

IEC 63171-1 EMC performance with Pepperl+Fuchs 10BASE-T1L prototype transceivers

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Purpose and Objectives

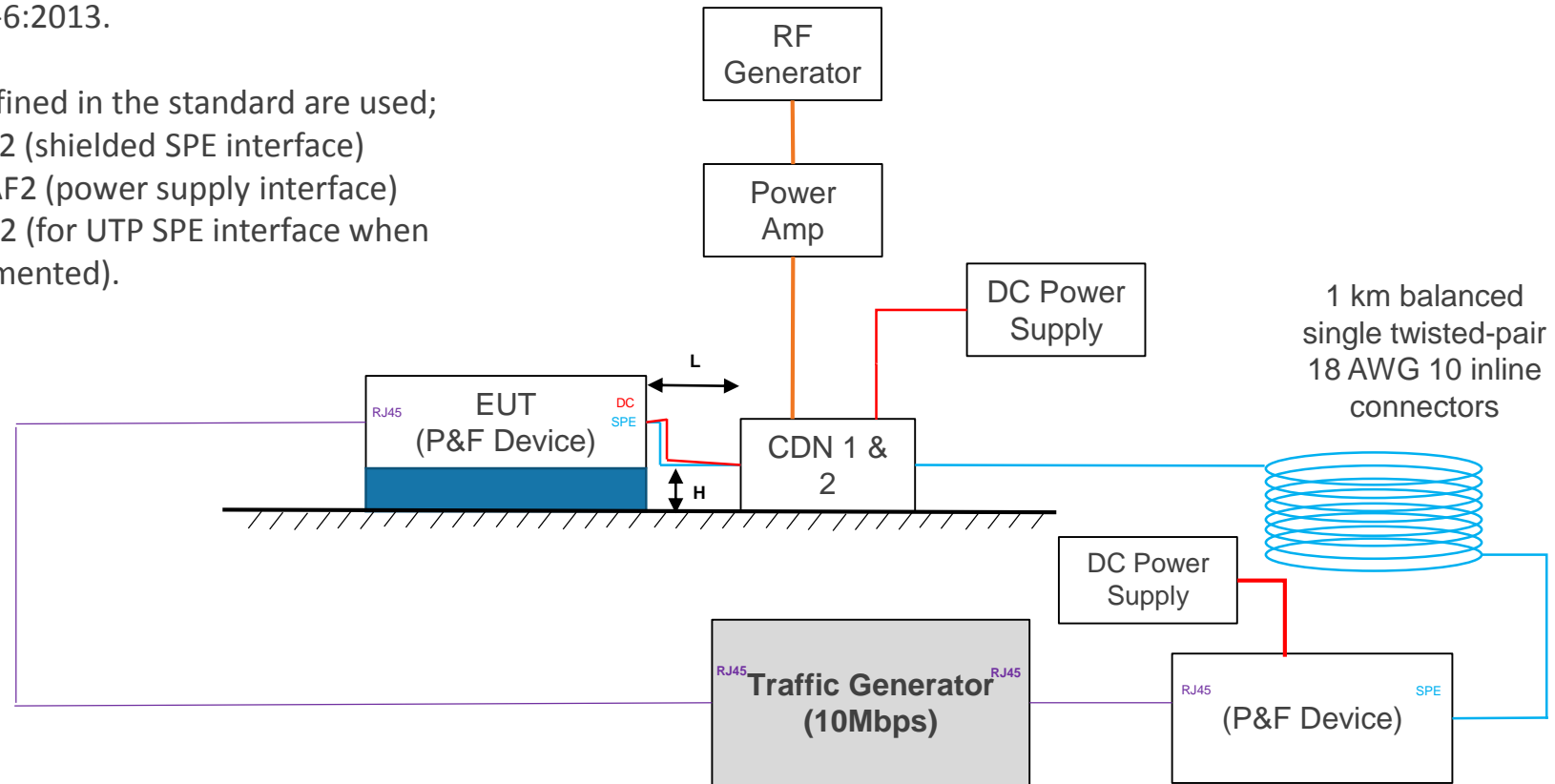
- Demonstrate PEPPERL+FUCHS 10BASE-T1L transceivers with IEC 63171-1 MDI connectors and a 1 km 18 AWG link segment with 10 inline connections passes IEC 61000-4-6 conducted immunity at 10 V/m
- Demonstrate that CommScope and Panduit IEC 63171-1 plug and jack components can be interchanged and pass IEC 61000-4-6 at 10 V/m

