Macrobending and microbending Losses

CF
17 ottobre 2012

Annamaria Cucinotta
Dip. di Tecnologie dell'Informazione
Università di Parma

Straigth fiber

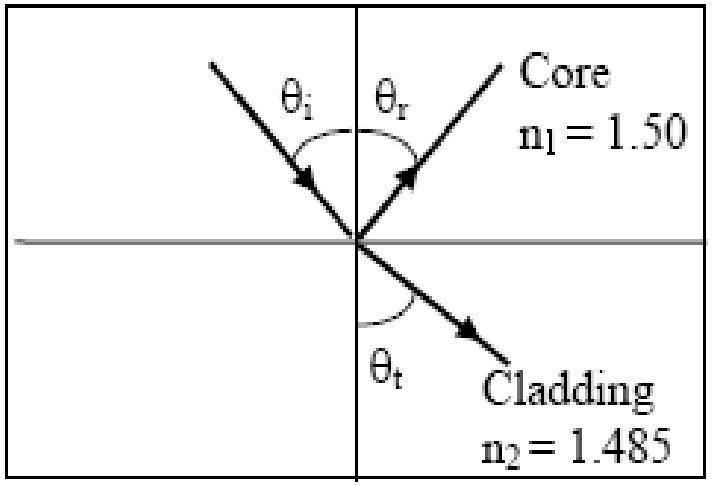


Fig. 2: Reflection and refraction at the core/cladding interface.

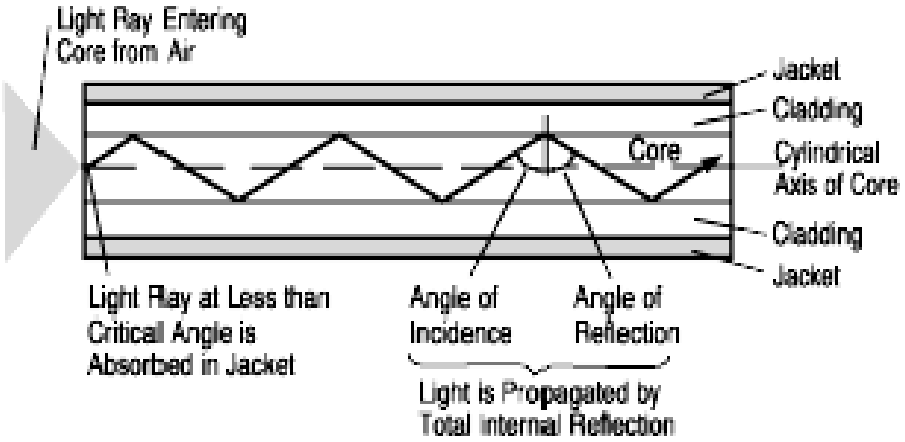


Fig. 3: Total Internal Reflection at the core/cladding interface.

