100GEL PACKAGE ASPECTS UPDATE

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Comments

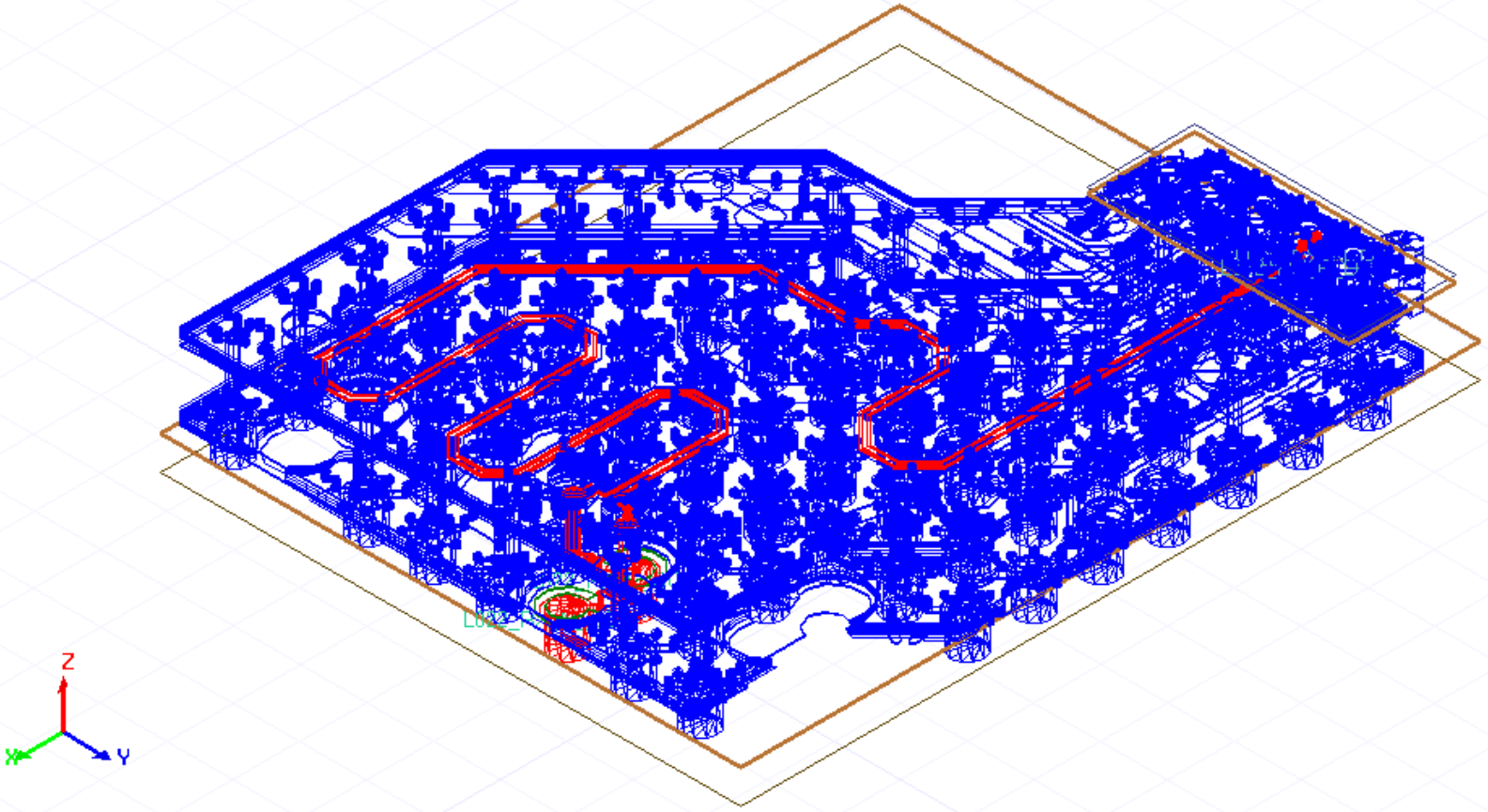
- PTH (plated through hole) on a thick core package seems inductive
- Coreless small packages not evaluated
- There seem to be 3 package cases for channel compliance
  - High radix packages with a long trace route
  - High radix packages with a short trace route
  - Low radix packages coreless packages

Package Model Extractions

- 30mm PKG trace was design and extracted using HFSS
- Trace width ≈ 30µ
- Dielectric Loss Coefficient = 0.0049 @ 10GHz (Room Temp)
- Next generation surface roughness treatment

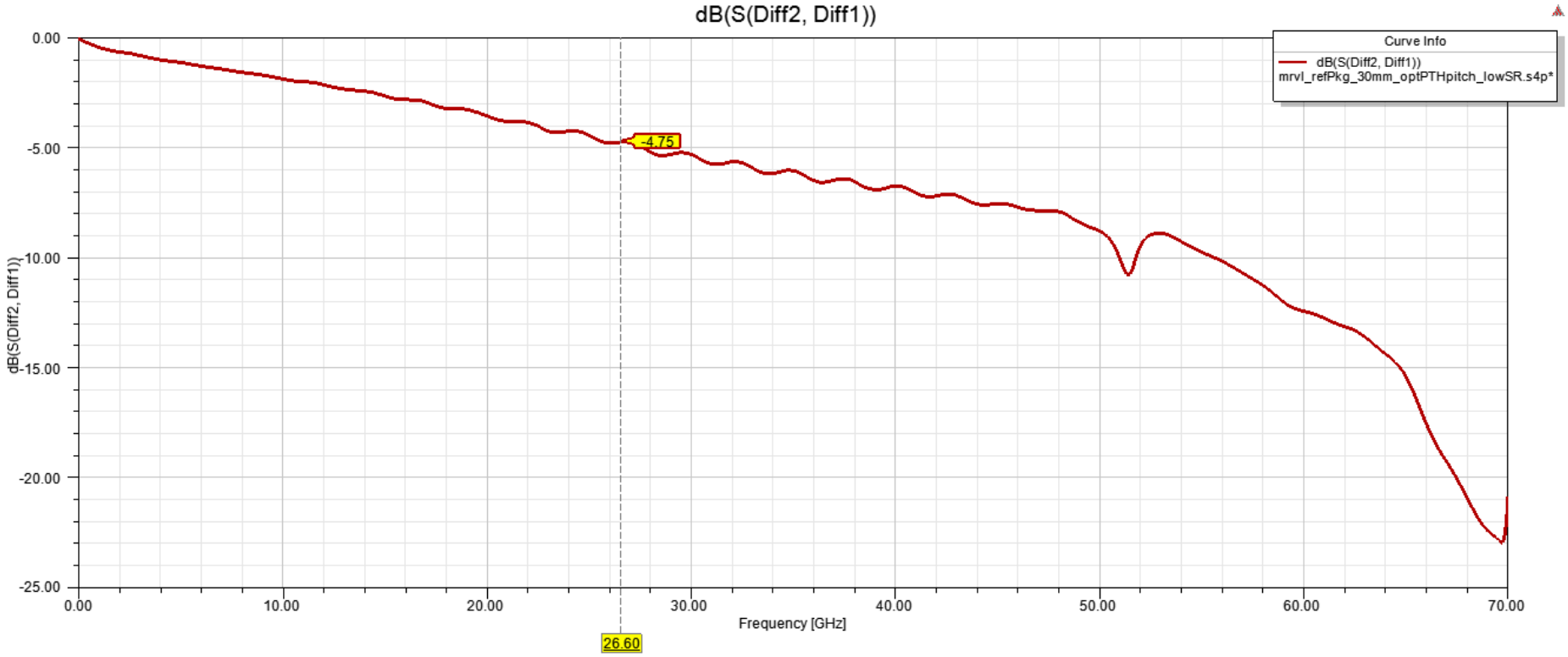
- 30mm PKG trace with PTH @ mid of trace resulted in reflection within the compensation tap region
  - Reflection was bigger, but due to location better COM
  - May want to decide on exact location after definition of reference receiver topology
- 8mm model was supplied with higher Xtalk – For extraction of sigma Xtalk noise - WIP

