NEWTON'S RINGS USING LED EXPERIMENT KIT

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Abstract

1) To determine the radius of curvature of given plano-convex lens using yellow LED and Newton's rings.
2) To determine the unknown wavelength of the given LEDs by using Newton's rings and plano-convex lens of known radius of curvature and hence determining the energy bandgap of the given LED.

I. Aim

1) To determine the radius of curvature of given plano-convex lens using yellow LED and Newton's rings.
2) To determine the unknown wavelength of the given LEDs by using Newton's rings and plano-convex lens of known radius of curvature and hence determining the energy bandgap of the given LED.

II. Apparatus

Travelling microscope, plano-convex lens, glass plates, yellow, green, blue and red LED modules with power supply, magnifying glass.

III. Theory

The energy band gap E of a semiconductor is given by

$$R = \frac{D_m^2 - D_n^2}{4\lambda(m-n)}$$

R = radius of curvature of plano convex lens
D_m = Diameter of the m^{th} ring
D_n = Diameter of the n^{th} ring
m,n = number of rings as measured from the center of the ring m > n
λ = Wavelength of LED light source

$$E = \frac{hc}{\lambda}$$

Where E = bandgap of LED h = plank's constant
c = speed of light

IV. Procedure

- Setup the components.
- Align the yello LED module with the stand such that the light if incident at the center of the inclined glass plate.
- Make sure that the light coming from the LED should fall withing the area of the plane glass plate kept at 45 degree in wooden box.
- Count the rings from the center which is taken as the zeroth ring and go the left hand side until you reach the last visible ring.
- Note the readings on the horizontal scale of the Travelling microscope.
- Using the value of the wavelenth find the radius of curvature of the given planoconvex lens.
- Now without disturbing the TM replace the source with unknown wavelenght and repeate the procedure as in the last step.
- Find the wavelengths of red, green, blue LEDs and hence find the energy band gap for the LEDs.

Table 1: *Example table*

Name		
First name	Last Name	Grade
John	Doe	7.5
Richard	Miles	2

V. Observations

- Current C = 8.03 mA
- Distance between probes S = 0.24 cm
- Thickness of sample W = 0.05 cm

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$$e = mc^2 \tag{1}$$

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VI. Procedure

- Put the four probe arrangement in the oven and connect the lead of the oven to socket(10). Also insert a PT100 temperature sensor into the hole given at the top of the four probe arrangement.
- Conncet the red and black plug leads of the four probe arrangement to 4mm sockets marked as voltage V.
- Conncet the yello plug leads to 4mm sockets marked as current.
- Change swith to current mode to display the current reading.
- Switch on the apparatus and slightly increase the current using current knob, say 4mA and note that the voltage should be positive.
- Set the current to desired value say 8 mA using current adjusting knob. Also select the range of multiplier using switch to x1 or x10.
- Switch on the oven. Green LED will glow showing the oven is on.
- Change switch to temperature for display to show temperature reading.
- Note the probe voltage on display for different values of temperatures.

VII. Discussion

i. Subsection One

A statement requiring citation [Figueredo and Wolf, 2009]. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies

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ii. Subsection Two

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References

[Figueredo and Wolf, 2009] Figueredo, A. J. and Wolf, P. S. A. (2009). Assortative pairing and life history strategy - a cross-cultural study. *Human Nature*, 20:317–330.