EMC Test Setup

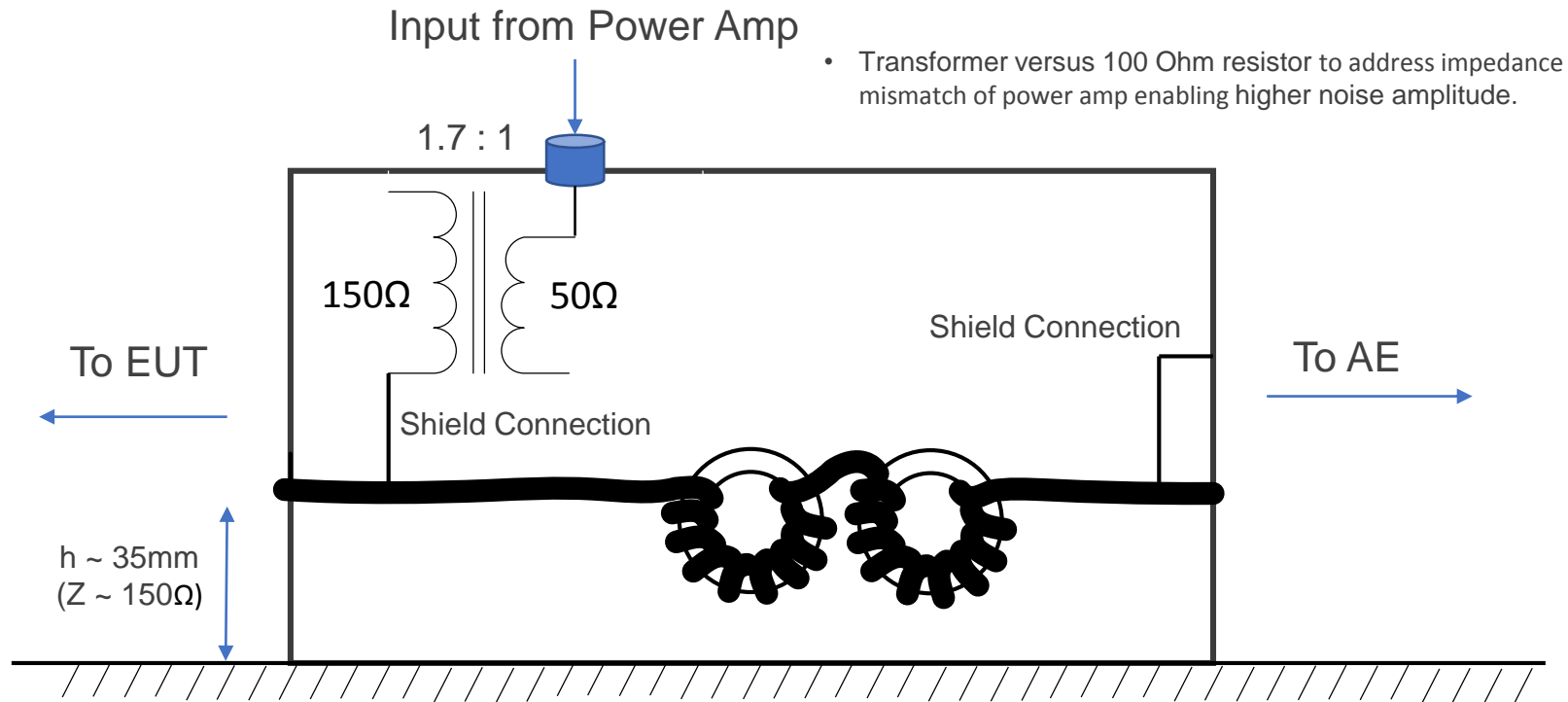
The conducted immunity measurements per IEC 61000-4-6:2013.

