Updated Test Data for Channels based on Proposed Category 8.2 Connectivity IEC 61076-3-110 Augmented RJ45

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IEEE P802.3bq 40GBASE-T Task force
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Abstract

The objective of this contribution in support of IEEE 802.3bq 40GbE standard development is to provide direct test data for copper cable channels utilizing the standard connectors per IEC/ISO 61076-3-110 (Augmented RJ45) . The data covers a variety of channels: 5m, 7m, 10m, 30m and 50m constructed with several cables.
Testing was done in 2 GHz and 3 GHz spectra. Data demonstrated that use of IEC/ISO 61076-3-110 connectivity resulted in channels with improved transmission characteristics RL. NEXT , ACR, etc. The availability of copper connectivity is vital for implementation of 40GbE technology.

Rationale:

The copper cabling channels of improved transmission parameters Return loss, NEXT , ACRF , TCL are needed to make the market adoption of 40GbE possible.

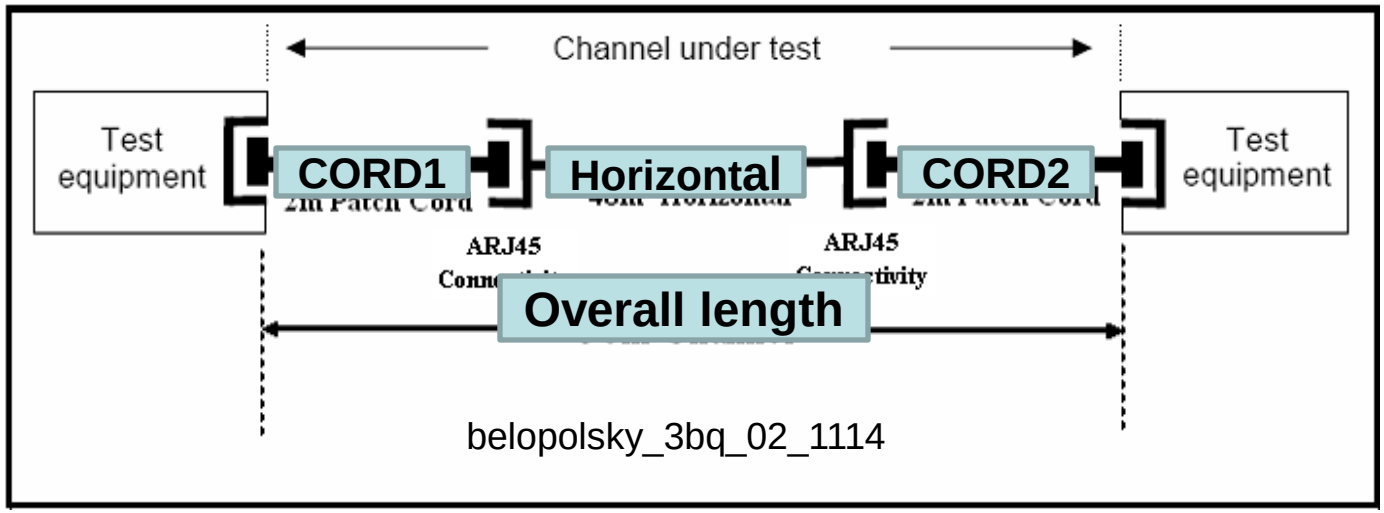
USERS' CONCERNS

- **Length of copper cabling (up to 30 m) may not address some applications**
- **Copper channels can provide only marginal transmission performance**
- **Complex PHY and DSP would be needed to compensate for marginal transmission abilities of copper**
- **40GbE may have very high energy requirements**
- **RJ45 connectivity may not provide enough safety margin for robust implementation**

Updated Test Data for Channels based on Proposed Category 8.2 Connectivity IEC 61076-3-110 *Augmented RJ45*

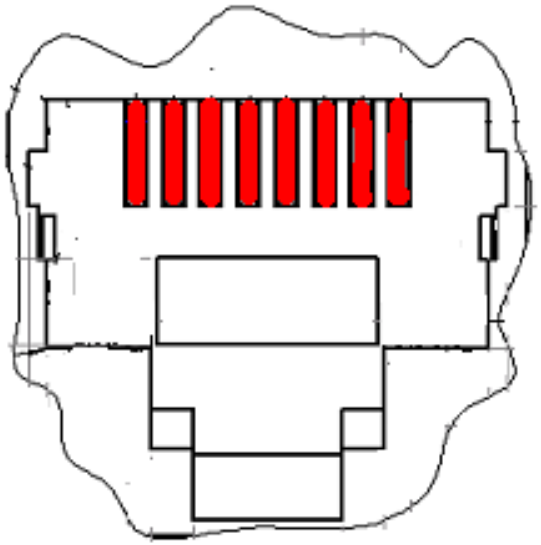
List of Channels

ChX	Overall Length, m	Channel construction, m			Connectors in channel	Cable Supplier	Measurment Apparatus
		Cord 1	Horizontal	Cord 2			
Ch1	7	2	3	2	4	D,D	WireExp
Ch2	7	1	5	1	2	A,A	E5071C
Ch3	7	1	5	1	2	B.A	E5071C
Ch4	10	1	6.5	2.5	2	D,D	WireExp
Ch5	10	1	6.5	2,5	2	A.A	WireExp
Ch6	10.5	2	6.5	2	2	A,A	WireExp
Ch7	30	2	26	2	2	A,D	WireExp
Ch8	30	2	26	2	4	D,D	WireExp
Ch9	30	2	26	2	2	A,A	WireExp
Ch10	50	2	46	2	2	A,A	E5071C



STANDARD CONNECTOR INTERFACES

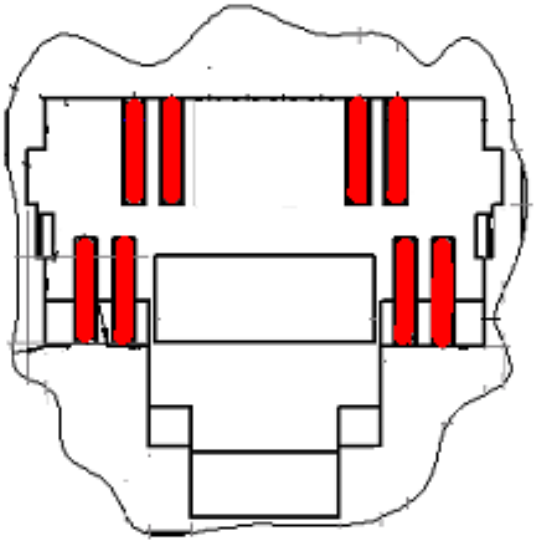
reviewed in this presentation



IEC 60603-7

8-CONTACTS

Category 3 to 6_A,
Proposed category 8.1



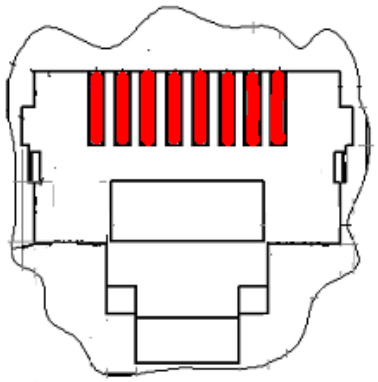
IEC 61076-3-110

8-CONTACTS

Category 7_A
Proposed category 8.2

COMPENSATION vs. ISOLATION

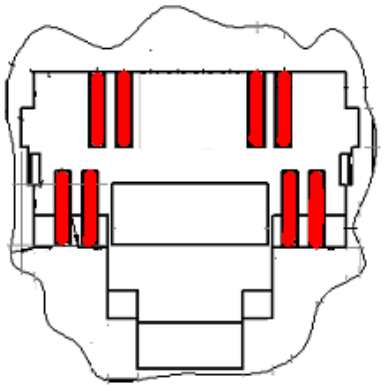
Major difference between proposed 8.1 and 8.2



RJ45 8-CONTACTS

Proposed category 8.1

RJ45 use ***COMPENSATION*** to reduce differential NEXT. Method of creating the crosstalk equal in amplitude but opposite in phase by adding capacitive and inductive elements



