

COM 2.24 with ERL usage update for Draft 3.1

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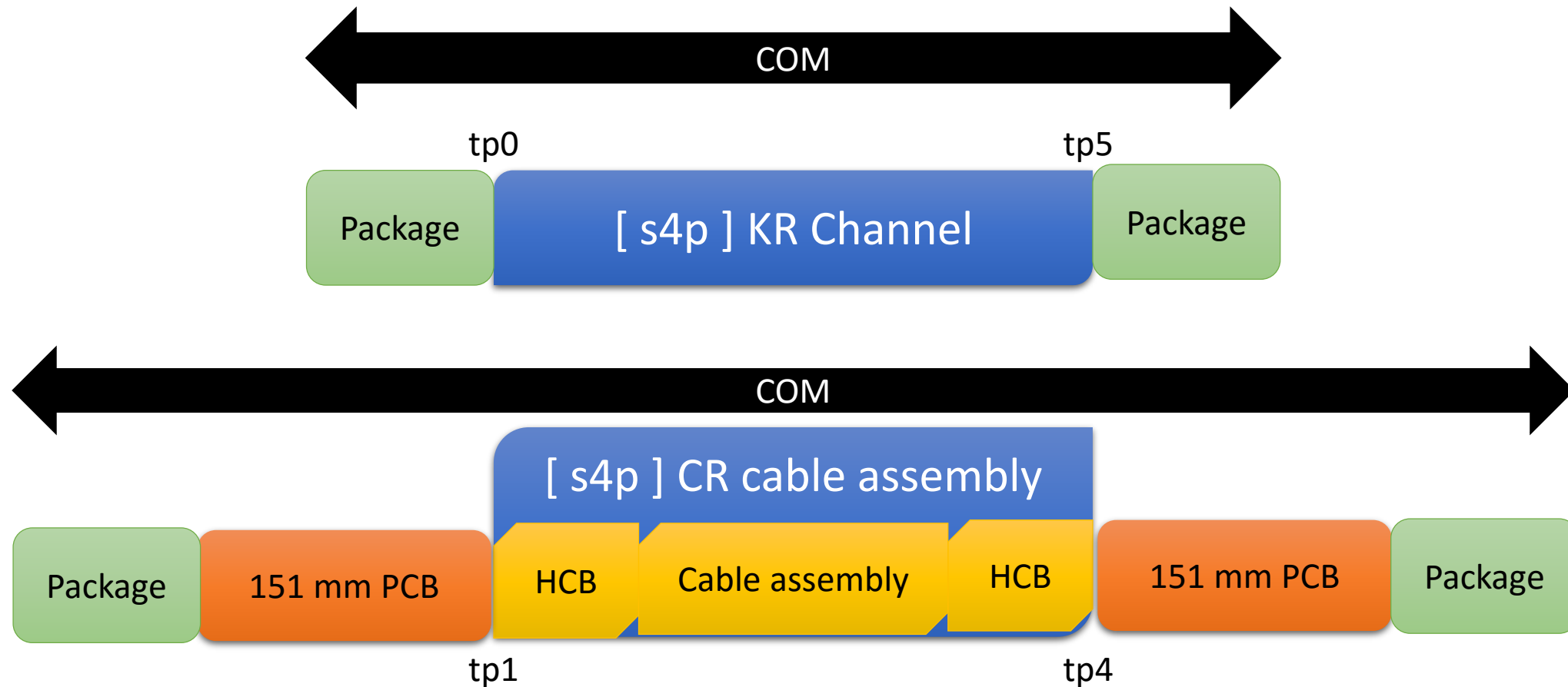
Acknowledgement: Thanka to Joel Meyers, TE for aid in code debugging