Synthetic 30mm Package Model Extraction

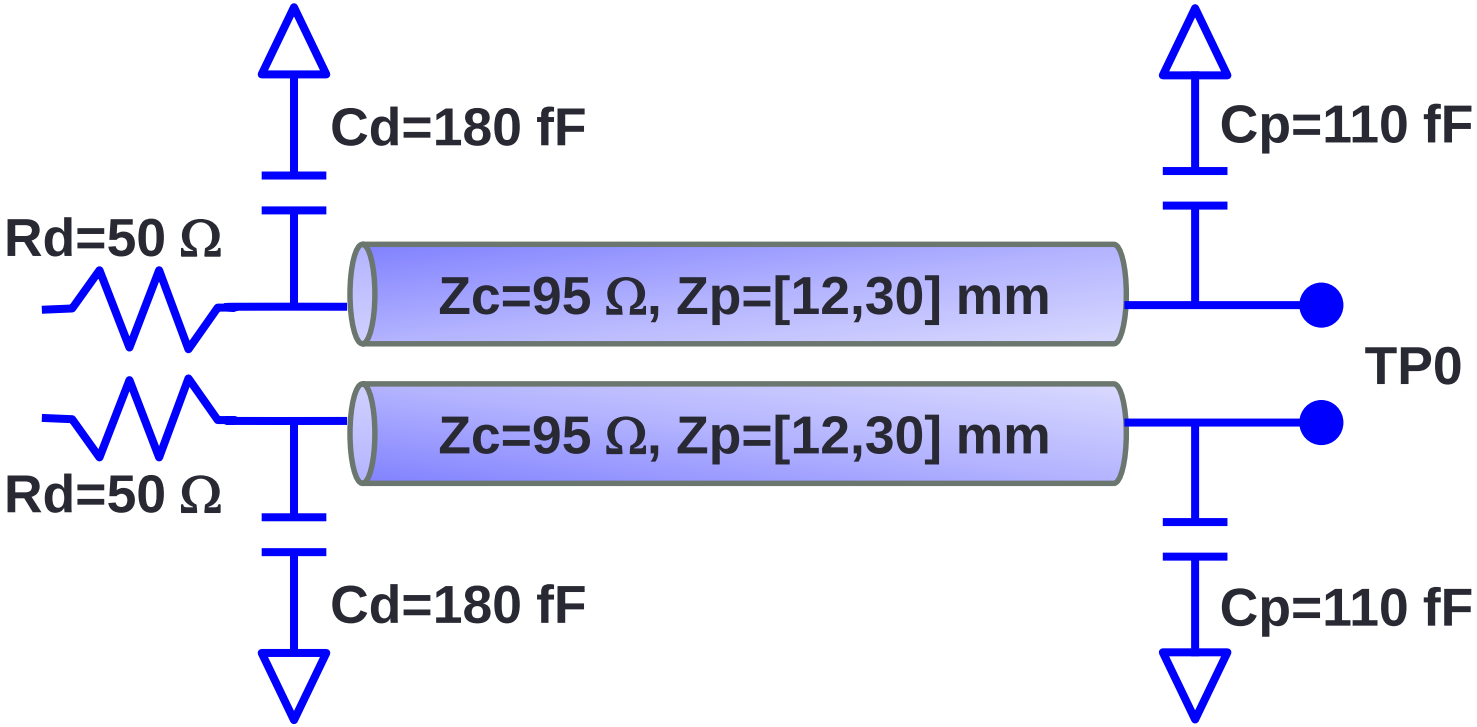


Synthetic 30mm Package Model Extraction

- Loss amount resulted in an amount close to 5dB @ 26.6GHz (aligned with prediction)
- No Manufacturing tolerance
- No temperature related extra loss