Augmented RJ45 8-CONTACTS

Proposed category 8.2

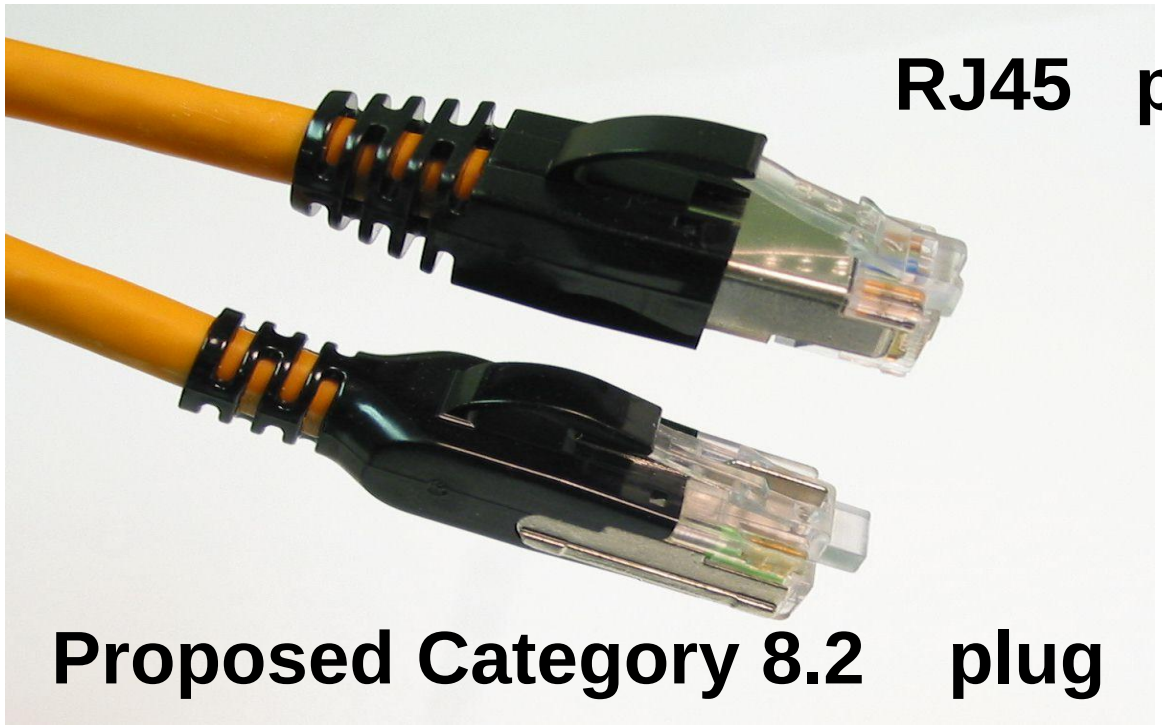
Augmented RJ45 use **ISOLATION** to avoid differential NEXT. Faraday cage is built around each differential pair.

Proposed CATEGORY 8.1 and 8.2 Connectivity

NOT

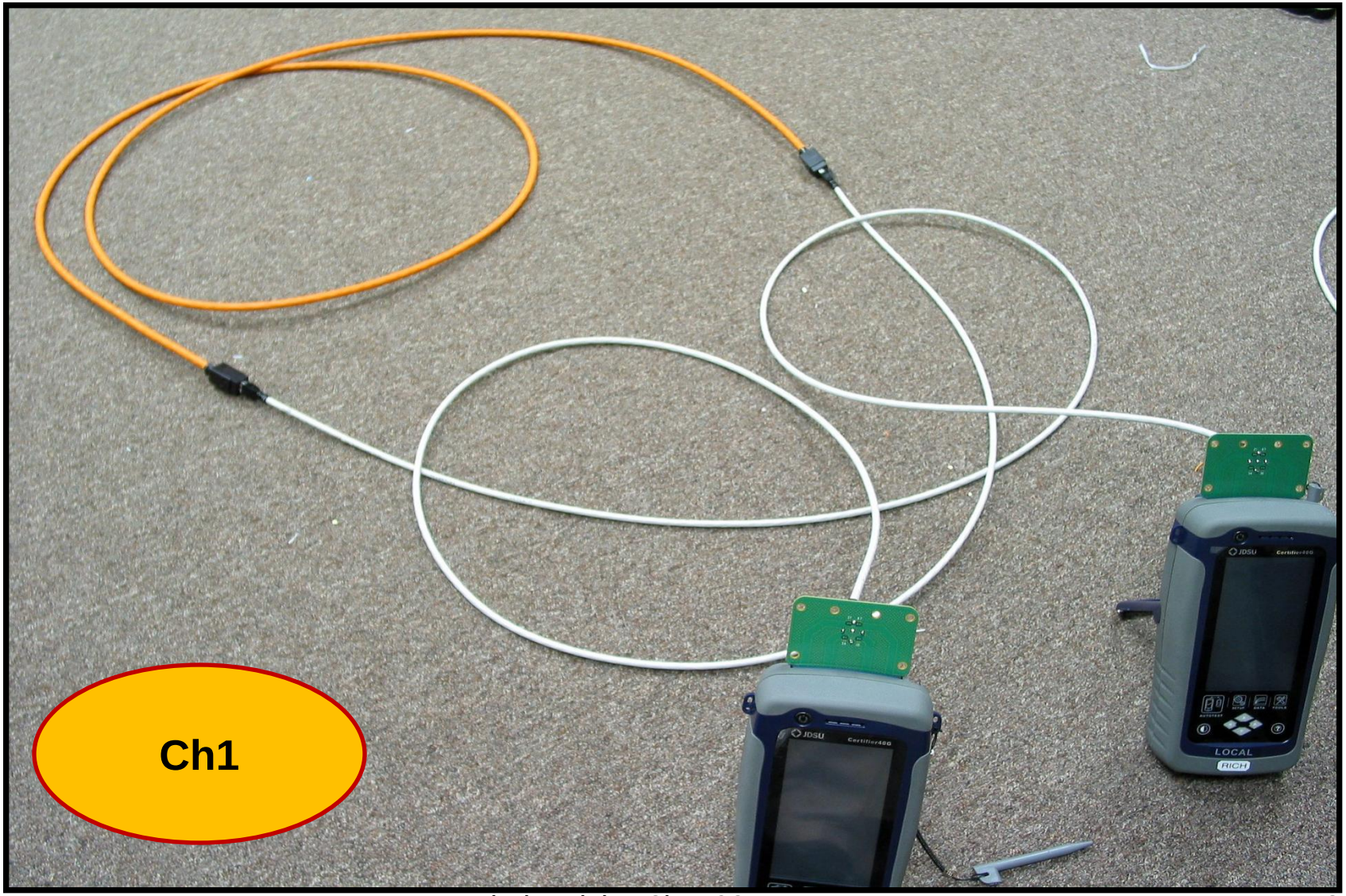
mutually exclusive

All Standard Connectors Utilize 8-wire Patch Cords



Category 6 shielded RJ45 plug is shown combined with Augmented RJ45 Plug in same patch cord

7m *IEC 61076-3-110* Augmented RJ45 2-3-2 Channel



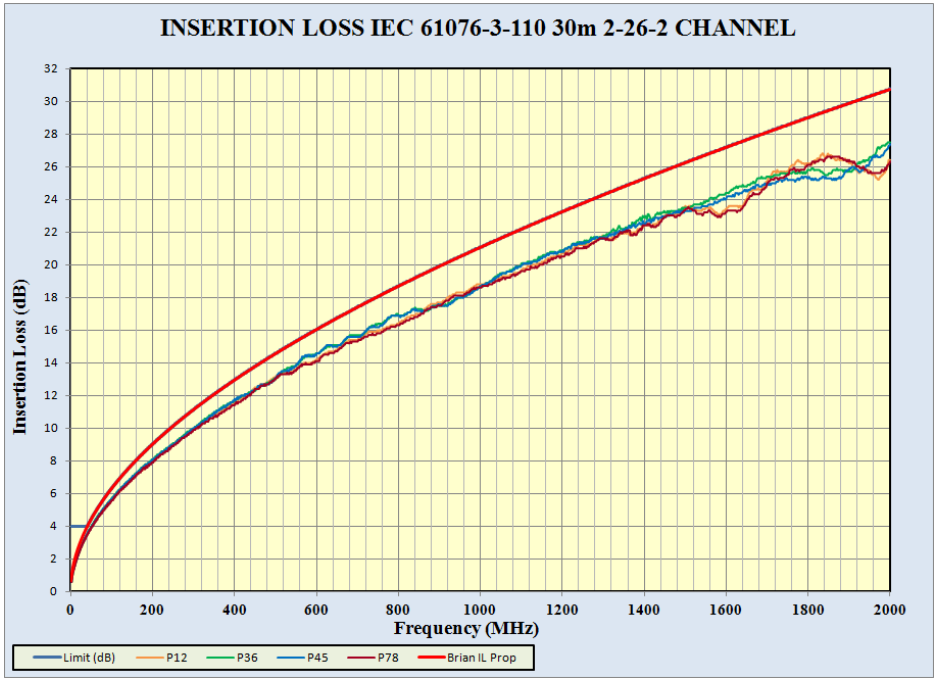
30m *IEC 61076-3-110* Augmented RJ45 2-26-2 Channel

