Experiment No.

Characterization Of FBG

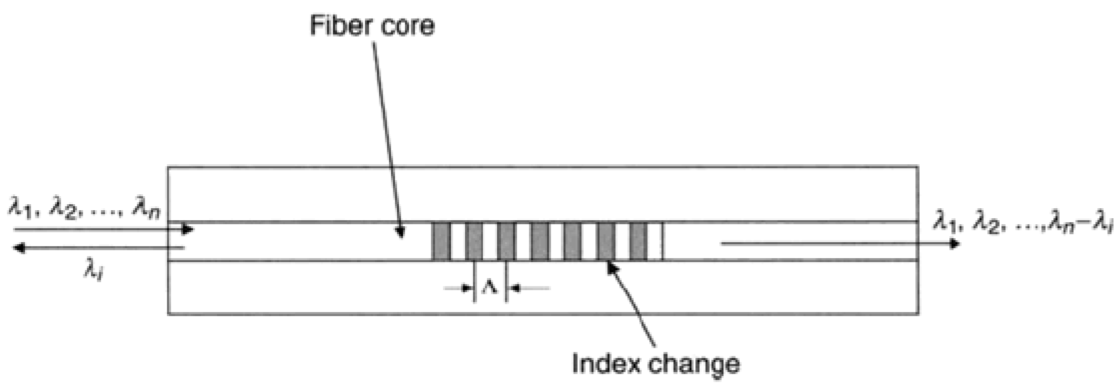
Aim: To determine the reflectivity of the given Fiber Bragg Grating at four different wavelengths.

Software Used: Optisystem 17.0.0

Theory:

Fiber Bragg Gratings are made by laterally exposing the core of a single-mode fiber to a periodic pattern of intense laser light. Exposure produces a permanent increase in the refractive index of the fiber's core, creating a fixed index modulation according to the exposure pattern. This fixed index modulation is called a grating.

At each periodic refraction change a small amount of light is reflected. All the reflected light signals combine coherently to one large reflection at a particular wavelength when the grating period is approximately half the input light's wavelength. This is referred to as the Bragg condition, and the wavelength at which this reflection occurs is called the Bragg wavelength. Light signals at wavelengths other than the Bragg wavelength, which are not phase matched, are essentially transparent. This principle is shown in Figure 1.



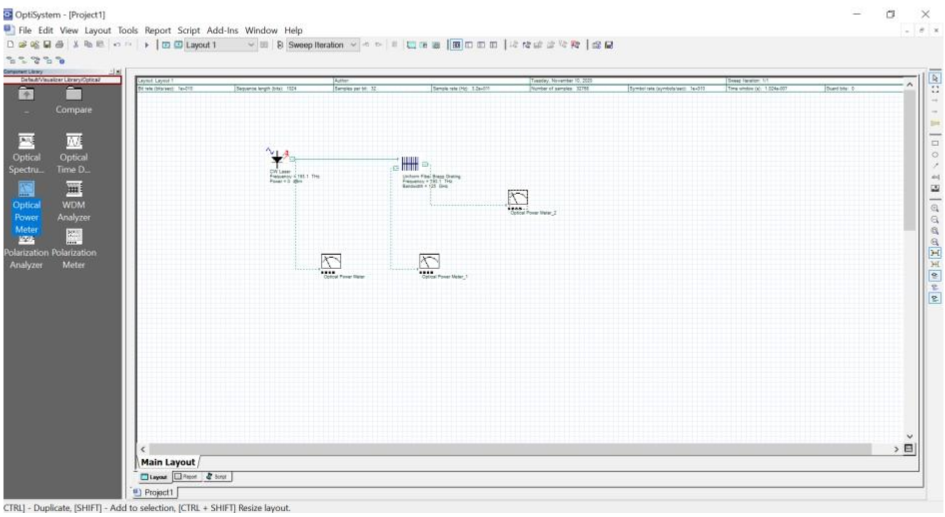
Schematic diagram of a fiber Bragg grating.

