PHY F214 PHYSICS LAB-8 REPORT SEM-1 2017-2018

EXP NO. = 10 EXP NAME = NEWTON'S RINGS

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AIM:

To observe Newton's rings formed by the interference produced by a thin air film and to determine the radius of curvature of a plano convex lens with it.

APPARATUS:

Travelling microscope,sodium vapour lamp , plano-convex lens,plane glass plate with mount, magnifying lens.

Principle used:

The phenomenon of newtons rings is basically caused and explained due to the wave nature of light two waves. When a plano convex lens oflong focal length is placed on a plane glass plate ,a thin film of air is enclosed between the two a horizontal beam of light from a monochromatic source falls on a 45 degree glass plate B . A part of the incident light is reflected towards the air film enclosed by the lens and plate .The reflected beam from the thin air is viewed with a microscope . Interference takes place between the beams reflected at the lower surface of the lens and the upper surface of the glass plate and bright and dark circular fringes are observed .

The path difference between th two waves is = 2μt where t is the distance between the lens and the glass plate at a particular point and the radius of cuvature =R where $D^2=4mR\lambda$ where m is the order of the dark ring D is the diameter of the dark ring λ is the wavelength of the light source used and R is the radius of curvature of the plan convex lens.

OBSERVATION AND PROCEDURE:

First of all we clean thelens and the glass plate and place the lens over the plate with the curved face below then we switch on the monochromatic light source and let the beam fall at 45 degree on the glass plate which is kept above this arrangement to obtain the maximum intensity of light on the arrangement next we focus the microscope on the ring and adjust the angle of the glass plate and the position of microscope and light source to obtain a clear image of the newton's rings and then we start measuring the distances between each of the darker rings to measure the radius of the plan convex lens.

TABLE OF READINGS

λ = 5893 A or $5.893*10^{-5}$ cm

the least count of the vernier scale is = 0.001cm

least count of the main scale = 0.05cm

mth order	Diameter of ring(cm)	Radius of lens(cm)
20	0.581	71.6021127
19	0.561	70.270928
18	0.55	71.2945679
17	0.539	72.4990268
16	0.522	72.247794
15	0.507	72.6989649
14	0.493	73.6494267
13	0.47	72.0868305
12	0.455	73.1888823
11	0.444	76.0285701
10	0.427	77.3498218
9	0.411	79.6241303
8	0.388	79.8320041
7	0.375	85.2252067
6	0.354	88.6051247
5	0.342	99.239776
4	0.303	97.3708213
3	0.277	108.503026
2	0.24	122.178856
1	0.199	168.00017

The average radius of the lens = 86.5748 cm

We can see from this table that the distance between each dark ring decreases gradually as their order increases and at the end they become completely indistinguishable .

We can see here that there are various fluctuations in the radius of the lens that is because of the experimental errors while moving the microscope there may be a backlash error and error in noting the readings through the vernier.

INFERENCE:

The inference that we draw from this is that light shows wave nature as it undergoes interference between the light waves at the two surfaces that is at the lens and the glass plate.Wecan also see that the rings are circular this is due to the circular symmetry of the lens and the system .The distance between the rings keeps on decreasing as we move farther and farther away from the center of the ring.

POSSIBLE ERRORS:

1. **The microscope may not be parallel with the edge of the glass plate.**
2. **There can be manual error while taking the vernier scale reading.**
3. **There can be experimental error while moving the microscope such as backlash error as the microscope should be moved in one direction only .**
4. **There is also an error due to the non perfectness of equipments as we can see from the tables that the rings have different diameters at the two sides of the center and that is due to the unevenness of the lens and the glass plate.**
5. **There can also be an error as the light source is not perfectly monochromatic and coherent.**