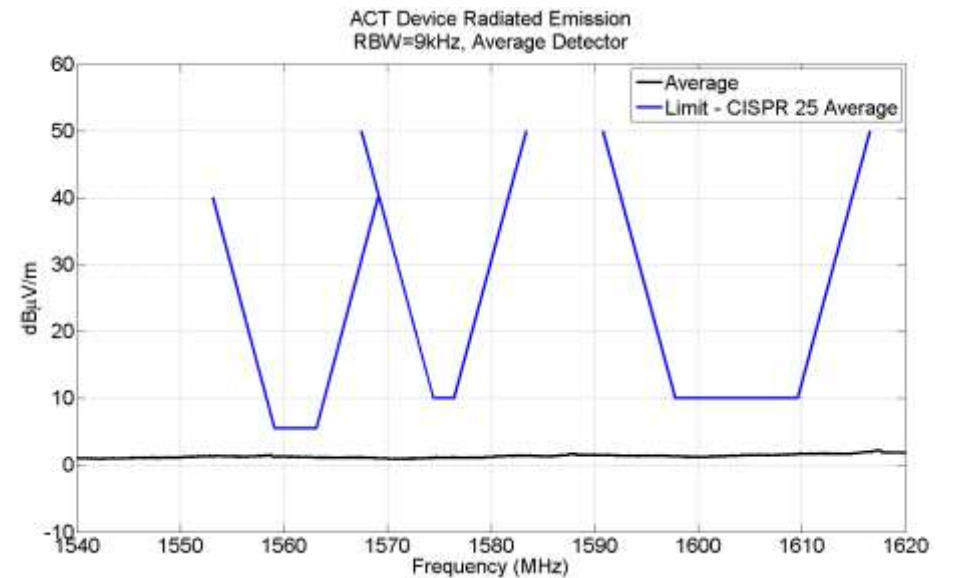
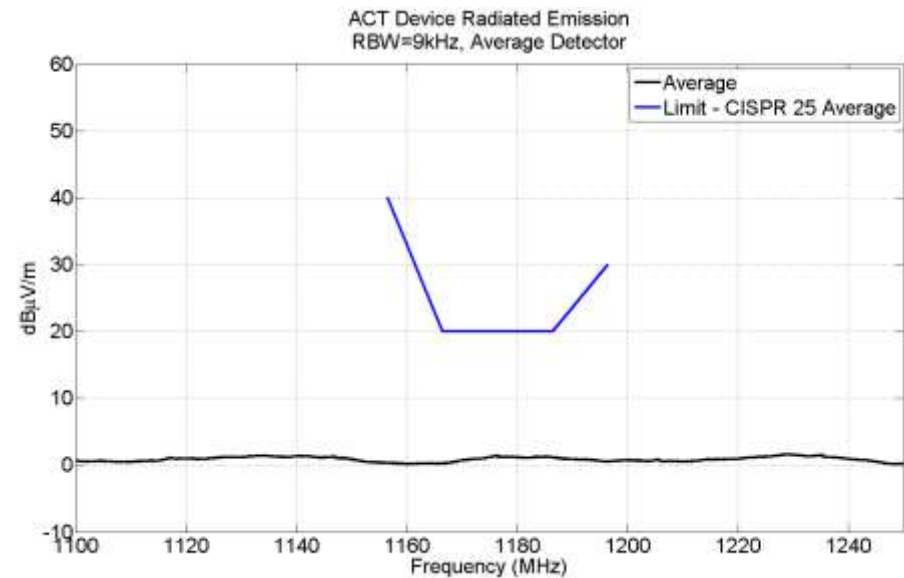
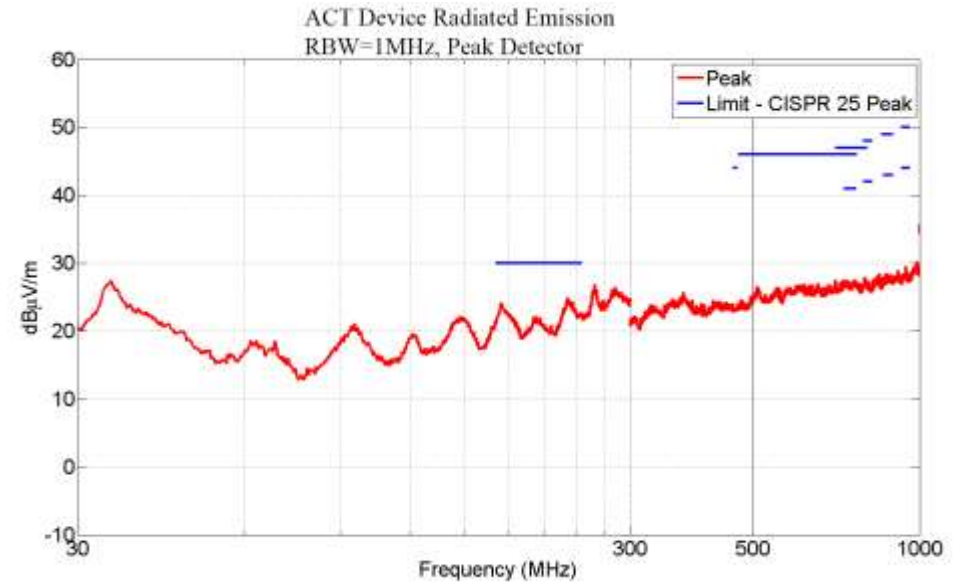
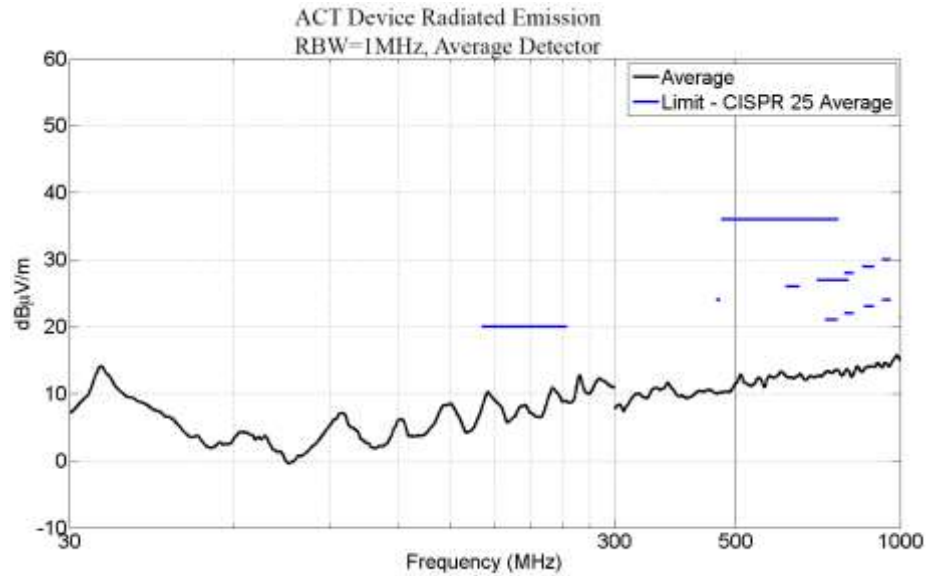
- **ACT Mode**
 - Upstream – 100Mbps DME
 - Downstream – 10Gbps PAM4
- **EMC Setup**
 - Standard **CISPR 25** setup
 - Coaxial cable type: cx031
 - Cable length: 1.8 m



