802.3dj D1.0
Comment Resolution - Electrical track
Adee Ran, Cisco
Introduction

- This slide package was assembled by the 802.3dj electrical editorial team to provide background and detailed resolutions to aid in comment resolution.
- Acknowledgement to Howard Heck, Adam Healey, Chris Diminico, Mike Dudek, Matt Brown, and Kent Lusted for reviewing and contributing to this work.
- Text in red indicates editors’ explanation of the comments. Italics indicate an editor’s observation which might be subjective.
- The responses to the comments may point to the slides for reference but the comment report is the official record.
Cross-Clause topics
Bessel-Thomson measurement filter bandwidth
[15 comments. 178/179/176D/176E]

Comment #60 is against 178.9.2 (Transmitter characteristics) and suggests 67 GHz. Comment #32 proposes a similar bandwidth for receiver test calibration (178.9.3.3). The reasoning for both is that “The Bessel-Thomson filter should track fr”. Comments #131 and #133 against 176E suggest 58.4375 GHz with similar reasoning based on different assumed f_r.

Note that there has never been a requirement to have the bandwidth of the measurement B-T filter equal to the COM f_r parameter (part of the Rx model).

(4 comments)

Comment #230 and comment #245 suggest 65 GHz with reasoning based on connector availability. Note that the B-T filter is implemented in the test equipment and the cost of other setup components is likely less significant.

(2 comments)

Comment #225 highlights an error in D1.0 - the value 40 GHz appears once although it has not been part of the baseline (and thus has not been adopted). The proposed value here and in #217 is 65 GHz based on “test equipment capabilities and demonstrated channel rolloff”. Comments #124 and #388 also address the same issue but suggest changing to TBD.

(4 comments)

Comments #399, #410, #412, #422, #425 suggest the value 62 GHz.

(5 comments)

Summary: The suggested values are 58.4375, 62, 65, and 67 GHz.

Editorial team proposal: use a BW of X GHz for signal measurements in 178, 179, 176D, 176E. Replace all TBDs and the “40 GHz” that wasn’t adopted. Proposed value for X is 65.
ERL (14 comments, 178/179/179B)

There are several similar comments:
- #29 against 178.9.2.2 (KR Tx/Rx ERL) with N=400 (x2 of 802.3ck)
- #28 against 178.9.2.1.2 (KR test fixture ERL) with N=400 (x2 of 802.3ck)
- #43 against 178.10.3 (KR channel ERL) with N=7000 (x2 of 802.3ck)
- #48 against 179.9.4.8 (CR Tx/Rx ERL) with N=1600 (x2 of 802.3ck)
- #51 against 179.11.3 (CR cable assembly ERL) with N=4500 (same as 802.3ck)
- #58 against 179B.4.2 (Mated test fixtures ERL) with N=1600 (x4 of 802.3ck), tw=1, DER0=2e-5

All propose values for ERL parameters, dividing $T_r$ by 2 and multiplying N by as noted above, relative to the values in 802.3ck (100G).

Additional comments #237, #238, #239, #240 (Tr, beta_x, rho_x, N for KR Tx/Rx ERL, respectively) suggest some of the ERL parameters with the same values as above:

Other comments
- #241 proposes 44 for N_bx for KR Tx/Rx ERL
- #231 and #244 propose -3 dB for min dERL (KR Tx/Rx)
- #252 proposes 11 dB for min ERL (KR channel)

The justification provided for ERL parameters is very basic but may be sufficient.

No comments address ERL parameters in Annex 176D (C2C component and channel) and 176E (C2M host and module) which are mostly TBD.

Editorial team proposal:
- Accept the suggested remedies of comments 28, 29, 43, 48, 51, 58, 241, 244, 252
- Refer 237, 238, 239, 240 to #29
- Use the suggested values from clause 178 and 179 to fill in TBDs for annex 176D and annex 176E respectively, except for the value of N and minimum ERL/dERL which will stay TBD.
The comment suggests that the value 0.2 ns may not be correct.