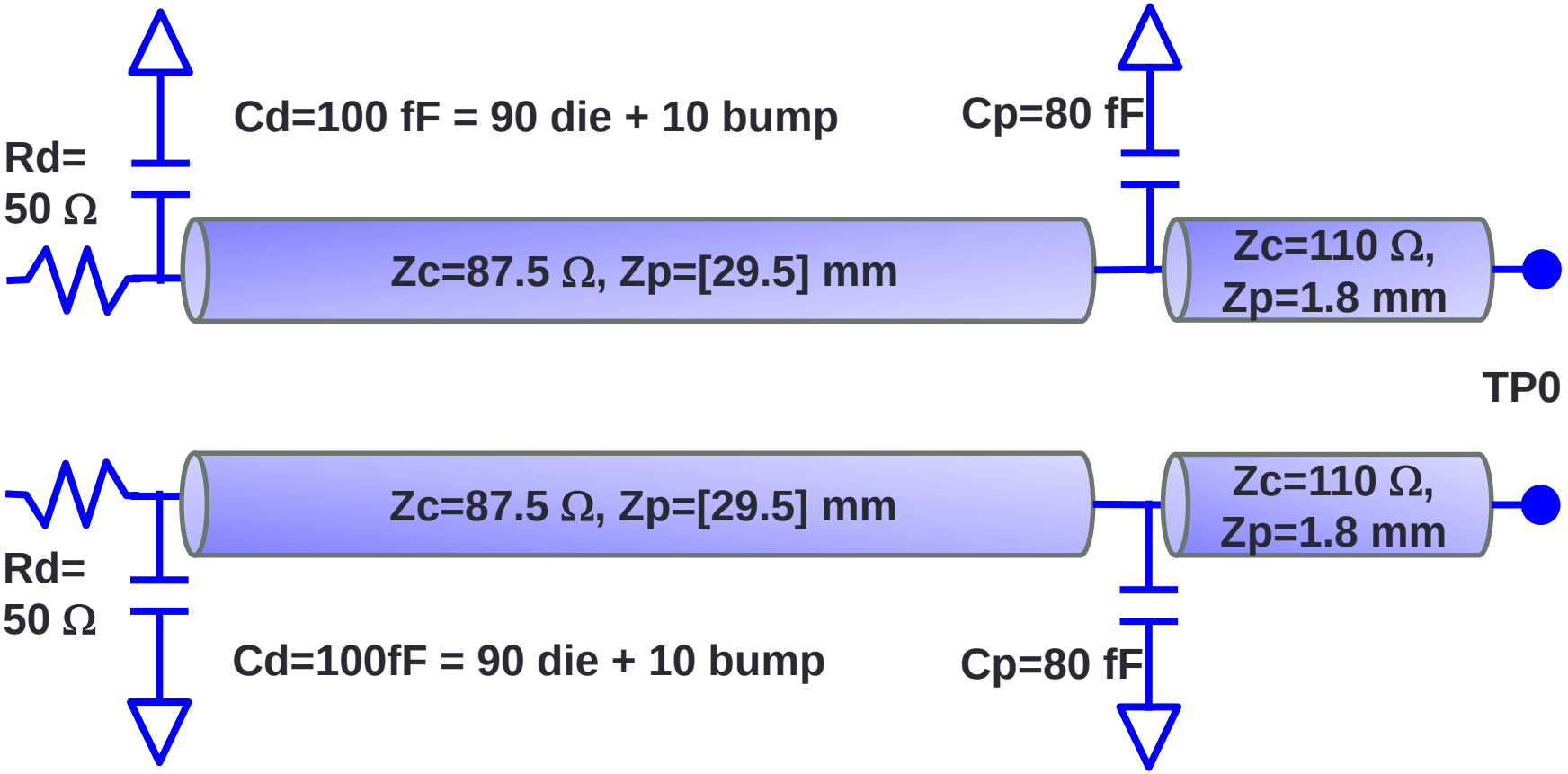


IEEE802.3 cd COM package model

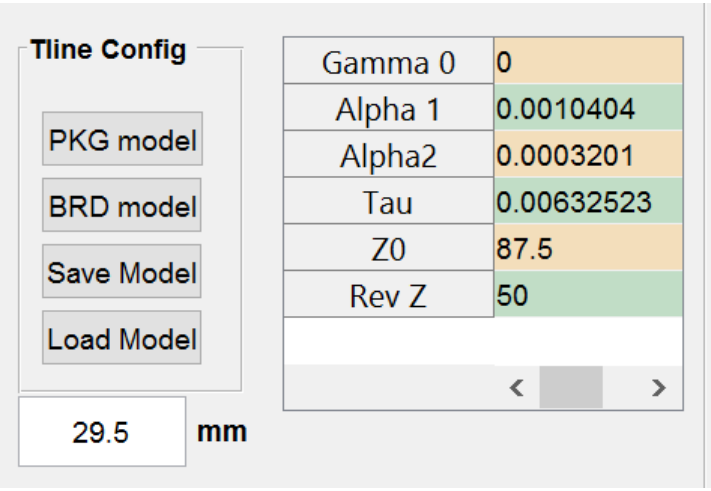


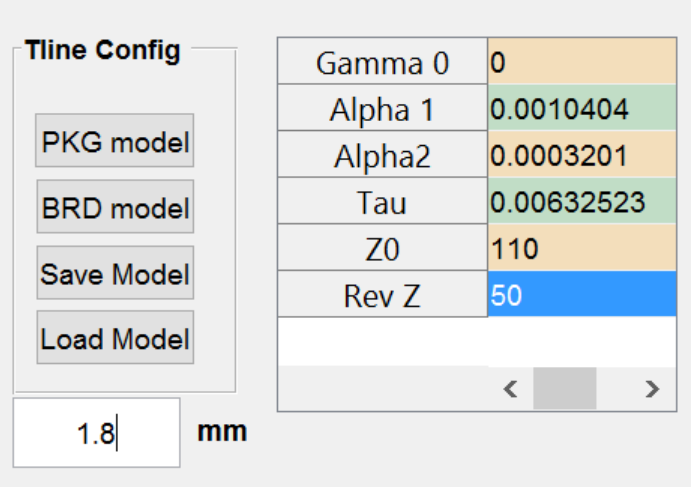
REFERENCE

Matching to extracted packages model

