

Experiment 6

The objective of this experiment is to measure the numerical aperture of the plastic fiber provided with the kit using 660 nm wavelength LED.

Equipments Required:

- Link-A kit.
- 1 Meter Fiber cable.
- NA JIG.
- Steel Ruler.
- Power supply.

Theory:

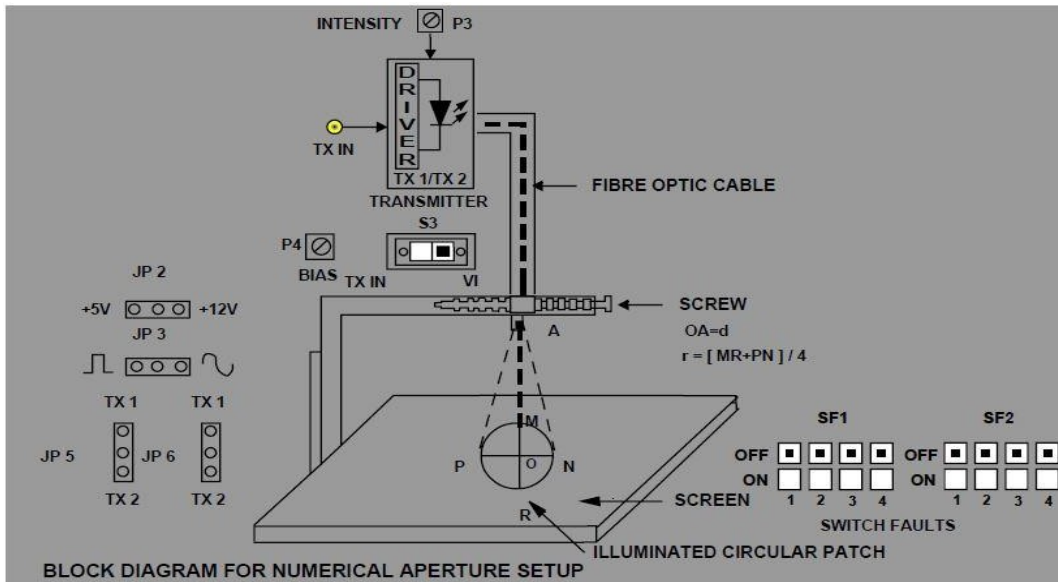
Numerical aperture refers to the maximum angle at which the light incident on the fiber end is totally internally reflected and is transmitted properly along the fiber. The cone formed by the rotation of this angle along the axis of the fiber is the cone acceptance of the fiber. The light ray should strike the fiber end within its cone of acceptance, else it is refracted out of the fiber core.

Considerations in NA measurement:

It is very important that the optical source should be properly aligned with the cable and distance from the launched point and the cable is properly selected to ensure that the maximum amount of optical power is transferred to the cable.

This experiment is best performed in a less illuminated room. Measurement of Numerical Aperture
Measurement of the Numerical Aperture (NA) of the fiber

Block diagram for Numerical Aperture Set-up:



PROCEDURE:

- Connect the power supply cables with proper polarity to kit. While connecting this, ensure that the power supply is OFF. Do not apply any TTL signal from Function Generator. Make the connections as shown in block diag.
- Keep all the switch faults in OFF position.
- Keep Pot P3 fully Clockwise Position and P4 fully anticlockwise position.
- Slightly unscrew the cap of LED SFH756V (660 nm). Do not remove the cap from the connector. Once the cap is loosened, insert the fiber into the cap. Now tight the cap by screwing it back. Keep Jumpers JP2 towards +5V position, JP3 towards sine position, JP5 & JP6 towards TX1 position.
- Keep switch S3 towards VI position.
- Insert the other end of the fiber into the numerical aperture measurement jig. Hold the white sheet facing the fiber. Adjust the fiber such that its cut face is perpendicular to the axis of the fiber.
- Keep the distance of about 10 mm between the fiber tip and the screen. Gently tighten the screw and thus fix the fiber in the place.
- Now adjust Pot P4 fully Clockwise Position and observe the illuminated circular patch of light on the screen.
- Measure exactly the distance d and also the vertical and horizontal diameters MR and PN

indicated in the block diagram.

- Mean radius is calculated using the following formula. $r = (MR + PN) / 4$
- Find the numerical aperture of the fiber using the formula. $NA = \sin \max = r / d + r$
Where max is the maximum angle at which the light incident is properly transmitted through the fiber.

Observation Table:

S. No.	d (in cm)	r (in cm)	NA

Results

Discussions: