

ERL KR Baseline Proposal

Richard Mellitz (Samtec), Howard Heck (Intel)

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The β_x Parameter for ERL is Derived from Package Loss and Reference Channel Loss

12 mm
package

31 mm LC
package

The ERL β_x parameter is computed from difference in package delay, package loss, and maximum channel loss with packages.

31 mm LC
package

28 dB

31 mm LC
package

Update β_x from mellitz_3ck_02_0519

- ❑ $Tp\delta$ is the timing difference between pulse responses between the 12 mm and 31 mm package
 - $Tp\delta = 1.1760e-10$ for .3ck
- ❑ ΔIL is the fit loss difference at the Nyquist frequency between the 12 mm and 31 mm package
 - $\Delta IL = 2.112$ dB for .3ck
- ❑ $IL_{ref} = 37.098$ dB channel for .3ck with the 31 mm package

$$\beta_x = \frac{10^{\frac{-(IL_{ref}-\Delta IL)}{20}} - 10^{\frac{-(IL_{ref})}{20}}}{TP\delta 10^{\frac{-(IL_{ref})}{20}}}$$

$$\beta_x = 2.3407 \text{ GHz}$$

Update ρ_x for ERL Computation

❑ The parameter, ρ_x , uses the ERL of the

- at the test point where ERL is computed
- other side

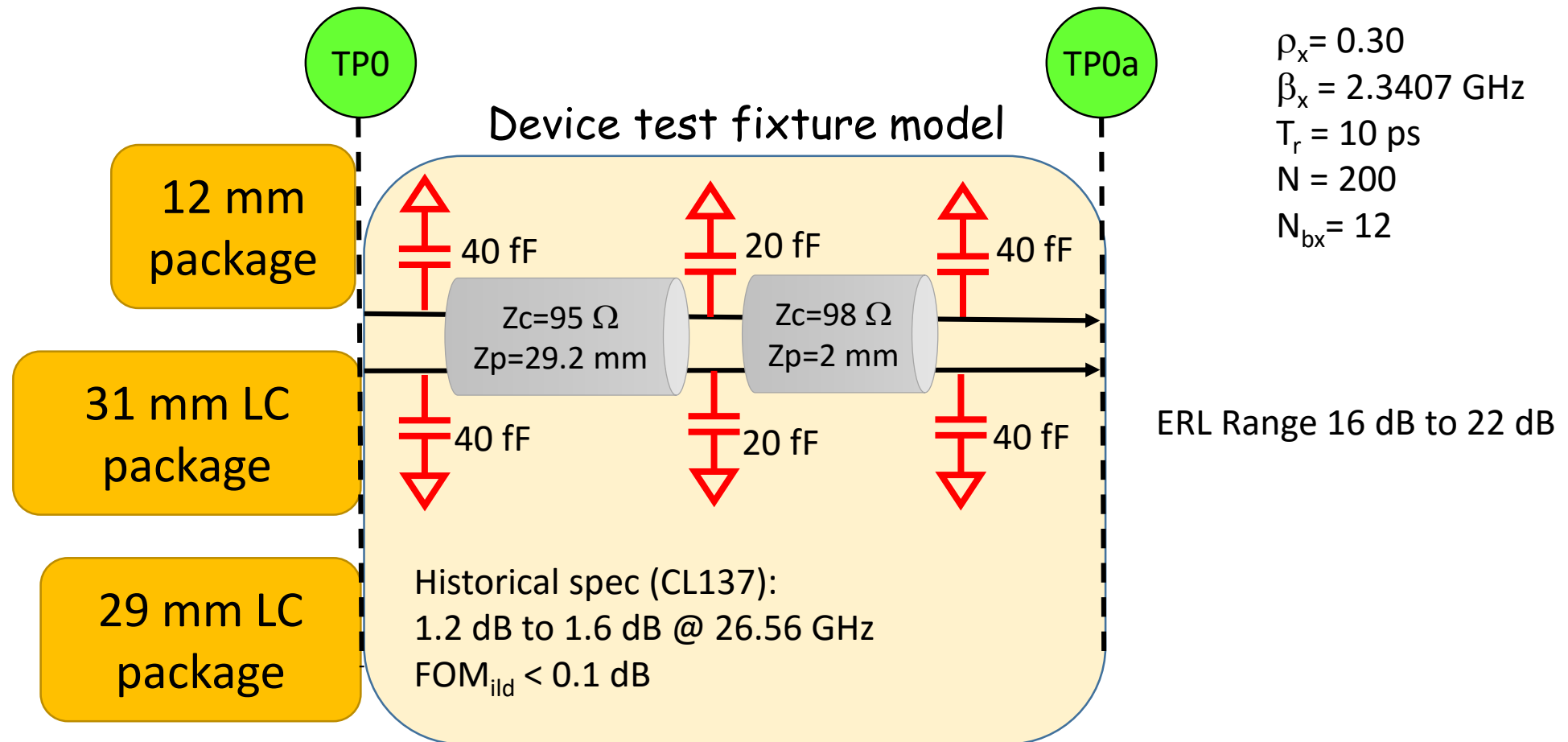
❑ $\rho_x = 10^{\frac{-ERL}{20}}$

❑ This caps the re-re-reflection at the test point from the DFE range

❑ ERL min device ~ 15.5 $\rho_x \cong 0.17$ for channel

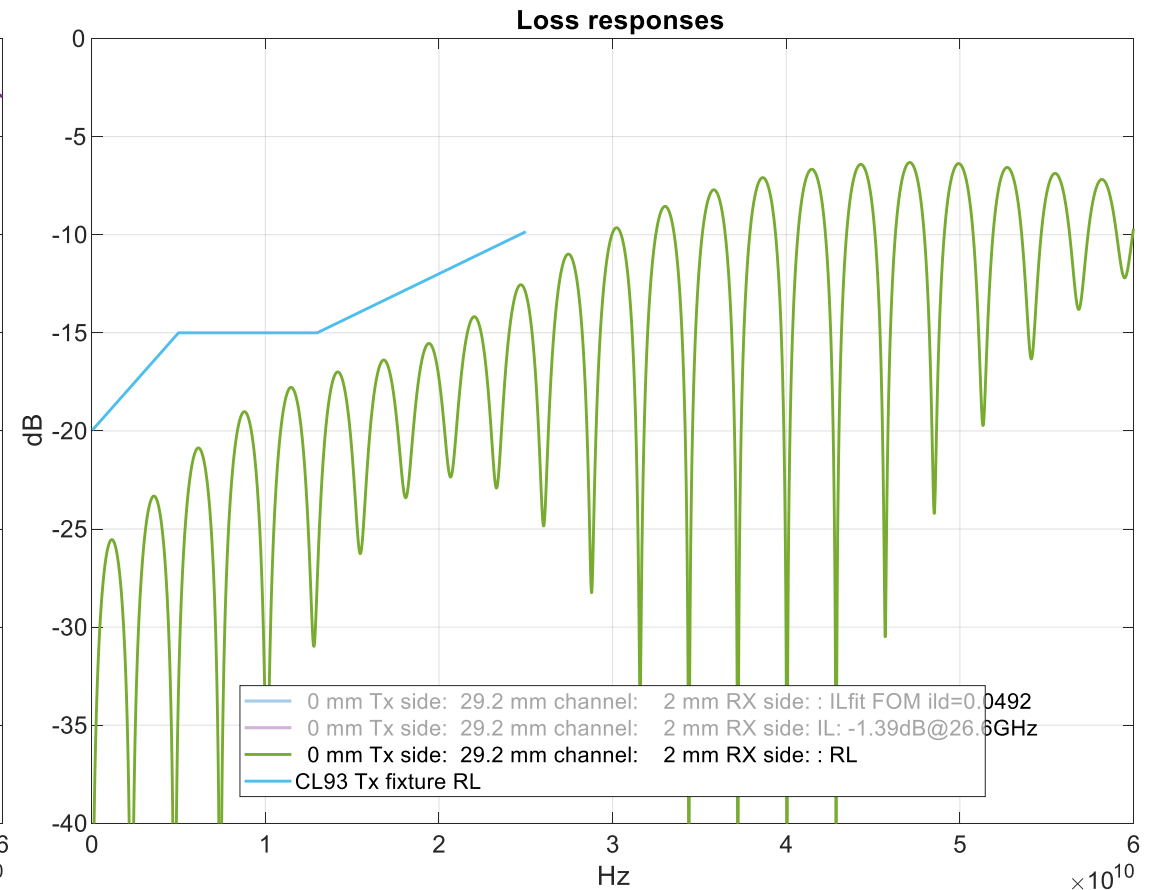
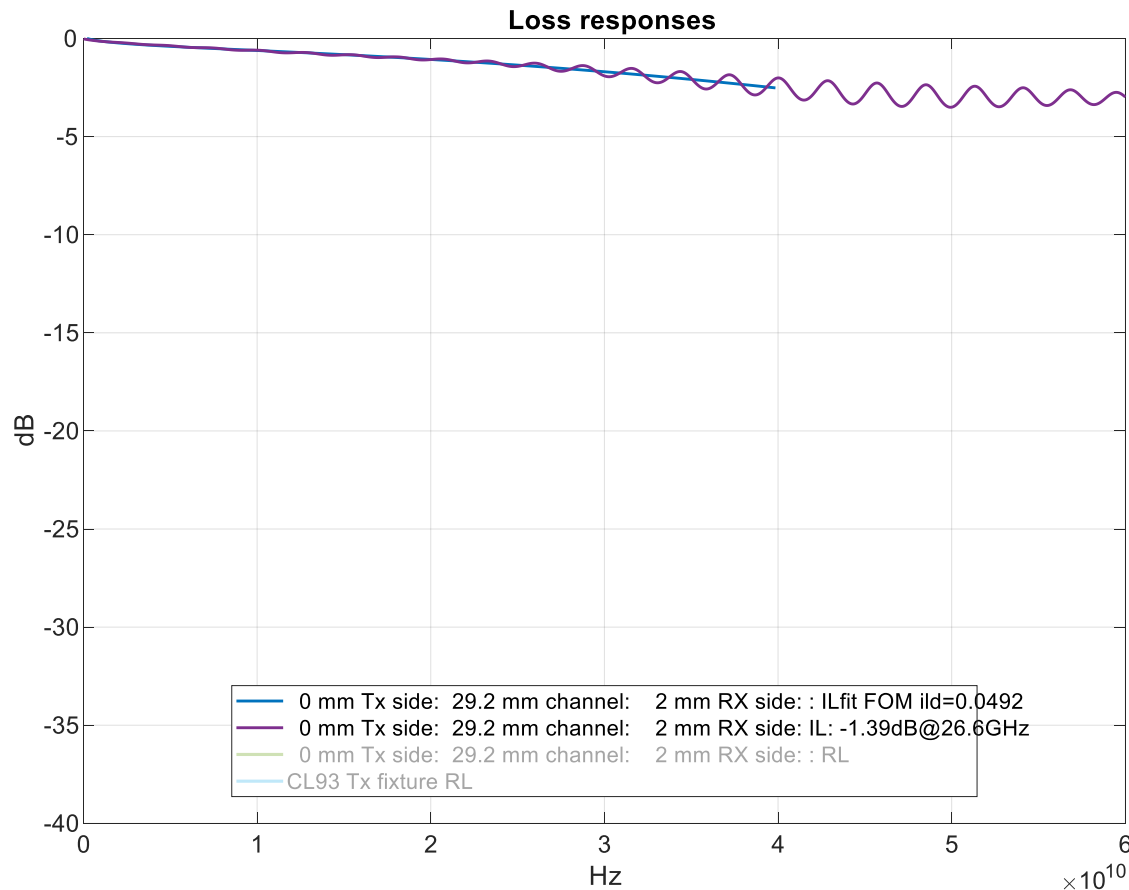
❑ ERL min channel ~ 10.5 $\rho_x \cong 0.30$ for device

