3 - FRESNEL DOUBLE MIRROR AND DOUBLE PRISM

OBJECTIVES

- To analyze the interference phenomenon by using Fresnel's Double Mirror and Double Prism

EQUIPMENTS

- **White Light Source**
- **Green and Red Filters**
- **Fresnel's Double Mirror and Double Prism**
- **Viewfinder**

GENERAL INFORMATION

Fresnel's Double Mirror is made of two mirrors that have almost 180° between them.

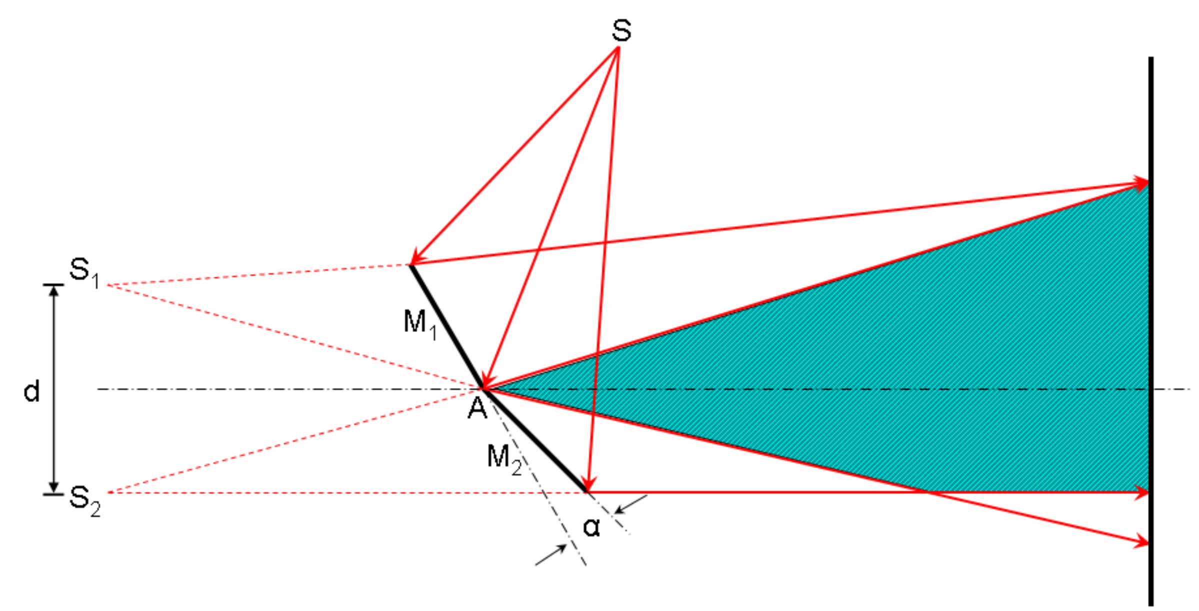

Figure 1: Fresnel Double Mirror

The wavefront of light from a point source S is reflected by mirrors and splits into two beams. Thus, the images of the light source S on mirrors 1 and 2 (S_1 and S_2) appear on the screen. The S_1 and S_2 image sources are synchronized. If they are brought close enough to each other, it will be sufficient for the light waves from these sources to be coherent in order to observe interference.

