

CORNING



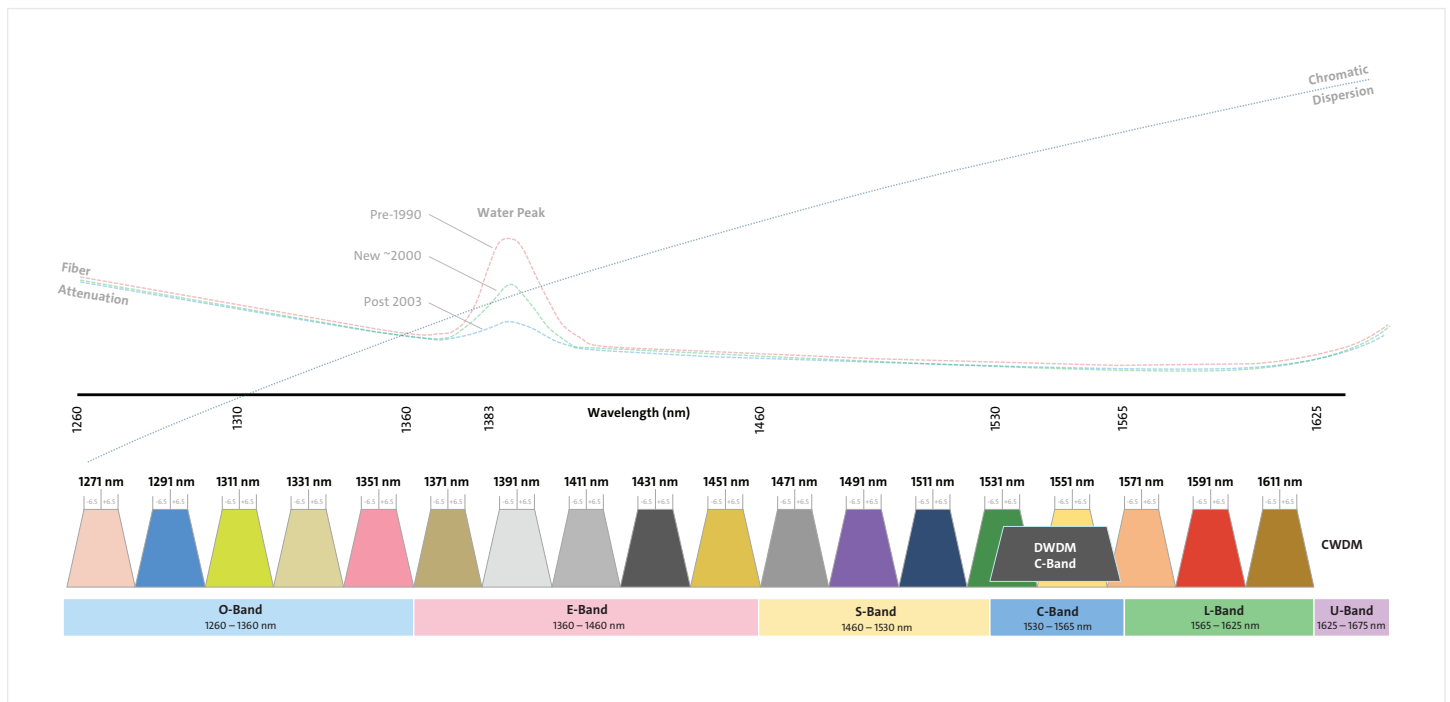
Coarse Wavelength Division Multiplexing Solutions Guide

Coarse Wavelength Division Multiplexing (CWDM)

Corning coarse wavelength division multiplexing (CWDM) solutions utilize advanced thin-film-filter technology. CWDM solutions are available in industry-standard 20 nm spacing with options for a 1310 nm RF overlay bypass as well as single or bidirectional test ports. Connectorized and spliced solutions are available in various platforms for the inside and outside plant environments.