ERL for reference package with fixture



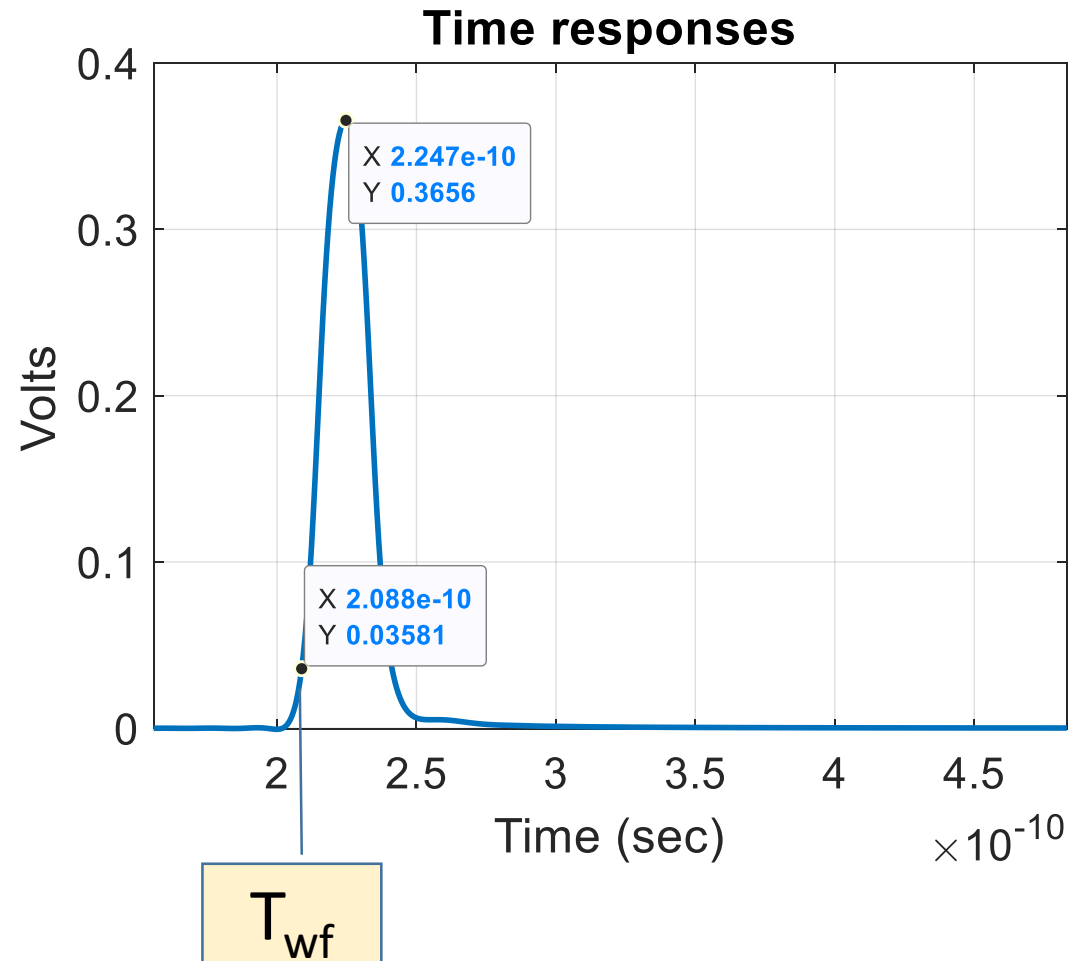
This Test fixture IL and RL are better compared to .3cd specifications

FOM_{ild} is ~ 0.05 dB (spec was 0.1 dB)



Suggested method to determine T_{fx}

- ❑ Acquire pulse response from TP0(TP5) to TP0a(TP5a)
- ❑ Determine pulse peak voltage
- ❑ Determine the time, T_{wf} where the pulse is 10% of peak height
- ❑ $T_{fx} = 2 * T_{wf}$
- ❑ In example at side
 - $T_{fx} = 4.16e-10$