2/06/2018

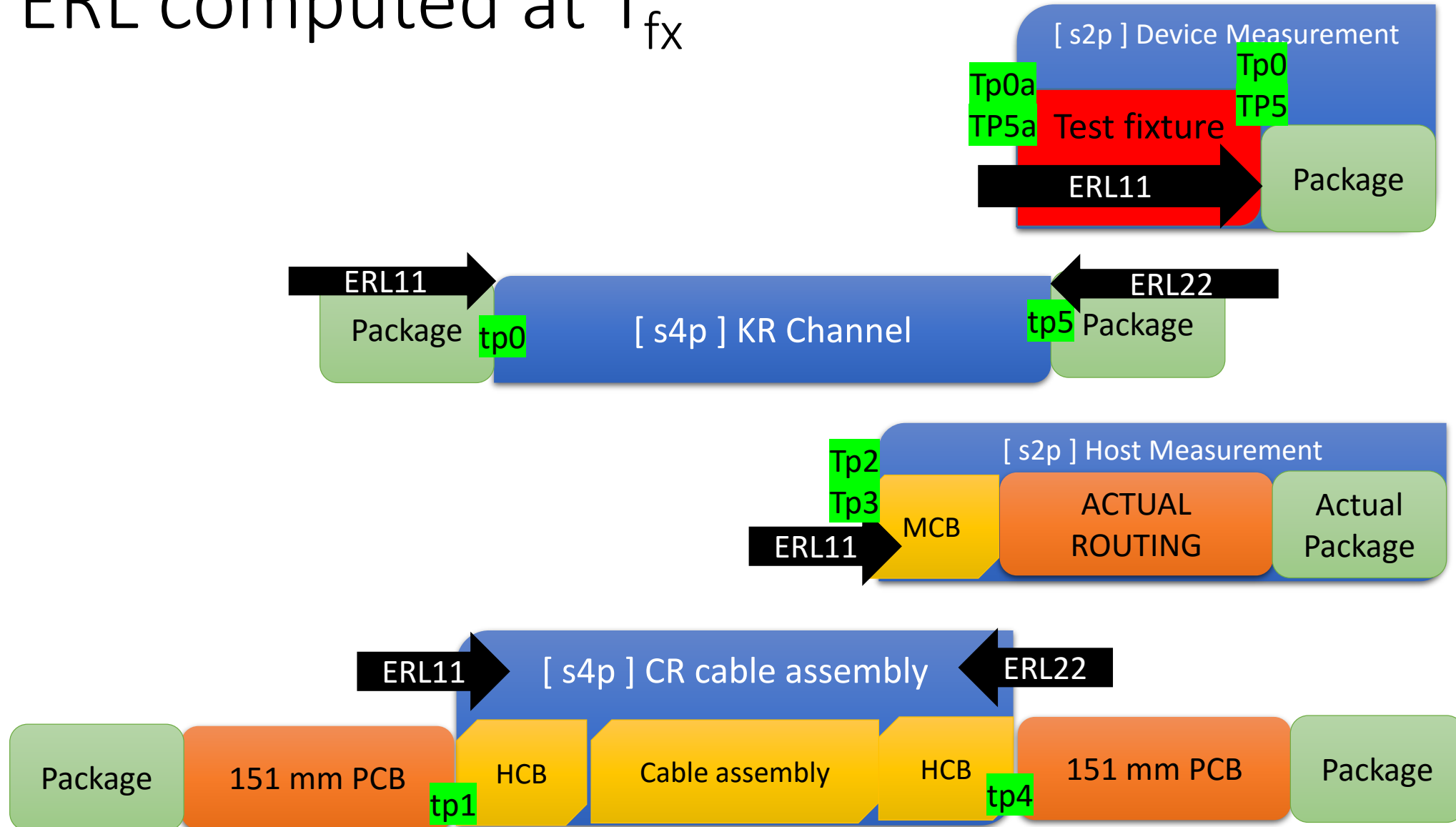
ERL control parameter in spreadsheet

Non standard control options			
COM_CONTRIBUTION	0	logical	1=bar chart of ISI. Xtalk, System noise contribution. 0=bath tub curves
TDR	1	logical	1 enables TDR. Required for ERL
ERL	1	logical	1 enables ERL 2 enables ERL and uses s2p file
Z_t	50	ohms	Single ended TDR reference impedance
ERL_ONLY	1	logical	1 disables COM computation
TR_TDR	0.0189	ns	TDR transition time (T_r)
TDR_duration	10		Time range on number times channel delay*
TDR_f_BT_3db	19.921875	GHz	Bandwidth for Bessel Thompson filter (not used)
TDR_Butterworth	1	logical	Enable Butter work filter
beta_x	10700000000	Hz	Package performance loss
rho_x	0.44		$10^{(-ERL1_min/20)} + 10^{(-ERL2_min/20)} + 0.13$ ERL1 and ERL2 are the ERL into each side of a test poit.
fixture delay time	0.00E+00		set to zero for no fixture. For a CR cable this is determined outside of this program (T_{fx})
Grr_limit	0		If 0 limit= $px(1+px)$ as limit in 8023cd-anx93A-ERL-proposal If 1 limit = 1 as limit as in mellitz_cd_01a_011
ERL_FOM	0		If 0 use variance as in 8023cd-anx93A-ERL-proposal If 1 use complete CDF as in mellitz_cd_01a_011

COM computed “Die to Die”



ERL computed at T_{fx}



Example 1

Non standard control options	
COM_CONTRIBUTION	0
TDR	1
ERL	1
Z_t	50
ERL_ONLY	1
TR_TDR	0.0189
TDR_duration	10
TDR_f_BT_3db	19.921875
TDR_Butterworth	1
beta_x	10700000000
rho_x	0.44
fixture delay time	0.00E+00
Grr_limit	0
ERL_FOM	0

- ❑ ERL is set to 1 and ERL only set to 1
- ❑ We're considering one through channel here (s4p)
- ❑ Crosstalk channels will be ignored
- ❑ If Include PCB = 1
 - The ERL will not use the PCB

