Module stressed input loss calibration and other loss curves

P802.3ck D3.0 comments 202 216 218 223

Piers Dawe, Nvidia

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Same as dawe_3ck_02_0122 apart from new slide 11

Supporters

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- Tim Brackett Wilder Technologies

Calibrating the components outlined in red

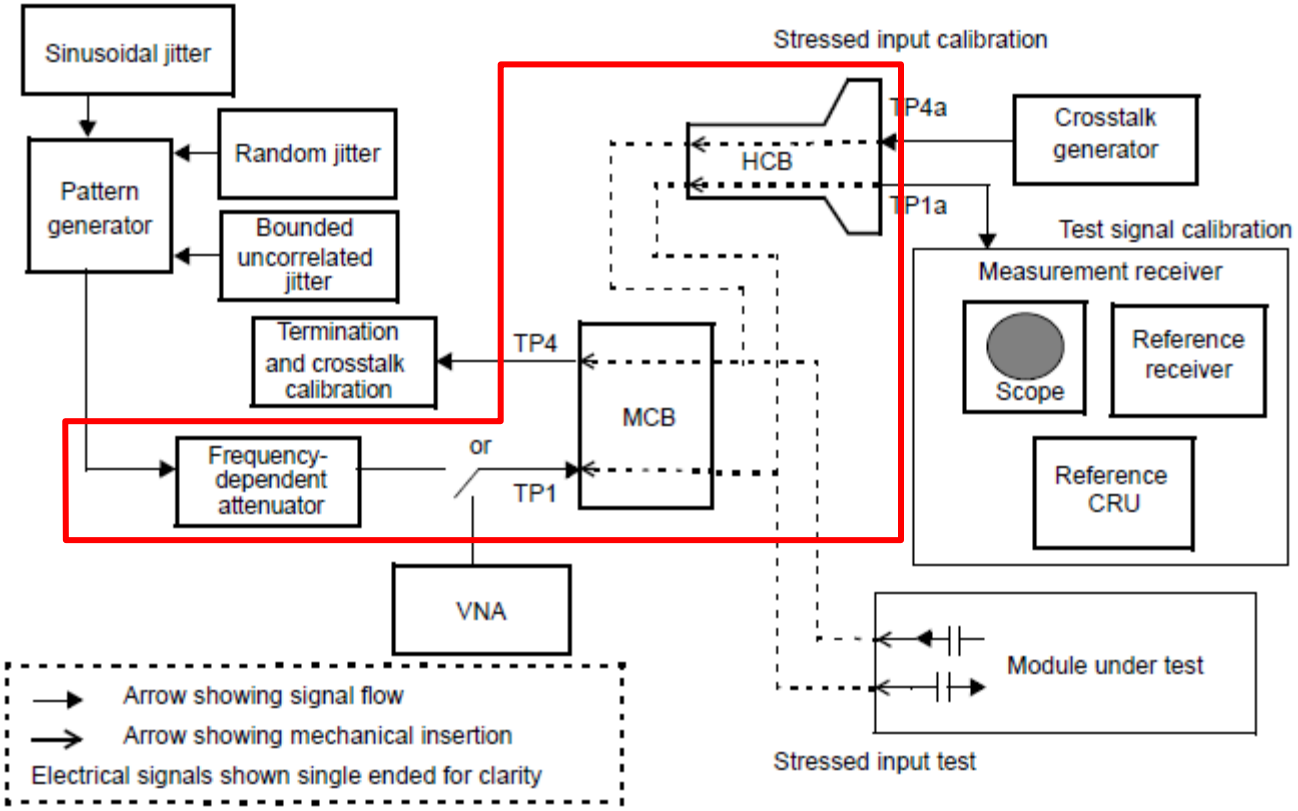


Figure 120G–10—Example module stressed input test

