IEEE 802.3av 10GEPON PHY Summary

Issues

- Wavelength Allocation
- Optical Budget
- Summary

The Purpose

- The purpose of the presentation is to summarize 10GEPON PHY parameters
- The data in the presentation has been taken from the presentations which presented during the last 4 meetings by several members
- The motivation is to take the summary towards consensus

Wavelength Allocation - Presentations

- 14 presentations have been presented about Wavelength Allocation for 10GEPON
- Suggested wavelengths were from several members:

murata_1_0506 – Sumitomo
mukojima_1_0506 – OKI
kubota_1_0506 – NEC
chang_1_0506 – Vitesse
ben-amram_1_0506 - PMC
effenberger_1_0706 – Huawei
merel_1_0706 – Luxtera
tanaka_1_0706 – KDDI
hirth_1_0706 – Teknovus
mukojima_1_0706 – OKI
takizawa_1_0706 – Fujitsu
kimura_1_0706 – Hitachi
tsuji_1_3av_0906 – Sumitomo
tanaka_1_3av_0906 – KDDI

Wavelength Allocation – Straw polls

Straw Polls (Cont.)

3. What Wavelength plan?

A) Upstream 10G: (33 people in room)

• 1310 nm	Y:	30	N:	1
• 1490 nm	Y:	0	N:	24
• 1550 nm	Y:	2	N:	25
• 1530-40 nm	Y:	17	N:	2
• 1560 nm and above:	Y:	18	N:	7

B) Downstream 10G: (29 people in room)

• 1310 nm	Y:	0	N:	26
• 1490 nm	Y:	10	N:	12
• 1550 nm	Y:	8	N:	16
• 1530-40 nm	Y:	15	N:	6
• 1560 nm and above	Y:	21	N:	2

Wavelength Allocation - Summary

Band	Wavelength [nm]	10G US	Date 06’	10G DS	Date 06’
O-Band	1260 – 1360	OKI 1310nm Vitesse 1310nm Huawei 1310nm Teknovus 1310nm	May May July July		
E-Band	1360 – 1460				
S-Band	1460 – 1530				
C-Band	1530 – 1565	Fujitsu 1539nm Luxtera 1542nm Sumitomo 1560nm	July July September	PMC 1530nm Huawei 1530nm Luxtera 1532nm OKI 1539nm Vitesse 1550nm Teknovus 1550nm KDDI 1550nm or Longer Sumitomo 1560nm	May July July July May July September September
L-Band	1565 – 1625			Fujitsu 1600nm	July
U-Band	1625 – 1675				

Wavelength Allocation - DS

- 10GEPON should take in account existing GEPON
- 10GEPON should support presence of RF Video
- 10G Downstream:
  - 1st choice 1560nm and above
    - **Advantages**
      - Mature technology
      - Available today for SDH/SONET 10 Gbit/s system with multiple vendors
      - Easy to achieve modulation speed
      - Available as Laser Diodes and as Optical Amp (EDFA)
    - **Disadvantage**
      - In some cases optical Band Pass filter will be needed at the ONU
  - 2nd choice 1530-40nm
    - **Advantages**
      - Same as 1560nm
      - ONU doesn't need optical Band Pass filter
    - **Disadvantage**
      - May collide with the Upstream

Wavelength Allocation – US

- 10G Upstream
  - **1st choice is 1310nm**
    - Fiber attenuation is 0.5dB/km ie. **10db** for 20km
    - Widely available lasers
    - Time division multiplexing with 1G at OLT
  - **2nd choice 1530-40nm**
    - Fiber attenuation is 0.3dB/km ie. **6db** for 20km
    - Lasers are available, but might be more expensive
    - No shared DBA between 1G and 10G upstream at OLT
- Note that 1530nm offers additional ***4dB!*** for the Optical Budget
- 1530nm is available in the market for 10G applications
- Additional wavelength increases the Upstream throughput in a mixed network

Optical Budget – Presentations

- 16 presentations have been presented about Optical Budget
- The presentation were from several companies:
  - murata_1_0506 – Sumitomo
  - otaka_1_0506 – NTT
  - kimura_1_0506 – Hitachi
  - kubota_1_0506 – NEC
  - chang_1_0506 – Vitesse
  - effenberger_1_0706 – Huawei
  - merel_1_0706 – Luxtera
  - tanaka_1_0706 – KDDI
  - mukojima_1_0706 – OKI
  - otaka_1_0706 – NTT
  - ben-amram_1_0706 - PMC
  - takizawa_1_0706 – Fujitsu
  - takahashi_1_0706 – Mitsubishi
  - murata_1_0706 – Sumitomo
  - wada_1_0706 – NEC
  - hajduczenia_3av_0906 – Siemens

Optical Budget – Straw Poll

Straw Polls (Cont.)

2c) Which 3 Maximum Channel Insertion Losses do you prefer?

- ~20dB, ~24dB, ~28 dB (i.e. PX10, PX20, B+): 6
- ~20dB, ~24dB, ~29 dB (i.e. PX10, PX20, B++): 13
- ~20dB, ~24dB, ~30 dB (i.e. PX10, PX20, C): 2
- No Opinion: 7

(Total in the room 29)

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Optical Budget – Straw Poll (Cont)

Straw Polls (Cont.)

2b) How many 10 Gb Optical Power Budgets should we standardize on (Compatibility with PX10 and PX20 is assumed to be a requirement)?

- One: 1
- Two: 0
- Three: 24
- No Opinion: 3

(Total in the room 28)

Optical Budget – Summary

Optical Budget Range [dB]	In Favor
23 – 26	KDDI [23dB]
26 – 29	Sumitomo [26dB] NEC [26dB] Mitsubishi [27.5dB] Huawei [28dB]
29	Hitachi [29-26dB] Vitesse [29-26dB] NTT [29dB] ETRI [29dB] PMC [29-23dB]
>29	Fujitsu [30dB] OKI [31-23dB] NEC [32dB]

Optical Budget – Conclusion

- The conclusion from the presentations:
  - 29dB is the most common request optical budget
  - 23, 26dB were also requested
- Straw Poll conclusion
  - 20, 24, 29db classes were requested

10GEPON should adapt the Worse Case scenario of GEPON

Optical Budget with FEC

- Some presentations include FEC in loss budget. Some do not. In many presentations it is unclear whether or not FEC is included.
- FEC “expands” the optical budget by about 3dB with R-S. This relaxes the optics requirements.
- We should clarify this issue.

Summary

- **Wavelength plan**
  - Upstream – 1310nm (1G)
  - Upstream – 1530nm or 1310nm(10G)
  - Downstream – 1490nm (1G)
  - Downstream – 1550nm (Video overlay)
  - Downstream – 1565nm (10G)
- **Optical Budget**
  - 3 Classes
    - Class I TBD
    - Class II 24-26dB
    - Class III 29dB

FEC could improve the Optical Budget by 3dB