Steps Towards CR Compliance Methodology

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Background and Recommendation

- Piers presented a call to action for CR signal quality in June, dawe_3dj_01a_2406
- CR channels are made of two parts: Host(s) comprising of TX/RX device package and breakout routing to a pluggable port, and a cable assembly connecting the Hosts, which may be designed by more than one party
- Previous 802.3 projects had defined a single Host type and cable assembly with multiple metrics for compliance. The 802.3dj project has defined multiple Host and cable assembly types that can used in combination as a compliant CR link
- The following slides illustrate what that means for compliance points, compliance fixtures, and the necessary channel segment models and measurements needed to make progress on the CR methodology for 802.3dj

From Dawe_3dj_01a_2406

- Optical specs and C2M specs qualify **observable signals at defined interfaces with regard to their effect** on a reference receiver after the downstream part of the channel
  - Optical: TECQ and TDECQ
  - C2M: near end eye and far end eye

- Similarly, C2M assesses the signal at the compliance point with a reference receiver rather than deconstructing what might have caused it

- De-embedding over 20 dB, backwards towards the source, when we need to look forward to the point of use to find if the signal will be suitable for the reference receiver, less than 20 dB downstream, is misguided
- Diagnosing the de-embedded source and part-channel separately rather than assessing the observable signal at the compliance point, is misguided
  - R_peak and SNR_ISI for the channel, not well aligned to the reference receiver

- Holistic quality metrics combine the effects of multiple causes of impairment without the expense and inefficiency of trying to diagnose each cause separately

Combine the quotas as FOM does

- In today's CR, a transmitter may trade off its voltage noise vs. its nonlinear distortion because they are both components of SNDR, but not its noise vs. jitter, v_f vs. R_LM, R_peak vs. SNDR... This is wasteful

- *Over 2 dozen comments submitted against D1P0, isolating specific TBDs ..may not converge on a solution space, or may "leave margin on the table"*

802.3dj CR “Framework”

Table 179A–2—Channel (TP0d-TP5d) configuration matrix for hosts and cable assemblies

Host designation	Cable assembly designations compatible with Host-Low partner	Cable assembly designations compatible with Host-Nominal partner	Cable assembly designations compatible with Host-High partner
Host-Low 6.5 dB	CA-A,B,C,D	CA-A,B,C	CA-A,B
Host-Nominal 11.5 dB	CA-A,B,C	CA-A,B	CA-A
Host-High 16.5 dB	CA-A,B	CA-A	not supported

- *Interested parties leveraged KR (in terms of compliance methodology) and promoted CR with multiple configurations within the 40dB limit (TP0d-TP5d)*

CR “Baseline” Topology

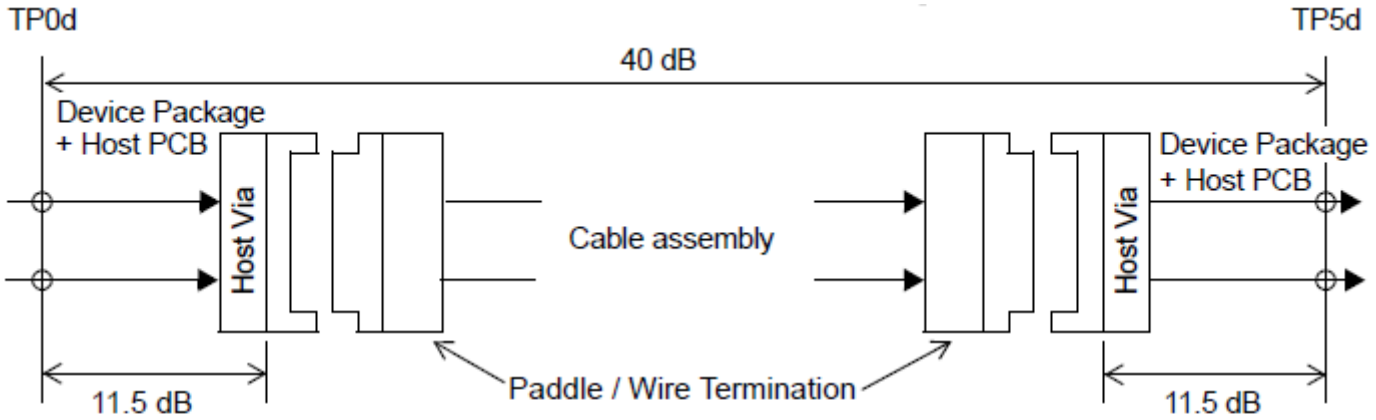


Figure 179A–4—Host-Nominal to Host-Nominal Channel (TP0d-TP5d) at 53.125 GHz

- *Interested parties leveraged KR (in terms of compliance methodology) and promoted CR with multiple configurations within the 40dB limit (TP0d-TP5d)*