Microbending vs Macrobending

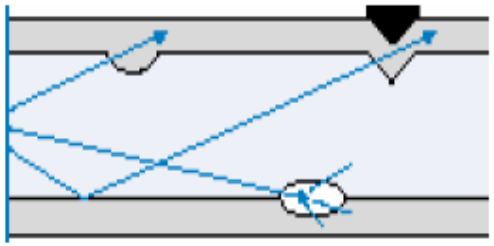


Fig. 4: Microbending

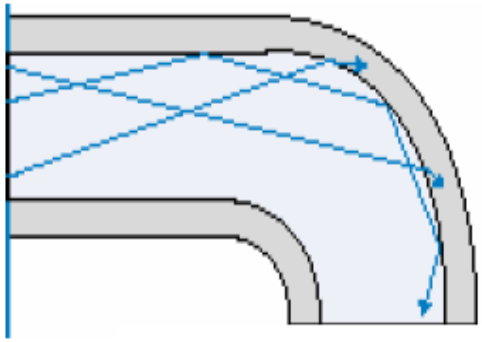
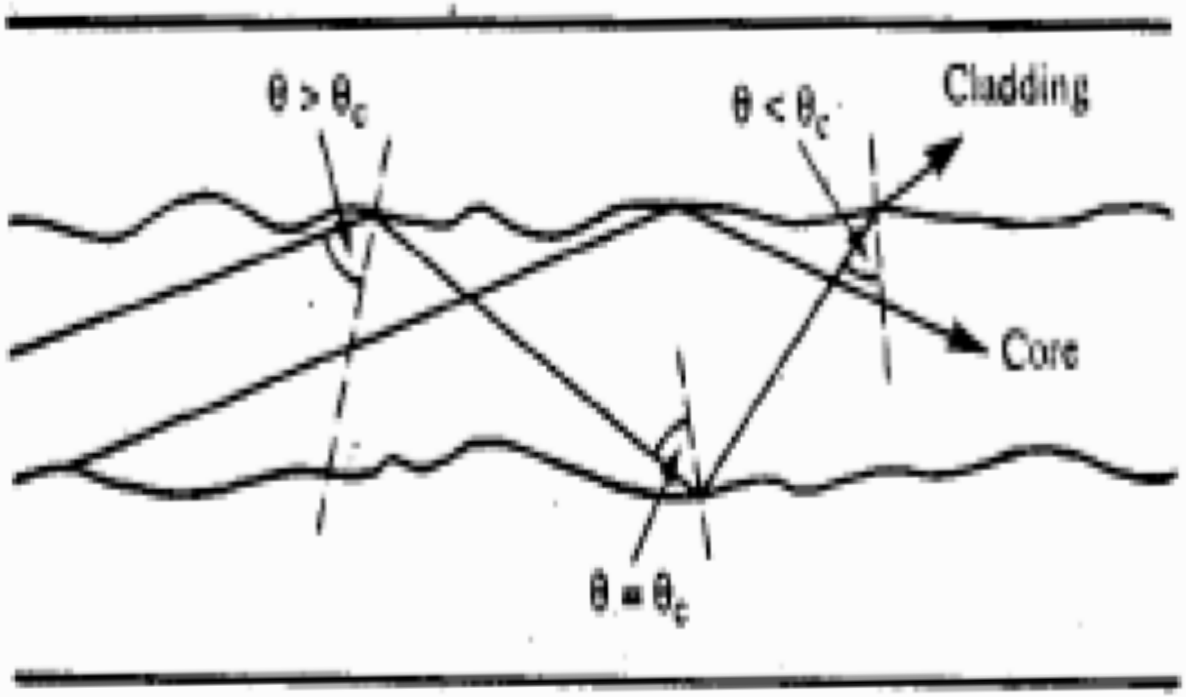


Fig. 5: Macrobending

Microbending



Total internal reflection fails if $\theta < \theta_c$

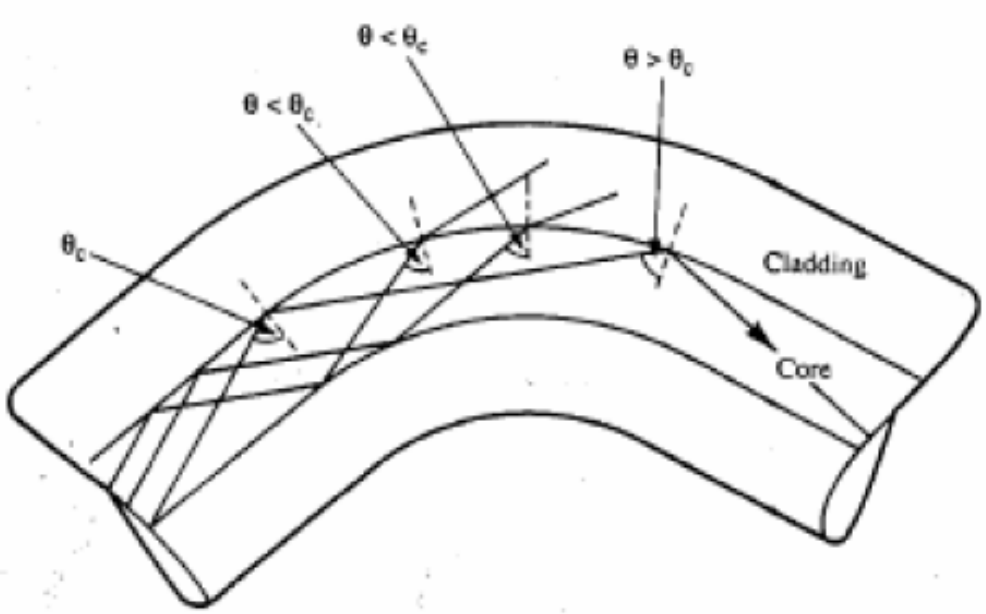


Fig. 6: θ_C is the critical angle and θ is the incident angle.

