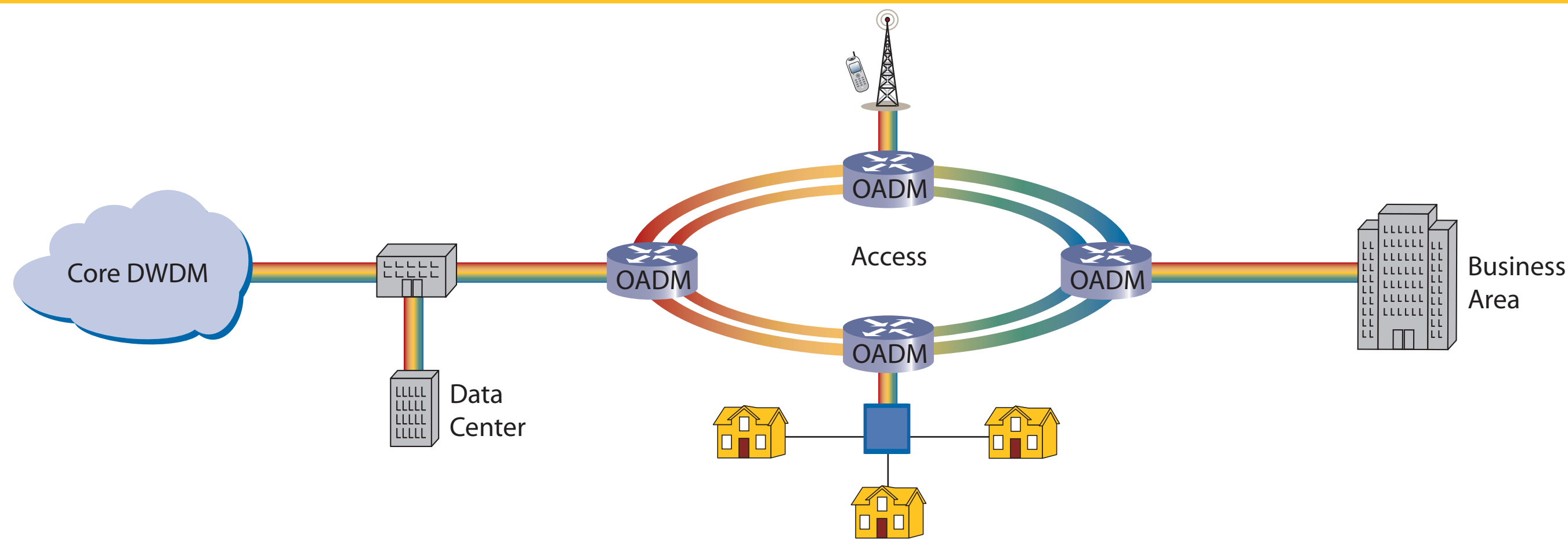


Understanding CWDM Networks

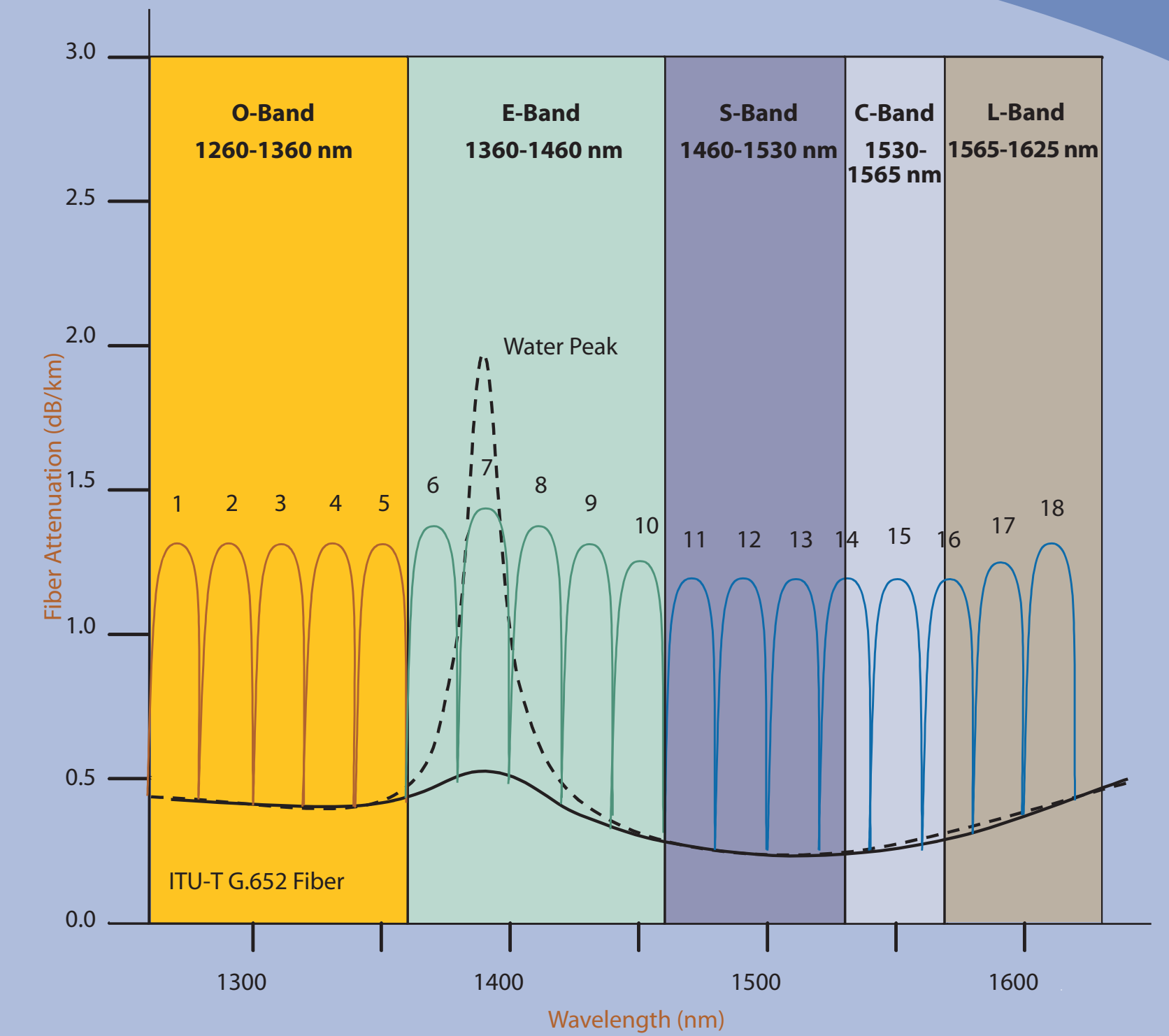


Glossary

CO	Central Office
CWDM	Coarse Wavelength Division Multiplexing
DEMUX	Demultiplexer
DFB	Distributed Feedback
DWDM	Dense Wavelength Division Multiplexing
MUX	Multiplexer
OADM	Optical Add-Drop Multiplexer
ORL	Optical Return Loss
OTDR	Optical Time Domain Reflectometer
PDL	Polarization Dependent Loss

Characteristics of CWDM

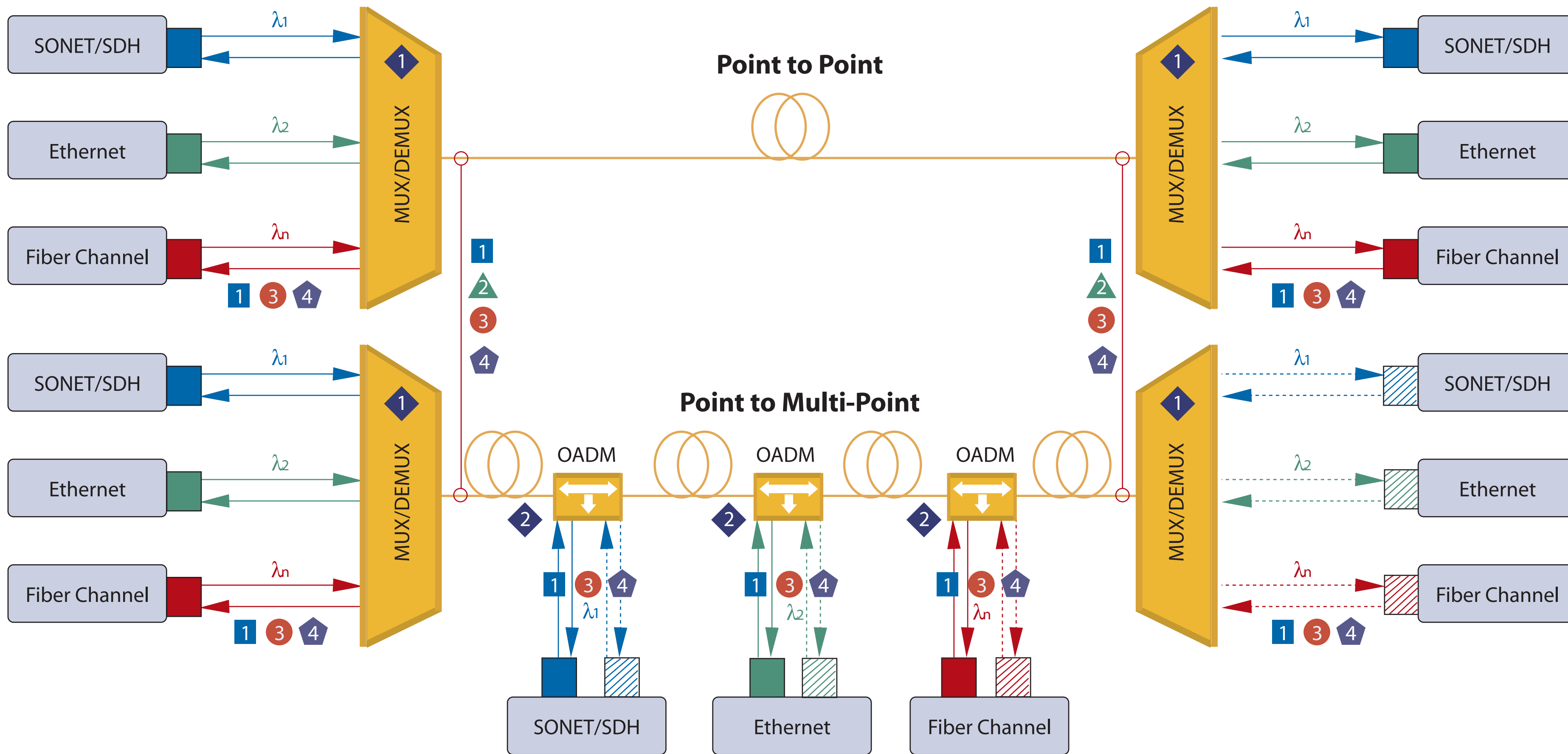
ITU-T Standards	
G.694.2: Spectral grids for WDM applications; CWDM wavelength grid	Provides the wavelength grid for CWDM applications, which supports a channel spacing of 20 nm.
G.695: Optical interfaces for CWDM applications:	Applies to multiplexing applications for point-to-point links of up to 16 channels at 2.5 Gb/s. Signal transmission can be either unidirectional or bidirectional.
Key Feature	
Standards	ITU-T G.694.2 / G.695
Operation Bands	O, E, S, C, and L Bands (1271 to 1611 nm)
Number of Wavelengths	Up to 18
Wavelength Spacing	20 nm
Wavelength Drift Tolerance	± 6.5 nm
Applications	Metro-Access, Regional Network, Private Data Network (up to 80 km)