Features	Benefits
Passive and outside plant hardened	Power or temperature-controlled environment not required
Epoxy-free optical path	Higher reliability
Low insertion loss and high isolation	Minimum impact on insertion loss budgets and lower transmission costs
Transport protocol independent	Flexibility
Standards	Approvals and Listings: Telcordia qualified

ITU-T G.694.2 CWDM Standard





1 Select product family.

CTX = Centrix™ cassette
 EG1 = EDGE™ WDM Module
 EMR = EMF/FMS Right Hand Module
 EML = EMF/FMS Left Hand Module
 E2R = EMF/FMS Right Hand
 Double Module
 E2L = EMF/FMS Left Hand
 Double Module
 LG1 = LGX Single Width Module
 LG2 = LGX Double Width Module
 RAK = 1RU Shelf R2K = 2RU Shelf

Hardened Preconn terminals

V28 = Evolv® 2x8

Splice Trays

BK7 = BPEO K7 Tray
 CL1 = Insert for 2541, 2543 long and
 short trays (BPEO and Fiber Dome)

2 Select Com connector.

B3 = LC APC 6C = SC APC
 A9 = LC UPC 3C = SC UPC
 MA = mDC APC MU = mDC UPC
 44 = OptiTap® 77 = OptiTip® (pin)
 P# = Pushlok™ 90 = 900 μm loose
 (# = 1 fiber, 2 fiber) tube
 25 = 250 μm fiber

3 Select channel/function connector.

B3 = LC APC 6C = SC APC
 A9 = LC UPC 3C = SC UPC
 MA = mDC APC MU = mDC UPC
 44 = OptiTap 77 = OptiTip (pin)
 P# = Pushlok 90 = 900 μm loose
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 25 = 250 μm fiber tube

4 Select WDM function option.

A = MUX (1 Com)
 B = DEMUX (1 Com)
 C = Dual (Mux and DeMux; 2 Com)
 See Note 1

5 Select number of CWDM channels.

1 = 1	7 = 7	D = 13
2 = 2	8 = 8	E = 14
3 = 3	9 = 9	F = 15
4 = 4	A = 10	G = 16
5 = 5	B = 11	H = 17
6 = 6	C = 12	J = 18

6 Select first group starting channel.

Z = No wavelength
 K = 1271 nm L = 1291 nm M = 1311 nm
 N = 1331 nm P = 1351 nm Q = 1371 nm
 R = 1391 nm S = 1411 nm U = 1431 nm
 A = 1451 nm B = 1471 nm C = 1491 nm
 D = 1511 nm E = 1531 nm F = 1551 nm
 G = 1571 nm H = 1591 nm J = 1611 nm

7 Select first group ending channel (consecutive channels).

Z = No wavelength
 K = 1271 nm L = 1291 nm M = 1311 nm
 N = 1331 nm P = 1351 nm Q = 1371 nm
 R = 1391 nm S = 1411 nm U = 1431 nm
 A = 1451 nm B = 1471 nm C = 1491 nm
 D = 1511 nm E = 1531 nm F = 1551 nm
 G = 1571 nm H = 1591 nm J = 1611 nm

8 Select second group starting channel.

Z = No wavelength
 K = 1271 nm L = 1291 nm M = 1311 nm
 N = 1331 nm P = 1351 nm Q = 1371 nm
 R = 1391 nm S = 1411 nm U = 1431 nm
 A = 1451 nm B = 1471 nm C = 1491 nm
 D = 1511 nm E = 1531 nm F = 1551 nm
 G = 1571 nm H = 1591 nm J = 1611 nm

9 Select second group ending channel (consecutive channels).

Z = No wavelength
 K = 1271 nm L = 1291 nm M = 1311 nm
 N = 1331 nm P = 1351 nm Q = 1371 nm
 R = 1391 nm S = 1411 nm U = 1431 nm
 A = 1451 nm B = 1471 nm C = 1491 nm
 D = 1511 nm E = 1531 nm F = 1551 nm
 G = 1571 nm H = 1591 nm J = 1611 nm

10 Select 1310 nm wideband option.

N = None
 Y = With 1310 nm option

11 Reserved for serialization.

- = None

12 Select monitor/test option.

N = None
 1 = Single Fiber Mux or DeMux
 Single directional test point
 (Tx) 1%
 2 = Single Fiber Mux or DeMux
 Single directional test point
 (Tx) 2%
 5 = Single Fiber Mux or DeMux
 Single directional test point
 (Tx) 5%
 A = Single Fiber In, two directional
 1% test points (Tx and Rx)
 B = Single Fiber In, two directional
 2% test points (Tx and Rx)
 C = Single Fiber In, two directional
 5% test points (Tx and Rx)
 D = Two Fibers In, two directional
 test points 1% (Tx and Rx)
 E = Two Fibers In, two directional
 test points 2% (Tx and Rx)
 F = Two Fibers In, two directional
 test points 5% (Tx and Rx)