Therefore, light propagates through the grating with negligible attenuation or signal variation. Only those wavelengths that satisfy the Bragg condition are affected and strongly back- reflected. The central wavelength of the reflected component satisfies the Bragg relation: $\lambda_{Bragg} = 2n\Lambda$, with n the index of refraction and Λ the period of the index of refraction variation of the FBG.

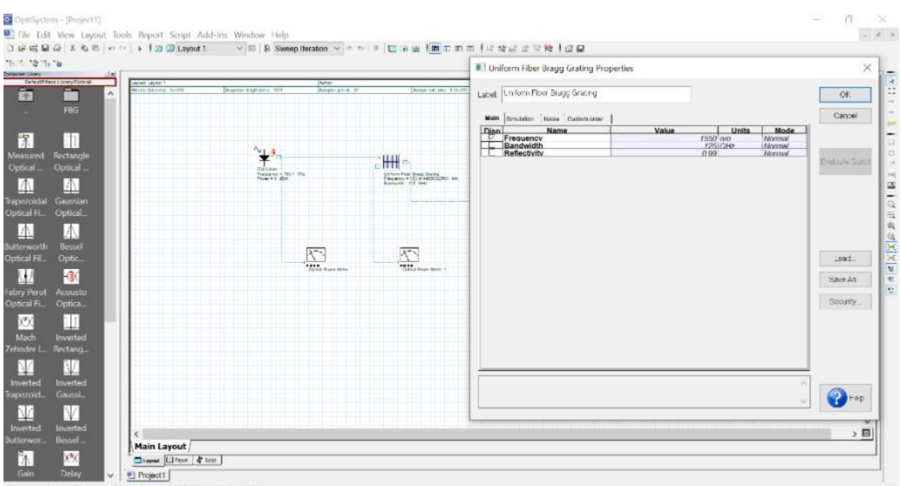
Procedure:

1. Open OptiSystem Simulation software.

2. Click on New File.
3. From the Component Library, select Default > Transmitters Library > Optical Sources. Drag CW and place it in the layout.
4. Drag Uniform FBG from the Filters Library > Optical > FBG and place it in the layout.
5. Select optical power meters from Visualization Library and place it as shown in the figure below.

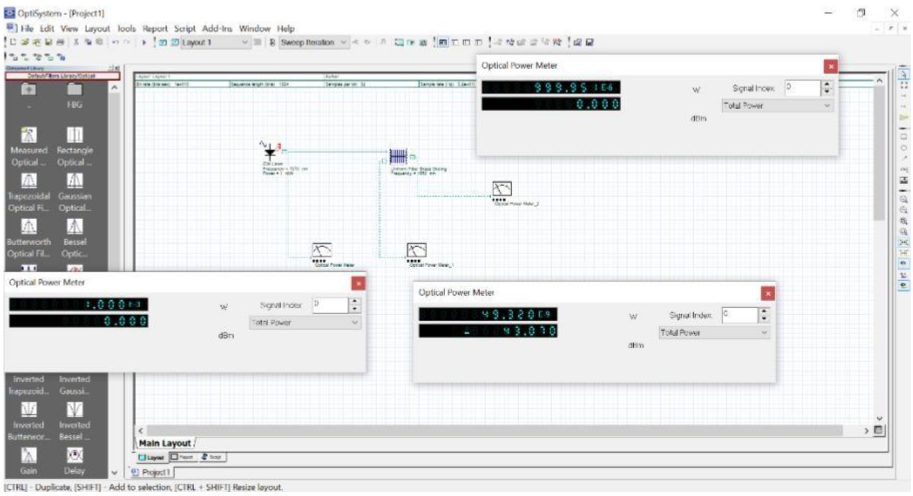


6. Double click on FBG and set wavelength as 1550nm.



7. Double click on CW Laser and set power to 1mW and wavelength to 1510 nm. Simulate it.

8. Observe the reading in power meter (Input power, Reflected Power and Transmitted Power) and note down it.



9. Repeat simulation for 1510 nm, 1550 nm and 1570 nm.

10. Complete the Observation Table.

Observation Table:

Sr. No.	Wavelength (nm)	Input Power, P1	Reflected Power	Transmitted Power, P2	Reflectivity, $R = \frac{P1-P2}{P1}*100$

Result Analysis and Discussion:

Conclusion: