PMD Call For Contributions

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Background

- This CFC expresses the opinion of Frank Effenberger only, and is not meant to limit the discussion on any topic
- Instead, it hopes to direct some contributions to some PMD topics that need attention to enable the group to make informed decisions
- It also attempts to build on previously presented materials by trying to identify rough consensus positions (but without committing to these)

Coexistence Requirements

- Which pre-existing systems need support?
  - EPON, 10GEPON, 10/1EPON, RF video, RFoG DS, RFoG return, OTDR
  - So far, we have explicit requirement only for 10GEPON
- How do 25G, 50G, and 100G coexist?
  - It seems “TDM” type coexistence is preferred
- What method of coexistence with 10GEPON is desired?
  - WDM or TDM
  - There is disagreement of what “concurrent” means
  - WDM is certainly simpler

Practical issues

- What kind of OLT rearrangement is good?
  - Side-by-side deployment, or replacement
  - This influences how we estimate the relative cost of different options
  - Multi-generational OLTs may not be technically feasible
- What flavors of system will be popular?
  - Several have indicated a preference for a “cheap 25G system” for residential-like applications
    - Might that cheap system be just 25G down/10G up?
    - If so, then a cheap symmetrical 25G not so needed?
  - Full 100G system seems important
    - Namesake system, next major speed level
  - Will 50G really be a popular speed?
    - It can be defined, but not particularly optimized

Ecosystem issues

- The key challenge of any new PON system is getting to volume as quickly as possible
- The 100G Ethernet market is a ready source of building blocks
  - 100G Ethernet volume will dwarf 100GEPON for a long time, making it an important precedent
  - But, many specifications need revision
- ITU Q2/15 will also develop 25G per channel
  - Strong reasons to use a common PMD
    - Avoid market confusion
    - Higher volumes at all times

Wavelength Plans

- The following aspects are formative preferences
  - Use O-band 25G operation
    - Below 1340nm for DML usage
  - Fixed plan of 4 channels each way
  - Diplexer guard band at least ~30nm
- Interest in placing all 8 wavelengths in the O-band
  - Meets many of the above mentioned preferences
  - But is it technically feasible?

Fiber impairments

- Fiber impairments need analysis
- Dispersion
  - Dependence on wavelength, line code
  - Methods and effectiveness of compensation
- 4 wave mixing
  - Important when dispersion is low (O-band)
- Raman depletion and crosstalk
  - Important when power levels are high
- None of these seem show-stopping
  - But the group needs to develop the modeling to better understand their impact

Spectrum needed

- Recognition that power budget will require cooled lasers for the important 29 dB budget class
  - Hence, CWDM and wider band widths out of question
- LR4 style plan is one option
  - 2nm band width, 800 GHz spacing
  - Allow all O-band operation with WDM coexistence
- Even wider plans have been proposed
  - Supposed to have better yields
- What is the actual impact (yield, relative cost) of a wider band plan?

Line Code

- Preference for transmitting an NRZ signal
  - Gives the largest loss budget of all the codes
  - Could be detected conventionally, as duobinary signal, or with MLSE receiver, if the signal is pre-coded
- Does the pre-coding help/hurt the various receiver methods?
- What component combinations have the best performance-cost ratio:
  - 25G EML+25G APD
  - 25G EML+10G APD + electrical compensation
  - 10G EML+10G APD + electrical compensation

FEC Super- or Sub-rating

- Just as in 10GEPON, FEC is mandatory (disableable?)
- Use sub-rating (like 10GEPON)?
  - Optics requirements are a little easier
  - Payload rate is reduced ~15%
- Use super-rating (like 100G Eth)?
  - Maintains payload at full rate
  - Optics get stretched a little further
- Unlike 10G, the 25G system is already stretching the optics 2.5x
  - A little more won't hurt
  - Also, 100G Eth market has introduced 28Gb/s super-rating

FEC coding

- Loss budget is under pressure
- FEC with a longer codeword length is needed
  - If so, perhaps 1 dB optical gain is possible at same code rate
- Interaction with the EPON MAC
  - If fragmentation becomes possible, then longer codewords have lesser impact
  - If not, then enhanced FEC may not be possible

Straw Poll

- On a scale of 1-5, with 5 being most important (must be included) and 1 being least important (can be omitted), which pre-existing system an NG-EPON system must coexist?
  - 1G-EPON (PX) _____
  - 10/1G-EPON (PRX) _____
  - 10G-EPON (PR) _____
  - GPON _____
  - RF video (1500-1560 nm) _____
  - RFoG DS[1] (1540-1565 nm) _____
  - RFoG US[1] (1600-1620 nm) _____
  - OTDR (>1625 nm) _____
  - Other (write in) _____

1) Per ANSI/SCTE 174 2010

Straw Poll

- On a scale of 1-5, with 5 being most important (must be included) and 1 being least important (can be omitted), rate the following DS/US Systems speeds.

Speed	Rating
25/10G	_____
25/25G	_____
50/10G	_____
50/25G	_____
50/50G	_____
100/10G	_____
100/25G	_____
100/50G	_____
100/100G	_____