

AIM: To determine wavelengths of the laser beam and to find spacing of the Etalon

APPARATUS REQUIRED:

Diode laser, plane convex lens, Fabry - Perot Etalon, Diffuser Screen with scale and needle, optical rail, power supply.

FORMULA:

$$\lambda = \left(\frac{2d}{N} \right) \Delta$$

$$t = n D^2 \lambda / \chi_n^2$$

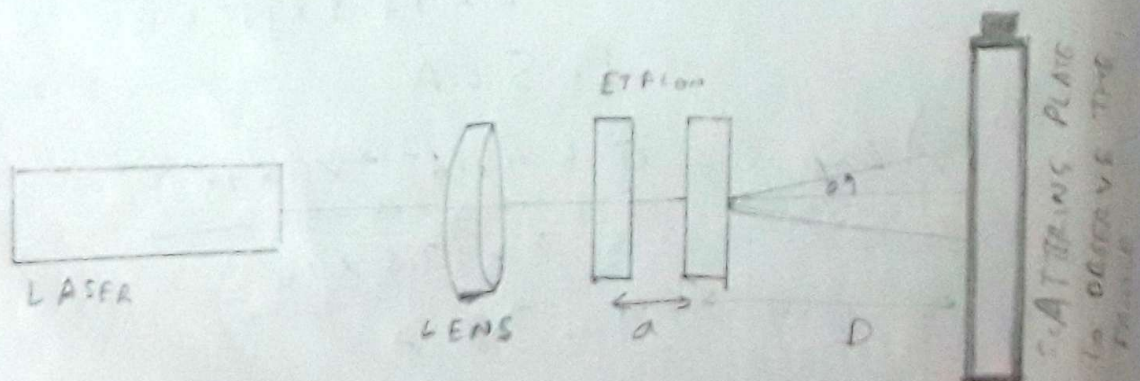
$$\Delta = \frac{d}{d'}$$

$$\chi_n^2 = \chi_{m+n}^2 - \chi_m^2$$

$$d = \frac{\lambda N}{2}$$

where $\lambda \rightarrow$ wavelength of light laser, $N \rightarrow$ no of fringes to be counted, $\Delta \rightarrow$ is the calibration constant of the micrometer.

DIAGRAM:



OBSERVATION TABLE :

No of fringes Counted (N)	Initial micrometer reading (A)	Final micrometer reading (B)	Distance moved (A-B) mm	Average mm (d)
20	5.07	5.64	0.57	0.49
20	5.64	6.09	0.45	
20	6.09	6.56	0.45	

To find the spacing of the Etalon

Distance between the screen and Fabry Perot

Etalon $D = 645 \text{ mm}$

cal &
19/4

CALCULATION: $\lambda = \frac{2 \times 0.49}{20} = 0.049 \text{ mm}$
 $= 490 \mu\text{m}$

Fringes	Radius (r) (cm)	Radius ² (r ²) (cm ²)	$x_n^2 = x_{m+n}^2 - x_m^2$	$t = n \cdot 0^2 \lambda / x_n^2$
x_m	7.31	53.44	8.34	0.0488
x_{m+1}	7.56	57.15	6.85	0.0595
x_{m+2}	7.86	61.78	4.47	0.0912
x_{m+3}	8.0	64.00	4.56	0.0902
x_{m+4}	8.17	66.75	4.82	0.0845
x_{m+5}	8.28	68.56	3.69	0.1104
x_{m+6}	8.46	71.57	2.91	0.1401
x_{m+7}	8.5	72.25	3.96	0.1029
x_{m+8}	8.63	74.48		
x_{m+9}	8.73	76.21		

Average : 0.09095 cm
 $\Rightarrow 0.9095 \text{ mm}$

RESULT:

Wavelength of laser beam: 490 nm

Final spacing of Etalon: 0.09095 cm
 $= 0.9095 \text{ mm}$

[16 BCE 0789]
