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25/50/100G PON optical vendor input

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Supporters:

- Accelink
- Broadcom
- Finisar
- Hisense-Ligent
- Macom
- Mitsubishi
- Source Photonics
- Sumitomo

Questionnaire and responses

- A questionnaire was sent to 10 optical component vendors
  - Laser and photodiode vendors
  - Optical module vendors
- Written responses were received from 8 vendors
- Some (but not all) vendor responses tended to be conservative
  - E.g. some vendors only gave current values– they were not comfortable quantitatively projecting improvements in the year 2020, although acknowledging improvements would happen.

Questionnaire cover page

Introduction

- The IEEE 802.3ca Task Force is standardizing 25/50/100G EPON.
- Compared to 10G EPON PR30 we need to find about 5 dB more to support 25G.
- Primarily we must obtain this from improved transmitter and receiver design.
- The purpose of this questionnaire is understand what improvements could be had by year 2020, consistent with low cost PON implementation.
- In addition, we also need to minimize the impact of a multiple wavelength architecture on the cost-optimized first generation 25G EPON. Therefore minimizing the cost of filtering and tight channel spacings is required.
- Optical vendors are requested to answer the questions/fill in the tables on the following slides.

References: contributions to the May 2016 25/50/100G EPON Task Force

- "25G power budget: 1st iteration" harstead_3ca_1a_0516.pdf
- "25G/50G/100G EPON wavelength plan" harstead_3ca_2_0516.pdf

25G transmitter cost: question

What do you estimate will be the cost of a 25G TOSA in the year 2020 relative to a 10G EML TOSA?

	Relative TOSA cost in year 2020
10G EML	1
25G EML	
25G cooled DML	
25G uncooled DML	

25G transmitter cost: responses

TOSA cost in year 2020, relative to 10G EML TOSA			
	number	mean	σ
25G EML	6	1.8	0.7
25G cooled DML	7	1.4	0.8
25G uncooled DML	7	0.8	0.5

When a range was given, both the lower and upper values were considered as separate inputs, so that uncertainty is expressed in the standard deviation

→**Evidence that an effort should be made to accommodate cooled and uncooled DMLs, especially for upstream**

25G transmitter launch power and ER: question

- What is the maximum AVP_{min} (minimum average power) and ER for an EML and/or DML transmitter?
- Conditions:
  - launched from a low cost PON BOSA with a 45° diplexer
  - over I-temp, EOL
  - No post amplifier
  - For low cost (i.e. high yield) volume deployment in year 2020.
- Minimum targets shown in parentheses– but more would be helpful.

	AVP_{min} (dBm)	ER (dB)
EML	(5)	(8)
cooled DML	(7)	(6)
uncooled DML	(6.5)	(5.5)

25G transmitter launch power and ER: responses

AVPmin (dBm)	number	mean	σ
EML	6	4.5	0.8
cooled DML	8	7.0	1.2
uncooled DML	6	4.7	1.5
ER (dB)			
EML	6	7.5	0.8
cooled DML	8	5.3	0.9
uncooled DML	6	4.7	1.0

When a range was given (maximum 1 dB), the higher value was chosen.

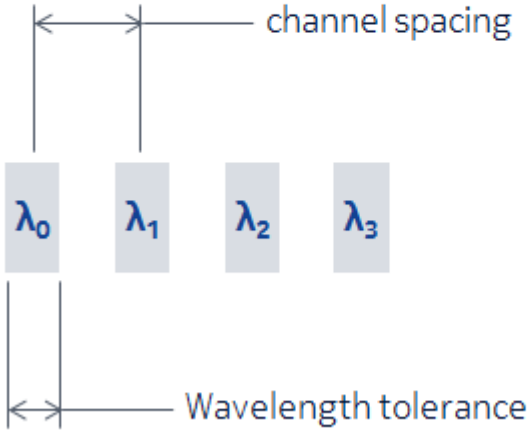
→Inputs to be used in harstead_3ca_2_0716

Transmitter wavelength and wavelength tolerance: question

The first 25G wavelength pair λ_0 will likely be placed in the O-band.

If the next 3 wavelength pairs λ_1, λ_2, and λ_3 are also placed in the O-band, instead of in the C or L bands:

what is the minimum channel spacing and minimum wavelength tolerance that can be supported without imposing significant additional cost?