Bending depends on MFD (thus on the wavelength)

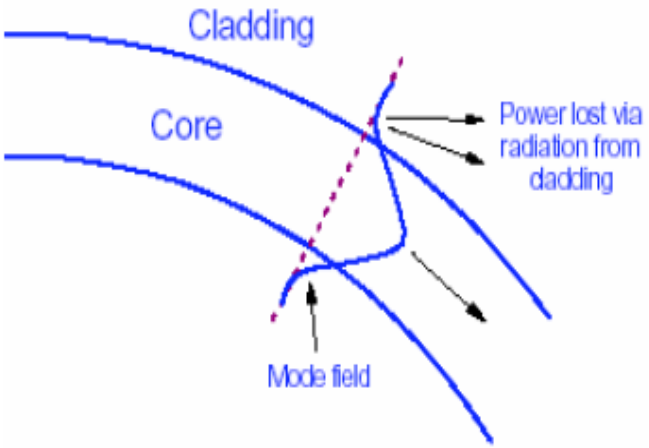


Fig. 8: A smaller mode field diameter results in a smaller amount of attenuation because of less radiation loss.

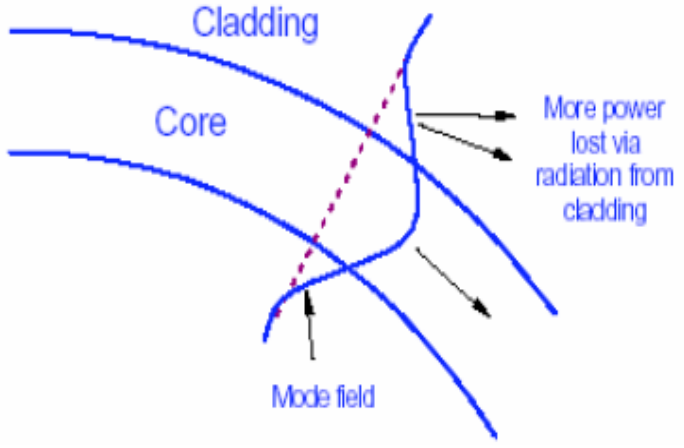


Fig. 9: A larger mode field diameter results in a larger amount of attenuation because of more radiation loss.