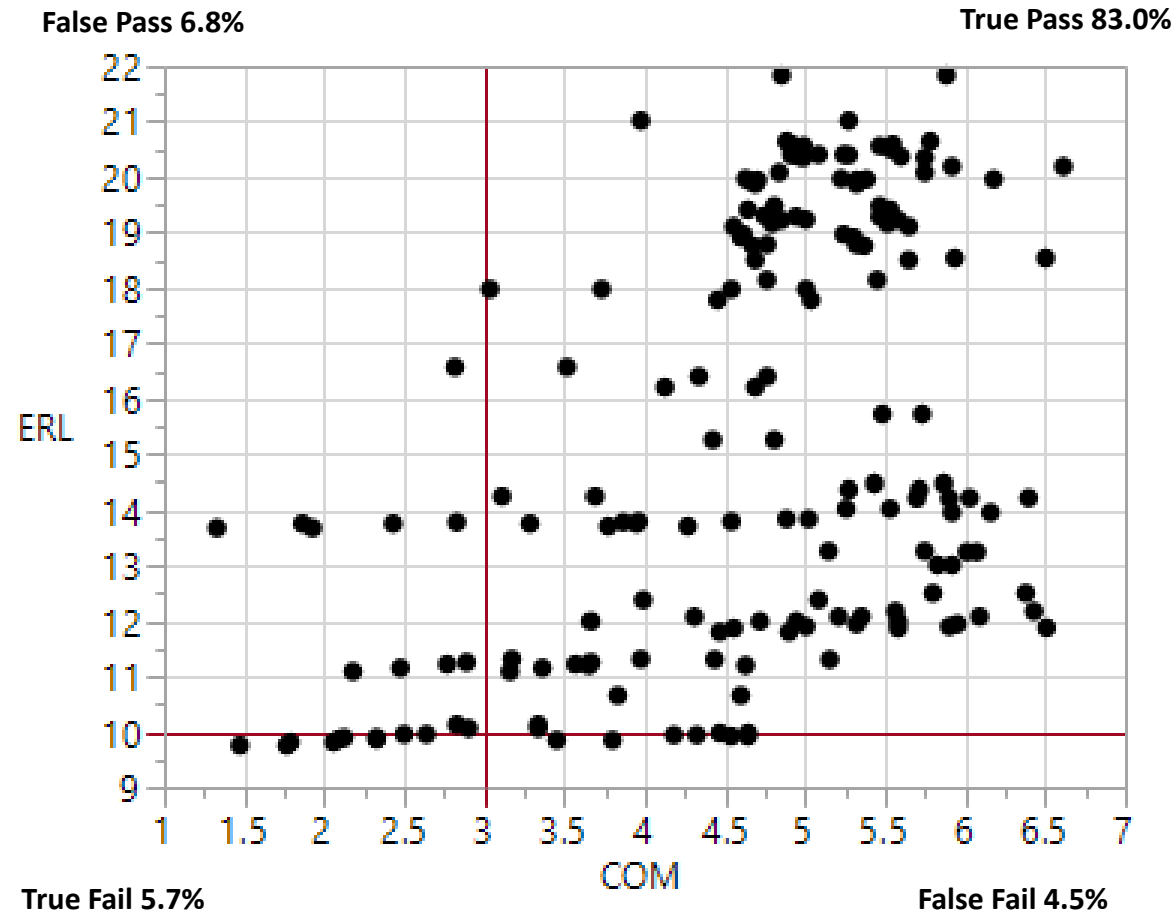


ERL results for different package lengths

- ❑ ERL 31 mm LC package = 16.9 dB
- ❑ ERL 30 mm LC package = 16.1 dB
- ❑ ERL 29 mm LC package = 15.9 dB
- ❑ ERL 20 mm LC package = 16.3 dB
- ❑ ERL 12 mm LC package = 16.1 dB
- ❑ Allowing for ~0.4 dB for margin, 15.5 dB seems like a good limit
 - Note: Physical device data has not been published yet