There are several similar comments:
- #227 against 179.9.4.8 (CR host transmitter ERL)
- #218 against 179.11.3 (CR cable assembly ERL)
- #219 against 179.9.5.5 (CR host receiver ERL)
- #220 against 176E.3.3.3 (C2M Host output ERL)
- #221 against 176E.3.4.2 (C2M Module output ERL)

Editorial team proposal: REJECT #218, #622, #227, #219, #620.
- For host ERL, the existing specification of Tfx is appropriate.
- For module and cable assembly ERL, the proposal is not specific enough.

**179.9.4.8 Transmitter effective return loss (ERL)**

The ERL of the transmitter at TP2 is defined by the procedure in 93A.5 using the values in Table 179–9 and Table 179–15, and with the value of T\(_{fx}\) equal to twice the delay between the test fixture connector and the test fixture host-facing connection minus 0.2 ns or as needed to remove test-fixture discontinuities from the ERL result. For module: “module-facing” For cable assembly: “cable facing”

Note that the 0.2 in the existing text is a reduction from “twice the delay between the test fixture connector and the test fixture host-facing connection”. This means the measurement is time gated to remove reflections from the whole test fixture except for a length equivalent 0.1 ns (assuming “twice” has precedence over “minus”). 0.1 ns is approximately 17 mm, so for hosts, the time-domain response starts at 17 mm before the HCB’s card end, and likely includes the pad and via. Using different values may cause the via to be excluded, which may affect the ERL result. For modules and cable assemblies, the MCB has a receptacle, which may require different time gating, but the proposal would leave Tfx open for interpretation and creates ambiguity.
COM (minimum/target value)  
[13 comments, 178/179/179A/176D]

<table>
<thead>
<tr>
<th>CI 178</th>
<th>SC 178.10</th>
<th>P 284</th>
<th>L11</th>
<th># 250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Li, Mike</td>
<td>Intel</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comment Type: TR  
Comment Status: X  
COM(min) is TBD

This comment and multiple others suggest using 3 dB as the minimum COM for channels:
- 178.10 channel: #33, #250, #402, #253
- 179.11 cable assembly: #50, #413
- 176D.4 channel: #430
- 179A.7 TP0d-TP5d: #57

3 dB is also suggested for Rx test channel calibration:
- 178.9.3.3: #249, #400
- 179.9.5.3: #49, #411
- 176D.3.4.4: #427

The referenced presentation, https://www.ieee802.org/3/dj/public/24_05/lim_3dj_01_2405.pdf, does not include a rationale for the proposed value of COM.

The minimum COM should be based on expected implementation penalty with respect to the new reference receiver, for which many parameters are TBD. Specifically, the presentations https://www.ieee802.org/3/dj/public/24_05/healey_3dj_01b_2405.pdf and https://www.ieee802.org/3/dj/public/24_05/shakiba_3dj_02_2405.pdf are relevant in this context.

However, the same value is proposed in several comments, so it may be in consensus and enable moving forward.

Editorial team proposal: Use the value X for minimum COM for channels and for test setup calibration in KR/CR/C2C. Proposed value for X is 3 dB.
2 comments (#395, #387) about the reference impedance for specifications suggest that it should match the system impedance, and that 46 Ohm (92 Ohm differential) is a possible value.

The reference impedance for specifications (not $R_0$) affects ERL and other RL results (S-parameter values depend on the reference impedance), and if test equipment is matched to this impedance it will also affect time-domain measurements ($R_{peak}$, $SNR_{ISI}$).

Designs may take this into consideration, and it would be preferable if these specs do not penalize components matched to the “system impedance” (assumed impedance of the other system components). ⇒ see next slide.
This comment and 3 similar ones (#396, #397, #391, #392) are about the R_d parameter, which is used as the terminations (Tx and Rx) in the COM pulse response calculation. The value in the suggested remedy seems to be differential, and would become 46 Ohm single ended.

