

Gain Control of SOA Preamplifier

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Supporters

Motivation

- At the last meeting in Chicago, Motion #9 on the extension of the discovery message was passed.

Motion #9

In order to extend OLT burst receiver dynamic range, move to extend the discovery message shown in umeda_3ca_1b_0318.pdf pages 7 and 8 to support ONUs with different RX_RSSI to be registered in different time slots. Align the table with new bit positions in draft as amended in this meeting.

Moved: Daisuke Umeda

Second: Dekun Liu

For: 19

Against: 0

Abstain: 3

Technical ($\geq 75\%$) Motion Passed

- In order to use RX_RSSI indicator, we propose to announce OLT Rx thresholds and OLT/ONU transmitter powers from OLT to all ONUs in this contribution.

Table 144-6 Discovery Information Fields

GATE MPCPDU discovery information fields		
Bit	Flag field	Values
0	Reserved	Ignored on Reception
1	OLT is 10G upstream capable	0 – OLT does not support 10 Gb/s reception 1 – OLT supports 10 Gb/s reception
2	OLT is 25G upstream capable	0 – OLT does not support 25 Gb/s reception 1 – OLT supports 25 GB/s reception
3-4	Reserved	Ignored on reception
5	OLT is opening 10G discovery window	0 – OLT cannot receive 10 Gb/s data in this window 1 – OLT can receive 10 Gb/s data in this window
6	OLT is opening 25G discovery window	0 – OLT cannot receive 25 Gb/s data in this window 1 – OLT can receive 25 Gb/s data in this window
→ 7-8	Reserved	Ignore on Reception
7-9 → 9-11	ONU Rx_RSSI indication	000 : registration for all ONUs 001 : registration for ONUs $RSSI < th1$ 010 : registration for ONUs $RSSI \geq th1$ 100 : registration for ONUs $RSSI < th0$ 101 : registration for ONUs $RSSI \geq th0$ & $RSSI < th1$ 110 : registration for $RSSI \geq th1$ & $RSSI < th2$ 111 : registration for ONUs $RSSI \geq th2$
10-15 → 12-15	Reserved	Ignored on reception

- Recommend to leave reserved bits at Bits7-8 for future updates and shift “ONU RSSI indication” to Bits9-11.
- In order to use ONU RSSI indication, ONUs need RSSI thresholds th0-2 information.