See Note 2

13 Select upgrade and OTDR port options.

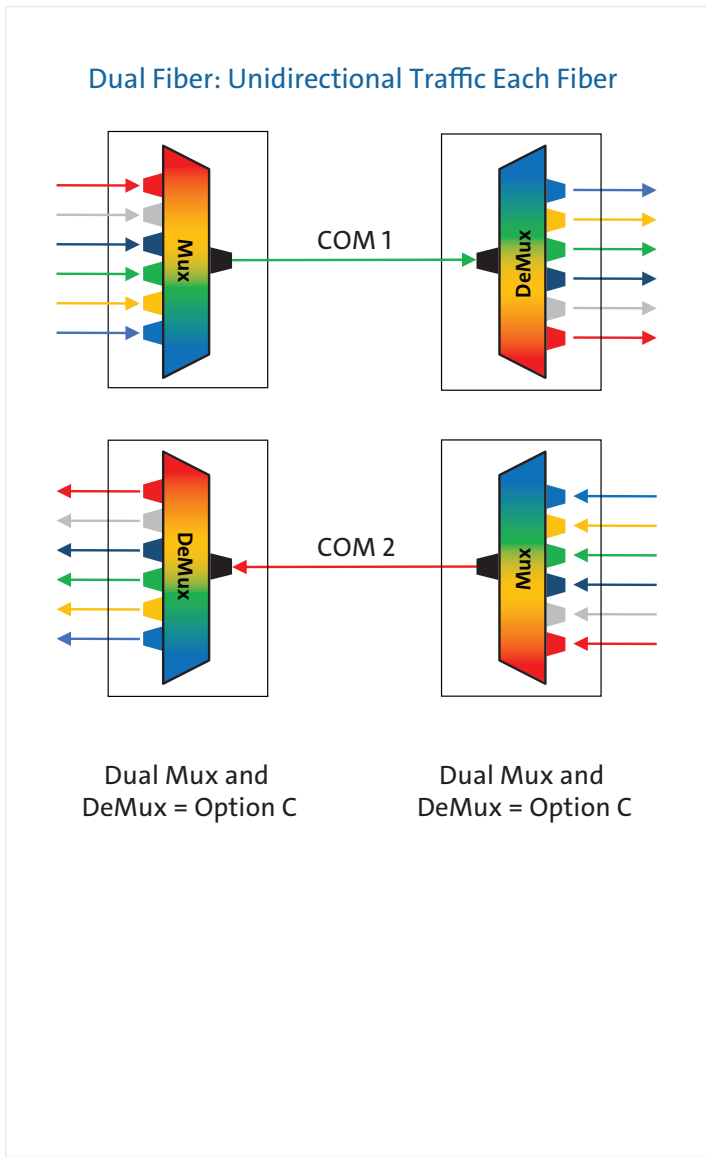
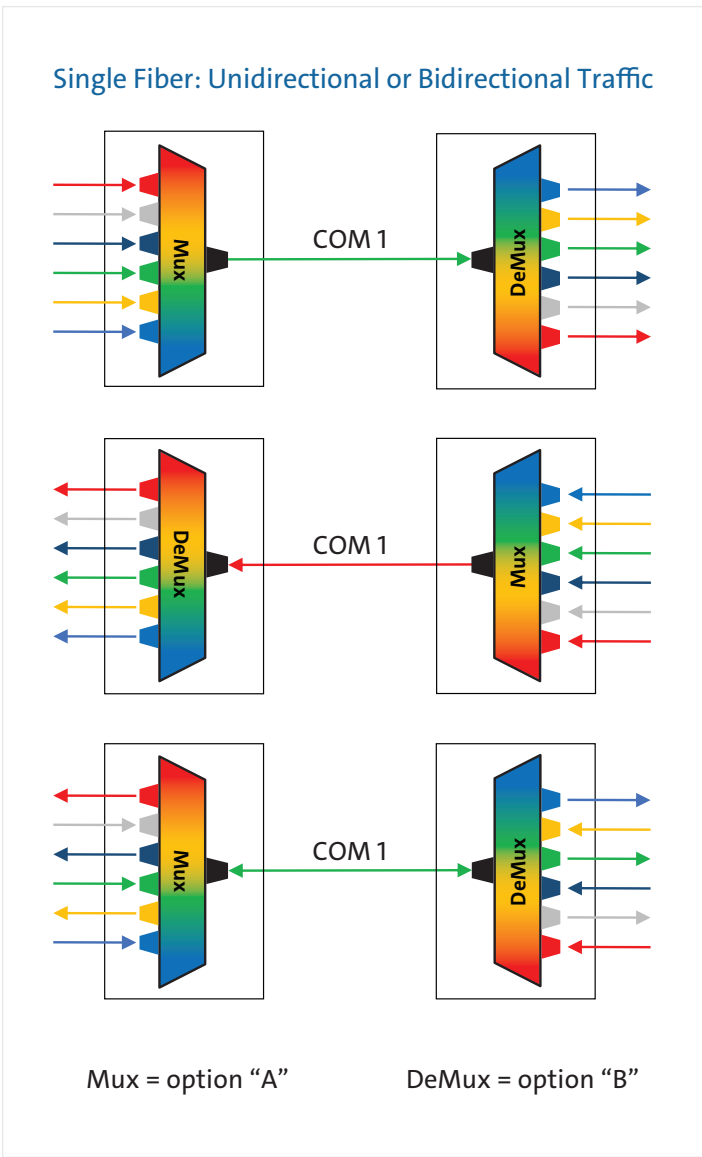
N = None
 T = OTDR
 U = Upgrade (UPG)
 A = UPG and OTDR

