



# AUI-C2C TBD Removal

Comments 548-551, 554-556

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EVERY CONNECTION COUNTS





# Supporters

Mike Dudek, Marvell

# Objective

Provide proposed value for all Annex 176C TBDs in D1.3.

C#	SC	Topic	Location
548	176C.4.3	TX SCMR	Table 176C-1
549	176C.4.3	TX RLcc	Table 176C-1
550	176C.4.3.4	TX SNR <sub>ISI</sub>	Text
551	176C.4.3.5	TX ERL: N	Table 176C-2
554,555	176C.5.2	Channel ILdd	Table 176C-5 & text
556	176C.5.3	Channel ERL	Table 176C-5 & text

# SCMR



Comment: Minimum signal to AC common-mode noise ratio (SCMR) is TBD in D1.3.

Proposal: Change TBD to 15 dB, consistent with KR (Table 178-6)

Table 176C-1—Transmitter electrical characteristics at TP0v

Parameter	Reference	Value	Units
Signaling rate (range)		106.25 ± 50 ppm	GBd
...		...	
Signal to AC common-mode noise ratio, <i>SCMR</i> (min)	176C.4.3.3	TBD	dB

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Table 178-6—Summary of transmitter specifications at TP0v

Parameter	Reference	Value	Units
Signaling rate (range)		106.25 ± 50 ppm	GBd
...		...	
Signal to AC common-mode noise ratio, <i>SCMR</i> (min)	178.9.2.6	15	dB

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# TX RLcc



Comment: Minimum common-mode to common-mode return loss (RLcc) is TBD in D1.3.

Proposal: Change TBD to 3.25 dB, consistent with KR (Table 178-6)

Table 176C-1—Transmitter electrical characteristics at TP0v

Parameter	Reference	Value	Units
Signaling rate (range)		106.25 ± 50 ppm	GBd
...		...	
Common-mode to common-mode return loss, <i>RLcc</i> (min)	179.9.4.8	TBD	dB

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Table 178-6—Summary of transmitter specifications at TP0v

Parameter	Reference	Value	Units
Signaling rate (range)		106.25 ± 50 ppm	GBd
...		...	
Common-mode to common-mode return loss, <i>RLcc</i> (min)	178.9.2.3	3.25	dB

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# TX SNR<sub>ISI</sub>

- Comment: The method specified for signal-to-residual-intersymbol-interference ratio (SNR<sub>ISI</sub>) is defined in 179.9.4.3 with exceptions TBD.
- Proposal: Remove “with exceptions TBD” and remove editor’s note.

## D1.3

### 176C.4.3.4 Signal-to-residual-intersymbol-interference ratio

Signal-to-residual-intersymbol-interference ratio  $SNR_{ISI}$  is defined by the method specified in 179.9.4.3 with exceptions **TBD**.

*Editor's note: In Annex 120F there was an exception for the continuous time filter settings. No exceptions were suggested in the adopted baseline, but it seems reasonable that some parameters may be different.*

Signal-to-residual-intersymbol-interference ratio shall meet the specification for  $SNR_{ISI}$  (min) in Table 176C-1.

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## Proposal

### 176C.4.3.4 Signal-to-residual-intersymbol-interference ratio

Signal-to-residual-intersymbol-interference ratio,  $SNR_{ISI}$ , is defined by the method specified in 179.9.4.3.

Signal-to-residual-intersymbol-interference ratio shall meet the specification for  $SNR_{ISI}$  (min) in Table 176C-1.



# TX/RX ERL Reflection Signal Length (N)

- Comment: The length of the reflection signal, N, for ERL calculation is TBD.
- Proposal: Change TBD to 400 UI, consistent with KR (Table 178-8). This is consistent with prior standards (.cd, .ck) wherein the values for KR and C2C identical. The proposed value scales to account for the reduction in unit interval.

Table 176C-2—Transmitter and receiver ERL parameter values

Parameter	Symbol	Value	Units
Transition time associated with a pulse	$T_r$	0.005	ns
Incremental available signal loss factor	$\beta_x$	0	GHz
Permitted reflection from a transmission line external to the device under test	$\rho_x$	0.618	—
Length of the reflection signal	$N$	TBD	UI
Equalizer length associated with reflection signal	$N_{bx}$	16	UI
Tukey window flag	$\eta w$	1	—

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400

Clause	Interface	N	Reference
137	50G/lane KR	100	Table 137-5
163	100G/lane KR	200	Table 163-7
120F	100G/lane C2C	200	Table 120F-2
178	200G/lane KR	400	Table 178-7

# Channel ILdd

## Comments:

- Channel ILdd is TBD in Table 176C-5 and in 176C.5.2.
- 176C.5.2 also has a TBD frequency mask equation and plot.