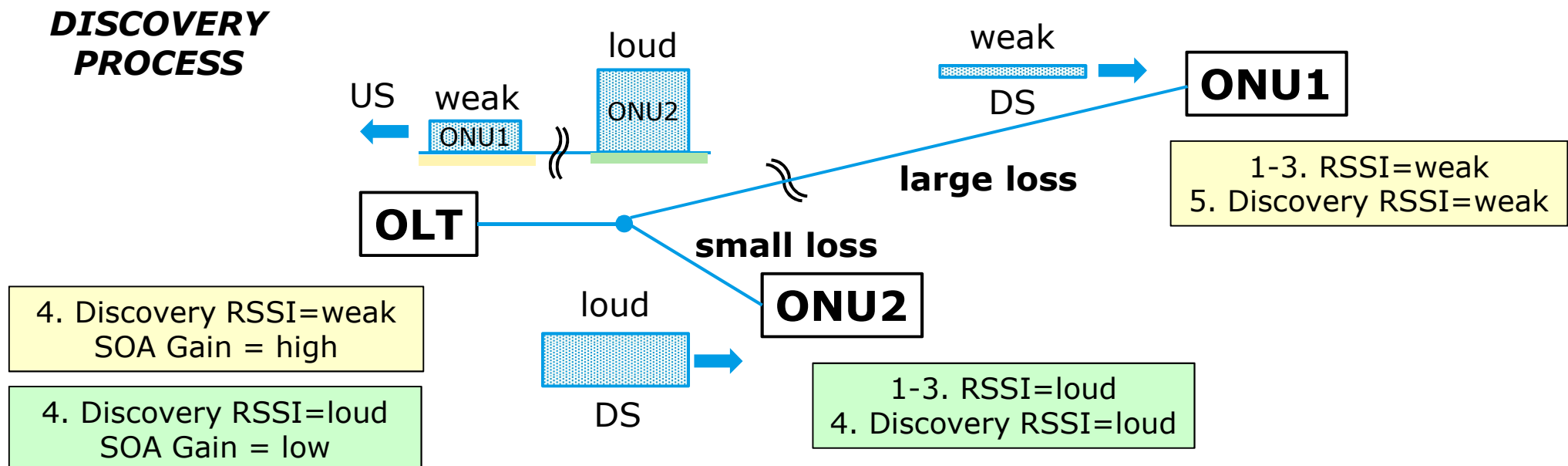
$$th_x = TH_x + OLT_Tx - ONU_Tx$$

TH_x : OLT Rx threshold

OLT_Tx : OLT Tx power, ONU_Tx : ONU Tx power

Discovery with ONU RSSI Indication

1. OLT announces parameters to calculate ONU RSSI thresholds by **DISCOVERY GATE message or a new MPCPDU**.
2. ONU receives the parameters and calculates ONU RSSI thresholds.
3. ONU monitors RSSI, compares the RSSI value with ONU Rx thresholds and determines the RSSI class.
4. OLT executes dedicated discovery by DISCOVERY GATE message with ONU RSSI Indication.
5. ONU responds to the DISCOVERY GATE with matched RSSI Indication.



Announcement of TH_x and OLT/ONU_Tx Parameters

OLT announces the following parameters to all ONUs.

Parameter	Description	Example
TH0 ⁽¹⁾	OLT Rx threshold 0 (Low)	-15 dBm
TH1 ⁽¹⁾	OLT Rx threshold 1 (Middle)	-12 dBm
TH2 ⁽¹⁾	OLT Rx threshold 2 (High)	-9 dBm
OLT_Tx ⁽²⁾	OLT transmitter power	6 dBm
ONU_Tx10G ⁽³⁾	ONU 10G transmitter power	6 dBm
ONU_Tx25G ⁽³⁾	ONU 25G transmitter power	6 dBm
(ONU_Tx50G) ⁽³⁾	Reserved (ONU 50G transmitter power)	

(Note)

(1) OLT announces "OLT Rx thresholds" TH_x and ONUs calculate "ONU RSSI thresholds" th_x.

$$\text{th}_x \text{ for 10G US ONU: } \text{th}_{x_10G} = \text{TH}_x + \text{OLT_Tx} - \text{ONU_Tx10G} \quad X=0,1,2$$

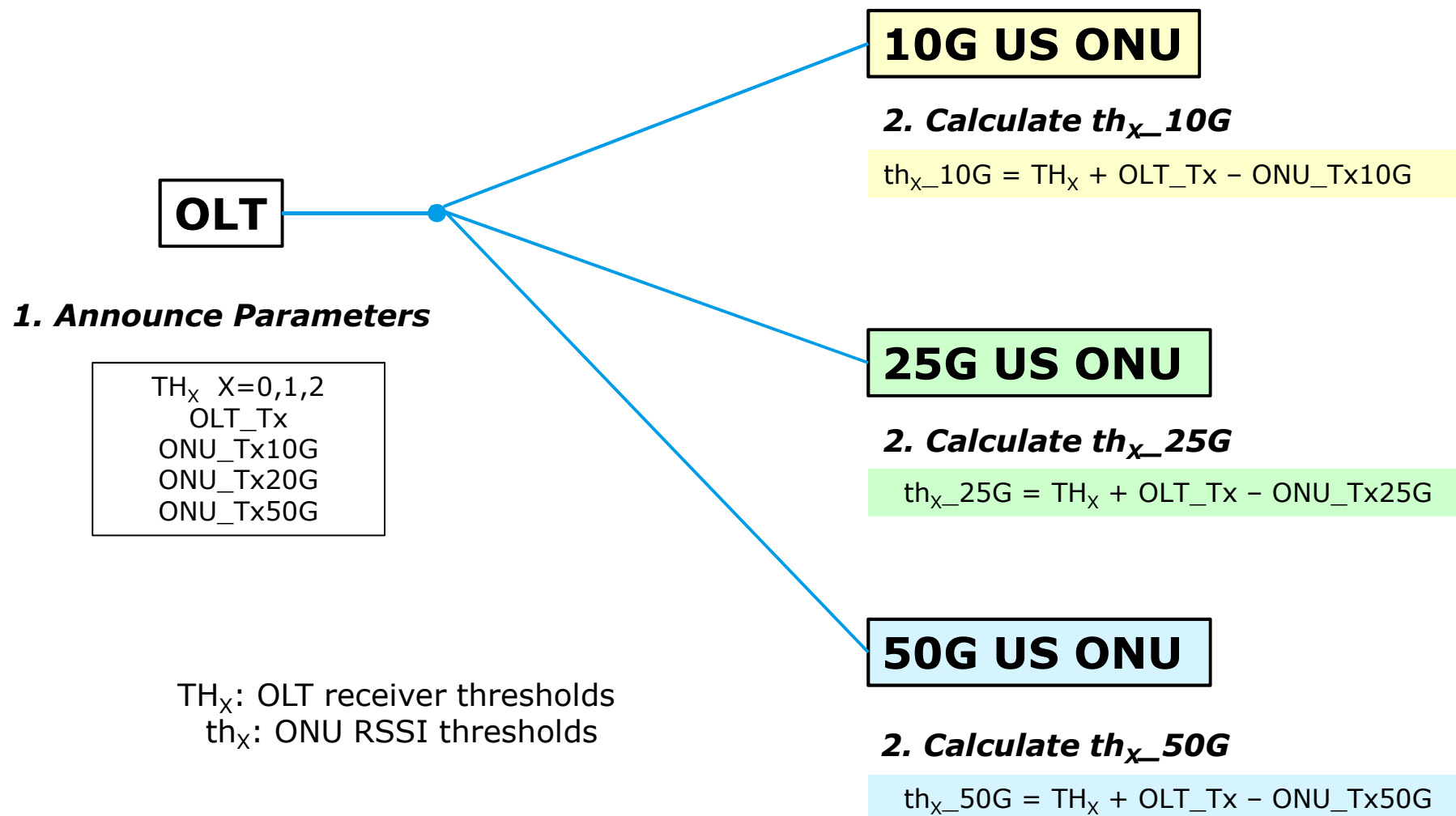
$$\text{th}_x \text{ for 25G US ONU: } \text{th}_{x_25G} = \text{TH}_x + \text{OLT_Tx} - \text{ONU_Tx25G} \quad X=0,1,2$$