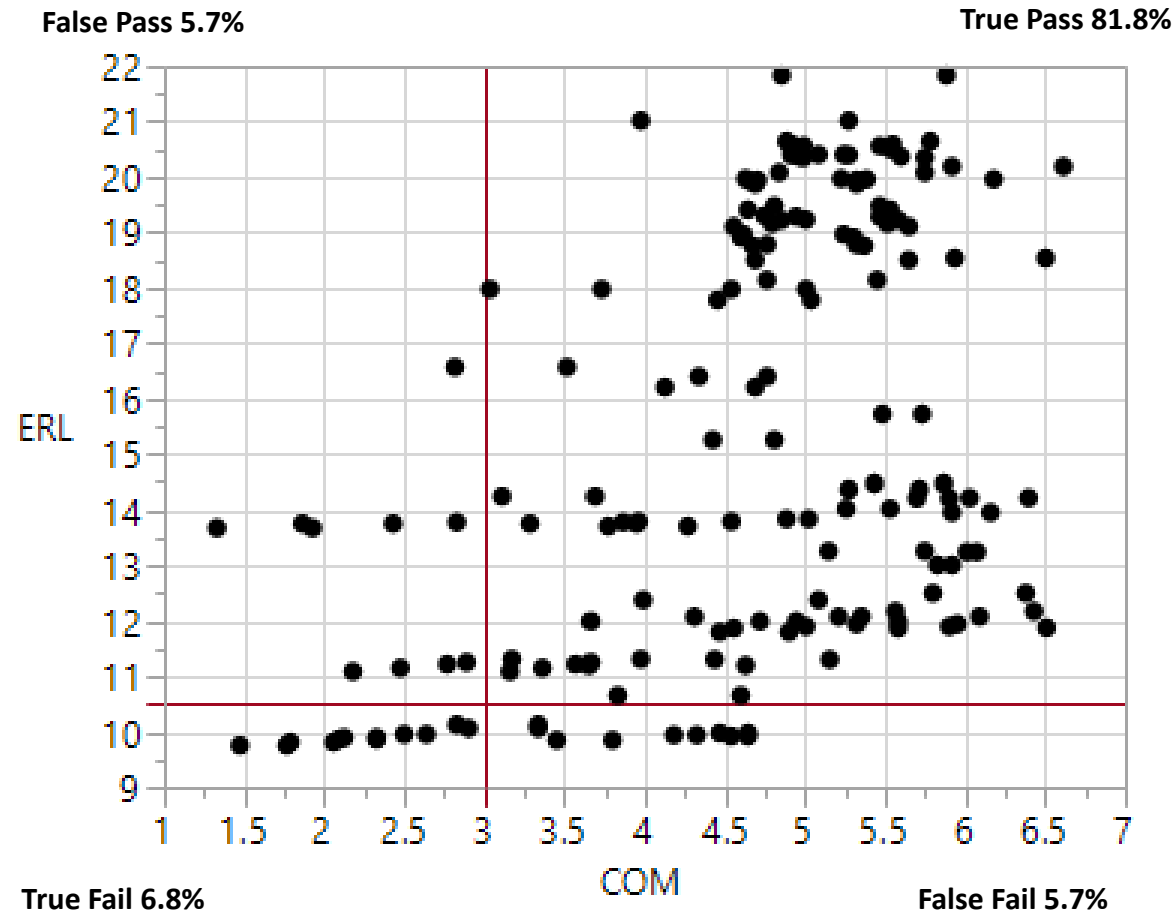
“Dialing in” ERL 10 dB

12 fixed taps
3 banks of 3 floating taps
40UI span
 $b_{\max}(1)=0.85$
 $b_{\max}(2..n)=0.2$



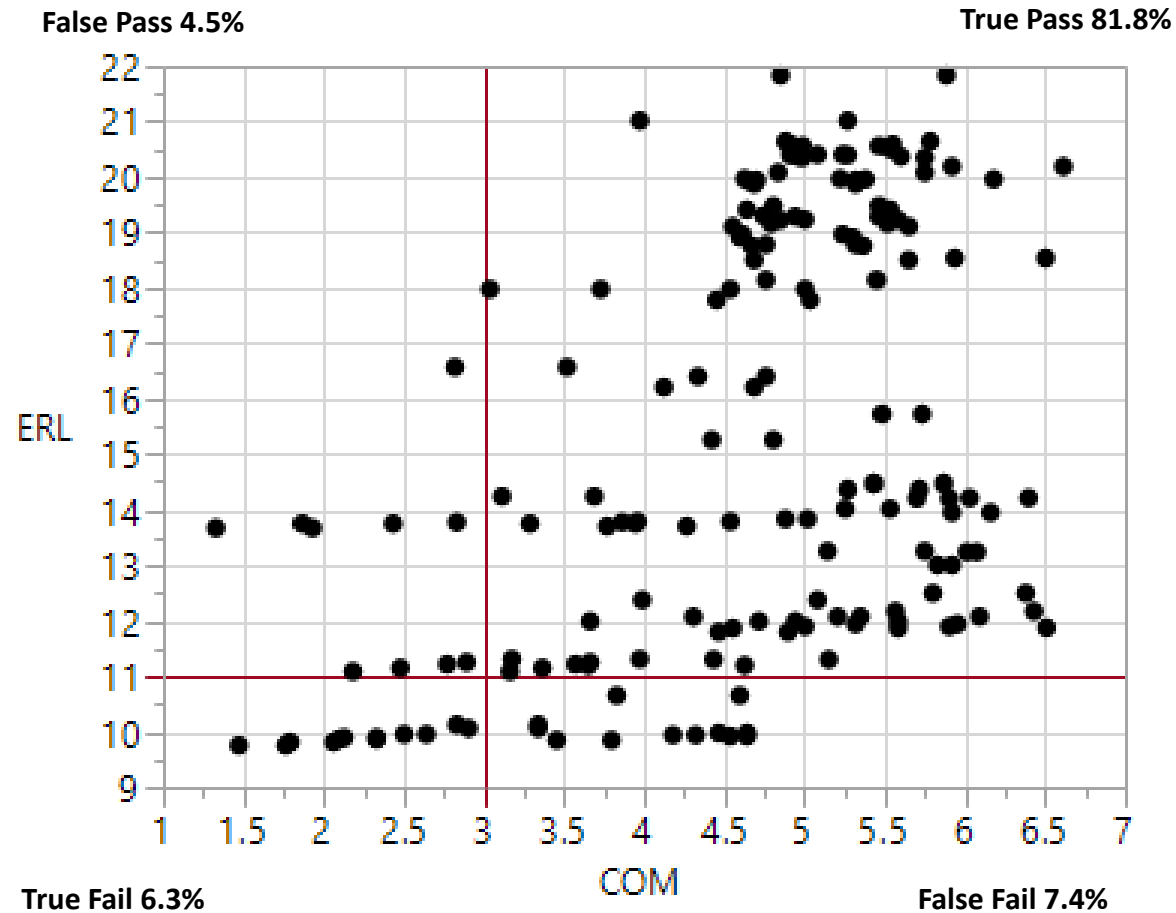
Dialing in" ERL 10.5 dB

12 fixed taps
3 banks of 3 floating taps
40UI span
 $b_{\max}(1)=0.85$
 $b_{\max}(2..n)=0.2$

