

Accounting for uncontrolled ISI in SNDR measurements

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Background

- ▶ The question is now what to do about ISI

From healey_3bs_02_0916.pdf

What does the SNDR requirement currently seek to control?

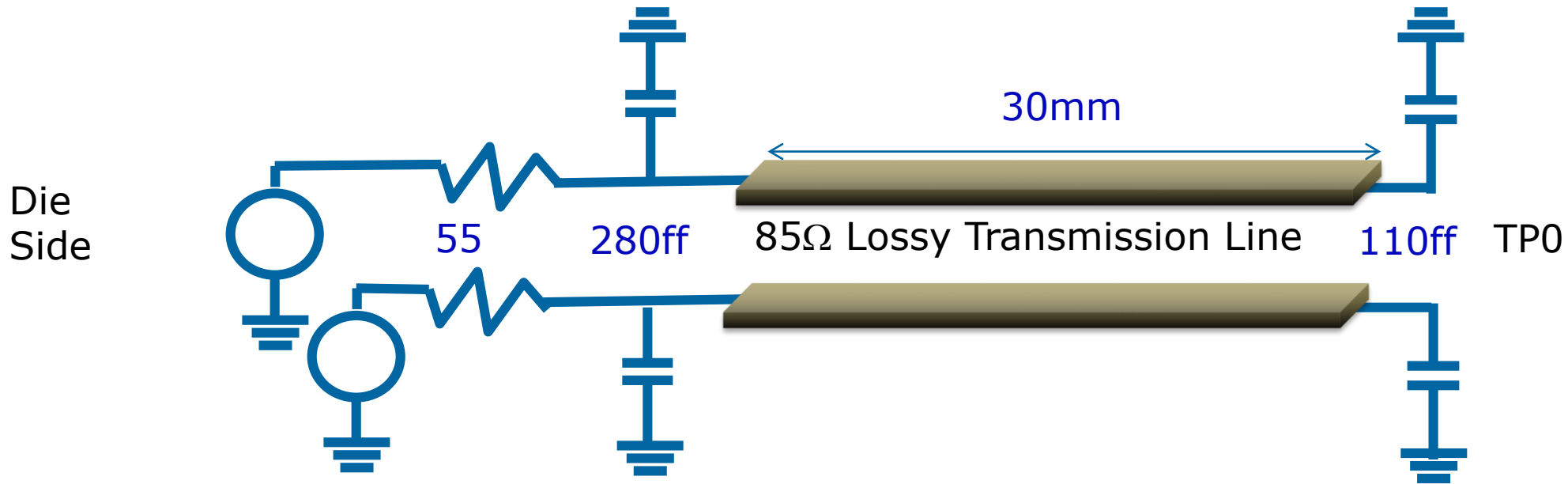
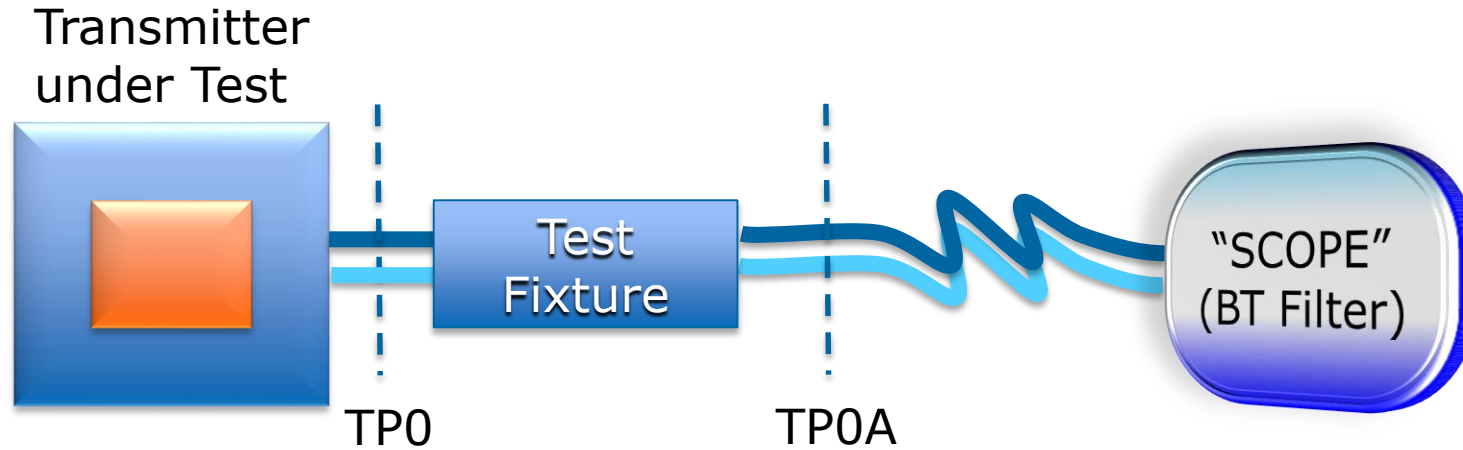
- Correlated (e.g, inter-symbol) interference
- Non-linear distortion
- Uncorrelated noise and interference

