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Experimental Evaluation of 25 and 40GBASE-T Channel Performance

Augmented RJ45 IEC 61076-3-110 Connectivity

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IEEE P802.3bq 40GBASE-T Task force
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Augmented RJ45 IEC 61076-3-110 Connectivity

Abstract

This contribution in support of IEEE 802.3bq 40GbE standard development summarizes the transmission test results for channels utilizing IEC 61076-3-110 Augmented RJ45 connectivity. The data covers a range of channels from 4m to 60m tested up to 2000 MHz. The cabling was provided by multiple vendors. The significant improvement of the major channels characteristics: NEXT, Return Loss, Transverse Conversion Loss was experimentally demonstrated. In particular, it was shown that with the use of IEC61076-3-110 connectivity a 57 to 60 dB NEXT @2000 MHz in a 30m channel can be achieved.

USERS' CONCERNS

- **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**
- **IEC 60603-7-81 connectivity may not provide enough performance safety margin for robust implementation**

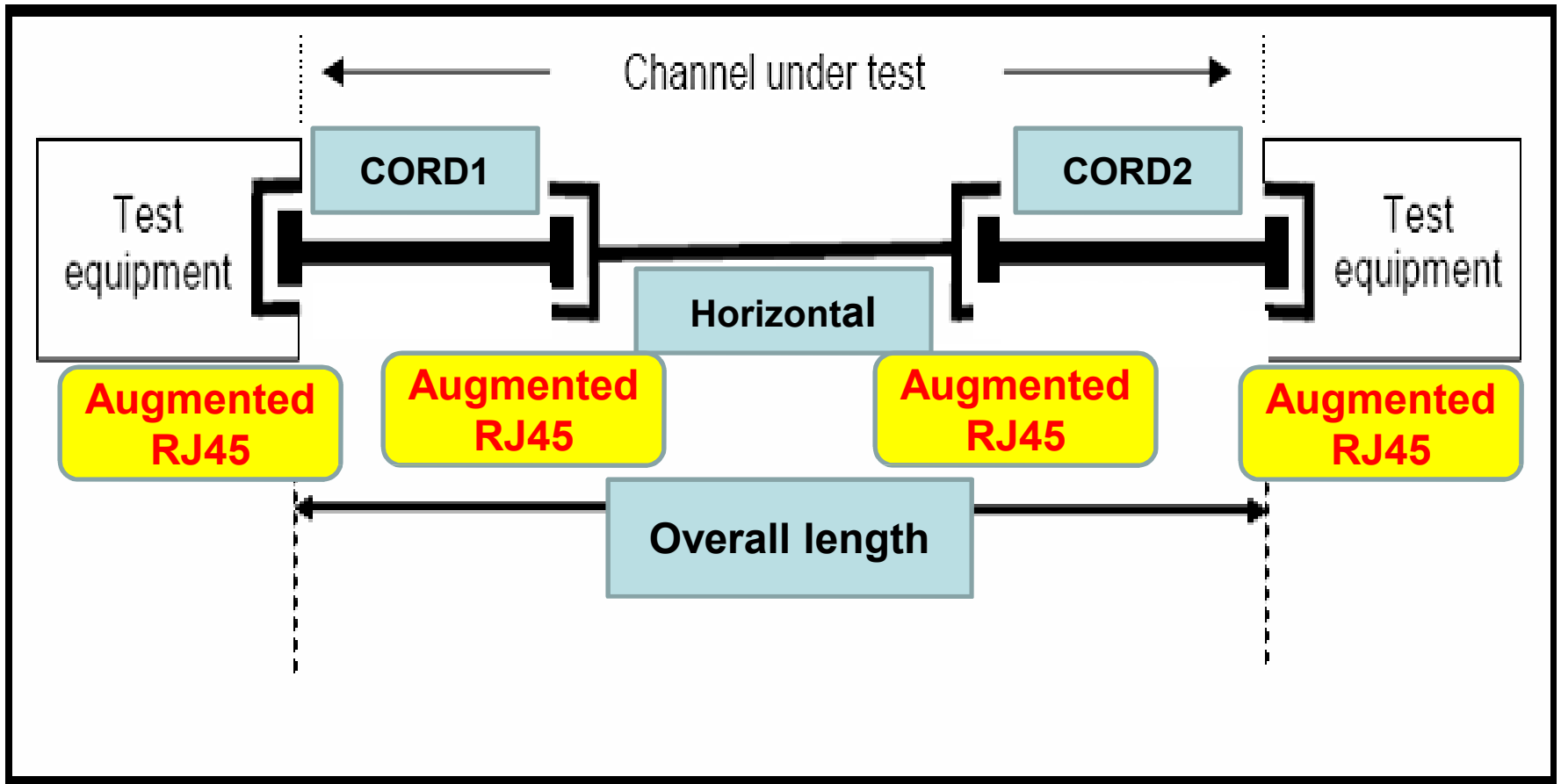
The Experimental evaluations was conducted using channels from 4m to 60m