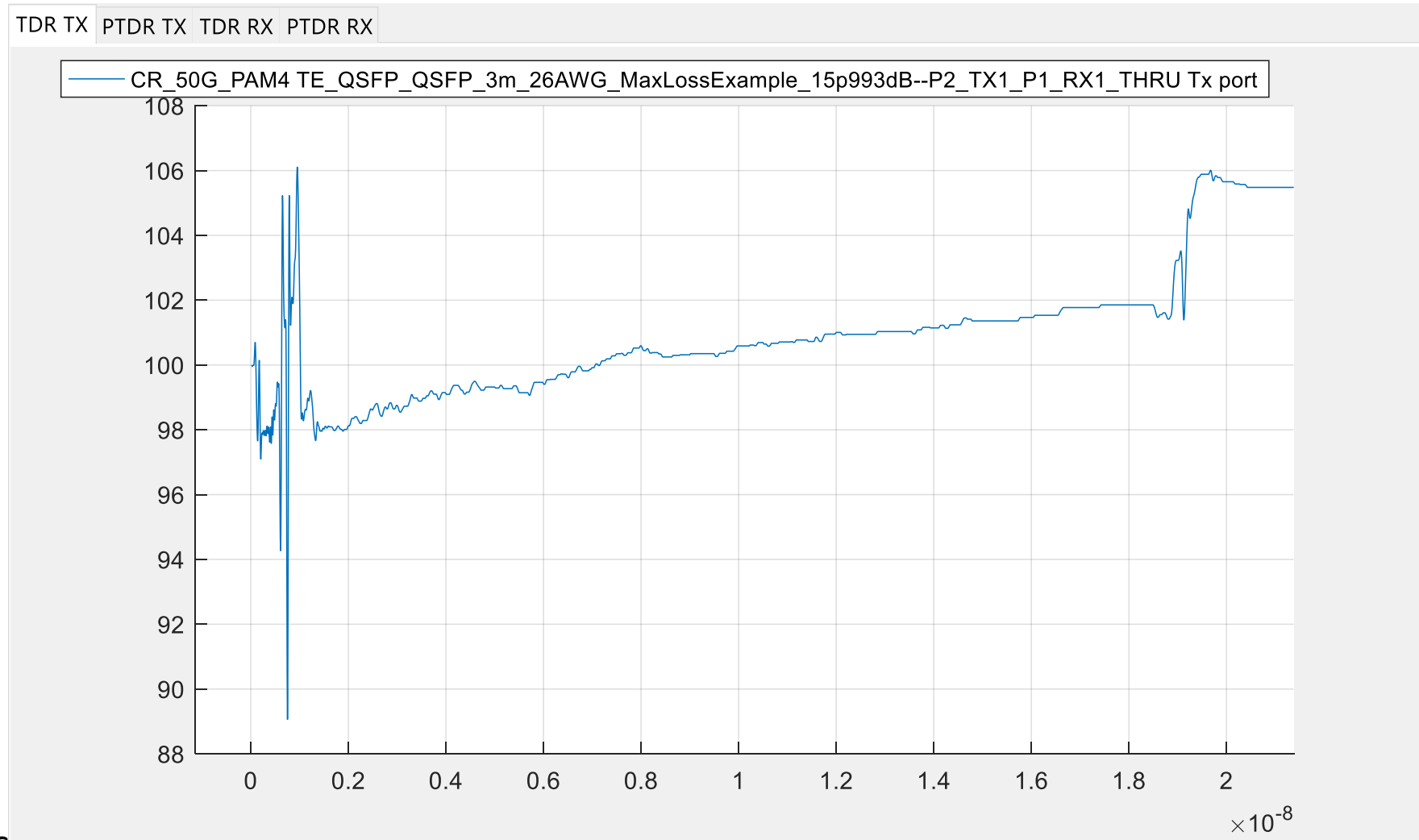
Example 1: running COM

```
>> com_ieee8023_93a_224
This is NOT an official IEEE document.
This is a computation example for exploring COM and ERL for projects like IEEE P802.3 50 Gb/s, 100 Gb/s, and 400 Gb/s, with some exploratory extensions and is not normative or official
Enter config XLS file or return will just pop a window to ask for the XLS file]:
Warning: In C:\Users\richardm\Documents\COM\doc and slides\Training\channels\TE_QSFP_QSFP_3m_26AWG_MaxLossExample_15p993dB\P2_TX1_P1_RX1_THRU.s4p:
