

1. Super-PON PMD Proposal

1.1. PMD Naming

Super-PON PMD naming conforms to the following convention, with individual elements shown in Table 1:

r1/r2GBASE-SPt-abc

Table 1 - Super-PON PMD Naming Convention

Parameter	Explanation	Allowed Values
r1	PMD downstream rate class (in Gb/s)	10
r2*	PMD upstream rate class (in Gb/s)	2.5, 10
G	PMD operates at Gigabit rates	
BASE	PMD uses a baseband signal	
SP	PMD is of Super-PON P2MP type	
t	PMD generation class	1, 2
a	PMD direction class	D, U
b	PMD first transmit channel supported	0 to F#
c*	PMD last transmit channel supported	0 to F#
* If r1 is equal to r2 (i.e., the PMD is symmetric), r2 is omitted.		
+ If c is equal to b (i.e., the PMD supports a single channel), c is omitted.		
# See Table 2.		

For example, using this convention:

- a generation 1 10G symmetric OLT PMD supporting only transmit channel 3 is identified as 10GBASE-SP1-D3;
- a generation 1 10G symmetric ONU PMD supporting transmit channels 2 to D is identified as 10GBASE-SP1-U2D;
- a generation 1 10G/2.5G asymmetric ONU PMD supporting transmit channels 2 to 6 is identified as 10/2.5GBASE-SP1-U26;
- a generation 1 10G/2.5G asymmetric ONU PMD supporting only transmit channel 4 is identified as 10/2.5GBASE-SP1-U4.

1.2. Channel Plan

The Super-PON channel plan is shown in Table 2.

Table 2 - Super-PON Channel Plan

Channel	Generation 1				Generation 2			
	L-band 1 (downstream)		C-band 1 (upstream)		L-band 2 (downstream)		C-band 2 (upstream)	
	Frequency (THz)	Wavelength (nm)	Frequency (THz)	Wavelength (nm)	Frequency (THz)	Wavelength (nm)	Frequency (THz)	Wavelength (nm)
0	187.613	1597.93	192.000	1561.42	189.807	1579.46	194.193	1543.78
1	187.711	1597.10	192.100	1560.61	189.906	1578.64	194.294	1542.98
2	187.809	1596.27	192.200	1559.79	190.004	1577.82	194.396	1542.18
3	187.906	1595.44	192.300	1558.98	190.103	1577.00	194.497	1541.38
4	188.004	1594.61	192.400	1558.17	190.202	1576.18	194.598	1540.57
5	188.102	1593.78	192.500	1557.36	190.301	1575.36	194.699	1539.77
6	188.200	1592.95	192.600	1556.56	190.400	1574.54	194.800	1538.97
7	188.297	1592.12	192.700	1555.75	190.499	1573.73	194.901	1538.18
8	188.395	1591.30	192.800	1554.94	190.597	1572.91	195.003	1537.38
9	188.493	1590.47	192.900	1554.13	190.696	1572.09	195.104	1536.58
A	188.590	1589.65	193.000	1553.33	190.795	1571.28	195.205	1535.78
B	188.688	1588.83	193.100	1552.52	190.894	1570.47	195.306	1534.99
C	188.786	1588.00	193.200	1551.72	190.993	1569.65	195.407	1534.19
D	188.883	1587.18	193.300	1550.92	191.092	1568.84	195.508	1533.40
E	188.981	1586.36	193.400	1550.12	191.191	1568.03	195.609	1532.61
F	189.079	1585.54	193.500	1549.32	191.289	1567.22	195.711	1531.82

1.3. Supported Combinations of OLT and ONU PMDs

Recommended pairings of OLT PMDs with ONU PMDs are shown in Table 3.

Table 3 - OLT and ONU Pairings

		ONU PMDs	
		10GBASE-SP1-Uyz	10/2.5GBASE-SP1-Uyz
OLT PMDs	10GBASE-SP1-Dx	10G/10G*	N/A
	10/2.5GBASE-SP1-Dx	N/A	10G/2.5G*

* For the pairing to work, channel x shall belong to the channel interval {y, z}.

