Impact of Test Fixtures on ERL, RL, SNR_{ISI} using COM and with Package Product Examples

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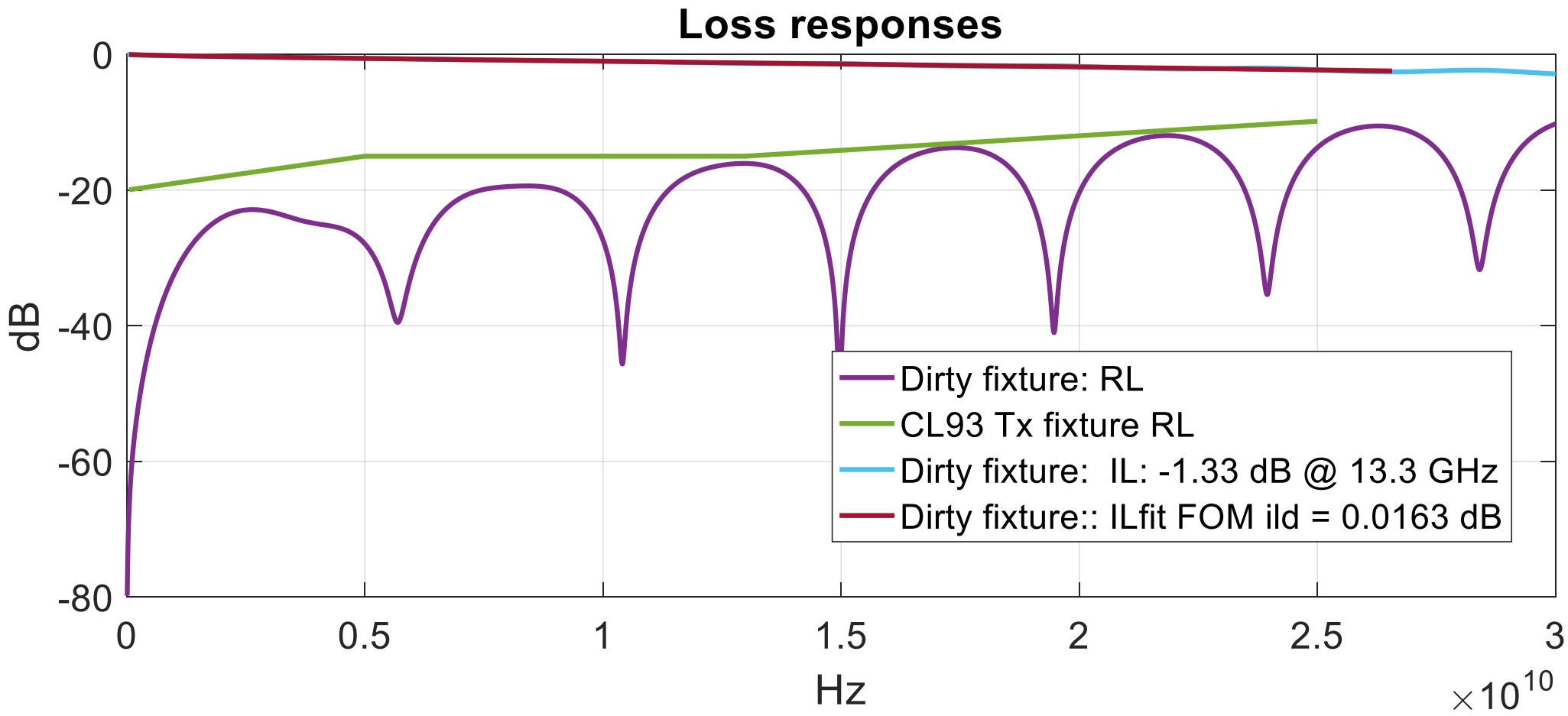
