Proposal of 25GBASE-PR30 downstream PMD parameter values

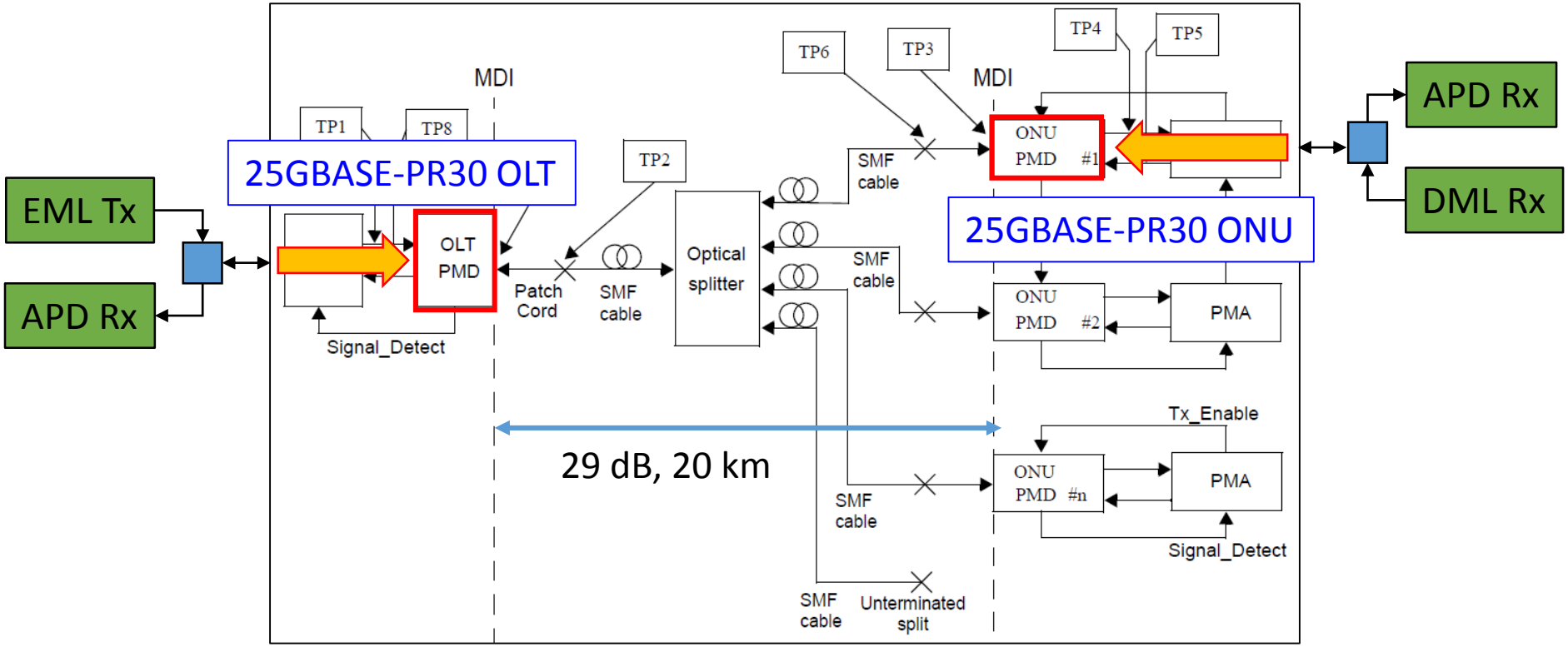
Hanhyub Lee and Hwan Seok Chung

IEEE P802.3ca 100G-EPON Task Force
Nov 07-11, 2016
San Antonio, USA

Motivation

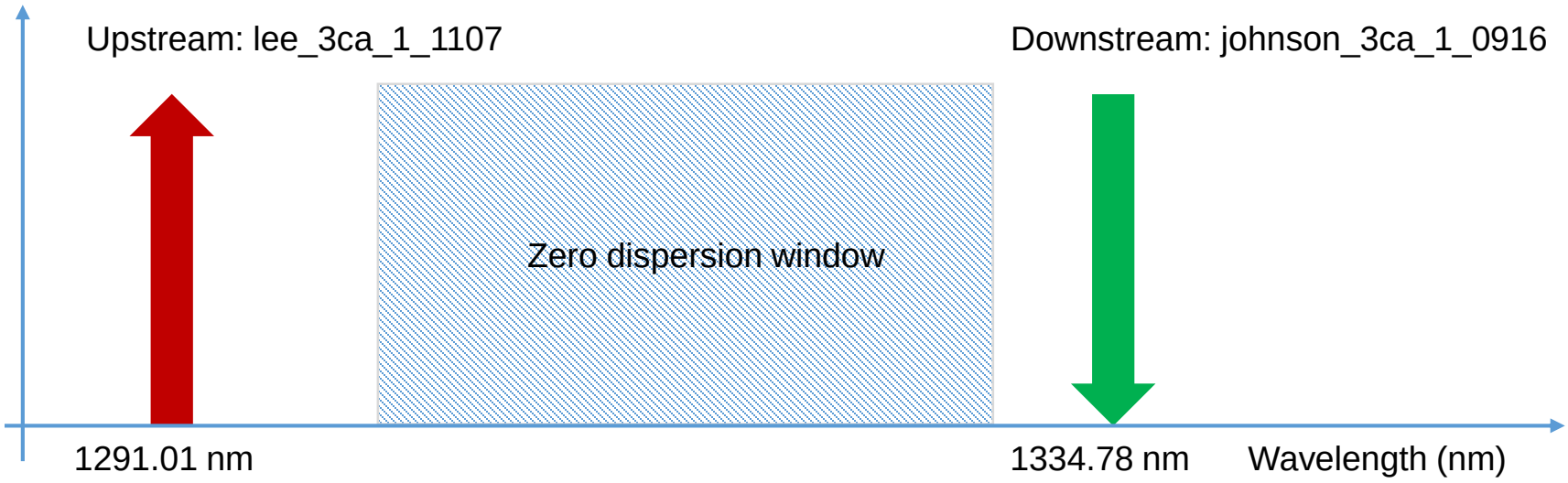
- This contribution proposed 25GBASE-PR30 PMD parameter values based on
  - IEEE 803.3av (10Gb/s Ethernet Passive Optical Network)
  - IEEE 802.3cc D.1.1 (25 Gb/s Ethernet over Single-Mode Fiber)
  - IEEE 802.3ca contributions
- 25GBASE-PR30 OLT and ONU PMD transmit and receive characteristics are proposed
  - 100GBASE-PR30 OLT and ONU PMD transmit and receive characteristics are not included because issues of wavelength MUX loss and optical amplifiers are still under discussion in the group

Configuration of 25GBASE-PR30



- OLT transmitter can use 25G EML for high ER and low dispersion induced power penalty
- OLT and ONU receivers can use 25G APDs in order to have high sensitivity
- ONU transmitter can use cooled 25G DML for high power and low cost

Type of PMD and references: 25GBASE-PR30



Type of PMD	Optics candidate	Reference
OLT transmit	25G EML Tx	802.3ca contributions
ONU receive	25G APD Rx	802.3ca contributions
ONU transmit	25G burstmode DML	802.3cc D.1.1.
OLT receive	25G burstmode APD	-

