25G base PHY wavelength plan

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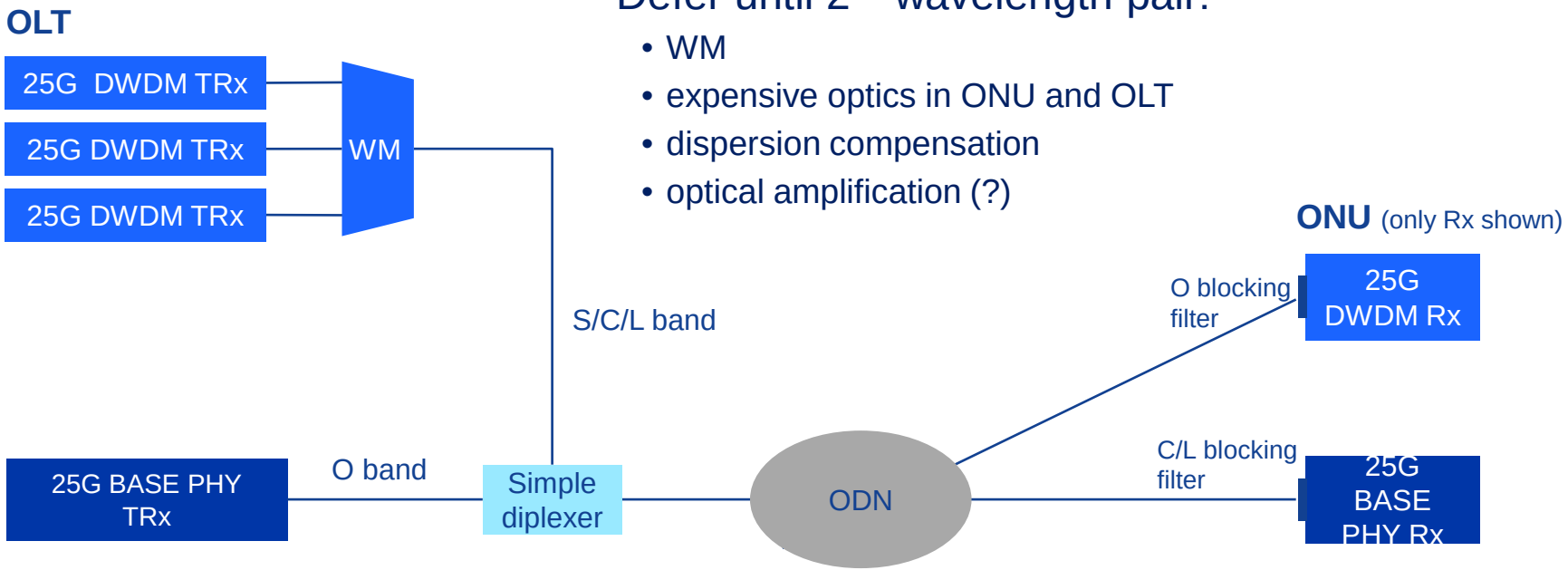
Review: 100G EPON PAYG architecture starting with low cost 25G base PHY

(harstead_3ca_1b_0116)

Defer until 2nd wavelength pair:

- WM
- expensive optics in ONU and OLT
- dispersion compensation
- optical amplification (?)



Why 25G base PHY in the O-band

- Leverage DML, EML, APD, SOA + p-i-n components from the 25G ecosystem
- In particular, leverage uncooled DMLs from 25G data center volumes

