

LED Array Experiments

The unit comes supplied with a plug-top psu and a 500l/mm diffraction grating.

Transmission through colour filters.

Plug the power supply into the unit and switch on. Use colour filters, typically red, green, yellow, magenta, cyan and blue.

View the box's LEDs through the filters and note which colours are reduced in intensity when viewed through the filters.

You should note that, for example, the red LED, when viewed through a red filter, shines brightly, as it does when viewed through yellow and magenta filters. When viewed through other filters the red LEDs intensity is diminished.

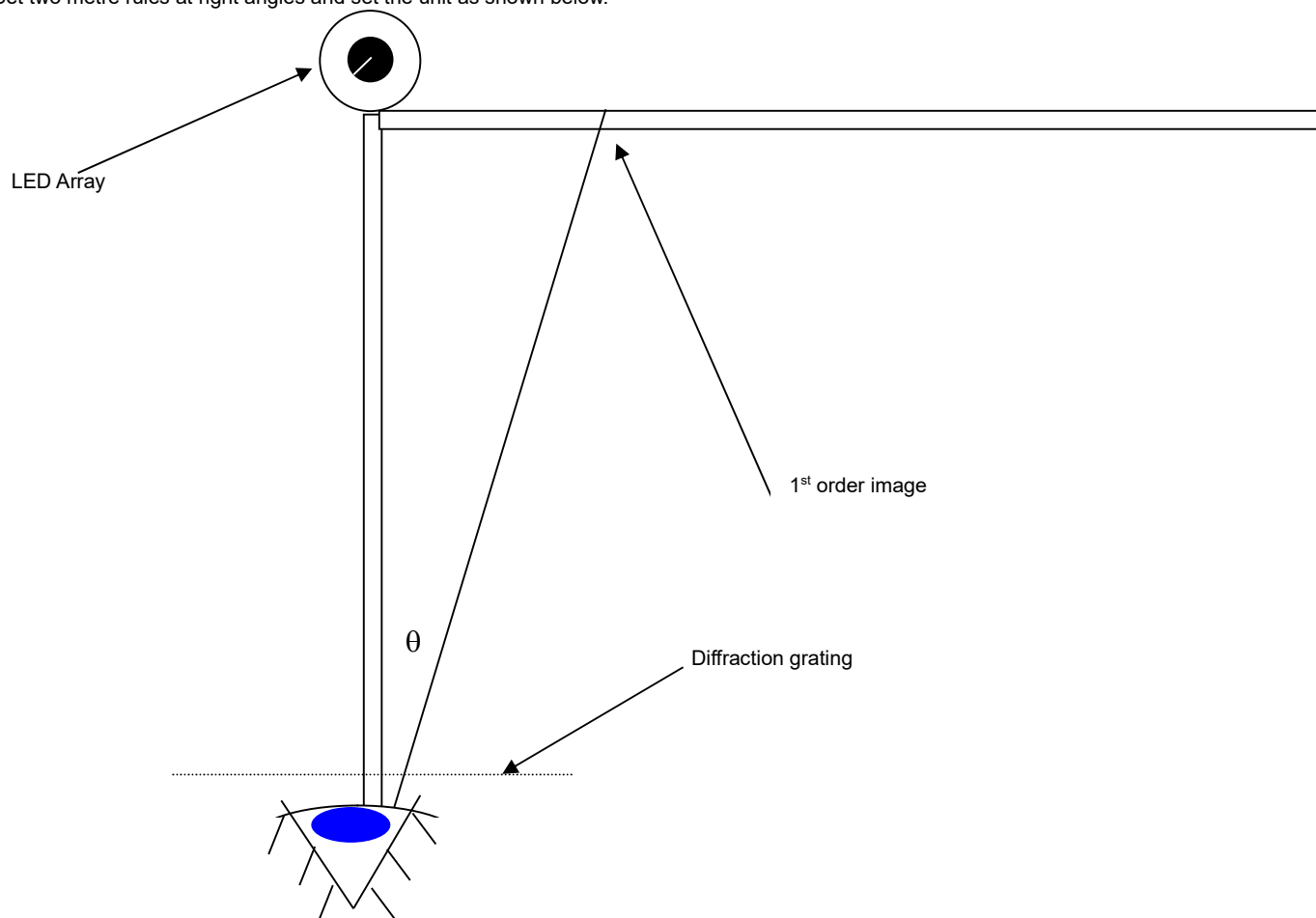
It should be possible to work out secondary colour mixing.

Transmission through a diffraction grating.

View the LEDs through the diffraction grating. It should be noted that first order diffraction patterns are shown. It will be noted that the first order diffraction pattern of the red LED is wider than that of the blue LED. It should also be noted that none of the LEDs gives off a pure colour (monochromatic light).

Measuring the wavelength of coloured light.

Set two metre rules at right angles and set the unit as shown below.



Using the diffraction grating, view the LEDs from the end of the metre rule as shown

Get a partner with a retort stand to move along the perpendicular metre rule until the retort stand is in the position where, say, the red end of the partial spectrum formed by the red LED is– this point is labelled “1st order image” on the diagram. You now need to work out the angle θ . This may be done by using a protractor set at the end of the ruler (where your eye was) and sighting along it to the clamp stand. Alternatively the angle may be calculated by trigonometry. It should also be possible to view the 2nd order spectrum and apply the formula below.

Using the formula $n\lambda = d \sin \theta$ the wavelength of the red light may be calculated. d is the diffraction grating spacing = $\frac{1}{500,000} = 2 \times 10^{-6} \text{m}$ (this is calculated for a 500lines/mm grating), n is the order of the image (in this case 1). Repeat for other LED colours.