- Loss is calibrated from the output of the pattern generator to TP1a

From Draft 3.0

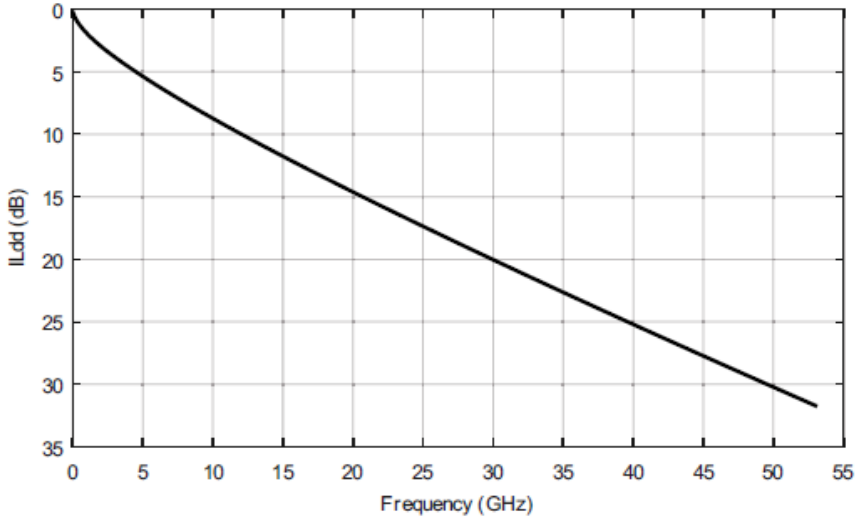
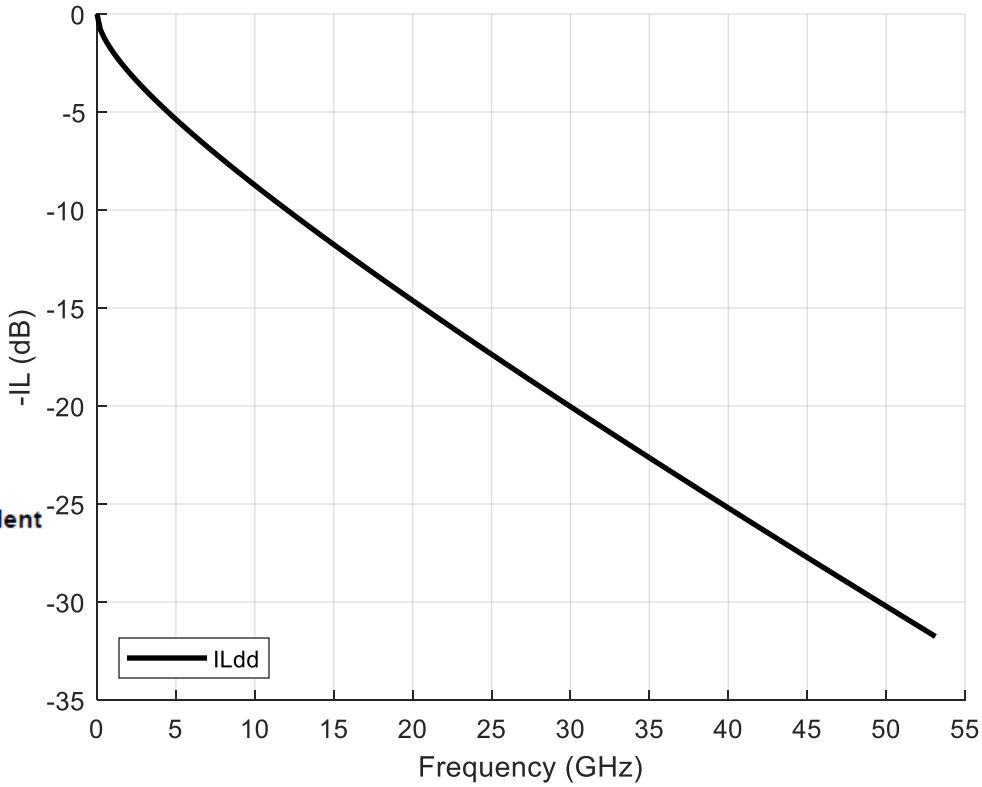
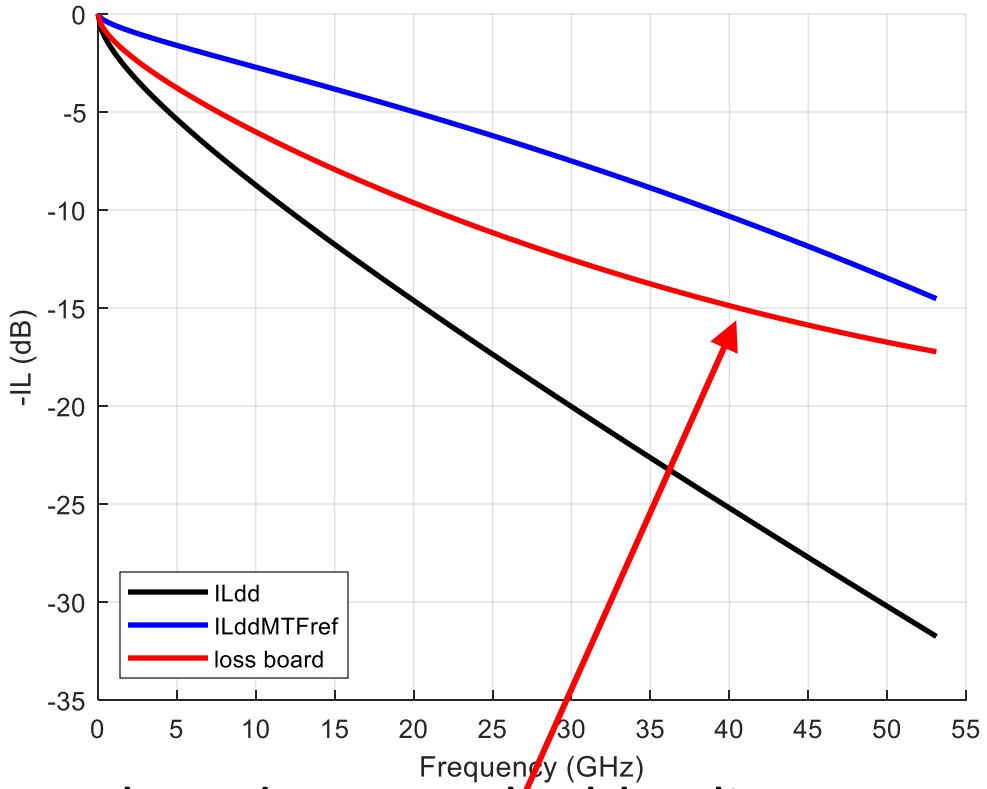


