Optoplex CORPORATION
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5G PON Mux/DeMUX Specification

Product Name	5G PON MUX/DeMUX
Description	16-Channel 50GHz DWDM Mux Module based on 50/100GHz Interleaver and 100GHz DWDM Thin Film Filters
Model	Section-10
File Number	
Version	2.0

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Revision History

Version	Date	Revision Description	Prepared	Approved
1.0	10/10/2018	Initial Release	Gary Wang	Songtao Du
2.0	4/15/2019	Updated channel plans	Nick Xiao	Songtao Du

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1. INTRODUCTIONS

This document describes 5G PON MUX (DeMUX) requirements. In each CWDM channels (in O-band or E-Band), there are 16 sub-DWDM channels at the low-wavelength (Low-Band) side, or the high-wavelength (High-Band) side of each CWDM channel (1271, 1291, 1311, 1331, 1351, 1411, 1431, 1451 and 1471), respectively. Each CWDM channel has a +/-7.5nm channel width, while the High-Band is defined as the CWDM channel + 7.5nm while the low-band is defined as CWDM channel – 7.5nm. Within the High- or the Low-Band, there are total 16 DWDM channels, respectively, with a channel spacing of about 0.37nm.

The MUX (or DeMUX) is based on optical interleaver and DWDM thin film filters. This configuration has wide operating temperature range (-40C to +85C) and superior performance, such as wide passband width, low insertion loss, high isolation, and excellent thermal stability, etc., over AWG technology.

2. DEFINITION

- All specifications should be guaranteed at the worst-case polarization state and over the entire operating environmental condition and end of life.
- The **Insertion Loss** of a device is defined as the maximum loss at a defined wavelength, taking into account the worst-case polarization state over the full operating temperature range.
- The **Insertion Loss Uniformity** of a device is the difference between the insertion loss of the best-case and worst-case channels.
- The **Polarization Dependent Loss** of a device is the maximum insertion loss difference between all polarization states at the defined wavelength.
- The **Reference Passband** is defined as a band of wavelengths around each center wavelength. It is used in the definition of crosstalk.
- The **Adjacent Crosstalk** of channel is the maximum insertion loss difference from the mean transmission at the ITU grid wavelength to the highest power over the all polarization and the ITU band of two adjacent channels.
- The **Non-adjacent Crosstalk** of channel is the maximum insertion loss difference from the mean transmission at the ITU grid wavelength to the highest power over the all polarization and the ITU band of the non-adjacent channels.
- The **Total Crosstalk** of channel is the total cumulative insertion loss difference from the mean transmission at the ITU grid wavelength to the highest power over the all polarization and the ITU band of all other channels including adjacent and non-adjacent channels.
- The **Wavelength Accuracy** is defined as the maximum difference between the defined wavelength and the center of measured 3dB passband.

3. STORAGE CONDITIONS

Parameter	Conditions	Min	Typ	Max	Units
Temperature		-40		85	ºC
Humidity	non-condensing	0		90	% R.H.

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4. ABSOLUTE MAXIMUM RATING

Parameter	Conditions	Min	Typ	Max	Units
Optical Power	on common port			500	mW

5. OPERATING CONDITIONS

5.1 COT MUX Modules

Parameter	Conditions	Min	Typ	Max	Units
Temperature		-10		75	ºC
Humidity	non-condensing	5		90	% R.H.

5.2 CRN DeMUX Modules

Parameter	Conditions	Min	Typ	Max	Units
Temperature		-30		85	ºC
Humidity	non-condensing	5		90	% R.H.

