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Wavelength plan comparison: proposed decision process

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Overview

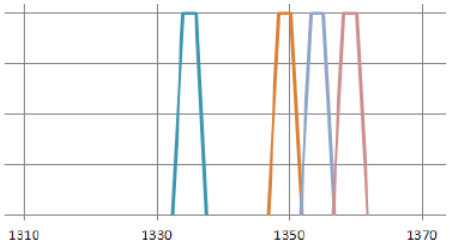
- Wavelength plan comparison update harstead_3ca_3_1116 scored Plans A, B, C, and D based on set of criteria.
- The decision to adopt 1+3 architectures more or less eliminated Plan C, narrowing to Plans A, B, and D.
- Of the original decision criteria, only a few remained that differentiated the 3 plans.
- What remains in Plans A, B, and D are two schemes for downstream and two schemes for upstream, and it's more useful to take decisions for the two directions (more or less) independently
  1. downstream plan decision: O-band vs. C-band
  2. upstream plan decision: WDM vs. TDM co-existence with 10G EPON
- Only two decisions are required to choose between 4 valid plans A, B, D, and "X"

Valid wavelength plans		Downstream decision	
		O-band	C-band
Upstream decision	WDM	**A**	**D**
	TDM	**B**	**"X"**

Downstream schemes

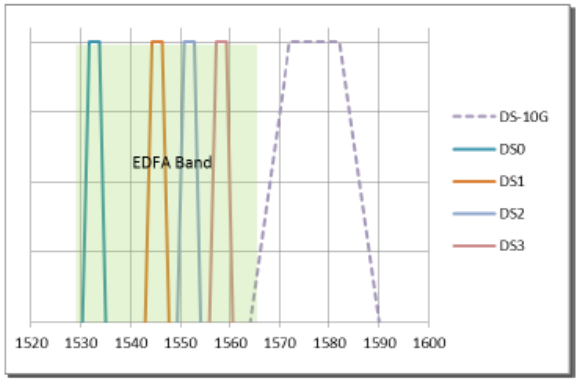
- **O-band schemes**, all similar
  - Plan A: johnson_3ca_1a_0916
  - Modified Plan A: zhang_3ca_1_1116
  - Modified Plan B: harstead_3ca_1_0117
- Consider zhang_3ca_1_1116 (adopted for Modified Plan B(1))

	Center freq	Center WL
DS0	224.600	1334.784
DS1	222.200	1349.201
DS2	221.400	1354.076
DS3	220.600	1358.987



- **C-band scheme**
  - Plan D: johnson_3ca_2_0916

	Center Freq (THz)	Center WL (nm)
DS0	195.600	1532.681
DS1	194.000	1545.322
DS2	193.200	1551.721
DS3	192.400	1558.173



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Downstream schemes advantages

O-band scheme:

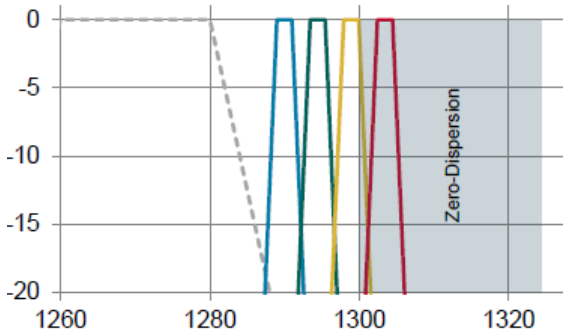
- **20 km reach without dispersion compensation**
  - C-band scheme requires dispersion compensation for >10 km. No “safe” options identified:
    - Gires-Tornois Etalon per umnov_3ca_1_1116. Risk: etalon - laser wavelength alignment, especially for US.
    - EDC. Risk: not clear how much improvement is feasible, especially for upstream burst mode and DMLs.
    - Dispersion compensation fiber (DCF)- No technical risk. But bulky and operationally complex; has never been used in broadband access.
  - Most operators don’t need >10km, but are split per miguelez_3ca_1a_0916. Requiring DCF could reduce NG EPON’s market acceptance.
- **Lower TDP, by 0.5-1.0 dB**
  - Compare fiber dispersion at:
    - 10 km at 1560 nm: 186 ps/nm
    - 20 km at 1360 nm: 103 ps/nm

C-band scheme

- **Wider DS/US gap**: for low cost 25G ONU focus beam BOSA, no additional loss compared to 10G EPON
  - However, latest analysis of funada_3ca_1_0117 indicates for Plan B also no additional loss, and for Plan A only <0.2 dB additional loss.
- **EDFA is a candidate technology**
  - SOA should be adequate for OLT post amp and will be smaller and lower cost

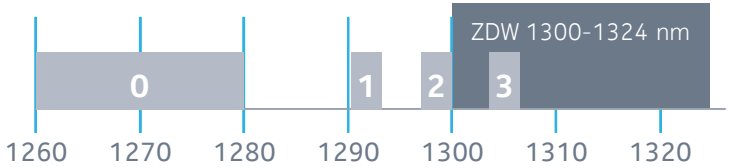
Upstream schemes

- **WDM co-existence with 10G EPON**
  - Plan A: johnson_3ca_1a_0916



	Center Freq (THz)	Center WL (nm)
US0	232.400	1289.985
US1	231.600	1294.441
US2	230.800	1298.927
US3	230.000	1303.445

- **TDM co-existence with 10G EPON**
  - Modified Plan B: harstead_3ca_1_011



Wavelength (nm)	Frequency (THz)	
1260-1280		US 0
1291.652	232.1	US 3
1298.365	230.9	US 2
1305.148	229.7	US 1

  - Technical risks considered in harstead_3ca_2_0117. On first analysis, risks appear to be manageable.

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Upstream schemes advantages (per harstead_3ca_2_0117)

WDM co-existence with 10G EPON

- **λ0 25G upstream capacity not shared with lower speed ONUs**
  - Significant but only when very high upstream service levels are offered on those low speed ONUs

TDM co-existence with 10G EPON

- **Lower cost implementation**

Element	Advantage
25/25 ONU	• Potential use of uncooled DML: 33% optics cost savings
25G OLT	• Fewer components and connections • Larger upstream λ0-λ1 gap for lower cost filtering.
25G power budget	• Wider DS/US gap: up to 0.2 dB advantage • One less filter in OLT: 0.5 dB advantage • Total advantage: 0.7 dB
100G ONU	• Relaxed wavelength tolerance (3 nm vs. 2 nm): 25% transmitter cost savings

- **No FWM risk with 1300-1324 nm ZDW fiber**
- **25G upstream co-existence with GPON** (effenberger_3ca_1_0117)

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Summary

- A wavelength plan decision process is proposed: consider the two downstream schemes and the two upstream schemes independently
- Advantages of each are identified.
- After making decisions, place checkmark in the appropriate cell:

		Downstream decision	
		O-band	C-band
Upstream decision	WDM		
	TDM		


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