$$\text{th}_x \text{ for 50G US ONU: } \text{th}_{x_50G} = \text{TH}_x + \text{OLT_Tx} - \text{ONU_Tx50G} \quad X=0,1,2$$

(2) A typical, calibrated or TSSI value can be announced as OLT transmitter power.

(3) Typical values are announced as ONU transmitter powers. ONU Tx power range is about 3dB and typical value is accurate enough.

Calculation of ONU RSSI thresholds



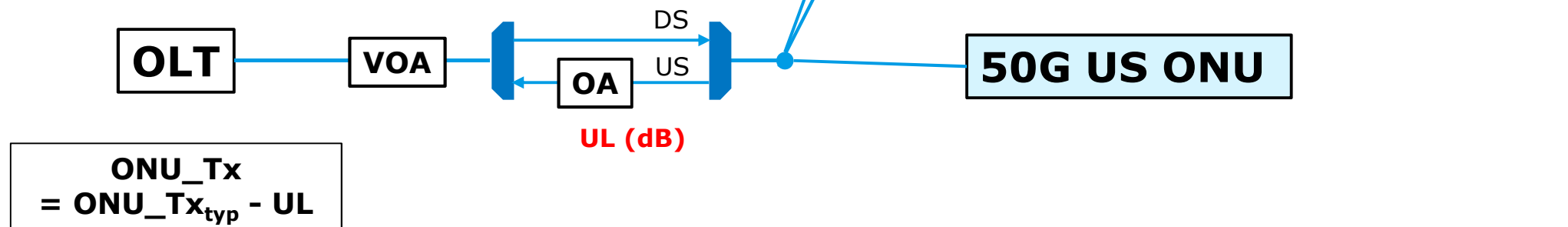
Consideration on Asymmetric Channel Insertion Loss

In some system tests, asymmetric C.I.L. configurations are needed.

Ex1. OLT sensitivity tests
US loss > DS loss

Ex2. ONU sensitivity tests
 DS loss > US loss

OLT announces OLT_Tx or ONU_Tx considering the loss difference between US and DS paths.