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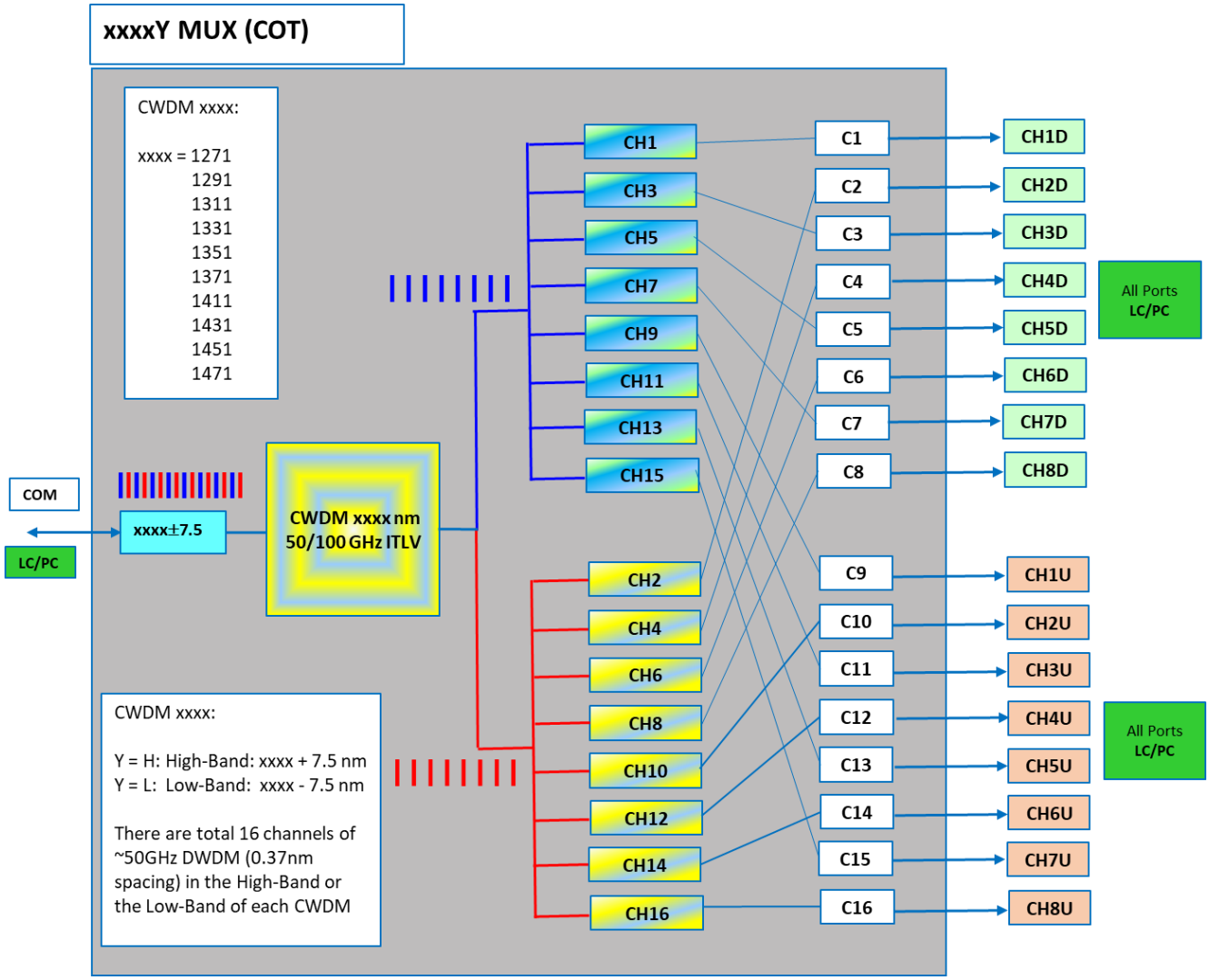
6. PRODUCT CONFIGURATION (SCHEMATIC)

6.1 16-Channel 50GHz DWDM Mux (COT)