Tests conducted in the laboratories located in the US and Switzerland

The majority of test data presented here has an upper limit of 2000 MHz, detailed test data at 1250MHz and 3000 MHz was also collected

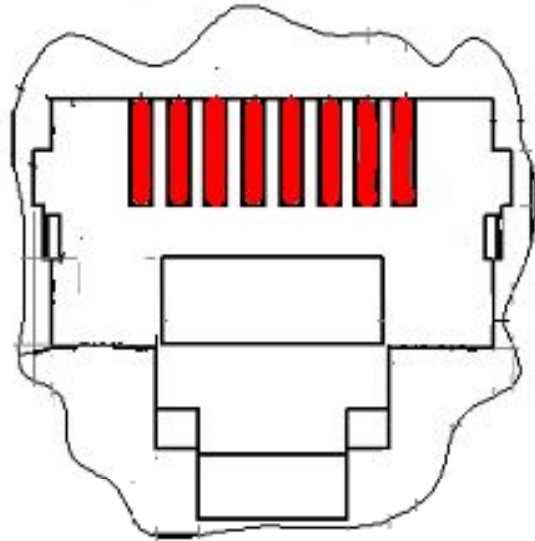
Horizontal cables were provided by 4 different suppliers

Patch cord cables were provided by 3 suppliers



STANDARD CONNECTOR INTERFACES

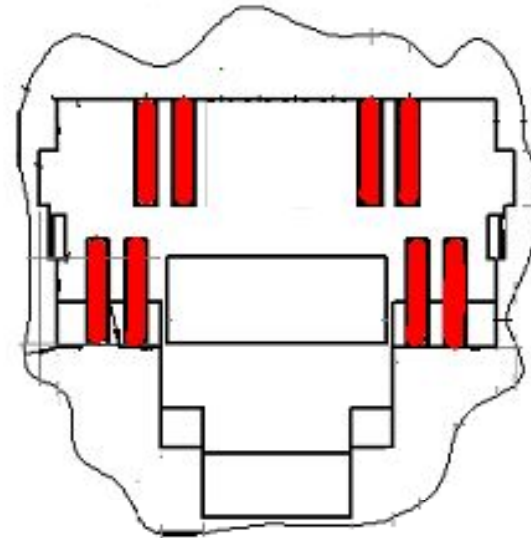
reviewed in this presentation



IEC 60603-7-series

RJ45 8-CONTACTS

***Category 3 to 6_A,
Proposed category 8.1***



IEC 61076-3-110

