

SOA preamplifier for 100G EPON

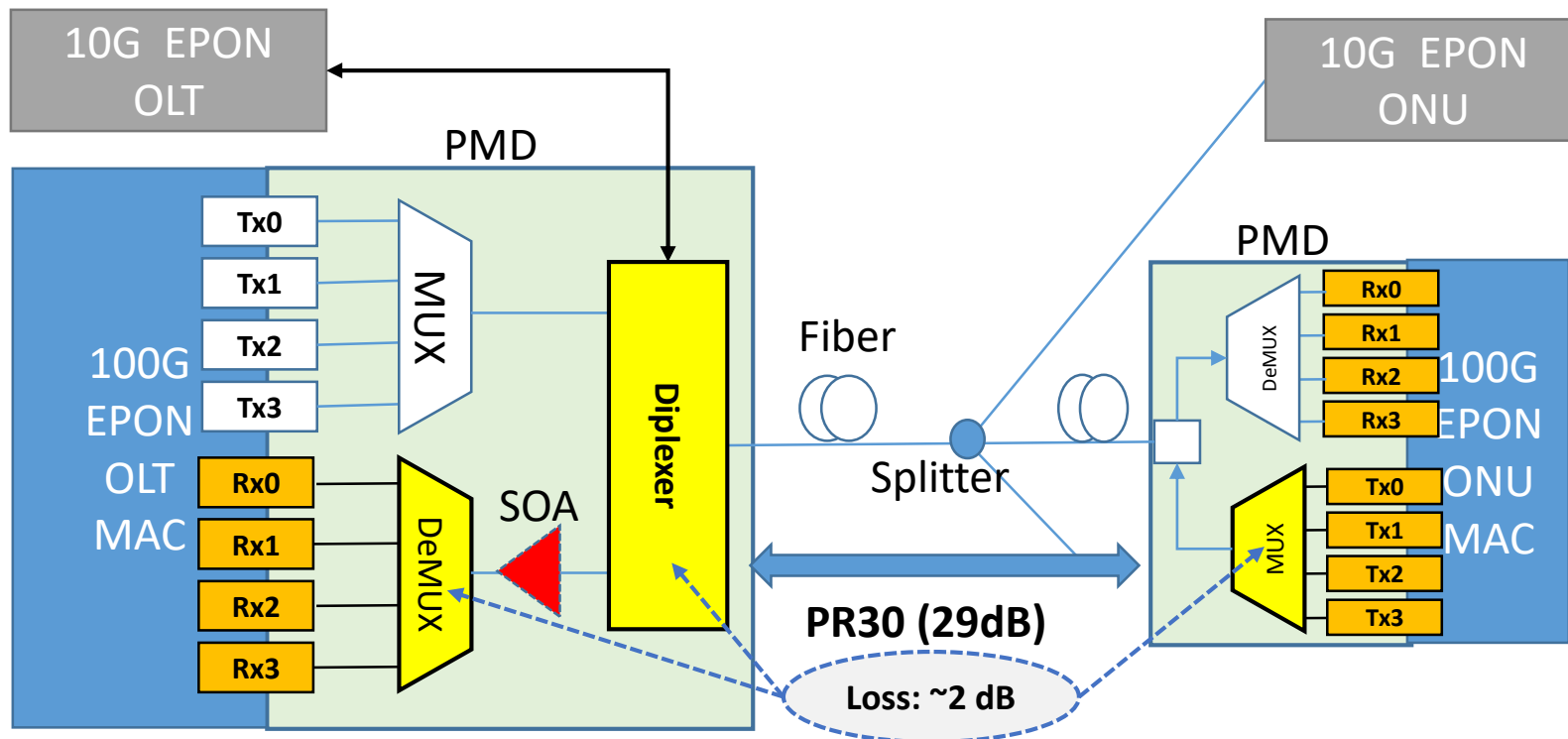
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Decisions to make next meeting

- ❑ Wavelength plan + PMD characteristics (Ed, John, Dekun, Hanhyub, Yong, James)
- ❑ TDM versus WDM coexistence (Ed, Frank, Dekun)
 - Triple-rate upstream considerations
 - SOA preamp (Dekun, John), Hanhyub)
- ❑ Channel bonding (Duane, Glen)
 - Downstream MPRS
 - Line coding
- ❑ Power budget classes – consider motion to exclude PR10 (Phil)
- ❑ FEC (use a strawman of RS(992,864) until further contributions for developing the loss budgets)
 - Impact of using same FEC in both DS and US (or not)

SOA preamplifier at OLT (WDM coexistence)