RE Measurement Result

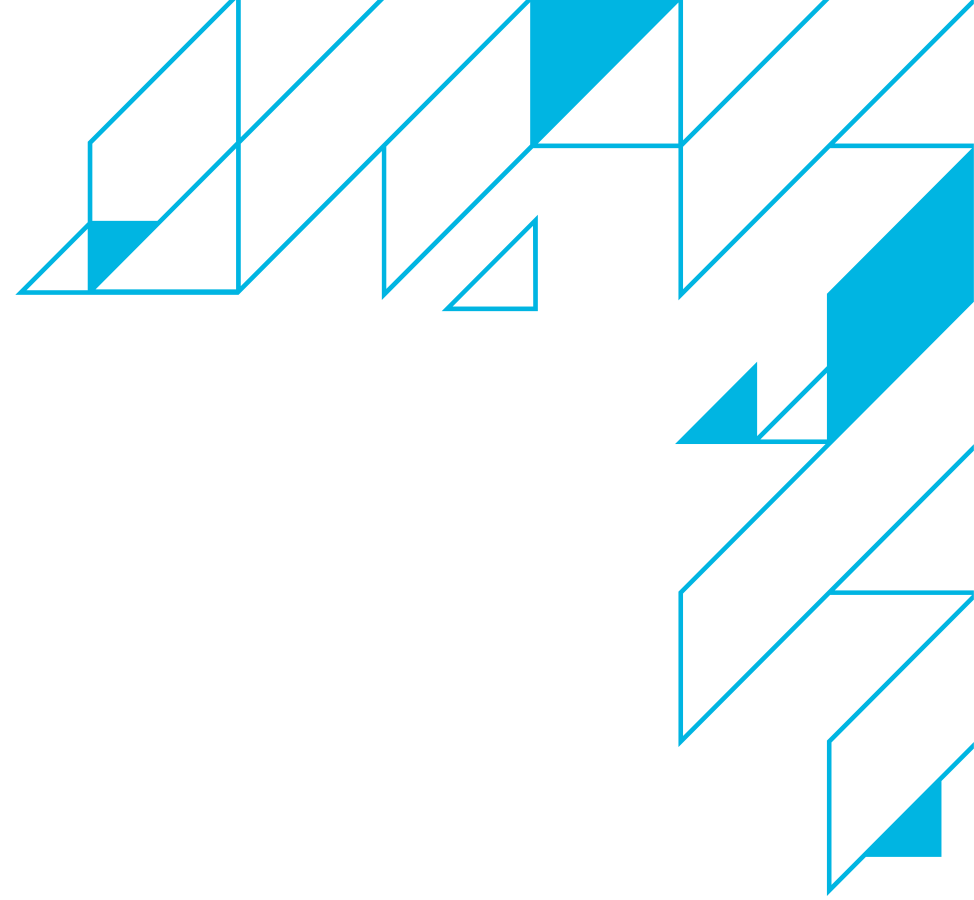


RE Measurement Result



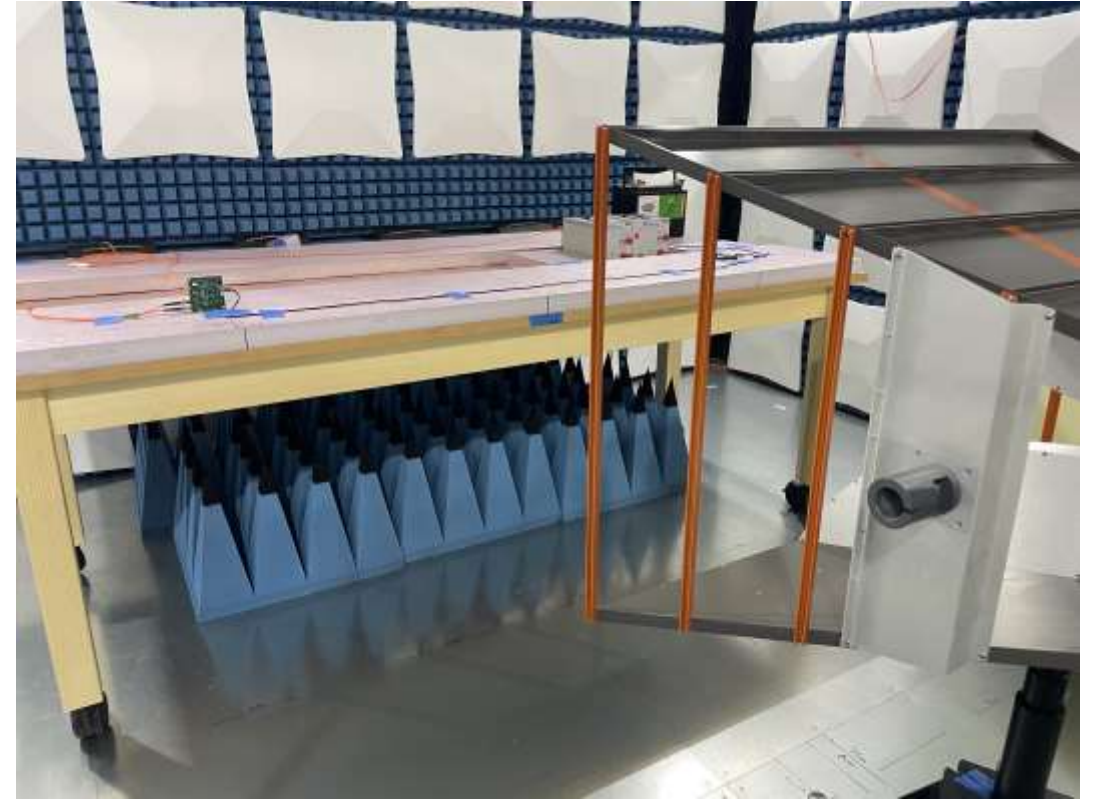