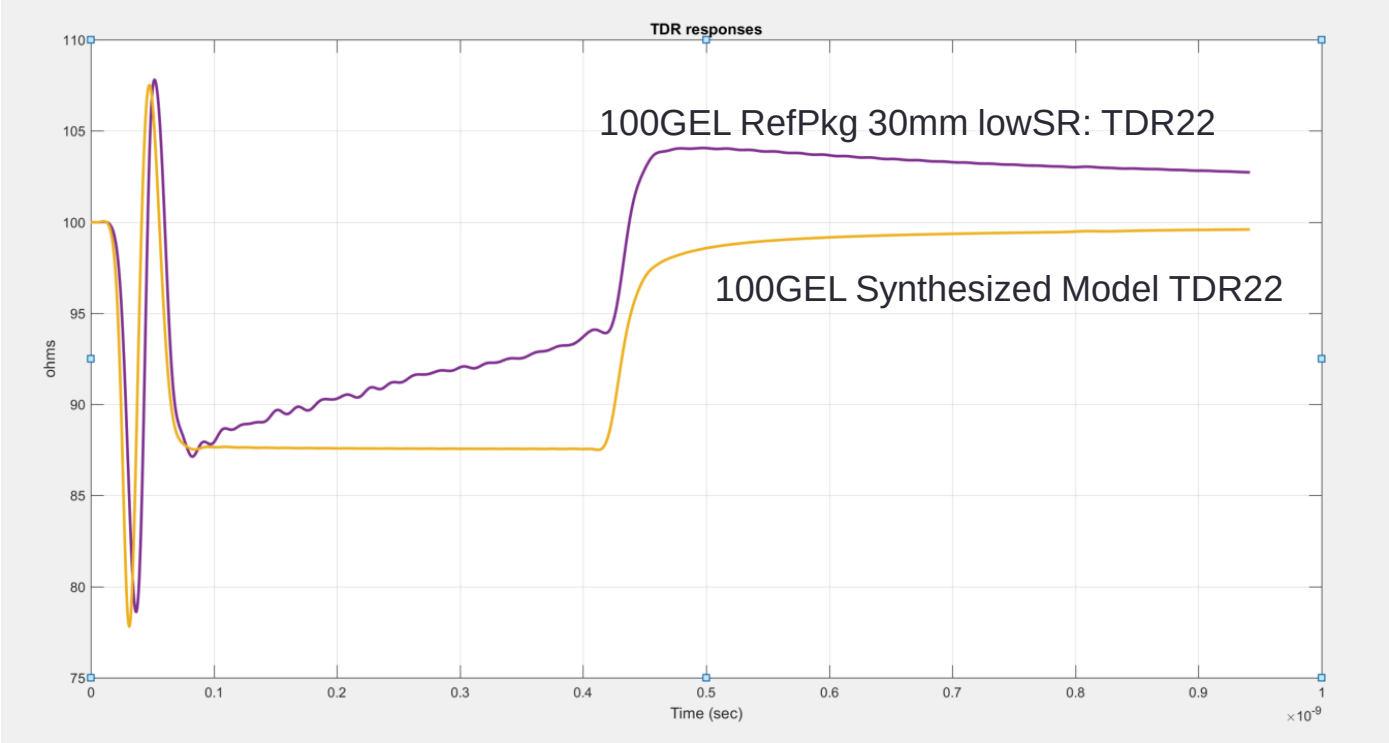


New Transmission Line Parameters

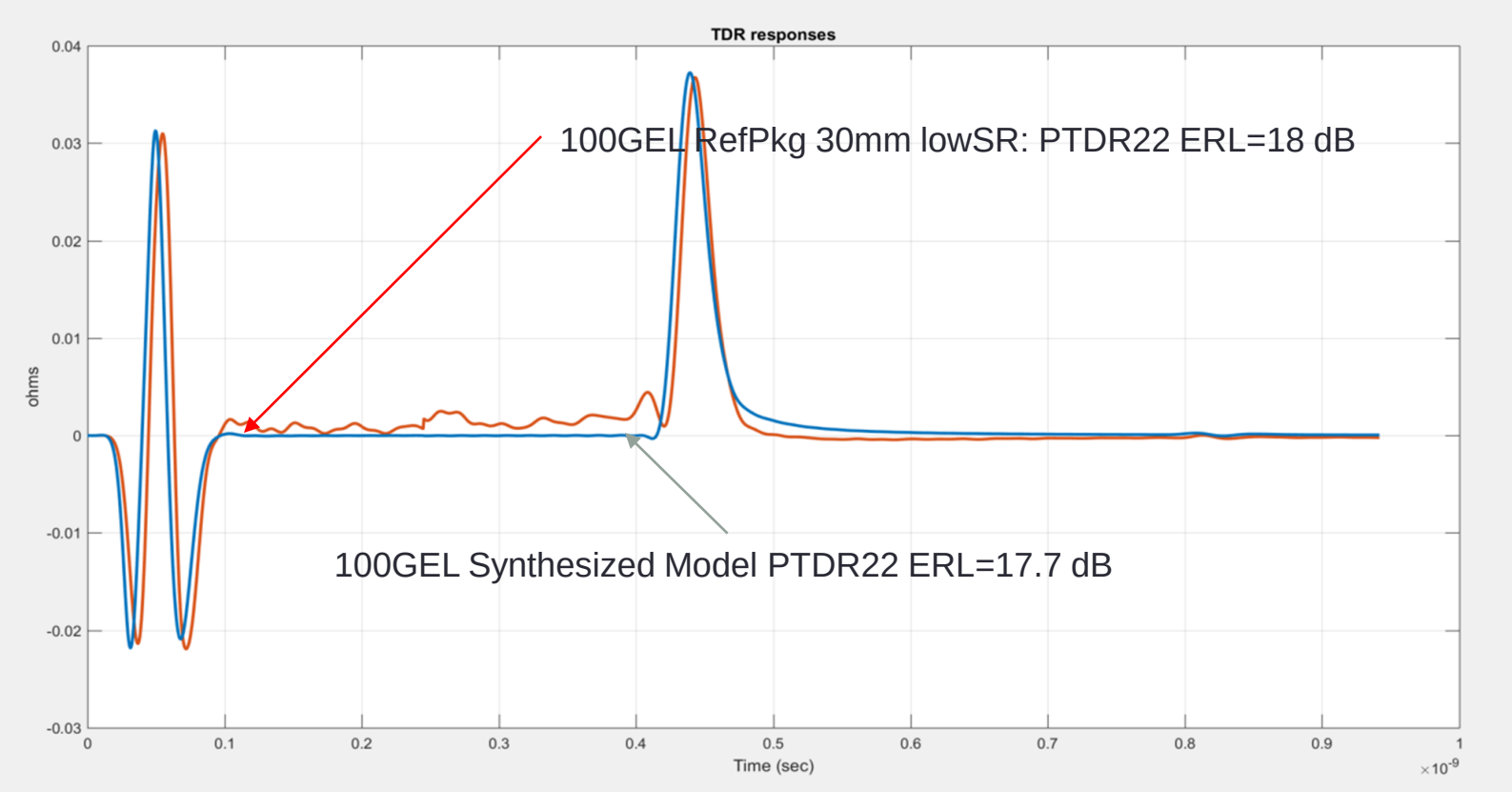




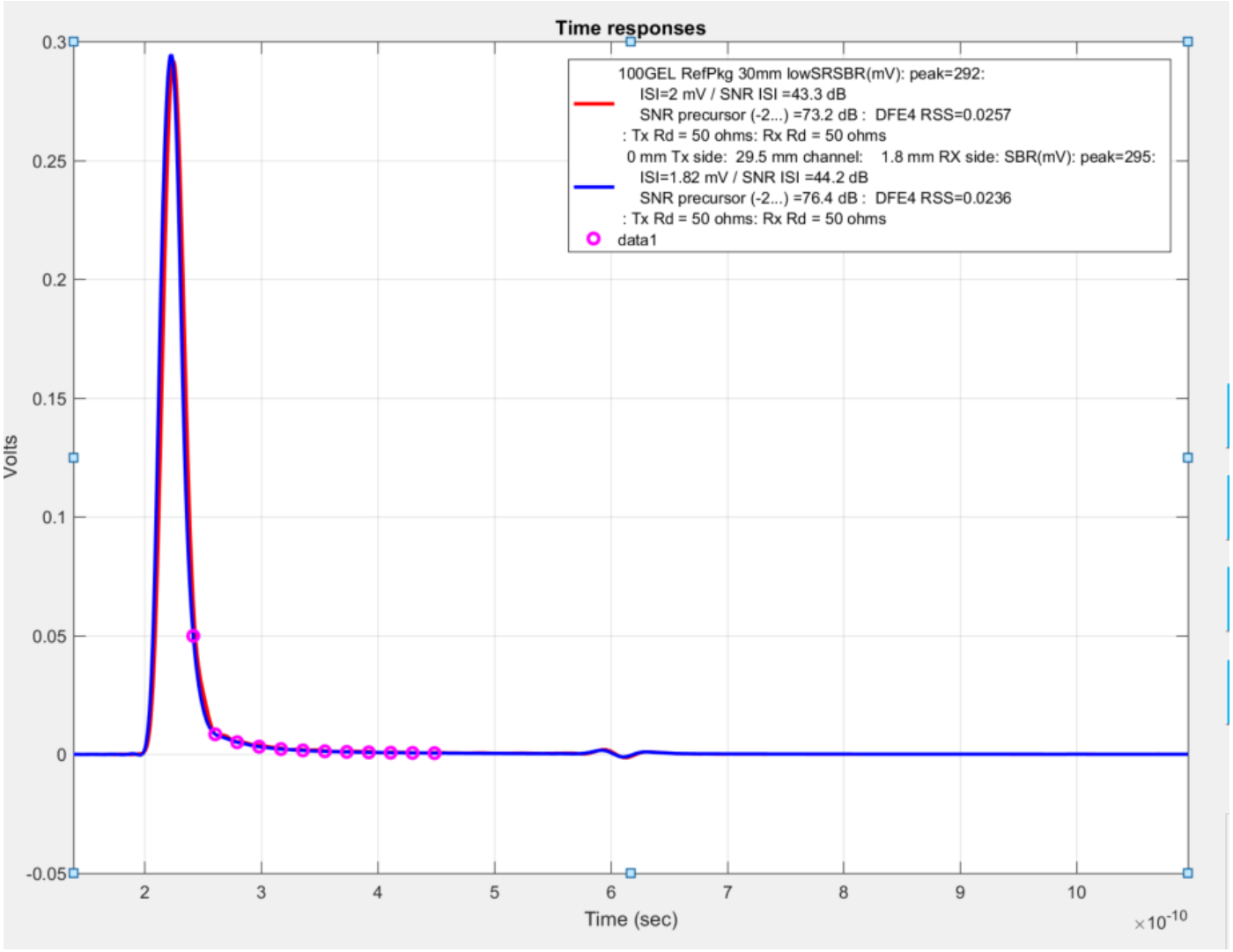
Matching 100GEL RefPkg 30mm lowSR TDR into package without die load



