Loss from TP0 to TP2

P802.3ck Draft 3.1 comments 41, 43

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Comments 41 and 43

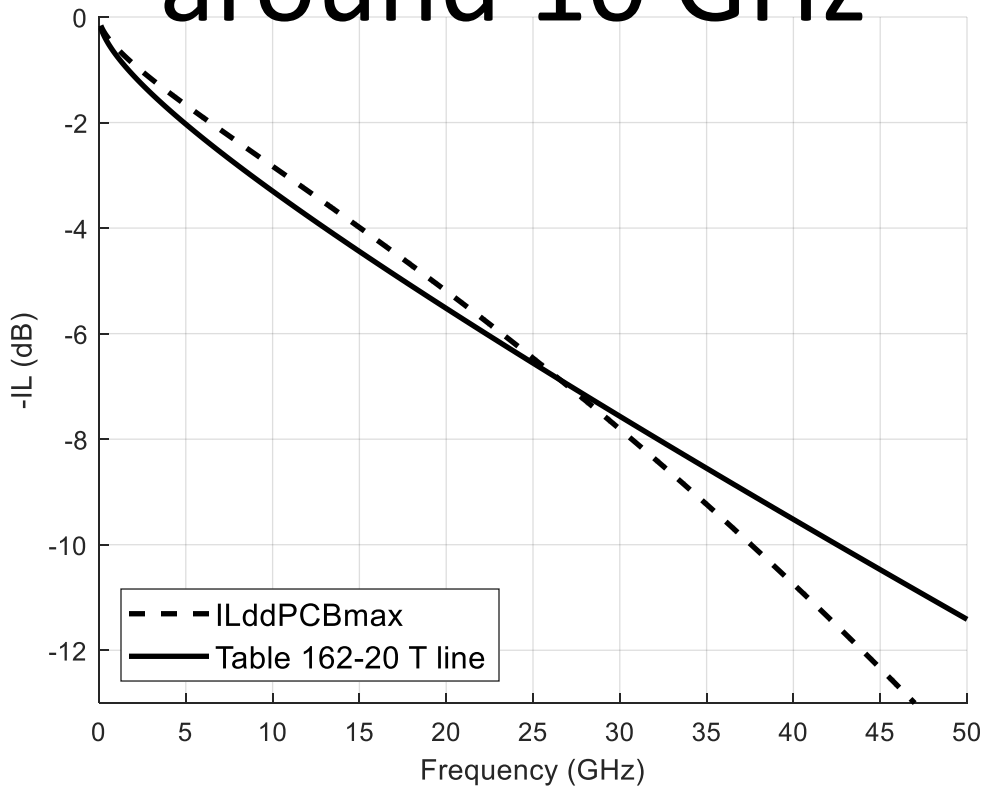
- 41 The equation for the channel from TP0 to TP2 or from TP3 to TP5 including the test fixture should be checked for consistency with the equations for the PCB, the mated test fixtures, and the cable test fixture traces, although there won't be a perfect match because of the allowances for ball grid array (BGA) footprint and host connector footprints, as well as the difference between product connector and test fixture connector
- 43 The revision to the mated test fixtures' reference loss to be more like real measurements makes a small difference to the expected Rpeak

Problem statement

- Expect that:
- $ILdd_{HostMax}$, TP0 to TP2 =
- PCB trace + small effects* + mated test fixtures
- PCB trace can be taken from
  - $ILdd_{PCBmax}$ in Eq. 162A–2, or
  - PCB model in Table 162–20
- Eq 162A–3 (TP0 to TP2) doesn't match either of these
  - Too little loss at low *f* and above Nyquist
- Mated test fixture definition has changed