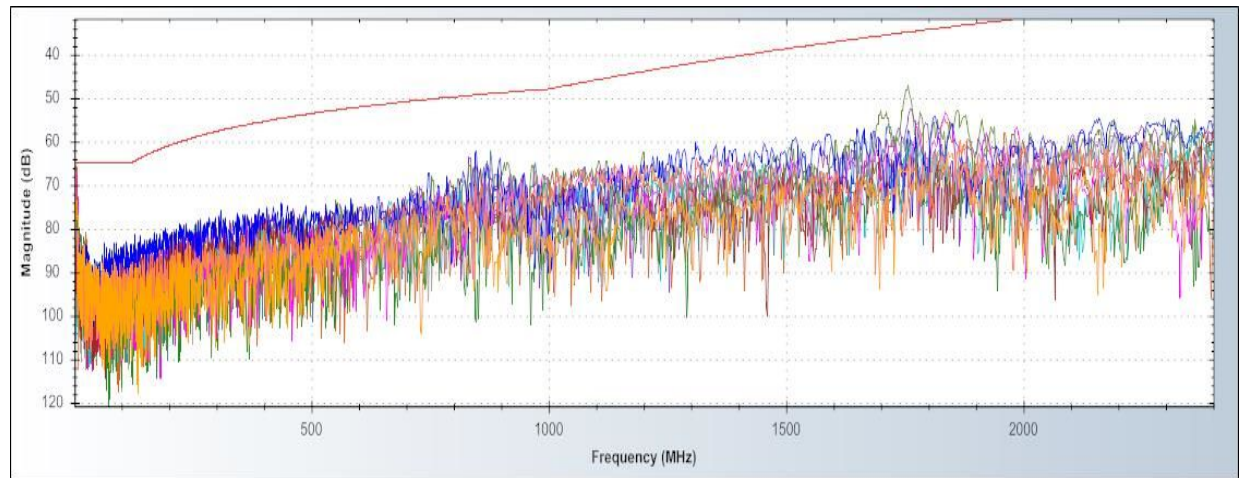
Augmented RJ45 8-CONTACTS

***Category 7_A
Proposed category 8.2***

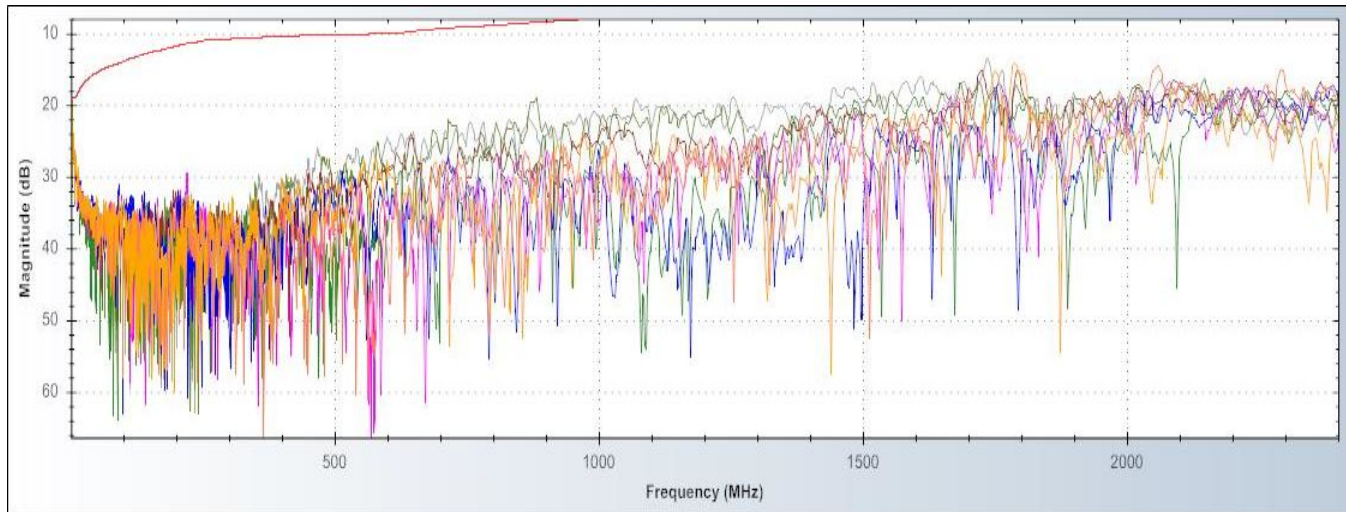
40GBASE-T

30 m

US Lab test results
The cables not the same as shown in the preceding slide



NEXT MARGIN @ 2000MHz > 30dB

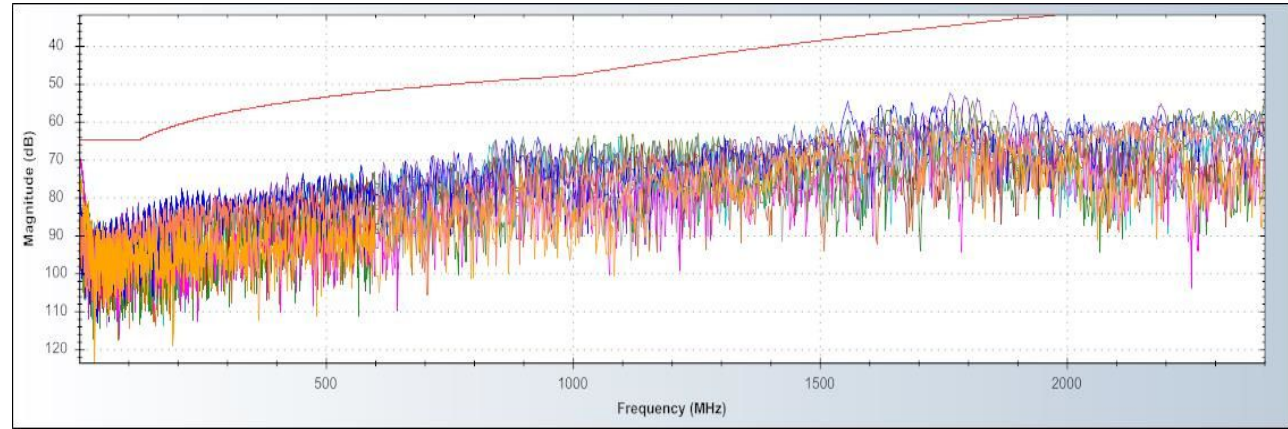


