



smar**to**ptics

CWDM & DWDM

Wavelength Guide

CWDM (Coarse Wavelength Division Multiplexing)

Up to 18 Wavelength channels (also referred to as lambdas or colours), can be transported over a dark fiber network. Up to 8 channels can be transported over a single dark fiber strand. These wavelengths are between 1270 and 1610nm and covered by ITU standard G.694.2. Each wavelength is separated by 20nm and due to the physical properties of light, each channel cannot interfere with the next, meaning complete separation from each other. Each channel is usually transparent to the speed and type of data, meaning that any mix of SAN, WAN, Voice and Video services can be transported simultaneously over a single fiber or fiber pair.

ITU channel no	Wavelength, nm	Color code
27	1270	
29	1290	
31	1310	
33	1330	
35	1350	
37	1370	
39	1390	
41	1410	
43	1430	
45	1450	
47	1470	violet
49	1490	grey
51	1510	blue
53	1530	green
55	1550	yellow
57	1570	orange
59	1590	red
61	1610	brown

DWDM (Dense Wavelength Division Multiplexing)

100GHz spacing (even channels)

Up to 40 Wavelength channels can be transported over a dark fiber network in the so called C-Band. An additional 40 channels are available in the L-Band but these are usually not used, due to difficulties in amplification and excessively long leadtimes. Networks are usually built with transceivers in the C-Band region. These wavelengths are covered by ITU G.694.1 and each wavelength is typically separated by 0.8nm or 100GHz. Each channel is usually transparent to the speed and type of data, meaning that any mix of SAN, WAN, Voice and Video services can be transported simultaneously over a single fiber or fiber pair. Apart from number of available channels DWDM has 4 additional benefits over its CWDM cousin:

- Tunable transceivers are available for 10G and 100G protocols which helps with spares and logistics
- DWDM wavelengths sit in a region of the fiber that can be amplified to extend the reach of the transceiver beyond its usual stated range
- It is better suited for higher speed protocols, such as 10G and even coherent 40/100G
- DWDM wavelengths sit in the lowest loss region of the fiber maximising transmission distances

ITU channel no	Wavelength, nm	Frequency, THz	SO channel No
61	1528.77	196.10	9610
60	1529.55	196.00	9600
59	1530.33	195.90	9590
58	1531.12	195.80	9580
57	1531.90	195.70	9570
56	1532.68	195.60	9560
55	1533.47	195.50	9550
54	1534.25	195.40	9540
53	1535.04	195.30	9530
52	1535.82	195.20	9520
51	1536.61	195.10	9510
50	1537.40	195.00	9500
49	1538.19	194.90	9490
48	1538.98	194.80	9480
47	1539.77	194.70	9470
46	1540.56	194.60	9460
45	1541.35	194.40	9450
44	1542.14	194.40	9440
43	1542.94	194.30	9430
42	1543.73	194.20	9420
41	1544.53	194.10	9410
40	1545.32	194.00	9400
39	1546.12	193.90	9390
38	1546.92	193.80	9380
37	1547.72	193.70	9370
36	1548.51	193.60	9360
35	1549.32	193.50	9350
34	1550.12	193.40	9340
33	1550.92	193.30	9330
32	1551.72	193.20	9320
31	1552.52	193.10	9310
30	1553.33	193.00	9300
29	1554.13	192.90	9290
28	1554.94	192.80	9280
27	1555.75	192.70	9270
26	1556.55	192.60	9260
25	1557.36	192.50	9250
24	1558.17	192.40	9240
23	1558.98	192.30	9230
22	1559.79	192.20	9220
21	1560.61	192.10	9210
20	1561.42	192.00	9200
19	1562.23	191.90	9190
18	1563.05	191.80	9180
17	1563.86	191.7	9170
16	1564.68	191.6	9160
15	1565.50	191.5	9150
14	1566.31	191.4	9140
13	1567.13	191.3	9130
12	1567.95	191.2	9120
11	1568.11	191.1	9110

CWDM Channel 1530nm

CWDM channel 1550nm

DWDM (Dense Wavelength Division Multiplexing)