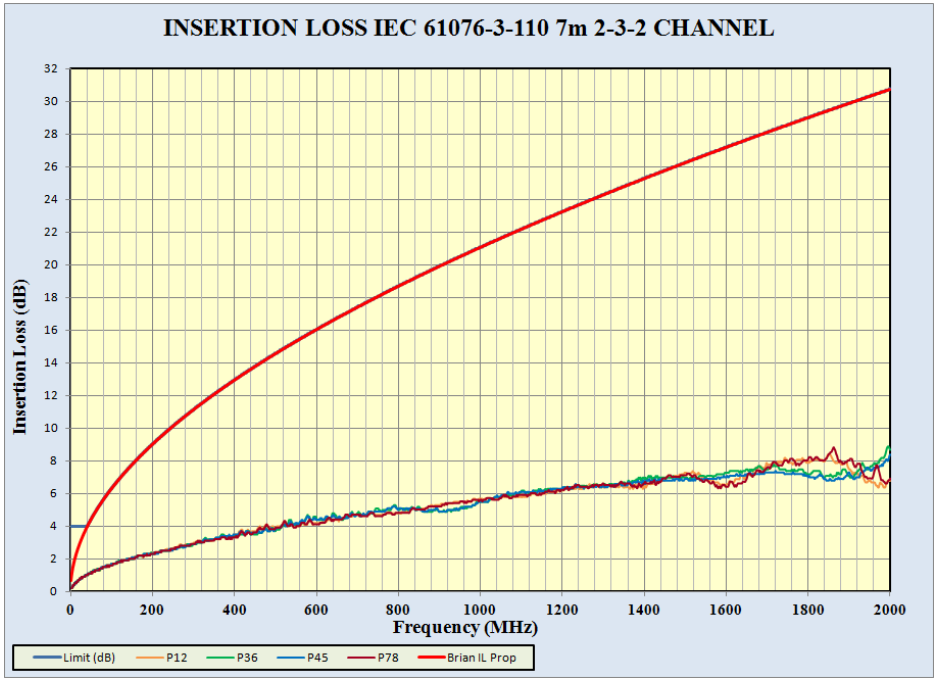
Commercially Available Products

IEC 61076-3-110 **Augmented RJ45**

Channel Insertion Loss

30m 2+26+2 **7m 2+3+2**





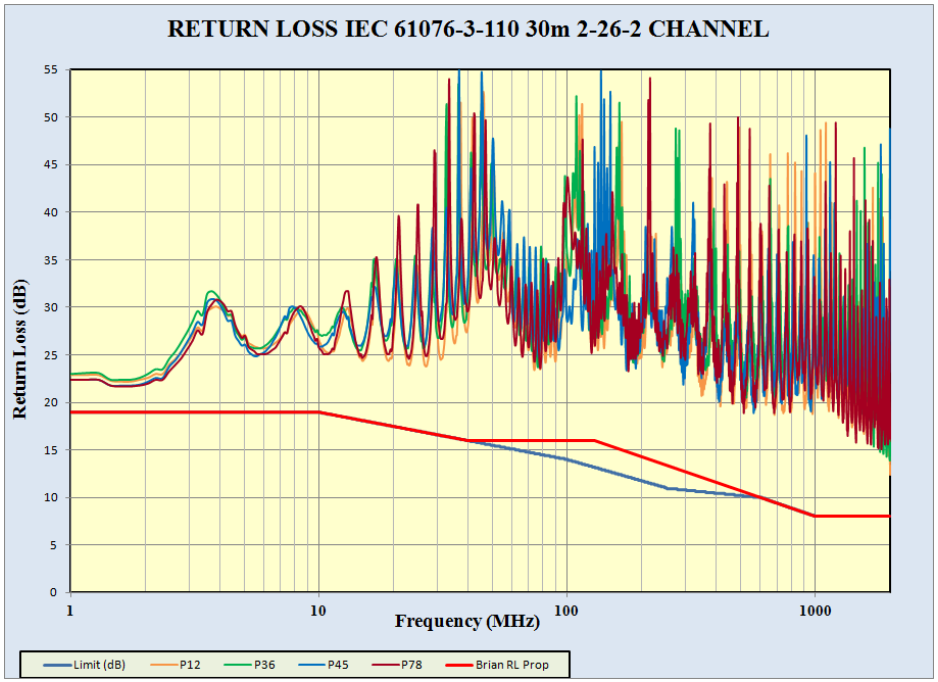
Ch8 **Ch1**

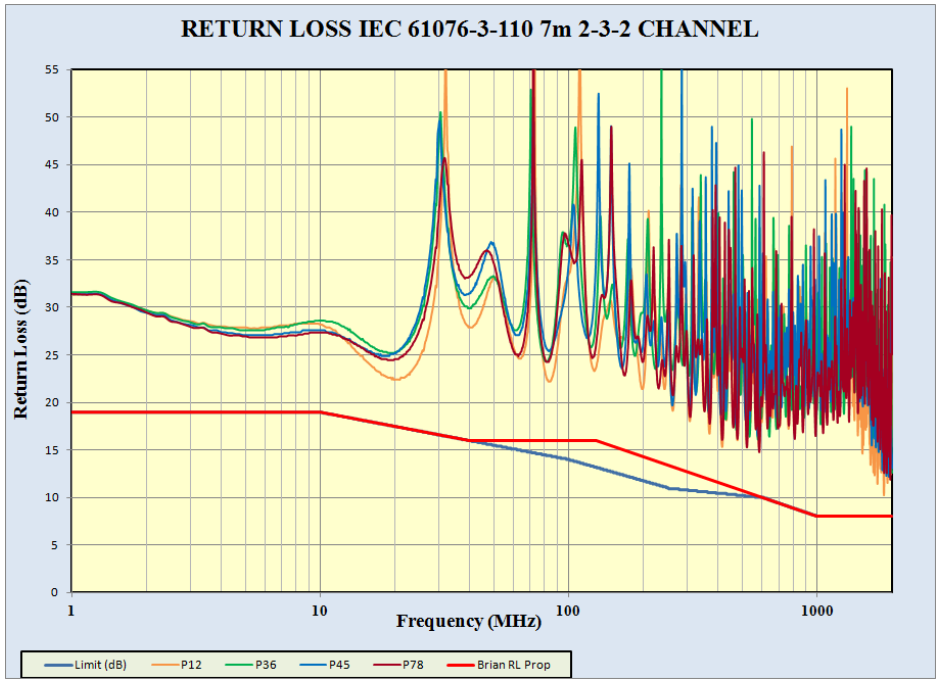
End-to-End 4-connector channel . MDI connectors included

