Meeting Minutes

Group: IEEE 802.3 100G-EPON Task Force

Event: Task Force Interim meeting

Date: **From**: 24 May, 2016 **To**: 26 May 2016

Location: Whistler BC Canada

24 May 2016

8:05 AM – The meeting was called to order by the Working Group Vice Chair. Glen Kramer assumed the Chair in Curtis Knittle's absence. Duane Remein volunteered to serve as recording secretary. The Chair held Introductions and gave the opening report.

Motion #1
Approve the agenda for Task Force meeting to be held May 24-25 2016, in Whistler, BC located in file http://www.ieee802.org/3/ca/public/meeting_archive/2016/05/agenda_3ca_0516.pdf
Moved: Jorge Salinger Seconded: Marek Hajdcuzenia
Procedural > 50% Passed by voice without opposition

Motion #2
Approve the Minutes for Task Force meeting held Mar 2016, in Macao, PRC located in file http://www.ieee802.org/3/ca/public/meeting_archive/2016/03/minutes_unapproved_3ca_0316.pdf

Moved: Duane Remein Seconded: Kevin Noll
Procedural > 50% Passed by voice without opposition

The Chair reviewed meeting decorum, the Task Force reflector & WEB page, and IEEE Organization & Bylaws. The IEEE patent policy was read.

8:21 AM –A call for patents was made. No response was received.

The Chair reviewed the Guidelines for IEEE-WG Meetings, IEEE process, goals for meeting, project documents/objectives, future meeting (San Diego in July, Ft. Worth in Sept.) polls were taken.

Presentations and Discussion

8:30 AM –Presentations

MSO FTTH Infrastructure Realities **Phil Miguelez** **Comcast**
This presentation provided a survey of Comcast's network from an FTTH perspective highlighting existing plant facilities which should be considered in NG-EPON standardization.
miguelez_3ca_1a_0516.pdf

25G ONU Options to increase Network Capacity

Shawn Esser **Finisar**

This presentation made the argument that 25G ONUs will be the large majority of deployed ONUs and will still achieve 50/100G network capacity and result is lower overall cost.

esser_3ca_1b_0516.pdf

100G EPON wavelength plan discussion **Dekun Liu** **Huawei Technologies**

This presentation suggested the wavelength plan should be a 1+3 plan with uniform channel spacing.

liu_3ca_1_0516.pdf

NGEPON wavelength plan **Xingang Huang** **ZTE Corporation**

This presentation proposed a wavelength plan with all channels in the O Band using DWDM grid with 800 GHz spacing (DS ~1340-1360 nm, US ~1290-1310 nm). It was also noted that a cooled laser would be needed for industrial temperature range.

huang_3ca_1_0516.pdf

100G-EPON wavelength plan proposal **John Johnson** **Broadcom**

This presentation suggested the wavelength plan be kept in the O Band for both US & DS on a 10 nm grid with 20 nm minimum between US & DS. It was also noted that use of cooled lasers should be considered to meet the 29 dB power budget.

johnson_3ca_1b_0516.pdf

O-band Wavelength Allocation for 100G EPON

Hanhyub Lee **ETRI**

This presentation suggested that US might first use 10G channel rate (i.e., 25/10G, 50/20G, 100/40G) with later migration to 25G burst mode upstream. Use of O Band is preferred and US 10G channels might use different wavelengths than 25G US (e.g., using 200 GHz spacing).

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Collimated beam structure cost evaluation **Dekun Liu** **Huawei Technologies**

This presentation reviewed the cost, complexity, and benefits of using collimated beam optical devices.

liu_3ca_2_0516.pdf

Consideration about wavelength allocation in O-band

Tomoyuki Funada **Sumitomo Electric**

This presentation reiterated a previous position that wavelength plan be confined to O band for both US & DS. Use of an uncooled laser may be impossible for the 29 dB budget. Data on component cost and manufacturing fall out was provided for various optical component options. Two wavelength plans were proposed for 1+4:

1) DS - 16 nm @ 1294 nm (low cost ch 1) + 4 ch on 800 GHz grid (@ ~1310-1325 nm)
   US - 4 nm @ 1358 nm (low cost ch 1) + 4 ch on 800 GHz grid (@ ~1330-1350 nm)
2) DS - 4 nm @ 1290 nm (low cost ch 1) + 4 ch on 800 GHz grid (@ ~1300-1315 nm)
   US - 4 nm @ 1358 nm (low cost ch 1) + 4 ch on 800 GHz grid (@ ~1322-1340 nm)

funada_3ca_1_0516.pdf

12:25 PM – Recessed for Lunch **1:40 PM** - reconvened, Curtis assumed the chair.

