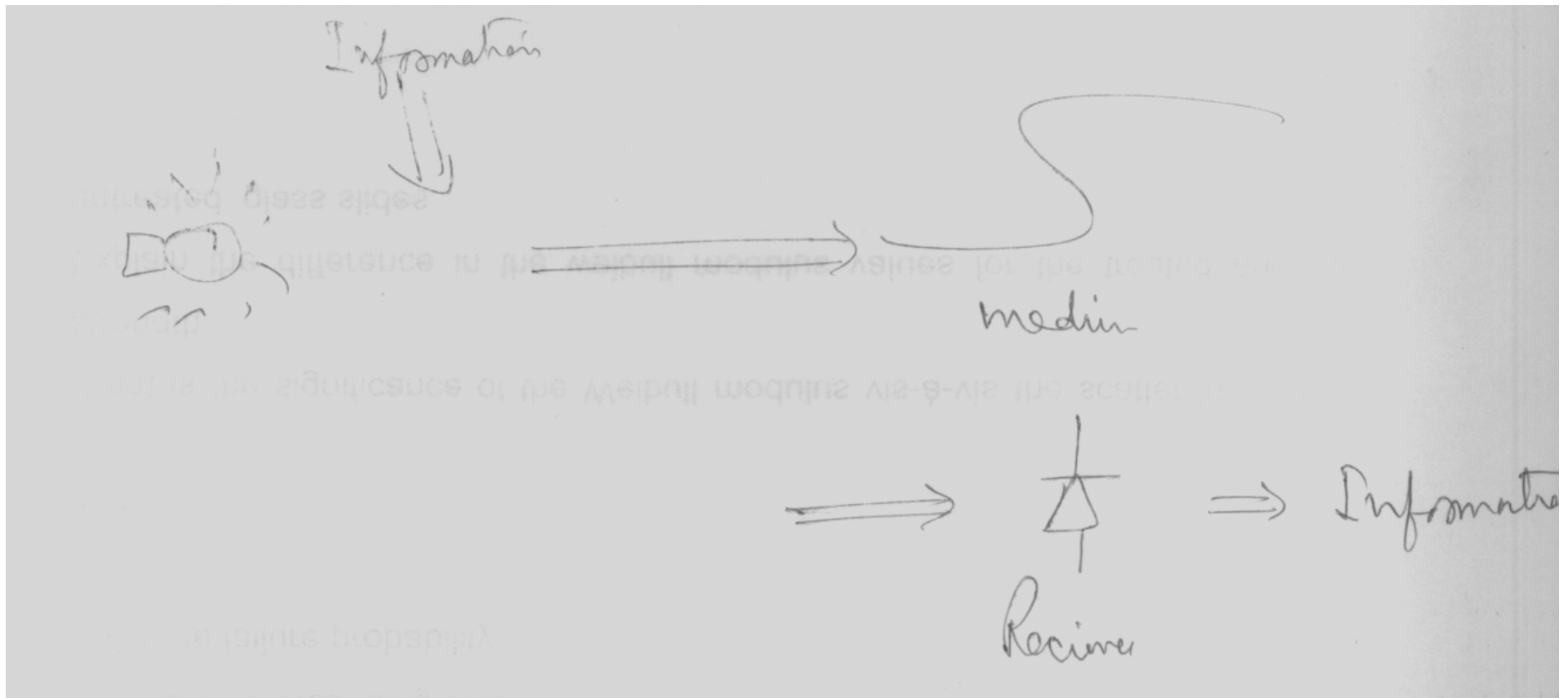


Introduction to Optical Communication

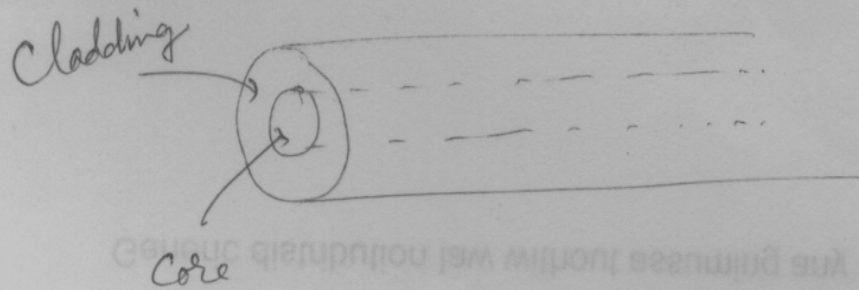
Yatindra Nath Singh
EE/ACES
IIT Kanpur