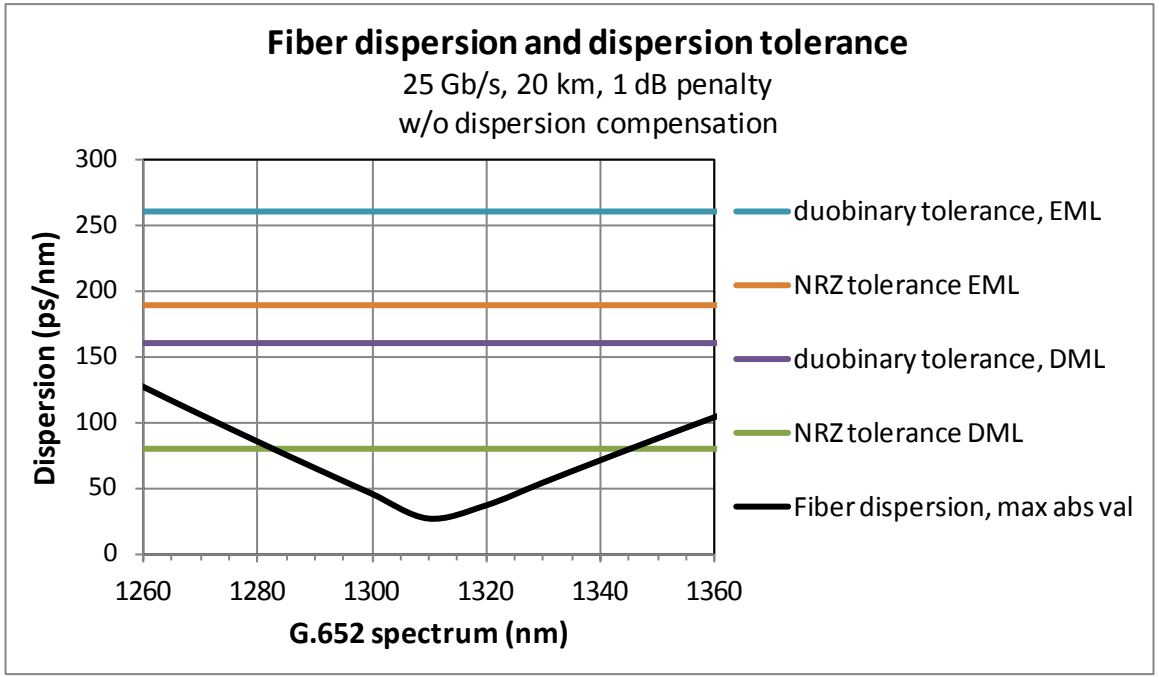
  (refer to harstead_3ca_1_0316)

  – But will need higher launch power for PON
- Minimum dispersion in the O-band mitigates chromatic dispersion and allows for the use of DMLs.

Why DML vs. EML

- Inherently lower power dissipation and lower cost
- Higher volumes (data center) → lower cost
- Inherently higher output power
  - ease receiver sensitivity requirements → lower cost
  - possibly avoid optical amplification → lower cost

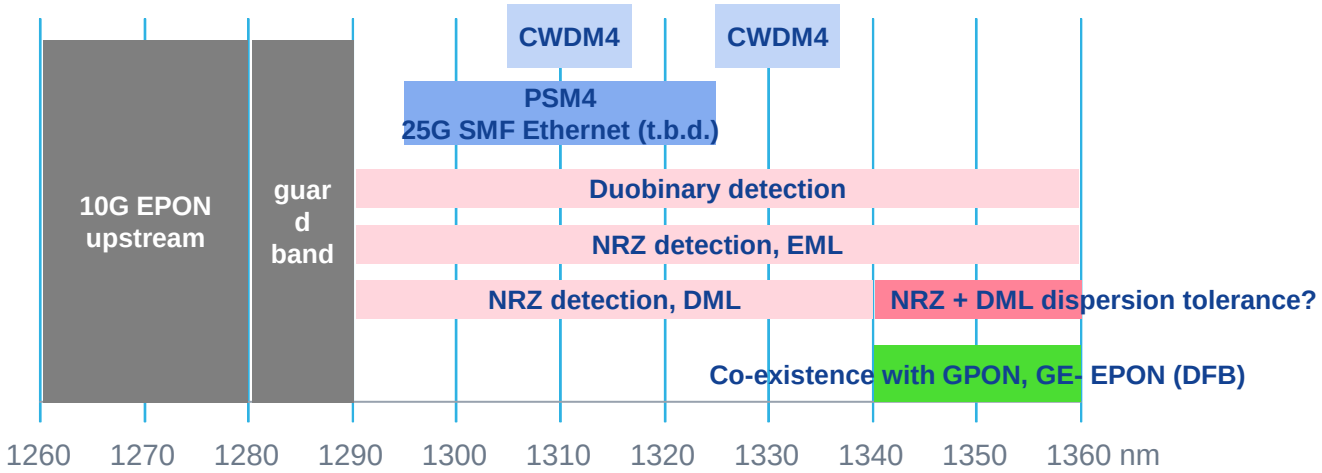
Chromatic dispersion tolerance



detection	EML	DML
duobinary	✓	✓
NRZ	✓	Need DC at edges

- NRZ+DML dispersion tolerance:
  - For 1260 nm, need 127 ps/nm
  - For 1360 nm, need 103 ps/nm
- Are those dispersion tolerance values practical with EDC
  - at the OLT?
  - at the ONU?