25G power budget: 1st iteration **Ed Harstead** **Nokia**

This presentation reviewed DML vs EML technologies and their impact on OMA optical power budget. For both US and DS there appears to be about 1 dB gap (depending on TDP) to closing the budget, even when allowing for an SOA in the US receiver at the OLT. This would need to be closed using an improved FEC (for example). This does not include the 2.5 dB insertion loss for the expected mux/demux for 50/100G systems.

harstead_3ca_1a_0516.pdf

25G/50G/100G EPON wavelength plan **Ed Harstead** **Nokia**

This presentation examined the wavelength plan. It was suggested that an US/DS guard band of 35 nm be maintained to keep 25G costs low. As another 25G cost optimization strategy it was suggested that 50/100G wavelengths be located in the C/L Band.

harstead_3ca_2_0516.pdf

Update of 25G NRZ experiments **Yong Guo** **ZTE Corporation**

This presentation gave the results of several experiments on 25G SPD, 25G CDR and 10G APD with equalization.

guo_3ca_1a_0516.pdf

Study on Chromatic Dispersion on 25G NRZ in O-band

Dekun Liu **Huawei Technologies**

This presentation examined the impact of chromatic dispersion within the O Band and concluded that for < 1330 nm the dispersion penalty is relatively small (<2 dB) whereas above ~1330 nm dispersion will be an issue.

liu_3ca_3_0516.pdf

Feasibility of 25G DML transmission **Naruto Tanaka** **Sumitomo Electric**

This presentation provided experimental results showing characteristics of an uncooled DML. To achieve a 29 dB power budget a cooled laser would be required (7.5 dBm launch power ER > 6 dB).

tanaka_3ca_1_0516.pdf

25G APD application for 25G PON

Dong Pan (presented by Chris Cole) **SiFotonics Technologies**

This presentation provided typical performance for a SiGe 25G APD.

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Unified Evolution-Ready 25/50/100 Gbps-EPON Architecture Proposal

Vincent Houtsma **Nokia Bell Labs**

This presentation further developed the idea of the "unified signaling architecture" using NRZ modulation at the transmitter and implementation dependent technology in the receiver. It was suggested that the transmitter use an electrical pre-coder to eliminate error propagation prior to NRZ transmission and to enable electrical Duobinary.

houtsma_3ca_1_0516.pdf

Choose Line Codes for 100G EPON to Mitigate the Impacts of Chromatc Dispersion

Eugene Dai **Cox Communications**

This presentation explored possible modulation types for NG-EPON. The conclusion is that if the wavelength plan is in O Band then NRZ should be selected whereas if C Band is selected then Duobinary may be preferred.

dai_3ca_1_0516.pdf

100G EPON Architectures, Wavelength Plans, and Line Codes

Eugene Dai **Cox Communications**

This presentation discussed the impact of 1+3 and 1+4 architectures on the wavelength plan. The conclusion is that a 1+4 architecture is preferred with the 25G channel in the O Band using NRZ modulation while the 4 channel system should operate in the C Band and use Duobinary modulation.

dai_3ca_2_0516.pdf

6:22 PM – recessed for the day.

25 May 2016

8:05 AM – reconvened. Continued presentations

Channel bonding for upstream **Yong Guo** **ZTE Corporation**

This presentation noted that in some systems there may be patch cords of differing lengths on different channels that will cause skew between channels potentially causing issues with frame play out.

guo_3ca_3_0516.pdf

Channel bonding for downstream **Yong Guo** **ZTE Corporation**

This presentation suggested that in the US direction bonded channels always be granted together (e.g., 100G ONUs always granted 4 channels simultaneously) as a means of simplifying the channel bonding.

guo_3ca_2_0516.pdf

Skew sources in 100GEPON **Duane Remein** **Huawei Technologies**

This presentation discussed skew and jitter sources in the NG-EPON system and how these can be mitigated.