	CS (nm)	width (nm)
EML		
cooled DML		

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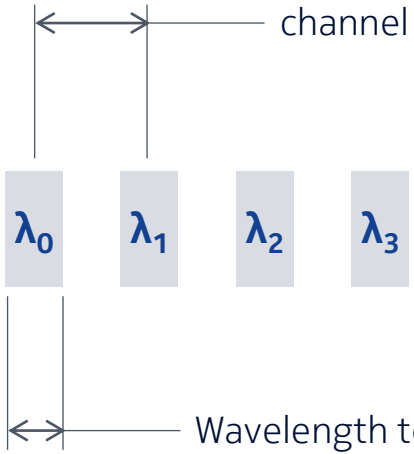
Transmitter wavelength and wavelength tolerance: responses

What is the minimum channel spacing and minimum wavelength tolerance that can be supported without imposing significant additional cost?



Vendors split:

- 5 indicated 800 GHz (4.5 nm)
- 2 indicated wider spacings, 6 and 10 nm.

	number	mean	σ
EML	4	3.4	1.4
cooled DML	6	3.0	1.2

→Inputs to be used in harstead_3ca_3_0716

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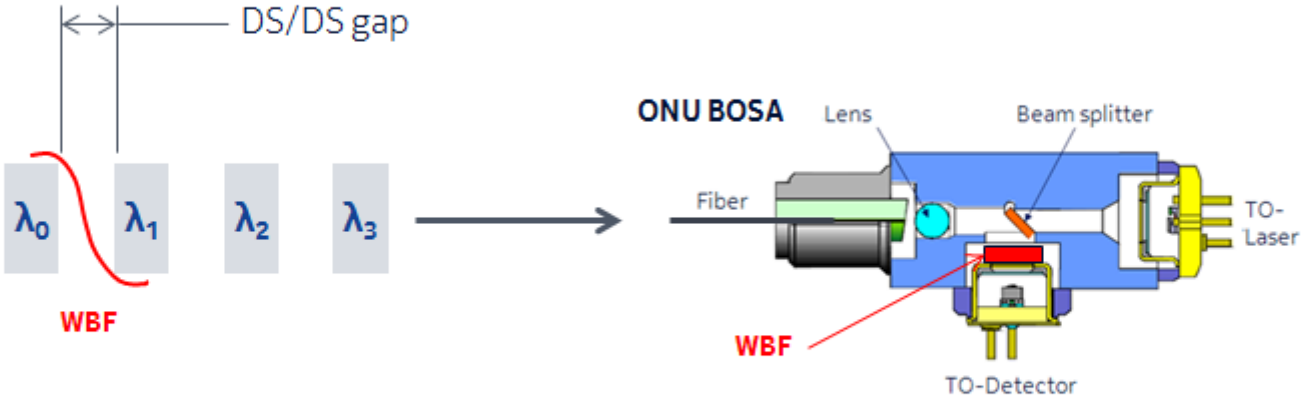
ONU receiver wavelength blocking filter (WBF) cost and insertion loss: question

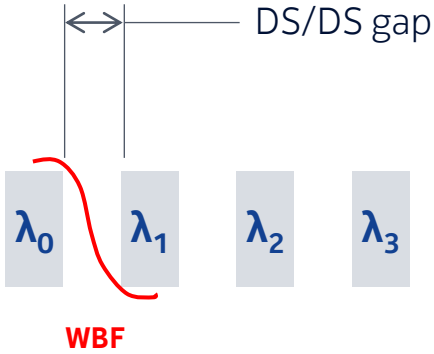
The 25G ONU module must be able to detect λ0 while rejecting λ1, λ2 and λ3.

This will require a WBF in front of the receiver.



1. What is the minimum size of the downstream/downstream gap before the WBF imposes significant cost and insertion loss?
2. What is the cost adder and insertion loss if the gap is about 3 nm (800 GHz LAN WDM)?

ONU receiver wavelength blocking filter (WBF) cost and insertion loss: responses



1. What is the minimum size of the downstream/downstream gap before the WBF imposes significant cost and insertion loss?

	number	mean	σ
Min value (nm)	4	11	7

2. What is the cost adder and insertion loss if the gap is about 3 nm (800 GHz LAN WDM)?
   - 5 responses, **4: high, 1: small**

→Inputs to be used in harstead_3ca_3_0716

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