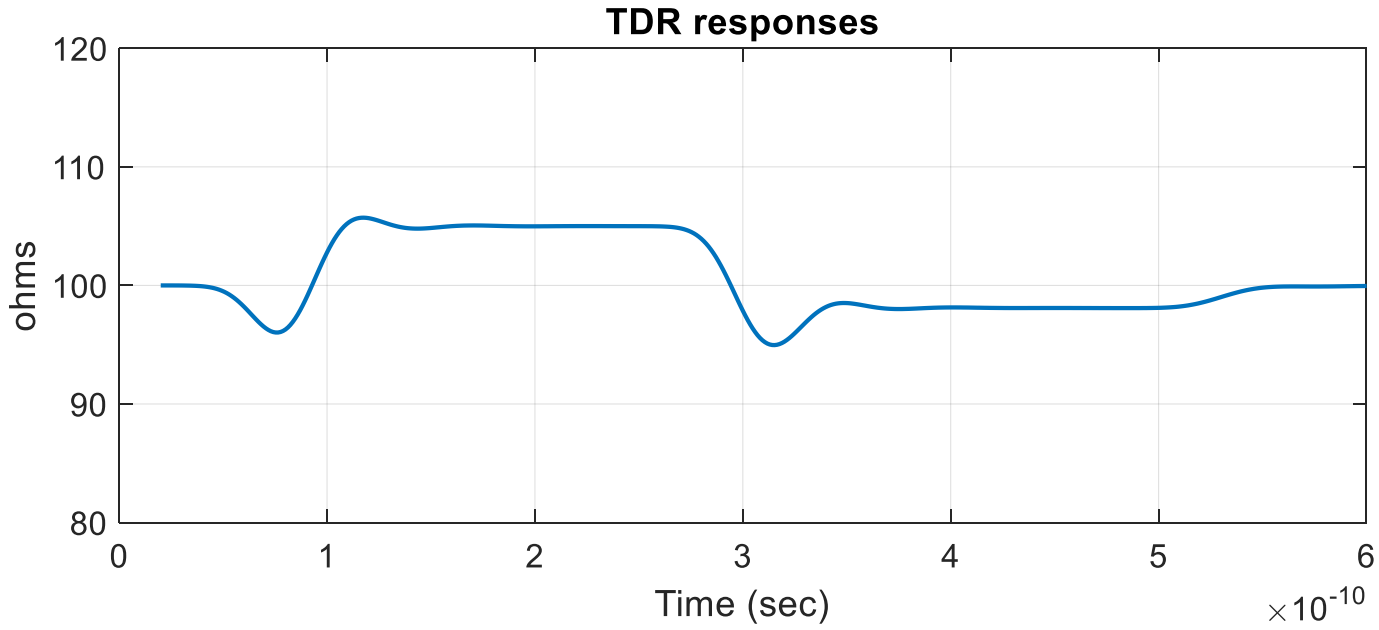
Test fixture with 1.2 to 1.6 dB IL and < 0.1 dB FOM ILD, A somewhat “dirty fixture”, but passing



