Cable Assembly Measurement Data
3 Meter – no FEC Consensus Building

IEEE802.3by
Megha Shanbhag, Nathan Tracy
July 14, 2015

Objective

- To allow 3 meter cables to work without FEC we will need a combination of changes which might include -
  a. Cable assembly budget
  b. COM threshold
  c. Tx/Rx parameters
  d. Package model

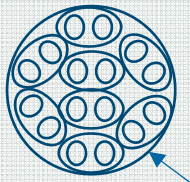
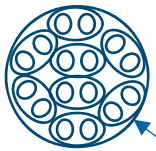
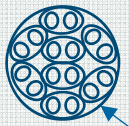
- The current draft calls out a cable assembly(TP1-TP4) loss budget of 16.5dB for the 3 meter cable (CA-S)

- To address (a) from above list we are presenting some options to reduce the 16.5dB value

- This should make it easier to allow some changes to above items b/c/d to enable the 3m-no FEC solution

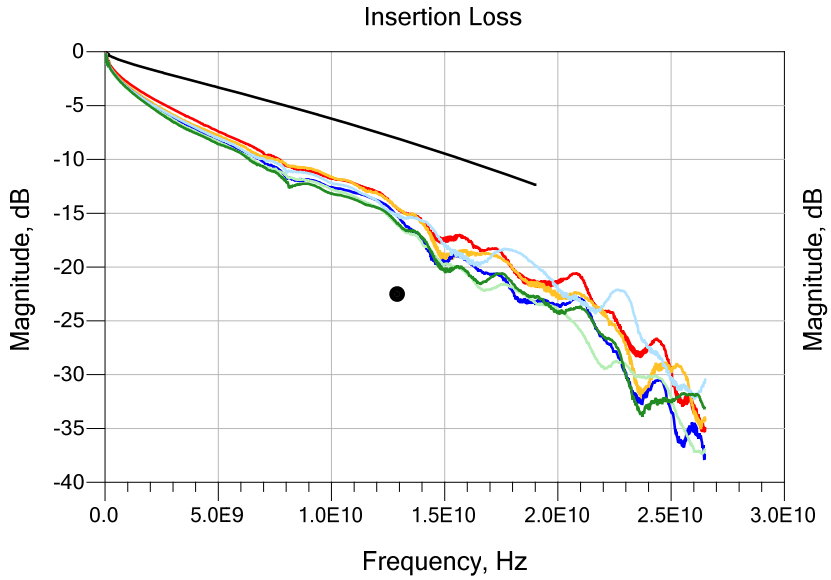
Cable Type and Proposed TP1-TP4 Budget

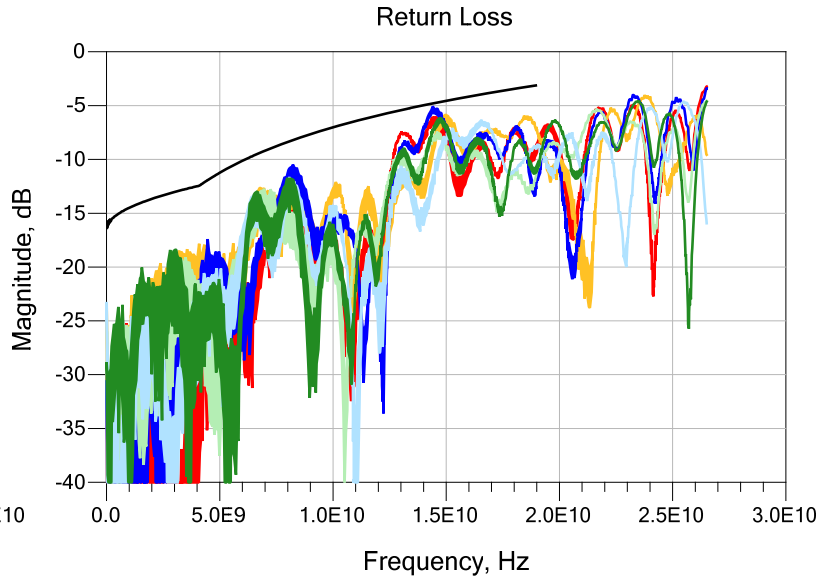
For Reference Only

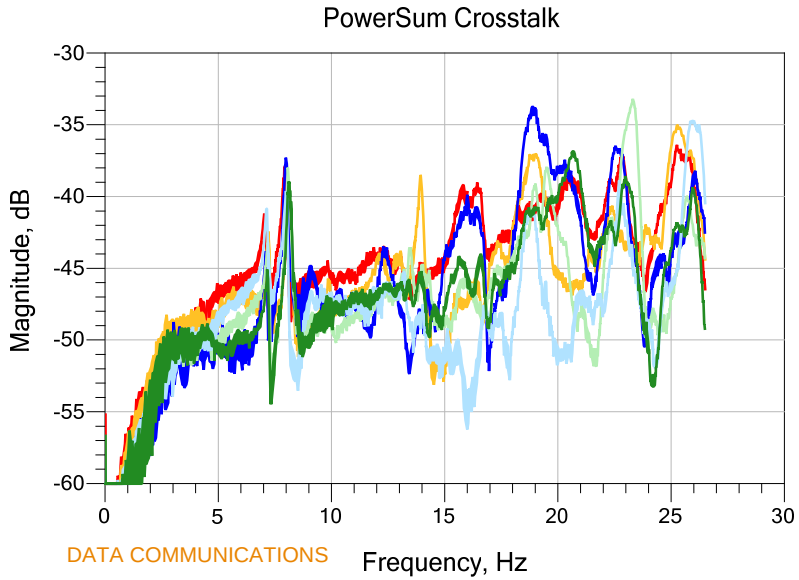
Length	Cable AWG	Bundled Cable Diameter*	Bend Radius*	TP1-TP4 loss
3 meter	24	 9.8 mm	68 mm	14.5dB
3 meter	25	 9.0 mm	63 mm	15.3dB
3 meter	26	 8.3 mm	58 mm	16dB

- Data is for QSFP-QSFP cable assembly type since that is the largest size of MDI type
- Bundled Cable pictures are illustrative only. They are not to scale and do not represent actual construction

Near Limit Example Data (all cables are QSFP to QSFP)







3m-24AWG Near Limit Example, 14.47dB @ 12.89GHz