- This presentation focuses on the first two terms
- Calculations of “SNDR” do not include the uncorrelated noise/interference term

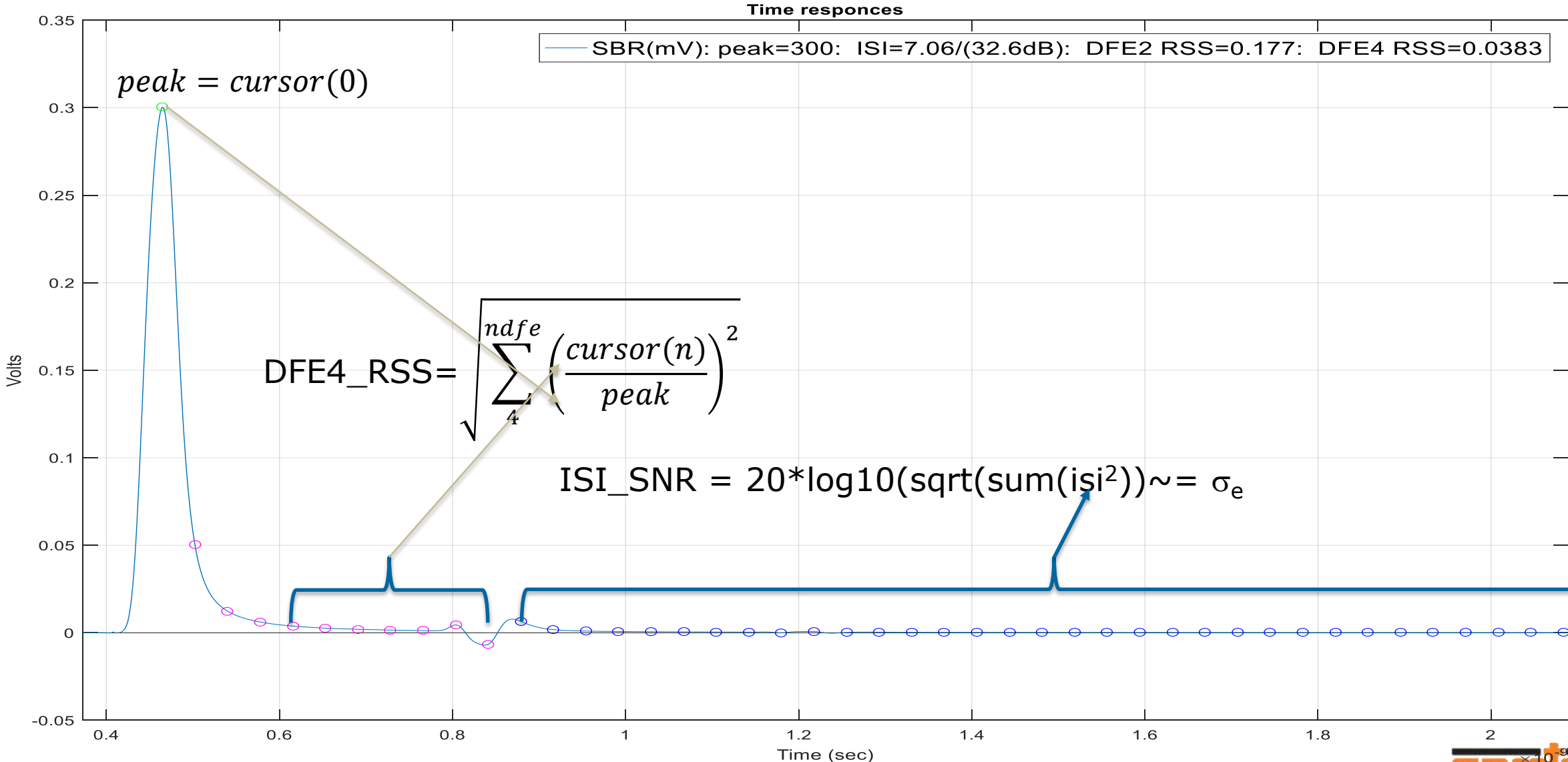
Recommendations

- Compute the linear fit pulse and linear fit error with $D_p = 2$ and $N_p = 200$
- This is expected to make the linear fit error a measure of non-linear **distortion**

