ICN Limit for 100GBASE-CR10

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09/08/2011

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Summary

› **Proposal is to change only the mated MCB/HCB ICN requirements to accommodate the 10 lane connector.**

– No changes made to channel or cable assembly requirements

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QSFP vs CXP connector layout contributors to ICN

CXP

QSFP+

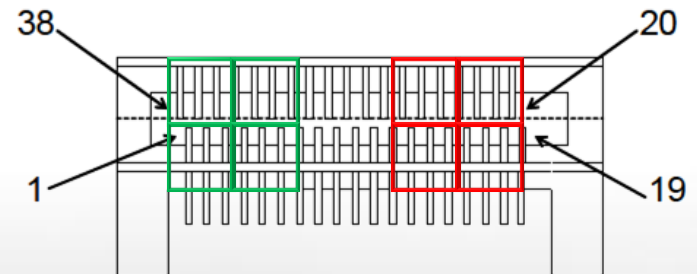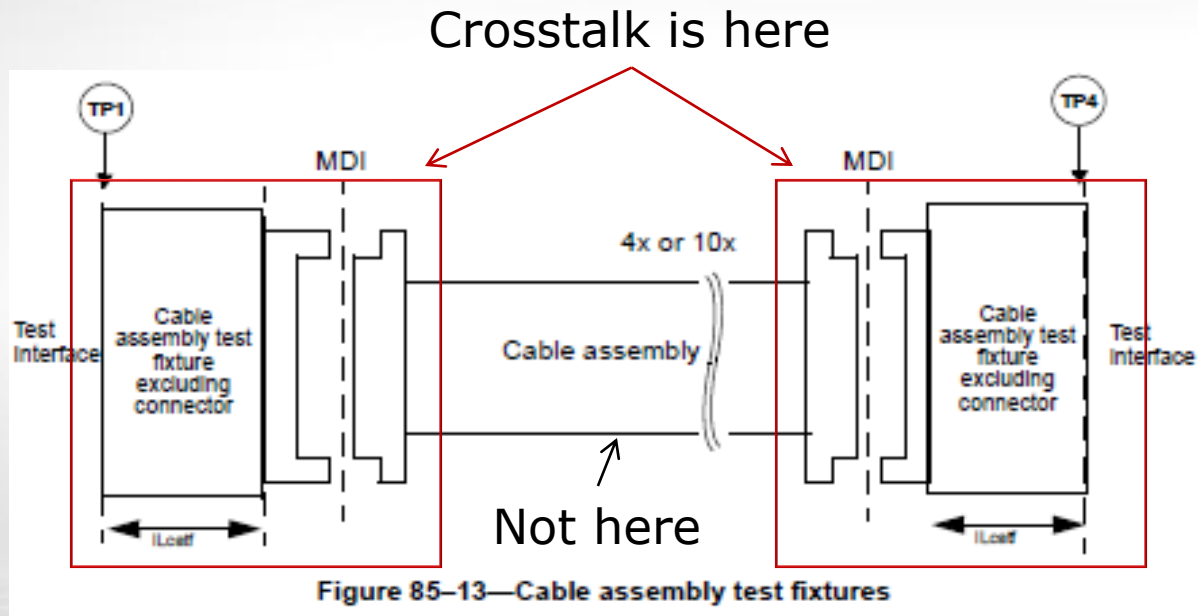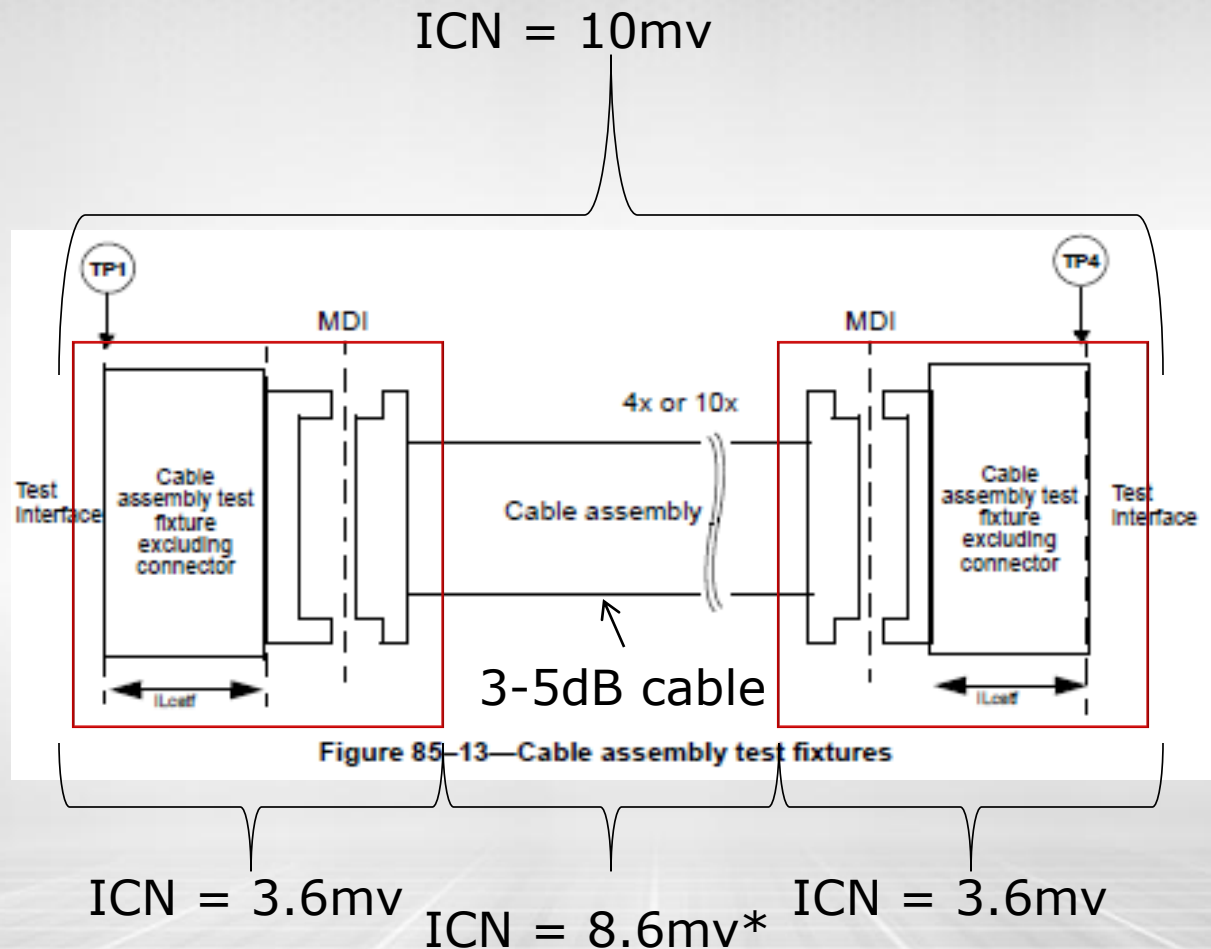Figure 85–25—Example MDI board receptacle