Proposal : OLT PMD transmit characteristics: Downstream

Description	Unit	Proposal	802.3av (10GBASE-PR30)	802.3cc D.1.1 (25GBASE-ER)	johnson_3ca_1a_0916	harstead_3ca_1_0916	guo 3ca_1a 0716	lee_3ca_1_0316	liu_3ca_1_0916	umeda_3ca_1_0316
Signaling speed (range)	GBd	25.78125 ± 100 ppm	10.3125 ± 100 ppm	25.78125 ± 100 ppm						
Wavelength	nm	1334.78	1575 to 1580	1295 to 1310	1334.78	-				
Side Mode Suppression Ratio (min)	dB	30	30	30	-	-	-	-	-	-
Average launch power (max)	dBm	TBD	5	6	-	-	6	-	-	-
Average launch power (min)	dBm	5	2	-1.6	-	5	3	5	6	5.6
Average launch power of OFF transmitter (max)	dBm	-39	-39	-30	-	-	-	-	-	-
Extinction ratio (min)	dB	TBD	6	4	-	8	6	7	-	-
$RIN_{20}OMA$ (max)	dB/Hz	-130	-128	-130	-	-	-	-	-	-
Launch OMA (min)	dBm	TBD	3.91	0.4	-	6.62	3.78	6.25	-	-
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}	UI	TBD	{0.25, 0.40, 0.45, 0.25, 0.28, 0.40}	{0.31, 0.4, 0.45, 0.34, 0.38, 0.4)	-	-	-	-	-	-
Optical return loss tolerance (max)	dB	15	15	20	-	-	-	-	-	-
Transmitter reflectance (max)	dB	-12	-10	-12	-	-		-	-	-
Transmitter and dispersion penalty (max)	dB	1	1.5	2.7	-	-	1	1	2	1
Decision timing offset for transmitter and dispersion penalty	UI	±0.05	±0.05	-	-	-	-	-	-	-
Note			10GBd	DML	EML	EML	EML	EML	EML	EML