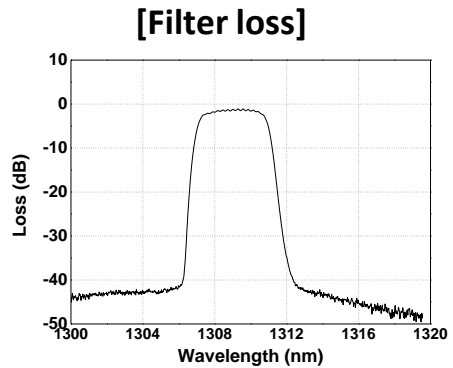
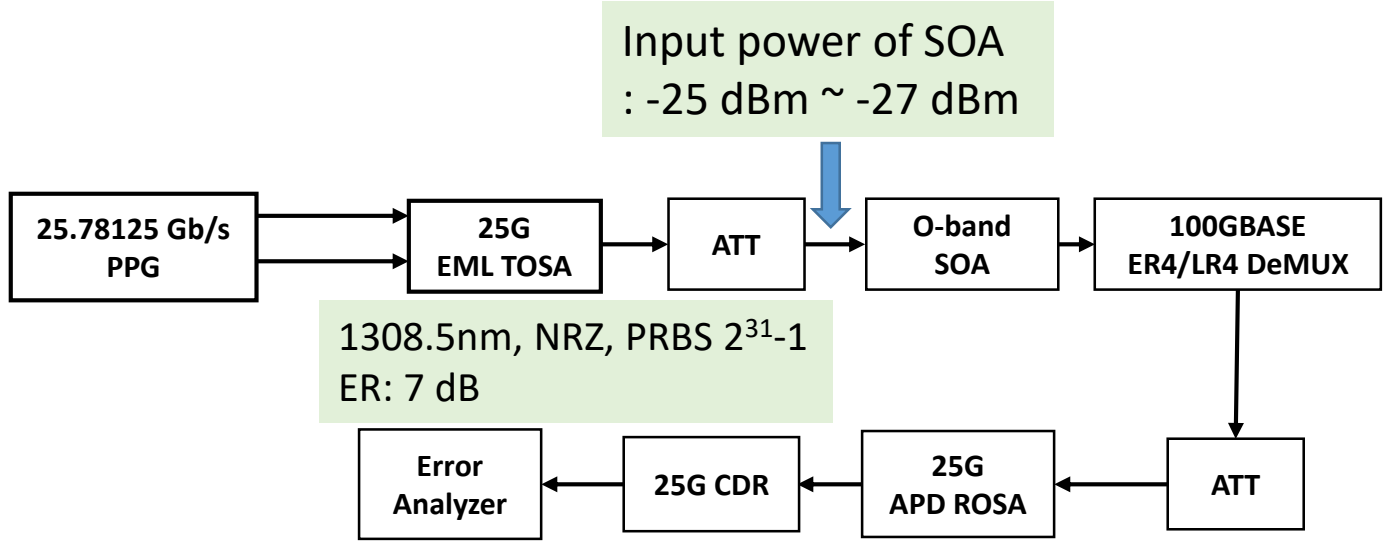
- 100G EPON would use SOA to compensate MUX and DeMUX loss.
- For WDM coexistence configuration, a diplexer is needed in front of 100G EPON OLT (Detail configuration is described in appendix I)
- To compensate an additional loss of diplexer, OLT PMD must include SOA as a preamplifier.

SOA input power

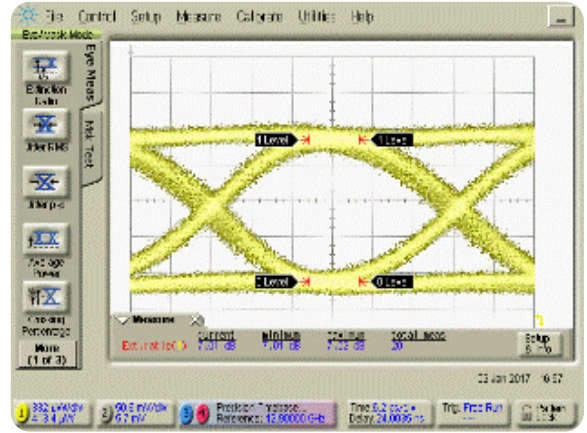
ONU Tx (dBm)	MUX loss (dB)	ODN loss (PR30) dB	WE loss (dB)	SOA input power (dBm)
10	2	29	2	-23
9	2	29	2	-24
8	2	29	2	-25
7	2	29	2	-26
6	2	29	2	-27
5	2	29	2	-28
4	2	29	2	-29
3	2	29	2	-30

- Without SOA, a received power of Rx is less than -25 dBm due to DeMUX loss (2 dB) in front of 25 Gb/s APD based OLT Rx.
- -25 dBm of received power is not enough to archive BER of 10^{-3} considering transmission performance of a cooled DML based ONU Tx.
 - http://www.ieee802.org/3/ca/public/meeting_archive/2016/11/tanaka_3ca_1_1116.pdf
 - http://www.ieee802.org/3/ca/public/meeting_archive/2016/11/huang_3ca_1a_1116.pdf
- Investigation of BER performance of SOA amplified signal is important when an input power to SOA is low