<http://home.iitk.ac.in/~ynsingh>

Optical Link

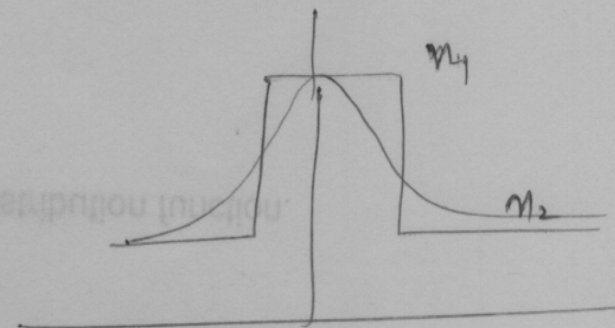


Optical fiber



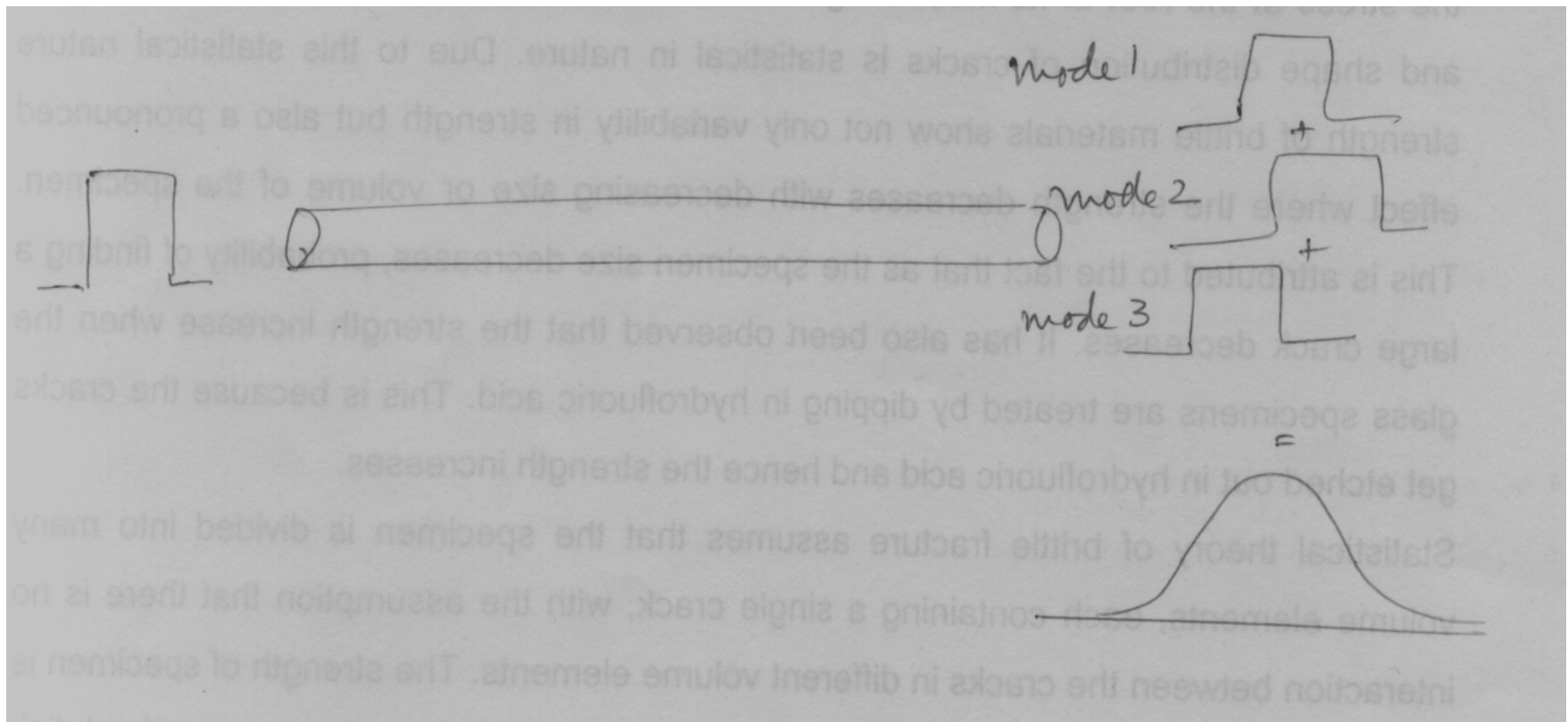
$$n_{\text{core}} > n_{\text{cladding}}$$

