100GBASE-ER4-lite PMD Status & Next Steps

40Gb/s and 100Gb/s Fiber Optic Task Force

SMF Ad-Hoc

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Background

- HSSG identified the need for 40km interface, for example:

  http://www.ieee802.org/3/hssg/public/nov06/goergen_02_1106.pdf
- 802.3ba Task Force wrote a 100GbE-ER4 specification based on the available technology: EML TX & SOA RX (at the time there was no 25G APD technology)
- 25G APD technology is now available, marginally meeting the 100GbE-ER4 RX Sens.
- Relaxing ER4 power budget and RX Sens., for example by 3dB, enables 25G APD implementations
- 25G APD enables ER4 in a small module, for example CFP4, by eliminating the thermal load of the SOA
- 25G APD enables low extinction ratio and lower cost TX, for example DFB laser based, reducing cost and power
- ER4-lite PMD idea was introduced to SMF Ad Hoc in:

  http://www.ieee802.org/3/bm/public/smfadhoc/meetings/apr16_13/cole_03_0413_smf.pdf

Status & Next Steps

- ER4-lite PMD discussion is captured in the 4/16/13 minutes
- An important suggestion was to add KR4 FEC to further reduce 25G APD requirements
- A straw poll showed SMF Ad Hoc interest to further discuss ER4-lite in .bm (11 happy, 4 don't care, 3 not)
- Off-line emails and discussions then followed to determine interest in formally proposing ER4-lite as a new PMD in .bm
- While there was continued interest, concerns also arose about proposing ER4-lite this late in the .bm project
- Because of insufficient time to build consensus, especially around 5C, an ER4-lite proposal will not be made in .bm
- The next step will be to propose an OTU4 40km APD based application code at the ITU-T SG15/Q6 July'13 meeting
- ER4-lite will be proposed in a later 802.3 project, either with other PMDs, or stand-alone like 40GbE-FR in .bg

ER4-lite DML/APD Specification Alternative

100GBASE-Standard	LR4 10km	ER4 40km (Eng)	**ER4-lite[3] 40km (Eng)**
TX OMA (min) dBm	-1.3[1]	0.1	**0.0[1]**
TX ER (min) dB	4	8	**4**
RX OMA (max) dBm	4.5	4.5	**-4**
SRS OMA (max) dBm	-6.8[2]	-17.9	**-16.7[2]**
RX Sens OMA (info max) dBm	-8.6	-21.4	**-18.5**
Power Budget (info) dB	8.5	21.5	**20**
Penalties (info) dB	2.2	3.5	**2.5**
Loss Budget (info) dB	6.3	15: 30km 18: 40km	**17.5**

[1] at 1dB TDP [2] at 1.8dB VEC penalty [3] includes KR4 FEC

G.959.1 DML/APD 40km Code Alternative

G.959.1 Code	4I1-9D1F	4L1-9C1F	**to be proposed**
TX AOP (min) dBm	-0.6	-2.7	**0.0**
TX ER (min) dB	4	8	**4**
RX AOP (max) dBm	4.5	4.5	**-4**
RX AOP (min) dBm	-6.9	-20.7	**-17.5**
RX Sens AOP (min) dBm	-8.4	-23.2	**-19.5**
Penalty (max) dB	1.5	2.5	**2.0**
Attenuation (max) dB	6.3	18	**17.5**

NOTE – The BER for these application codes is required to be met only after the error correction (if used) has been applied. The BER at the input of the FEC decoder can therefore be significantly higher than 10^{-12} (10^{-6} recommended).