100G EPON wavelength plan discussion

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Background

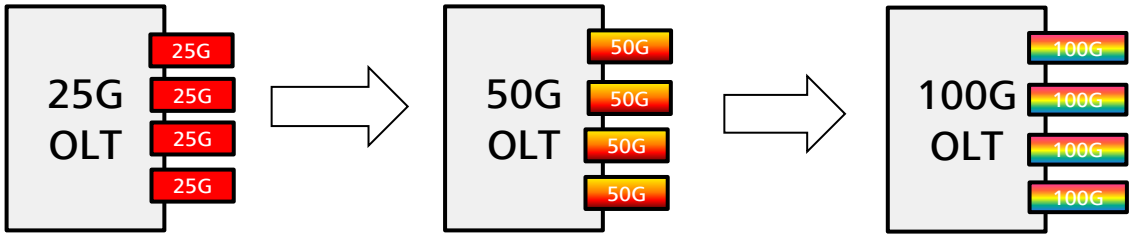
- There could be two options on the wavelength number of 100G EPON architecture
  - 1 + 3 : The wavelength pair of 25G are one pair of 100G PON
  - 1+ 4: The wavelength pair of 25G are not one pair of 100G PON
- This contribution analyzes the advantages and disadvantages of the two architectures, and suggest some considerations we need to notice for 100G EPON wavelength plan.

The origin of the 1+4 plan

- **Admittedly, 1+4 seems strange, so why did it come up?**
- **Common believe is wider wave band optics = cheap**
- **Hopes that the 25G single channel system could use uncooled lasers, thus requiring 20nm wide band**
  - Commonality with 32GFC, perhaps?
- **Reuse of LR4 optics for the 100G system is good**
  - Spectrally efficient
  - Re-use of an existing optical module at the ONU
- **However, as was presented on the consensus building call, uncooled lasers are unlikely**
  - Hence, the justification of the 1+4 plan might go away

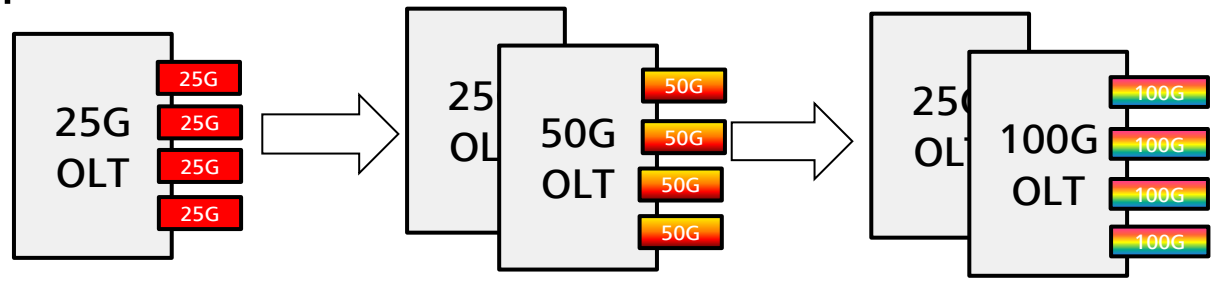
100G EPON upgrade path

1 + 3



Replace the original OLT board to the new OLT board when upgrade

1 + 4



Add another OLT board when upgrade from 25G to 50G/100G

- 1 + 3 has better upgrade simplicity and flexibility :
  - 1 + 3 upgrade doesn't need to increase extra chassis (no extra space, no W1r components)
  - 1 + 3 allows operators skip to deploy 25G OLT but still support 25G ONUs, which can decrease OLT generations .

