Which loss Measurement wavelengths do I need?

Introduction

Fiber optic loss testing is usually performed at expected current and future operating wavelengths, since optical loss can vary widely across the range of potential operating wavelengths.

Fiber Type	Most common operating λ nm	Common operating λ nm	Typical loss tests λ nm	Source Type	Other λ nm	Out of band loss tests λ nm
Plastic 1 mm	650		650	LED		
PCS 200u	650	850	650 / 850	LED		
Glass multimode 50/125, 62.5/125	850	1300	850 / 1300	LED	1270 - 1610 CWDM	
Glass single mode 9.5/125, Traditional	1310	1550	1310 / 1550	Laser		>1580
Glass single mode 9.5/125, DWDM	C band 1525 - 1565	L band 1570 - 1610	1550 / 1610	Laser	S band ≈ 1420 - 1530	1625
Glass single mode 9.5/125, CWDM	1310, 1490, 1550	1270 - 1610	1310, 1490, 1550	Laser	1383	1625

It has been standard practice for many years to perform single mode fiber tests at 1550 nm (in addition to 1310 nm), to help find identify cabling stress points. Typically, a kinked cable may pass at 1310 nm, but fail at 1550 nm.

Laser sources are unsuitable for work on multimode fiber, since very unstable power meter readings are obtained. For optimum multimode accuracy, a mandrel wrap and a LED source with standards compliant characteristics are required.

DWDM

C band systems may only be loss tested at 1550 nm. C & L band systems are typically loss tested at 1550 / 1625 nm. The S band is currently somewhat ill-defined, and may run into the fiber water absorption peak, so loss measurement will need to be at the shortest relevant wavelength, and 1550 nm.

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CWDM

Attenuation in CWDM systems is usually measured at only a few wavelengths, and varies quite substantially depending on the application and fiber type. The water absorption peak at 1383 nm may require evaluating, and a 1390 nm laser is adequate for this task. Most current systems avoid the water peak wavelength area due to this potential loss problem. Loss checking of passive CWDM channel filters requires specific CWDM compliant light sources.

"Out of band" single mode

Has been traditionally specified as "1625" nm. This has traditionally used Fabry-Perot lasers with poor spectral accuracy. New DFB lasers have much better properties for this application, since their actual operating wavelength is more tightly controlled (see table below). For true WDM compliance, the out of band wavelength must be <1620 mn. There is also an emerging class of "1650" nm devices, however their poor wavelength accuracy and high cost makes them less useful.

Some typical laser performance data

Nominal center λ	**Laser Type**	**Center λ Tolerance @ 25 °C**	**Center λ Range @ 25 °C**	**Typ Center λ / °C coefficient**	**Center λ Range 0 - 50 °C**	**Typ λ Width FWHM, nm**	**Total λ Range 0 - 50 °C, FWHM**	**Power meter detector type**
1310 nm	Fabry-Perot	± 30 nm	1280 - 1340	± 0.4	1270 - 1350	3	1268.5 - 1351.5	Ge or InGaAs
1550 nm	Fabry-Perot	± 30 nm	1520 - 1580	± 0.4	1510 - 1590	3	1508.5 - 1591.5	Ge or InGaAs
CWDM	DFB	± 3 nm	± 0.1	±2.5 nm	0.1	±5.5 nm	InGaAs	
1610 nm	DFB	± 3 nm	1607 - 1613	± 0.1	1604.5 - 1615.5	0.1	1604.5 - 1615.5	InGaAs
1625 nm	DFB	± 5 nm	**1620 - 1630**	± 0.1	**1617.5 - 1632.5**	0.1	**1617.5 - 1632.5**	InGaAs
1625 nm	Fabry-Perot	± 30 nm	1595 - 1655	± 0.4	1585 - 1665	3	1583.5 - 1667.5	InGaAs
1650 nm	Fabry-Perot	± 30 nm	1620 - 1680	± 0.4	1610 - 1690	3	1608.5 - 1691.5	InGaAs