10G US ONU

25G US ONU

2. Calculate th_{x_25G}

$$th_{x_25G} = TH_x + OLT_Tx - ONU_Tx_{25G}$$

=

$$th_{x_25G} = TH_x + OLT_Tx - (ONU_Tx_{25G_{typ}} - UL)$$

Ex.1 OLT sensitivity test

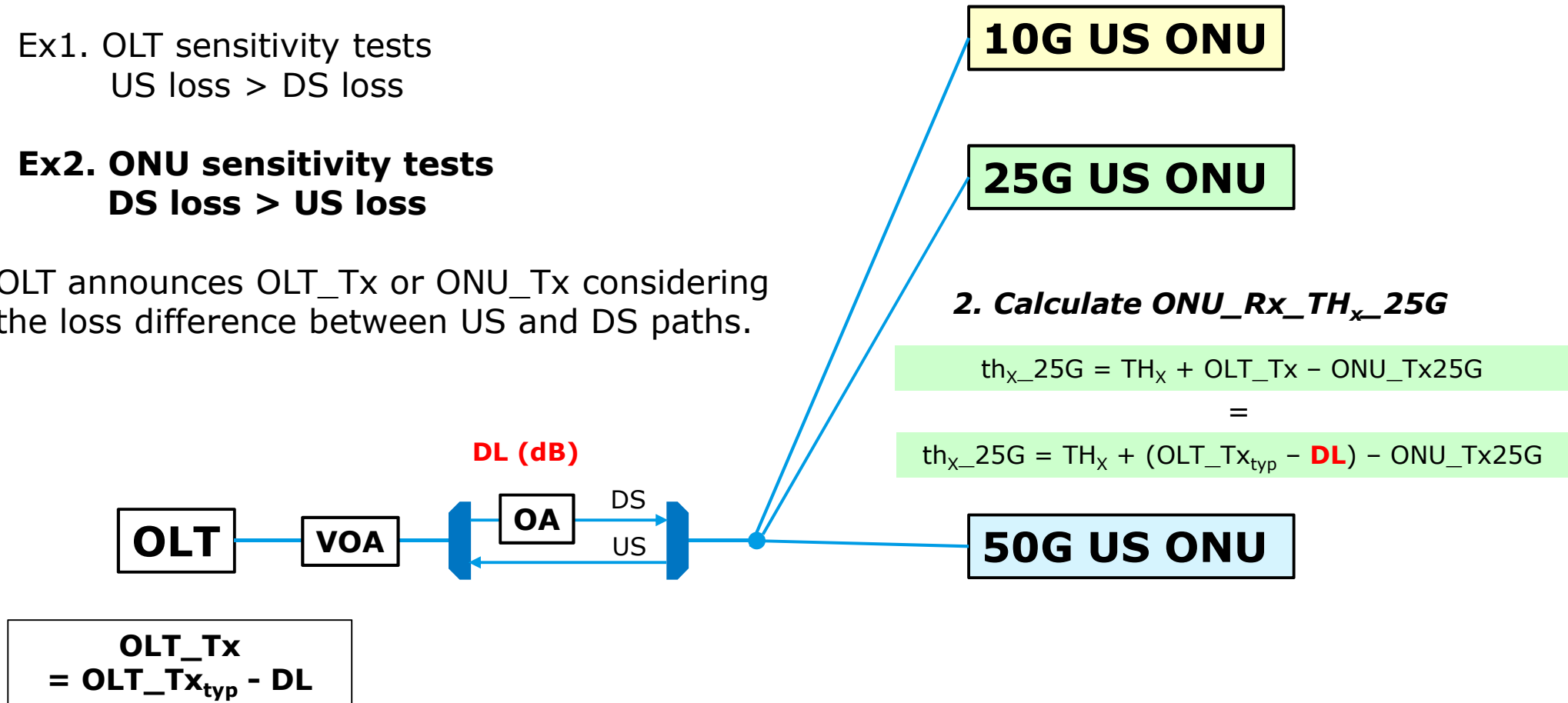
Consideration on Asymmetric Channel Insertion Loss

In some system tests, asymmetric C.I.L. configurations are needed.

Ex1. OLT sensitivity tests
US loss > DS loss

Ex2. ONU sensitivity tests
DS loss > US loss

OLT announces OLT_Tx or ONU_Tx considering the loss difference between US and DS paths.



Ex.2 ONU sensitivity test

Announcement TH_x and OLT/ONU_Tx Parameters by DISCOVERY GATE message

Use 16 Octets on DISCOVERY GATE MPCPDU to announce OLT Rx threshold and OLT/ONU transmitter power information.

- TH_x : OLT Rx thresholds are 16-bit signed two's-complement value, with the LSB equal to 0.1 uW, covering the range of 0 to 6.5535 mW (~ -40 to +8.2 dBm)
- OLT_Tx and ONU_Tx: OLT/ONU Tx powers are 16-bit signed two's-complement values, with the LSB equal to 0.8 uW, covering the range of 0 to 52.428 mW (~ -31 to +17.2 dBm)

OLT Rx threshold and OLT/ONU Tx power Information fields			
Octet	Field	Value	Unit
0-1	TH0	0 to 6.5535 mW (~ -40 to 8.2 dBm)	0.1 uW
2-3	TH1		
4-5	TH2		
6-7	OLT_Tx	0 to 52.4 mW (~ -31 to +17.2 dBm)	0.8 uW
8-9	ONU_Tx10G		
10-11	ONU_Tx25G		
12-15	Reserved	Ignored on reception	