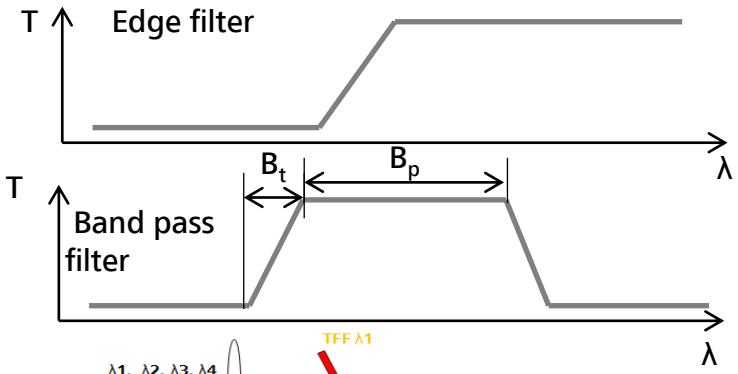
Some concerns on 1 + 3

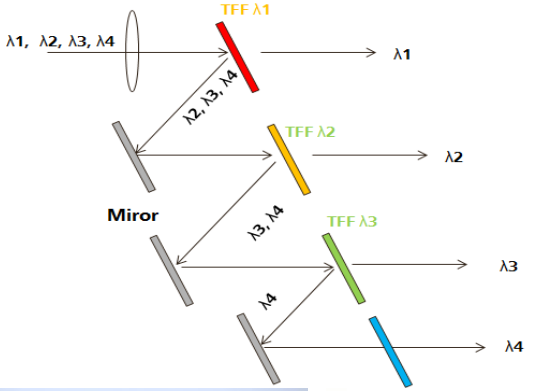
- For 1+4 architecture, we should always be able to have a uniform channel spacing for 100G OLT/ONU modules.

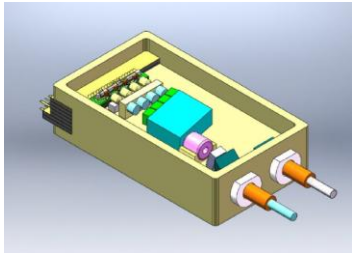
- For 1 + 3 architecture , we may have some non-uniform grid and even interleaved grids for downstream and upstream wavelength , this will result in some constrains and complexities for 100G modules.
  - Non-uniform grids will limit the application of PLC integration technologies for 100G.
  - Interleaved downstream and upstream wavelength plan also will result in some difficulties on mux/demux design for 100G modules