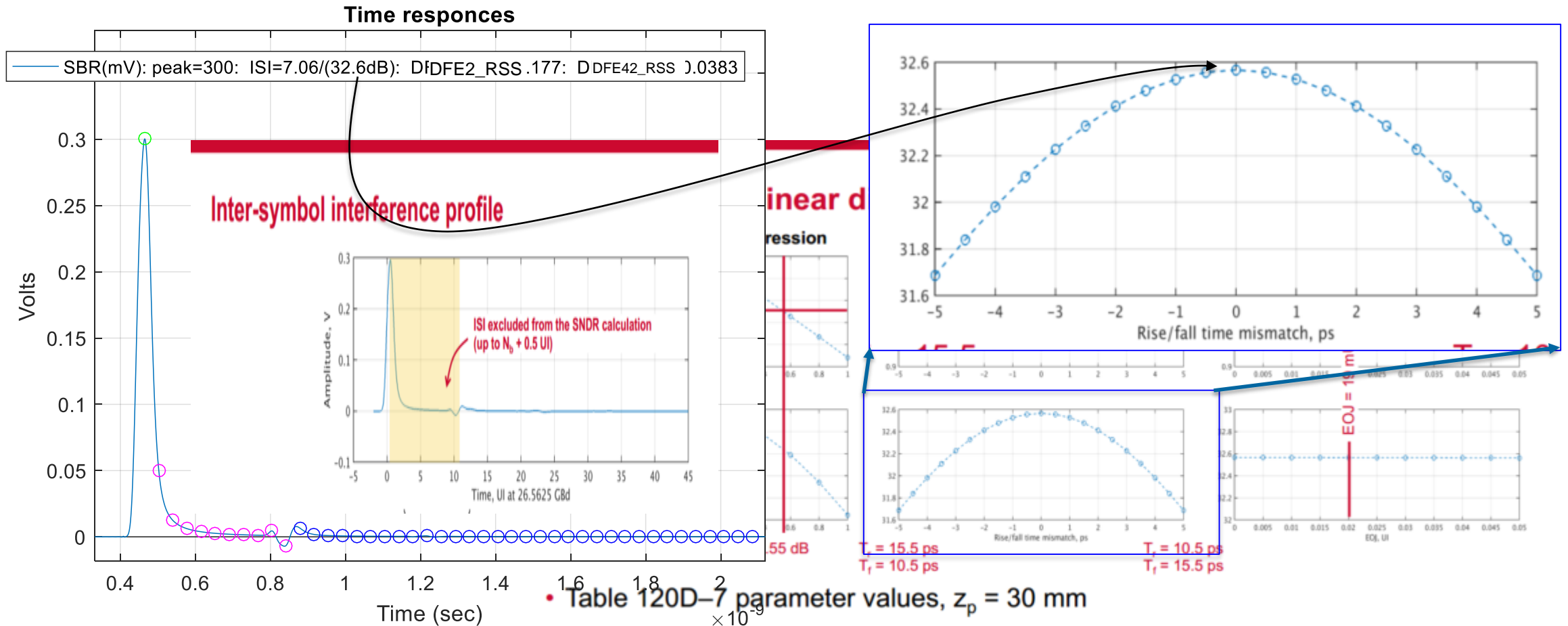
Transmitter Test Set-Up



Define terms: ISI_SNR and DFE_RSS



Single Bit Response reasonably agrees with healey_3bs_02_0916



- Table 120D-7 parameter values, $z_p = 30$ mm
- TP0-TP0a model is 38 mm of host PCB trace
- SNDR is weakly influenced by non-linear distortion – ISI dominates