RL MARGIN @ 2000MHz > 8dB

Augmented RJ45

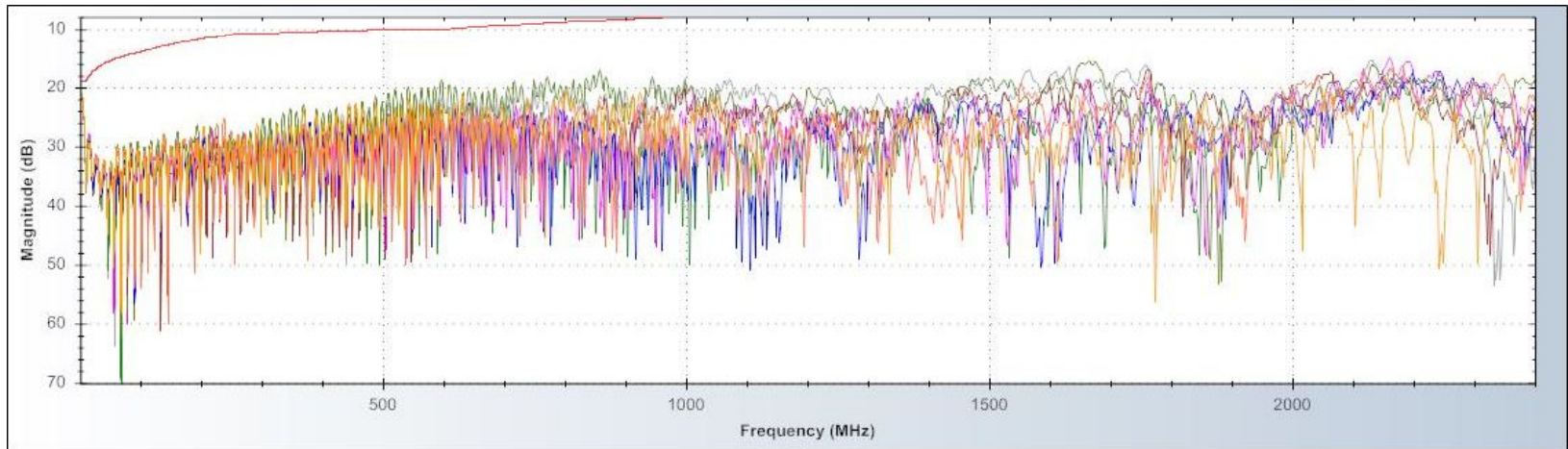
40GBASE-T

10 m



Augmented RJ45

NEXT MARGIN @ 2000MHz > 38dB



RL MARGIN @ 2000MHz > 7dB

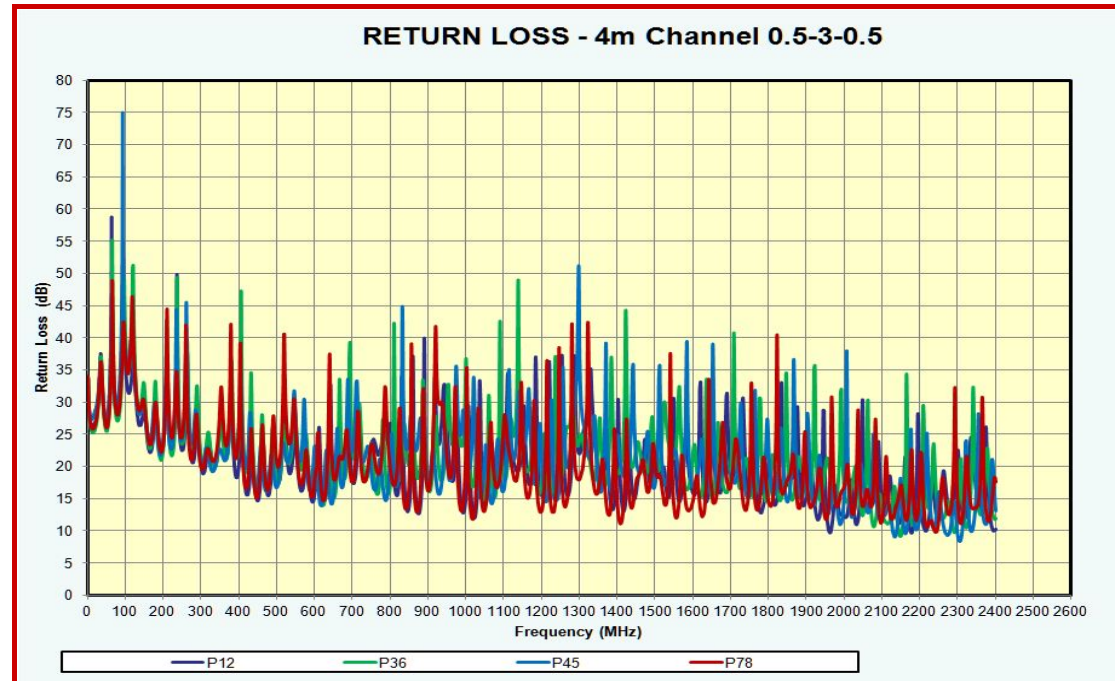
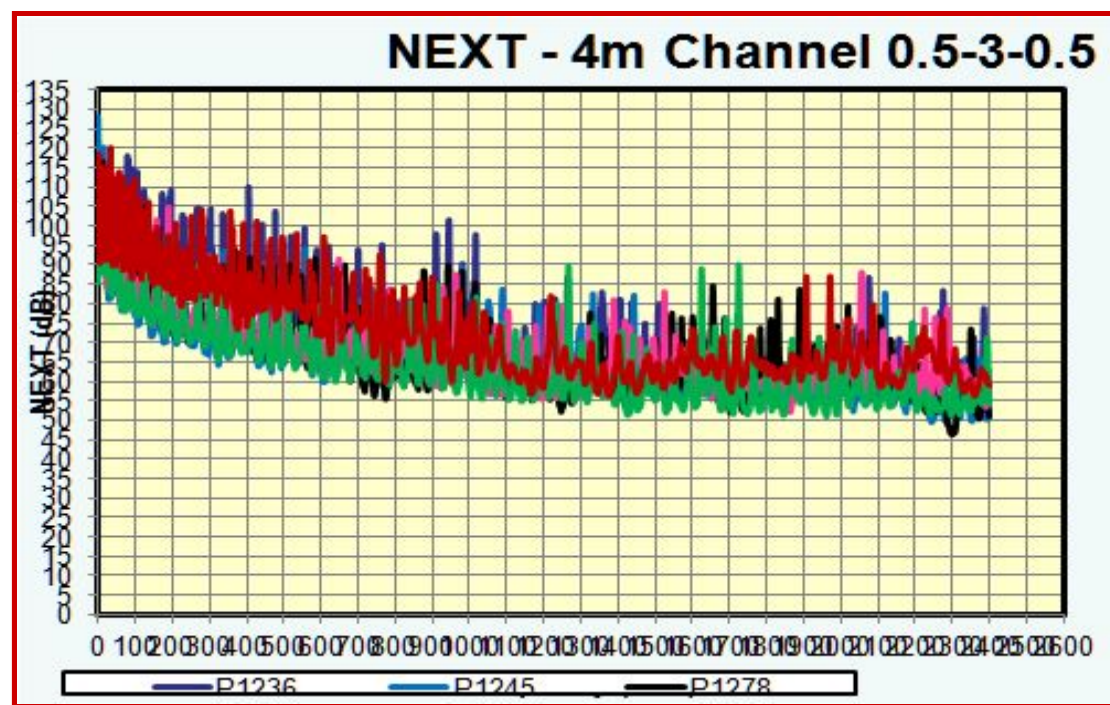
2000 MHz