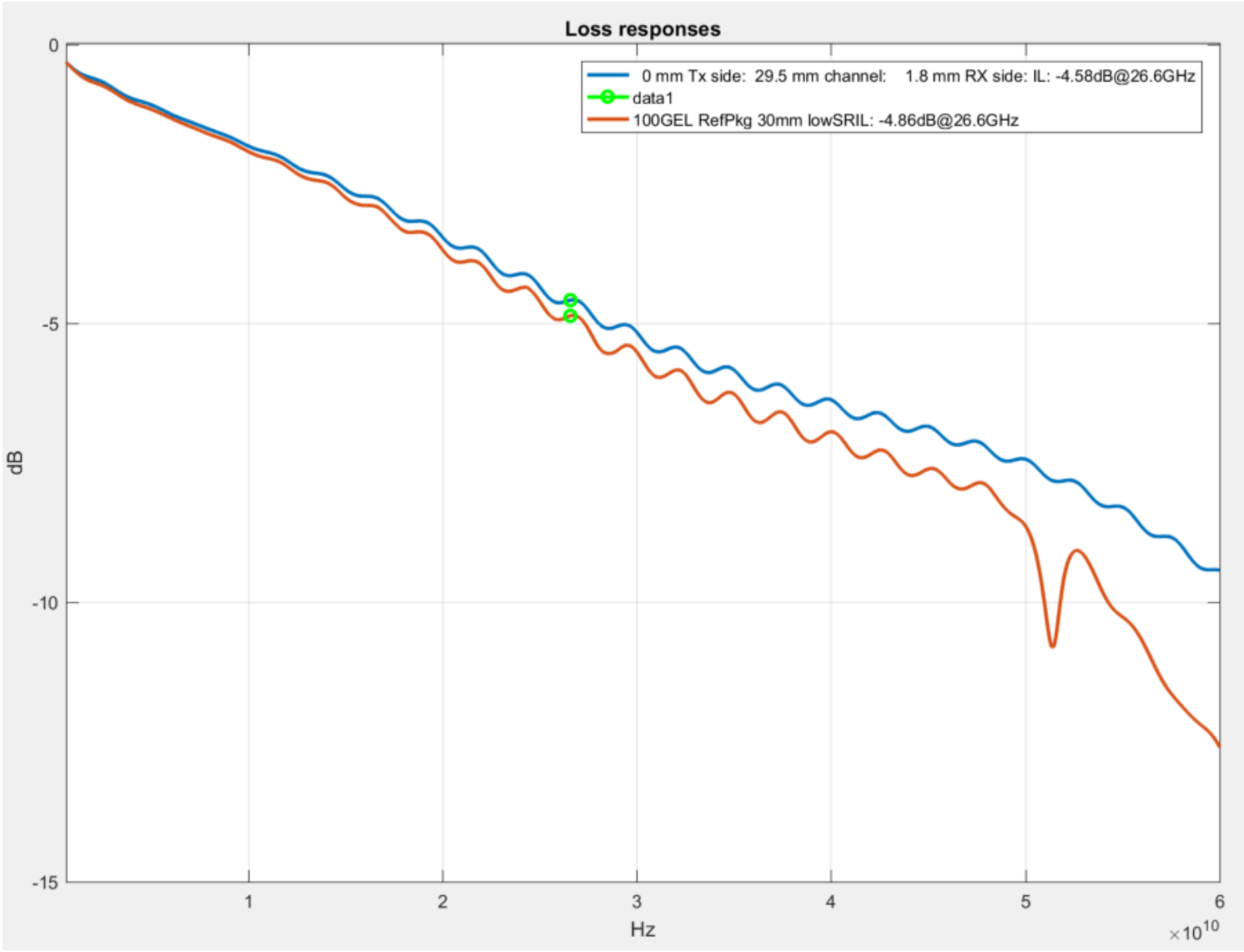
PTDR and ERL match is good



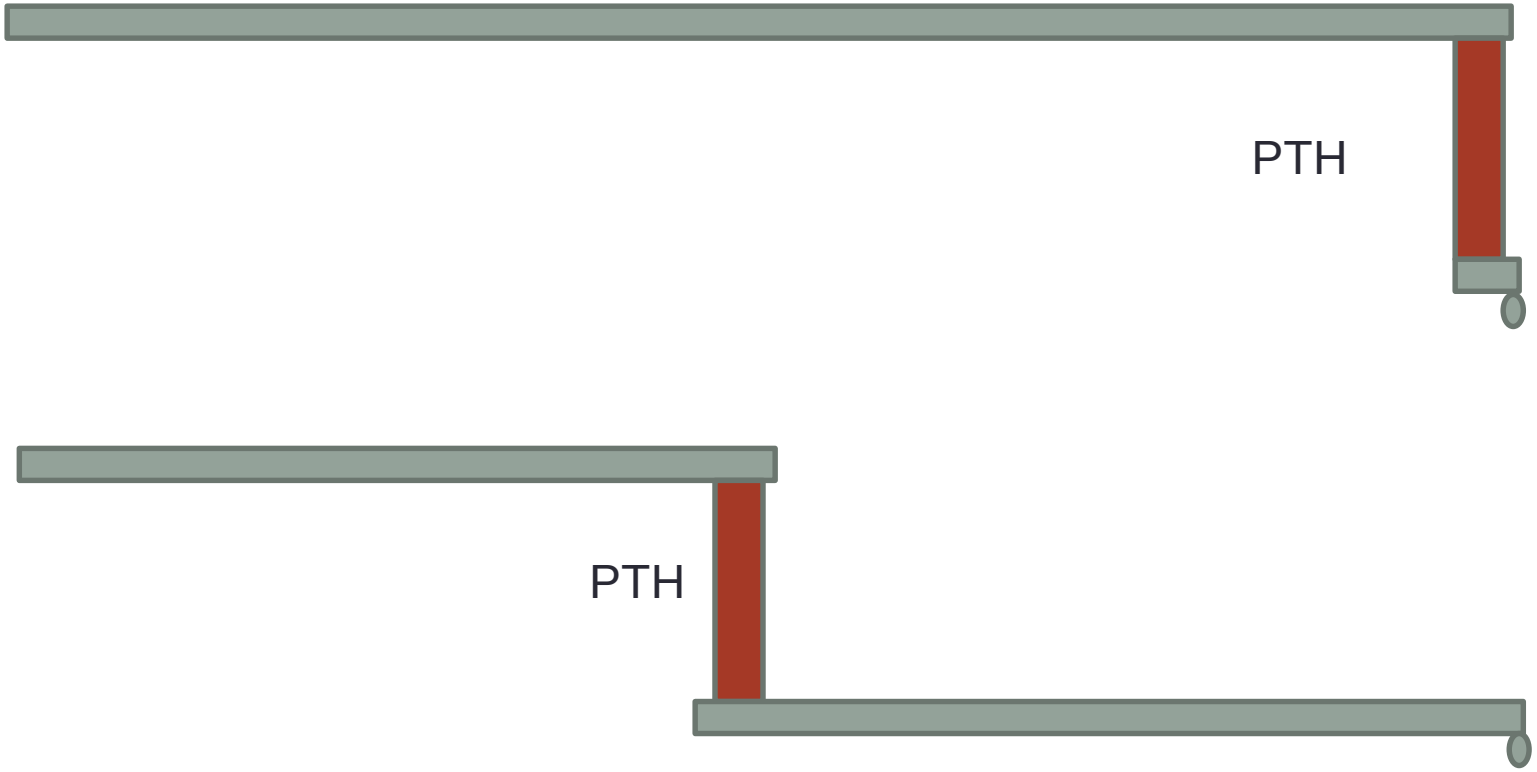
Pulse Response (6 ps edge) Compares Well