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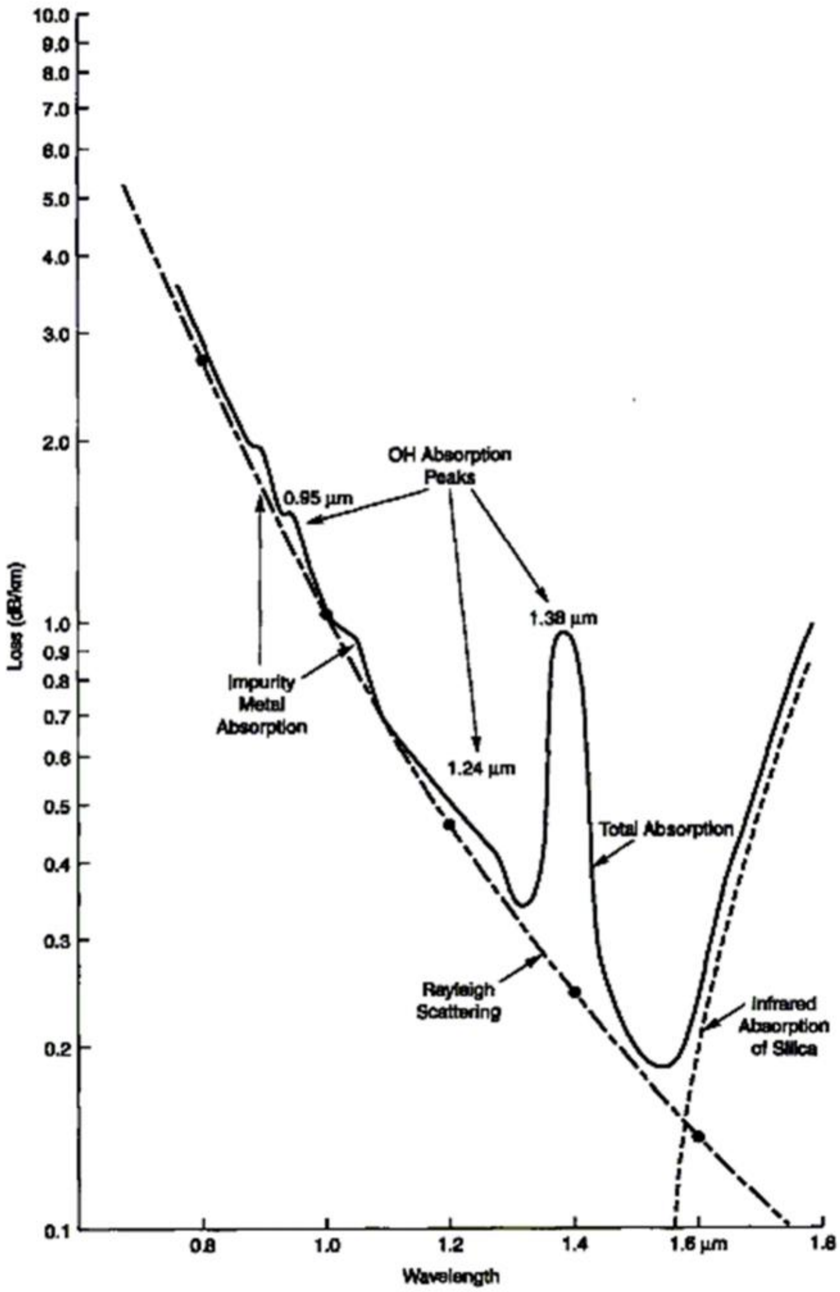
This graph shows how typical single mode fiber attenuation varies with wavelength. Modern fibers may have a negligible water absorption peak at 1.38 µ
This clearly shows that wavelength uncertainly of tests above 1600 nm has a major impact on loss measurement



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