  * 0.2 dB for BGA and connector footprints

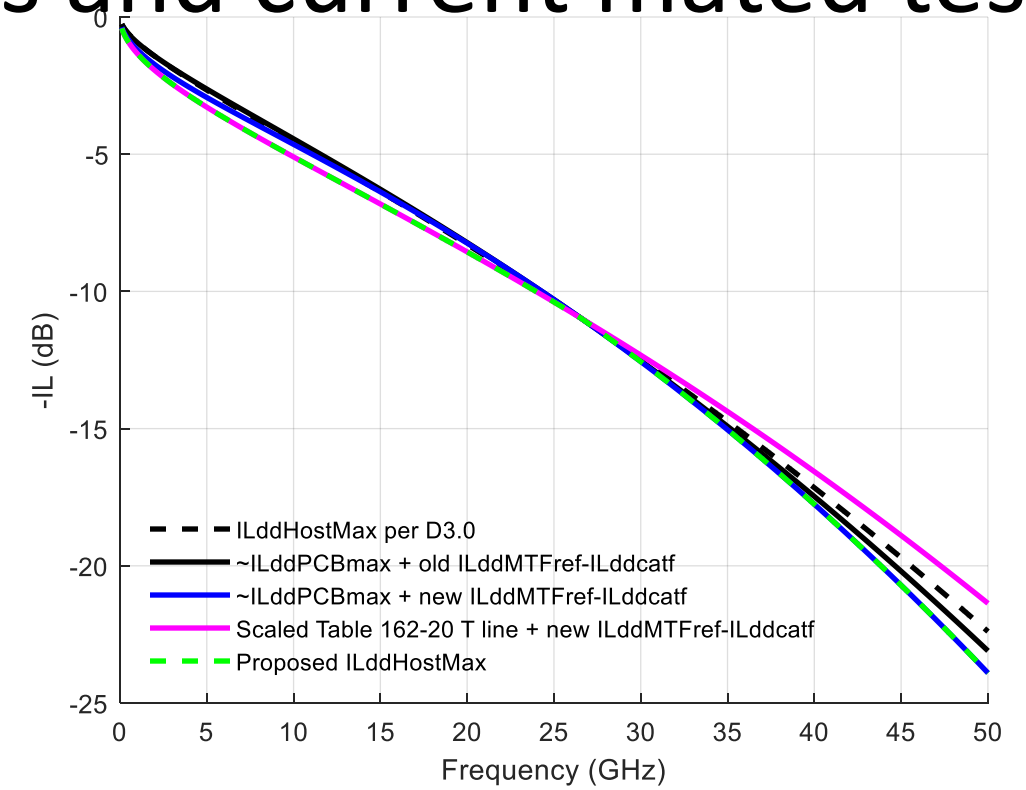
More than "max" loss is likely around 10 GHz