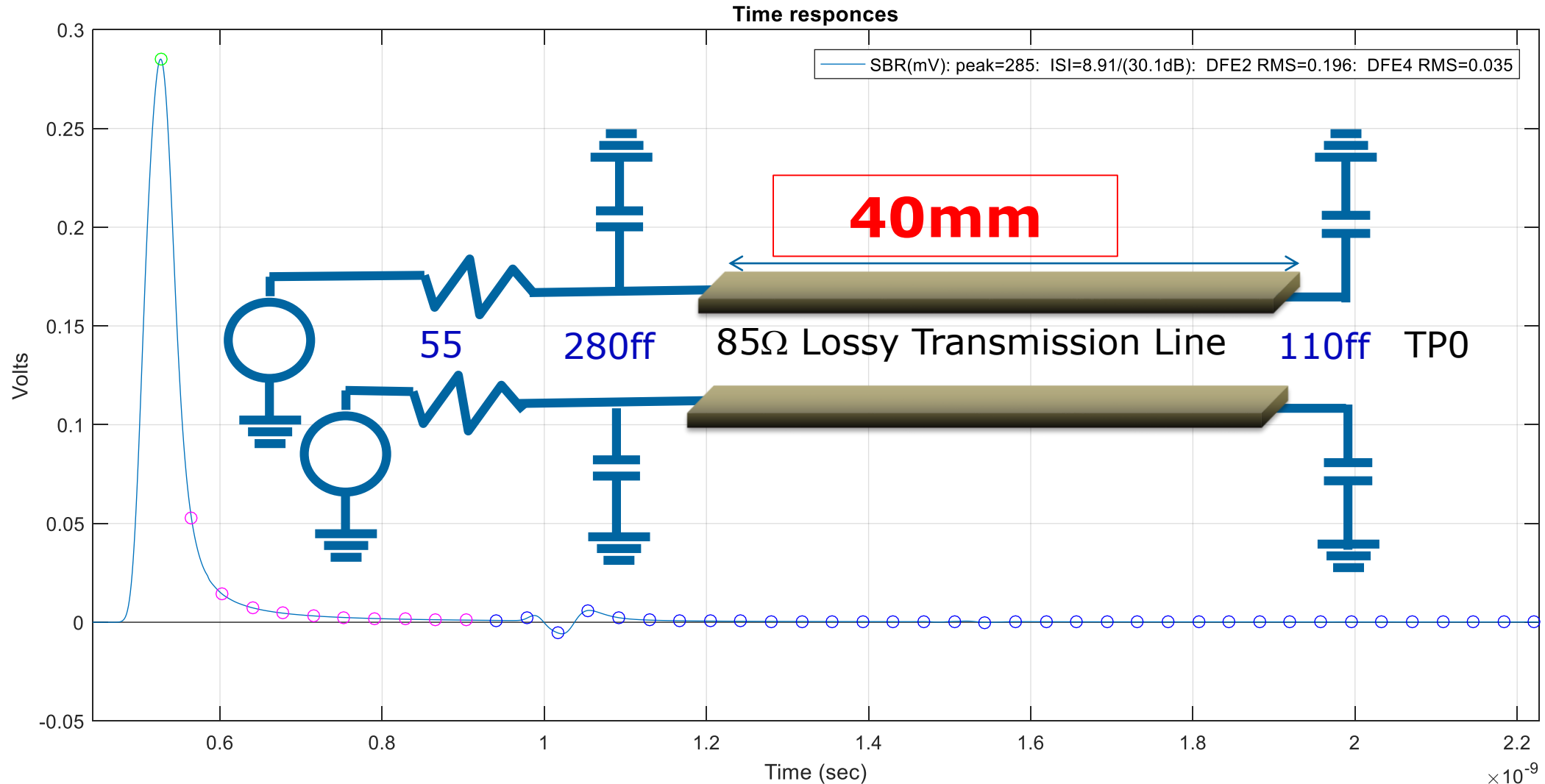
6 | IEEE P802.3bs Task Force, September 2016