Figure 85–21—Example Style-1 MDI board receptacle

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Why ?

- We believe that the crosstalk/ICN was incorrectly divided between the connectors and the cables
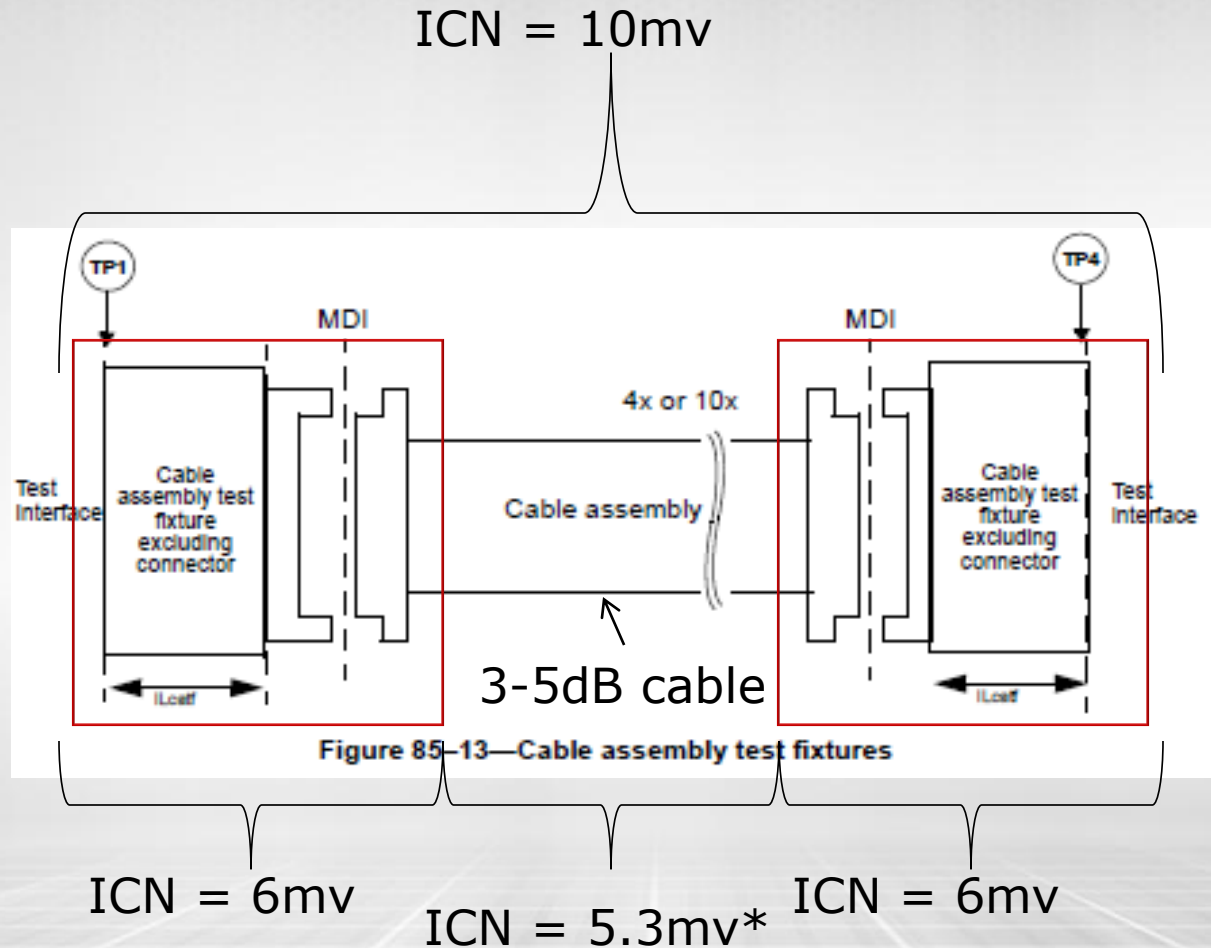
Crosstalk is here

Figure 85–13—Cable assembly test fixtures

Not here

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Crosstalk allocation

ICN = 10mv

Figure 85-13—Cable assembly test fixtures

ICN = 3.6mv

ICN = 8.6mv*

ICN = 3.6mv

3-5dB cable

*calculated

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Proposed Crosstalk allocation

ICN = 10mv

Figure 85-13—Cable assembly test fixtures

3-5dB cable

ICN = 6mv

ICN = 5.3mv*

ICN = 6mv

*calculated

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Proposed Changes – ICN Limit

› ICN Limit for mated HCB/MCB

Parameters	Proposed ICN (mV)	Std ICN Limit (mV)
SDNEXT ICN	**3.0**	0.7
SDFEXT ICN	**4.0**	2.5
ICN for Single Disturber	**5.0**	**2.596**
MDNEXT ICN	**3.5**	1.0
MDFEXT ICN	**5.0**	3.5
ICN for Multiple Disturbers	**6.1**	**3.64**

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Max Loss Channel with 10 lane connector

› **Models for Cable, host and mated test fixture were used to create a worst case channel**

The maximum channel insertion loss is determined using Equation (85A–3). The maximum channel insertion loss is 24.44 dB at 5.15625 GHz.

$$IL_{Chmax}(f) = IL_{Camax}(f) + 2IL_{Host}(f) - 2IL_{MatedTF}(f) \ \text{(dB)} \tag{85A–3}$$

for 50 MHz $\leq f \leq$ 7500 MHz.