n = refractive index.



distance from
Center

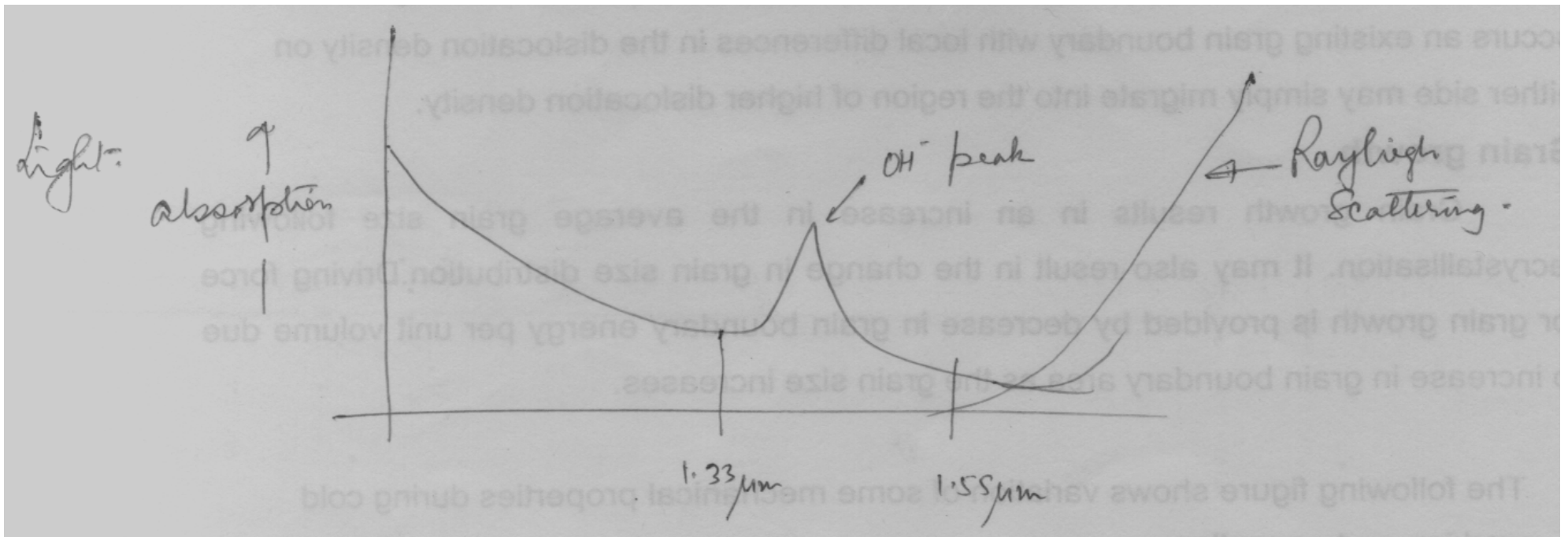
