Date 5.9.19

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Optical Fiber Characterization

Apparatus available :

- Diode laser
- Optical fiber
- Laser - fiber coupler
- Optical rail
- Pinhole photo detector
- Power supply for laser and detector output measurement unit

Aim :

To determine numerical aperture of a given multimode optical fiber.

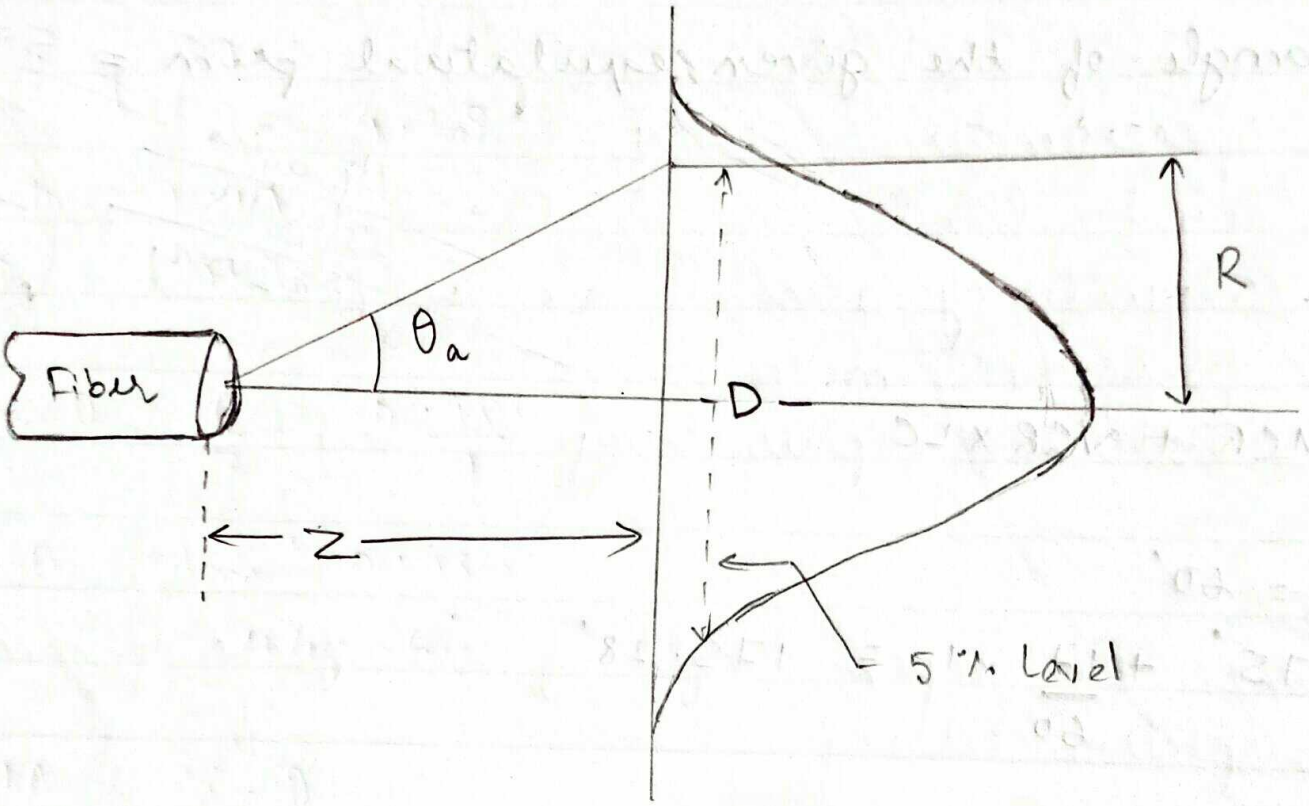
Theory :

A multi mode optical fiber will only propagate light that enters the fiber within a certain cone, known as the acceptance cone of the fiber. The half-angle of this cone is called the acceptance angle, θ_a.

$$\text{Acceptance angle} \quad \theta_a = \tan^{-1}(R/z)$$

where, D is the diameter of far field intensity at 5% intensity level of the maximum attainable intensity and z is the distance between detector and the fiber out end.

Teacher's Signature : .....