4 m

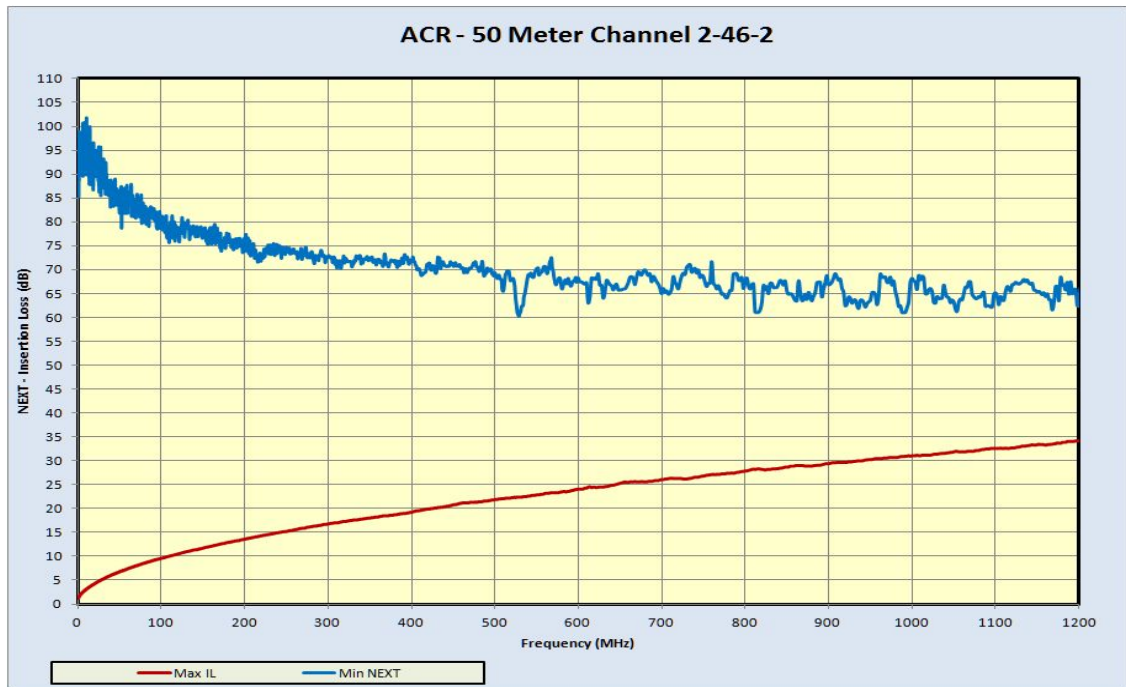
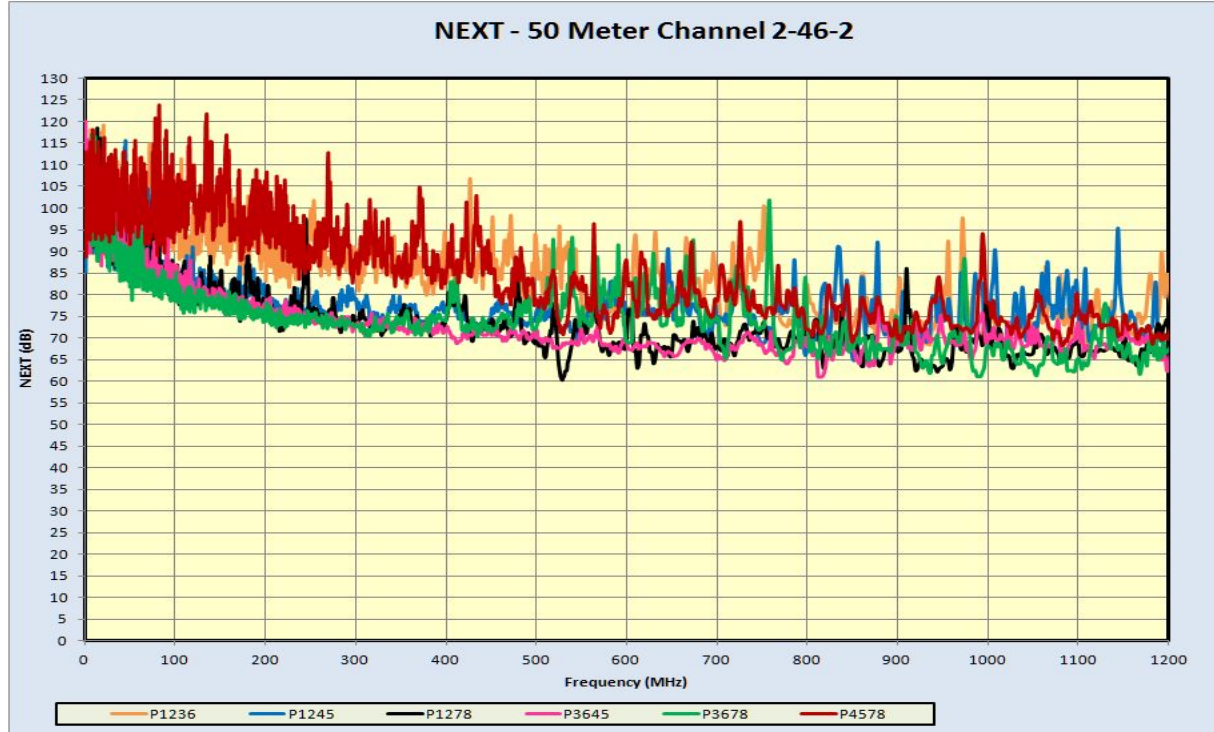
A super-short channel constructed to demonstrate capabilities