IEC 61076-3-110 **Augmented RJ45**

Channel Return Loss

30m 2+26+2 **7m 2+3+2**



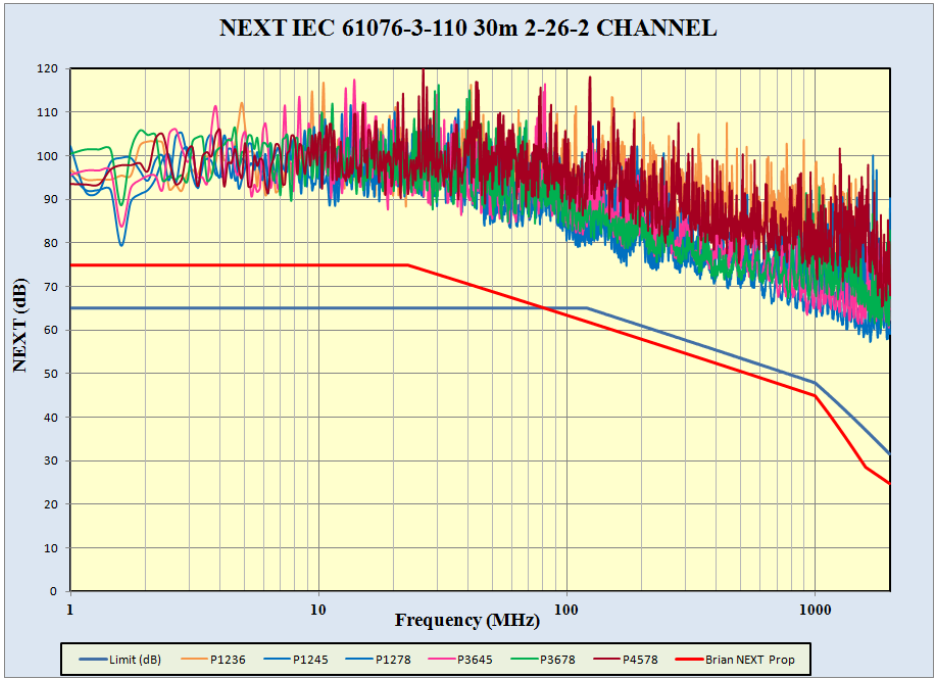


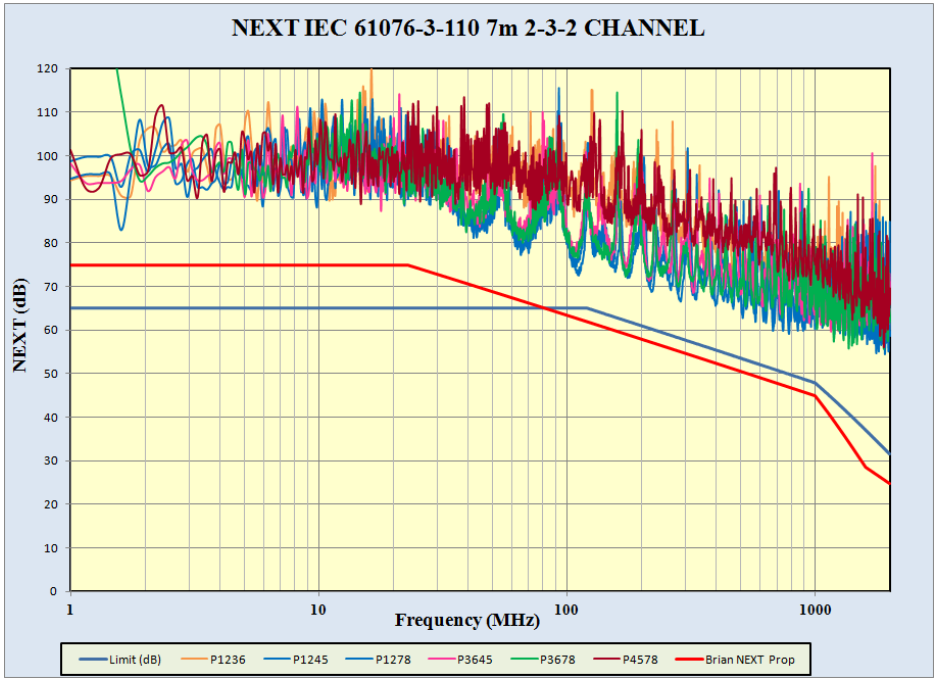
Ch8 **Ch1**

End-to-End 4-connector channel . MDI connectors included

IEC 61076-3-110 Augmented RJ45 Channel NEXT

30m 2+26+2 **7m 2+3+2**





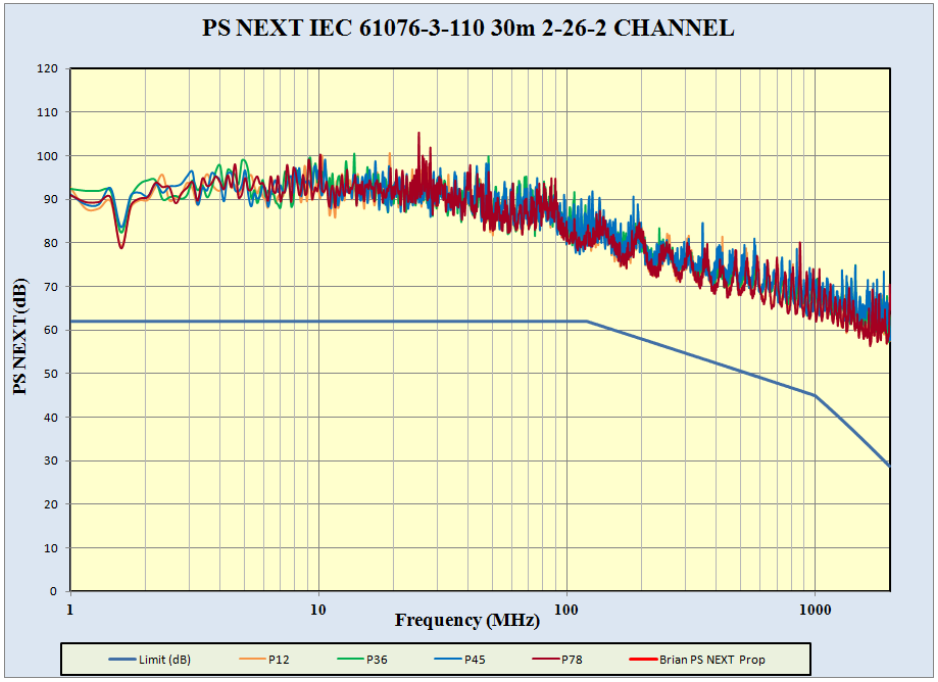
Ch8 **Ch1**

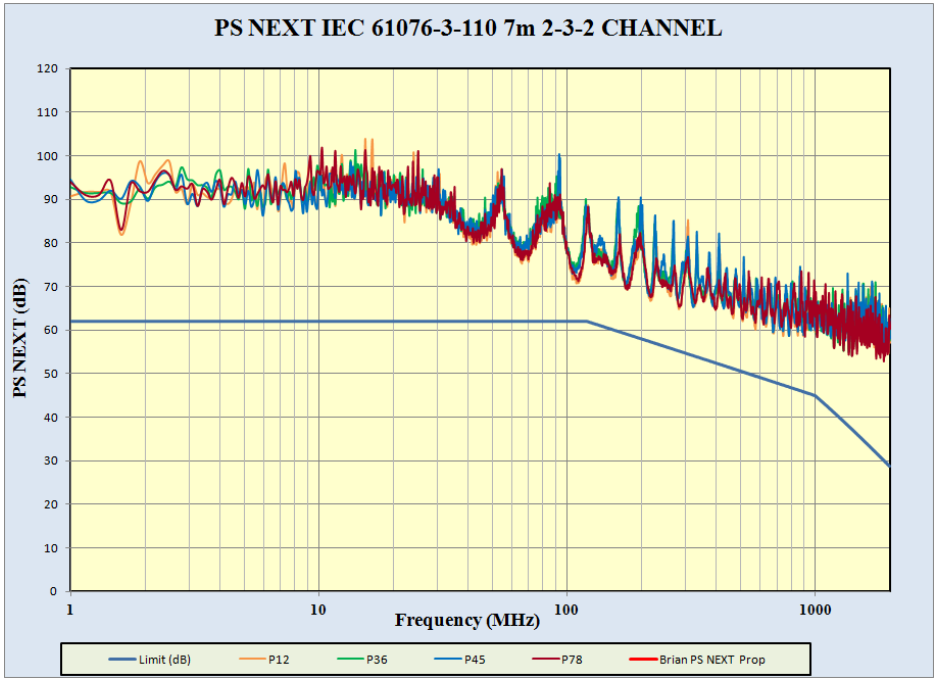
End-to-End 4-connector channel . MDI connectors included