14 Select number of total CEXs in solution.

1 = 1	7 = 7
2 = 2	8 = 8
3 = 3	9 = 9
4 = 4	A = 10
5 = 5	B = 11
6 = 6	C = 12

See Note 3

Note 1: Functions—Mux, DeMux, or Both



Note 2: Test/Monitor Port Options

WDM Function Options (A= Mux, B= Mux and DeMux, C = DeMux)			Test/Monitor Options (1%, 2%, 5%)	
A	Single Fiber Mux, Single directional test point (Tx)		1, 2, 5	
B	Single Fiber Mux, Single directional test point (Rx)		1, 2, 5	
A, B	Single Fiber in (bidirectional Mux/DeMux), two directional test points (Tx and Rx)		A, B, C	
C	Two Fibers in (Mux AND DeMux), two directional test points (Tx and Rx)		D, E, F	

Note 3

This option allows for multiple instances of a particular Mux/DeMux in one module or cassette. The maximum number of devices allowed is dependent on the form factor of the module/cassette, the connector type chosen, and the number of services being combined.

Inside Plant



Centrix™



EMF (Right; Double height)



LGX (Single and Double wide modules)



EMF (Right; Double height)



EDGE™



1 and 2 RU Shelf

Outside Plant



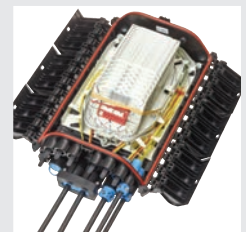
K7 WDM Tray (BPEO)



WDM Insert for 2542 and 2543 trays (BPEO and Fiber Dome)



Evolv® (2x8) with PushLok™



BPEO Closure



FiberDome Closure

Hardware Capacities

IPS Platform	Connector (fiber) Capacity		
	SC	LC	MDC (2-fiber)
Centrix™ (CTX)	24	36	
LGX Single Wide (LG1)	12	28	
LGX Double Wide (LG2)	24	56	
EDGE™ WDM Module (EG1)		12	18 (36)
EMF (Right Hand) Single Height (EMR)	12	24	
EMF (Left Hand) Single Height (EML)	12	24	
EMF (Right Hand) Double Height (E2R)	24	48	
EMF (Left Hand) Double Height (E2L)	24	48	
1RU Shelf (RAK)	22	44	
2RU Shelf (R2K)	44	88	

IPS Platform	Connector (fiber) Capacity	
	Pushlok™ (1-Fiber)	Pushlok (2-Fiber)
Evolv® 2x8 (V28)	18	18 (36)

Spliced - splice tray/insert	Fiber Leg Capacity
	Fiber (250 μm or 900 μm)
BPEO K7 Tray (BK7)	28
Fiber Dome and BPEO Tray Inserts (CL1)	14