Augmented RJ45

belopolsky_IEEE 802.3bq_01_0315

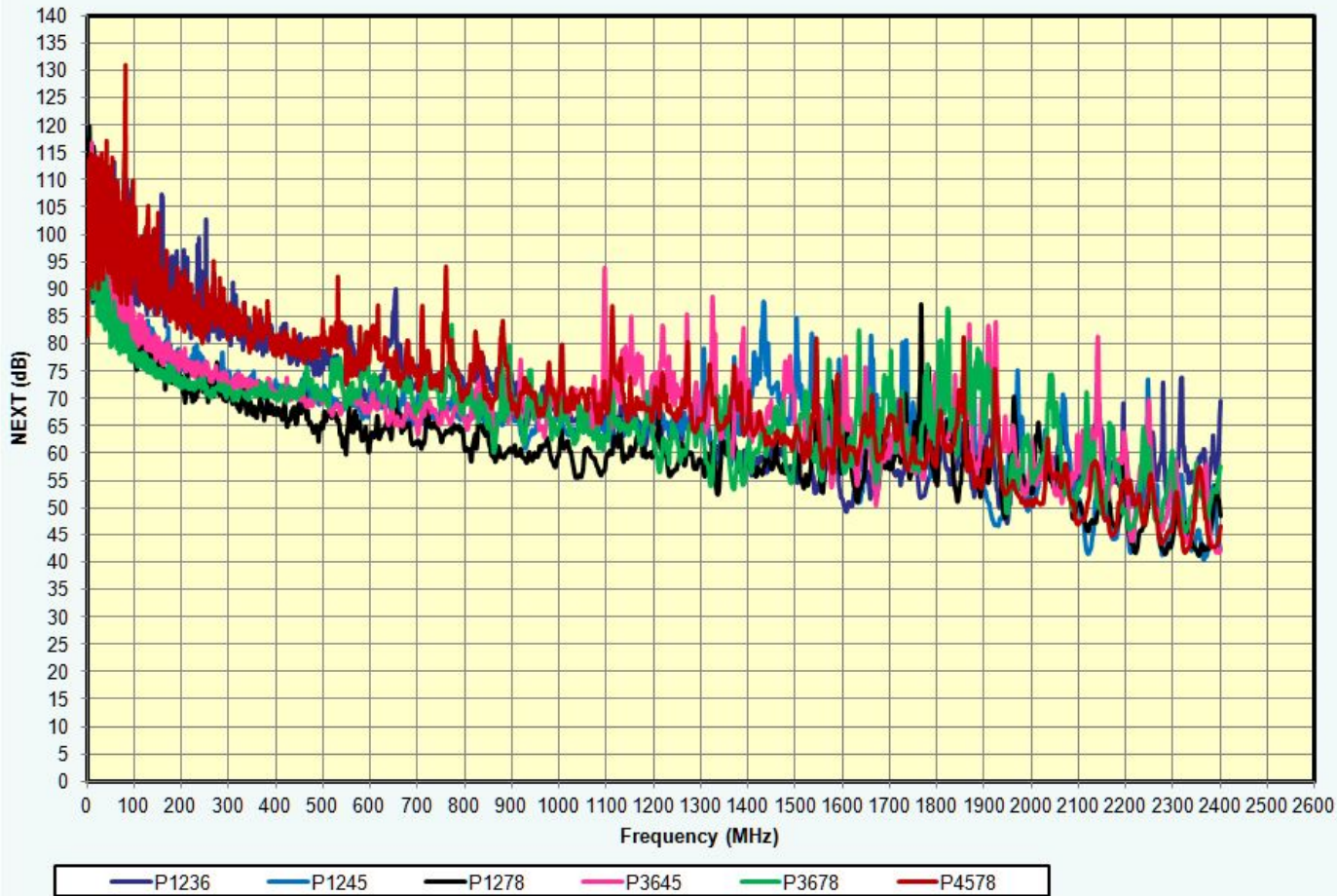


Experimental 25GBASE-T 50 m



Augmented RJ45

NEXT - 60 Meter Channel 2-56-2



Experimental
25GBASE-T
60 m

This channel used a category 7a rated shielded cable

Augmented RJ45

**Channels based on Proposed Category 8.2
Connectivity IEC 61076-3-110 Augmented RJ45**

Augmented RJ45 channel List					
Overall Length, m	Channel construction, m			Connectors in channel	Measurement Apparatus
	Cord 1	Horizontal l	Cord 2		
4	0.5	3	0.5	2	WireExp
7	2	3	2	4	WireExp
7	1	5	1	2	E5071C
7	1	5	1	2	E5071C
10	1	6.5	2,5	2	WireExp
10.5	2	6.5	2	2	WireExp
30	2	26	2	2	WireExp
30	2	26	2	4	WireExp
30	2	26	2	2	WireExp
50	2	46	2	2	E5071C
60	2	56	2	2	WireExp

Measurement Data Summary

A

RL

Overall Length, m	Channel construction, m			Connectors in channel	ARJ45 channel RL, dB	
	Cord 1	Horizontal	Cord 2		1000 MHz	2000 MHz
40GbE CHANNEL						