## Proposal:

- Set recommended channel insertion loss = 32 dB in Table 176-5 and in 176C.5.2.
  - Based on slide 7 of heck\_3dj\_01a\_2407.
  - Comment #254 proposes the same value.
- Remove equation (176C-4) and Figure 176C-6.
  - Consistent with 178.10.3.
  - Comment #449 also proposes to delete the equation and figure.



## D1.3

**176C.5.2 Channel insertion loss (recommended)**

The channel insertion loss should meet Equation (176C-4). Actual channel insertion loss could be higher or lower than that given by Equation (176C-4) due to the channel insertion loss deviation (ILD), return loss, and crosstalk. Note that for this equation the channel insertion loss at the Nyquist frequency is less than or equal to TBD dB.

$$ILdd(f) \leq TBD \quad (176C-4)$$

for  $0.01 \leq f \leq 53.125$

where  
 $f$  is the frequency in GHz  
 $ILdd$  is the channel insertion loss in dB

The insertion loss limit is illustrated by Figure 176C-6.

Meets equation constraints

**Figure 176C-6—Channel insertion loss limit**

*Editor's note (to be removed by D2.0, or when values are adopted): Channel insertion loss requirements were left to be determined in the adopted baseline proposal. Contributions in this area are encouraged.*

# Channel ILdd

For reference, the changes made to channel ILdd in D1.3, 178.10.3 are shown to the right.

## 178.10.2 Channel insertion loss (recommended)

The channel insertion loss should meet Equation (178-5):

$$IL_{dd}(f) \leq \{TBD\} \tag{178-5}$$

where

$IL_{dd}(f)$  is the insertion loss in dB at frequency  $f$

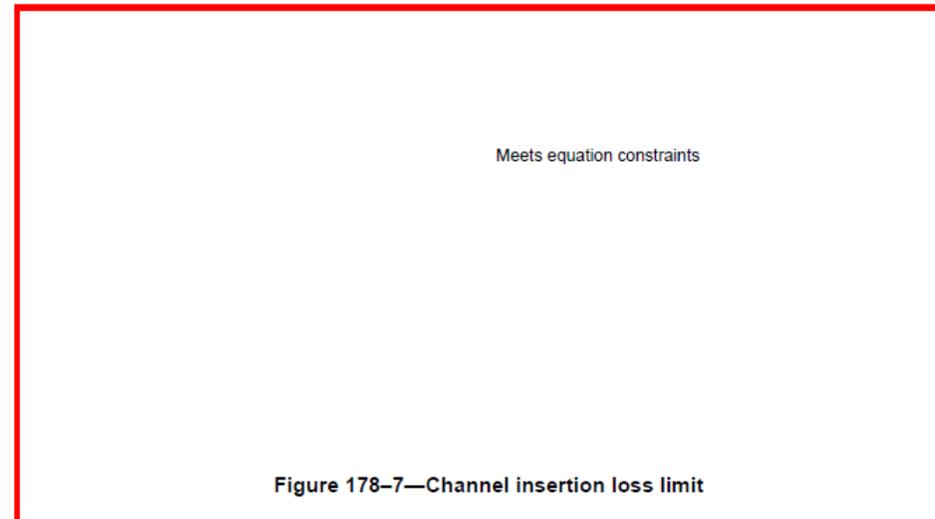
$f$  is the frequency in GHz

The insertion loss limit is illustrated by Figure 178-7.

*Editor's note (to be removed by D2.0, or if values are adopted): Channel insertion loss requirements were left to be determined in the adopted baseline proposal. Contributions in this area are encouraged.*

The recommended maximum channel insertion loss,  $IL_{dd}$ , is 40 dB at 53.125 GHz.

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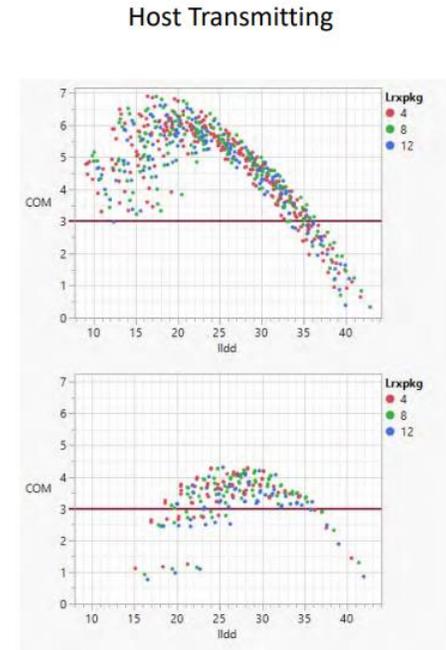
# Channel ILdd

## Proposed

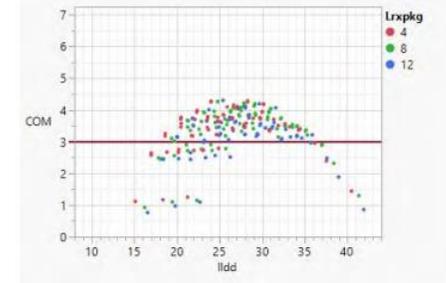
**176C.5.2 Channel insertion loss (recommended)**  
The recommended channel insertion loss, I<sub>ldd</sub>, is 32 dB at 53.125 GHz.