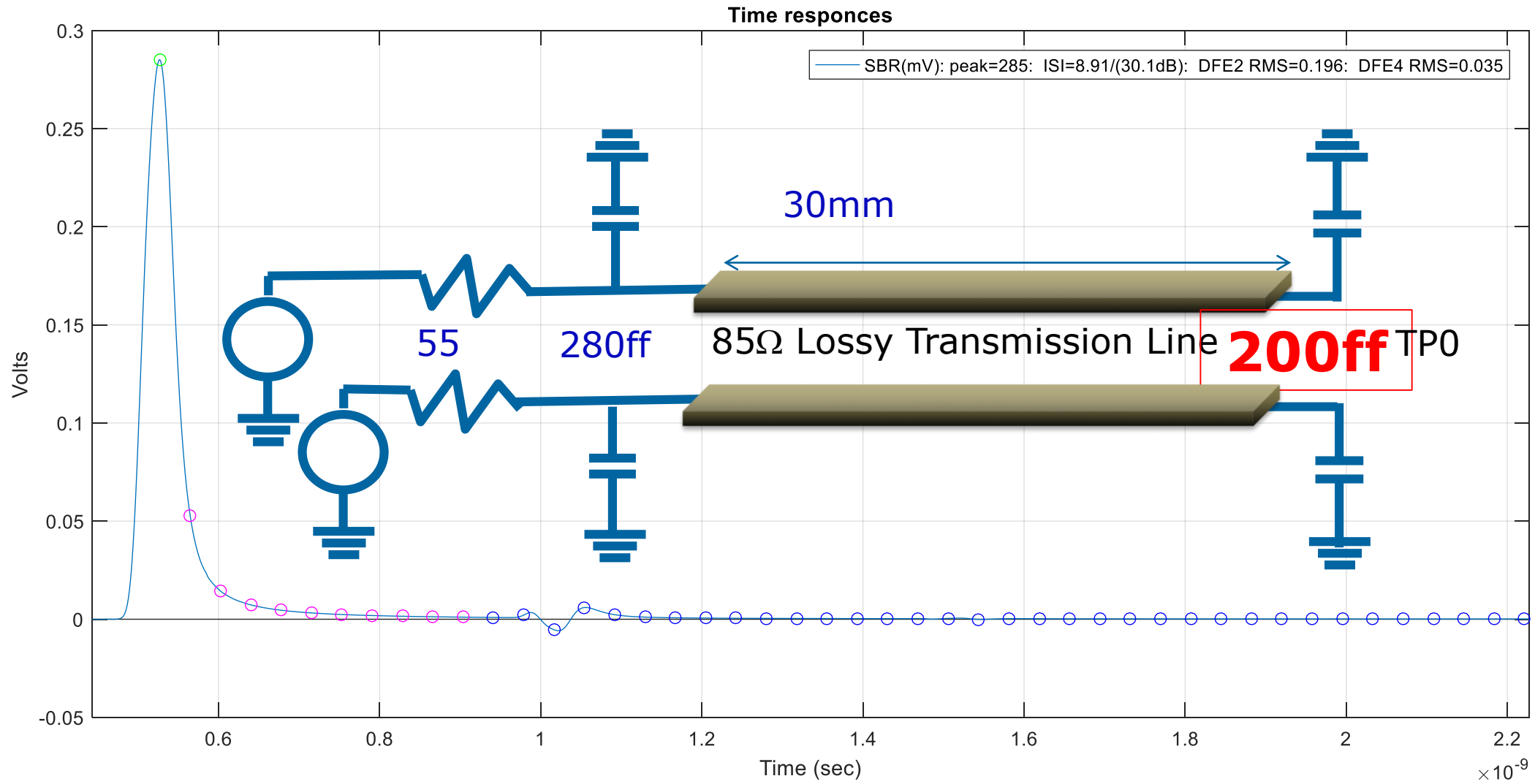
SNDR with out ISI is quite low

- ▶ For the 30mm reference package ISI creates 32.6 dB SNR
- ▶ SNDR would be around 48dB if:
 - ISI is removed and we use “Gain expansion/compression” and “Rise/fall time mismatch” data in healey_3bs_02_0916