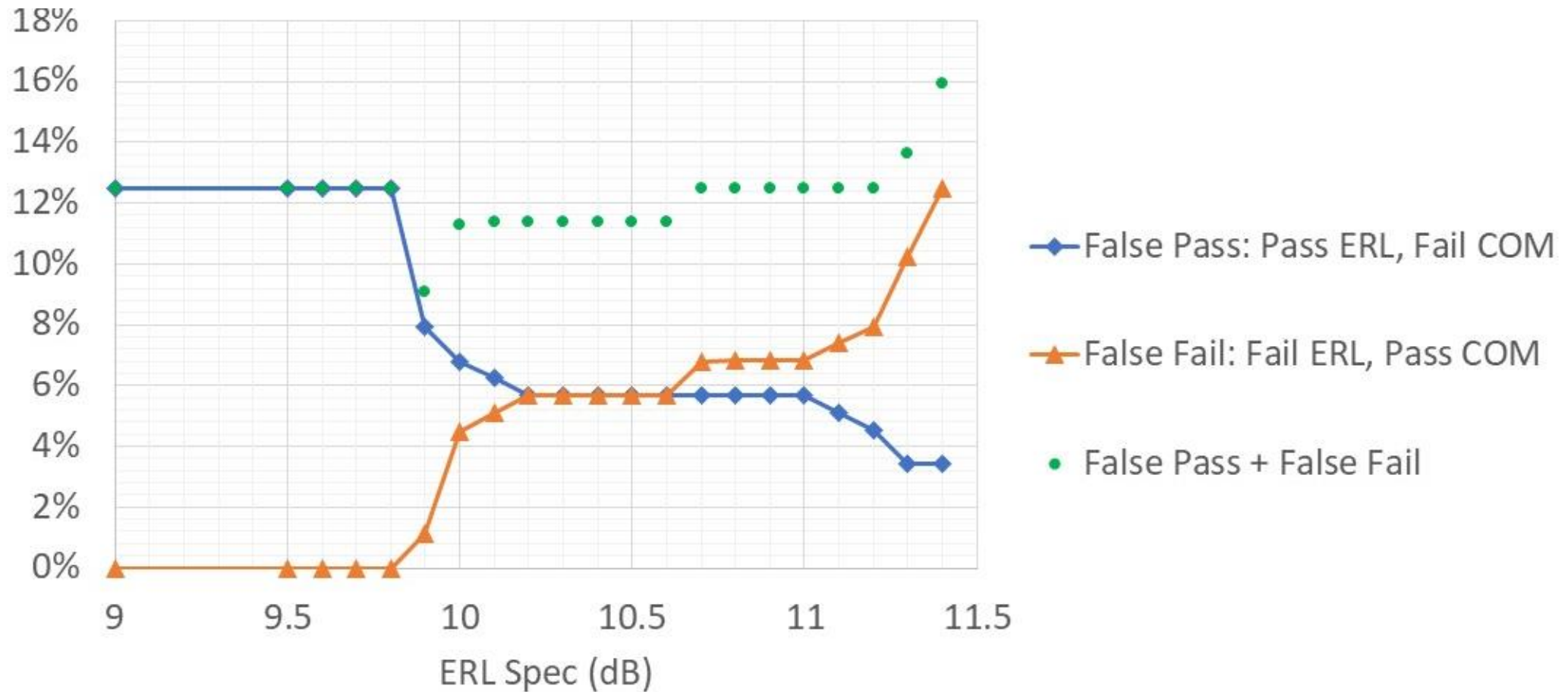


“Dialing in” ERL 11 dB

12 fixed taps
3 banks of 3 floating taps
40UI span
 $b_{\max}(1)=0.85$
 $b_{\max}(2..n)=0.2$



Results: False Pass/False Fail



ERL Parameters for KR

KR Tx and Rx device

- ☐ $\rho_x = 0.30$
- ☐ $\beta_x = 2.3407$ GHz
- ☐ $T_r = 10$ ps
- ☐ $N = 200$
- ☐ $N_{bx} = 12$
- ☐ $ERL_{min} = 15.5$ dB
- ☐ Set $FOM_{ild} > 0.05$ for device test fixtures