the maximum frequency provided, 2.65e+10, is less than the signaling rate: 2.65625e+10
> In com_ieee8023_93a_224>read_s4p_files (line 3243)
In com_ieee8023_93a_224 (line 297)
ERL11 = 15.310 dB: ERL22 = 14.982 dB:
ERL11RMS = 58.335 dB: ERL22RMS = 57.565 dB:

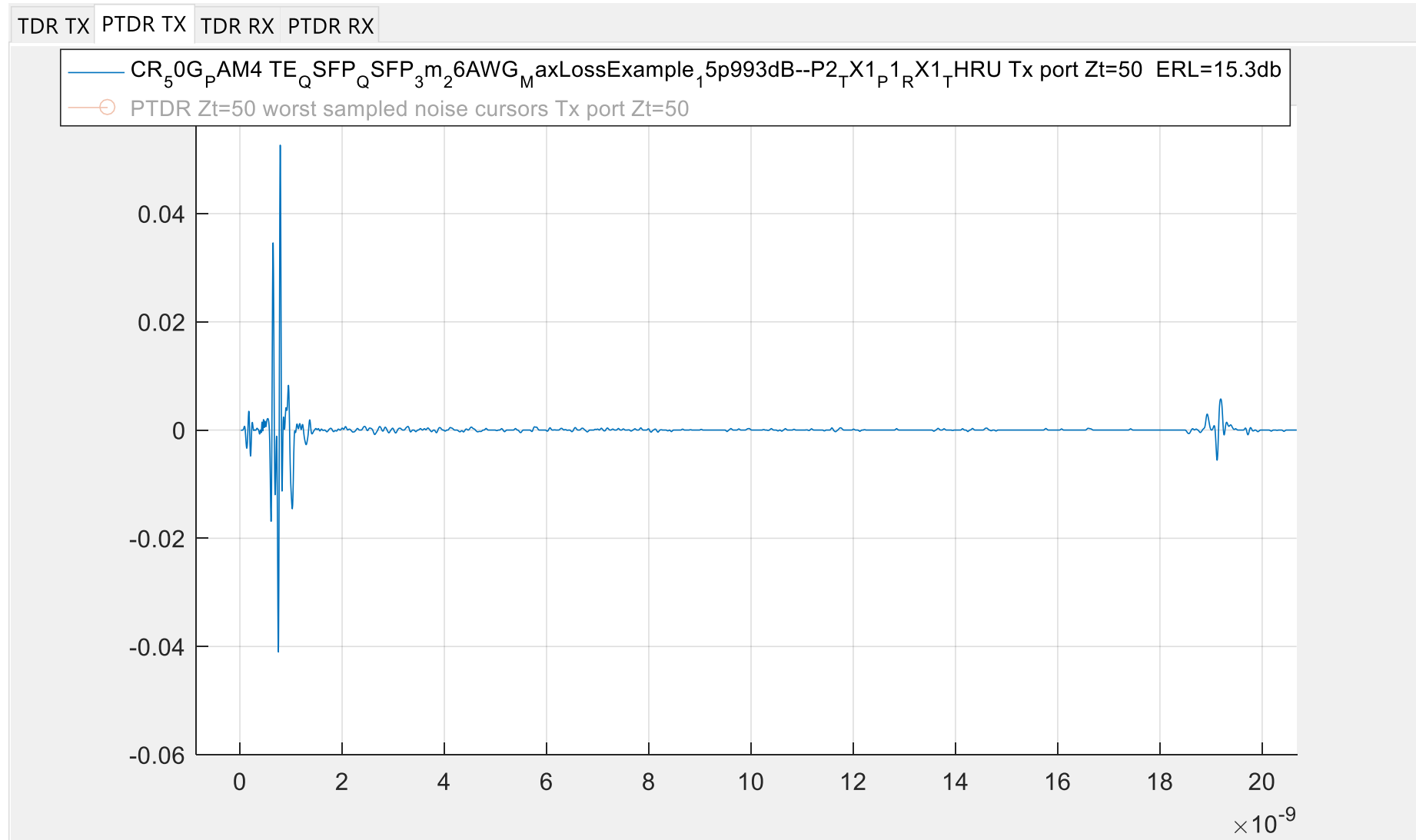
ans =

      Z11: 0
      Z22: 0
      ERL11: 15.3097
      ERL22: 14.9818
      ERL11RMS: 58.3347
      ERL22RMS: 57.5654
code_revision: '2.24'
config_file: 'C:\Users\richardm\Documents\COM\doc and slides\Training\config_com_ieee...'
Z_t: 50
file_names: '"CR 50G PAM4 --P2_TX1_P1_RX1_THRU"'
```