IEC 61076-3-110 Augmented RJ45

Channel PS NEXT

30m 2+26+2 **7m 2+3+2 D**



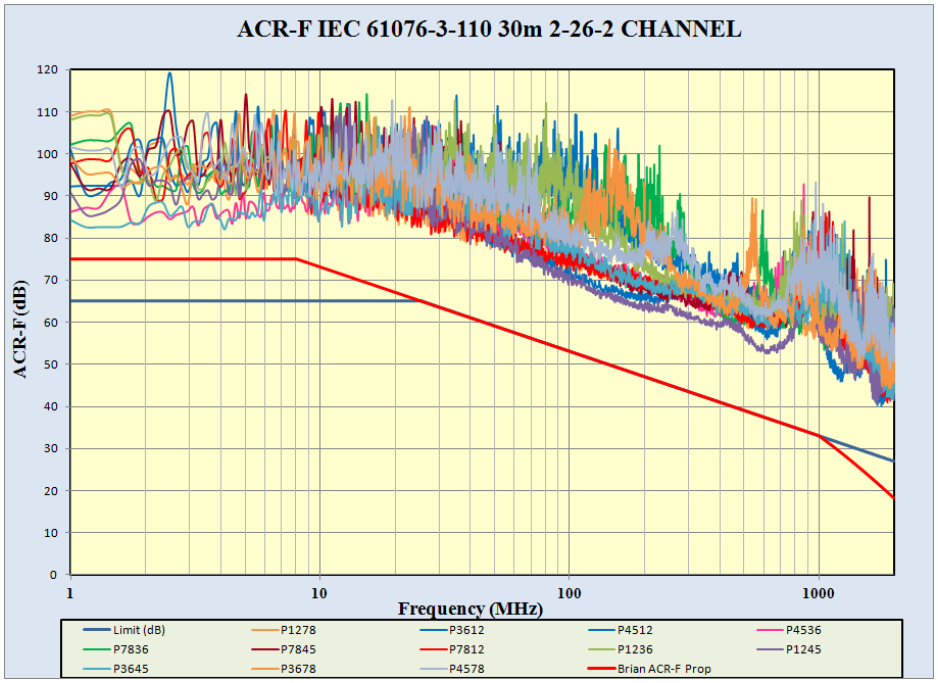


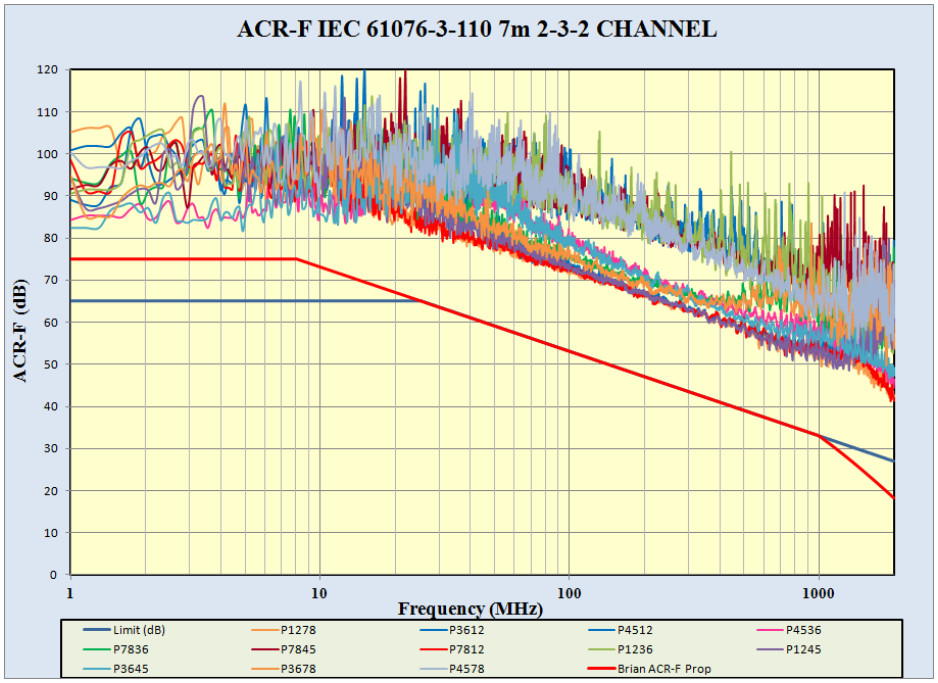
Ch8 **Ch1**

End-to-End 4-connector channel . MDI connectors included

IEC 61076-3-110 Augmented ***RJ45*** Channel ACR-F

30m 2+26+2 **7m 2+3+2**





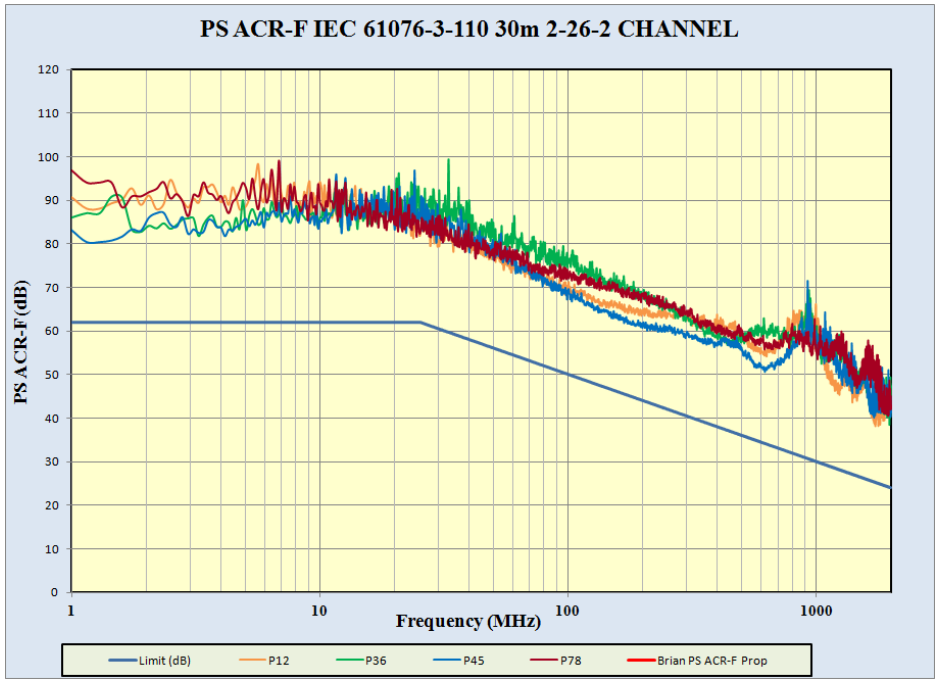
Ch8 **Ch1**

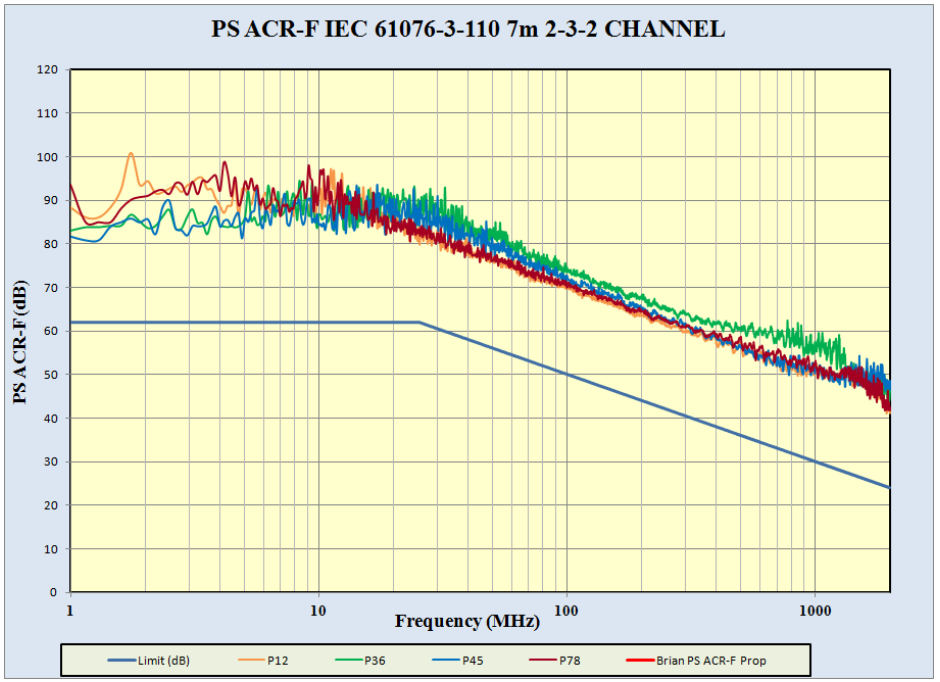
End-to-End 4-connector channel . MDI connectors included