Other comments suggest different values:
- #255, #256: 46.25 Ohm
- #141, #137: 50 Ohm

The value of R_d affects the reference ERL (and thus dERL) and the reflections within the reference package (and thus COM and dR_peak).

ERL is also affected by the reference impedance for measurements (which is now, effectively, 50 Ohm single-ended - see previous slide) so these specifications are closely tied with each other.

Note that if R_d is different from the termination used in time-domain measurements (e.g. scope) then A_v, A_fe and A_ne need to change to create the minimum compliant v_f when measured on a scope. Additionally, Tx output specifications may need to be changed.

Editorial team proposal:
- Change Rd (both t and r) from TBD to X Ohm in COM device parameters tables (Table 178–12, Table 179–15, Table 176D).
- Change the reference impedance statements (178A.1.3, 178.9.1, 179.9.3, 179.11.1, and 176D.3.2) to define a reference single-ended impedance of X Ohm for all specifications, e.g., insertion loss, return loss, and ERL. Add a similar statement in 176E.

Proposed value for X: 46 Ohm.

If X is different from 50 Ohm, add a NOTE that s-parameter measurements may be made with a different impedance and converted mathematically to that reference. Add an editor’s note that output waveform measurements on 50 Ohm scopes need to be addressed.

If the reference impedance is different from R_d, add an editor’s note after each COM parameter table, noting that the values of A_v, A_ne and A_fe need confirmation.
COM R_0 parameter
[9 comments, 178/179/176D/176E]

2 comments (#35, #52) suggest that R_0 should not affect COM result.

7 comments (#254, #403, #414, #141, #431, #136, #438) suggest the value 50 Ohm for R_0, as used in previous projects.

Note that the reference impedance for specifications is stated explicitly in 178.9.1, 179.9.3, 179.11.1, and 176D.3.2 (see previous slide), and does not refer to R_0.

178A.1.3 already defines the reference impedance for s-parameters (effectively 50 Ohm single ended), so the R_0 parameter in COM tables may be redundant.

178A.1.3 Measurement of the channel under test

The S-parameters for each signal path are measured between the test points specified by the clause or annex that utilizes this calculation. It is recommended that the scattering parameters be measured with a uniform frequency step from a start frequency no greater than 10 MHz (TBC) to a stop frequency of at least 169 GHz. The measurement frequency step corresponds to the time span of the pulse response derived from the S-parameters (see 178A.1.6). The frequency step should be chosen to be small enough so that all significant components of the pulse response are included.

The reference impedance for the measurement of differential-mode S-parameters is 100 Ω.
The comment suggests that COM should use no Tx equalization.

There are several other comments on the same topic:

- #142 against 176D and #138 against 176E suggest -0.3:0.02:0 for c(-1), 0.02:0.14 for c(-2), -0.14:0.02:0.14 for c(1), and no c(-3)
- #258 against 178 suggests no c(-3)
- #259 against 178 suggests 0:0.02:0.16 for c(-2)
- #260 against 178 suggests -0.4:0.02:0 for c(-1)
- #261 against 178 suggests 0.54 for c(0)
- #262 against 178 suggests -0.2:0.02:0 for c(1)
- #405 against 178 and #416 against 179 suggest matching the ranges with the Tx characteristics table (which has different values from the two sets above)

The values proposed by multiple comments do not indicate consensus in this area.

The contributions so far are not sufficient evidence for not needing a Tx FFE as suggested in the comment. The chosen Tx FFE values ("no equalization") in analysis presented so far is due to the unlimited Rx FFE coefficients used in the analysis, but these limits are still TBD.

The possible inclusion of an ADC model (with dynamic-range-dependent quantization noise), presented in https://www.ieee802.org/3/dj/public/24_05/healey_3dj_01b_2405.pdf, may change the chosen Tx FFE.