Downstream wavelength trade-offs



1310 nm

- Will leverage the highest volumes of 25G ecosystem
- Allows for both duobinary and NRZ detection with DML

1350 nm

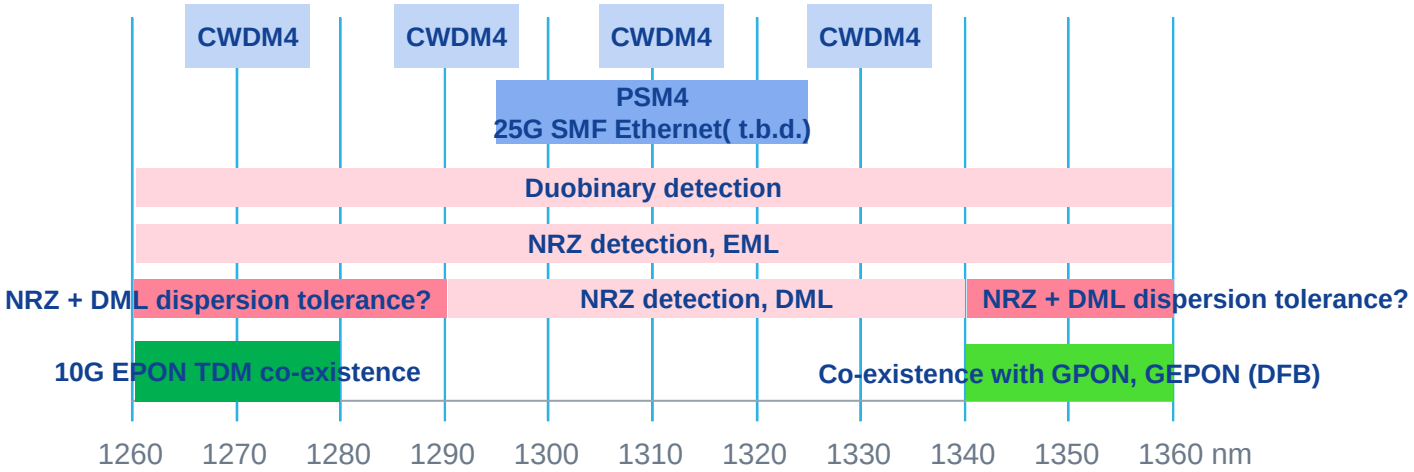
Pros:

- WDM co-existence with GE-EPON (DFB)
- WDM co-existence with GPON

Cons:

- 25 Gb/s lasers on a new λ
- NRZ detection with DML, may require EDC in the ONU

Upstream wavelength trade-offs



1270 nm
TDM co-existence with 10G EPON

- Leverages CWDM4 volumes
- NRZ detection with DML, may require EDC in the OLT

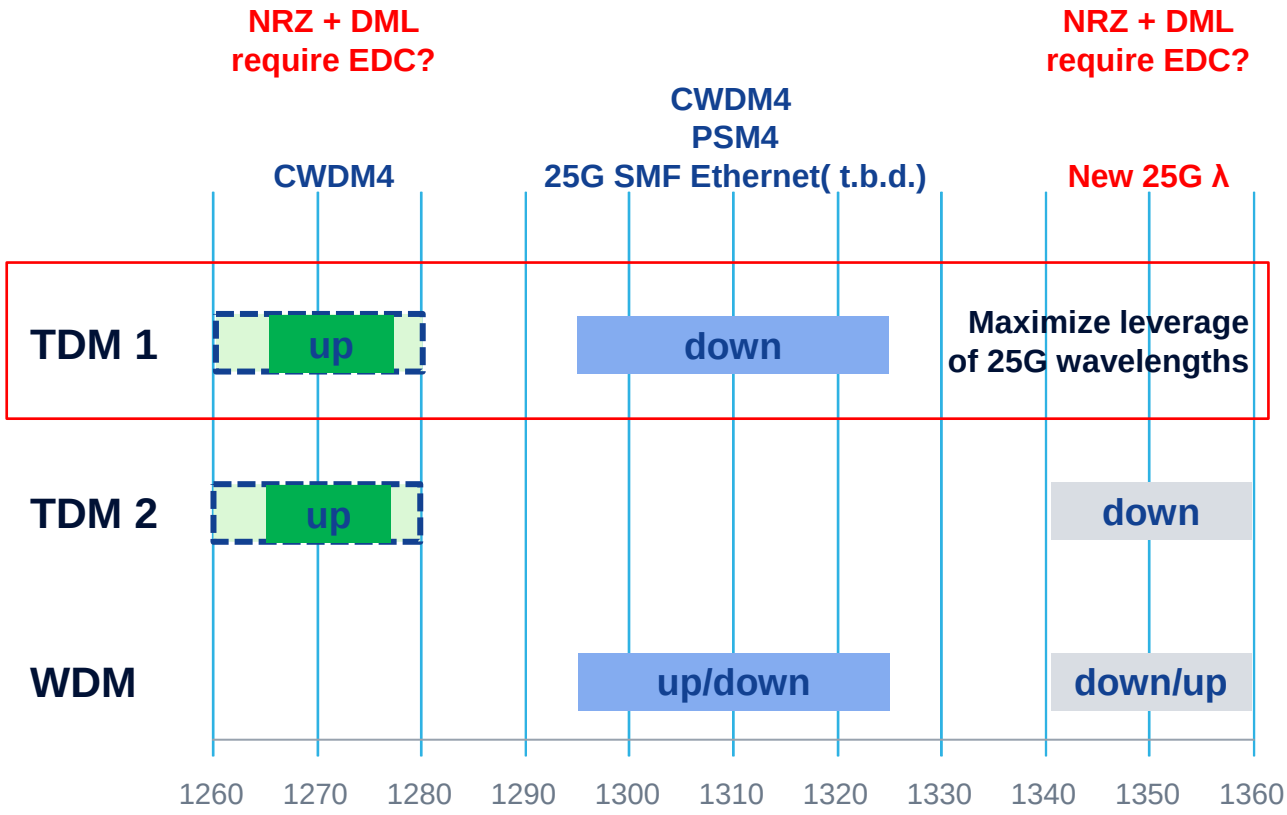
1310 and 1350 nm
WDM co-existence with 10G EPON