remein_3ca_3_0516.pdf

This presentation included a tool to calculate skew due to different wavelengths.

remein_3ca_4_0516.xlsm

Open discussion on channel bonding **Dekun Liu** **Huawei Technologies**

This presentation suggested that additional study is needed to assess the impact of deployment models and service flow bandwidth demand on channel bonding architecture.

liu_3ca_4_0516.pdf

Considerations for Recovering Frame Sequence on MPCP+

Kyeong-hwan Doo **ETRI**

This presentation discussed sources of TQ Drift and its impact on frame reordering at MPCP+.

doo_3ca_1_0516.pdf

MPCP+: Downstream Channel Bonding State Diagrams

Glen Kramer **Broadcom**

This presentation provided state diagrams detailing the downstream MPCP+ process.

kramer_3ca_1a_0516.pdf

MPCP+ Issues and solutions **Frank Effenberger** **Huawei Technologies**

This presentation suggested an alternative MPCP+ architecture for the upstream direction.

effenberger_3ca_1_0516.pdf

Motion #3

Move to adopt NRZ modulation at the transmitter for each 25Gb/s per channel.

Moved: Jorge Salinger Seconded: Duane Remein

For: 18 Against: 0 Abstain: 8

Technical <GE> 75% Passed

Motion #4

Move to postpone motion #3 until after the task force reaches consensus on the wavelength bands.

Moved: Eugene Dai Seconded: Shawn Esser

For: 8 Against: 10 Abstain: 9

Procedural > 50% Failed

Motion #5

Move to adopt that the first 25Gb/s channel wavelength pair be in the O band.

Moved: Eugene Dai Seconded: Jorge Salinger

For: 19 Against: 7 Abstain: 1

Technical <GE> 75% Failed

Motion #6

Move to adopt that the first 25Gb/s channel upstream wavelength be in the O band.

Moved: Jorge Salinger Seconded: Eugene Dai

For: 19 Against: 7 Abstain: 3

Technical <GE> 75% Failed

Straw Poll # 1

If the TF decides to use C-band, then align with NG-PON2 C-band channels.

Agree:	1
Disagree:	7
No opinion:	0
Not enough information:	21

Straw Poll # 2

For 100G-EPON architecture, I prefer:

1+3 architecture:	14
1+4 architecture	5
No opinion:	1
Not enough information:	6

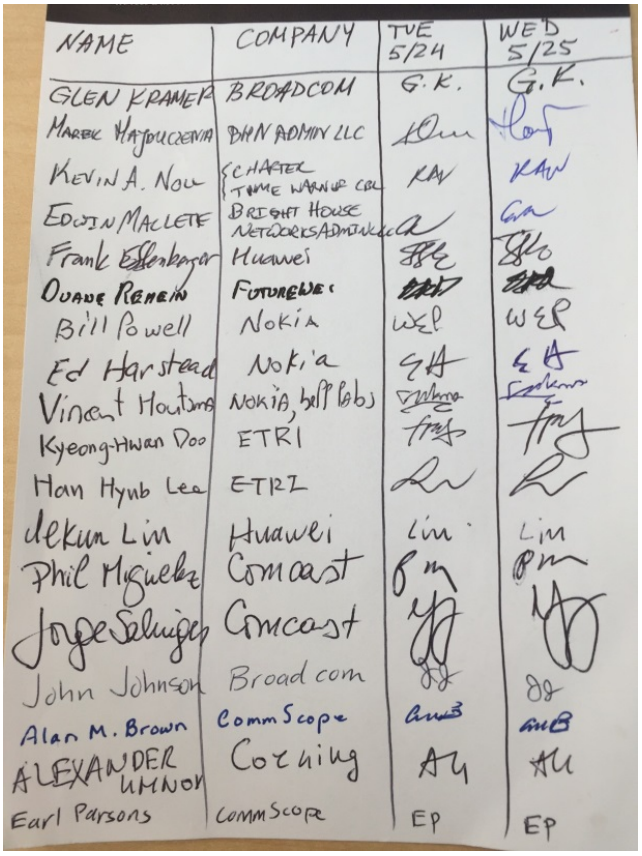
Straw Poll # 3	
For 100G-EPON architecture, I prefer to see all wavelengths located in the O-band:	
Agree:	13
Disagree:	2
No opinion:	1
Not enough information:	10

The Chair presented the closing report. The Task Force agreed that a 3 day meeting in San Diego would be preferred. The chair intends to charter an ad hoc to assist in moving the Task Force forward. The chair briefly discussed work plans and assigned action items (see closing report). Goals for next meeting were discussed.