Editorial team proposal:
- #37: REJECT, there is no consensus to make the proposed changes. Further analysis of the required range of Tx FFE in conjunction with the reference Rx and consensus building is encouraged.
- #138, #142, #258, #259, #260, #261, #262, #405, #416: REJECT resolve using the response to comment #37.
COM f_r parameter
[9 comments, 178/179/176D/176E]

Comment #36 suggests that the values 0.5, 0.55, 0.58 and 0.6 are candidates, and suggests 0.6. The suggested relationship between f_r and measurement bandwidth has not been established.

Several values are suggested in various comments:
- #36, #53: 0.6
- #404, #415, #432, #439: 0.58 (no rationale)
- #137, #141: 0.55 (no rationale in this presentation)
- #257: 0.5 (refers to lim_3dj_01_2405, but no rationale in this presentation)

Previous reference receivers used the value 0.75, but several past contributions suggest that a lower value would both be more realistic and yield better COM results.
No comment suggests that there should be a difference between interfaces.

With not-too-different values proposed in several comments, it may be possible to reach consensus and enable moving forward.

Editorial team proposal:
Use f_r = X*f_b as reference receiver bandwidth for all electrical interfaces (Table 178-13, Table 179-16, Table 176D-6, and Table 176E–7).
Proposed value of X: 0.55
COM Rx FFE length parameters
[9 comments, 178/179/176D/176E]

Editorial team proposal:
Use d_w=5 (as proposed in lusted_3dj_07_2405), N_fix=14, N_g=2, N_f=4, and N_max=50 (as proposed in lusted_3dj_01_2406 (a?)) to replace TBDs in Table 176D–7 and Table 176E–7.

Add editor’s notes similar to that in slide 4 of lusted_3dj_07_2405 and slide 5 of lusted_3dj_01_2406 (a?) to denote that these values need further analysis. Keep these values TBD in clauses 178 and 179.

Additional proposals for these parameters are included in consensus presentations, see https://www.ieee802.org/3/dj/public/24_05/lusted_3dj_07_2405.pdf and https://www.ieee802.org/3/dj/public/24_06/lusted_3dj_01_2406.pdf (a?).
COM Rx FFE coefficient limits
[14 comments, 178/179/176D/176E]

4 separate comments against COM Rx FFE coefficient limits in clause 178:
- Wmax: 0.7 (#279) and Wmin: -0.7 (#280)
- bmax : 0.85 (#281) and bmin: 0.3 (#282)
- Floating tap min/max (#283 and #284)

For bmax, comment #140 (176E) and #144 (176D) propose 0.75 (but also d_w)

Comments #42 (178) and #54 (179) suggest multiple choices for many parameters (not a specific proposal).

Comments #504 (176D), #70 (179), #71 (178), and #72 (176E) propose values for some of these parameters along with many others.
The presentation [https://www.ieee802.org/3/dj/public/24_05/heck_3dj_01b_2405.pdf](https://www.ieee802.org/3/dj/public/24_05/heck_3dj_01b_2405.pdf) was provided in support of #504. Slides 25-26 include proposed values for these parameters (per index).

A wide range allowed for FFE coefficients, combined with not accounting for quantization noise, effectively assumes a high-resolution ADC and causes the Tx FFE coefficients not to be utilized in COM optimization. This implies that receivers do not need Tx equalization. The penalties of real receivers having more limited FFE equalization, which would some Tx equalization, have not been analyzed. Further analysis in this area is encouraged.

However, if consensus can be achieved, having numbers instead of TBDs is a step forward.

**Editorial team proposal:**
REJECT #279-#284, #140, #144, and #504, due to lack of consensus. REJECT #42 and #54 due to lack of specific proposals.
Alternatively:
Use the proposed values of w_max, w_min, b_max, b_min in comments 279-282 to replace TBDs in Table 178–13, Table 179–15, Table 176D–7, and Table 176E–7.
Add editor's notes similar to that in slide 4 of [https://www.ieee802.org/3/dj/public/24_05/lusted_3dj_07_2405.pdf](https://www.ieee802.org/3/dj/public/24_05/lusted_3dj_07_2405.pdf) to denote that these values need further analysis.
COM CTLE parameters
[6 comments, 178/176D/176E]