- ▶ Q: What would be a reasonable specification for SNDR if we remove ISI contribution?
 - 40 dB?
- ▶ Initial Recommendation:
 - Specify ISI_SNR to be more than the reference package 32.6 dB

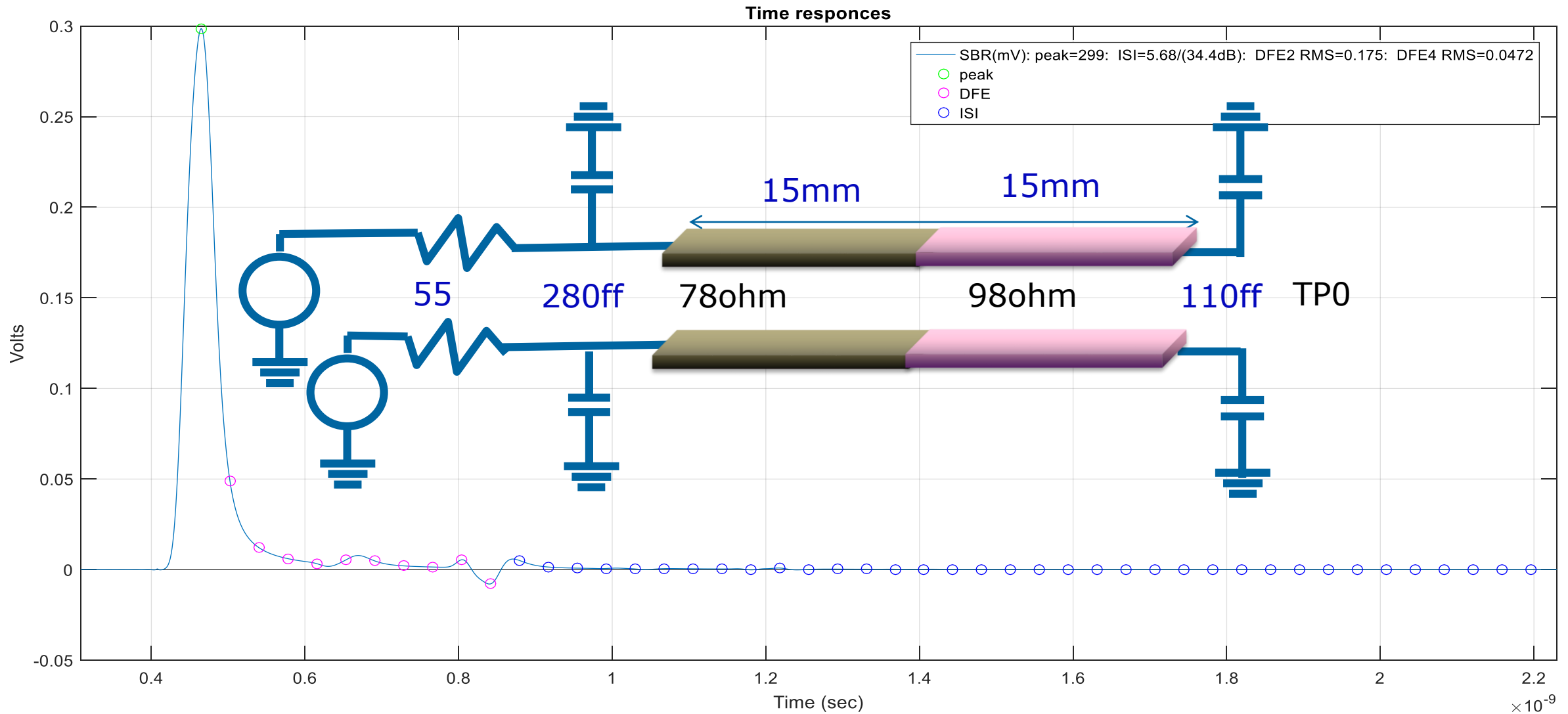
Explore packages which could fail: 40mm/ISI_SNR=30.1 dB