Sample Configurations and Part Numbers

CWDM Configuration Examples	Example Hardware Description	# fibers/ ports required	Part Number Examples		# fibers/ ports required	Part Number Examples
			Mux (A)	DeMux (B)		
4CH CWDM High – 1551, 1571, 1591, 1611	4 Channel CWDM; LGX Single Wide Module, SC UPC Com, SC UPC Channels, 1551-1611, UPG, 1 Device per module	6	LG1C3C3CA4FJZZN-NU1	LG1C3C3CB4FJZZN-NU1	12	LG1C3C3CC4FJZZN-NU1
4CH CWDM Intermediate H – 1471, 1491, 1511, 1531	4 Channel CWDM; Eclipse® Module, LC UPC Com, LC UPC Channels, 1471-1531, UPG, 1 Device per module	6	ECLCA9A9A4BEZZN-NU1	ECLCA9A9B4BEZZN-NU1	12	ECLCA9A9C4BEZZN-NU1
4CH CWDM Intermediate L – 1351, 1371, 1431, 1451 (skip 1391 and 1411)	4 Channel CWDM; BPEO K7 Tray, 1351, 1371, 1431, 1451 (skip 1391 and 1411), 5% Test port (SC APC), 1 Device per module	6	BK7C2525A4PQUAN-5N1	BK7C2525B4PQUAN-5N1	12	BK7C2525C4PQUAN-FN1
4CH CWDM Low – 1271-1331	4 Channel CWDM; EDGE Module, LC APC Com, LC APC Channels, 1271-1331, 5% Test port, 1 Device per module	6	EG1CB3B3A4KNZZN-5N1	EG1CB3B3B4KNZZN-5N1	12	EG1CB3B3C4KNZZN-FN1
8CH CWDM High – 1471-1611	8 Channel CWDM; Centrix Cassette, SC UPC Com, SC UPC Channels, 1471-1611, UPG, 1 Device per module	10	CTXC3C3CA8BJZZN-NU1	CTXC3C3CB8BJZZN-NU1	20	CTXC3C3CC8BJZZN-NU1
8CH CWDM Low – 1271-1371, 1431-1451 (skip 1391 and 1411)	8 Channel CWDM; 1RU Shelf, LC UPC Com, LC UPC Channels, 1271-1371, 1431-1451 (skip 1391 and 1411), 5% Test Port, UPG, 2 Device per shelf	22	RAKCA9A9A8KQUAN-5U2	RAKCA9A9A8KQUAN-5U2	44	RAKCA9A9A8KQUAN-FU2
8CH CWDM Low – 1311-1451	8 Channel CWDM; EMF Right Hand Single Height module, LC UPC Com, LC UPC Channels, 1311-1451, UPG, 1 Device per module	10	EMRCA9A9A8MAZZN-NU1	EMRCA9A9B8MAZZN-NU1	20	EMRCA9A9C8MAZZN-NU1
16CH CWDM – 1311-1611	16 Channel CWDM; Centrix Cassette, LC APC Com, LC APC Channels, 1551-1611, with 1310 nm, 1 Device per module	18	CTXCB3B3AGMJZZY-NN1	CTXCB3B3BGMJZZY-NN1	36	CTXCB3B3CGMJZZY-NN1
18CH CWDM – 1271-1611	18 Channel CWDM; Centrix Cassette, SC UPC Com, SC UPC Channels, 1271-1611, with 1310 nm, 1 Device per module	20	CTXC3C3CAJKJZZY-NN1	CTXC3C3CAJKJZZY-NN1		

Specifications

Parameters	4CH	8CH	16CH
CH Spacing (nm)	20	20	20
CH Passband Width (nm)	6.5	6.5	6.5
CWDM CH IL (dB)	1.4	1.5	2.5
Ripple in Passband (dB)	0.3	0.3	0.3
Adjacent CH Isolation (dB)	30	30	30
Non-Adj CH Isolation (dB)	45	45	45
Directivity (dB)	50	50	50
Return Loss (dB)	45	45	45
PDL (dB)	0.2	0.2	0.3
PMD (dB)	0.2	0.2	0.3
With 1310 Express Port			
Express Port IL (dB)	1.4	1.4	1.4
Express Port Isolation (dB)	15	15	15
With 5% Monitor			
CWDM CH IL (dB)	1.8	1.9	2.9
Monitor Port IL (dB)	16	16	16
With 2% Monitor			
CWDM CH IL (dB)	1.7	1.8	2.8
Monitor Port IL (dB)	19	19	19