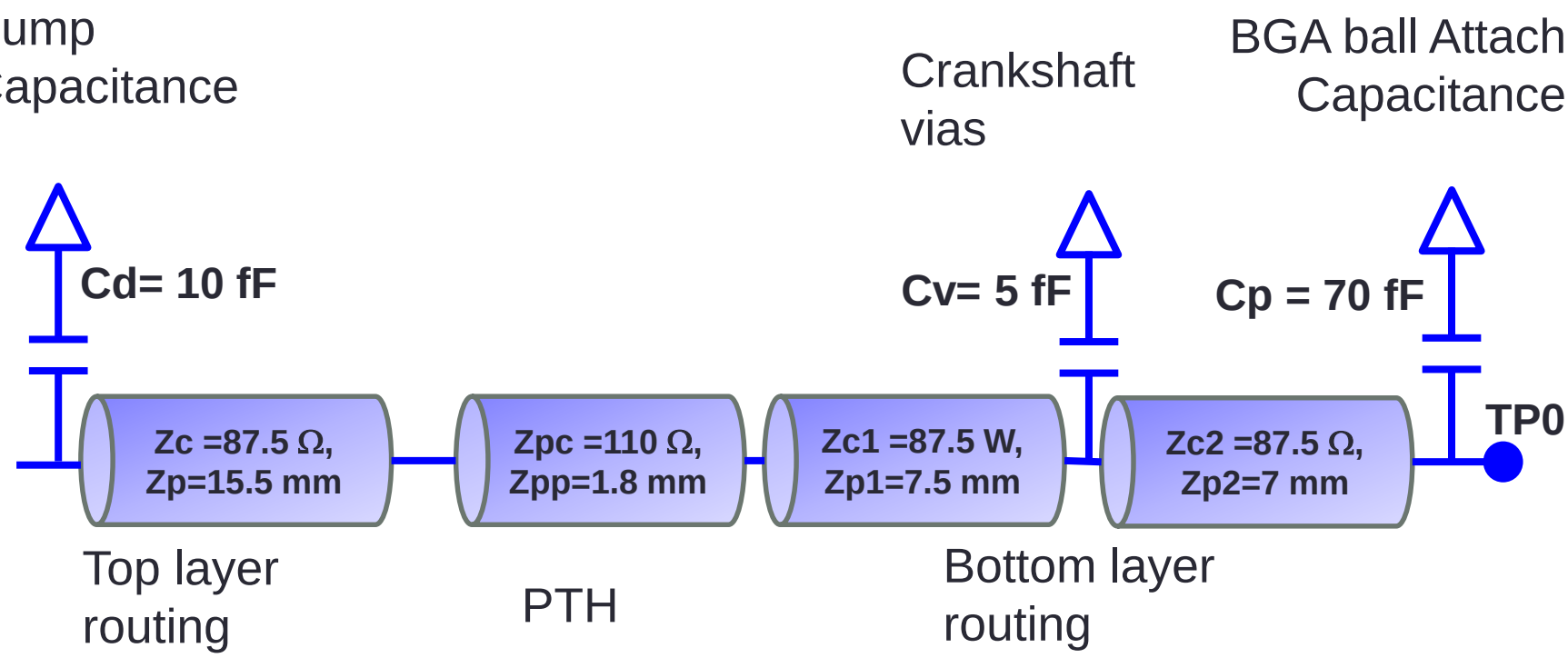
IL compare


Loss responses
0 mm Tx side: 29.5 mm channel: 1.8 mm RX side: IL: -4.58dB@26.6GHz
data1
100GEL RefPkg 30mm lowSRIL: -4.86dB@26.6GHz
0
-5
-10
-15
dB
1
2
3
4
5
6
Hz
×10^10