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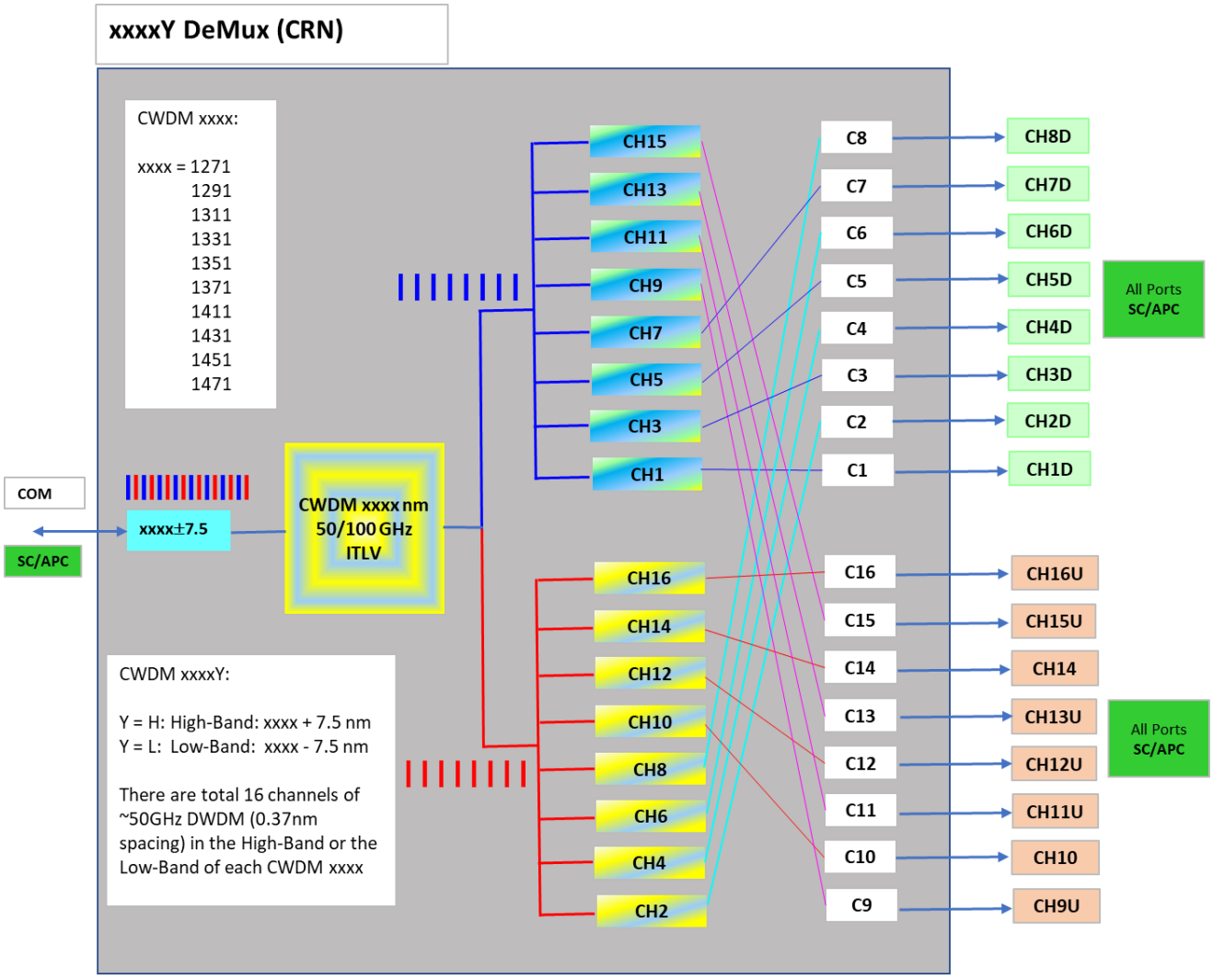
6.2 16-Channel 50GHz DWDM DeMux (CRN)



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7. OPTICAL SPECIFICATIONS

Parameter	Conditions	Min	Typ	Max	Units
Number of Channels			16		*ch*
Channel Spacing			0.37		*nm*
Nominal Center Wavelength	Refer to Section-10, Channel Plan (16ports)				
Center wavelength accuracy	Relative to ITU	-0.02		0.02	*nm*
Reference Passband Filter Bandwidth @-0.5dB	Relative to ITU	-0.11		0.11	*nm*
Filter Bandwidth @ -1.0dB		-0.15		0.15	*nm*
Filter Bandwidth @ -3.0dB		-0.16		0.16	*nm*
Filter Bandwidth @ -20.0dB		-0.68		0.68	*nm*
Adjacent Channel Crosstalk	within Reference Passband			-27	*dB*
Non-adjacent channel Crosstalk	within Reference Passband			-30	*dB*
Total integrated Crosstalk	within Reference Passband			-24	*dB*
Insertion Loss MUX + DEMUX (Including connector)	@ Center wavelength		**5.0**		*dB*
	within Reference Passband			**6.0**	*dB*
Insertion Loss Uniformity	@ Center wavelength			1.0	*dB*
Polarization Dependent Loss	within Reference Passband			0.5	*dB*
Polarization Mode Dispersion	within Reference Passband			0.5	*ps*
Return Loss	At all input/output ports, including connectors	45			*dB*
Chromatic dispersion	within Reference Passband	-10		+10	*ps/nm*