4 separate comments against COM CTLE parameters in Table 178-13 (non-TBD):
- \( g_1: -15:1:0 \) (#263) (-15 instead of -20)
- \( g_2: -5:1:0 \) (#264) (-5 instead of -6)
- \( f_{z1}, f_{z2}: f_b/4.233, f_b/80 \) (#265) (fb/4.233 instead of fb/2.5)
- \( f_{p1}, f_{p2}, f_{p3}: f_b/1.8973, f_b/2.6562, f_b/80 \) (#266) (fb/1.8973 instead of fb/2.5 and fb/2.6562 instead of fb)

The referenced presentation https://www.ieee802.org/3/dj/public/24_05/lim_3dj_01_2405.pdf does not include a rationale for the proposed changes (highlighted) to the existing values of these COM parameters, nor clarifies why they should be made different from those of clause 179.

Editorial team proposal:
- Use the identical CTLE parameters from Table 178-13 and Table 179-16, without change, in C2C (Table 176D-6) and C2M (Table 176E–7)
- Align \( f_{z1}, f_{z2}, f_{p1}, f_{p2}, f_{p3} \) in all tables
- Remove \( f_{LF} \) from Table 176D-7

Comment #433 suggests changes in Table 176D–6 (C2C) to align it with Table 178-13 (KR)
- Suggests \( f_{z2} = f_b/80 \) (replacing TBD)
- Suggests \( f_{p3} = f_b/80 \)

Comment #440 suggests CTLE parameters for the C2M reference receiver in Table 176E–7 (all currently TBD) that are aligned with the COM parameters of clause 178 and 179.

In addition, the editorial team noticed that Table 176D-7 includes the parameter \( f_{LF} \) which is not defined in Annex 176A (it is replaced by \( f_{p3} \) and \( f_{p1} \)).
COM T_r parameter
[6 comments, 178/179/176D/176E]

<table>
<thead>
<tr>
<th>CI</th>
<th>SC</th>
<th>P286</th>
<th>L50</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>179</td>
<td>179.10.1</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

Mellitz, Richard

Comment Type: TR
Comment Status: X
scale Tr from 802.3ck. Understand that this is not the Tr at TP0d.

Suggested Remedy:
set Tr to 0.00375 ns

Proposed Response: Response Status: TBD

This comment suggests that the transition time T_r used in COM should be scaled down from the value 7.5 ps used in 802.3ck, resulting in 3.75 ps; and states that “this is not the Tr at TP0d”.

Other comments (#268, #407, #418, #435, #441) suggest the value 4 ps instead.

Editorial team proposal:
- Change T_r from TBD to X ps in Table 178–13, Table 179–15, Table 176D–7, and Table 176E–7.
- Add editor’s notes similar to that in slide 4 of https://www.ieee802.org/3/dj/public/24_05/lusted_3dj_07_2405.pdf to denote that this value needs further analysis.

Proposed value of X: 4

Note that T_r (modeled prior to the device termination) contributes to the transition time at TP0d (after the device termination), and will therefore affect Tx specifications at TP0v (specifically, the reference R_peak). The sensitivity of these specifications to the suggested values has not been addressed by any contributions. Further analysis in this area is encouraged.

However, having numbers instead of TBDs is a step forward, if consensus can be achieved.
The following presentation was reviewed by the task force at the May interim meeting: https://www.ieee802.org/3/dj/public/24_05/mellitz_3dj_02_2405.pdf
The presentation suggested effectively changing the definition of the “signal” component of SNDR as shown in the excerpts below.

The motivation is that this way the SNDR measurement at different losses between the source and the measurement point yield consistent results.

The presentation suggests a specific way of writing this definition as a correction factor “So we don’t change prior standards”, but this can be done specifically for the clauses in this project without affecting other standards.

Comment #47 seems to suggests essentially the same change.