7	1	5	1	2	22	23
7	1	5	1	2	20	19
10	1	6.5	2,5	2	19	17
10.5	2	6.5	2	2	19	18
30	2	26	2	2	21	20
30	2	26	2	4	18	16
30	2	26	2	2	19	15
25GbE CHANNEL						
50	2	46	2	2	19	14
60	2	56	2	2	19	13
LIMIT PN-568-C-2-1-Draft 3.0					8	8

Measurement Data Summary



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 3.0 February 2015

NEXT

Overall Length, m	Channel construction, m			Connectors in channel	ARJ45 channel NEXT, dB	
	Cord 1	Horizonta l	Cord 2		1000 MHz	2000 MHz
40GbE CHANNEL						
7	1	5	1	2	61	64
7	1	5	1	2	69	61
10	1	6.5	2,5	2	68	60
10.5	2	6.5	2	2	67	59
30	2	26	2	2	66	60
30	2	26	2	4	63	58
30	2	26	2	2	62	57
25GbE CHANNEL						
50	2	46	2	2	52	49
60	2	56	2	2	56	46
LIMIT PN-568-C-2-1-Draft 3.0					19.3	9.8

CONCLUSION

Multiple tests demonstrated that IEC 61076-3-110 connectivity can support 40GbE transmission in short and longer channels and should be included to IEEE 802.3bq as an alternative MDI connector interface