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8. PHYSICAL PARAMETERS

8-1. COT MUX

Parameter	Conditions	Min	Typ	Max	Units
Package Case	Length		120		mm
	Width		70		mm
	Height		15		mm
	Weight		120		grams
	Material	Aluminum			
Input (COM)	Connector	LC/UPC			
	Fiber length	480	500	520	mm
Output (channel)	Connector	LC/UPC			
	Channel Fiber length	470	500	530	mm
Fiber Type		SMF28e			
Fiber Jacket	All pigtails	900			um
Fiber Color	All fibers	White			

8-2. CRN DeMUX

Parameter	Conditions	Min	Typ	Max	Units
Package Case	Length		120		mm
	Width		70		mm
	Height		15		mm
	Weight		120		grams
	Material	Aluminum			
Input (COM)	Connector	SC/APC			
	Fiber length	480	500	520	mm
Output (channel)	Connector	SC/UPC			
	Channel Fiber length	480	500	320	mm
Fiber Jacket		900			um
Fiber Color		All, white, translucency			

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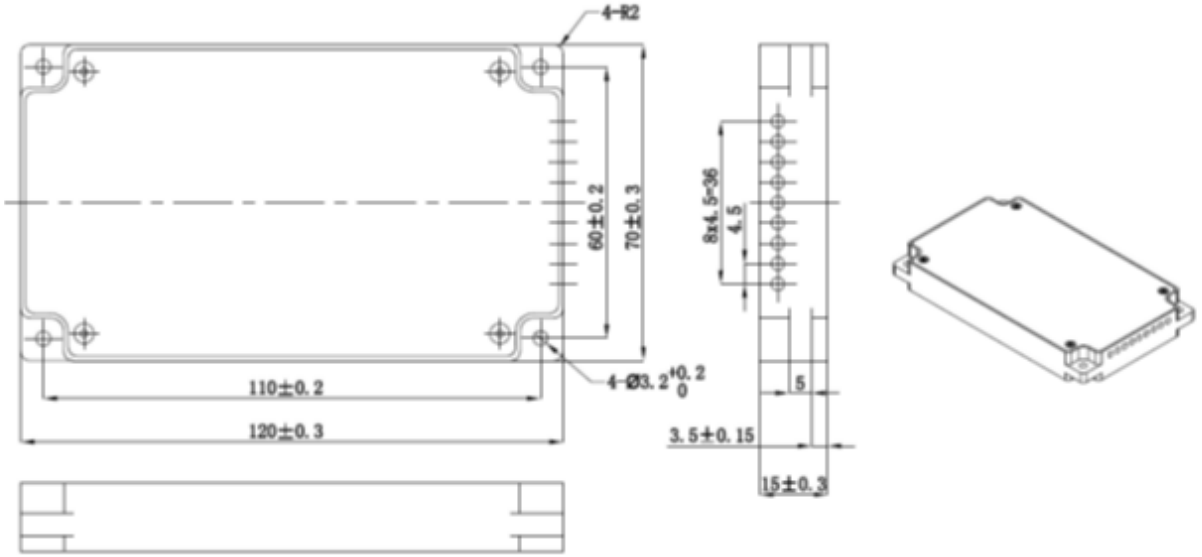
8-3. Module Drawings



NOTES

1. Material : AL 6061 (option)
2. After treatment : Black Anodizing after sanding
3. Surface : Cleaning
4. No burr and scratch on the surface
5. Packing : Wrapping
6. Height 15 +/-0.3 mm max

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9. CHANNEL WAVELENGTH PLAN

9.1 High-Band

DWDM Ch#	1271H				1291H			
	Wavelength (nm)	Waveleng Spacing (nm)	Freq (THz)	Freq Spacing (GHz)	Wavelength (nm)	Waveleng Spacing (nm)	Freq (THz)	Freq Spacing (GHz)
8	1271.27	0.37	235.821		1291.27	0.37	232.169	
7	1271.64	0.37	235.753	68.6	1291.64	0.37	232.102	66.5
6	1272.01	0.37	235.684	68.6	1292.01	0.37	232.036	66.5
5	1272.38	0.37	235.616	68.5	1292.38	0.37	231.969	66.4
4	1272.75	0.37	235.547	68.5	1292.75	0.37	231.903	66.4
3	1273.12	0.37	235.479	68.5	1293.12	0.37	231.837	66.4
2	1273.49	0.37	235.410	68.4	1293.49	0.37	231.770	66.3
1	1273.86	0.37	235.342	68.4	1293.86	0.37	231.704	66.3
16	1274.23	0.37	235.273	68.3	1294.23	0.37	231.638	66.2
15	1274.6	0.37	235.205	68.3	1294.6	0.37	231.571	66.2
14	1274.97	0.37	235.137	68.3	1294.97	0.37	231.505	66.2
13	1275.34	0.37	235.069	68.2	1295.34	0.37	231.439	66.1
12	1275.71	0.37	235.000	68.2	1295.71	0.37	231.373	66.1
11	1276.08	0.37	234.932	68.1	1296.08	0.37	231.307	66.1
10	1276.45	0.37	234.864	68.1	1296.45	0.37	231.241	66.0
9	1276.82		234.796	68.1	1296.82		231.175	66.0