CR “Host” Compliance

Table 179A–4—Minimum Insertion loss budget values at 53.125 GHz

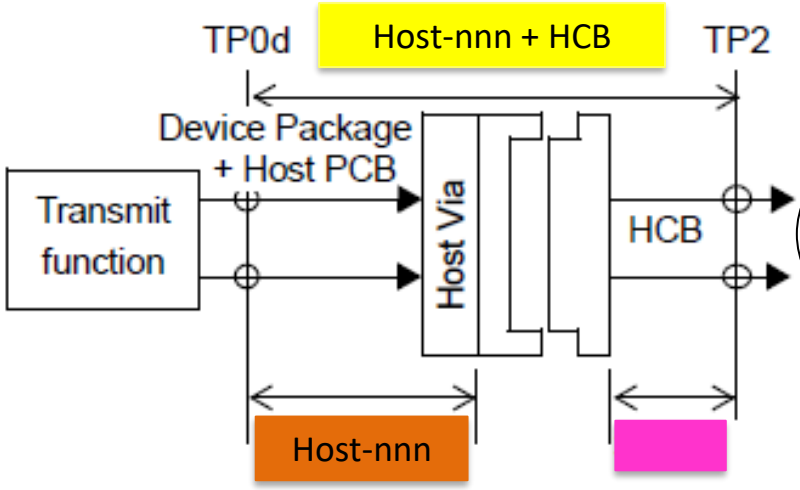
Link Configuration	$ILdd_{Ca,min}$	$ILdd_{Ch,min}$
Host-High to Host-Nominal	TBD	TBD
Host-High to Host-Low	TBD	TBD
Host-Nominal to Host-Nominal	TBD	TBD
Host-Nominal to Host-Low	TBD	TBD
Host-Low to Host-Low	TBD	TBD

Table 179A–3—Maximum Insertion loss budget values at 53.125 GHz

Link Configuration	$ILdd_{Ca,max}$	$ILdd_{Ch,max}$
Host-High to Host-Nominal	CA-A (19 dB)	40
Host-High to Host-Low	CA-B (24 dB)	40
Host-Nominal to Host-Nominal	CA-B (24 dB)	40
Host-Nominal to Host-Low	CA-C (29 dB)	40
Host-Low to Host-Low	CA-D (34 dB)	40

“Min” Host is the MCB?