- Same as downstream

What can be concluded?

1. 1310 nm leverages all 3 data center technologies; has the best dispersion performance.
2. But we can’t put both downstream and upstream at 1310 nm.
3. All things equal, avoid 1350 nm (a new 25 Gb/s wavelength).
4. Whether to co-existence (WDM) with GPON may have an impact.
   - Why we might care: GPON co-existence may improve chances of 25G PHY layer convergence with a future 25G ITU-T PON, and help drive common volumes to lower cost.
5. There are 3 primary options
   - assuming minimum 35-40 nm wavelength spacing to use cheap 45 deg BOSA diplexer.

Options



Coexistence	
10G EPON	GPON
TDM	✘
TDM	WDM
WDM	✘

25G/10G TDM co-existence

In principle 25/10 TDM coexistence could be easier to implement than 10/1:

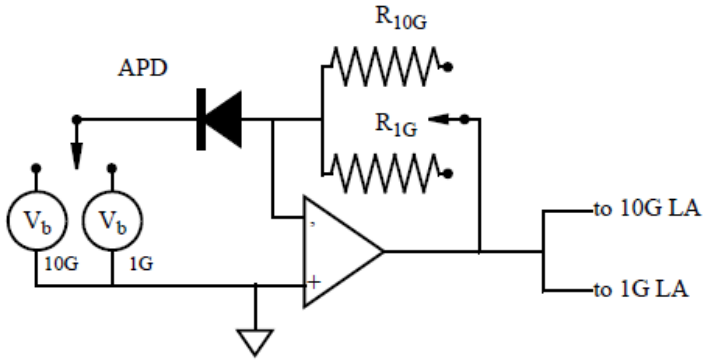
→ if using a 10 Gb/s receiver for 25 Gb/s

TIA and APD bias switching would not be required in a 25/10 dual-rate receiver

Experimental results of a 25/10 dual-rate receiver to be published.

Optimal dual-rate 10/1 receiver

10G EPON 802.3av, Fig. 75A-2c



Questions

For EPON operators

- How important to co-exist with GEPON (DFB)?

For silicon and system vendors

- For TDM options A and B, if implemented with DML and NRZ detection, is it practical to support a CD tolerance value of
  - 127 ps/nm at 1260 nm in the OLT
  - 103 ps/nm at 1360 nm in the ONU or OLT

For optical component vendors

- How do these affect leveraging of 25G data center DML volumes and impact cost?
  - increased optical launch power (~ 6dBm)
  - new 25G wavelength at 1350 nm

For all

- There are tradeoffs (not documented here) between TDM and WDM co-existence with 10G EPON. Which is preferred?
- How important is it to co-existence with GPON, to encourage PHY layer convergence with ITU-T?


Alcatel·Lucent