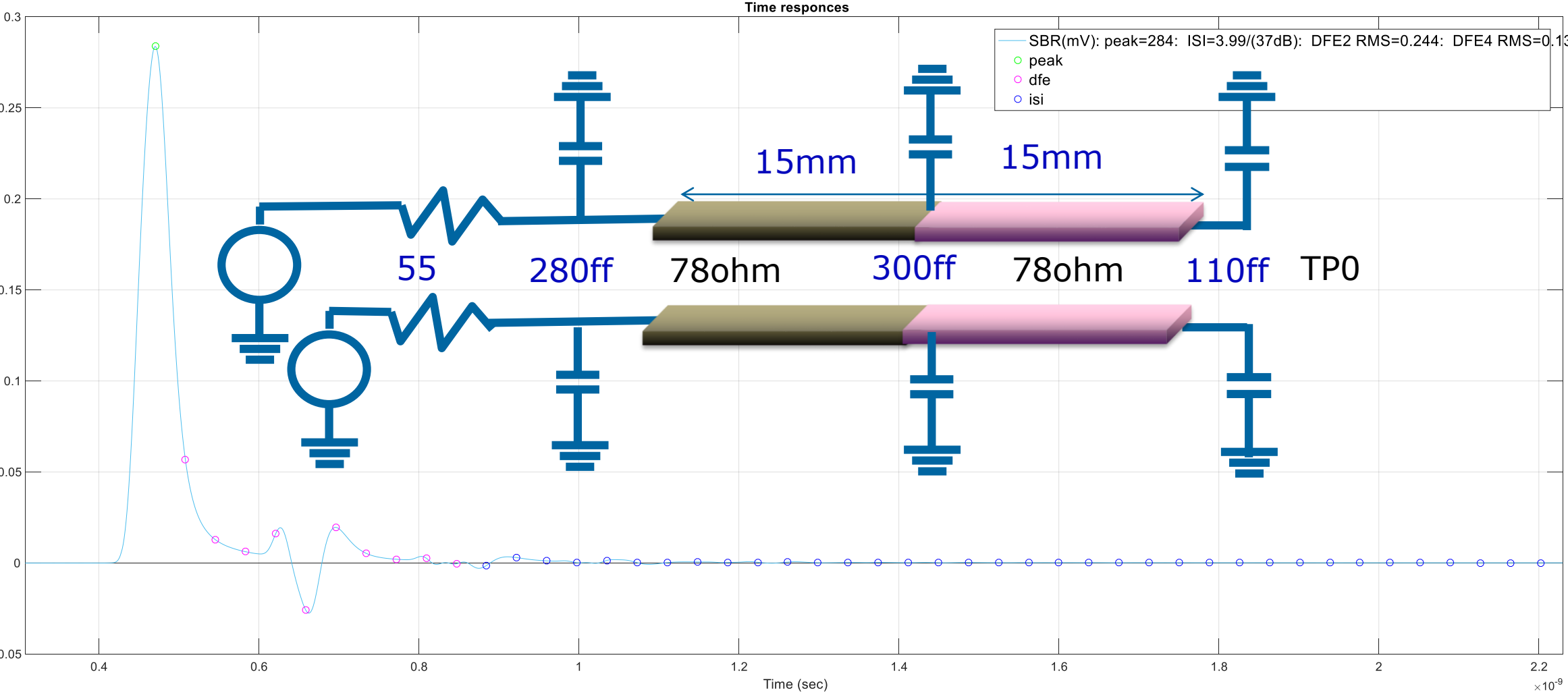
Explore packages which could fail: $C_p=200\text{ff}$, $\text{ISI_SNR}=30.1\text{ dB}$