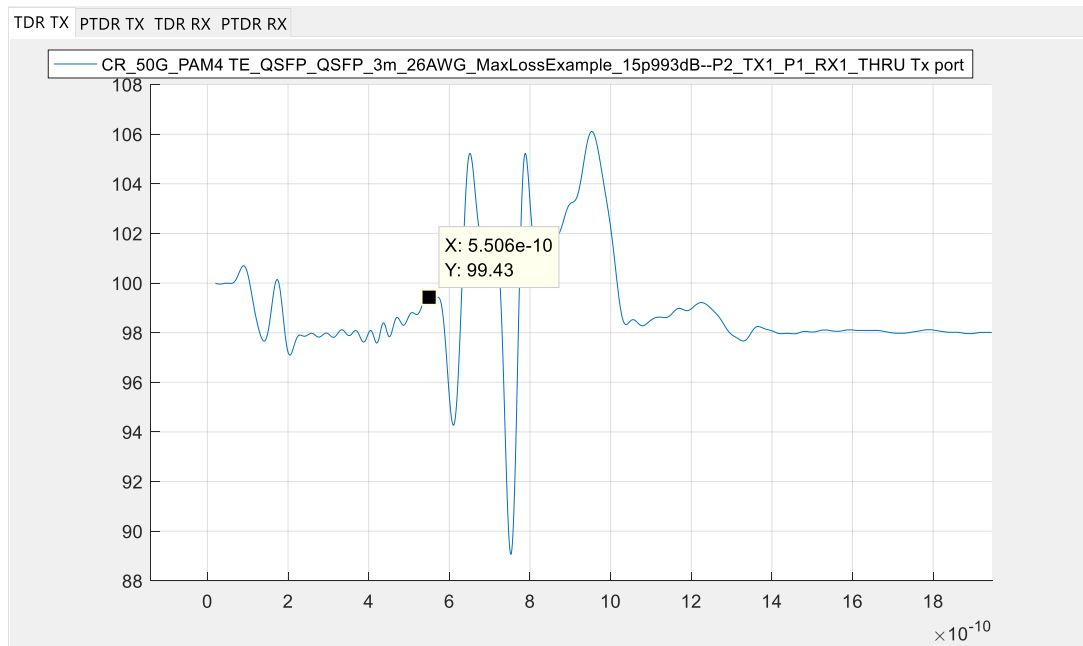
EXAMPLE 1: TDR looking into the transmit end



