

Power budget proposals for Wavelength Plan A

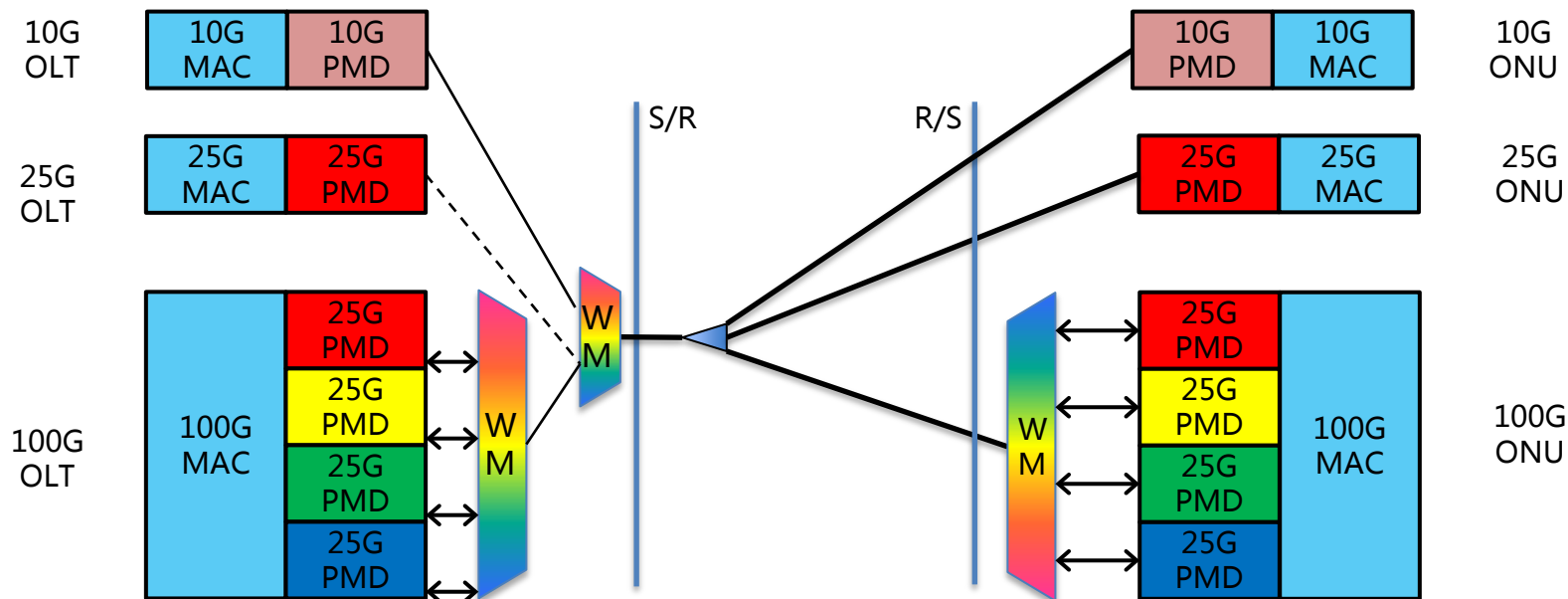
Yong Guo

Xingang Huang

Jun Shan Wey



100G-EPON architecture and reference points



Downstream

- Uses wavelengths above 1340nm in O+ band
- 25G EML in OLT transmitter and 25G APD in ONU receiver
- WM as a part of OLT transceiver

Upstream

- Uses wavelengths near zero dispersion in O- band
- Cooled 25G DML in ONU transmitter and 25G APD in OLT receiver
- WM as a part of ONU transceiver

Power budget analysis

During the November meeting, the following optical parameters for S/R & R/S reference points are recognized:

- Rx sensitivity based on 25G Ge/Si APD without amplifier
 - Based on test results from guo_3ca_1a_0516 and pan_3ca_1_0916, -28.5dBm receiver sensitivity for 25G APD ROSA at BER of 10^{-3} can be used as the baseline value. If adopting 4.5dB margin (2dB TO can yield margin, 1dB Temperature margin, 1dB end of life margin and 0.5dB BOSA loss) as suggested in harstead_3ca_4_0117, -24dBm with 25G EML (ER=8dB) is feasible for 25G ONU.
 - By considering ER difference (1dB) of using 25G DML and upstream burst penalty (1dB), we believe -22dBm sensitivity is reasonable for 25G OLT.
- Tx power without amplifier
 - Min 6dBm for 25G EML is challenging (based on umeda_3ca_1_0316)
 - So, min +4dBm for 25G EML is safe based on our vendors' suggestion
 - Min 6dBm for 25G DML is feasible (based on tanaka_3ca_1_0516.pdf)
 - So, Min +4dBm for 25G DML is appropriate, +6dBm is reserved for future use (i.e., for 100G)
- 1dB TDP for both upstream and downstream is assumed
 - Additional penalties (e.g., more TDP and loss of coexistence filters) can be considered using enhanced FEC (needs 0.5-1dB more gain)

Power budget proposal for S/R and R/S point

To support PR30 budget class, the following power budget is proposed

- Because +4dBm for 25G EML is not enough to support 29dB budget, downstream post amplifier is needed at OLT to close the 2dB gap
- Because -22dBm sensitivity for OLT receiver and 4dBm for ONU transmitter is not enough to support 29dB budget, upstream pre amplifier is needed at OLT to close the 4dB gap
- Amplifiers are not needed at ONU side.

Transmission Direction	Parameter	Proposed Value (dBm)
DS	Min OLT launch power (dBm) at S/R	+6 (needs post amplifier)
	Max OLT launch power (dBm) at S/R	+9 (needs post amplifier)
	ONU sensitivity (dBm) at R/S	-24
US	Min ONU launch power (dBm) at R/S	+4
	Max ONU launch power (dBm) at R/S	+7
	OLT sensitivity (dBm) at S/R	-26 (needs pre amplifier)

Power budget considerations for 100G

For 100G, additional 2dB mux/demux loss has to be considered at both sides.

Based on vendor's feedback, at least 2dB improvement for 25G APD sensitivity can be expected in a few years

- TO-can yield margin can be reduced by improving the packaging uniformity and tightening specs. The yield margin is believed can be controlled <1dB.
- Temperature margin can be reduced to 0.5dB by adopting smaller power TIA (current TIA power consumption is 150mW, which can be reduced to <100mW).
- 0.5dB is expected for the assumption of end of life margin, Current APD IV&Resp changes are <10% after 5000hrs.
- At least 0.5dB Module level sensitivity can be improved by implementing EQ, limiting amplifier and CDR.

Transmission Direction	Parameter	Proposed Value (dBm)
DS	Min OLT launch power (dBm) at S/R	+6 (needs 2 dB higher SOA gain)
	Max OLT launch power (dBm) at S/R	+9 (needs 2 dB higher SOA gain)
	ONU sensitivity (dBm) at R/S	-24 (-26dBm APD sensitivity)
US	Min ONU launch power (dBm) at R/S	+4 (+2dB higher reserved for 25G DML)
	Max ONU launch power (dBm) at R/S	+7 (+2dB higher reserved for 25G DML)
	OLT sensitivity (dBm) at S/R	-26 (needs 2dB higher SOA gain)

Thank you



Tomorrow never waits