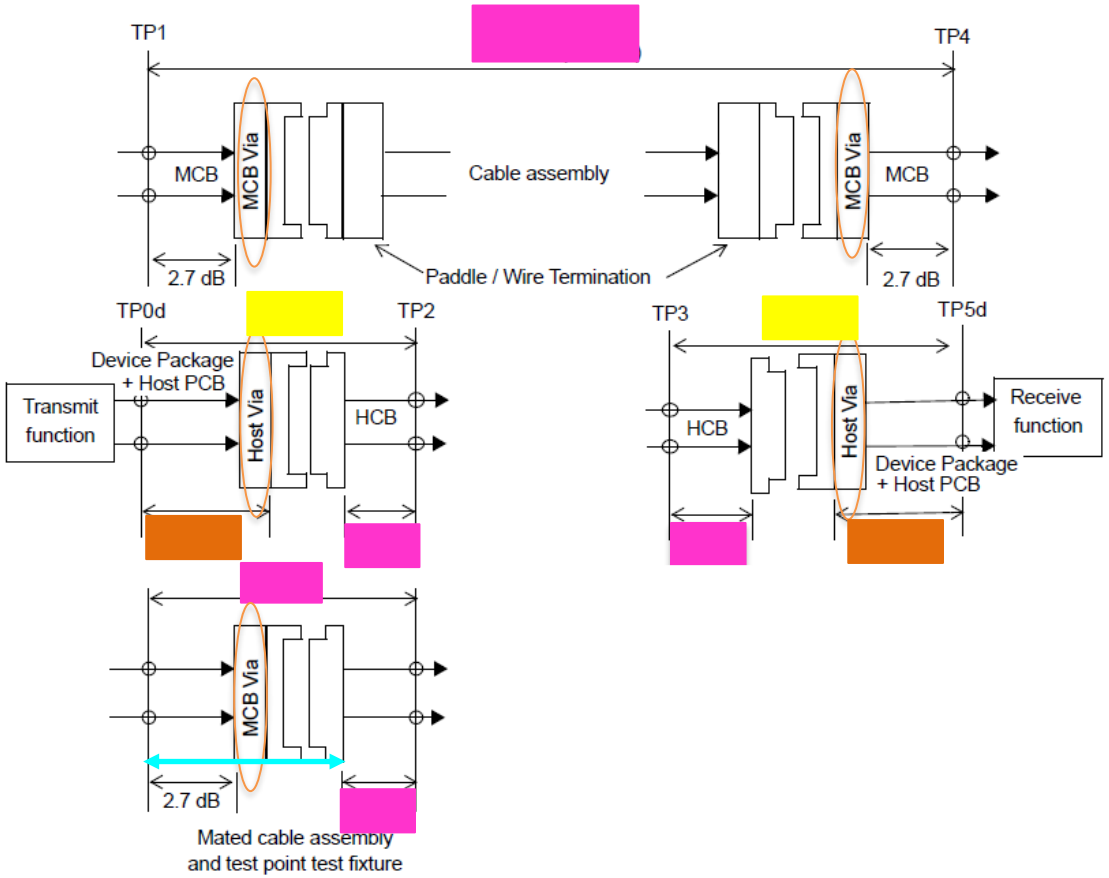
TP0d-TP2 looks like C2M



Same issue TP3-TP5d

$ILdd_{CA}$ is measured TP1-TP4

CR Compliance – The Cable Assembly



NOTE (TBD)—2.7 dB MCB PCB ILdd includes the RF connector (up to the RF connector reference plane).
The MCB via allowance is 0.8 dB

Figure 179A–3—Host-Nominal to Host-Nominal, Cable assembly, and test fixture insertion loss at 53.125 GHz

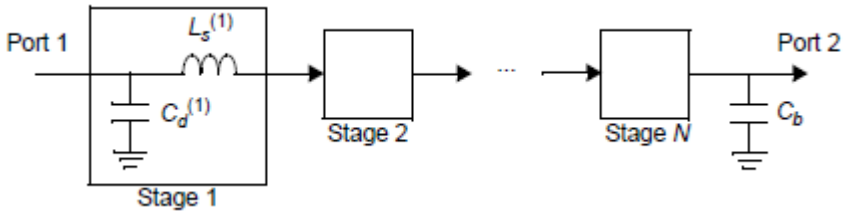
← No models of this flavor posted

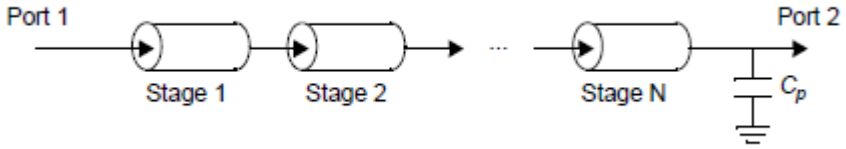
← No models of this flavor posted

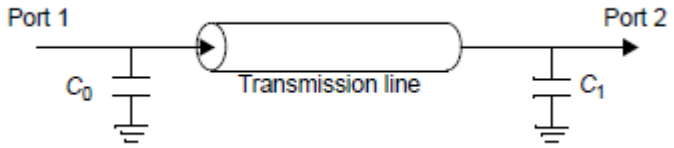
← No models of this flavor posted

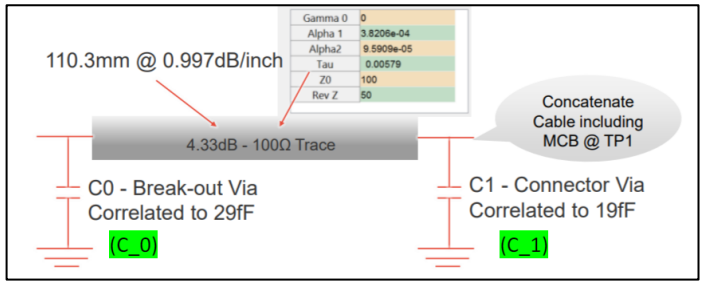
Time to consider new budget allocation points?