EXAMPLE 1: PTDR looking into the transmit end



EXAMPLE 1: Finding T_{fx} with Zoomed TDR looking into the transmit end



Non standard control options		
COM_CONTRIBUTION	0	logical
TDR	1	logical
ERL	1	logical
Z_t	50	ohms
ERL_ONLY	1	logical
TR_TDR	0.0189	ns
TDR_duration	10	
TDR_f_BT_3db	19.921875	GHz
TDR_Butterworth	1	logical
beta_x	10700000000	
rho_x	0.44	
fixture delay time	5.51E-10	
Grr_limit	0	
ERL_FOM	0	

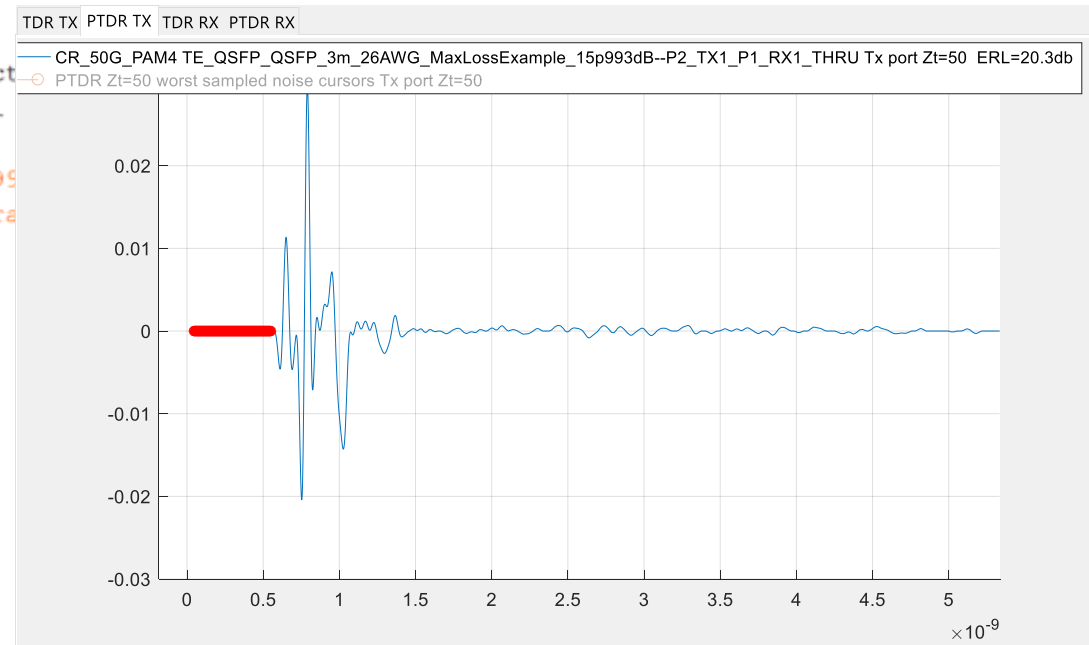
Useful command for rerunning last
 >> eval(getappdata(0,'cmd_str'))