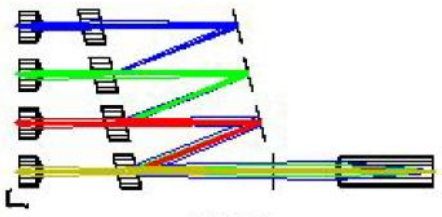
Two type mux/demux

Thin film filter

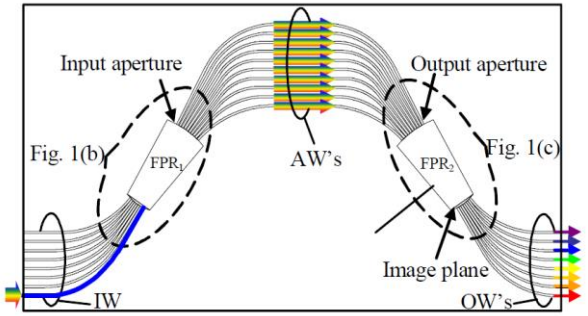


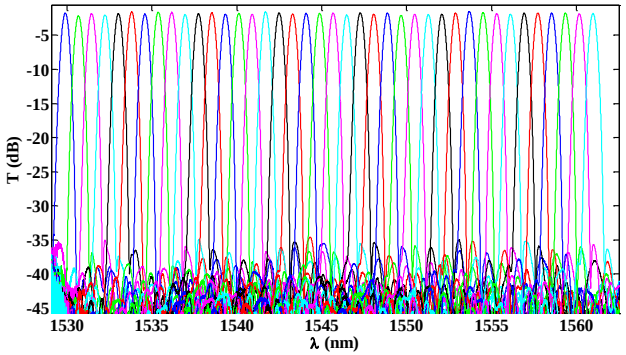






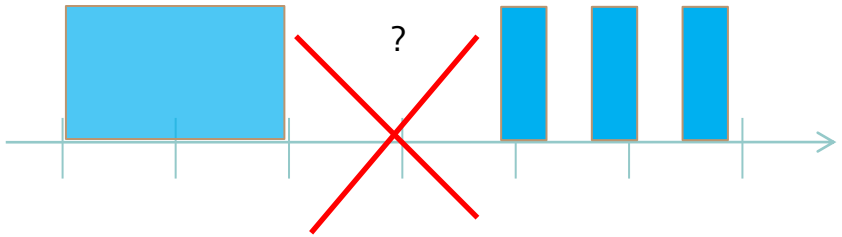
AWG



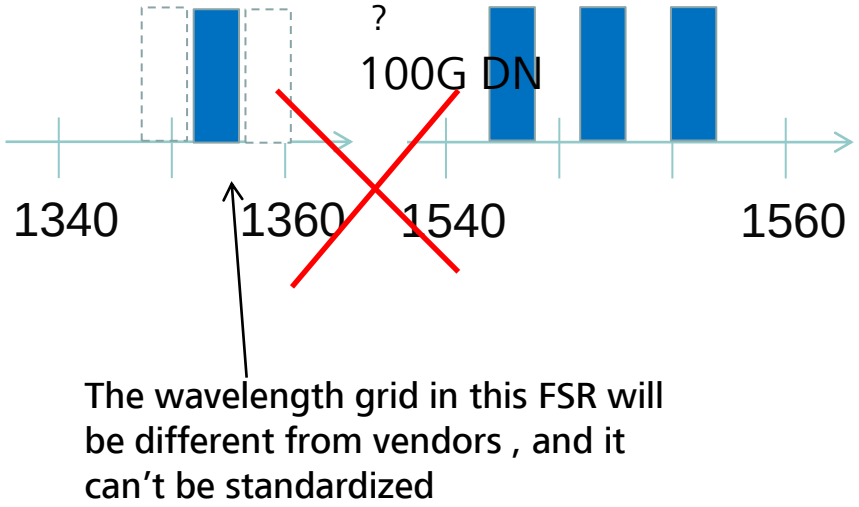


Constrains for the demuxs(1)

- Constrains for AWG:
  - Non-uniform pass band width for different channels is very difficult



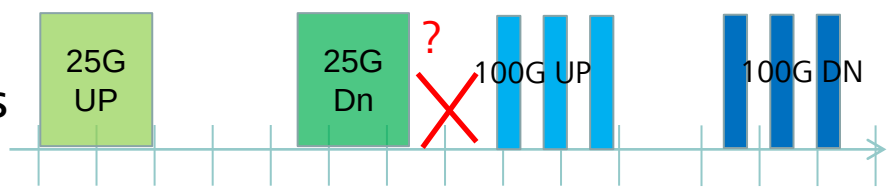
  - FSR is different from vendors to vendors(FSR is not possible to standardize for different vendors)
    - In all existing standards, they only define the wavelength grid of AWG in one FSR
    - FSR depends on the effective refractive index of AWG waveguide, which is related to the refractive index contrast ratio and depends on the specific technology for different vendors.



Constrains for the demuxs(2)

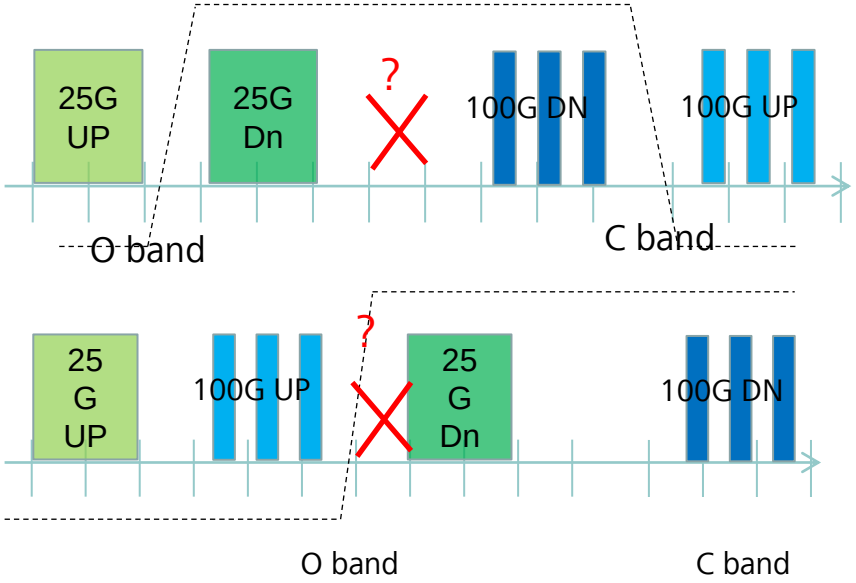
Constrains for thin film filter demux (TFF):

- Interleaved wavelength grid for DS/US is difficult to separate.(If we want to keep Tx's or Rx's together for 100G modules)



High B_p/ B_t

- Wide pass band but narrow transition band BPF should be avoid(High B_p/ B_t filter)



Summary

- From the evolution path consideration, 1+3 wavelength plan for 100G EPON has better upgrade simplicity and flexibility for the operators. It's preferred for 100G EPON wavelength plan.

- From cost effective and module footprint consideration, we should avoid non-uniform channel spacing and interleaved downstream/upstream wavelength plan for 100G EPON.

Thank you

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