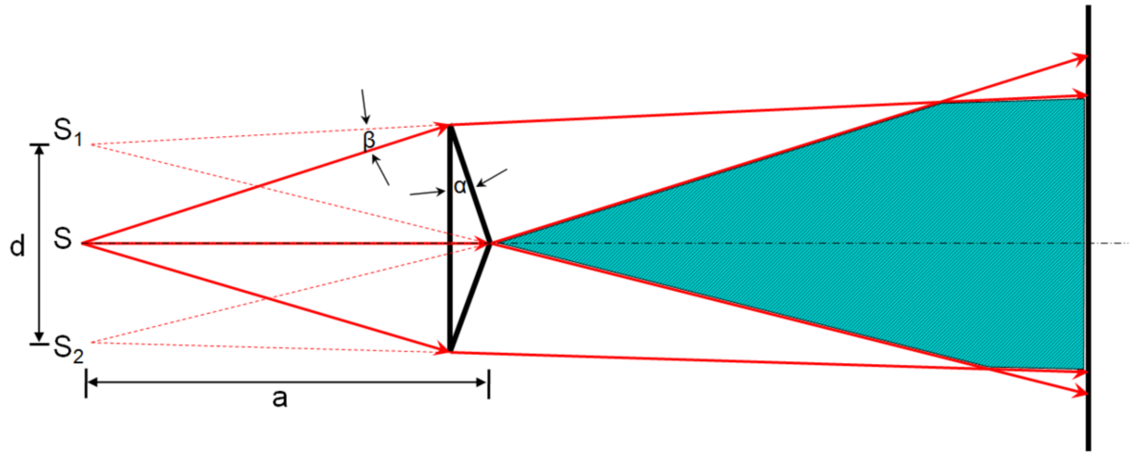

Figure 2: Fresnel Double Prism

The Fresnel Biprism is a system made up of two prisms that are very small at their apex and share a common base, each shaped like a right triangle (Figure 2). After the wavefront of light from source S is split into two parts by the biprism, the two beams overlap in a specific region on the screen, creating interference.

EXPERIMENT PROCEDURE

After the necessary conditions are met, the rays of light from the point source S either reflect off mirrors A_1 and A_2 or pass through the biprism system, creating a pattern of illumination on the viewport.

1. First, the Fresnel biprism experimental setup is arranged as shown in Figure 3 to observe the interference pattern. The rays of light that reach the viewport with a path difference equal to an integer multiple of the wavelength create regions of maximum intensity, while those with a path difference equal to a half-integer multiple of the wavelength create regions of minimum intensity. In the interference pattern, the distance between successive fringes is denoted as Δx.

$$\Delta x = \lambda \frac{L}{d}$$

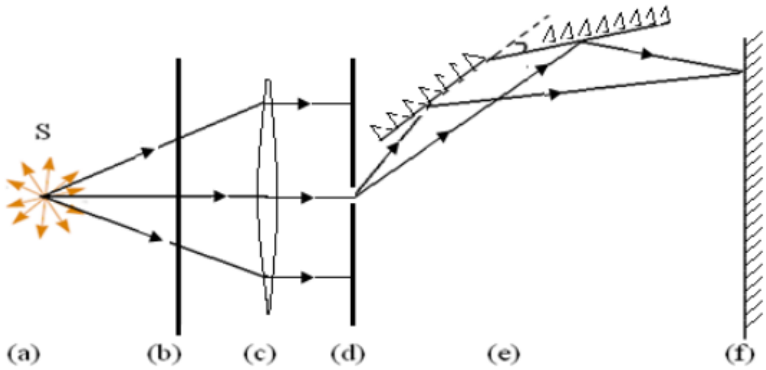

Figure 3: Experiment setup for double mirror (a)Light Source, (b)Filter, (c)Lens, (d)Coherency Slit, (e)Fresnel Double Mirror, (f)Screen

Here, λ is the wavelength of the light used, L is the distance between the viewport and the mirror or prism system, and d is the distance between the synchronized sources obtained using the biprism or double mirror. Given the wavelength of the light, the distance Δx between fringes is read from the viewport, and the length L is measured with a ruler. By substituting these values into the above formula, the distance between synchronized sources d is determined. The obtained values are then entered into Table 1.

Table 1: Results from Fresnel Double Mirror using red and green filters

$\lambda_{green} = 5592\ A°$	$\lambda_{red} = 6040\ A°$
$L =$............................	$L =$............................
$\Delta x_{min} =$..................................	$\Delta x_{min} =$..................................
$\Delta x_{max} =$..................................	$\Delta x_{max} =$..................................
$d =$....................................	$d =$....................................

2. First, the experiment is conducted using a red filter. Then, the experiment is repeated using a green filter. The differences in the resulting illumination patterns are discussed.

3. In the second stage of the experiment, the Fresnel double-prism experimental setup, as shown in Figure 4, is assembled, and the interference illumination pattern is observed.