where

f	is the frequency in MHz
$IL_{Chmax}(f)$	is the maximum channel insertion loss between TP0 and TP5
$IL_{Camax}(f)$	is the maximum cable assembly insertion loss using Equation (85–19)
$IL_{Host}(f)$	is the maximum insertion loss from TP0 to TP2 or TP3 to TP5 using Equation (85–14)
$IL_{MatedTF}(f)$	is the maximum insertion loss of the mated test fixture using Equation (85–36)
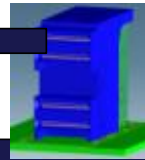
Modeled Channel Diff IL

By tuning the test fixture IL, the channel IL are closely matching the defined channel limit at the fundamental frequency and the frequency range of interest


m4
freq=5.160GHz
dB(SMM(15,16))=-25.206
IL_CR_CHANNEL_LIMIT=-24.449

85A.5 – IEEE Std 802.3ba-2010

Modeled Cable Assembly IL (IL$_{Camax}$)

m4
freq=5.160GHz
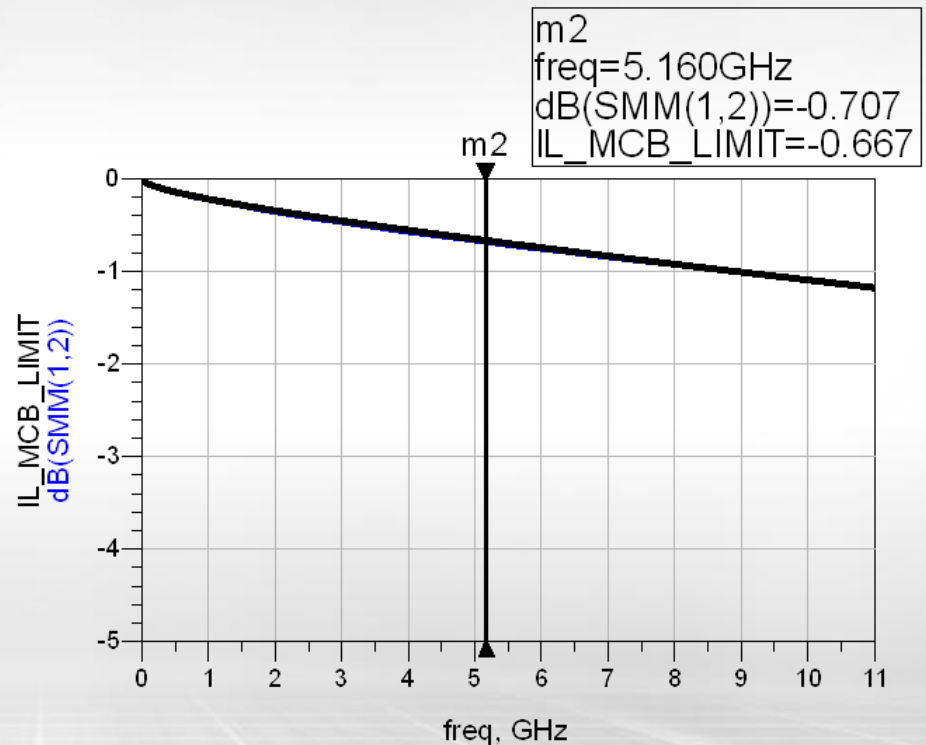dB(SMM(15,16))=-17.616
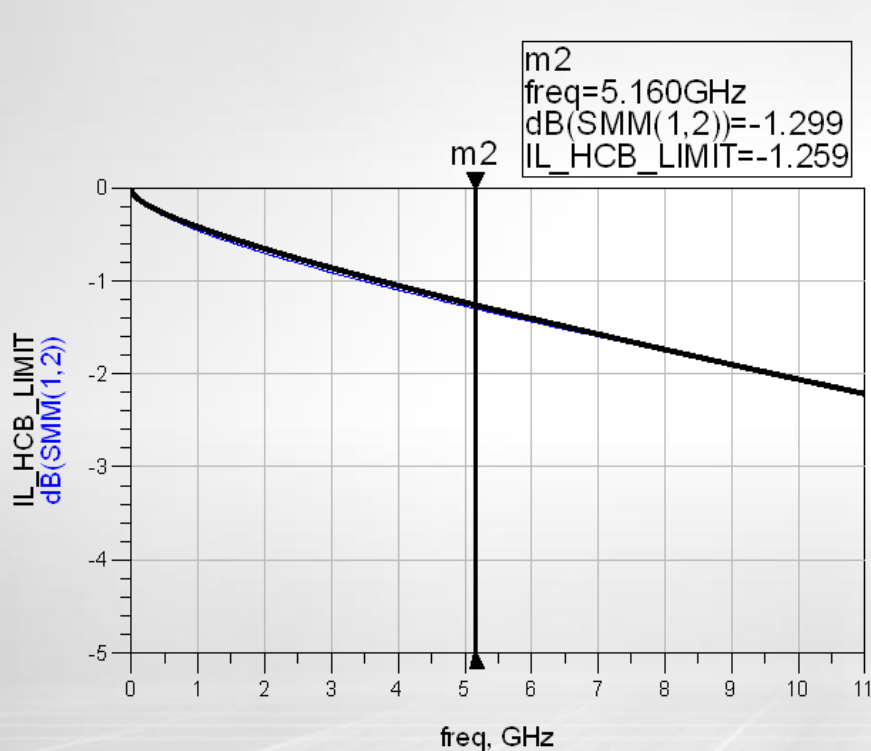FITTED_ATTN_LIMIT=-17.041