DWDM Ch#	1331H				1351H			
	Wavelength (nm)	Waveleng Spacing (nm)	Freq (THz)	Freq Spacing (GHz)	Wavelength (nm)	Waveleng Spacing (nm)	Freq (THz)	Freq Spacing (GHz)
8	1331.27	0.37	225.193		1351.27	0.37	221.860	
7	1331.64	0.37	225.130	62.6	1351.64	0.37	221.799	60.7
6	1332.01	0.37	225.068	62.5	1352.01	0.37	221.738	60.7
5	1332.38	0.37	225.005	62.5	1352.38	0.37	221.678	60.7
4	1332.75	0.37	224.943	62.5	1352.75	0.37	221.617	60.6
3	1333.12	0.37	224.880	62.4	1353.12	0.37	221.556	60.6
2	1333.49	0.37	224.818	62.4	1353.49	0.37	221.496	60.6
1	1333.86	0.37	224.756	62.4	1353.86	0.37	221.435	60.5
16	1334.23	0.37	224.693	62.3	1354.23	0.37	221.375	60.5
15	1334.6	0.37	224.631	62.3	1354.6	0.37	221.314	60.5
14	1334.97	0.37	224.569	62.3	1354.97	0.37	221.254	60.4
13	1335.34	0.37	224.506	62.2	1355.34	0.37	221.194	60.4
12	1335.71	0.37	224.444	62.2	1355.71	0.37	221.133	60.4
11	1336.08	0.37	224.382	62.2	1356.08	0.37	221.073	60.3
10	1336.45	0.37	224.320	62.1	1356.45	0.37	221.013	60.3
9	1336.82		224.258	62.1	1356.82		220.952	60.3

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DWDM Ch#	1431H				1451H			
	Wavelength (nm)	Waveleng Spacing (nm)	Freq (THz)	Freq Spacing (GHz)	Wavelength (nm)	Waveleng Spacing (nm)	Freq (THz)	Freq Spacing (GHz)
8	1431.27	0.37	209.459		1451.27	0.37	206.572	
7	1431.64	0.37	209.405	54.1	1451.64	0.37	206.520	52.7
6	1432.01	0.37	209.351	54.1	1452.01	0.37	206.467	52.6
5	1432.38	0.37	209.297	54.1	1452.38	0.37	206.415	52.6
4	1432.75	0.37	209.243	54.0	1452.75	0.37	206.362	52.6
3	1433.12	0.37	209.189	54.0	1453.12	0.37	206.309	52.5
2	1433.49	0.37	209.135	54.0	1453.49	0.37	206.257	52.5
1	1433.86	0.37	209.081	54.0	1453.86	0.37	206.204	52.5
16	1434.23	0.37	209.027	53.9	1454.23	0.37	206.152	52.5
15	1434.6	0.37	208.973	53.9	1454.6	0.37	206.100	52.4
14	1434.97	0.37	208.919	53.9	1454.97	0.37	206.047	52.4
13	1435.34	0.37	208.865	53.9	1455.34	0.37	205.995	52.4
12	1435.71	0.37	208.811	53.8	1455.71	0.37	205.942	52.4
11	1436.08	0.37	208.757	53.8	1456.08	0.37	205.890	52.3
10	1436.45	0.37	208.704	53.8	1456.45	0.37	205.838	52.3
9	1436.82		208.650	53.7	1456.82		205.786	52.3

