Wavelength Grid

CWDM Grid

The wavelength grid to support Coarse Wavelength Division Multiplexing (CWDM) applications is defined in G.694.2 (12/03 superseding 06/02) from ITU-T (the Telecommunication group of the International Telecom Union). This grid is designed to allow simultaneous transmission of several wavelengths with enough separation to permit the use of uncooled sources. Table 1 in this recommendation lists the 18 defined CWDM channels as the following channels (with 20 nm spacing per channel, 13 nm passband). Sometime channel 39 and 41 are omitted due to water peak.

Channel	Frequency	Wavelength[†]	Channel	Frequency	Wavelength
27	235.871 THz	1270 nm	45	206.611 THz	1450 nm
29	232.217 THz	1290 nm	47	203.802 THz	1470 nm
31	228.675 THz	1310 nm	49	201.068 THz	1490 nm
33	225.239 THz	1330 nm	51	198.407 THz	1510 nm
35	221.904 THz	1350 nm	53	195.815 THz	1530 nm
37	218.667 THz	1370 nm	55	193.290 THz	1550 nm
39	215.523 THz	1390 nm	57	190.829 THz	1570 nm
41	212.468 THz	1410 nm	59	188.430 THz	1590 nm
43	209.499 THz	1430 nm	61	186.091 THz	1610 nm

LAN-WDM Grid

For distances of 10 km and longer IEEE has in 802.3ba defined the LAN-WDM grid to be used for e.g. 100 Gbps transport (namely 100 GBase-LR4, 100 GBase-ER4 and 100 GBase-ZR4). This grid originally consisted of four channels (1309.14 nm/1304.58 nm/1300.05 nm/1295.56 nm) but has later been extended with additional four channels to honour e.g. 400 Gbps transport (namely 400 GBase-LR8, 400 GBase-ER8 and 400 GBase-ZR8).

Channel	Frequency	Wavelength	Channel	Frequency	Wavelength
1	229.000 THz	1309.14 nm	5	233.000 THz	1286.66 nm
2	229.800 THz	1304.58 nm	6	233.800 THz	1282.26 nm
3	230.600 THz	1300.05 nm	7	234.600 THz	1277.89 nm
4	231.400 THz	1295.56 nm	8	235.400 THz	1273.55 nm

[†]: ITU-T G.694.2 (06/02) introduced the original CWDM channels which are commonly used. ITU-T G.694.2 (12/03) shifted these channels by 1nm (i.e. 1271, 1291 .. 1611) to align with common industrial practice.

DWDM Grid

ITU-T has in recommendation G.694.1 (02/12) specified various variants of the DWDM grid in the S-, C-and L-band‡, all with the outset of the central frequency 191.100 THz.

The most frequently used DWDM grid is with 100 GHz spacing, as listed below. In addition, ITU-T has defined denser grids, with 6.25 GHz, 12.5 GHz, 25 GHz, and 50 GHz spacing, see G.694.1 Table 1. For the 50 GHz grid the channels/frequencies are many times nominated with an H, as in the below table.

Flexgrid has been introduced in G.694.1 (02/12) §7. The central frequency of the flexgrid is defined by 193.1+ n×0.00625 in THz, with a slot width of m×12.5 in GHz. For examples of usage please refer to ITU-T G.694.1 (02/12), Appendix I.

Recently – with the rapidly increase of needed frequencies due to the higher bandwidth demand – various vendor now talks about conventional, extended, and super C-band, where the frequency ranges are:

Conventional C-band	3.2 THz wide	191 850 – 195 000 GHz.	~1562,64 – ~1537,40 nm
Conventional L-band	4.8 THz wide	186 050 –190 950 GHz	~1611,35 – ~1570,01 nm
Extended C-band	4.8 THz wide	191 350 – 196 100 GHz	~1567,13 – ~1528,77 nm
Extended L-band	4.8 THz wide	185 500 –190 300 GHz	~1616.13 – ~1575.37 nm
Super C-band	6.1 THz wide	190 625 – 196 750 GHz	~1572,68 – ~1523,72 nm
Super L-band	6.1 THz wide	184 225 – 190 300 GHz	~1627.32 – ~1575.37 nm

Channel	Frequency	Wavelength	Channel	Frequency	Wavelength
06	190.600 THz	1572,8880 nm	17	191.700 THz	1563.8626 nm
06H	190.650 THz	1572,4755 nm	17H	191.750 THz	1563.4548 nm
07	190.700 THz	1572,0632 nm	18	191.800 THz	1563.0472 nm
07H	190.750 THz	1571,6512 nm	18H	191.850 THz	1562.6399 nm
08	190.800 THz	1571,2393 nm	19	191.900 THz	1562.2327 nm
08H	190.850 THz	1570,8277 nm	19H	191.950 THz	1561.8258 nm
09	190.900 THz	1570,4162 nm	20	192.000 THz	1561.4191 nm
09H	190.950 THz	1570,0050 nm	20H	192.050 THz	1561.0125 nm
10	191.000 THz	1569.5940 nm	21	192.100 THz	1560.6062 nm
10H	191.050 THz	1569.1832 nm	21H	192.150 THz	1560.2001 nm
11	191.100 THz	1568.7727 nm	22	192.200 THz	1559.7943 nm
11H	191.150 THz	1568.3623 nm	22H	192.250 THz	1559.3886 nm
12	191.200 THz	1567.9522 nm	23	192.300 THz	1558.9831 nm
12H	191.250 THz	1567.5423 nm	23H	192.350 THz	1558.5779 nm
13	191.300 THz	1567.1326 nm	23	192.300 THz	1558.9831 nm
13H	191.350 THz	1566.7231 nm	23H	192.350 THz	1558.5779 nm
14	191.400 THz	1566.3138 nm	24	192.400 THz	1558.1729 nm
14H	191.450 THz	1565.9047 nm	24H	192.450 THz	1557.7680 nm
15	191.500 THz	1565.4959 nm	25	192.500 THz	1557.3634 nm
15H	191.550 THz	1565.0872 nm	25H	192.550 THz	1556.9590 nm
16	191.600 THz	1564.6788 nm	26	192.600 THz	1556.5548 nm
16H	191.650 THz	1564.2706 nm	26H	192.650 THz	1556.1508 nm