IEC 61076-3-110 Augmented RJ45

Channel PS ACR-F

30m 2+26+2 **7m 2+3+2 D**



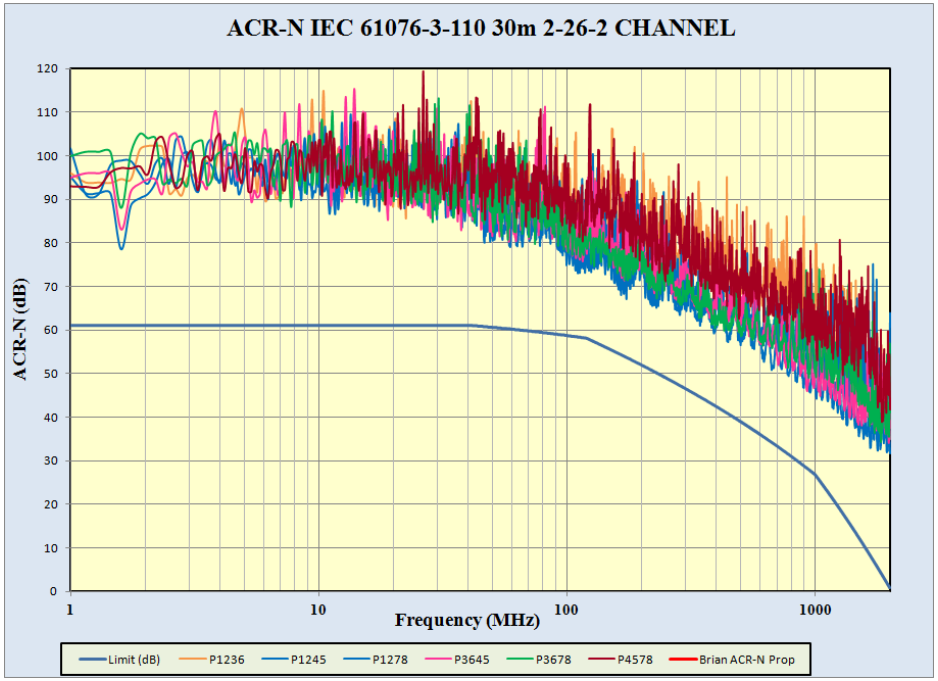


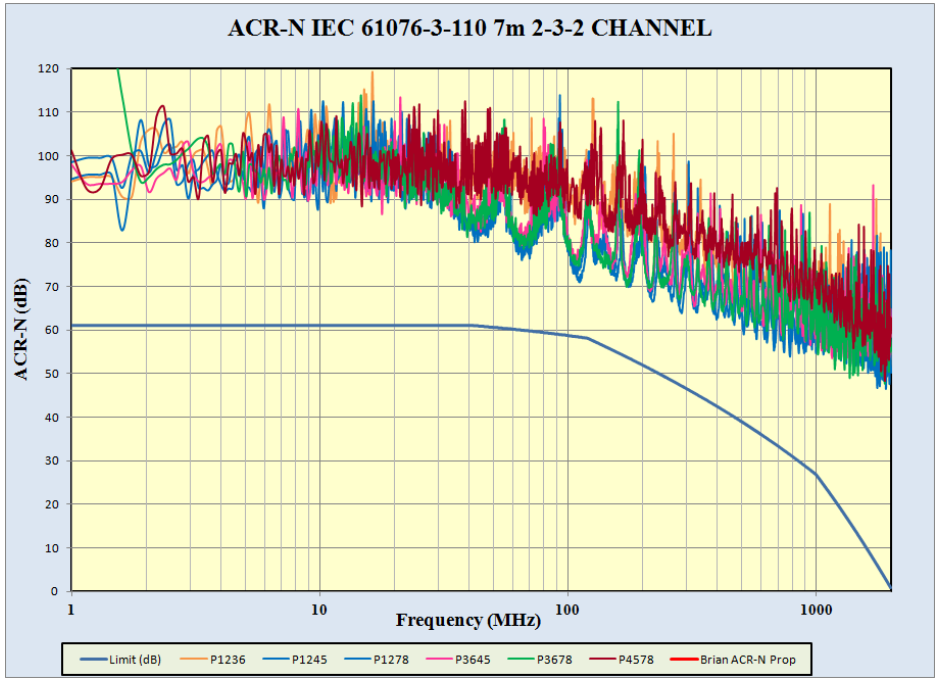
Ch8 **Ch1**

End-to-End 4-connector channel . MDI connectors included

Channel ACR-N

30m 2+26+2 **7m 2+3+2 D**



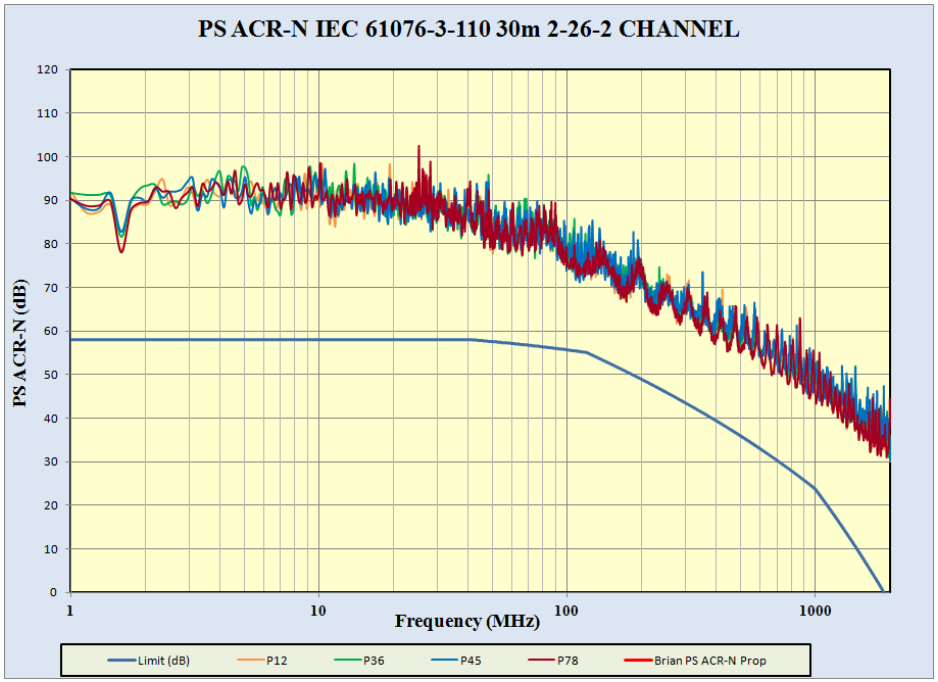


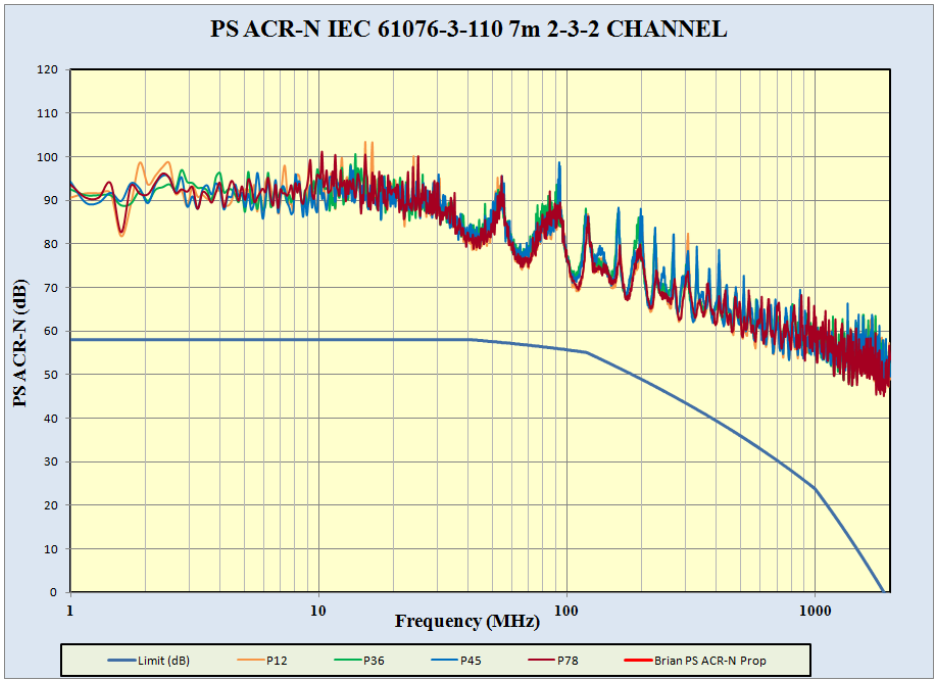
Ch8 **Ch1**

End-to-End 4-connector channel . MDI connectors included

Channel PS ACR-N

30m 2+26+2 7m 2+3+2 D



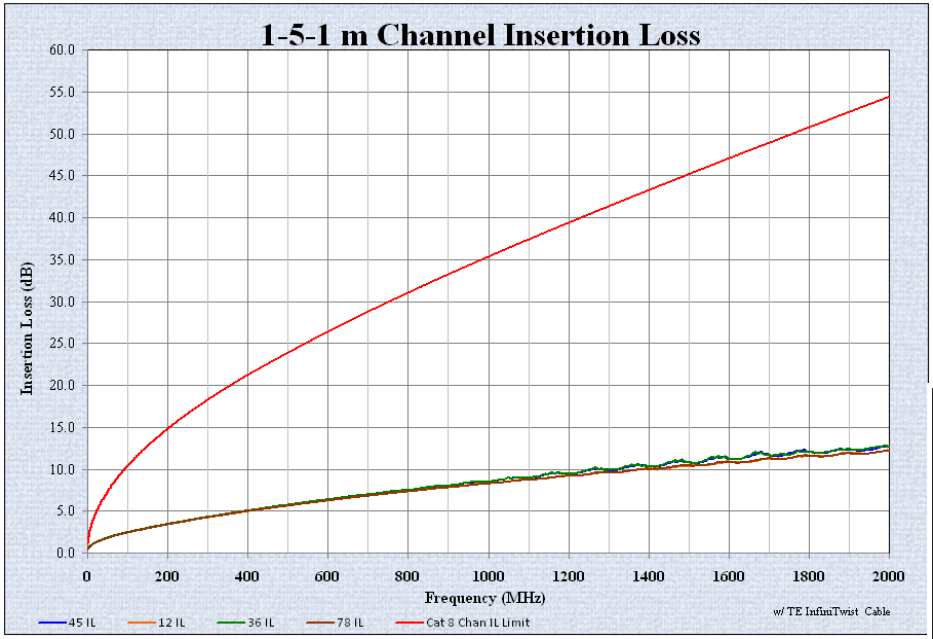


Ch8

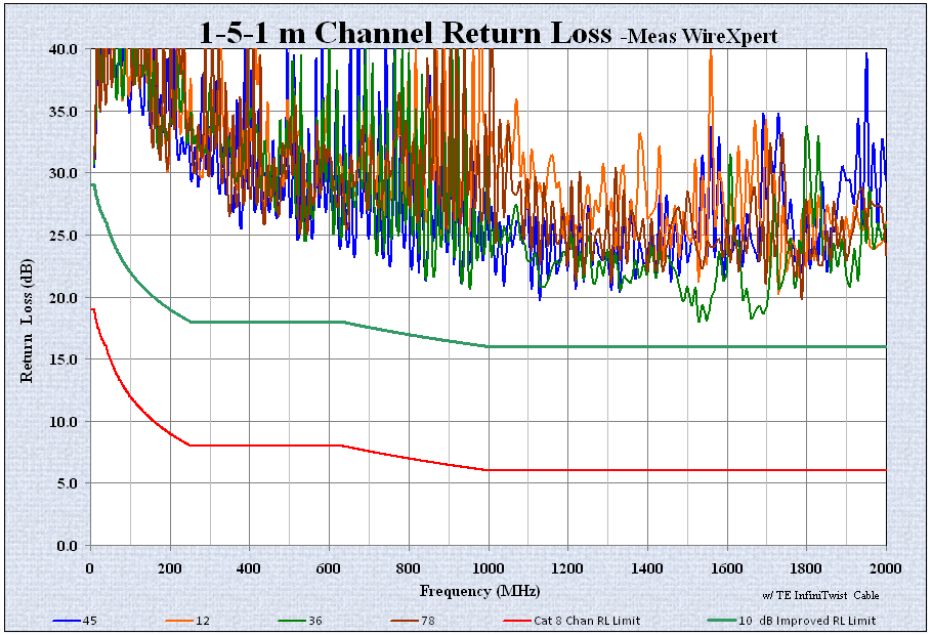
Ch1

End-to-End 4-connector channel . MDI connectors included

7m *IEC 61076-3-110* Augmented RJ45 CHANNEL **1+5+1**



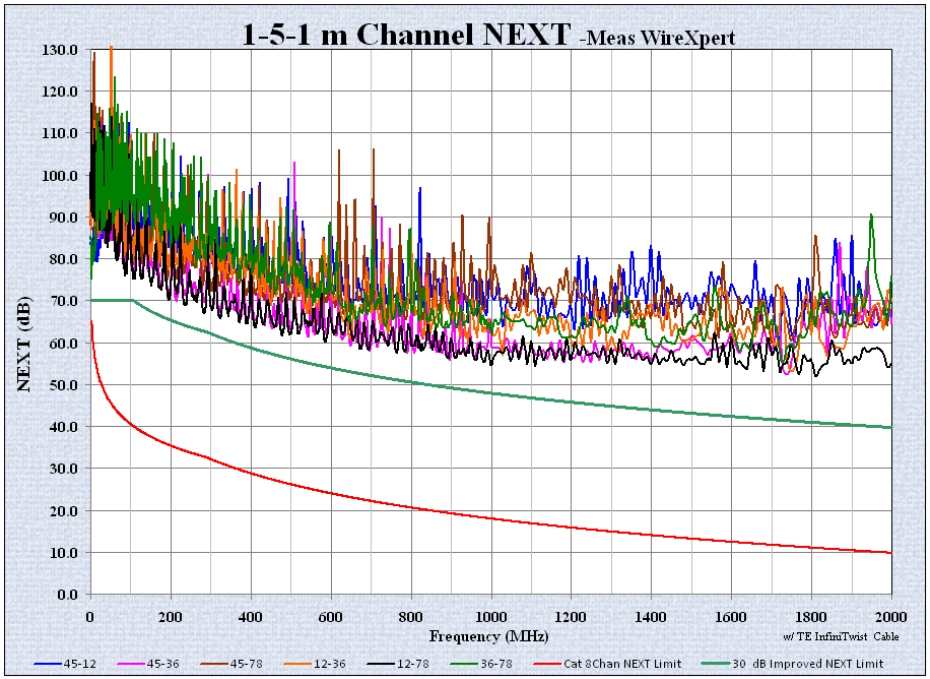
Ch2

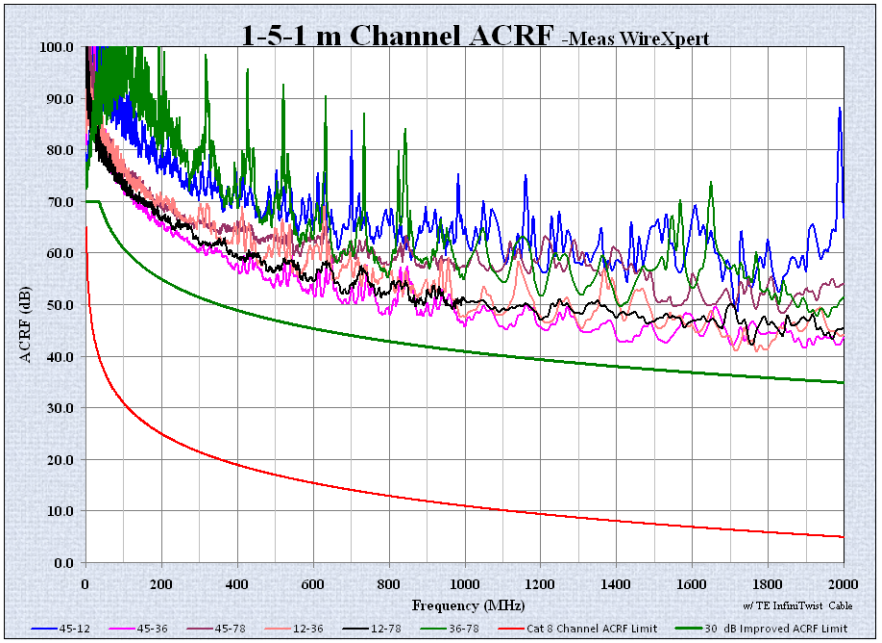


Ch2

7m *IEC 61076-3-110* Augmented RJ45 CHANNEL **1+5+1**