This is the PCB trace *only*

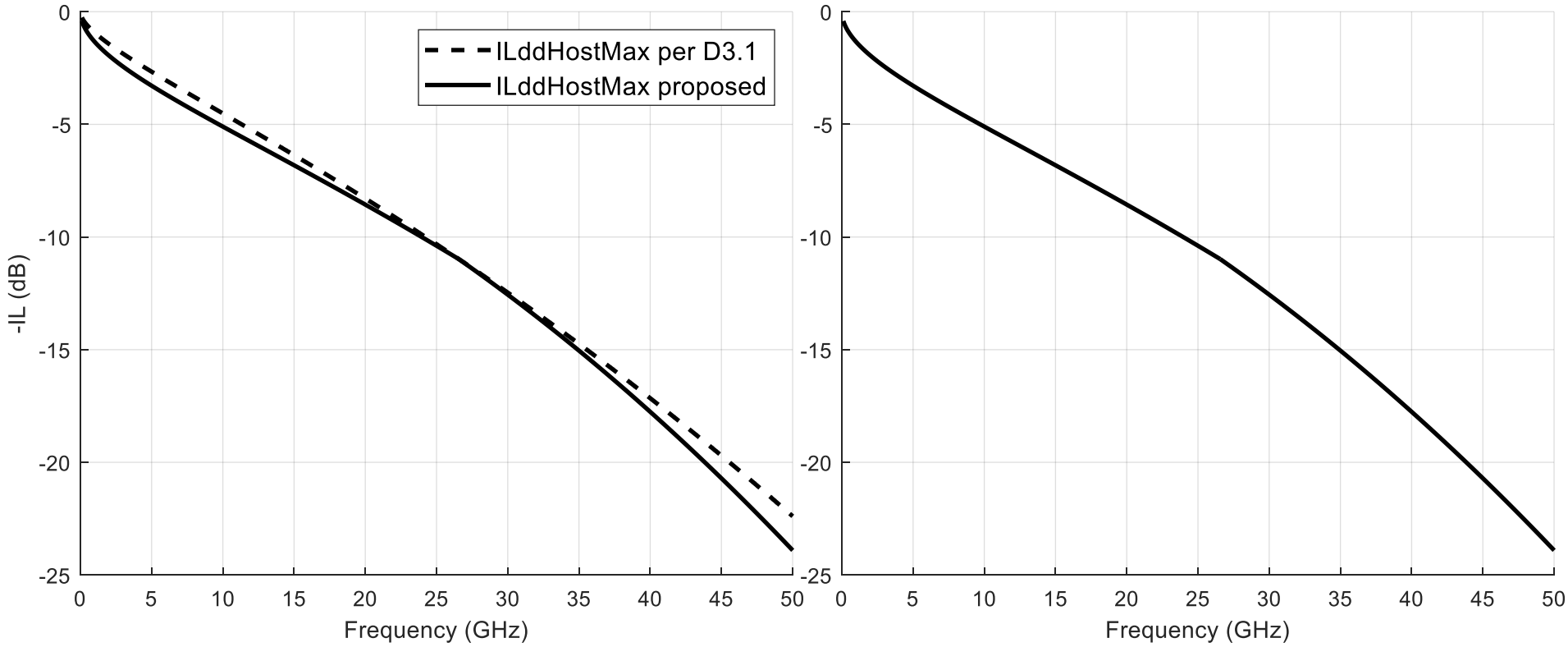
- We use the PCB model in Table 162–20 in COM for qualifying CR cables, and C2M module output and module stressed input, so it provides a valid host channel
- The $ILdd_{PCBmax}$ curve (scaled 120E MCB/HCB PCB traces) is valid too

TP0-TP2 with range of max-loss host channels and current mated test fixtures



- Need to allow more curvature at low frequencies, but also roll-off well above Nyquist
- Recommend the magenta line below Nyquist and the blue above
  - A channel that rolls off more strongly than blue above ~35 GHz would work too
- Combination is shown as dashed green