ITU-T G.694.2 CWDM Grid

Nominal central wavelengths (nm)	
1	1271
2	1291
3	1311
4	1331
5	1351
6	1371
7	1391
8	1411
9	1431
10	1451
11	1471
12	1491
13	1511
14	1531
15	1551
16	1571
17	1591
18	1611

Common CWDM Deployment Topologies



Network Element Parameters

1 MUX/DEMUX Unit

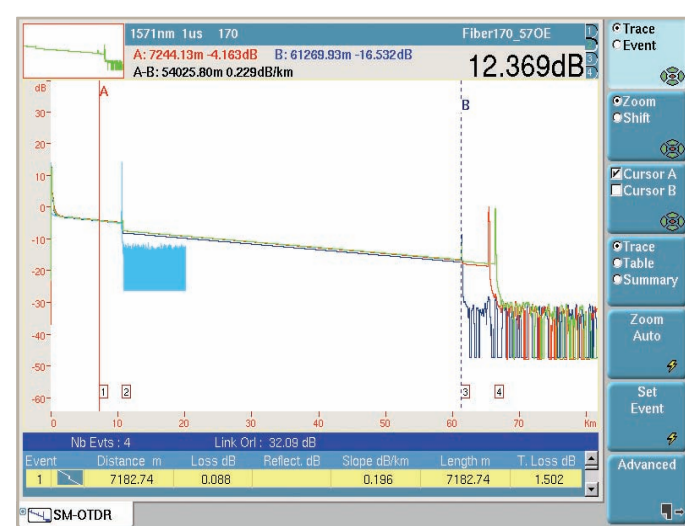
Parameters	Unit	Values
Center Wavelength	nm	ITU-T CWDM Wavelengths
0.5 dB Pass Bandwidth	nm	≥13
Insertion Loss	dB	≤3.5
Adjacent Channel Isolation	dB	≥40
Optical Return Loss	dB	≥50
PDL	dB	≤0.1