CDNs defined in the standard are used;

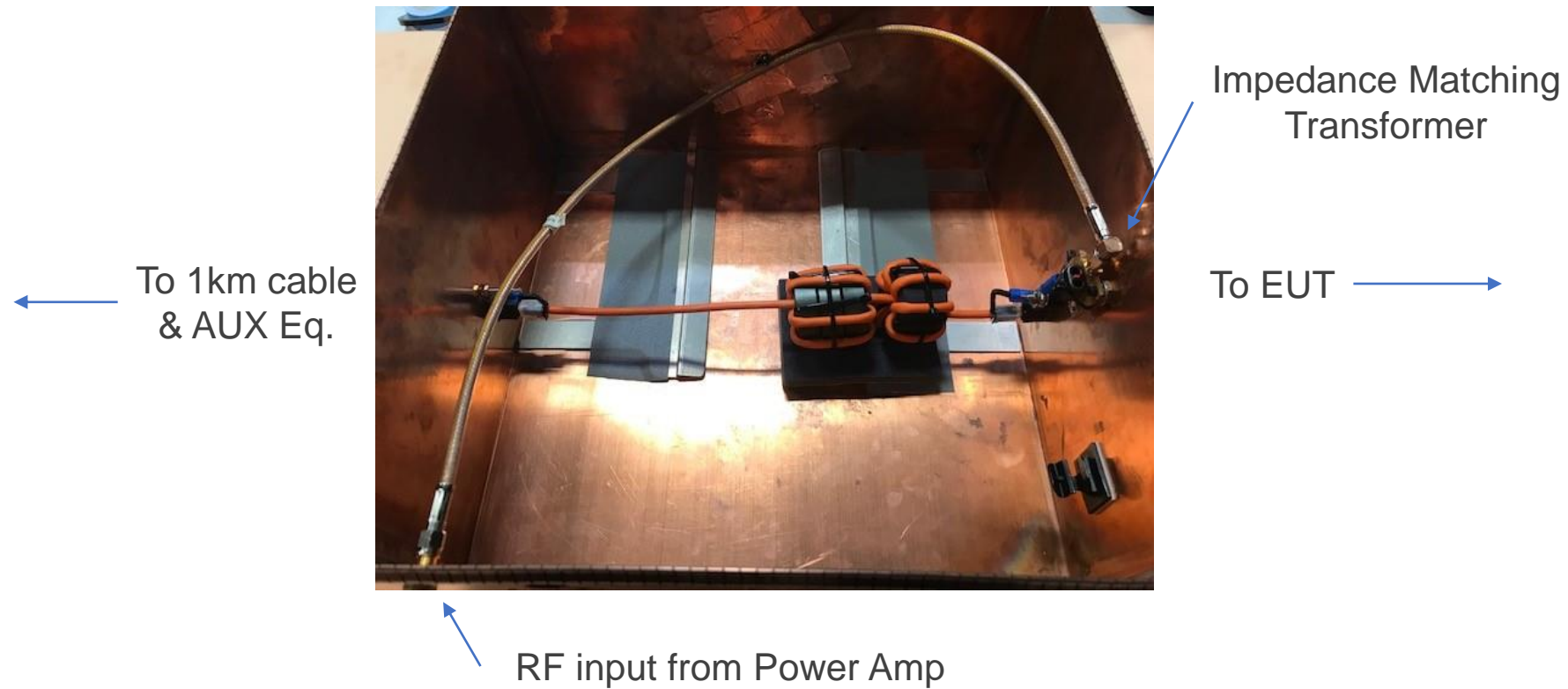
- CDN-S2 (shielded SPE interface)
- CDN-AF2 (power supply interface)
- CDN-T2 (for UTP SPE interface when implemented).