Measurement

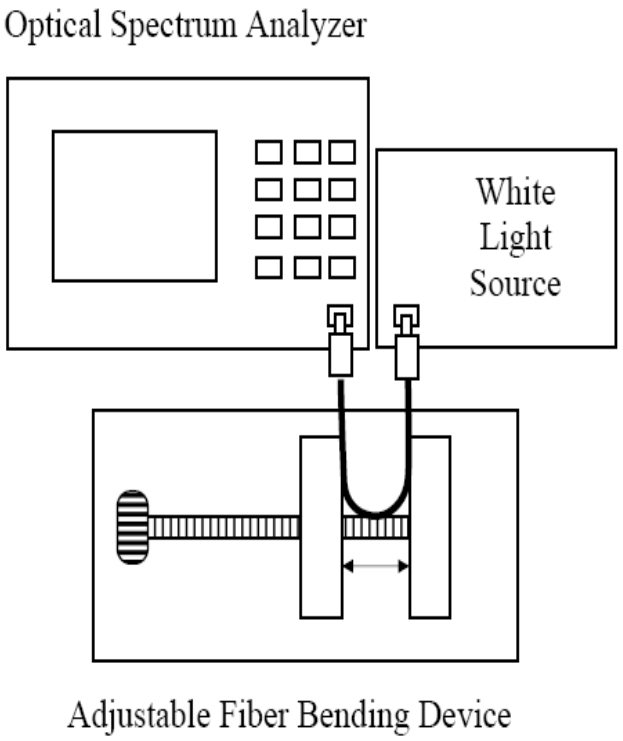


Fig. 14: Schematic of the Experimental Set-up

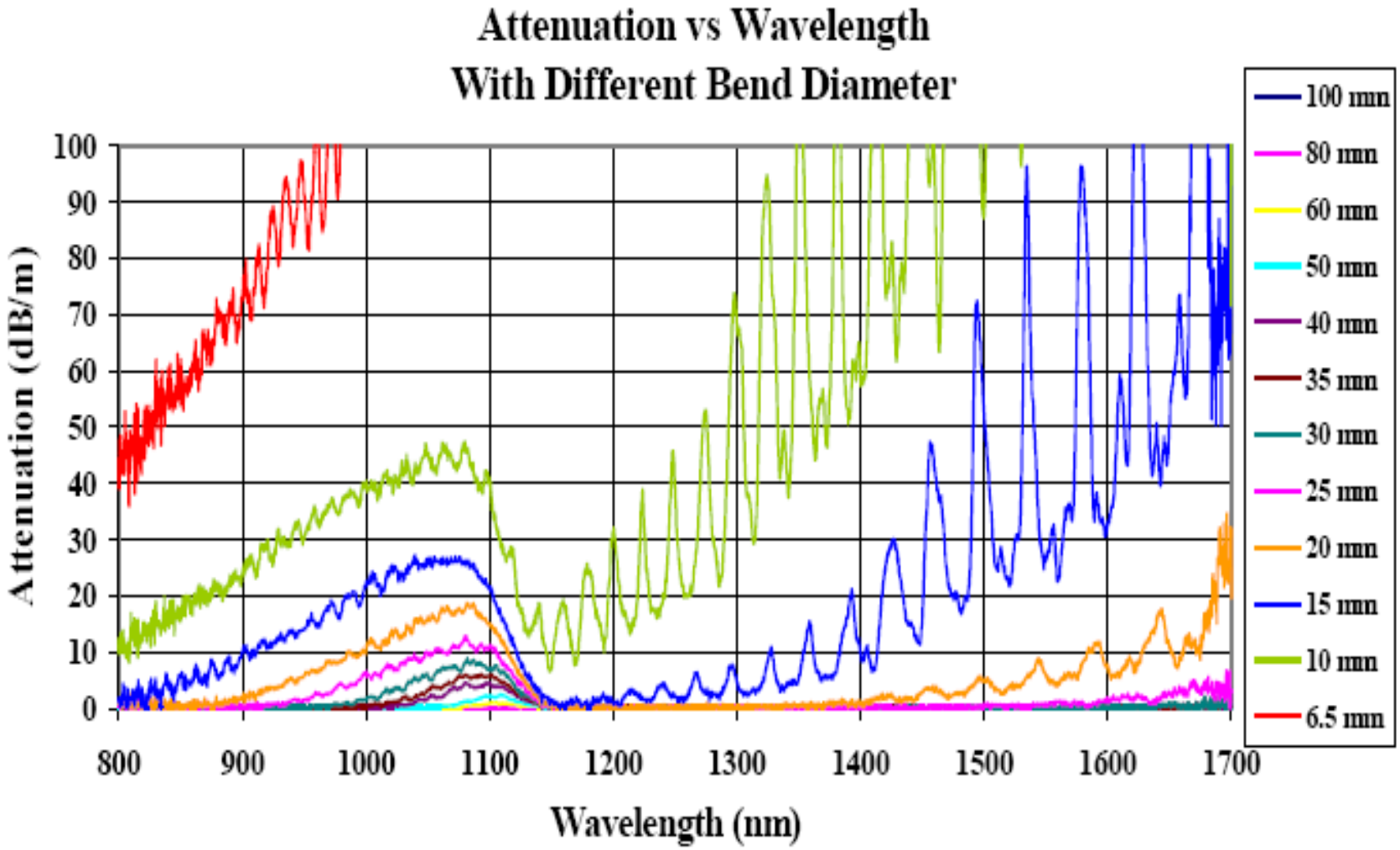


Fig. 15: Graph of Attenuation per meter vs. Wavelength for various bend diameters