Figure 120G–11—Module stressed input target high-loss frequency-dependent attenuator differential-mode to differential-mode insertion loss



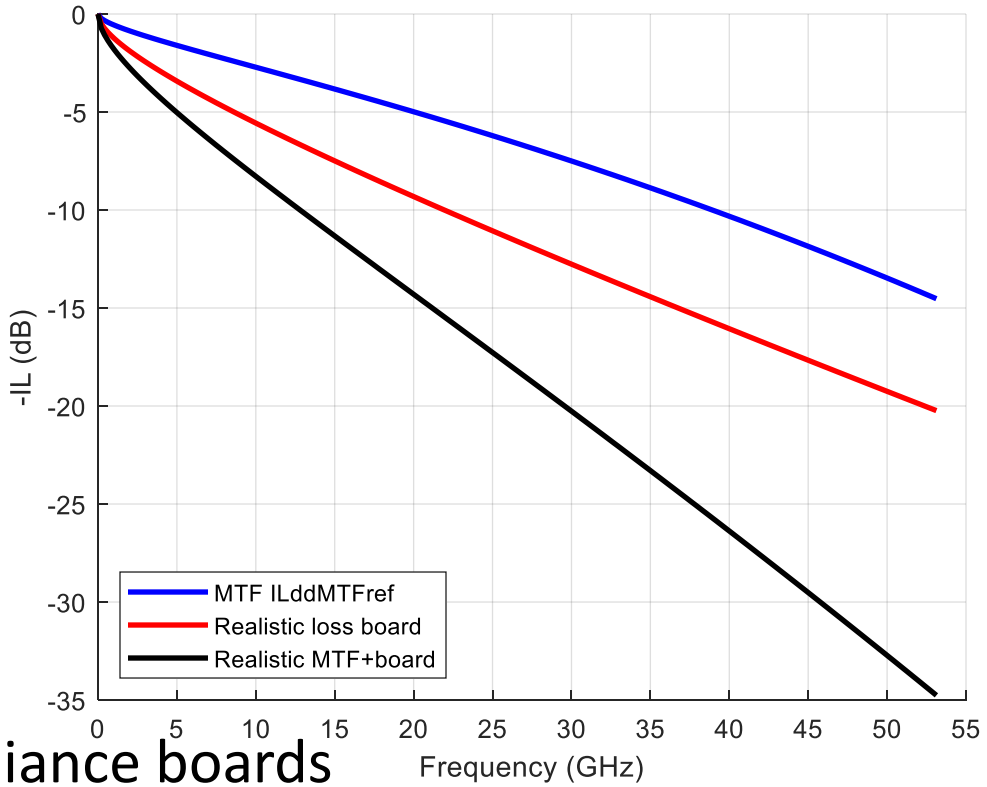
- 18.2 dB at Nyquist
- $ILdd(f) = 1.54\sqrt{f} + 0.3865f$ (120G-3)
- In spite of the figure title, this is not the frequency-dependent attenuator alone

D3.0



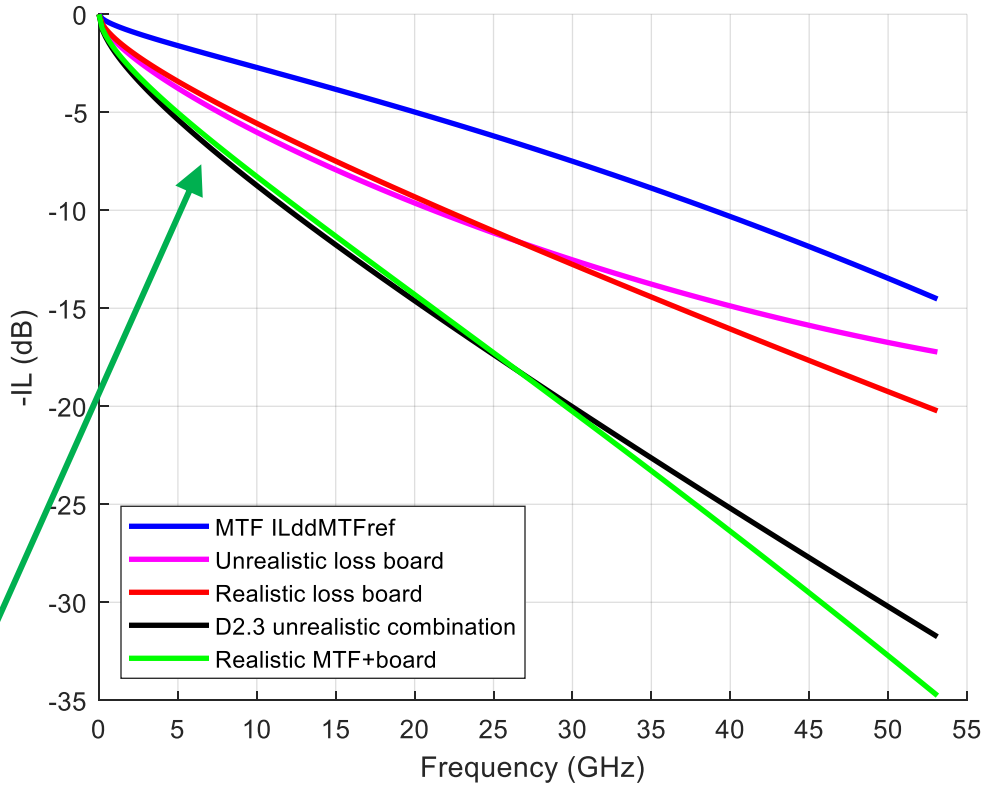
- The mated compliance boards target the blue line
  - *ILddMTFref*(*f*) = 0.942(0.471√*f* + 0.1194*f* + 0.002**f*^2) Eq 162B–5
  - 6.6036 dB at Nyquist
- So the frequency-dependent attenuator must target the red line which bends too much the wrong way (*f*^2 term with wrong sign)
- Impractical, and not representative of the host-to-module channel and the channels used for module output compliance