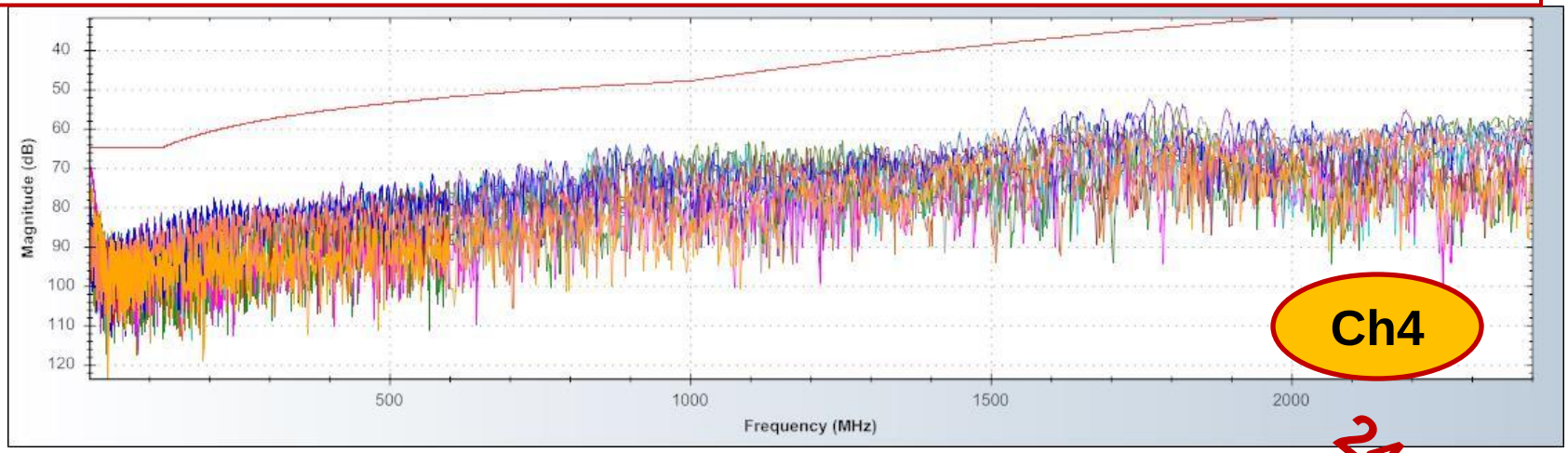
Ch2





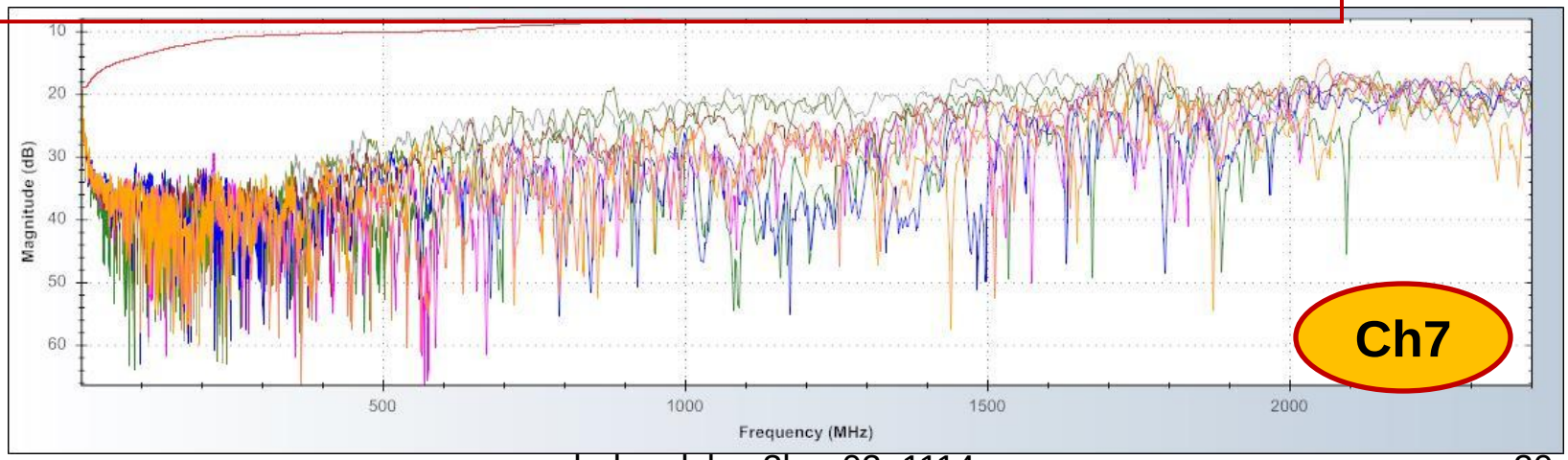
Ch2

10m *IEC 61076-3-110* Augmented RJ45 Channel 1+6.5+2.5 NEXT

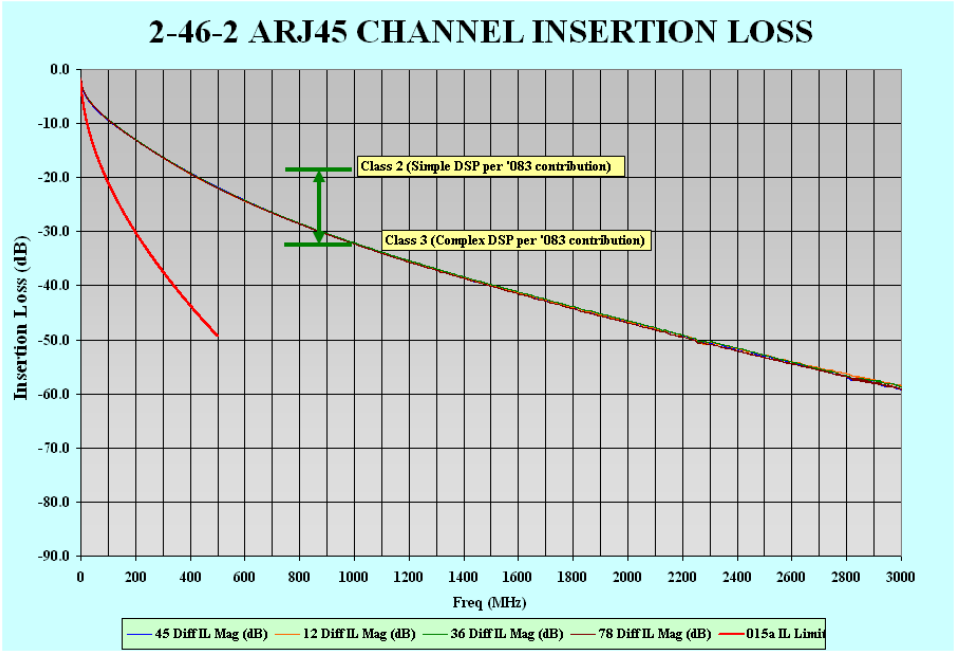


2400 MHz

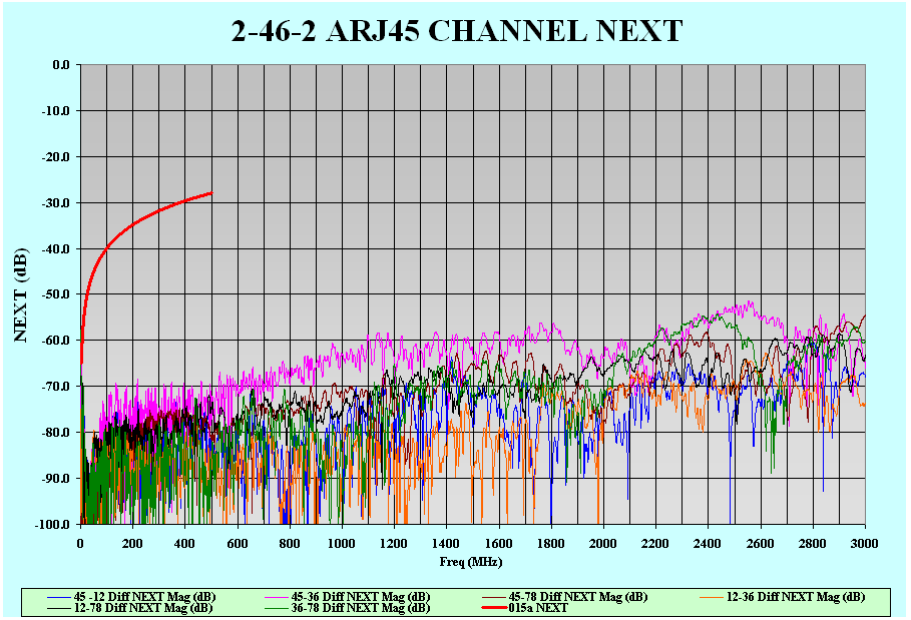
30m *IEC 61076-3-110* Augmented RJ45 Channel 2+26+2 RL



50m *IEC 61076-3-110* Augmented RJ45 CHANNEL **2+46+2**



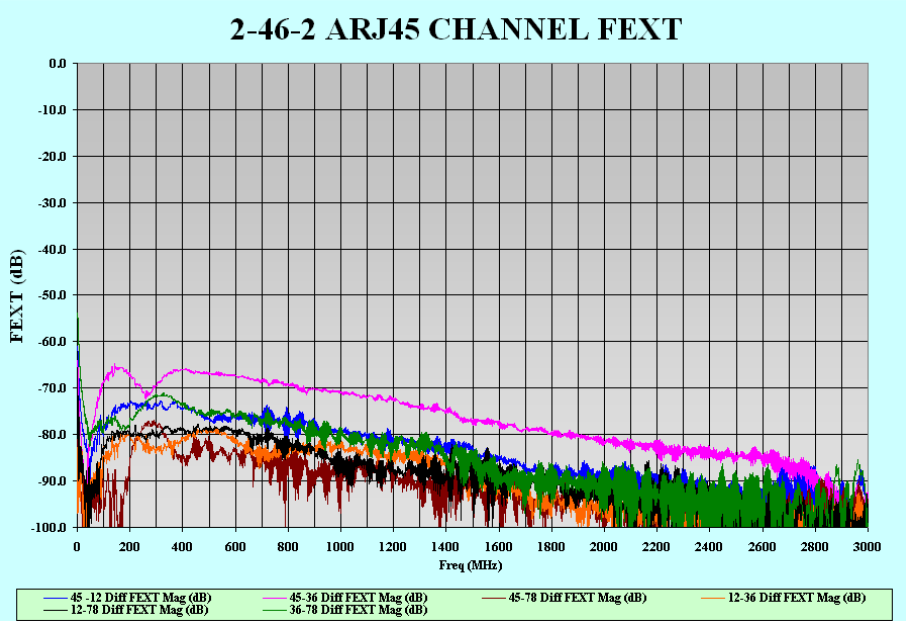
Ch10 3000MHz

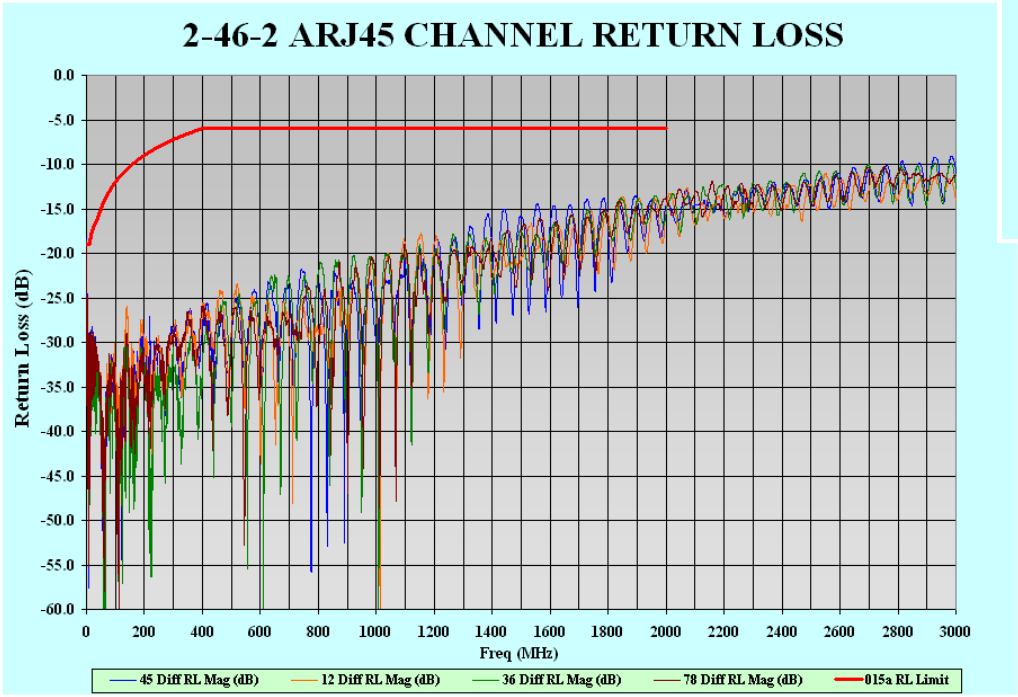


Ch10 3000MHz

50m *IEC 61076-3-110* **Augmented RJ45** CHANNEL ***2+46+2***

Ch10 3000MHz





Ch10 3000MHz

Measurement Data Summary

A

RL

No	Overall Length, m	Connectors in channel	Proposed cat 8.2 IEC61076-3-110 *Augmented RJ45* channel RL, dB	
			1000 MHz	2000 MHz
Ch1	7	4	17	14
Ch2	7	2	22	23
Ch3	7	2	20	19
Ch4	10	2	19	17
Ch5	10	2	19	18
Ch6	10.5	2	21	20
Ch7	30	2	18	16
Ch8	30	4	19	15
Ch9	30	2	19	14
Ch10	50	2	19	14

Measurement Data Summary

B

Use of IEC/ISO 61076-3-110 Standard Interface connectors resulted in significant improvement of transmission characteristics as compared to requirements of Category 8 PN-568-C-2-1-Draft 2.0c

NEXT

No	Overall Length, m	Connectors in channel	Proposed cat 8.2 *Augmented RJ45IEC61076-3-110* channel NEXT, dB		
			500 MHz	1000 MHz	2000 MHz
Ch1	7	4	67	63	58
Ch2	7	2	62	61	64
Ch3	7	2	71	69	61
Ch4	10	2	76	73	62
Ch5	10	2	71	68	60
Ch6	10.5	2	70	67	59
Ch7	30	2	67	66	60
Ch8	30	4	69	63	58
Ch9	30	2	63	62	57
Ch10	50	2	71	62	60
LIMIT PN-568-C-2-1-Draft 2.0c			30	19	10

CONCLUSION

- ***Multiple tests demonstrated that IEC 61076-3-110 Connectivity can support 40GbE transmission in short and longer channels and should be considered for IEEE 802.3bq as an option for MDI connector interface***