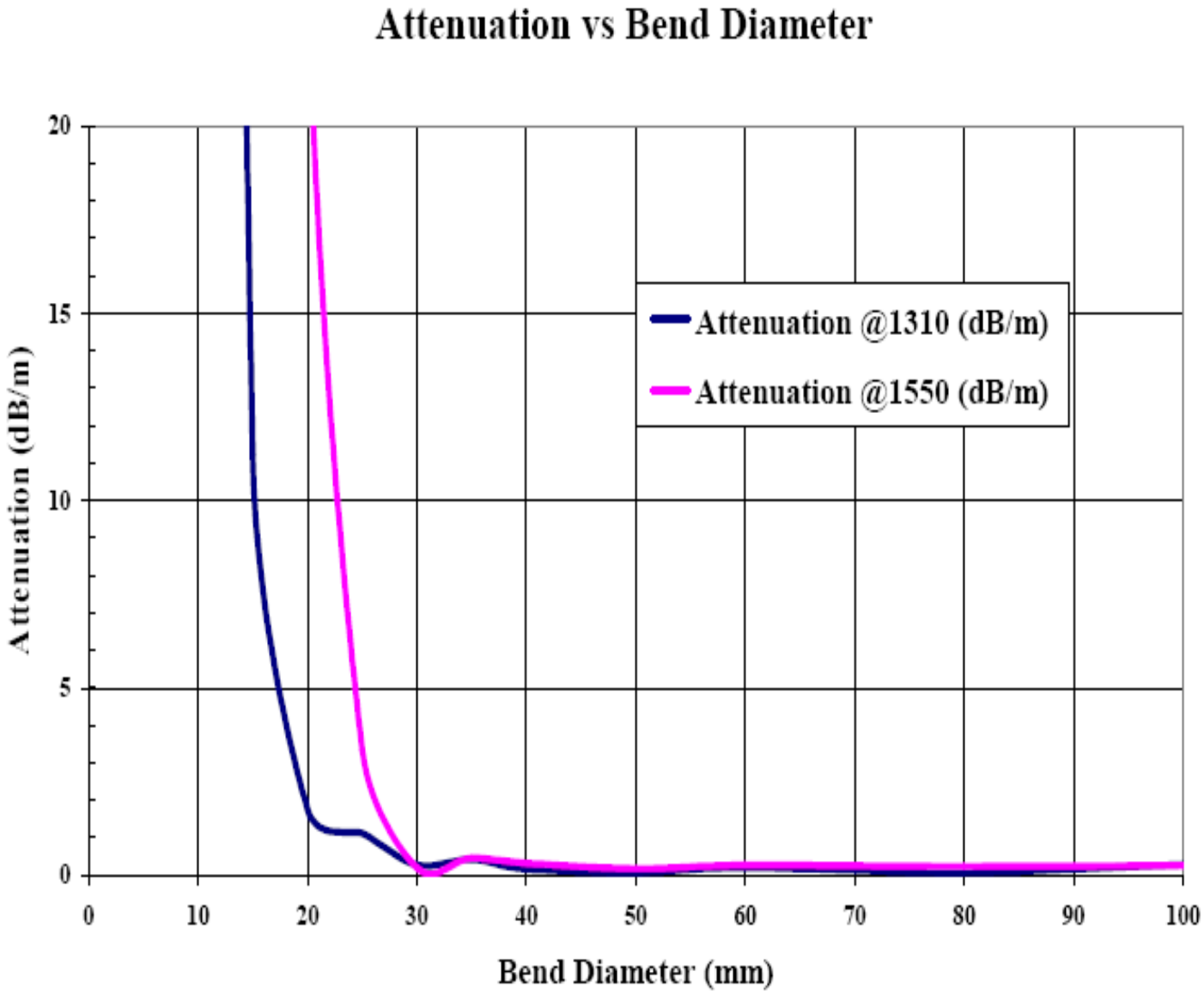
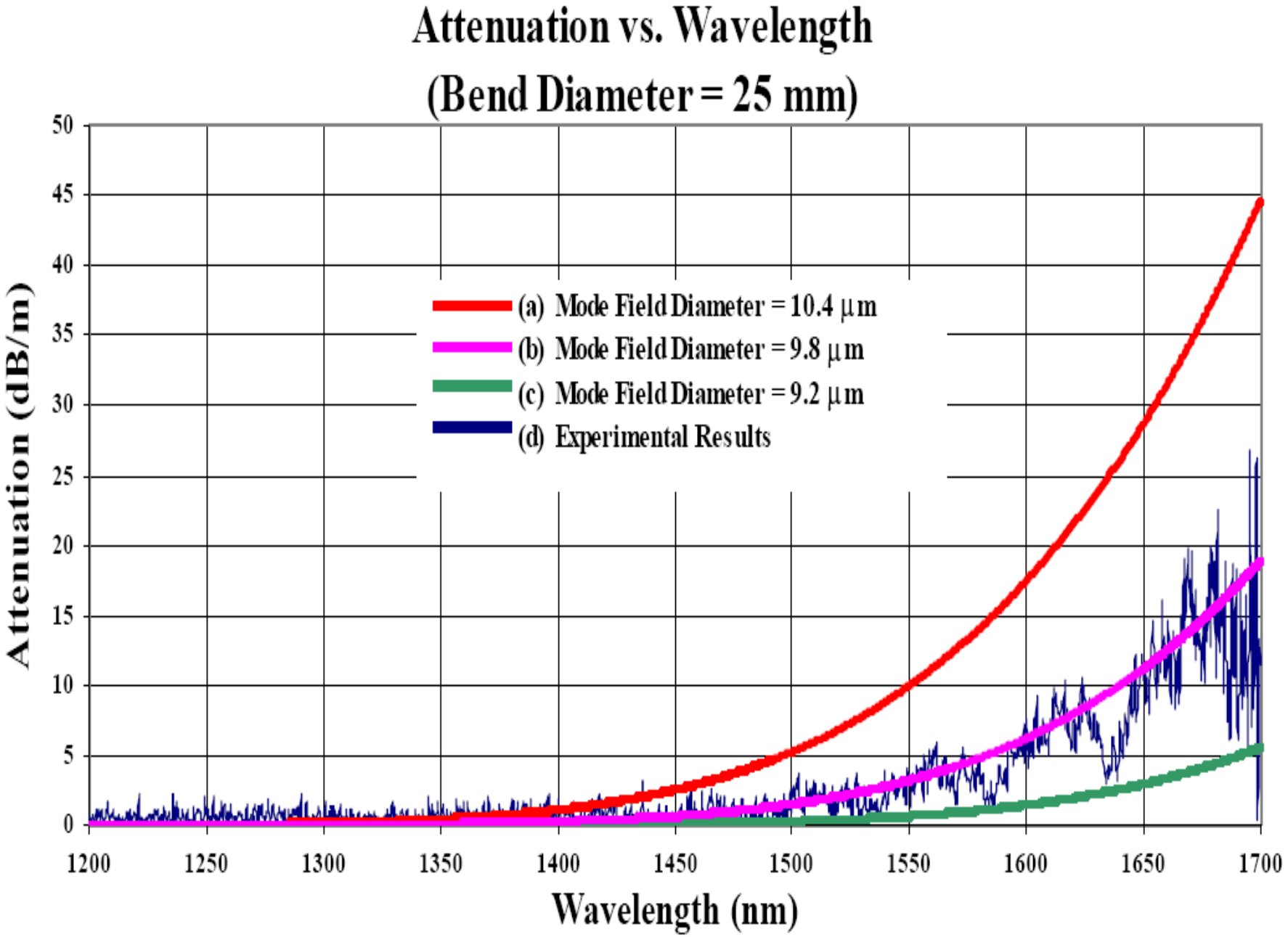


Fig. 17: Graph of Attenuation vs. Bend Diameter at wavelengths 1310nm and 1550nm.


Attenuation vs. Wavelength
(Bend Diameter = 25 mm)
Attenuation (dB/m)
Wavelength (nm)
50
45
40
35
30
25
20
15
10
5
0
1200
1250
1300
1350
1400
1450
1500
1550
1600
1650
1700
(a) Mode Field Diameter = 10.4 μm
(b) Mode Field Diameter = 9.8 μm
(c) Mode Field Diameter = 9.2 μm
(d) Experimental Results