

# PHYF214 PHYSICS LAB REPORT SEM1 2018-2019

## Lab 4 Group 7: Newton's Rings [NR]

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### 1 Experimental Tasks

1. To determine the radius of curvature of the plano-convex lens by measuring the radii of Newtons rings.

### 2 Apparatus

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

### 3 Theory

A thin wedge-shaped air film is created by placing a plano-convex lens on a flat glass plate. When a monochromatic beam of light is made to fall at almost normal incidence on the arrangement. ring-like interference fringes are observed in the reflected light. The diameters of the dark fringe rings are measured and the radius of curvature of the convex lens determined using the formula

$$D_m^2 = 4m\lambda \quad (1)$$

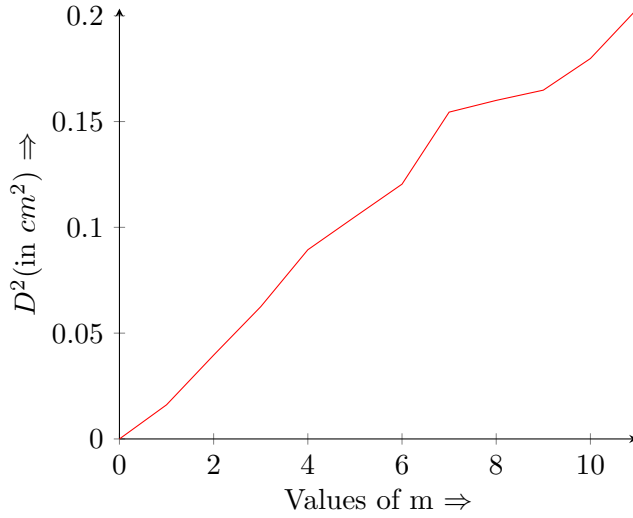
### 4 Observations and Analysis

#### 4.1 Trial 1:

Table 1: Data gathered during trial 1.

Value of m	Position of left ring (in cm)	Position of Right ring(in cm)	Diameter(in cm)	$D^2$ (in $cm^2$ )
0	2.95	2.95	0	0
1	3.01	2.883	0.127	0.016129
2	3.045	2.846	0.199	0.039601
3	3.075	2.825	0.25	0.0625
4	3.095	2.796	0.299	0.089401
5	3.1	2.776	0.324	0.104976
6	3.11	2.763	0.347	0.120409
7	3.148	2.755	0.393	0.154449
8	3.15	2.75	0.4	0.16
9	3.155	2.749	0.406	0.164836
10	3.159	2.735	0.424	0.179776
11	3.176	2.725	0.451	0.203401

Figure 1: Graph of  $D^2$  vs  $m$  for trial 2



**Analysis:**

Slope of the graph  $4\lambda R = 0.01847cm^2$

$\therefore R = 78.43cm$ .

Standard deviation  $\sigma = 7.56cm$ .

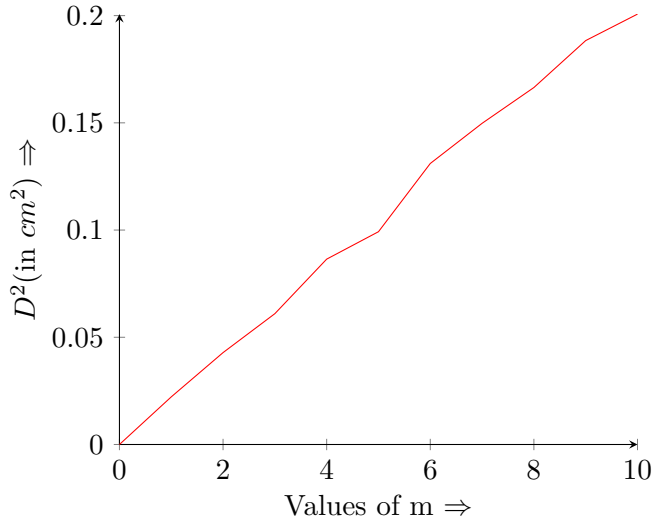
$\therefore R = 78.43 \pm 7.56cm$ .

**4.2 Trial 2:**

Table 2: Data gathered during trial 1.

Value of m	Position of left ring (in cm)	Position of Right ring (in cm)	Diameter (in cm)	$D^2$
0	2.909	2.909	0	0
1	3.025	2.876	0.149	0.022201
2	3.057	2.85	0.207	0.042849
3	3.076	2.829	0.247	0.061009
4	3.104	2.81	0.294	0.086436
5	3.112	2.797	0.315	0.099225
6	3.138	2.776	0.362	0.131044
7	3.15	2.763	0.387	0.149769
8	3.158	2.75	0.408	0.166464
9	3.17	2.736	0.434	0.188356
10	3.175	2.727	0.448	0.200704

Figure 2: Graph of  $D^2$  vs  $m$  for trial 1



***Analysis:***

Slope of the graph  $4\lambda R = 0.02055cm^2$

$\therefore R = 87.24cm$  Standard deviation  $\sigma = 3.15cm$ .

$\therefore R = 87.24 \pm 3.15cm$ .

## 5 Precautions

- The microscope should be parallel to the edge of the glass plate.
- If you place the cross wire tangential to the outer side of a particular ring on one side of the central spot, then the cross wire should be placed tangential to the inner side

of the same ring on the other side of the central spot

- The travelling microscope should move only in one direction.

## 6 Conclusions and Results

- The radius of lens is found to be as  $R = 78.43 \pm 7.56cm$  in the first trial.
- The radius of lens is found to be as  $R = 87.24 \pm 3.15cm$  in the second trial.