### COM vs I<sub>ldd</sub>

heck\_3dj\_02\_2405



mellitz\_3dj\_elec\_03\_230504



IEEE P802.3dj July 2024

Host Transmitting

Host Receiving

heck\_3dj\_01a\_2407, slide 7<sup>7</sup>

# Idd for Rx ITT

If we adopt max IL recommendation of 32 dB for C2C

- we can calculate the Test 2 IL targets as an 8 dB delta from the KR/CR max of 40dB.  $\Delta = 8 \text{ dB}$ 
  - Class A: 25.5 (min) 26.5 (max)
  - Class B: 22 (min) 23 (max)
- we can calculate the Test 1 IL based on a 16 dB minimum loss (see previous slide), as a 16 dB delta (for the min case relative to max case)  $\Delta = 16 \text{ dB}$ 
  - Class A: 9.5 (min) 10.5 (max)
  - Class B: 9.5 (min) 10.5 (max)

Table 178-10—Receiver interference tolerance parameters

Parameter	Test 1 (low loss)			Test 2 (high loss)			Units
	Min	Max	Target	Min	Max	Target	
Block error ratio <sup>a</sup>	$< 1.45 \times 10^{-11}$						—
Insertion loss, <i>IL<sub>dd</sub></i> , at 53.125 GHz <sup>b</sup>			—			—	dB
Receiver package class A	14.5	15.5		33.5	34.5		
Receiver package class B	14.5	15.5		30	31		
COM including effects of broadband noise <sup>c</sup>	—	—	3	—	—	3	dB

<sup>a</sup>The block error ratio (see 178.2) is measured instead of the FEC symbol error ratio in step 10) of the receiver interference tolerance method defined in 93C.2.

<sup>b</sup>*IL<sub>dd</sub>* measured between TPt and TP5 (see Figure 93C-4) plus *IL<sub>dd</sub>* of the specific package used by the test transmitter. See 178.9.3.3.2.

Table 176C-4—Receiver interference tolerance parameters

Parameter	Test 1 (low loss)			Test 2 (high loss)			Units
	Min	Max	Target	Min	Max	Target	
Block error ratio <sup>a</sup>	$< 1.45 \times 10^{-11}$						—
Insertion loss, <i>IL<sub>dd</sub></i> , at 53.125 GHz <sup>b</sup>			—			—	dB
Receiver package class A	TBD	TBD		TBD	TBD		
Receiver package class B	TBD	TBD		TBD	TBD		
COM including effects of broadband noise <sup>c</sup>	—	—	3	—	—	3	dB

<sup>a</sup> The block error ratio (see 174A.6) is measured with BER<sub>added</sub> specified in 176C.2

<sup>b</sup> *IL<sub>dd</sub>* measured between TPt and TP5 (see Figure 93C-4) plus *IL<sub>dd</sub>* of the specific package used by the test transmitter. See 178.9.3.3.2.

# Channel ERL

- Comment: In D1.3, 176C.5.3 lists the channel ERL as TBD, while Table 176C-5 specifies a value of 9.7 dB (minimum), which was the value adopted in the resolution of comment #66 against D1.2.
- Proposal: Set the minimum ERL in 176C.5.3 to a value of 9.7 dB, consistent with Table 176C-5 per comment #66 against D1.2.

Table 176C-5—Channel characteristics summary

Description	Reference	Value	Unit
Minimum COM	176C.5.1	3	dB
Maximum insertion loss at 53.125 GHz (recommended)	176C.5.2	TBD	dB
Minimum ERL	176C.5.3	9.7	dB
Differential-mode to common-mode return loss, $RL_{cd}$	176C.5.4 176C.5.4	Equation (178-5)	dB
Maximum AC-coupling 3 dB corner frequency	176C.5.5	50	kHz

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## 176C.5.3 Channel ERL

The channel ERL at TP0 and at TP5 is computed using the procedure in 93A.5 with the values in Table 176C-8. Parameters that do not appear in Table 176C-8 take values from Table 176C-6. Channel ERL at TP0 and at TP5 shall be greater than or equal to TBD dB.

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Thank you