85.10.2 – Figure 85-9, Equation 85-19, IEEE Std 802.3ba-2010

The modeled IL for Mated Test Fixture (IL$_{MatedTF}$)

m4
freq=10.31GHz
dB(SMM(1,2))=-4.620
IL_HCB_MCB_LIMIT_MIN=-3.017
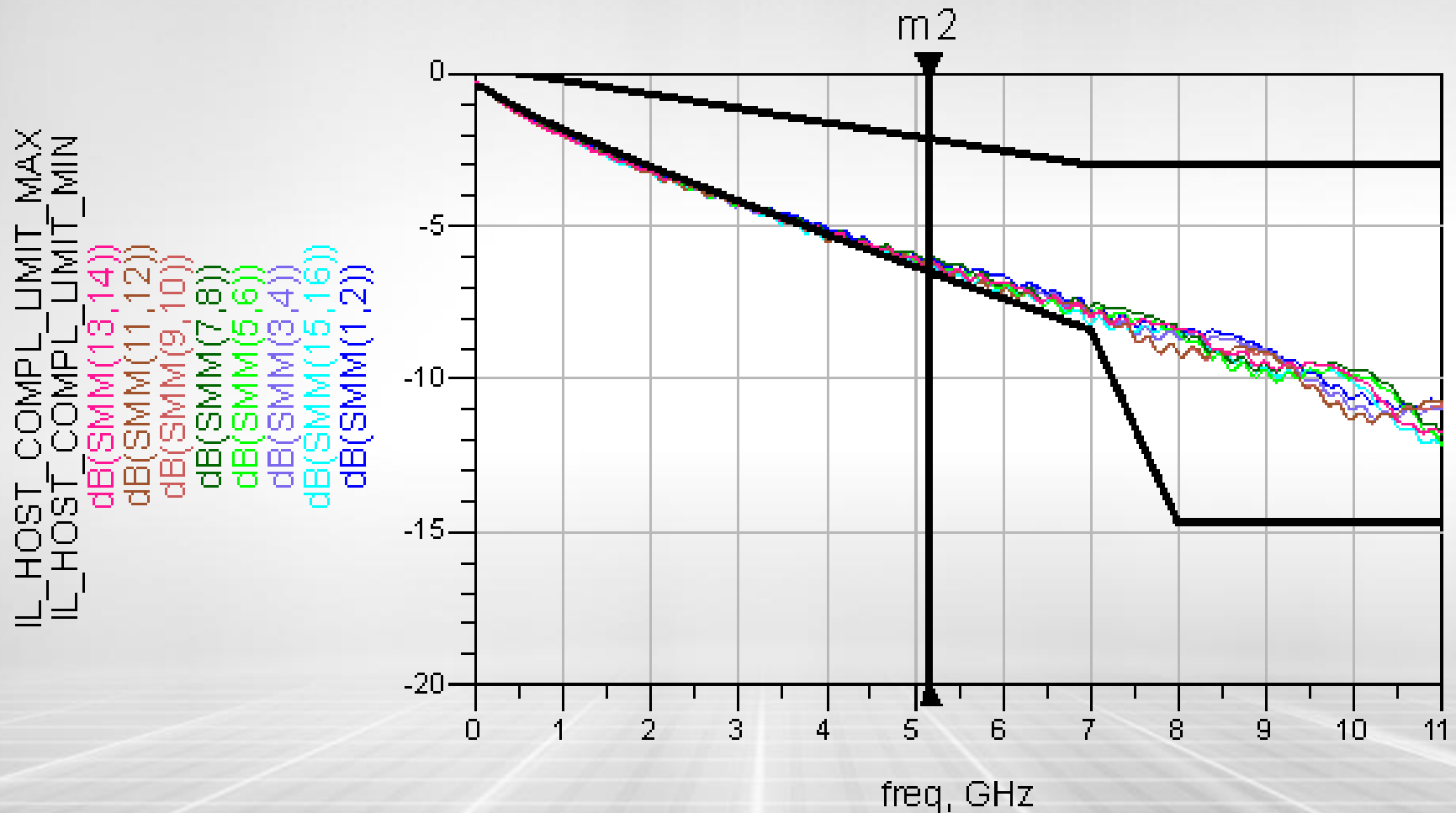IL_HCB_MCB_LIMIT_MAX=-6.902
dB(SMM(15,16))=-4.130