Fiber
θ_a
D
R
Z
5 % Level

Observations :

Z	Micrometer Reading (mm)	Detector o/p current	D
1 mm			
	11.5	0	
	12.3	0	
	12.8	0	1.97 mm
	13.55	1.5	
	13.69	5.1	
	13.79	11.5	
	13.85	16.5	
	13.90	22.7	
	14.02	42	
	14.05	48.9	
	14.13	61.6	
	14.20	71	
	14.25	80	
	14.5	87.3	
	14.6	77	
	14.65	70.4	
	14.7	66	
	14.85	60	
	14.9	52.0	
	15.0	42.5	
	15.2	36	
	15.5	15.4	19BCE2076 5 Sep 19
	15.85	0	

Result :-

Numerical Aperture (NA) of the optical fiber 0.701 (uni

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Calculations :

Max Value = 87.3

5% of 87.3

= 4.38

D = 1.97

$R = \frac{D}{2} = 0.985$

$\tan\theta = \frac{R}{\frac{1}{2}} = 0.\frac{985}{1}$

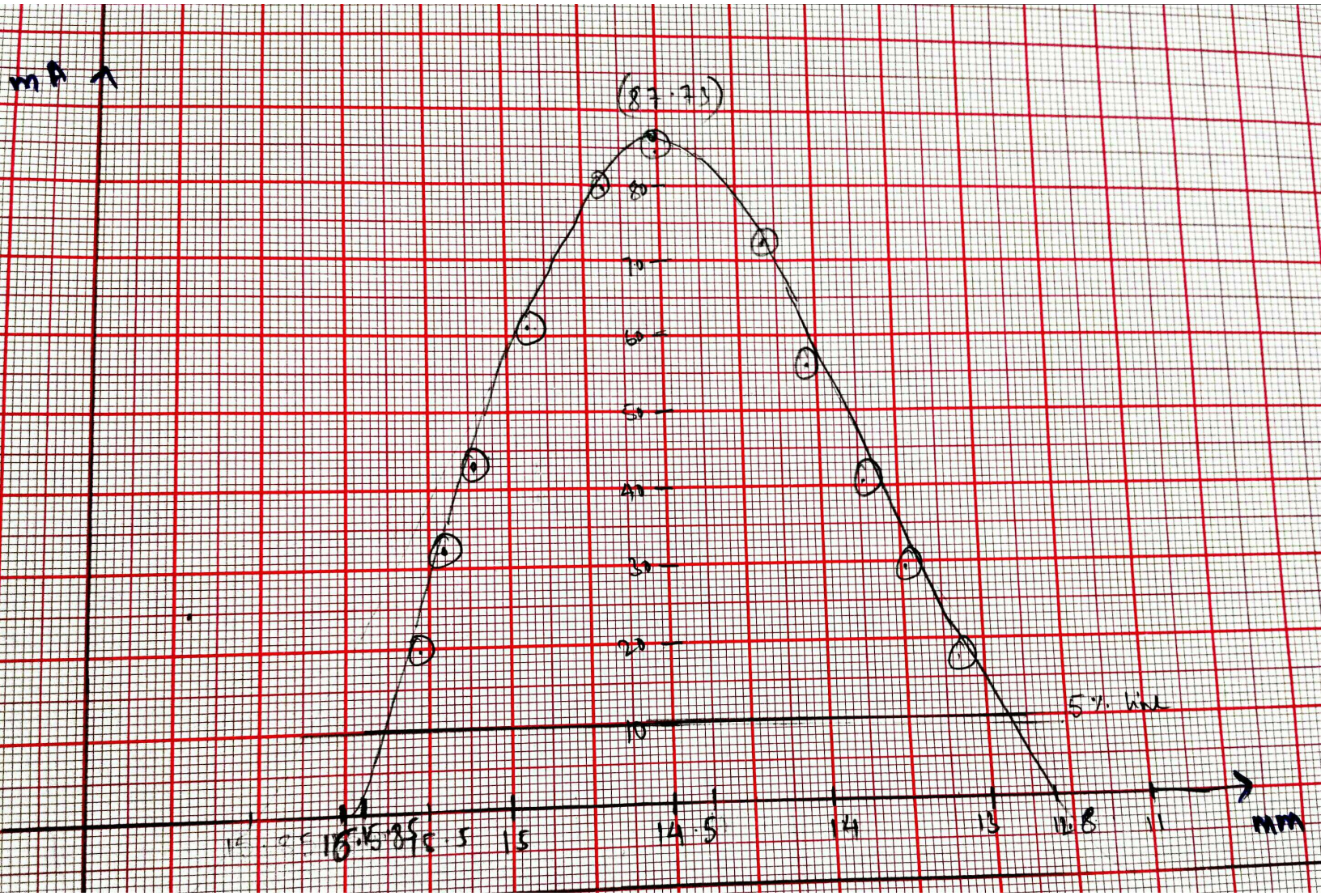
$\theta = \tan^{-1} 0.985$

$= 44.56^{\circ}$

NA = Sin θ

= Sin 44.56

= 0.701 units


mA
(87.73)
80
70
60
50
40
30
20
10
5% line
15.5
15
14.5
14
13
12.8
11
mm