Proposal : ONU PMD receive characteristics: Downstream

Description	Unit	Proposal	802.3av (10GBASE–PR30)	802.3cc D.1.1 (25GBASE-ER)	johnson_3ca_1a_0916	harstead_3ca_1_0916	guo 3ca_1a 0716	liu_3ca_1_0916	lee_3ca_1_0316
Signaling speed (range)	GBd	25.78125 ± 100 ppm	10.3125 ± 100 ppm	25.78125 ± 100 ppm					
Wavelength	nm	1334.78	1575 to 1580	1295 to 1325	1334.78				
Bit error ratio (max)	–	10^{-3}	10^{-3}	$5x10^{-5}$					
Average receive power (max)	dBm	TBD	-10	-5					
Damage threshold (max)	dBm	-9	-9	TBD					
Receiver sensitivity (max)	dBm	-25	-28.5	-		-25.5	-27	-25	-25
Receiver sensitivity OMA (max)	dBm	TBD	-26.59	-17.6			-25.09		
Signal detect threshold (min)	dBm	-44	-44	-					
Receiver reflectance (max)	dB	-12	-12	-26					
Stressed receive sensitivity (max)	dBm	TBD	-27	-					
Stressed receive sensitivity OMA (max)	dBm	TBD	-25.09	TBD					
Vertical eye–closure penalty	dB	TBD	1.5	TBD					
Stressed eye jitter (min)	UI pk to pk	0.3	0.3	TBD					
Jitter corner frequency for a sinusoidal jitter	MHz	4	4	-					
Note			APD	APD		APD	APD	APD	APD

Consideration of ONU transmit characteristics: Upstream

Description	Unit	Consideration	802.3av (10GBASE–PR30)	802.3cc D.1.1 (25GBASE-ER)	lee_3ca_1_1107	harstead_3ca_2a_0716	guo 3ca_1a 0716	liu_3ca_1_0916	houstma_3ca_1_0716
Signaling speed (range)	GBd	25.78125 ± 100 ppm	10.3125 ± 100 ppm	25.78125 ± 100 ppm					
Wavelength	nm	1291.10	1260 to 1280	1295 to 1310	1291.1				
Side Mode Suppression Ratio (min)	dB	30	30	30					
Average launch power (max)	dBm	TBD	9	6			9	6	
Average launch power (min)	dBm	TBD	4	-1.6		8	5		
Average launch power of OFF transmitter (max)	dBm	-45	-45	-					
Extinction ratio (min)	dB	TBD	6	4		8	6		
RIN_{20} OMA (max)	dB/Hz	-130	-128	-130					
Launch OMA (min)	dBm	TBD	4.78			8.78	5.78		
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}	UI	TBD	{0.25, 0.40, 0.45, 0.25, 0.28, 0.40}	{0.31, 0.4, 0.45, 0.34, 0.38, 0.4}					
Optical return loss tolerance (max)	dB	15	15	20					
Transmitter reflectance (max)	dB	-12	-10	-12					
Transmitter and dispersion penalty (max)	dB	TBD	3.0	2.7			1	2	1.7
Decision timing offset for transmitter and dispersion penalty	UI	±0.0625	±0.0625						
Ton (max)	ns	TBD	512						
Toff (max)	ns	TBD	512						
Note				DML	-	DML	DML	-	DML

Consideration of OLT receive characteristics: Upstream

Description	Unit	Consideration	802.3av (10GBASE–PR30)	802.3cc D.1.1 (25GBASE-ER)	lee_3ca_1_1107	guo 3ca_1a 0716	liu_3ca_1_0916
Signaling speed (range)	GBd	25.78125 ± 100 ppm	10.3125 ± 100 ppm	25.78125 ± 100 ppm			
Wavelength	nm	1291.10	1260 to 1280	1295 to 1325	1291.10		
Bit error ratio (max)	–	10^{-3}	10^{-3}	$5x10^{-5}$			
Average receive power (max)	dBm	TBD	-6	-5	-	-	-
Damage threshold (max)	dBm	TBD	-5	TBD	-	-	-
Receiver sensitivity (max)	dBm	TBD	-28	-	-	-25	-25
Receiver sensitivity OMA (max)	dBm	TBD	-27.22	-17.6	-	-24.22	-
Signal detect threshold (min)	dBm	-45	-45	-	-	-	-
Receiver reflectance (max)	dB	-12	-12	-26	-	-	-
Stressed receive sensitivity (max)	dBm	TBD	-21	-	-	-	-
Stressed receive sensitivity OMA (max)	dBm	TBD	-20.22	TBD	-	-	-
Vertical eye–closure penalty	dB	TBD	2.99	TBD	-	-	-
Stressed eye jitter	UI pk to pk	0.3	0.3	TBD	-	-	-
Jitter corner frequency for a sinusoidal jitter	MHz	4	4	-	-	-	-
$T_{receiver\_settling}$ (max)	ns	TBD	800	-	-	-	-
Sinusoidal jitter limits for stressed receiver conformance test (min, max)	UI	(0.05, 0.15)	(0.05, 0.15)	-	-	-	-
Note			APD	APD	-	-	APD

Upstream discussions

- Need more contributions for following issues to decide upstream PDM parameter values
  - 25G burstmode DML transmitter characteristics
    - ✓Output power
    - ✓ER
    - ✓Turn on/off time
  - 25G Burst mode receiver characteristics
    - ✓Settling time

Summary

- Downstream PMD parameter values for 25GBASE-PR30 are proposed
- The proposed values are decided based on the contributions and IEEE standards
- The proposed PMD table can be initial values for developing draft 1.0 of IEEE802.3cc