50GHz spacing channels

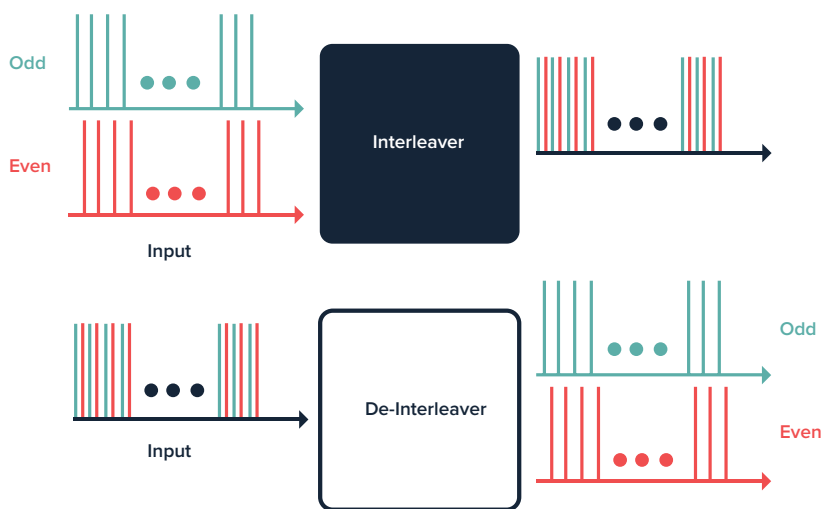
A further 40 Wavelength channels can be added to the C-Band by using 50GHz spaced transceivers instead of 100GHz to increase the capacity from 40 to 80 channels. They are used with an additional multiplexer called an interleaver which weaves the 50GHz odd and even channels together.

ITU channel no	Wavelength, nm	Frequency, THz	SO channel No
61,5	1528,38	196,15	9615
60,5	1529,16	196,05	9605
59,5	1529,94	195,95	9595
58,5	1530,72	195,85	9585
57,5	1531,51	195,75	9575
56,5	1532,29	195,65	9565
55,5	1533,07	195,55	9555
54,5	1533,86	195,45	9545
53,5	1534,64	195,35	9535
52,5	1535,43	195,25	9525
51,5	1536,22	195,15	9515
50,5	1537,00	195,05	9505
49,5	1537,79	194,95	9495
48,5	1538,58	194,85	9485
47,5	1539,37	194,75	9475
46,5	1540,16	194,65	9465
45,5	1540,95	194,45	9455
44,5	1541,75	194,45	9445
43,5	1542,54	194,35	9435
42,5	1543,33	194,25	9425
41,5	1544,13	194,15	9415
40,5	1544,92	194,05	9405
39,5	1545,72	193,95	9395
38,5	1546,52	193,85	9385
37,5	1547,32	193,75	9375
36,5	1548,11	193,50	9365
35,5	1548,91	193,55	9355
34,5	1549,72	193,45	9345
33,5	1550,52	193,35	9335
32,5	1551,32	193,25	9325
31,5	1552,12	193,15	9315
30,5	1552,93	193,05	9305
29,5	1553,73	192,95	9295
28,5	1554,54	192,85	9285
27,5	1555,34	192,75	9275
26,5	1556,15	192,65	9265
25,5	1556,96	192,55	9255
24,5	1557,77	192,45	9245
23,5	1558,58	192,35	9235
22,5	1559,39	192,25	9225
21,5	1560,20	192,15	9215
20,5	1561,01	192,05	9205
19,5	1561,83	191,95	9195
18,5	1562,64	191,85	9185

DWDM (Dense Wavelength Division Multiplexing)

50GHz spacing (Interleaver)

An interleaver further expands the number of channels per fiber by multiplexing 50GHz spaced DWDM signals on to a 100GHz spaced channel plan. The 50 and 100GHz signals are commonly referred to as odd and even signals and it is these signals which are combined or interleaved together typically to move from 40 to 80 channels in the C-Band of the fiber.



About Smartoptics

Smartoptics offers optical transmission solutions making networks more powerful. Expanding bandwidth without the upfront investment or hassle of traditional WDM. Our products allow corporate data centers, governments, hosting solution providers and ISPs to build simple, straightforward and cost effective solutions to fulfill their ongoing and future network capacity needs. Headquartered in Oslo, Norway, Smartoptics is an international provider with thousands of installations all around the world. Our award-winning approach has helped companies from every industry sector stay ahead of expanding network demands.

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