November proposal



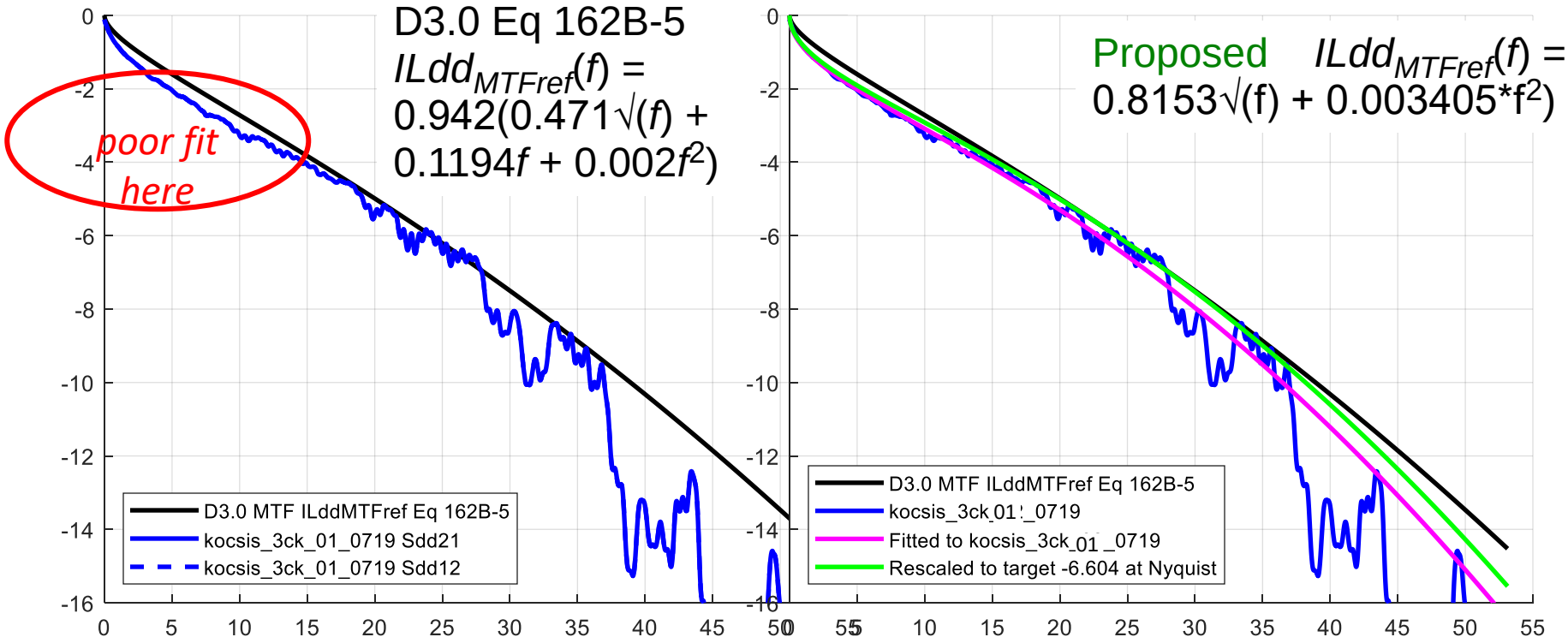
- Blue: mated compliance boards
  - *ILddMTFref*(*f*) = 0.942(0.471√*f* + 0.1194*f* + 0.002**f*^2) Eq 162B–5
  - 6.6036 dB at Nyquist
- Red: frequency-dependent attenuator
  - 0. 980926√f + 0.246243*f* (Eq 120G-3 revised) 11. 5964 dB at Nyquist
- Black: total
  - 1.42461√*f* + 0.358718*f* + 0.001884**f*^2 18.2 dB at Nyquist
- More practical and representative of the host-to-module channel, but... https://ieee802.org/3/ck/public/21_11/dawe_3ck_01a_1121.pdf