Dispersion



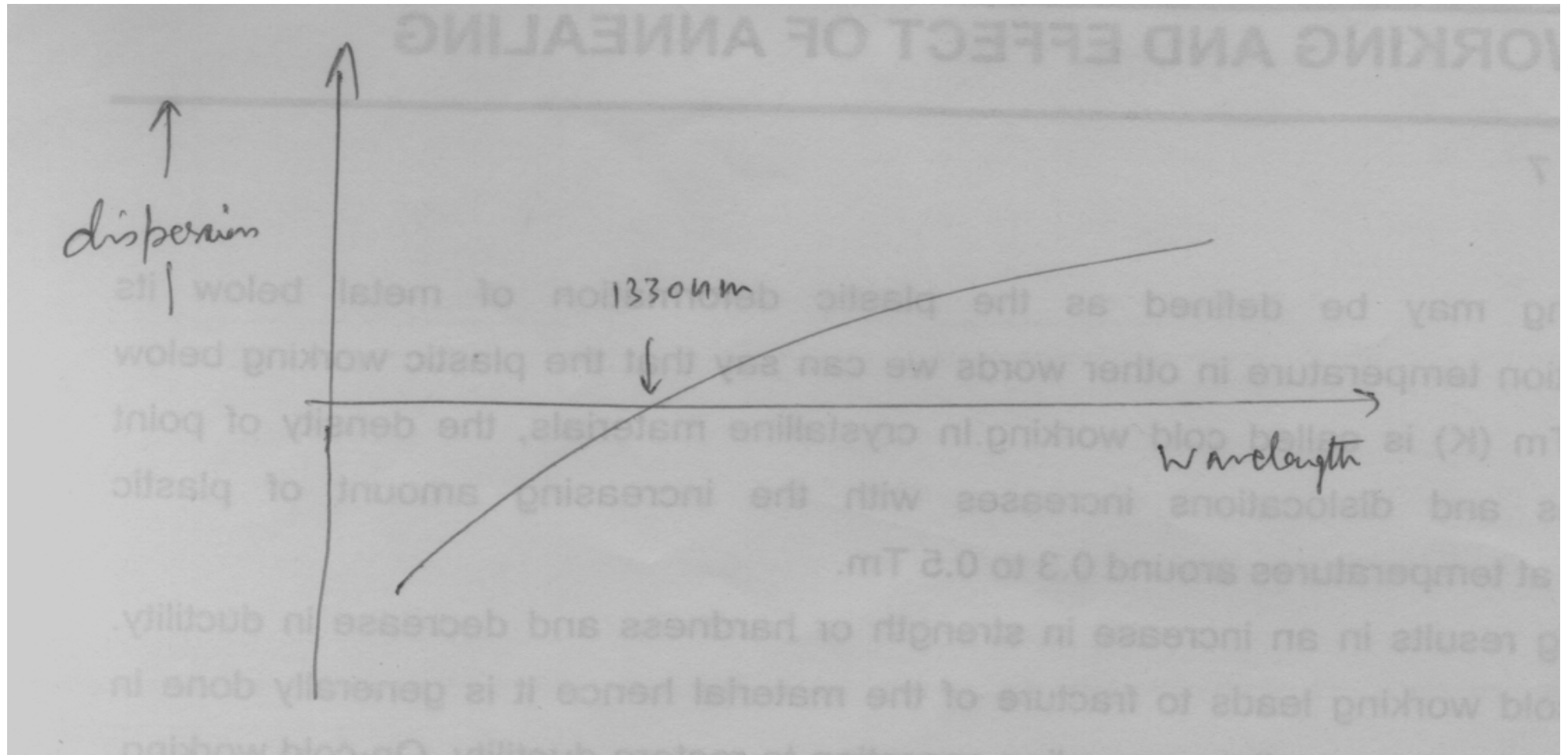
Attenuation



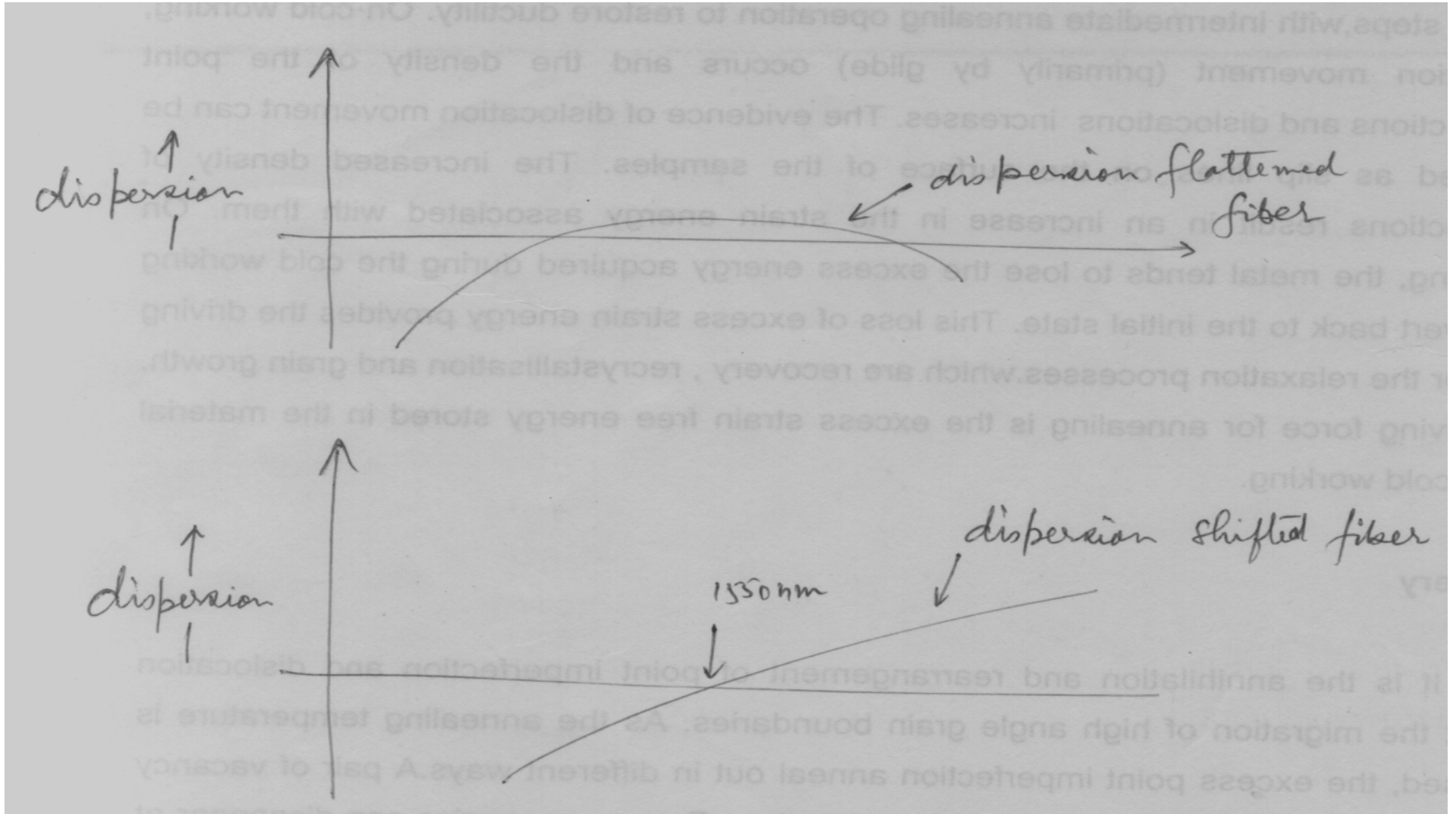
Loss curve for glass



Dispersion characteristics (Normal fiber)