Channel	Frequency	Wavelength	Channel	Frequency	Wavelength
27	192.700 THz	1555.7471 nm	48	194.800 THz	1538.9757 nm
27H	192.750 THz	1555.3435 nm	48H	194.850 THz	1538.5807 nm
28	192.800 THz	1554.9401 nm	49	194.900 THz	1538.1860 nm
28H	192.850 THz	1554.5370 nm	49H	194.950 THz	1537.7915 nm
29	192.900 THz	1554.1340 nm	50	195.000 THz	1537.3972 nm
29H	192.950 THz	1553.7313 nm	50H	195.050 THz	1537.0031 nm
30	193.000 THz	1553.3288 nm	51	195.100 THz	1536.6092 nm
30H	193.050 THz	1552.9265 nm	51H	195.150 THz	1536.2155 nm
31	193.100 THz	1552.5244 nm	52	195.200 THz	1535.8220 nm
31H	193.150 THz	1552.1225 nm	52H	195.250 THz	1535.4287 nm
32	193.200 THz	1551.7208 nm	53	195.300 THz	1535.0356 nm
32H	193.250 THz	1551.3193 nm	53H	195.350 THz	1534.6427 nm
33	193.300 THz	1550.9180 nm	54	195.400 THz	1534.2500 nm
33H	193.350 THz	1550.5170 nm	54H	195.450 THz	1533.8575 nm
34	193.400 THz	1550.1161nm	55	195.500 THz	1533.4653 nm
34H	193.450 THz	1549.7155 nm	55H	195.550 THz	1533.0732 nm
35	193.500 THz	1549.3150 nm	56	195.600 THz	1532.6813 nm
35H	193.550 THz	1548.9148 nm	56H	195.650 THz	1532.2896 nm
36	193.600 THz	1548.5148 nm	57	195.700 THz	1531.8981 nm
36H	193.650 THz	1548.1149 nm	57H	195.750 THz	1531.5068 nm
37	193.700 THz	1547.7153 nm	58	195.800 THz	1531.1157 nm
37H	193.750 THz	1547.3159 nm	58H	195.850 THz	1530.7248 nm
38	193.800 THz	1546.9167 nm	59	195.900 THz	1530.3341 nm
38H	193.850 THz	1546.5177 nm	59H	195.950 THz	1529.9436 nm
39	193.900 THz	1546.1189 nm	60	196.000 THz	1529.5534 nm
39H	193.950 THz	1545.7203 nm	60H	196.050 THz	1529.1633 nm
40	194.000 THz	1545.3219 nm	61	196.100 THz	1528.7734 nm
40H	194.050 THz	1544.9238 nm	61H	196.150 THz	1528.3837 nm
41	194.100 THz	1544.5258 nm	62	196.200 THz	1527.9942 nm
41H	194.150 THz	1544.1280 nm	62H	196.250 THz	1527.6049 nm
42	194.200 THz	1543.7305 nm	63	196.300 THz	1527.2158 nm
42H	194.250 THz	1543.3331 nm	63H	196.350 THz	1526.8269 nm
43	194.300 THz	1542.9360 nm	64	196.400 THz	1526.4382 nm
43H	194.350 THz	1542.5390 nm	64H	196.450 THz	1526.0497 nm
44	194.400 THz	1542.1423 nm	65	196.500 THz	1525.6614 nm
44H	194.450 THz	1541.7457 nm	65H	196.550 THz	1525.2733 nm
45	194.500 THz	1541.3494 nm	66	196.600 THz	1524,8853 nm
45H	194.550 THz	1540.9533 nm	66H	196.650 THz	1524,4976 nm
46	194.600 THz	1540.5573 nm	67	196.700 THz	1524,1101 nm
46H	194.650 THz	1540.1616 nm	67H	196.750 THz	1523,7228 nm
47	194.700 THz	1539.7661 nm			
47H	194.750 THz	1539.3708 nm			

Alternative naming of channels

In the above table the various channels are named after the frequency, i.e. 193.300 THz are named channel 33. Channels in the 50 GHz grid are named with an ‘H’ for high.

Another normal convention is to denote the channels with three or four digits. E.g. channel 193.300 THz is named 933 (alternatively 9330), whereas193.350 THz is named 9335.

Cisco in their nomenclature is naming their channels with frequency 191.350 THz being channel 1, 191.400 THz being channel 2 and so forth up to frequency 196.100 THz being channel 96.

Some vendors denote the CWDM channels with a ‘C’ in front of the channel number, e.g. C53 for channel 1530 (nm), whereas a DWDM channels has got the preface ‘D’, e.g. D92 for DWDM channel 920 (192 000 GHz).

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‡ : The various band used by OFC and ITU-T (G.694.1) are:

O-band (Original):	1260 – 1360 nm,	237.931 – 220.436 THz
E-band (Extended):	1360 – 1460 nm,	220.425 – 205.337 THz
S-band (Short wavelength):	1460 – 1530 nm,	205.336 – 195.943 THz
C-band (Conventional):	1530 – 1565 nm,	195.942 – 191.561 THz
L-band (Long wavelength):	1565 – 1625 nm,	191.560 – 184.488 THz
U-band (Ultra-long wavelength):	1625 – 1675 nm,	184.487 – 178.981 THz