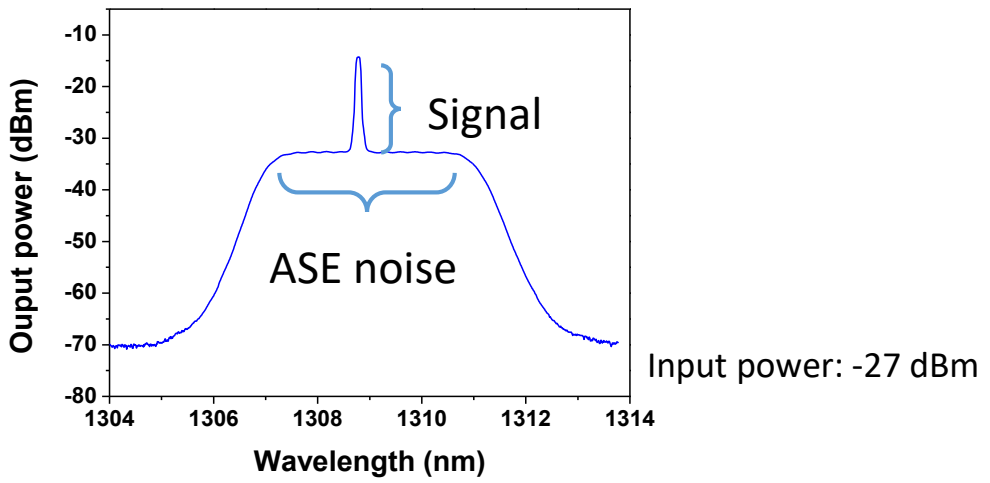
Experiment setup



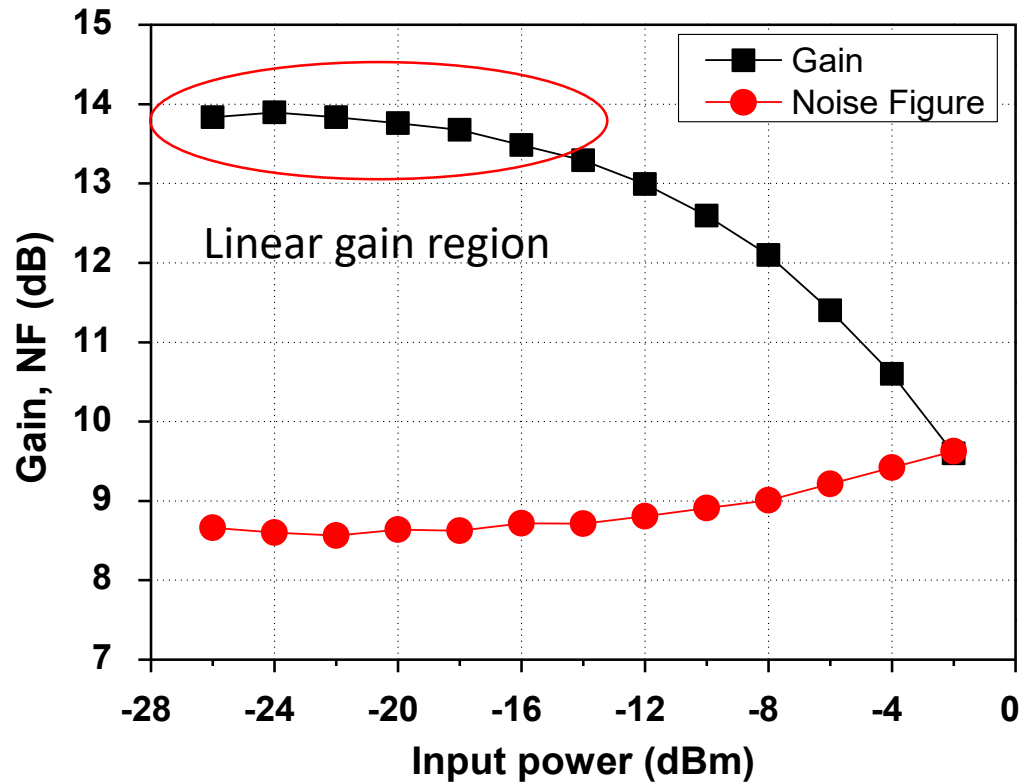
[Tx eye diagram]



[Output spectrum]