Summary, new plot for Fig 162A–2

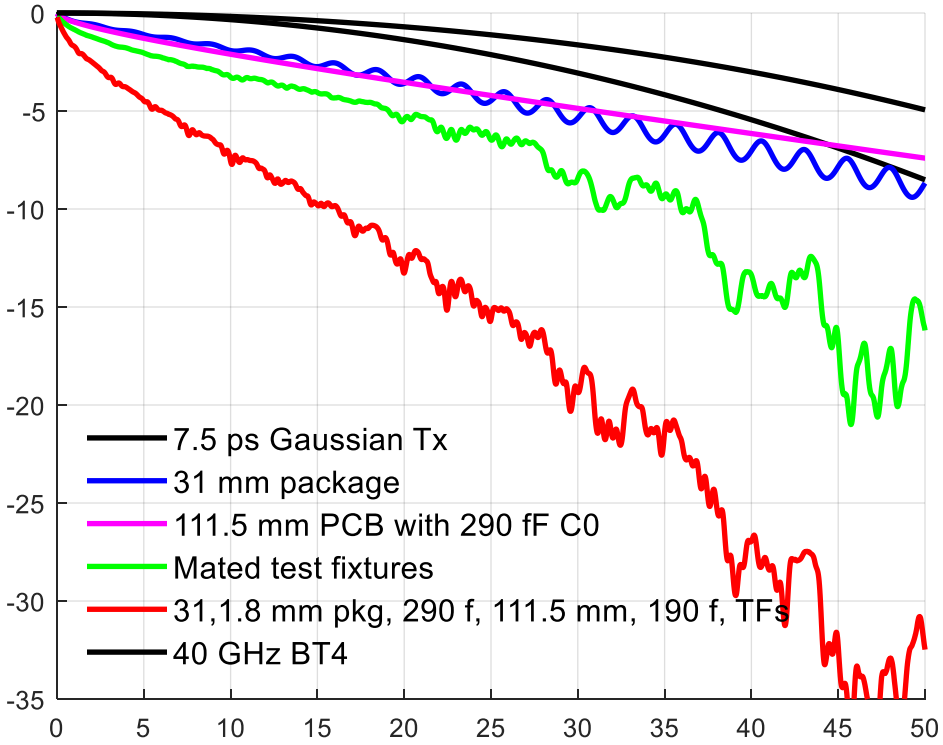


- Figure 162A–2 Insertion loss from TP0 to TP2 or from TP3 to TP5

Associated changes

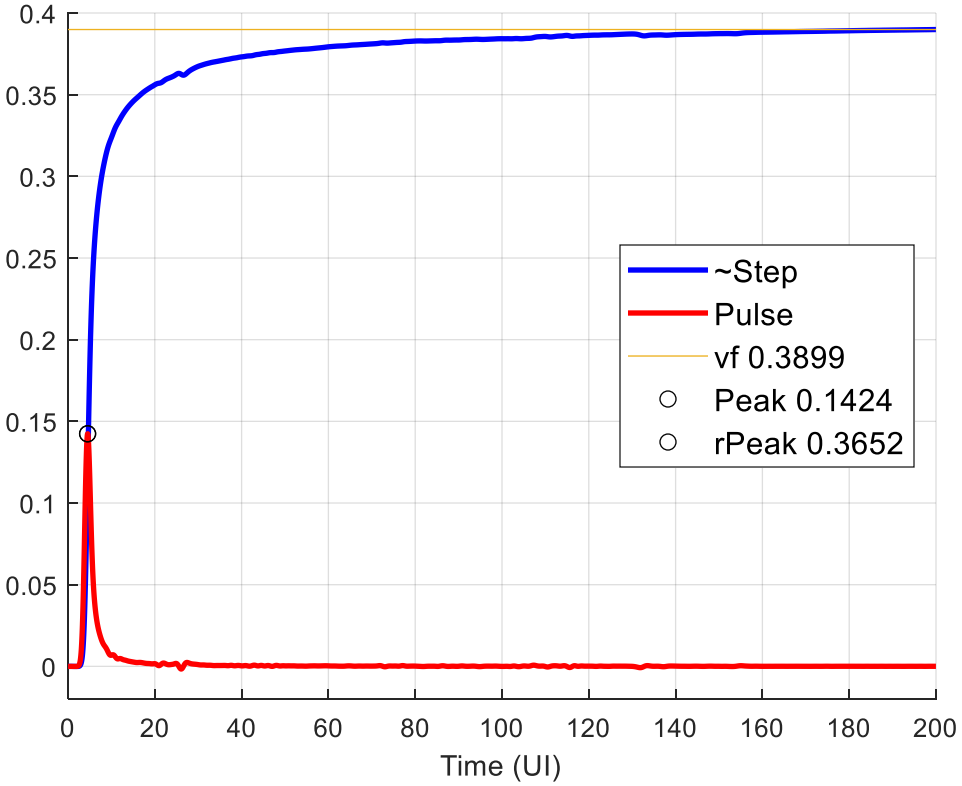
- Equation 162A–3
  - Existing: $ILdd_{Host} \leq ILdd_{HostMax}$ =
  - 1.5658*(0.471*sqrt(f) + 0.1194f + 0.002f^2)
  - Proposed: $ILdd_{Host} \leq ILdd_{HostMax}$ =
  - 1.2513*sqrt(f) + 0.08007f + 0.003405f^2 0.01 <= f <= 26.56
  - 1.1351*sqrt(f) + 0.05202f + 0.005310f^2 26.56 < f <= 50
- Recalculate *Rpeak* (min) based on the magenta line
  - Table 162-10
  - ISI affects *Rpeak* too, so can't use the smooth curves: have to go back to more realistic models with ISI
  - Existing: 0.397
  - Proposed: 0.36

The losses add up...



- Standard COM assumptions

Fitted pulse analysis



- *vf* is just above the spec limit of 0.387 V
- *Rpeak* at 0.365 is different to spec limit of 0.397
- ERL is 10.5? dB; draft spec limit is 7.3. Worse ERL in real product allows worse ISI which reduces *rPeak*