Radiated Immunity

ISO 11452-2

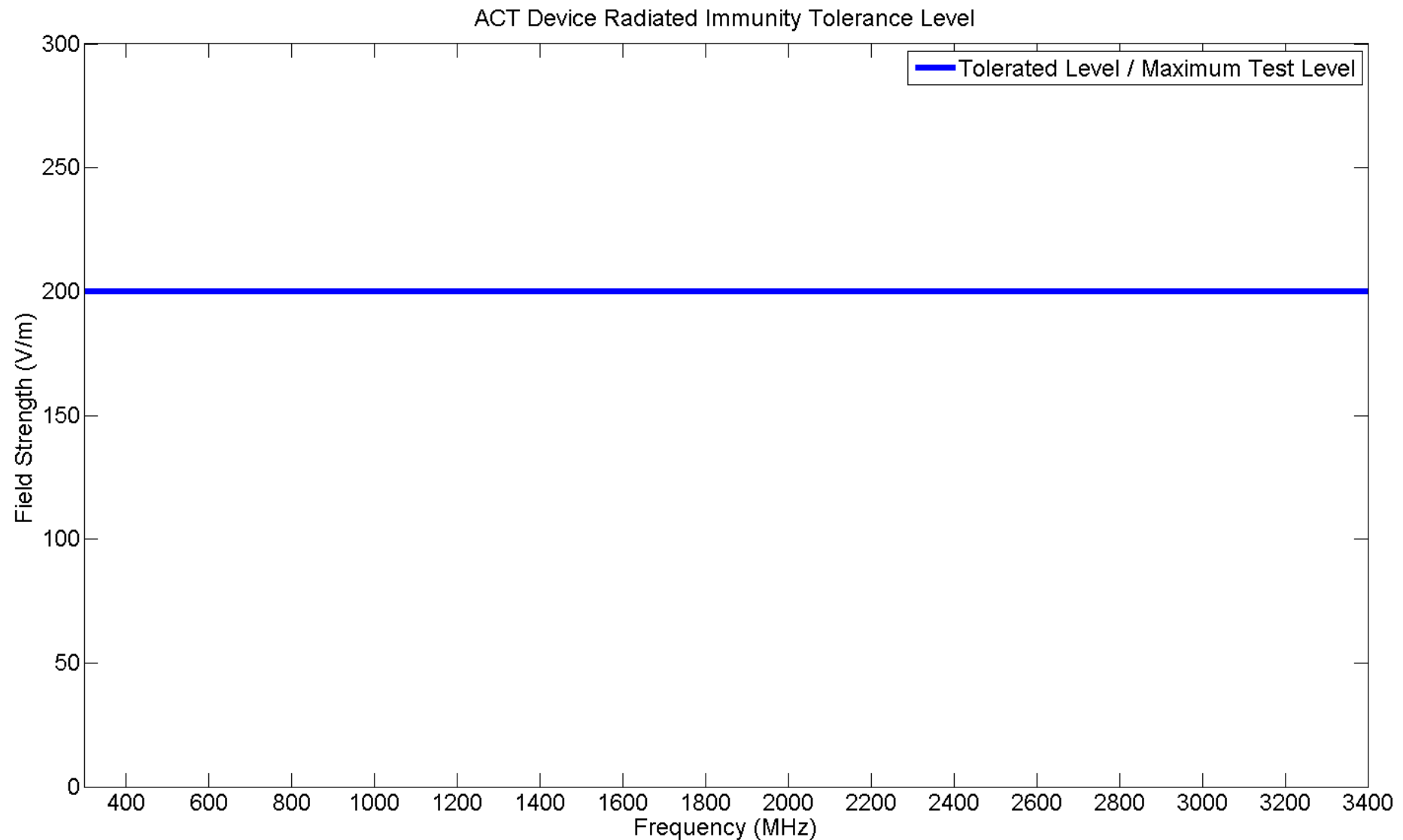


Radiated Immunity Evaluation Setup

- **ACT Mode**
 - Upstream – 100Mbps DME
 - Downstream – 10Gbps PAM4
- **EMC Setup**
 - Standard **ISO 11452-2** setup
 - Coaxial cable type: cx031
 - Cable length: 1.8 m