EXAMPLE 1: Zoomed PTDR showing T_{fx} adjustment

```
>> eval(getappdata(0,'cmd_str'))
This is NOT an official IEEE document.
This is a computation example for exploring COM and ERL for project
with some exploratory extensions and is not normative or official
Warning: In C:\Users\richardm\Documents\COM\doc and
slides\Training\channels\TE_QSFP_QSFP_3m_26AWG_MaxLossExample_15p993dB--P2_TX1_P1_RX1_THRU Tx port Zt=50 ERL=20.3db
maximum frequency provided, 2.65e+10, is less than the signaling rate
> In com_ieee8023_93a_224>read_s4p_files (line 3243)
In com_ieee8023_93a_224 (line 297)
ERL11 = 20.274 dB: ERL22 = 20.983 dB:
ERL11RMS = 63.335 dB: ERL22RMS = 63.843 dB:

ans =

    Z11: 0
    Z22: 0
    ERL11: 20.2735
    ERL22: 20.9830
    ERL11RMS: 63.3351
    ERL22RMS: 63.8428
    code_revision: '2.24'
    config_file: 'C:\Users\richardm\Documents\COM\doc and slides\Training\config_com_ieee8023_93a=5...'
    Z_t: 50
    file_names: '"CR_50G_PAM4 TE_QSFP_QSFP_3m_26AWG_MaxLossExample_15p993dB--P2_TX1_P1_RX1_THRU"'
```



Example 2. Computing ERL from a S2P file

Non standard control options	
COM_CONTRIBUTION	0
TDR	1
ERL	2
Z_t	50
ERL_ONLY	1
TR_TDR	0.0189
TDR_duration	10
TDR_f_BT_3db	19.921875
TDR_Butterworth	1
beta_x	10700000000
rho_x	0.44
fixture delay time	0.00E+00
Grr_limit	0
ERL_FOM	0

- ❑ ERL is set to 1 and ERL only set to 2
- ❑ We're considering one file (s2p) in the through channel file parameter position.
- ❑ Crosstalk channels will be ignored
- ❑ Set Include PCB = 0