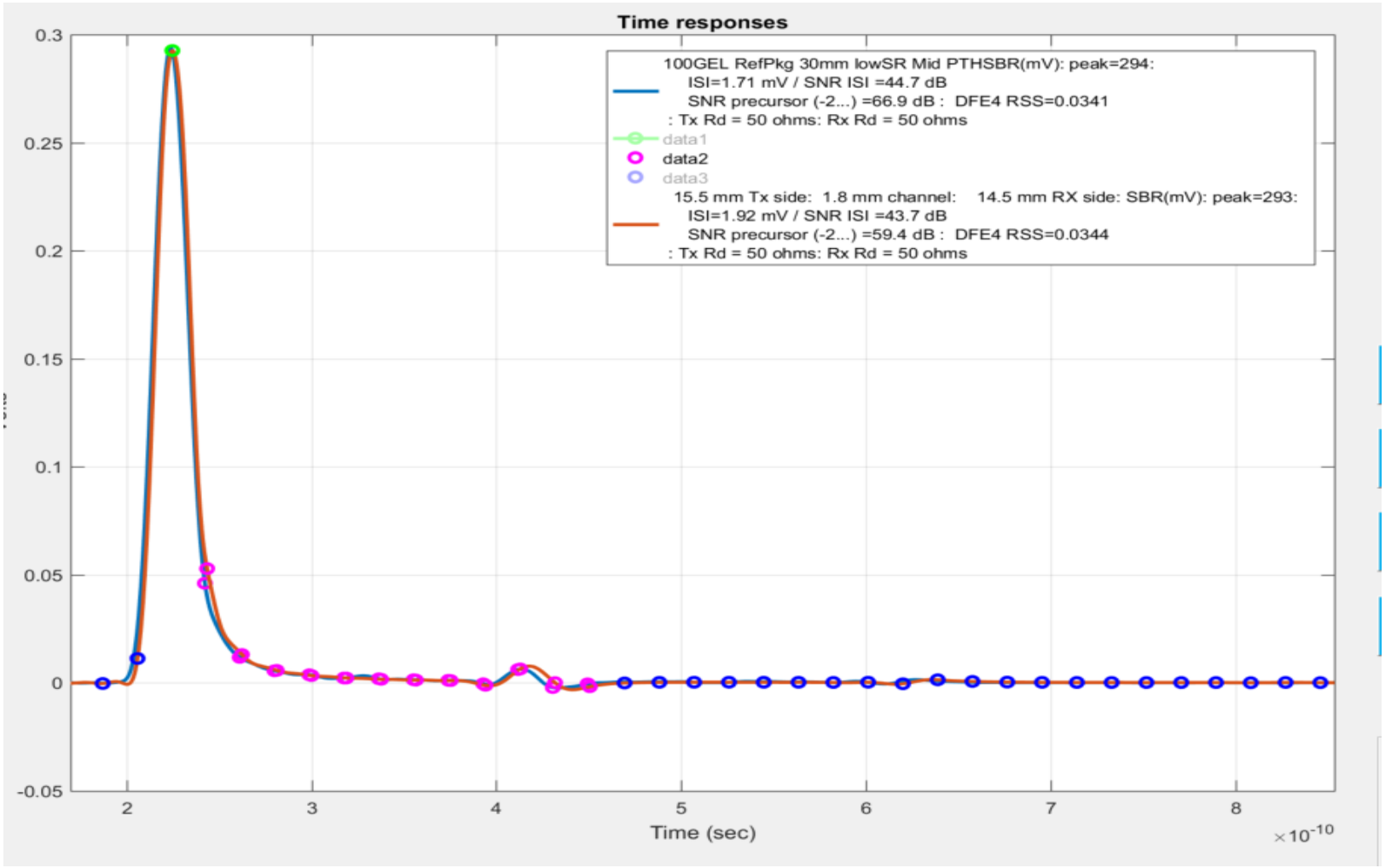
PTH moves to middle of package



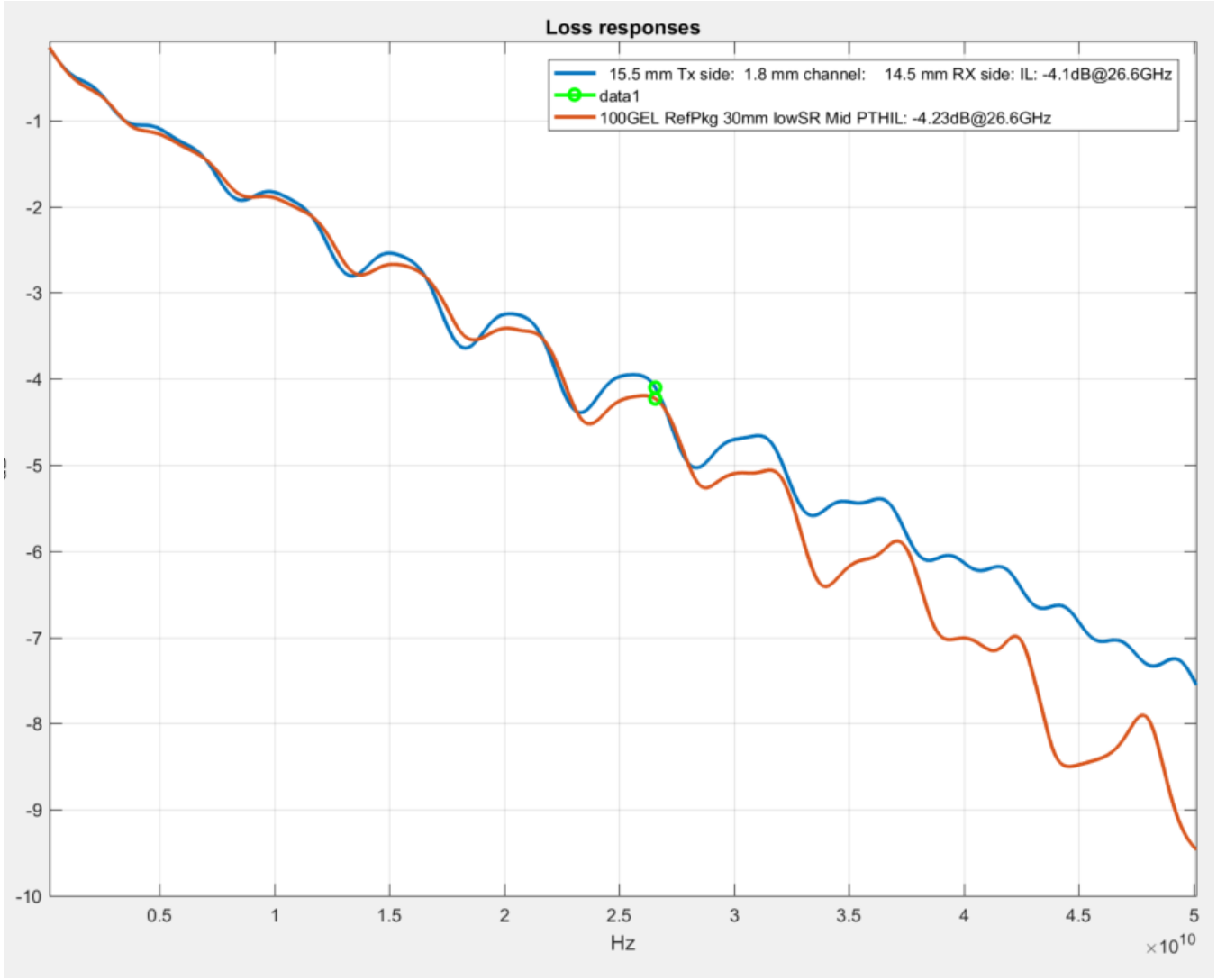
Match for the mid PTH model



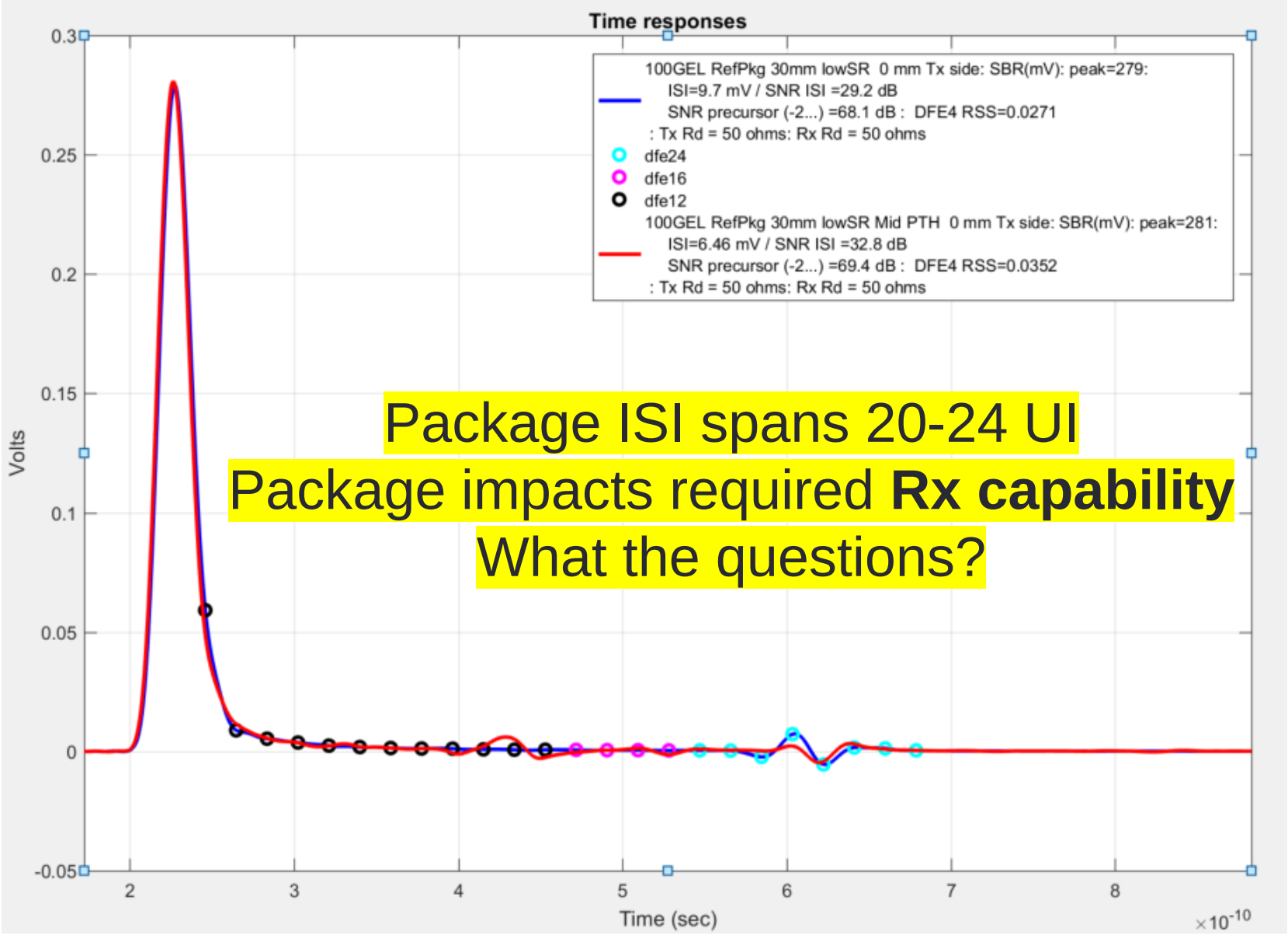
Pulse response compare (6 ps edge) (30 mm mid route PTH



IL compare


Loss responses
15.5 mm Tx side: 1.8 mm channel: 14.5 mm RX side: IL: -4.1dB@26.6GHz
data1
100GEL RefPkg 30mm lowSR Mid PTHIL: -4.23dB@26.6GHz
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Hz
×10^10

Die load (120 ff) pulse response and ISI taps

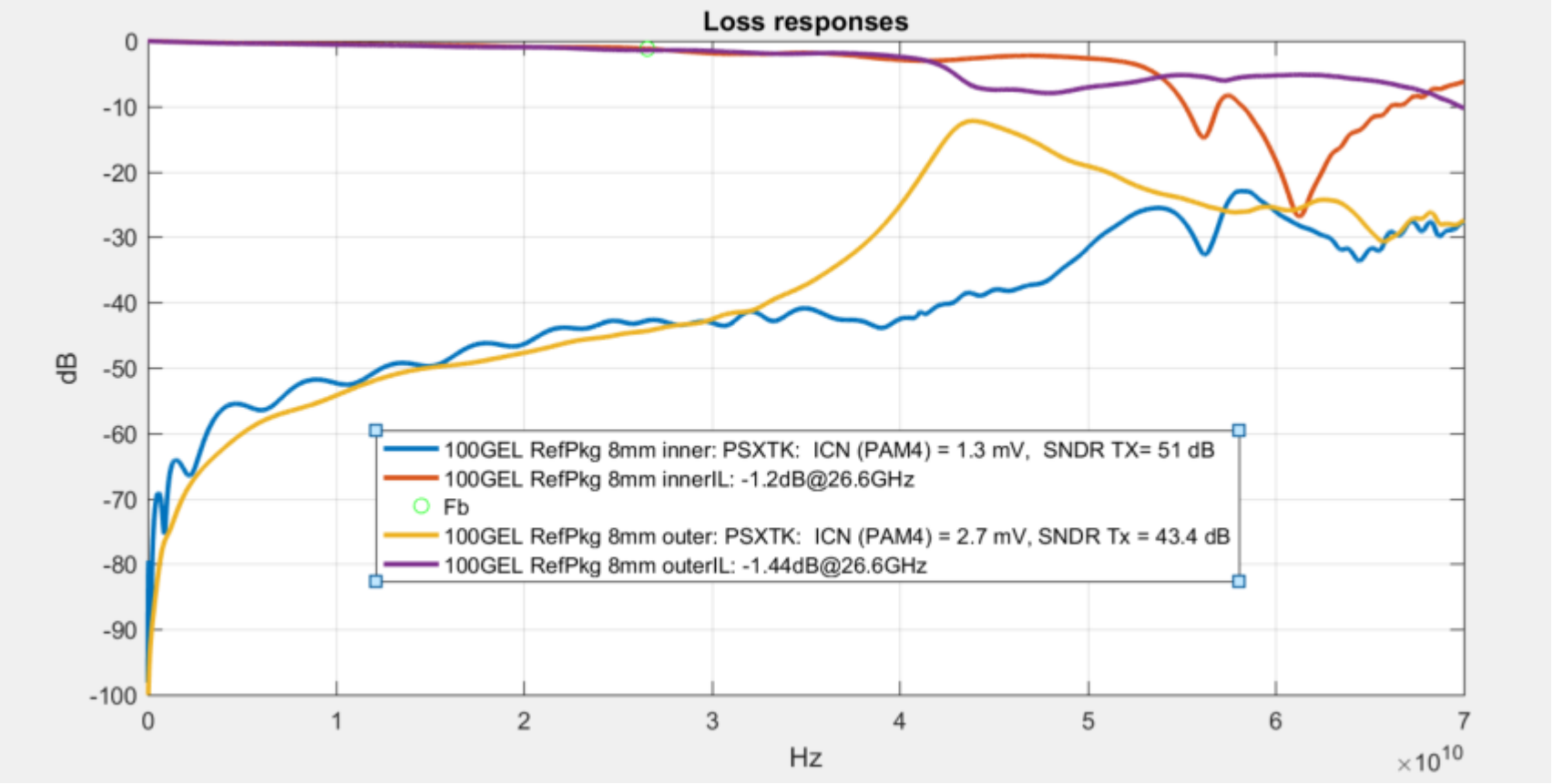


Package ISI spans 20-24 UI

Package impacts required **Rx capability**

What the questions?

8 mm package has between SNDR between 43 dB and 51 dB



Test fixture not included

Suggested Next Steps and Discussion

- To Pass COM, Recommend lowering Cdie (Cd) in COM to ~100fF – Discussion
- Discuss possible PTH discontinuity again once Rx topology is decided
- Evaluate the impact of Manufacturing tolerance and temperature ➔ discuss whether should be modeled or included in the COM margin
- More work on extracted dense PKG crosstalk – Simulate impact
- Should SNDR_Tx be matched to short vs long package routing? - Discussion
- Are new COM package model(s) required? – Discussion
- All this suggests there is an expectation for the Rx reference model