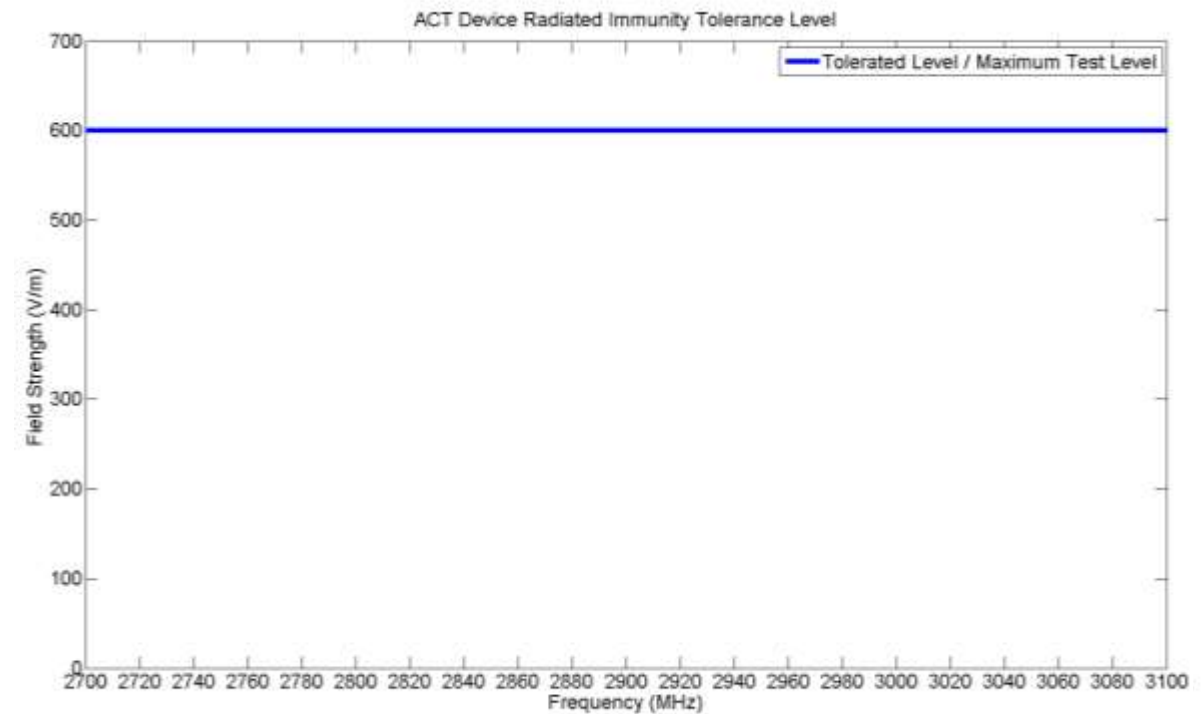
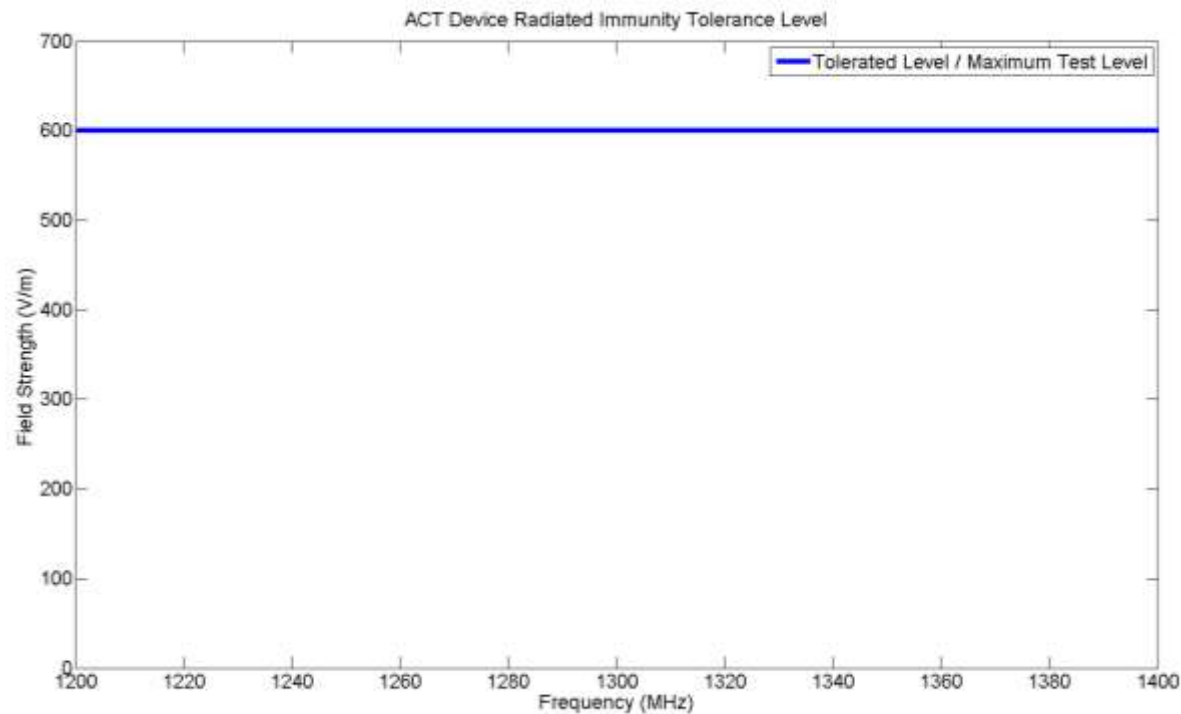