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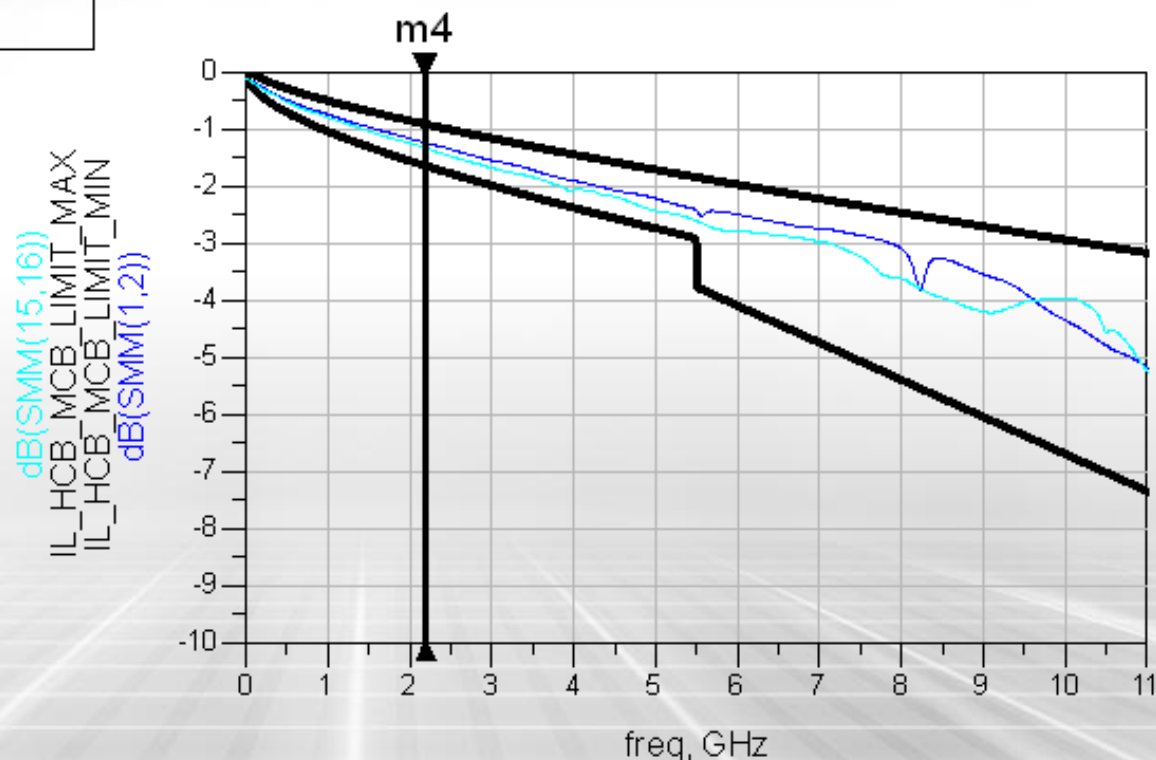
The Modeled IL for the Individual HCB, MCB

86A.5.1.1.1 – IEEE Std 802.3ba-2010

The Modeled IL for Host (IL$_{Host}$)

