

# The Interference of Light

## For: Year 12 Physics Students

### Description

This program links with the 'Light and Atoms' section of the SACE Stage 2 Physics curriculum.

Students conduct a number of procedures that explore concepts involved in the interference and diffraction of light, including double slit interferometry, calculating the wavelength of a red HeNe laser, measuring the diameter of a human hair, and using a phone's reflected diffraction pattern to calculate the pixel size of the screen.

In addition to the above procedures, two sets of Photoelectric Effect apparatus are available and can be used by school visitors.

The equipment in this session can also be used for design practicals.

### What will Students do?

This program can be undertaken as a single two-hour workshop or as a full-day visit, the latter including a campus tour and a physics presentation by University lecturers and/or post-graduate physics students.

Students participate in four experimental procedures:

#### *Double Slit Interferometry*

Students:

- use a double slit interferometer and a sodium vapour lamp to produce an interference pattern
- measure the bandwidth of the interference fringes
- calculate the distance from the screen to the double slits of their interferometer

#### *The Wavelength of a Red Helium-Neon Gas Laser*

Students:

- use a red HeNe laser and a transmission diffraction grating to produce a diffraction pattern on paper
- mark and measure the distance between the maxima of the resulting pattern
- calculate the wavelength of the laser light by employing  $d\sin\theta = m\lambda$

#### *The Diameter of a Human Hair*

Students:

- use a HeNe gas laser and a human hair to produce a diffraction pattern of light around the hair
- mark and measure the distance between the minima in the pattern
- calculate the width of the hair

### *The Pixel Size of a Mobile Phone*

Students:

- use a green diode laser and their own mobile phone to produce a reflected diffraction pattern on paper
- mark and measure quantities of the resulting pattern
- calculate the pixel size of their phone
- compare their calculated value to the value published online by the manufacturers

NB: This process was developed entirely by physics staff at the University of South Australia.

### **The Photoelectric Effect and Design Practicals**

Two sets of Photoelectric Effect apparatus are also available and can be used by school visitors upon request. Additionally, the equipment used in the 'Interference of Light' program can be employed for design practicals.

Please contact UniSA Connect for information on these additional possibilities or to convert your program to a design practical.

### **Timetable for the Full Day Program**

The Interference of Light Workshop – 2 hours

Break – 20 mins

Campus Tour – 1 hour

Lunch – 35 mins

Physics Presentation, including Career and UniSA Course Information – 45 mins

Evaluation – 10 mins

Total – 5 hours

NB: Session details and timetable changes may occur without notice.

### **Conditions**

- As this program is a practical activity, students and accompanying adults will be required to wear closed in shoes and appropriate dress.
- Teachers will receive confirmation of booking and pre-visit information.