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9.2 Low-Band

DWDM Ch#	1271L				1291L			
	Wavelength (nm)	Waveleng Spacing (nm)	Freq (THz)	Freq Spacing (GHz)	Wavelength (nm)	Waveleng Spacing (nm)	Freq (THz)	Freq Spacing (GHz)
8	1264.32	0.36	237.118		1284.32	0.36	233.425	
7	1264.68	0.37	237.050	67.5	1284.68	0.37	233.360	65.4
6	1265.05	0.36	236.981	69.3	1285.05	0.36	233.292	67.2
5	1265.41	0.37	236.913	67.4	1285.41	0.37	233.227	65.3
4	1265.78	0.36	236.844	69.3	1285.78	0.36	233.160	67.1
3	1266.14	0.37	236.777	67.3	1286.14	0.37	233.095	65.3
2	1266.51	0.36	236.708	69.2	1286.51	0.36	233.028	67.0
1	1266.87	0.37	236.640	67.3	1286.87	0.37	232.963	65.2
16	1267.24	0.37	236.571	69.1	1287.24	0.37	232.896	67.0
15	1267.61	0.36	236.502	69.1	1287.61	0.36	232.829	66.9
14	1267.97	0.37	236.435	67.1	1287.97	0.37	232.764	65.1
13	1268.34	0.37	236.366	69.0	1288.34	0.37	232.697	66.8
12	1268.71	0.36	236.297	68.9	1288.71	0.36	232.630	66.8
11	1269.07	0.37	236.230	67.0	1289.07	0.37	232.565	65.0
10	1269.44	0.37	236.161	68.9	1289.44	0.37	232.498	66.7
9	1269.81		236.092	68.8	1289.81		232.431	66.7

DWDM Ch#	1331L				1351L			
	Wavelength (nm)	Waveleng Spacing (nm)	Freq (THz)	Freq Spacing (GHz)	Wavelength (nm)	Waveleng Spacing (nm)	Freq (THz)	Freq Spacing (GHz)
8	1324.32	0.36	226.375		1344.32	0.36	223.007	
7	1324.68	0.37	226.313	61.5	1344.68	0.36	222.947	59.7
6	1325.05	0.36	226.250	63.2	1345.04	0.37	222.887	59.7
5	1325.41	0.37	226.188	61.5	1345.41	0.37	222.826	61.3
4	1325.78	0.36	226.125	63.1	1345.78	0.36	222.765	61.3
3	1326.14	0.37	226.064	61.4	1346.14	0.37	222.705	59.6
2	1326.51	0.36	226.001	63.1	1346.51	0.36	222.644	61.2
1	1326.87	0.37	225.940	61.3	1346.87	0.37	222.585	59.5
16	1327.24	0.36	225.877	63.0	1347.24	0.36	222.523	61.1
15	1327.6	0.37	225.815	61.3	1347.6	0.37	222.464	59.4
14	1327.97	0.37	225.752	62.9	1347.97	0.37	222.403	61.1
13	1328.34	0.36	225.690	62.9	1348.34	0.36	222.342	61.0
12	1328.7	0.37	225.628	61.1	1348.7	0.37	222.283	59.3
11	1329.07	0.37	225.566	62.8	1349.07	0.37	222.222	61.0
10	1329.44	0.37	225.503	62.8	1349.44	0.37	222.161	60.9
9	1329.81		225.440	62.7	1349.81		222.100	60.9

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10. 5G PON MUX/DEMUX ORDERING INFORMATION

CWDM Band	Low-Band		High-Band	
Mux/DeMux	COT (MUX)	CRN (DeMUX)	COT (MUX)	CRN (DeMUX)
1271	MX-1271L16COT	DX-1271L16CRN	MX-1271H16COT	DX-1271H16CRN
1291	MX-1291L16COT	DX-129116LCRN	MX-1291H16COT	DX-1291H16CRN
1311	MX-1311L16COT	DX-1311L16CRN	MX-1311H16COT	DX-1311H16CRN
1331	MX-1331L16COT	DX-1331L16CRN	MX-1331H16COT	DX-1331H16CRN
1351	MX-1351L16COT	DX-1351L16CRN	MX-1351H16COT	DX-1351H16CRN
1371	MX-1371L16COT	DX-1371L16CRN	MX-1371H16COT	DX-1371H16CRN
1411	MX-1411L16COT	DX-1411L16CRN	MX-1411H16COT	DX-1411H16CRN
1431	MX-1431L16COT	DX-1431L16CRN	MX-1431H16COT	DX-1431H16CRN
1451	MX-1451L16COT	DX-1451L16CRN	MX-1451H16COT	DX-1451H16CRN
1471	MX-1471L16COT	DX-1471L16CRN	MX-1471H16COT	DX-1471H16CRN