Radiated Immunity Evaluation Result



Passing Criteria: No Link / Traffic Loss

Radiated Immunity Evaluation Result – Radar Pulse



Passing Criteria: No Link / Traffic Loss

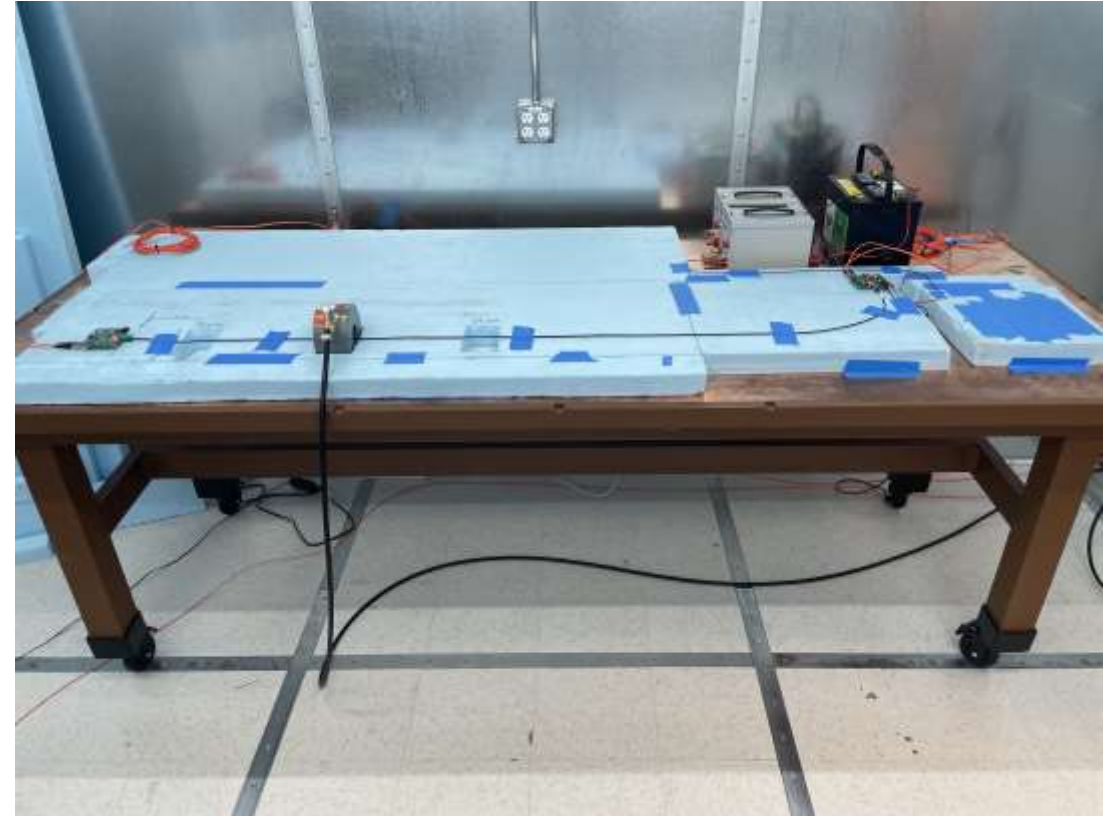
Bulk Current Injection

ISO 11452-4

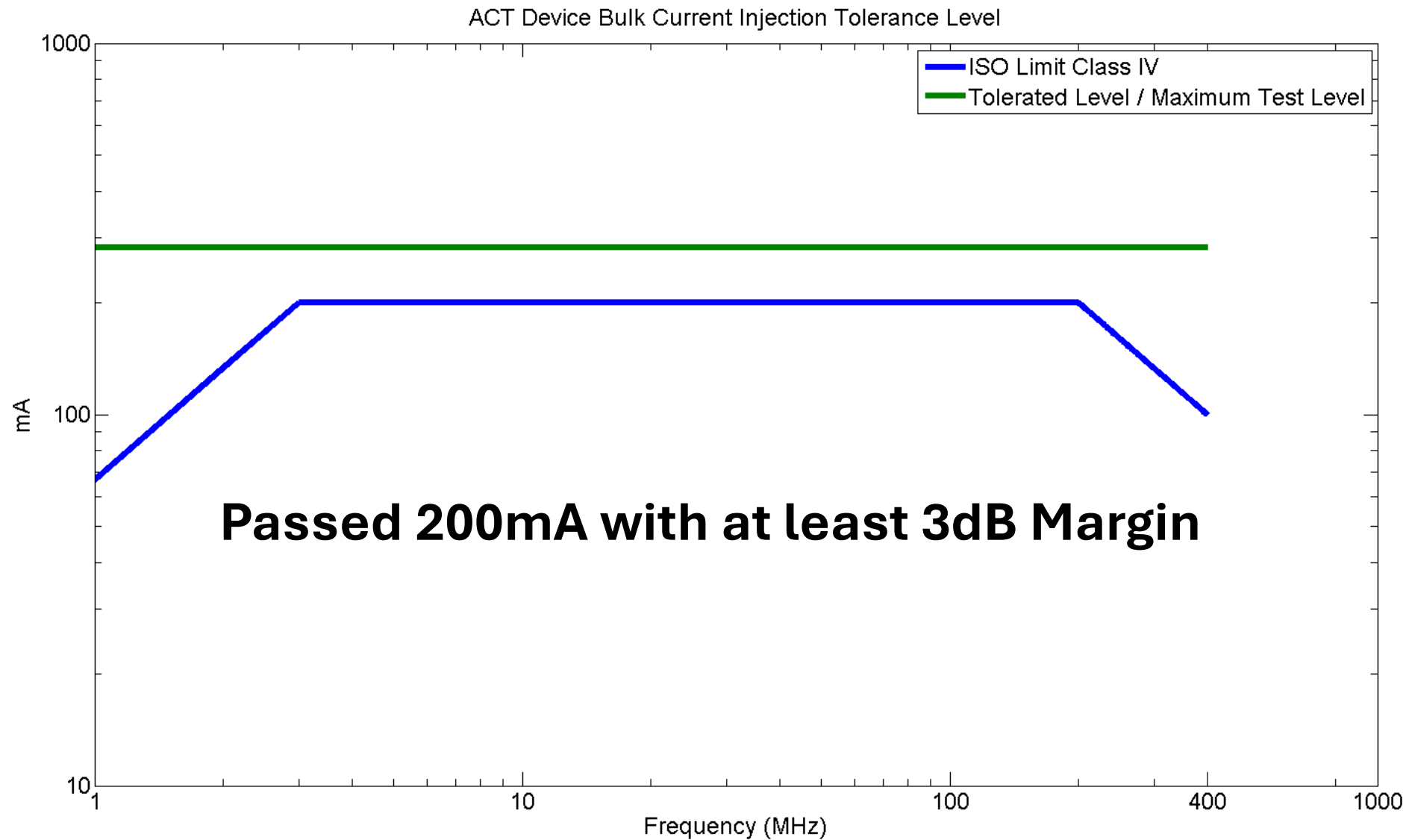


Bulk Current Injection Evaluation Setup

- ACT Mode
 - Upstream – 100Mbps DME
 - Downstream – 10Gbps PAM4
- EMC Setup:
 - Standard **ISO 11452-4** setup
 - Coaxial cable type: cx031
 - Cable length: 1.8 m



Bulk Current Injection Evaluation Result



Passing Criteria: No Link / Traffic Loss

Conclusion

- The radiated emission from a physical ACT device based on previously proposed ACT PSD on a coaxial channel has sufficient margin to pass stringent automotive requirement.
- The ACT device demonstrate sufficient tolerance to Radiated Immunity **200 V/m** and **Radar Pulse up to at least 600 V/m**.
- The ACT device will tolerate Bulk Current Injection with at least **+3 dB** margin relative to 200 mA.
- The result demonstrate the feasibility of **Crystal-less** and **Power over Coaxial** application of ACT device and withstand **difficult** EMC requirement **without Echo Cancellation, CMC, nor Metal Enclosure**
- ACT proposal is recommended as the top choice for its **excellent performance** in EM compatibility

Thank You!