3m-24AWG Near Limit Example, 14.49dB @ 12.89GHz
3m-25AWG Near Limit Example, 15.25dB @ 12.89GHz
3m-25AWG Near Limit Example, 15.35dB @ 12.89GHz
3m-26AWG Near Limit Example, 15.96dB @ 12.89GHz
3m-26AWG Near Limit Example, 15.993dB @ 12.89GHz

Power sum Crosstalk includes 3 FEXT and 4 NEXT aggressors

From “goergen_3by_01_0715r13”, possible COM change considerations

Running the TE 3m 28ga Pair 1 in COM

- TE 3m 28AWG 16.48dB cable assembly QSFP-SFP before any changes …
  - COM = 1.63dB
  - 30mm, Av=.4V, Afe=.4V, Ane=.6V, Cd=250ff, Cp=180ff, CTLE~12dB, Z_c=78.2ohms, SNR_tx~27dB, board_Z_c=109.8ohms

Bullet 1

- TE 3m 28AWG 16.48dB cable assembly QSFP-SFP with changes except cable loss and CTLE …
  - COM = 2.563dB
  - 30mm, Av=.43V, Afe=.43V, Ane=.645V, Cd=200ff, Cp=130ff, CTLE~12dB, Z_c=85ohms, SNR_tx~28.4dB, board_Z_c=109.8ohms

Bullet 2

- TE 3m 28AWG 16.48dB cable assembly QSFP-SFP with changes except cable loss …
  - COM =3.211dB
  - 30mm, Av=.43V, Afe=.43V, Ane=.645V, Cd=200ff, Cp=130ff, CTLE~16dB, Z_c=85ohms, SNR_tx~28.4dB, board_Z_c=109.8ohms

Bullet 3

- TE 3m 28AWG 16.48dB cable assembly QSFP-SFP with changes except cable loss, die cap, package cap and package impedance …
  - COM = 2.698dB / COM = 2.952 if board_Z_c=100ohms
  - 30mm, Av=.43V, Afe=.43V, Ane=.645V, Cd=250ff, Cp=180ff, CTLE~16dB, Z_c=78.2ohms, SNR_tx~28.4dB, board_Z_c=109.8ohms