TDR of test Fixture (w Butterworth filter and 13 ps 20%-80% Gaussian edge transition time)

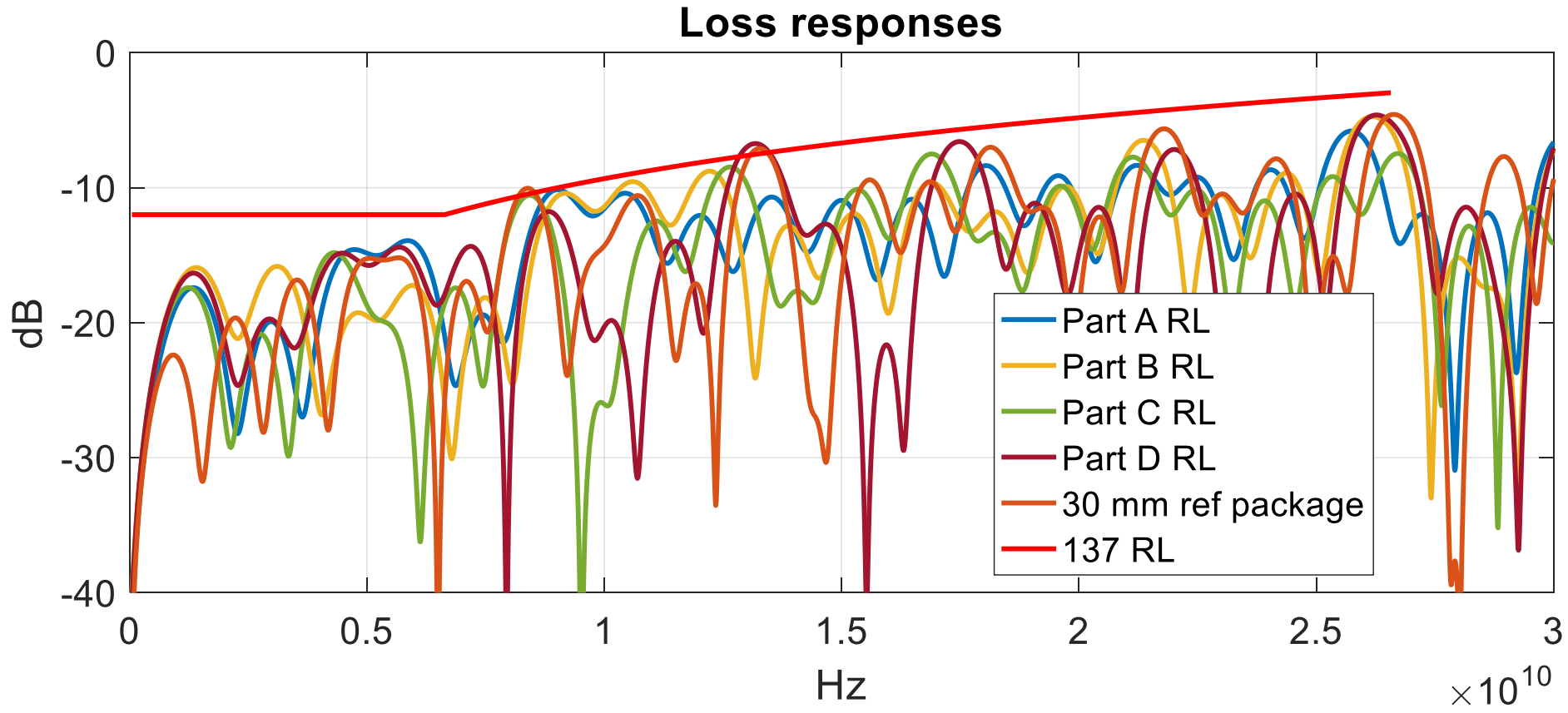


4 packages consider and the 30 mm reference package

- Part a 19mm rx
- Part b 14mm tx
- Part c 14mm rx
- Part d 17mm tx

- Manufacturing variations and actual die load not included yet
- Die load used for all
  - 180 fF for Cd
  - 50 ohm for Rd
- Package to board model (Cp)
  - Cp is included in the Parts. I.e. for computations Cp=0
  - Cp=110 fF for reference package

Return loss results take a bit of effort to unwind



ERL and SNR_{ISI} Results … so far

	SNR_{ISI} (dB)	ERL (dB)	COM (dB)
Part A	43.7	24.3	4.0
Part B	44.2	23.7	3.8
Part C	40.2	22.8	3.5
Part D	38.8	22.9	3.8
30 mm reference package	38.8	18.4	3.5
Passing D3.0 and ERL proposal	43	18.6	3.0

Discussion: Conclusions and Follow-on Work

ERL parameters and Channel

- Channel used for testing: Ch8_30_8F_t.s4p
  - http://www.ieee802.org/3/cd/public/channel/Cisco_Backplane_cha nnel_data.zip
- ERL parameters: β_x = 10.7E9, ρ_x =.31, T_{fx} = 4.604e-10 , Tr=18.9ps, Rx filter = Butterworth as in COM, PAM4 data, DER0 = 1e-4

Effective reflection waveform, $R_{eff}(t)$, is a $PTDR(t)$ filtered with a time gated weighting function

$$R_{eff}(t) = PTDR(t)\left(\rho_x(1+\rho_x)e^{-\frac{\left(\frac{t-T_{fx}}{T_b}-(N_b+1)\right)^2}{(N_b+1)^2}}\right)10^{\frac{\beta_x\left(t-T_{fx}-T_b(N_b+1)\right)}{20}}$$

DFE compensation and re-reflection

Loss compensation

β_x=10.7e9, $\rho_x = 10^{\frac{ERL_{cx}}{20}} = 0.31$,
$ERL_{cx} = 10.2\ dB$

N_b is the number for DFE taps
T_b is the time for one symbol (aka UI)
t is time in seconds
T_{fx} is the time associated with the end of the test fixture
ERL_{cx} is the minimum channel ERL

Gate and weighing accounting for Loss and DFE and is defined for $t < T_b(N_b + 1)+T_{fx}$