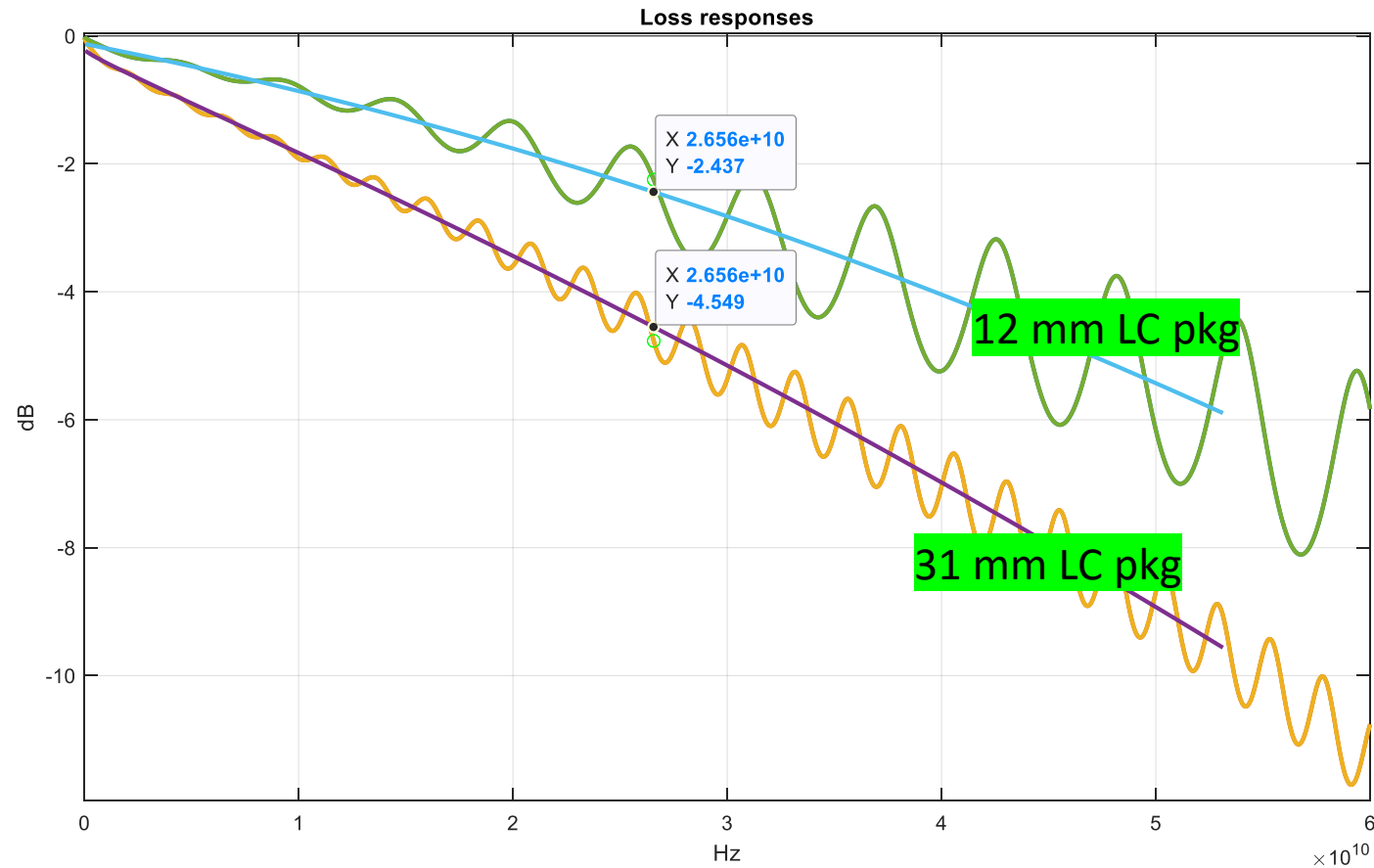
KR channel

- ☐ $\rho_x = 0.17$
- ☐ $\beta_x = 2.3407$ GHz
- ☐ $T_r = 10$ ps
- ☐ $N = 3000$
- ☐ $N_{bx} = 12$
- ☐ $ERL_{min} = 10.5$ dB

Thank You!

Back up data

Fitted Loss* Difference Between 12 mm and 31 mm Package is 2.112 dB



* C_d included

Time Delay Difference Estimate Between 12 mm and 31 mm LC Package is 117.6 ps