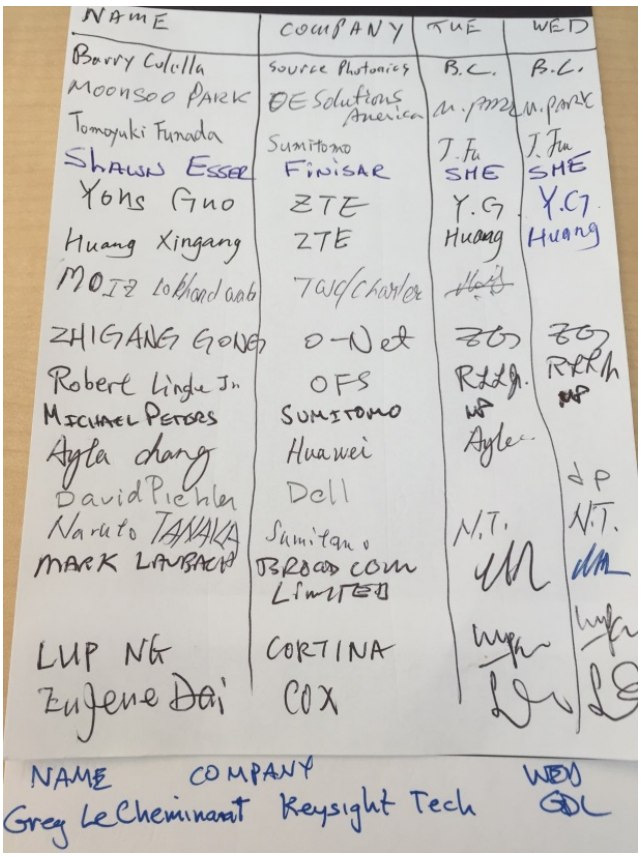
Motion #7		
Move to Adjourn.		
Moved: Kevin Noll		Seconded: Ed Mallette
Procedural > 50%	Passed by voice without opposition	

5:30 PM The meeting was adjourned.

Attendance



NAME	COMPANY	TUE 5/24	WED 5/25
GLEN KRAMER	BROADCOM	G.K.	G.K.
Marek Hajduczenia	DHN ADMIN LLC		
Kevin A. Noll	CHARTER TIME WARNER CBL	KAN	KAN
Edwin Mallette	BRIGHT HOUSE NETWORKS ADMIN LLC		
Frank Effenberger	Huawei		
Duane Remein	FUTUREWEI		
Bill Powell	Nokia	WEP	WEP
Ed Harstead	Nokia	EH	EH
Vincent Houtsma	Nokia, Bell Labs		
Kyeong-Hwan Doo	ETRI		
Han Hyub Lee	ETRI		
dekun Liu	Huawei	Liu	Liu
Phil Miguelez	Comcast		
Jorge Salinger	Comcast		
John Johnson	Broadcom		
Alan M. Brown	CommScope		
ALEXANDER UMNOV	Corning		
Earl Parsons	CommScope	EP	EP



NAME	COMPANY	TUE	WED
Barry Cutcilla	Source Photonics	B.C.	B.C.
Moonsoo Park	OE Solutions America	M.Park	M.Park
Tomoyuki Funada	Sumitomo	T.Fu	T.Fu
Shawn Esser	Finisar	SHE	SHE
Yong Guo	ZTE	Y.G	Y.G
Huang Xingang	ZTE	Huang	Huang
MOIZ Lokhandwala	TWC/Charter		
ZHIGANG GONG	O-Net		
Robert Lingle Jr.	OFS		
Michael Peters	Sumitomo		
Ayla Chang	Huawei	Ayla	
David Piehler	Dell		
Naruto TANAKA	Sumitomo	N.T.	N.T.
MARK LAUBACH	BROADCOM LIMITED		
LUP NG	CORTINA		
Eugene Dai	COX		
NAME	COMPANY		WED
Greg LeCheminant	Keysight Tech		GDL