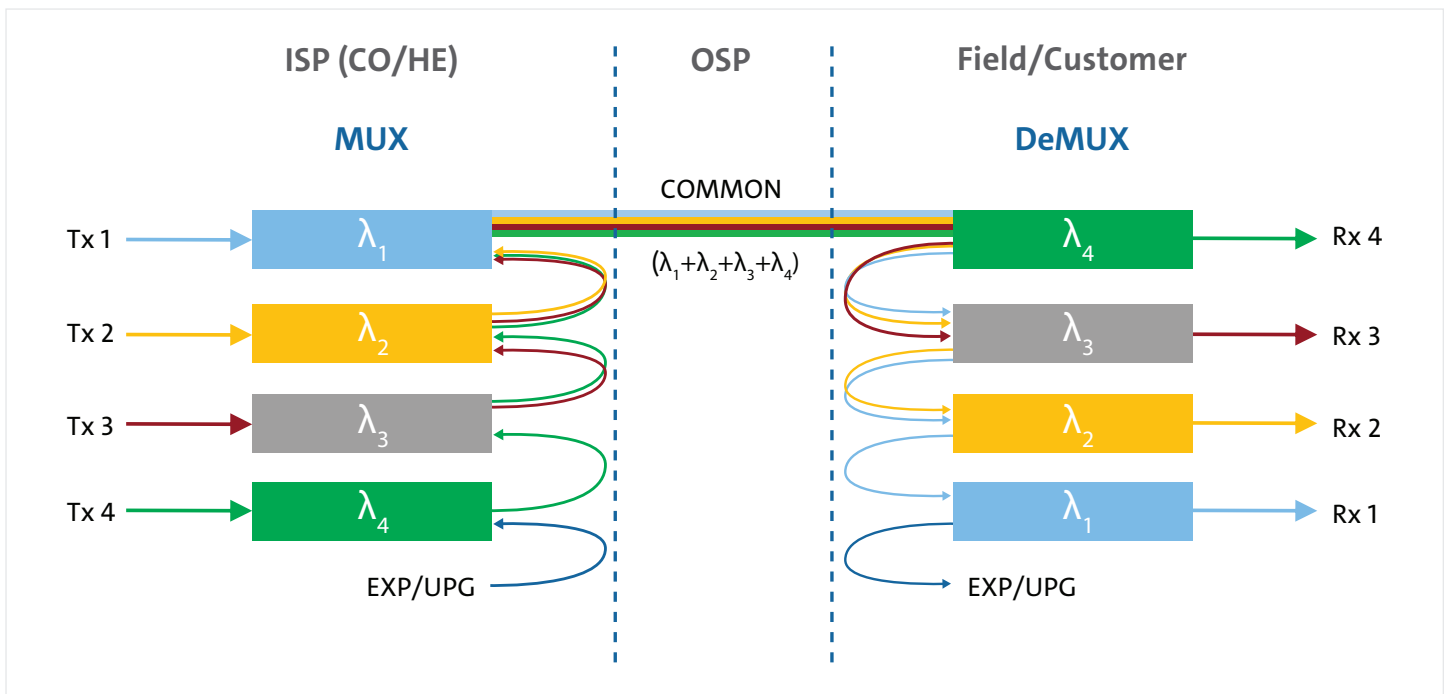
*Compact CWDM (CCWDM) devices

*Operation Temperature : -40°C to +85°C

*Optical parameters measured without connectors

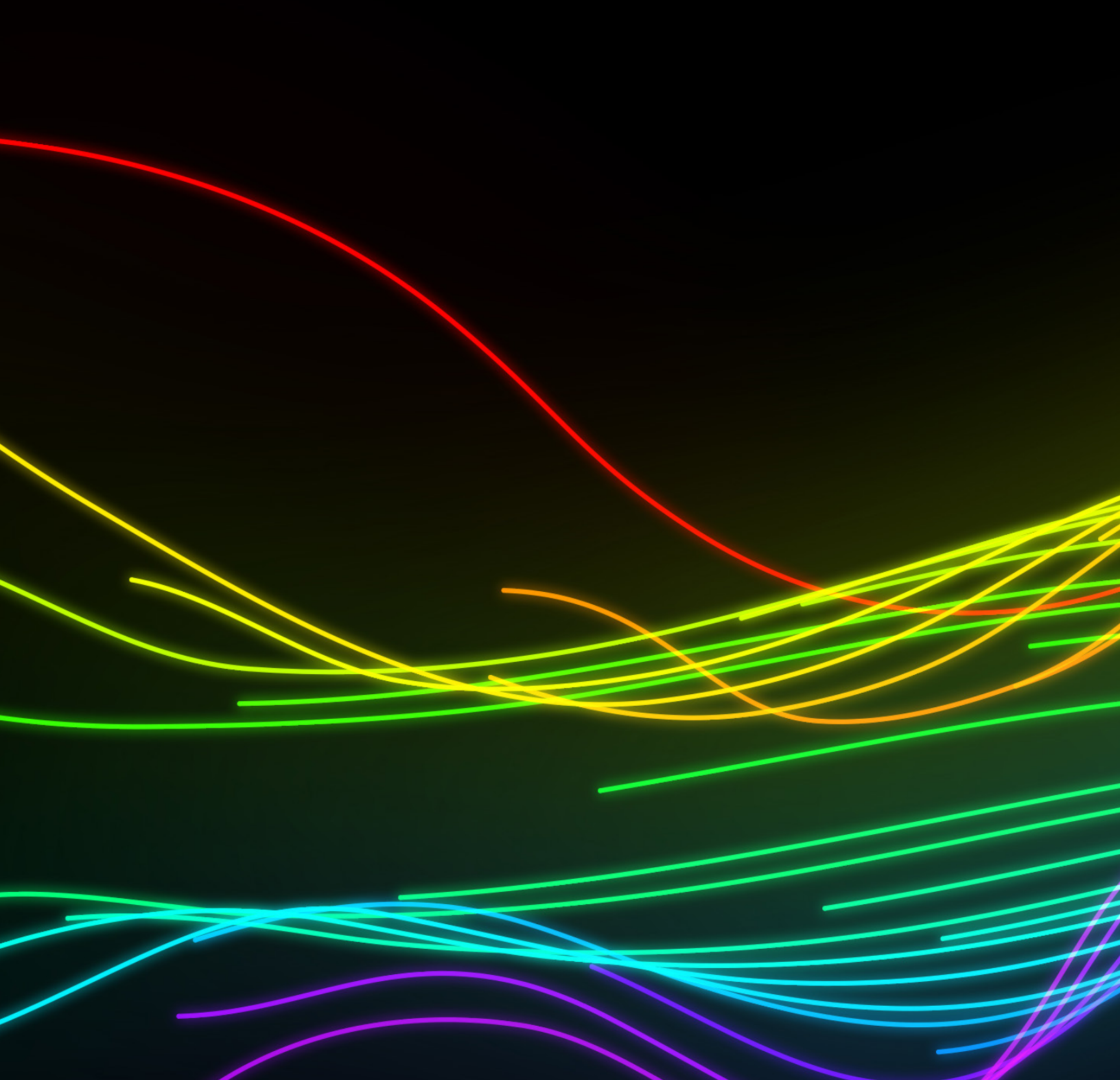
CWDM Considerations

- Fiber attenuation at 1383 nm is the ‘Water Peak.’ Legacy G.652 fibers are worst case scenario and typical designs do not use CWDM in this region. 1371 nm, 1391 nm, 1411 nm are wavelengths considered for skipping.
- G.652C, G.652D lowers the water peak to zero/near zero and enables CWDM in this spectrum.
- If DWDM is to be overlaid on CWDM, CWDM 1531 nm and 1551 nm channel spectrum is used.
 - If DWDM is to be amplified, amplify prior to combining with CWDM.
 - If using CWDM 1531 nm and/or 1551 nm channels for DWDM, some DWDM channels are ‘clipped’ and not usable.
 - 1531 nm DWDM passband: C44 – C59
 - 1551 nm DWDM passband: C20 - C43
- For balancing TFF (thin-film filter) cascade losses (tilt), have Mux and DeMux reversed.
 - i.e., when Mux is selected, Low to High channel number.
 - i.e., when DeMux is selected, High to Low channel number.



Note: to balance the insertion loss, reversing the order of the filters on one side of the link is considered to not penalize the last channel added/dropped.

Notes:



For further information

refer to Application Engineering Note: **Selecting Passive Wavelength Division Multiplexing Hardware – AEN177**, or contact Customer Care at 1-800-743-2675, CCSAmericas@corning.com.

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