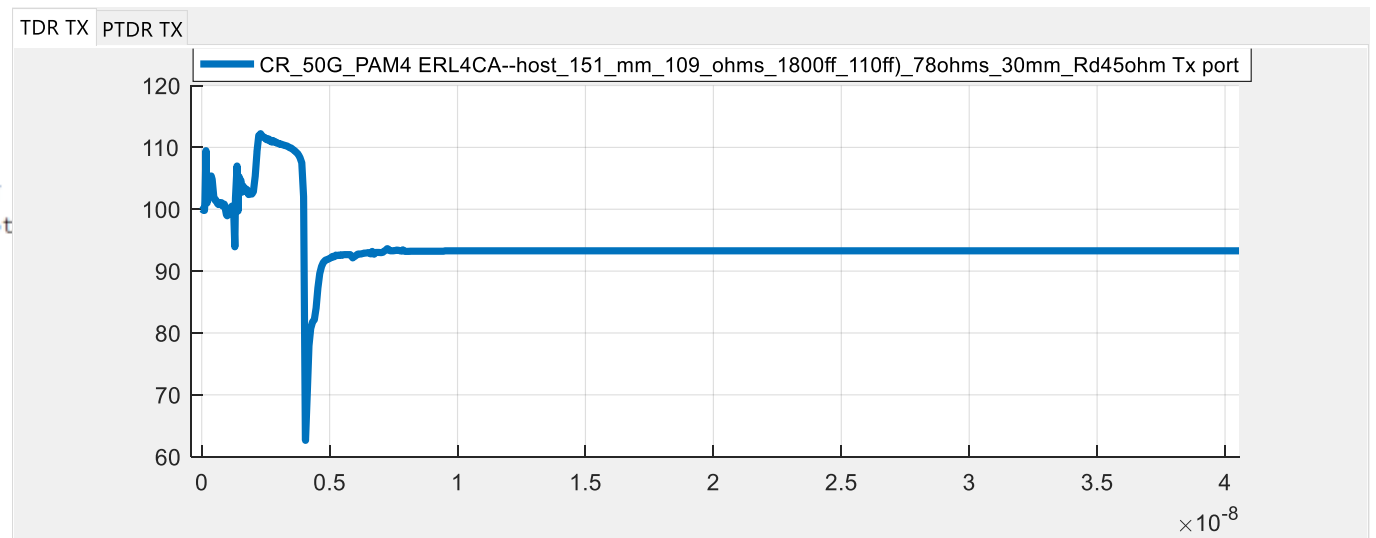
Example 2: Host example

- ❑ `com_ieee8023_93a_224('C:\Users\richardm\Documents\COM\doc and slides\Training\config_com_ieee8023_93a=50GBASE-change_me_cdD3p0.xls',0,0,'C:\Users\richardm\Documents\IEEE\IEEE802.3cd\COM\ERL4CA\host_151_mm_109_ohms_1800ff_110ff)_78ohms_30mm_Rd45ohm.s2p')`

```
>> eval(getappdata(0,'cmd_str'))
This is NOT an official IEEE document.
This is a computation example for exploring
with some exploratory extensions and is not
ERL11 = 11.166 dB:
ERL11RMS = 49.246 dB

ans =
```

```
      Z11: 0
      ERL11: 11.1661
      ERL11RMS: 49.2462
      code_revision: '2.24'
      config_file: 'C:\Users\richardm\Documents\COM\doc and slides\Training\conf...'
      Z_t: 50
      file_names: '"CR_50G_PAM4 ERL4CA--host_151_mm_109_ohms_1800ff_110ff)_78oh...'
```



Next

- ❑ Action to all: Validate draft 3.1 ERL limit values.
- ❑ Action: Implement N as number of UI ERL is computed over
- ❑ Action: Evaluate with ρ_x values in draft

Appendix – More info

COM configuration spreadsheet usage

	CA	KR	CR HOST	KR Device
config_com_ieee8023_93a=50GBASE-KR_device_or_CR_host_cdD3p0_Channel_ERL_ONLY_S2P.xls			x	x
config_com_ieee8023_93a=50GBASE-KR_or_CA_cdD3p0_Channel_ERL_ONLY.xls	x	x		
config_com_ieee8023_93a=50GBASE-CR_cdD3p0.xls		x		
config_com_ieee8023_93a=50GBASE-KR_cdD3p0.xls	x			

Note: for CA, CR-Host, and KR-device “fixture delay” (T_{fx}) is determined first outside of the COM program
More on this later