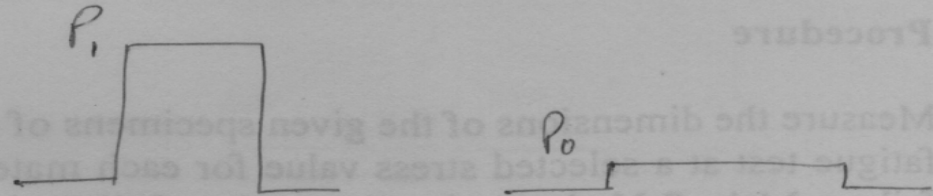
Modified dispersion characteristics



Modulation

Modulation Schemes

OOK



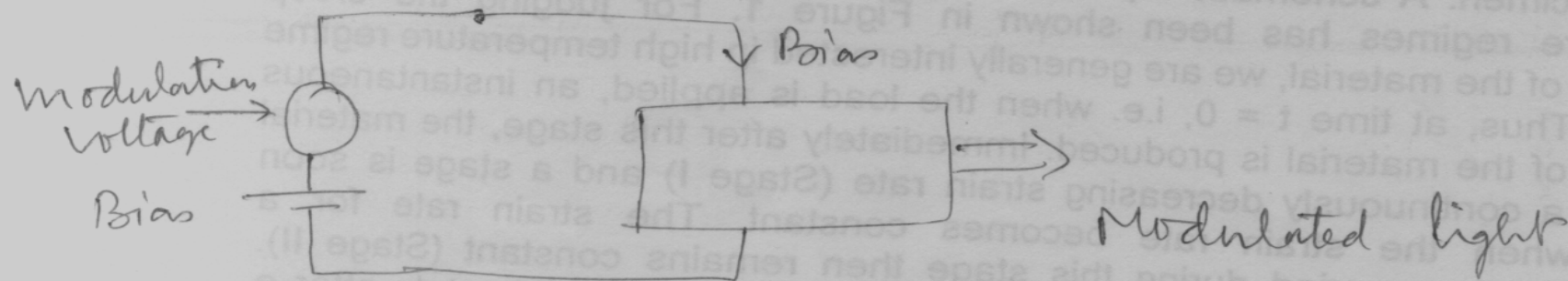
PSK

$$A_m \sin(\omega_c t + k_m(t))$$

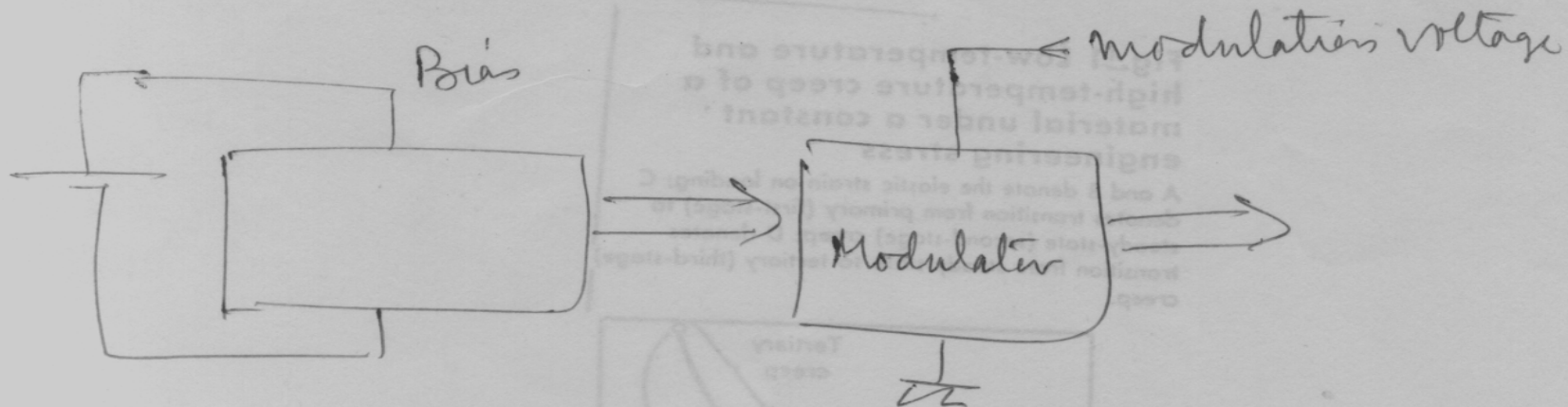
FSK