CDN



CDN

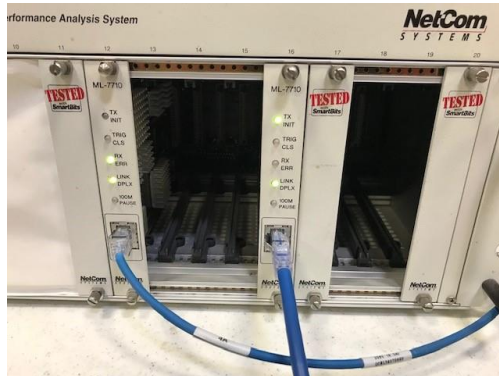


Test Configuration

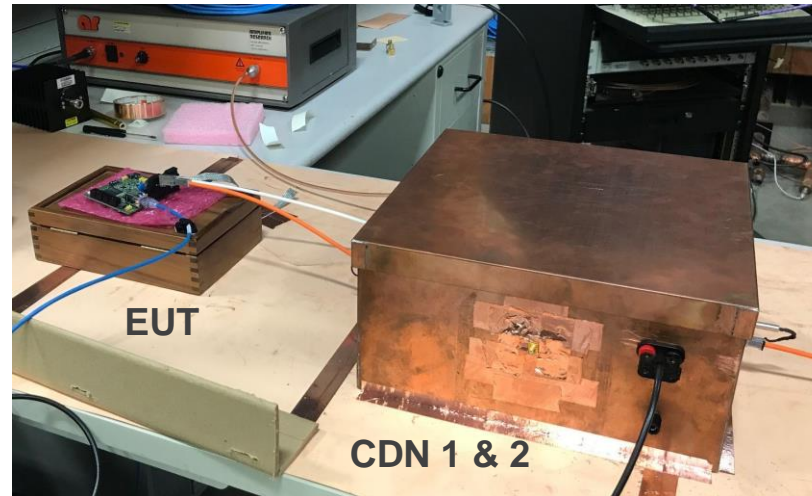
AUX Eq



Traffic Generator



1 km balanced single
twisted-pair 18 AWG
10 inline connectors



Inline connector

EUT with IEC 63171-1 MDI

MJ interface
to traffic tester



IEC 63171-1 MDI – Panduit shielded plug and connector

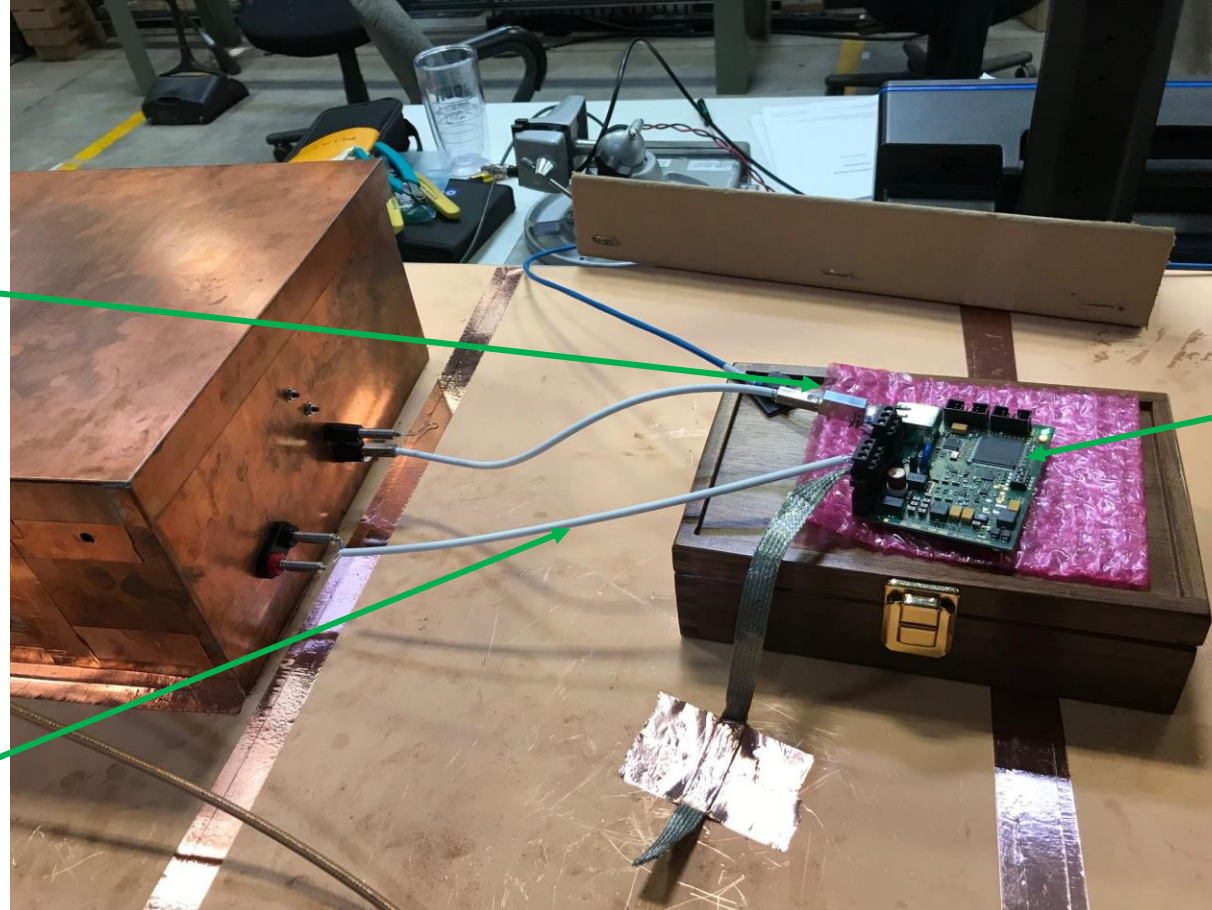
IEC 61000-4-6 Measurement and DUT Setup



Detail of cords connecting the CDN to the transceivers

**IEC 63171-1 MDI – CommScope
shielded plug and connector**

Power supply cord



**10-BASE-T1L
transceiver**

CDN 10BASE-T1L channel and input power connections



**IEC 63171-1 MDI – CommScope
shielded cord**

Pass Fail Criteria

Criteria A:

The link operated normally at all levels up to and including the 802.3cg 10Vrms Vo requirement.