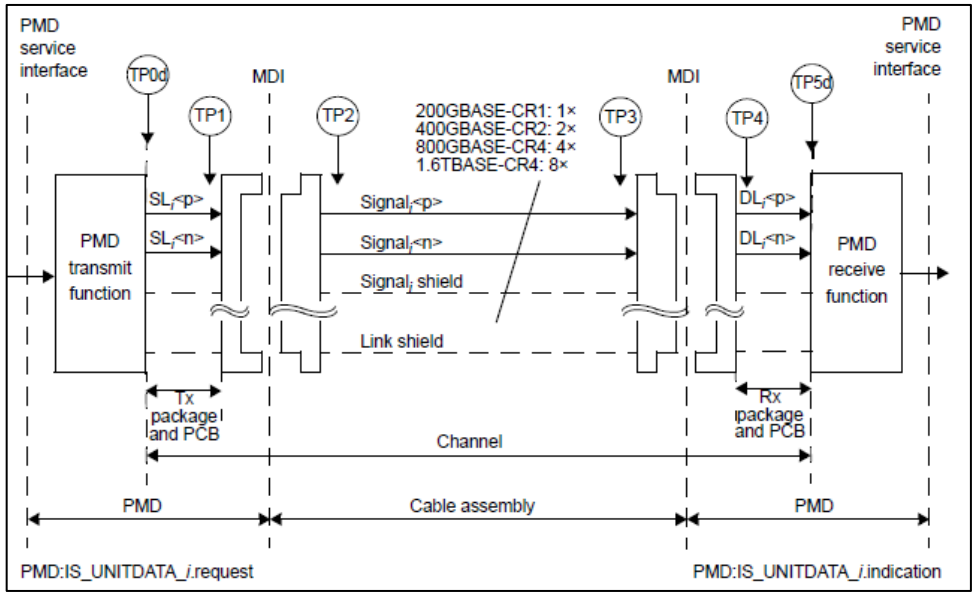
CR Compliance Methodology











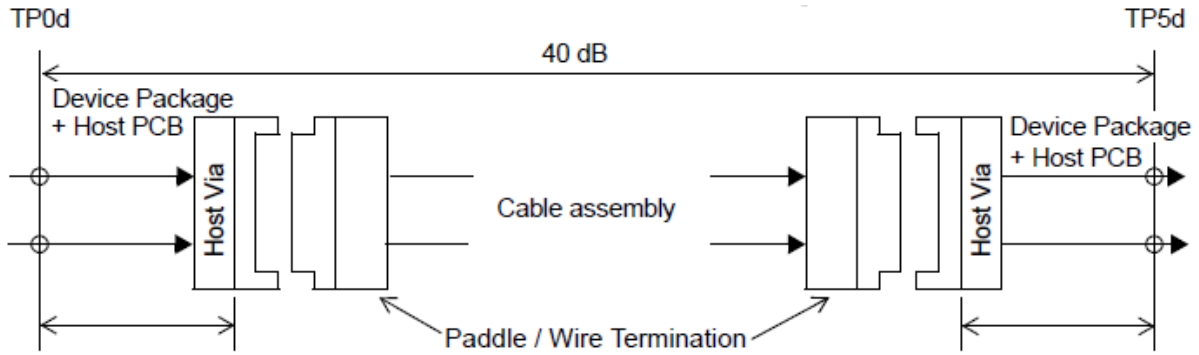
- *Variables like Rd, Cp, C0, C1, eta_0, SNR_TX all impact the solution space*

CR Model Priority Attributes

- Short/Reflective Hosts
  - ERL
- Package+Host allocations
  - With context for *Rd,* Cp, C0, C1, eta_0, SNR_TX
- RefRX settings matching channel allocations
- Impedance mismatches Fixtures/Channels
  - ERL
- Mating interface variation (effective wipe)
- Intra-pair skew (and how it's modeled/defined...)
- Allocations assuming cabled-hosts
- Crosstalk effects

Summary

- All CR models posted are of the flavor below:



- Additional models are needed to help the Task Force make progress on CR Compliance…
  - What should those models look like?
  - What are the key, or contributing, attributes (physical, electrical)?