$$A_c \sin(\omega_c t + k \int m(t) dt)$$

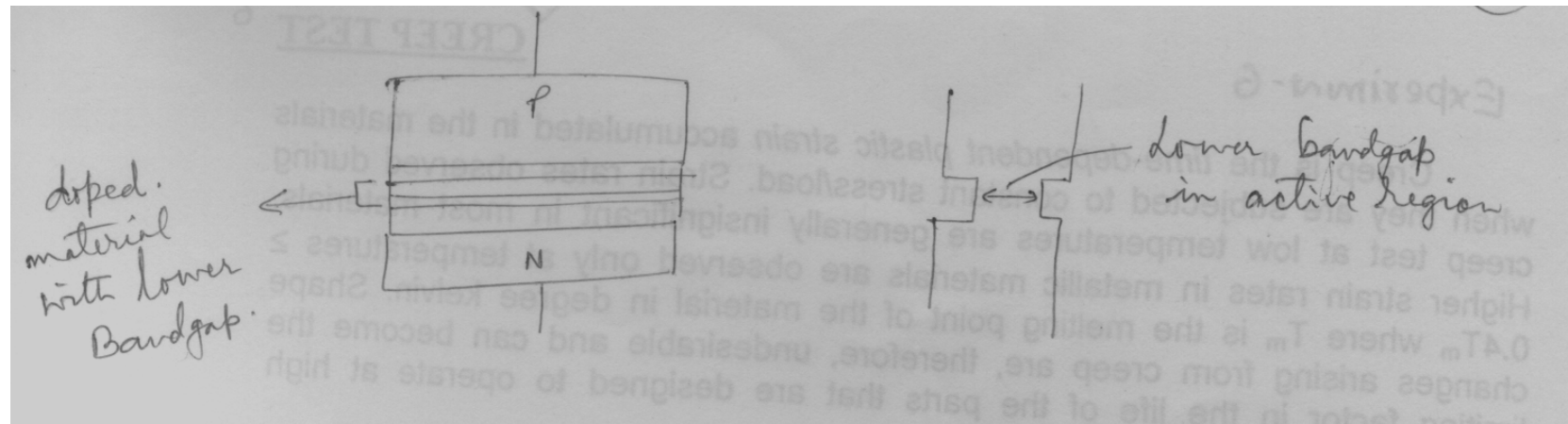
Internal/ External Modulation



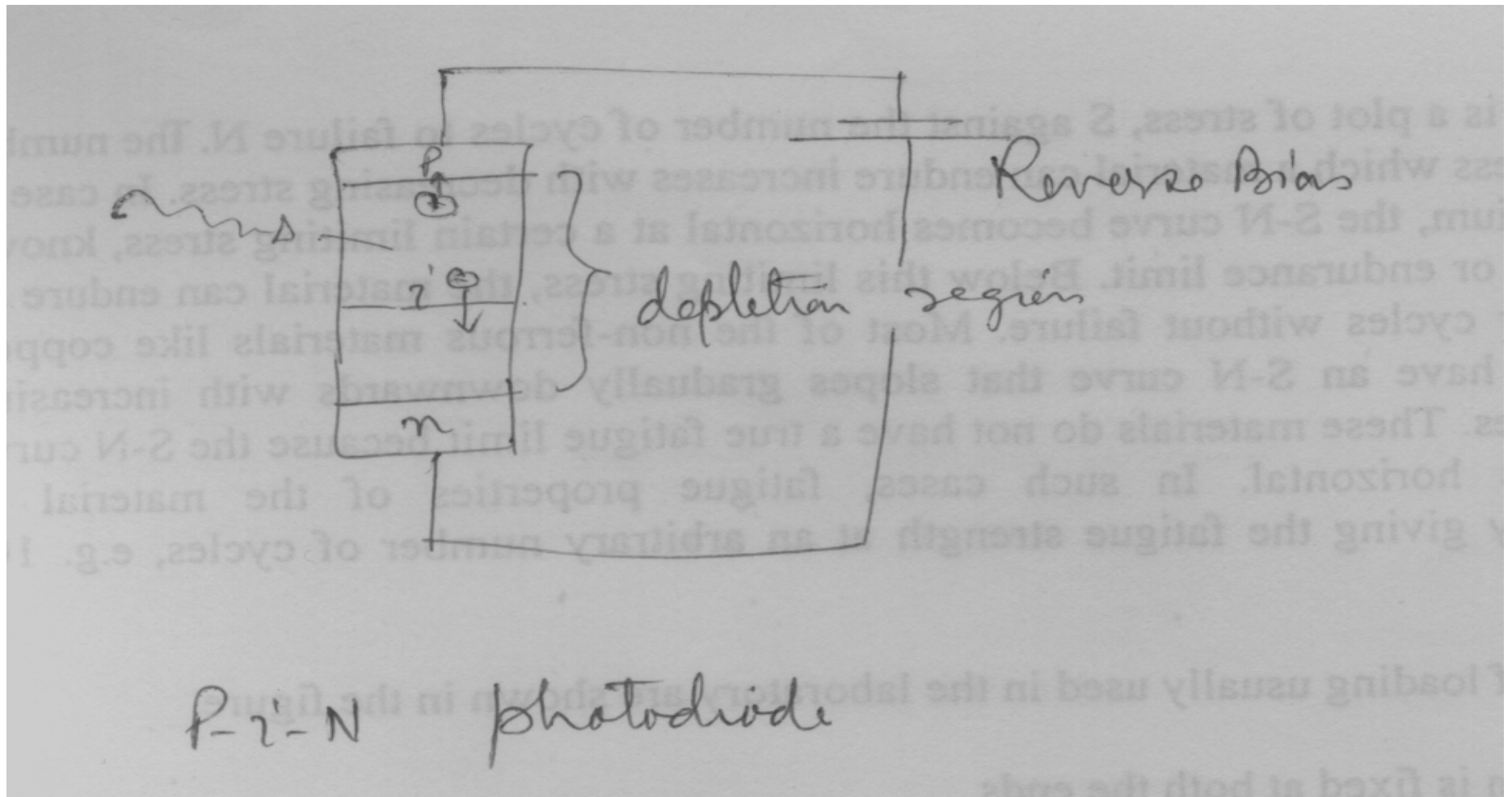
Direct Modulation



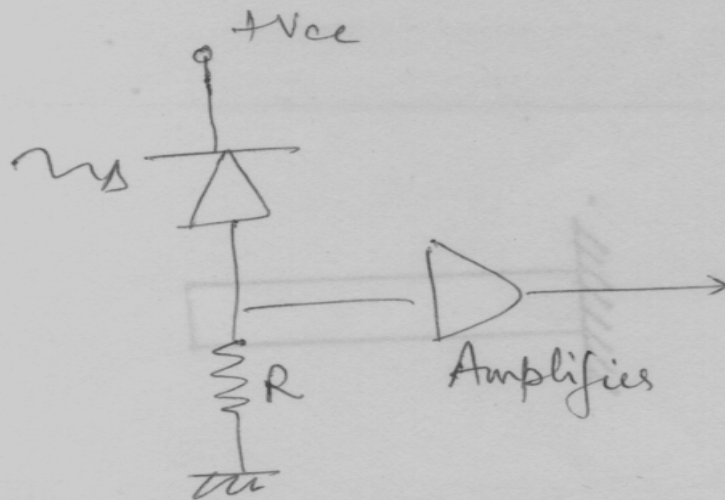
Double heterostructure laser



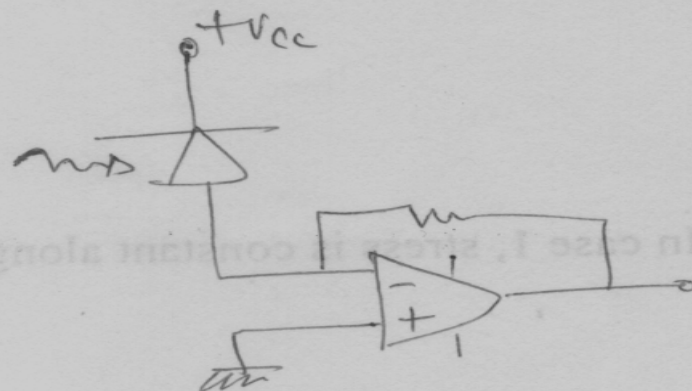
Photodiode



Receiver preamplifier



$$f_{3dB} = \frac{1}{2\pi RC}$$



Transimpedance
amplifier.

Noise in Receiver

Noise

Shot noise + Thermal noise.



\propto Power received



dependent on
Temperature T
Bandwidth B