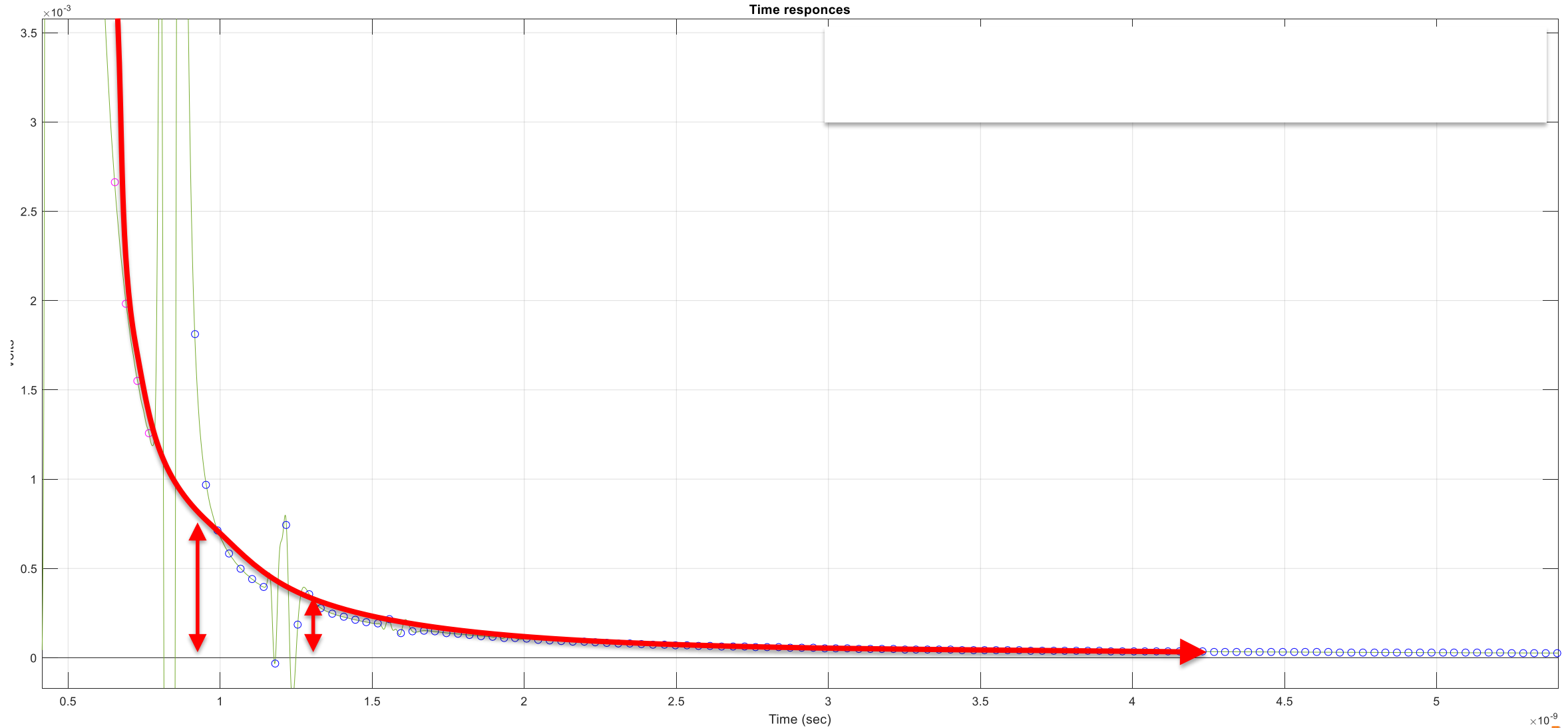
Explore packages which could pass: split impedance, ISI_SNR=34.4 dB



Explore packages which could pass ISI_SNR at 37dB but have more DFE RSS that ref. package



Receive Linear Equalization will remove this



Additional recommendations

- ▶ Add a step to determine the continuous time equalizer settings which yield the best ISI_SNR
 - Measure DFE4_RSS for this setting
- ▶ The specification of ISI_SNR must pass for all Tx FFE settings
- ▶ The ISI_SNR specification must exceed the ISI_SNR for the reference package
- ▶ The DFE4_RSS specification is not to exceed the DFE4_RSS for the reference package
- ▶ Also, specify peak/Vf where Vf is determine with $n_p=200$