Comparing November proposal to D3.0



- Green line is better than black line, except not bowed enough at lower frequencies

Comment 218 Real compliance boards



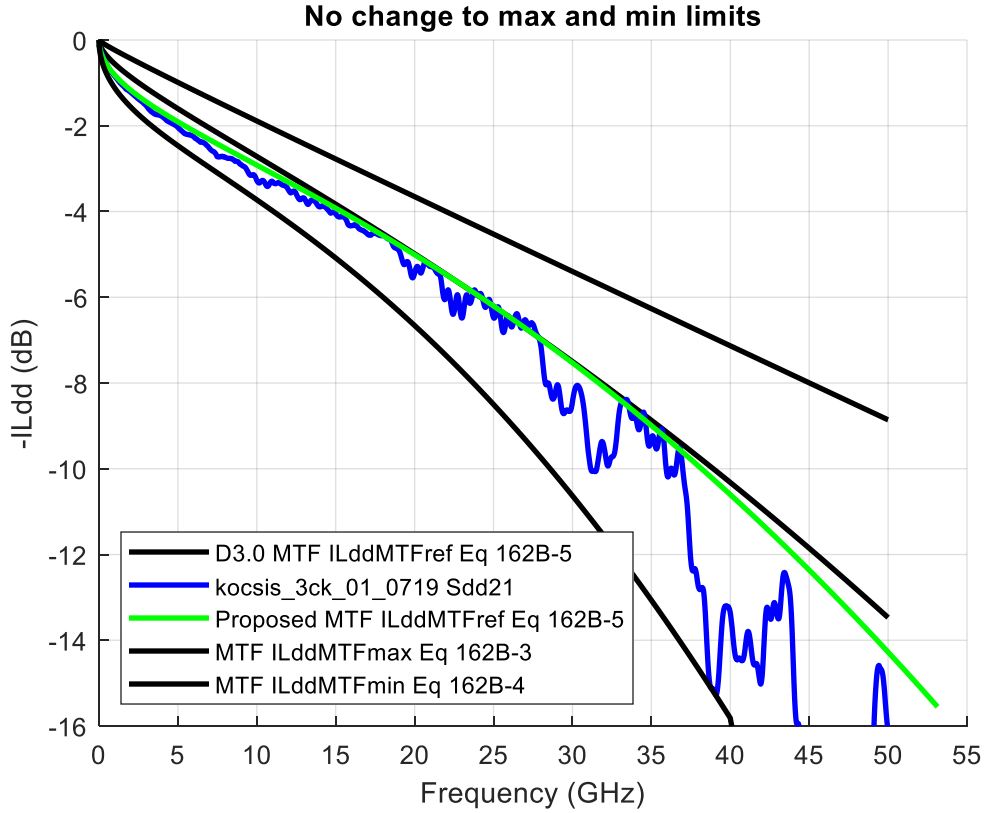
- We don't expect that compliance board traces will get shorter
  - Possibly the opposite as we go from 4 to 8 to maybe 16-wide modules
- But they might use better dielectric, and tolerancing and detailed improvements
- So the low frequency loss will improve less than the high frequency loss