2 OADM Unit

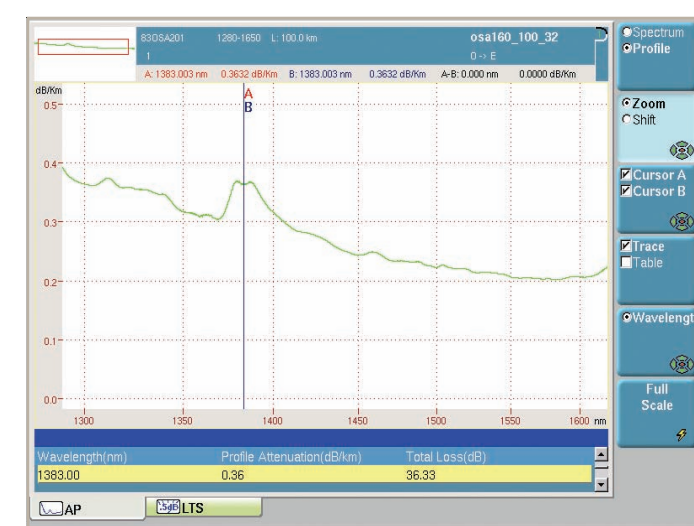
Parameters	Unit	Values
Center Wavelength	nm	ITU-T CWDM Wavelengths
0.5 dB Pass Bandwidth	nm	≥13
Add/Drop Insertion Loss	dB	≤1.5 (1 ch), 3 (4 ch)
Pass thru insertion loss	dB	≥1 dB
Optical Return Loss	dB	≥50
PDL	dB	≤0.1
Adjacent Channel Isolation	dB	≥40

CWDM Testing

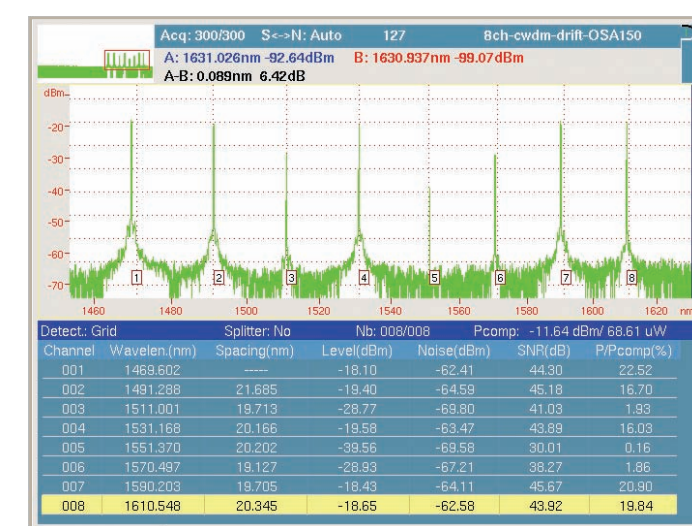
Network Lifecycle	Test Parameters	Test Instruments
Installation/ Fiber Qualification	- Connector inspection and cleaning - Insertion loss at 1310/1550/1625 nm - ORL measurement - Splice/Connector loss at 1310/1550/1625 nm - Length - Attenuation profile measurement (verify water peak width, identify fiber type) (standards, low water peak)	- Video Microscope and Cleaning Kit - Loss Test Set/OTDR - ORL Meter/OTDR - OTDR - OTDR - Spectral Analyzer (OSA, WDM)
System Turn-up and Wavelength Provisioning	- Connector inspection and cleaning - Channel power-level and wavelength verification - Wavelength route testing (Loss, ORL)	- Video Microscope and Cleaning Kit - Channel Checker/OSA - CWDM OTDR
Maintenance and Troubleshooting	- Transmitter/receiver power-level verification - Connector inspection and cleaning - Channel power-level and wavelength verification - Transmitter/receiver power-level verification - Failure localization per wavelength (loss) - Channel wavelength/power drift testing	- Power Meter/Channel Checker - Video Microscope and Cleaning Kit - Channel Checker/OSA - Power Meter/Channel Checker - CWDM OTDR - Channel Checker/OSA



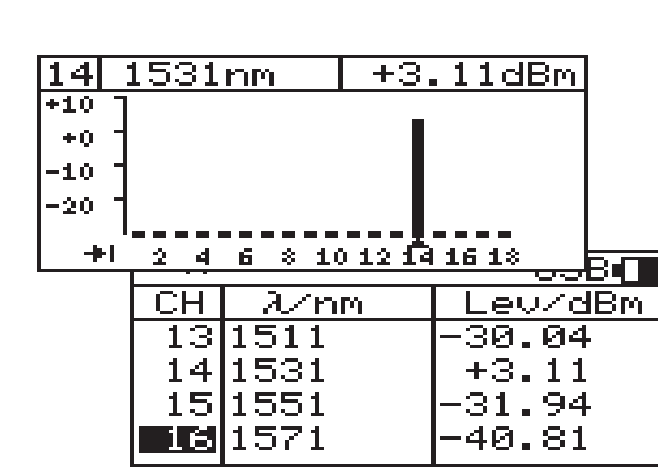
1 OTDR



2 Attenuation Profile



3 Optical Spectrum



4 Channel Power Level and Wavelength Verification

Fiber Optic Test Solutions



WaveReady™ Network Solutions



To learn more, visit www.jdsu.com/fibertest



We wrote the book on Fiber Optic Testing. Visit us online for your free copy.