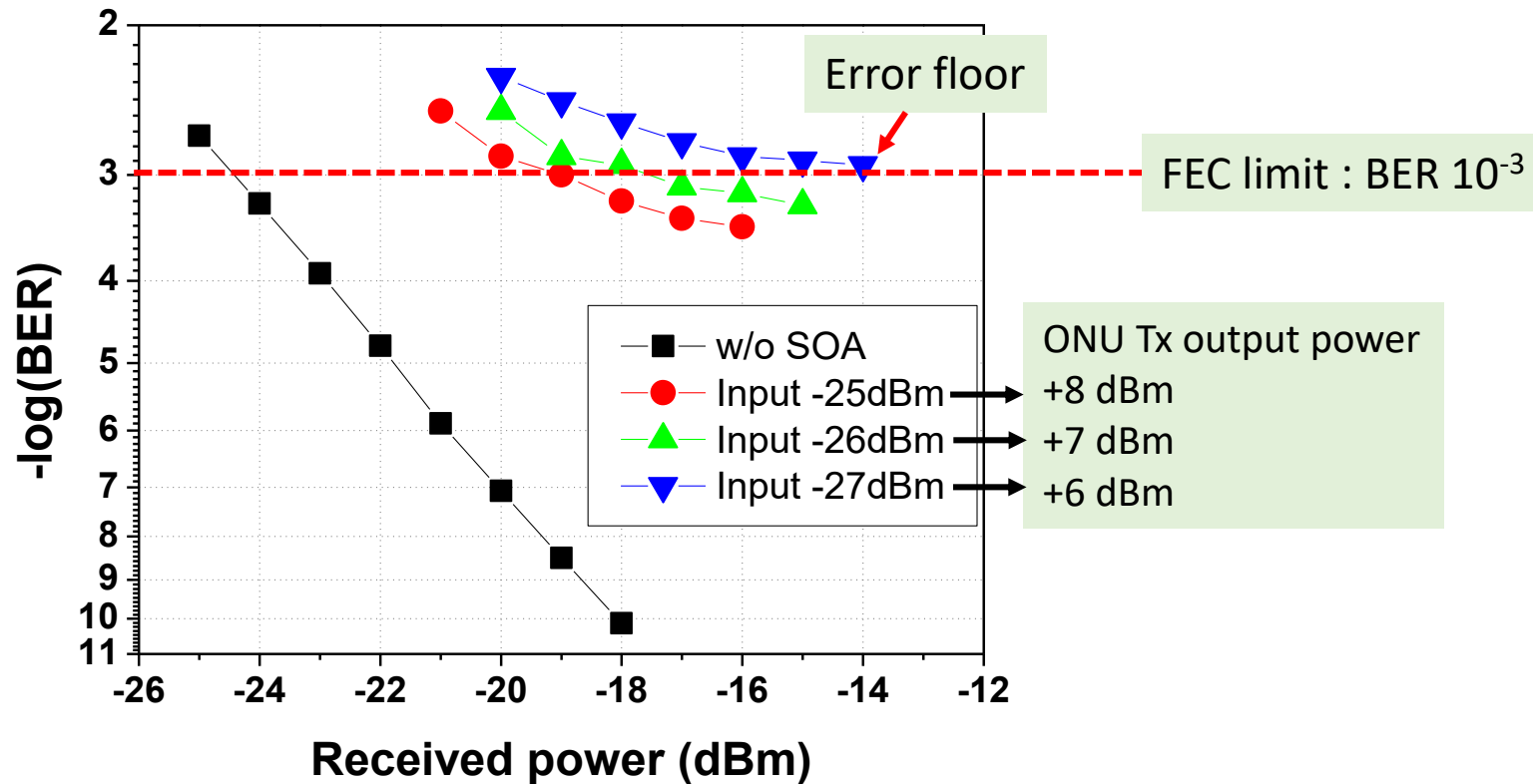


Gain & NF of O-band SOA



- Small signal gain and NF: 13.9 dB and 8.7 dB at -25 dBm input power
 - Operating current of SOA: 210 mA
 - Signal wavelength: 1308.5 nm

25G upstream BER of amplified signal



- In the case of input power of -27 dBm, even a received power increases to -14 dBm, a measured BER can not reach to 10^{-3} .
- It is because of small optical signal to noise ratio (OSNR) of amplified signal coming from small input power level and wideband ASE filtering.

Conclusion

- Technical feasibility of SOA preamplifier with 25 Gb/s APD receiver for 100G EPON with WDM coexistence is introduced.
- When the input power of SOA is less than -27 dBm, the measured BER can not reach BER 10^{-3} due to low OSNR and unfiltered ASE noise due to 100GBASE-LR4/ER-4 DeMUX.
- SOA with low NF and narrow band filtering will help to improve pre-amplified 25G Rx performance.
- Study of WDM amplification case is needed to investigate WDM crosstalk induced receiver sensitivity degradation.

Appendix I: Example of diplexer configuration