https://ieee802.org/3/ck/public/19_07/kocsis_3ck_01_0719.pdf

Associated changes

- Max/min mated compliance board limits?
  - No change, see next slide
- For 120G.3.4.3.2 Module stressed input test calibration, high-loss signal calibration *Comment 202*
  - Change L from 464 to 295.6 mm
  - Replace Eq 120G-3 with two equations:
  - Frequency-dependent attenuator $0.981\sqrt{f} + 0.2463f$
  - The loss of the combination is $1.7962\sqrt{f} + 0.2463f + 0.003405f^2$
  - Show all three curves (Eq 162B-5 mated compliance boards, frequency-dependent attenuator and the combination) in Figure 120G-11. Revise its title
- Slightly reduce R_{peak} (0.397 in D3.0 Table 162-10)
- In 162A.4 Transmitter and receiver differential printed circuit board (PCB) trace differential-mode to differential-mode insertion loss,
  - review the recommended maximum insertion loss from TP0 to TP2 or from TP3 to TP5 including the test fixture, Equation (162A-3) and Figure 162A-2
  - the $\sqrt{f}$ term may be too small
  - but this is only a recommendation

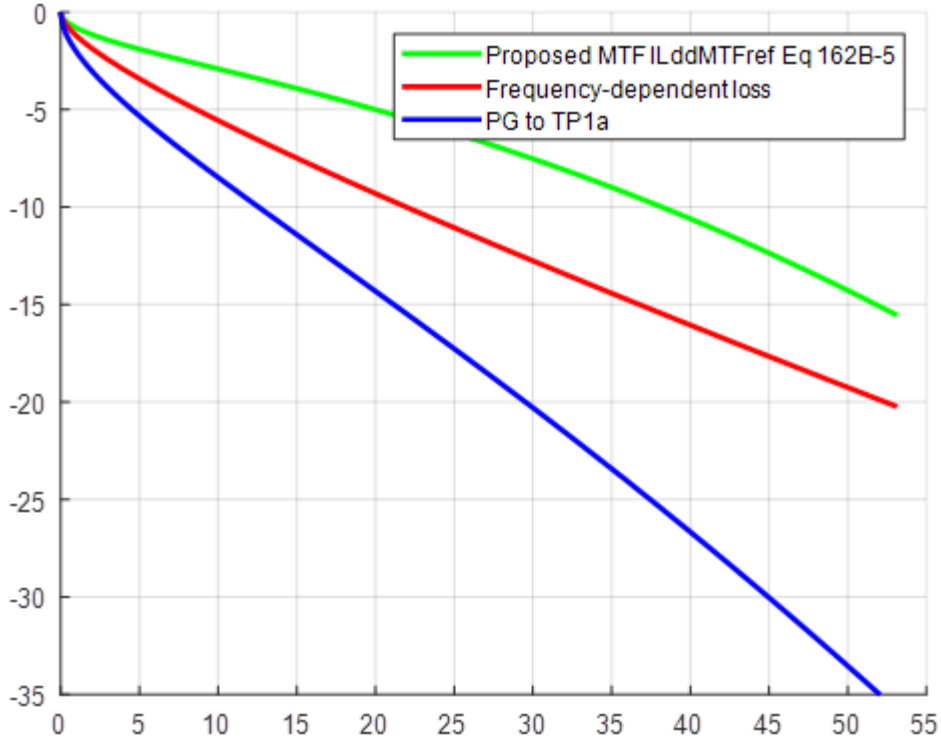
Comment 218 on compliance boards, summary



- Change equation 162B-5 from:
- $ILdd_{MTFref}(f) = 0.942(0.471\sqrt{(f)} + 0.1194f + 0.002f^2)$ to:
- $ILdd_{MTFref}(f) = 0.8153\sqrt{(f)} + 0.003405f^2)$
- Update Figure 162B-3, Mated test fixtures differential-mode to differential-mode insertion loss