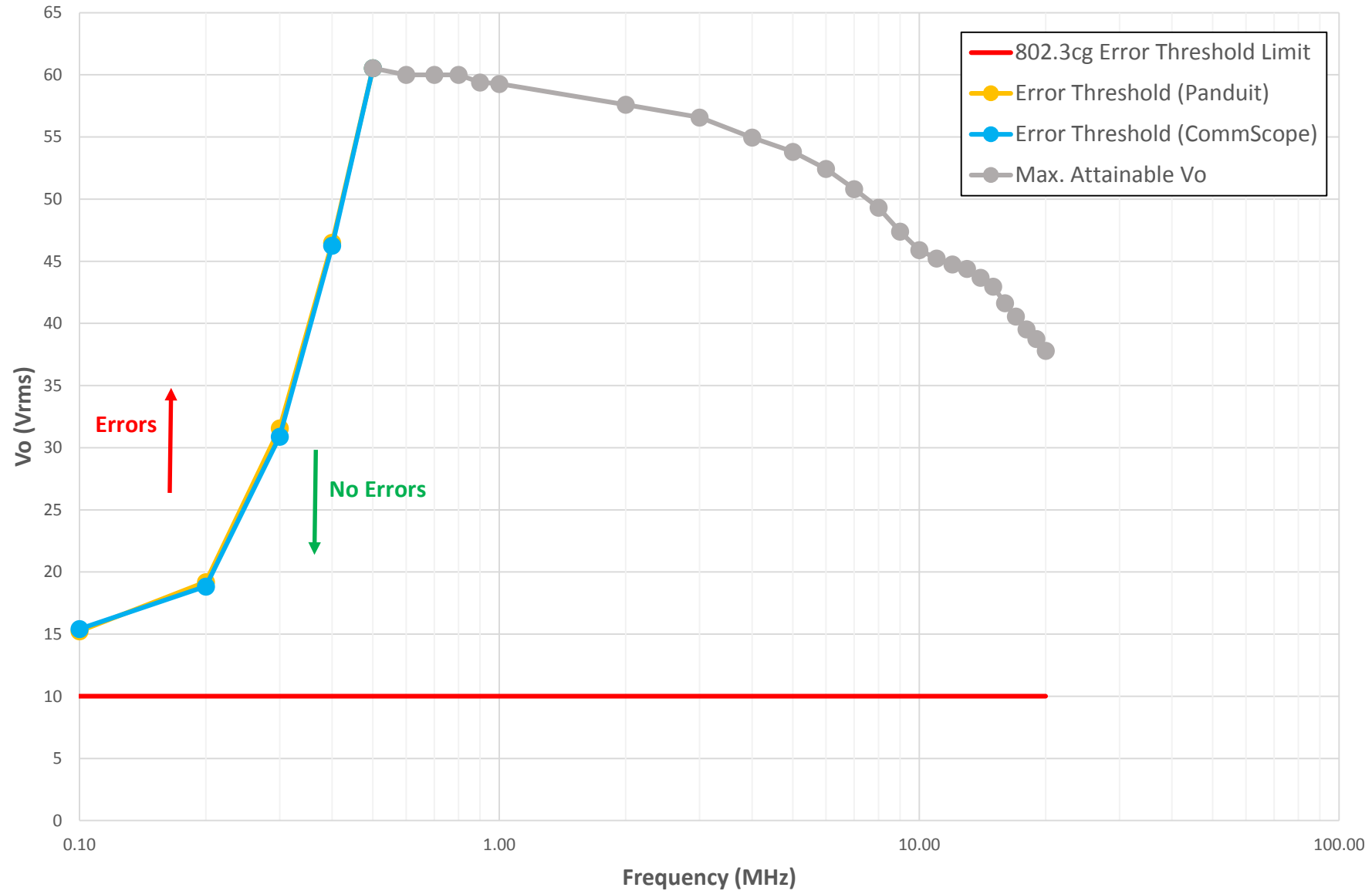
Criteria B:

The link experienced temporary degradation at levels at and above the Vo Error-Threshold levels shown in the plot, which are all well above the 10Vrms requirement, but self-recovered once the Vo level was reduced below the Error Threshold level.

- Links tested passed Criteria A up to 10 V/m

NOTE: Link/DUT also passed Criteria B above 10 V/m up because the 10BASE-T1L link recovered back to normal operation without operator intervention once the noise level was reduced below the error threshold level of 10 V/m

Conducted Immunity



Summary

- Pepperl+Fuchs 10Base-T1L development board easily met the conducted emissions requirement with IEC 63171-1 MDI connectors and patch cords from two independent vendors
- The plot also shows that the Error Threshold levels were not affected by changing out the CommScope plugs/cords, and MDI connectors with like Panduit components.
- The almost identical IEC 61000-4-6 EMC performance of Panduit and CommScope IEC 63171-1 connector/cords further demonstrates repeatable interoperability of SPE cords and MDI connectors

Re-Cap & Recommendation

- The design, testing, and standards effort for IEC 63171-1 components has spanned over 2 years and involved many useful discussions/interactions with IEEE 802.3cg members as referenced below:
 - http://www.ieee802.org/3/cg/public/July2017/keith_shariff_3cg_01_0717-rev2.pdf
 - http://www.ieee802.org/3/cg/public/Sept2018/pelletier_3cg_01a_0918.pdf
 - http://www.ieee802.org/3/cg/public/Nov2018/shariff_3cg_01a_1118.pdf
 - http://www.ieee802.org/3/cg/public/Aug2019/diminico_3cg_01_0819.pdf
 - http://www.ieee802.org/3/cg/public/Aug2019/shariff_3cg_08_0219.pdf
- IEEE 802.3cg should consider the long term strategic value of having a common connector to simplify testing while providing convenient mobility/interoperability of equipment and devices in the 10BASE-T1 ecosystem