- For the “S” in SNDR use the power variance of the signal at the measurement point as follows which is the in time and frequency domain
  \[ \sigma^2_s = \sum_{i=1}^{M(N_p-Dp-1)} p(n)^2 \]
  - Instead of \( p_{max} \)

- Consider SNDR as a ratio of signal power variance to noise power variance
  - Perhaps: SNDR should be \( 10 \times \log_{10} \left( \frac{\sigma^2_s}{\sigma^2_s + \sigma^2_n} \right) \)
SNDR/SCMR/SNR_TX
[6 comments, 178/179]

- #27 suggests setting the minimum SNDR in clause 178 to 33.5 dB based on the expected improvement from the new definition.
- #41 suggests using the same value for SNR_TX.
- #31 suggests that the correction factor (essentially the new numerator) be applied to SCMR in clause 178.
- #270 suggests 33 dB for SNDR in clause 178 (not related to the proposed redefinition of SNDR).

Editorial team proposal:
For #45:
- Change the definitions of SNDR in 179.9.4.6 and SCMR in 178.9.2.6 to use a numerator based on the suggested equations in [https://www.ieee802.org/3/dj/public/24_05/mellitz_3dj_02_2405.pdf](https://www.ieee802.org/3/dj/public/24_05/mellitz_3dj_02_2405.pdf) slides 12 and 13, with editorial license.
- Change SNDR (min) to $X$ in transmitter characteristics in 178, 179, and 176D.
- Change SNR_TX in COM tables to $X$.
Suggested value for $X$: 33.5 dB.

#47, #31, #27, #41, #270: resolve using the response to #45.
Jitter
[X comments, 178/179/176D/176E]

#236 refers to the following presentations:

#204 refers to
and the detailed proposal mentioned is

#271 and #272 suggest A_DD=0.02 UI and sigma_RJ=0.01 UI.

Both #236 and #204 (in ran_3dj_03_2405) suggest using jitter specifications based on the dual-Dirac model with parameters in #271 and #272. As a result, both proposals have approximately the same JRMS. EOJ is also similar.

The main difference is that comment #236 suggests using a new parameter J2.7u, while #204 (in ran_3dj_03_2405) suggests using J3u and J6u, measured only on the R03/F30 edges.

Additional relevant presentation was reviewed in the May interim meeting:
https://www.ieee802.org/3/dj/public/24_05/zivny_3dj_01a_2405.pdf, suggesting changes to the measurement method to potentially improve the precision. Straw Poll #8 was taken after the presentation:

- I would support the approach for the C2M and CR measurement specifications in zivny_3dj_01a_2405
- Results (all): Y: 12, N: 11 , NMI: 22 , A: 36

It appears that there is no clear consensus on adopting the proposed methodology changes. However, it is possible that there is consensus on some of the missing TBDs.

Editorial team proposal:
- For KR+C2C Tx (Tp0v) and CR (TP2), adopt the Jrms, J3u and EOJ values slide 12 of ran_3dj_03_2405, measured only on R03/F30 edges. Add editor’s notes that the jitter specification need confirmation.
- Separate discussions about C2M, J6u, and measurement over all 12 edges.
Pulse response linear fit
[5 comments, 178/179/176E]
[X comments, 178/179/176E]
Multiple COM parameters
[6 comments, 178/179/176D/176E]

Comments #70 and #71 propose a large set of COM parameter values together for CR and KR, respectively. Comment #72 proposes a similar set for C2M and suggests adding a table instead of referring to the parameters of C2C.

The referenced presentation, https://www.ieee802.org/3/dj/public/24_01/healey_3dj_01_2401.pdf, does not provide rationale for the suggested remedies of these comments. Specifically, slide #18 states that the values used are not a baseline proposal.

Comment #504 proposes a set of parameters for C2C, following analysis in https://www.ieee802.org/3/dj/public/24_05/heck_3dj_01b_2405.pdf. Comments #42 and #54 do not include a specific proposal (but suggest a series of straw polls).

There are multiple other comments that may result in adopting values for some of the proposed parameters. These comments may to be resolved partially by the responses to the other comments.