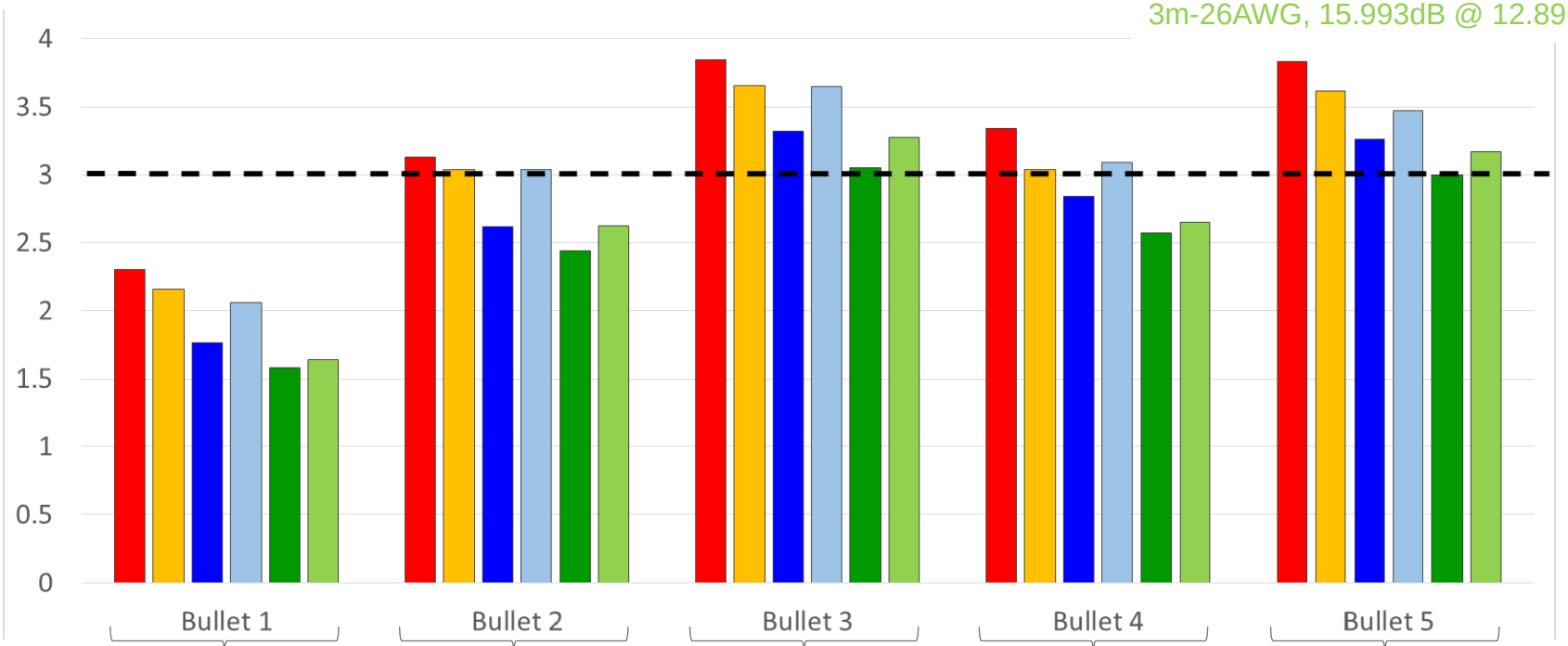
Bullet 4

- TE 3m 28AWG 16.48dB cable assembly QSFP-SFP with changes except cable loss, die cap, package cap …
  - COM = 2.819dB
  - 30mm, Av=.43V, Afe=.43V, Ane=.645V, Cd=250ff, Cp=180ff, CTLE~16dB, Z_c=85ohms, SNR_tx~28.4dB, board_Z_c=109.8ohms

Bullet 5

Proposed COM, 30mm Results

3m-24AWG, 14.47dB @ 12.89GHz
3m-24AWG, 14.49dB @ 12.89GHz
3m-25AWG, 15.25dB @ 12.89GHz
3m-25AWG, 15.35dB @ 12.89GHz
3m-26AWG, 15.96dB @ 12.89GHz
3m-26AWG, 15.993dB @ 12.89GHz



	Bullet 1	Bullet 2	Bullet 3	Bullet 4	Bullet 5
Av, V	0.4	0.43	0.43	0.43	0.43
Afe, V	0.4	0.43	0.43	0.43	0.43
Ane, V	0.6	0.645	0.645	0.645	0.645
Cd, ff	250	200	200	250	250
Cp, ff	180	130	130	180	180
CTLE, dB	12	12	16	16	16
Z_c, ohms	78.2	85	85	78.2	85
SNR_tx, dB	27	28.4	28.4	28.4	28.4
Board_Z_c, ohms	109.8	109.8	109.8	109.8	109.8

Values from previous slide

Summary

- Measured example data are shown that are close to TP1-TP4 limits suggested on slide 3
- Data is near worst case in terms of IL limit at Nyquist and includes crosstalk – 3FEXT and 4NEXT
- With some of the changes proposed to COM input parameters from “goergen_3by_01_0715r13” 3meter, no FEC might be feasible.
- All data will be contributed to the group for use towards closing the 3meter-no FEC effort.