85.8.3.4 Equation 85-14 , Figure 85-4 – IEEE Std 802.3ba-2010

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SIMULATION RESULTS

Using the modeled test fixture, individual components and channel are simulated to verify the IEEE Std. limits

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Mated Test Fixture (HCB/MCB) ICN

Table 85–12—Mated test fixtures integrated crosstalk noise

Parameter	Value	Units
Near-end integrated crosstalk noise voltage (RMS)	0.7	mV
Far-end integrated crosstalk noise voltage (RMS)	2.5	mV
MDNEXT integrated crosstalk noise voltage (RMS)	1	mV
MDFEXT integrated crosstalk noise voltage (RMS)	3.5	mV

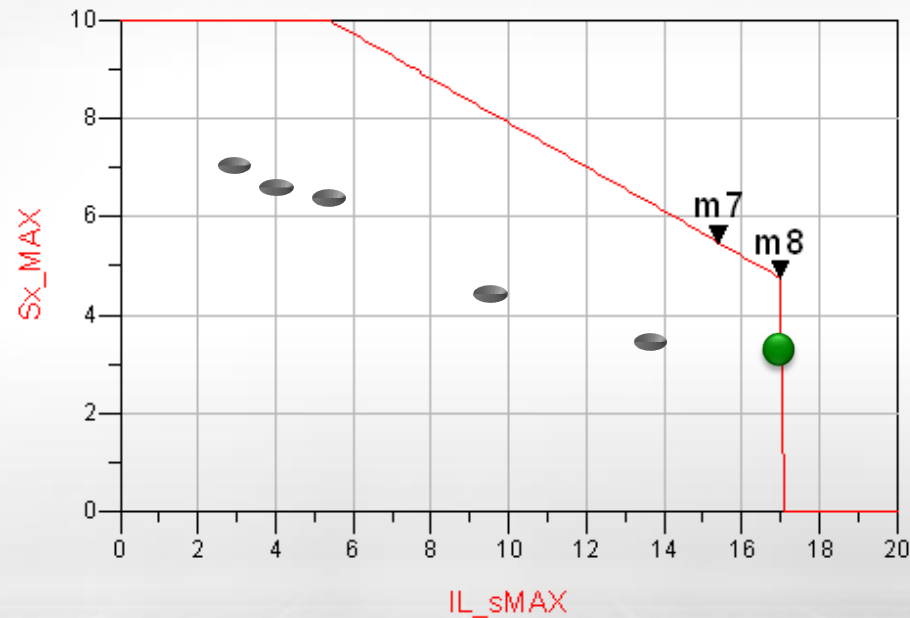|	Simulated FEXT ICN (mV)	FEXT ICN Limit (mV)	Simulated NEXT ICN (mV)	NEXT ICN Limit (mV)	Simulated Total ICN (mV)	ICN Limit (mV)
Single Disturber	2.549	2.5	2.227	0.7	3.385	2.596
Multiple Disturbers	3.991	3.5	2.691	1.0	4.814	3.640

Simulated data matches measured data with adjustments for insertion loss

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Cable Assembly ICN (Includes cable assembly test fixtures)

```
m7
indep(m7)=15.400
plot_vs(Sx_MAX, IL_sMAX)=5.470
```

```
m8
indep(m8)=17.000
plot_vs(Sx_MAX, IL_sMAX)=4.750
```

85.10.7,
equation 85-33 –
IEEE Std
802.3ba-2010

Snx	Sfx	Sx
2.699	1.874	3.286

ICN

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Summary

› **Summary**

- For the modeled "max" loss channel, the standard specified limits for cable assembly ICN can be met

- Mated test fixture ICN limits need to be changed

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Recommended change to table 85-12

(Mated test fixture integrated crosstalk noise)

Parameters	Proposed ICN Limit (mV)	Current Std ICN Limit (mV)
SDNEXT ICN	**3.0**	0.7
SDFEXT ICN	**4.0**	2.5
ICN for Single Disturber	**5.0**	**2.596 (Calculated)**
MDNEXT ICN	**3.5**	1.0
MDFEXT ICN	**5.0**	3.5
ICN for Multiple Disturbers	**6.1**	**3.64 (calculated)**

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Supporting material

Channel ICN vs. Informative annex

Equation 85A-6,
Figure 85A-2 –
IEEE Std
802.3ba-2010