Note that the presentations cited did not examine the effect of constraining the Rx FFE parameters (Wmin/Wmax), and disabled Tx equalization (c(i)). The assumption that receiver can operate with large Rx FFE coefficient values and without Tx FFE equalization may not be in consensus.

Editorial team proposal:
- REJECT comments #42 and #54 (no actionable remedy within the draft).
- Resolve the other comments after all other electrical comments, to possibly adopt values for parameters that have not been addressed by other comments and may be in consensus.
- Consider adding a COM table in Annex 176E as suggested by comment #72.
- If necessary, add editor's notes similar to that in slide 4 of https://www.ieee802.org/3/dj/public/24_05/lusted_3dj_07_2405.pdf to denote values that need further analysis.
Annex 176E
Annex 176E, C2M channel ILdd
Comments #130, #73

The referenced presentation is [https://www.ieee802.org/3/dj/public/24_05/ghiiasi_3dj_02a_2405.pdf](https://www.ieee802.org/3/dj/public/24_05/ghiiasi_3dj_02a_2405.pdf). It analyzes specific channels with unspecified module PCB loss and "8 mm CDR" module package. Several COM parameters used in this presentation have not been adopted.

Editorial team proposal:
Reject both comments due to the large difference. Continue working toward consensus loss budget for C2M in conjunction with COM parameters.
Annex 176E, Input specs
Annex 178A
It may not be clear that the solution for \( y_0 = P^{-1}(\text{DER}_0) \) is less than 0 for any \( \text{DER}_0 < 0.5 \).

It is specified that the magnitude of the result is used.

Expressions like \( y_0 = P^{-1}(1-\text{DER}_0) \) or \( \text{DER}_0 = 1-P(y_0) \) are used elsewhere in Annex 178A to make \( y_0 \) greater than 0.

Although also correct, use of different forms may lead to further confusion.

It would be better to add clarity to, and consistently use, an expression to map between a CDF value and the corresponding amplitude value.

In addition, there has been confusion about the relationship between \( \text{DER}_0 \) and PAM-L symbol error ratio (or BER) and it has been suggested that this relationship be clarified.
Annex 178A, DER0 (2 of 2)  
Comments #285, #362

178A.1.10.2 Noise and interference amplitude

The probability distribution function of the noise and interference amplitude is calculated using the procedure defined in 93A.1.7.3 using the sampled time-domain responses and noise variance defined in 178A.1.9. The corresponding cumulative distribution function is defined by Equation (178A–35).

\[
P(y) = \int_{-\infty}^{y} p(u)du
\]

[Use dummy variable in integrand.]

The noise and interference amplitude, \( A_{ni} \), is a positive value that satisfies the relationship \( P(-A_{ni}) = DER_0 \) where \( DER_0 \) is the target detector error ratio.

\[
(178A–35)
\]

[Re-write to clarify that the expected result is a positive number.]

The noise and interference amplitude, \( A_{ni} \), is a positive value that satisfies the relationship \( P(-A_{ni}) = DER_0 \) where \( DER_0 \) is the target detector error ratio.

NOTE 2—The target detector error ratio \( DER_0 \) is \( SER_1 \times L/(2L-2) \) where \( SER_1 \) is the maximum allowed probability of the initial error in a PAM-\( L \) error burst.

[Change Equations (178A–36) and (178A–37), as modified by comments #211, #212, #286, and #287, to use expressions similar to what is used in 178A.1.10.2.]

\[
COM_{MLSD} = COM_{DFE} + 20\log_{10} ( - P^{-1}(DER_{MLSD})/A_s ) - Q
\]

(178A–36)

\[
DER_{MLSD} = \sum_{j=1}^{\infty} \left( \frac{L-1}{L} \right)^{j-1} p \left( -A_s \left( u_j^T u_j \right)^{3/2} \right) \left( u_j^T V_j u_j \right)^{1/2}
\]

(178A–37)
Clause xxx, <topic>
Comment #<n>