New slide

New curves for Figure 120G-11



- Comment 202: Show all three curves (Eq 162B-5 mated compliance boards, frequency-dependent attenuator and the combination) in Figure 120G-11
- This plot is based on the compliance board curve accepted in comment 218 (shown green and called "proposed" here)
- It shows three of the lines on slide 7

Comment 223
Figure 163B-1 doesn't match Equation 163B-1

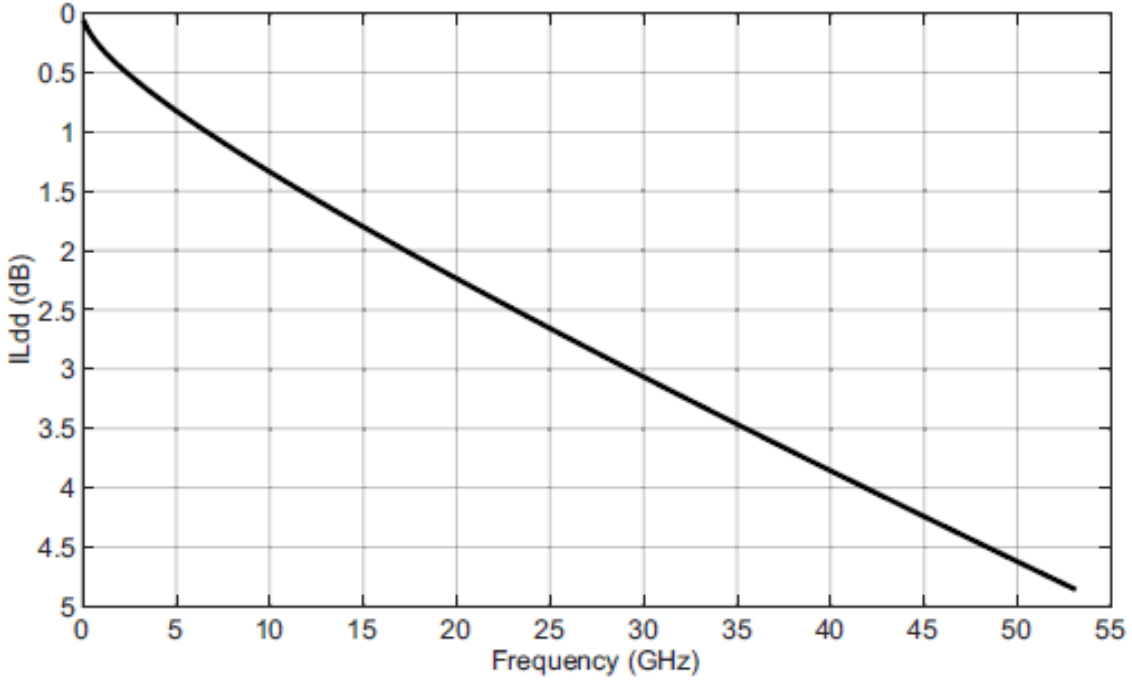


Figure 163B–1—Example test fixture differential-mode to differential-mode insertion loss

- D3.0 Eq 163B-1 $Ildd(f) = 0.074 + 0.2104\sqrt{f} + 0.0674f \quad 0.05 \le f \le 53.125$
- I believe the graph is right, and the right coefficients are 0, 0.235616, 0.059147
- Change to: $Ildd(f) = 0.235616\sqrt{f} + 0.059147f \quad 0.05 \le f \le 53.125$

Comment 216

- Please make it easier for the reader to judge the size of these losses
- Also, it's test fixture reference ... loss as in the text, not reference test fixture ... loss
- Please put *ILddcatf* on Figure 162B-1, and label the two lines (e.g. make one dashed), change figure title to "reference differential-mode to differential-mode insertion losses of test fixtures", refer to it from 162B.3, delete Figure 162B-2

Combined figures 162B-1 and 162B-2

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