APON Class A, B, & C
Physical Layer Requirements

MAXIM High-Frequency/Fiber Communications Group

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1   Introduction

A Passive Optical Network (PON), is a cost effective network topology, that addresses the last mile of the communication infrastructure connecting the central office (CO) to the business or residential customer.

ITU-T recommendation, G983.1 defines three classes of performance for APON (ATM-PON) systems. The three classes are to address different range requirements. This would enable tradeoffs between cost and reach, and consequently, operators could offer cost-effective solutions based on specific customer requirements. This note summarizes the requirements of various classes.

Fig (1) shows the main elements of a PON system.

In general the optical distribution network (ODN) constitutes the optical transmission media for the connection of OLT to the ONUs, and typically includes passive optical splitters.

2   Passive Optical Elements

The ODN normally consists of the following passive optical elements:

♦   Single mode optical fibers
♦   Optical connectors
♦   Passive branching components
♦   Passive optical attenuators
♦   Splices

The optical path losses are associated with the above elements.

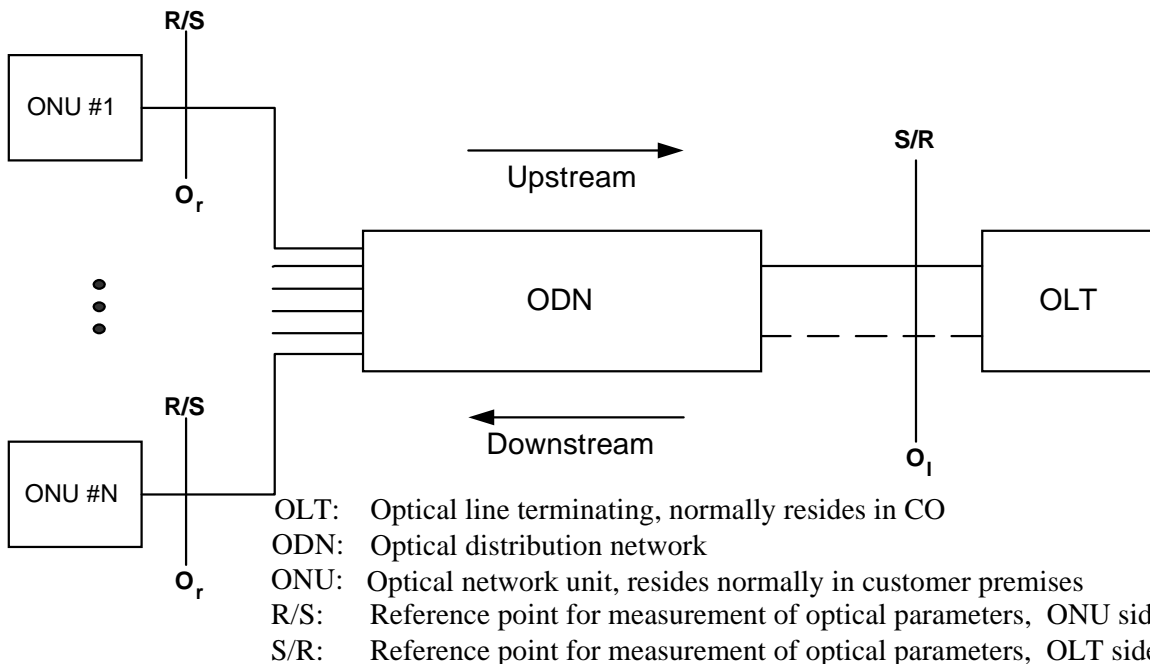Table (1) defines the optical path loss for the three classes of APON system.

OLT: Optical line terminating, normally resides in CO
ODN: Optical distribution network
ONU: Optical network unit, resides normally in customer premises
R/S: Reference point for measurement of optical parameters, ONU side
S/R: Reference point for measurement of optical parameters, OLT side

Figure 1.   Architecture of the PON system

Table 1. Classes of Optical Path Loss

	Class A (Note 1)	Class B	Class C
Minimum loss	5dB	10dB	15dB
Maximum loss	20dB	25dB	30dB
Maximum No. of ONUs per OLT, (Note 2)	Up to 8	Up to 16	Up to 32

Note 1. Class A only addresses systems operating at 622Mbps (G983.1).

Note 2. A 20km maximum range is assumed.

3 Optical Interface Parameters

The following tables define the optical interface parameters associated with the three classes of ODN.

Table 2. Parameters for 155Mbps Both Downstream and Upstream

	Single Fiber		Dual Fiber	
Items	Class B	Class C	Class B	Class C
Mean Launch Power, Min	-4dBm	-2dBm	-4dBm	-2dBm
Mean Launch Power, Max	+2dBm	+4dBm	+1dBm	+3dBm
Worst case sensitivity	-30dBm	-33dBm	-30dBm	-33dBm
Minimum overload	-8dBm	-11dBm	-9dBm	-12dBm

Table 3. Parameters for 622Mbps Downstream Direction

	Single Fiber			Dual Fiber		
Items	Class A	Class B	Class C	Class A	Class B	Class C
Mean Launch Power, Min	-7dBm	-2dBm	-2dBm	-7dBm	-2dBm	-2dBm
Mean Launch Power, Max	-1dBm	+4dBm	+4dBm	-2dBm	+3dBm	+3dBm
Worst case sensitivity	-28dBm	-28dBm	-33dBm	-28dBm	-28dBm	-33dBm
Minimum overload	-6dBm	-6dBm	-11dBm	-7dBm	-7dBm	-12dBm

Table 4. Parameters for 622Mbps Upstream Direction

Items	Both Single Fiber & Dual Fiber		
	Class A	Class B	Class C (Note 1)
Mean Launch Power, Min	-6dBm	-1dBm	-1dBm
Mean Launch Power, Max	-1dBm	+4dBm	+4dBm
Worst case sensitivity	-27dBm	-27dBm	-32dBm
Minimum overload	-6dBm	-6dBm	-11dBm

Note 1. The upstream class C values are best estimates and may change in the future.