1.4. PMD to MDI Optical Specifications for OLT PMDs

Table 4 - OLT Transmit Characteristics

Parameter	10GBASE-SP1-Dx	10/2.5GBASE-SP1-Dx	Unit
Signaling speed (range)	10.3125 ± 100 ppm		GBd
Channel wavelengths	x=0: 1597.93 ± 0.10 x=1: 1597.10 ± 0.10 x=2: 1596.27 ± 0.10 x=3: 1595.44 ± 0.10 x=4: 1594.61 ± 0.10 x=5: 1593.78 ± 0.10 x=6: 1592.95 ± 0.10 x=7: 1592.12 ± 0.10 x=8: 1591.30 ± 0.10 x=9: 1590.47 ± 0.10 x=A: 1589.65 ± 0.10 x=B: 1588.83 ± 0.10 x=C: 1588.00 ± 0.10 x=D: 1587.18 ± 0.10 x=E: 1586.36 ± 0.10 x=F: 1585.54 ± 0.10		nm
Side-mode suppression ratio (SMSR) (min)			dB
Average launch power (max)			dBm
Average launch power (min)			dBm
Average launch power of OFF transmitter (max)			dBm
Extinction ratio (min)			dB
RIN ₁₅ OMA (max)			dB/Hz
Transmitter and dispersion penalty (TDP) @ 0 to 1000 ps/nm residual CD			dB
Optical return loss tolerance (max)			dB
Transmitter reflectance (max)			dB
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}			UI

Table 5 - OLT Receive Characteristics

Parameter	10GBASE-SP1-Dx	10/2.5GBASE-SP1-Dx	Unit
Signaling speed (range)	10.3125 ± 100 ppm	2.578125 ± 100 ppm	GBd
Channel wavelength range	1549.24 to 1561.50		nm
Bit error ratio (max)	10 ⁻³		
Average receive power (max)			dBm
Damage Threshold			dBm
Receiver sensitivity (max)			dBm
Receiver reflectance (max)			dB
Signal detect threshold (min)			dBm
Stressed receiver sensitivity (max)			dBm

1.5. PMD to MDI Optical Specifications for ONU PMDs

Table 6 - ONU Transmit Characteristics

Parameter	10GBASE-SP1-Uyz	10/2.5GBASE-SP1-Uyz	Unit
Signaling speed (range)	10.3125 ± 100 ppm	2.578125 ± 100 ppm	GBd
Channel wavelengths: All channels included between y and z. When only y, the identified single channel.	y or z = 0: 1561.42 ± 0.08 y or z = 1: 1560.61 ± 0.08 y or z = 2: 1559.79 ± 0.08 y or z = 3: 1558.98 ± 0.08 y or z = 4: 1558.17 ± 0.08 y or z = 5: 1557.36 ± 0.08 y or z = 6: 1556.56 ± 0.08 y or z = 7: 1555.75 ± 0.08 y or z = 8: 1554.94 ± 0.08 y or z = 9: 1554.13 ± 0.08 y or z = A: 1553.33 ± 0.08 y or z = B: 1552.52 ± 0.08 y or z = C: 1551.72 ± 0.08 y or z = D: 1550.92 ± 0.08 y or z = E: 1550.12 ± 0.08 y or z = F: 1549.32 ± 0.08		nm
Side-mode suppression ratio (SMSR) (min)			dB
Average launch power (max)			dBm
Average launch power (min)			dBm
Transmitter and dispersion penalty (TDP) @ -450 ps/nm residual CD @ +450 ps/nm residual CD @ +900 ps/nm residual CD			dB
Average launch power of OFF transmitter (max)			dBm
Extinction ratio (min)			dB
RIN ₁₅ OMA (max)			dB/Hz
Optical return loss tolerance (max)			dB
Transmitter reflectance (max)			dB
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}			UI
Turn-on time (max)			ns
Turn-off time (max)			ns

Table 7 - ONU Receive Characteristics

Parameter	10GBASE-SP1-Uyz	10/2.5GBASE-SP1-Uyz	Unit
Signaling speed (range)	10.3125 ± 100 ppm		GBd
Channel wavelength range	1585.44 to 1598.03		nm
Bit error ratio (max)	10 ⁻³		
Average receive power (max)			dBm
Damage Threshold			dBm
Receiver sensitivity (max)			dBm
Receiver reflectance (max)			dB
Signal detect threshold (min)			dBm
Stressed receiver sensitivity (max)			dBm