2.6 FIBER SCATTERING LOSS MEASUREMENT:

Usually a high power laser source like He-Ne laser or Nd-YAG laser is used to provide sufficient input optical power to the fiber. The focusing lens focuses the light into the input end of the fiber having short length. Before and after the scattering cell or integrating sphere, the cladding mode strippers are used to avoid the light propagating in the cladding so that the scattering measurement is taken only for the light guided by the fiber core. Further the output end of the fiber is in index matched liquid to avoid reflections contributing to the optical signal within the integrating sphere. The light scattered from the fiber core is detected by the series solar cell in the integrating sphere. The integrating sphere also contains the index matching liquid surrounding the fiber. The detected signal by the series of solar cell gives the measurement of the scattered signal. The detected signal is given to lock in amplifier an to then to the recorder or nano voltmeter**.**

FIBER ABSORPTION MEASUREMENT:

Fiber absorption measurement will give the impurity level in the filter.

Fiber absorption loss(bB/km)= Fiber attenuation loss (dB/Km)- Fiber scattering loss(dB/km), Thus the fiber absorption lass istrhe difference between fiber attenuation loss and scattering loss.

Principle: Amount of light energy absorbed by the fiber= Heat energy developed in the calorimeter.

Construction:

Here there are two fibers one is the fiber under measurement and other is the dummy fiber. The dummy fiber is meant for compensation of any radiation loss of heat energy developed. These two fibers are mounted separately in silica capillary tubes surrounded by the low refractive index liquid like methanol in the calorimeter for good electrical contact. The light from the laser source is well focused on the fiber under measurement.

The dummy fiber is not connected with light input. Then the fiber guided light is inserted into the cladding mode stripper which removes the light propagated in the cladding of the fiber. After passing through the capillary tube, the fiber with light is

immersed in the index matching liquid to avoid reflections contributing to the optical signal within the capillary tube.

Procedure;

When the light enters the fiber under measurement there is a temperature rise in the capillary tube containing the fiber with light. The temperature rise due to absorption tube containing the fiber with light. The temperature rise due to absorption of energy by the fiber is measured for every 10 seconds by a thermocouple which is spirally around the silics tubes. The hot junction of the thermocouple and the cold junction of the thermocouple are connected with a nano voltmeter. Electrical calibration is done by placing a thin wire instead of fiber such that and passing known amount of current such that

$$mST=I^2RT=VIt$$

Fiber dispersion measurements:

Dispersion is measured in terms of pulse broadening. There are two types of fiber dispersions. One is intermodal dispersion and the other is intra nodal (or) chromatic dispersion. Both dispersion measurements can be performed using the same except the light source. Internodal dispersion measurement is made by the monochromatic laser with narrow spectral width.

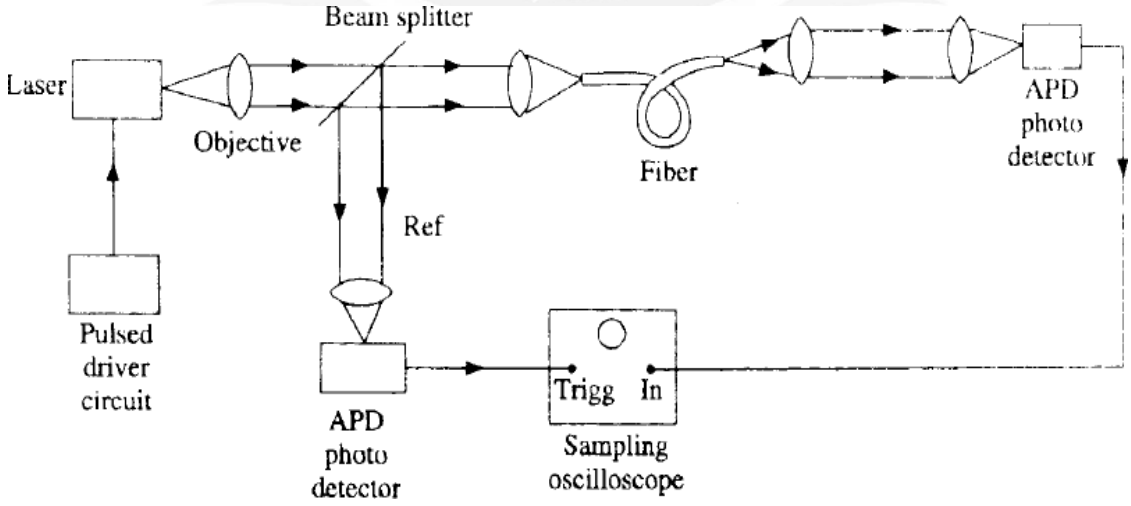

Figure 2.6.1 Fibre Dispersion Measurement

[Source: "Optical Fibre Communications" by J.M.Senior, Page:249]

This intermodal dispersion is dominant in the multimode fibers. The intra nodal dispersion measurement is made by the injection laser whose frequency or line width increases with respect to time.

The laser with driver circuit gives short narrow pulses of light. The laser light is focused onto the beam splitter. The beam splitter is used for triggering the oscilloscope and for input pulse with measurement. One of the beams passing through the beam splitter is again focused into the fiber under measurement. Normally its length is 1 km. The focused output laser beam is incident on the avalanche photodiode and it gives the output pulses. The input pulse and output pulse are displayed separately on the screen of sampling oscilloscope and they are in Gaussian shape.