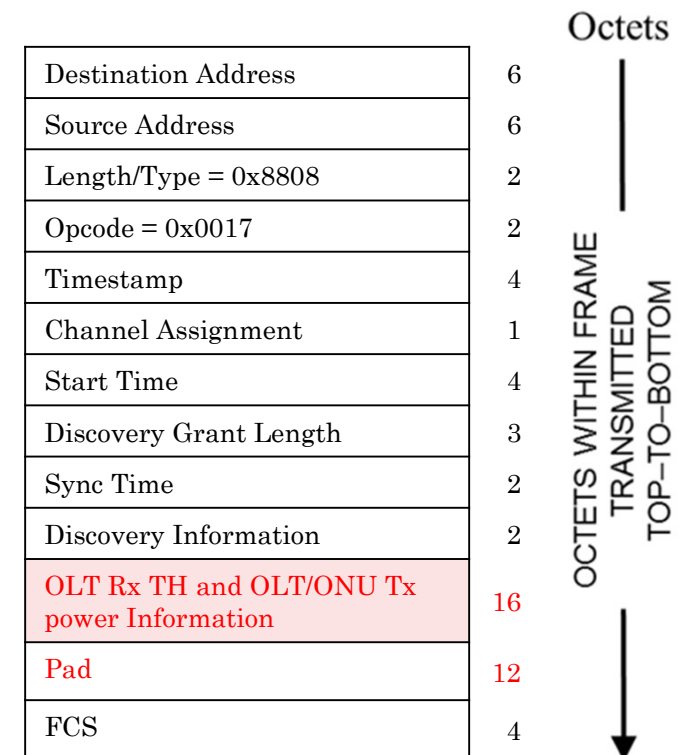


Figure 144-23 – DISCOVERY GATE MPCPDU

Announcement TH_x and OLT/ONU_Tx Parameters by a new MPCPDU message

- Opcode : 0x001a (next available)
- TH_x : OLT Rx thresholds are 16-bit signed two's-complement value, with the LSB equal to 0.1 uW, covering the range of 0 to 6.5535 mW (~ -40 to +8.2 dBm)
- OLT_Tx and ONU_Tx: OLT/ONU Tx powers are 16-bit signed two's-complement values, with the LSB equal to 0.8 uW, covering the range of 0 to 52.428 mW (~ -31 to +17.2 dBm)

Octet	Field	Value	Unit
0-1	TH0	0 to 6.5535 mW (~ -40 to 8.2 dBm)	0.1 uW
2-3	TH1		
4-5	TH2		
6-7	OLT_Tx	0 to 52.4 mW (~ -31 to +17.2 dBm)	0.8 uW
8-9	ONU_Tx10G		
10-11	ONU_Tx25G		
12-15	Reserved	Ignored on reception	

Destination Address
Source Address
Length/Type = 0x8808
Opcode = 0x01a
Timestamp
TH0
TH1
TH2
OLT Tx
ONU Tx10G
ONU Tx25G
Reserved/Pad
FCS



Reference Information of IEEE1904.1 SIPON

Monitor functions

9.1.5.6 Optical transmitter output power

The ONU and OLT should support the measurement of the output power of the optical transmitter. The measured value is represented in the format of a 16-bit unsigned integer (with the value range of 0 to 65535), with the LSB equal to 0.1 μ W, covering the range of 0 to +6.5535 mW (\sim -40 to +8.2 dBm). The measurement accuracy is better than ± 3 dB across the total measurement range.

9.1.5.7 Optical receiver input power

The ONU should support the measurement of the input power of the optical receiver. The measured value is represented in the format of a 16-bit unsigned integer (with the value range of 0 to 65535), with the LSB equal to 0.1 μ W, covering the range of 0 to +6.5535 mW (\sim -40 to +8.2 dBm). The measurement accuracy is better than ± 3 dB across the total measurement range.

Summary

- Proposed to leave reserved bits of Bits7-8 for future updates and shift “ONU RSSI Indication” to Bits9-11.
- Proposed the announcement of OLT Rx thresholds and OLT/ONU transmitter powers by DISCOVERY GATE message, and by a new MPCPDU message.
- Recommend the announcement by DISCOVERY GATE message for simple implementation.

Motion

Move to adopt slide **10** in umeda_3ca_1_0518 to announce of OLT/ONU transmitter powers and thresholds of receiver power class.

Moved:

Second:

For:

Against:

Abstain: