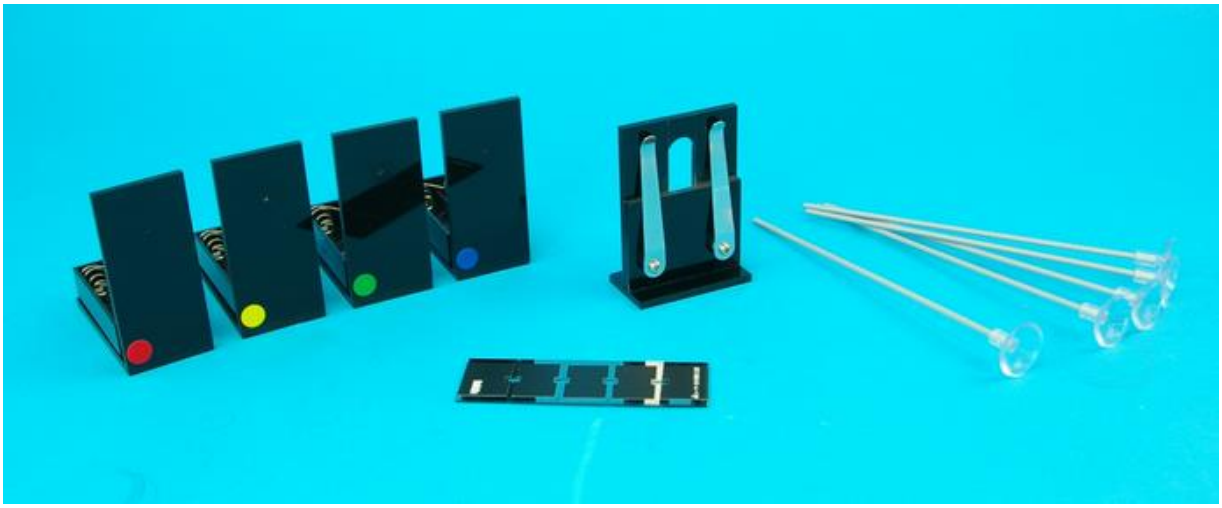
D20-1525-W0

Young's Experiment Set LED Type

(Diffraction & Interference of Light Experiments)

Instruction Manual



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2020/03

Precautions

You should not directly look into the laser rays when conducting experiments with laser rays and this product. Laser rays may damage your eyes.

You should not use "Slit for Light Diffraction Grating" without shield sticker which protect your eyes from laser rays, when you use the laser pointer. You should put the shield sticker on the product in order to avoid the reflection of Laser rays into your eyes before starting use of this product.

You should not disassemble this product. This product might stop working and warranty will be void.

Do not let students to conduct experiments without the presence of teacher or trainer. Teacher or trainer must instruct students about the safe ways of conducting experiments with this product before conducting experiments.

Be careful when handling the slit because it is made from glass. In the case that the slit is broken, do not touch bits of glass by your hands. Especially, do not let students to touch them.

If the slit breaks, stop experiments immediately as it can be dangerous for students or teachers, because they can cut themselves by the broken parts of the slit.

Keep the product dry and away from water. If exposed to water this product can be damaged and not work properly.

Put batteries out from the LED units and store separately when you do not use the product for experiment for a long time. If you do not put the batteries out from LED units, chemicals from the batteries could leak into the LED units, and damage the units. If that is the case, the product will be out of the warranty.

Thank you very much for purchasing this product. You should read and understand the precaution in advance before you start conducting experiments. Please store this instruction manual after reading somewhere close, so that you can refer to it easily if needed.

Introduction

This product Young’s Experiment Set LED type is for experiments of Light interference and diffraction using LED lights and consists of four LED units with different LED colors and Slit for light diffraction grating.

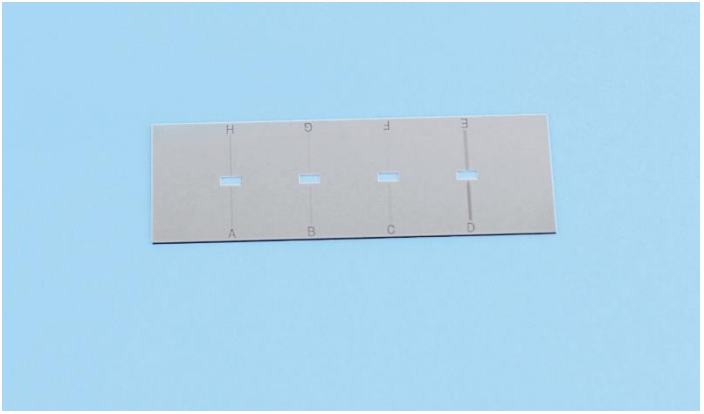
The purpose of the product is to make Young's interference experiment easy. Because the observation of interference and diffraction of light through single and double slit needs parallel rays from strong light source, generally laser beam has been used in school. If that is the case, using the laser beam needs strict safety control for students because the laser beam may be harmful to their eyes. To avoid this situation, optical benches with laser beam are widely used, but their use can be complicated for students, causing understanding of the interference and diffraction of light concept difficult.

To make easier for students to understand the concept of wave nature of light, this product provides an opportunity where students can observe and experience the interference and diffraction of light by themselves. Students in pairs, one will observe and the other one will write down the results of experiment, using the slit and LED light unit. They can observe easily with their own eyes the interference and diffraction fringe.

Slit for Light Diffraction Grating D20-1842-01

"Slit for Light Diffraction Grating" is a component of this set. “Slit for Light Diffraction Grating" is the highest quality grade slit that is suitable for Young's experiment. The single slit and double slit and diffraction gratings are on one plate of glass.

D20-1842-01 Slit for Light Diffraction Grating: 1 pc, Size: 76 x 26mm



D20-1842-01 Slit for Light Diffraction Grating

Specification

- Size: 76 x 26mm, Amount: 1 pc
- Slit: Single, Double slit (6 kinds), Diffraction Grating (2 kinds) (See Table 1)
- Shield Sticker: 1 sheet
- Four small square holes in the middle of the glass are for easier navigation of laser beam into the slit before starting observation.

Table 1. Number of Lines, width and gap of Slit for Light Diffraction Grating.

	A	B	C	D	E	F	G	H
Number of lines	2	2	2	30	10	1	1	1
Width (mm)	0.02	0.02	0.02	0.01	0.02	0.01	0.02	0.05
Gap (mm)	0.04*	0.07*	0.22*	0.02*	0.06*	-	-	

*The gap is measured from the middle of one slit to the middle of another slit.

Preparation for Experiment

You should attach the enclosed shield sticker on "Slit for Light Diffraction Grating" for protection of eyes to avoid damaging them by reflected laser ray. The slit and the enclosed sticker in the product comes separately like on following Fig. 1 and Fig. 2. As the surface condition of the slit is same as a mirror, it can be dangerous to use without the shield sticker.

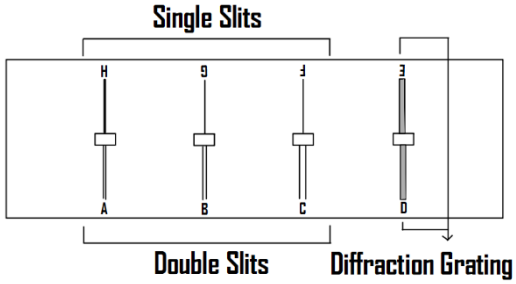


Fig. 1 Slit for Light Diffraction Grating

In addition, the surface of the slit can be easily removed or damaged by scratching, because of its sensitive thin coating. Therefore, the shield sticker is needed on the surface of coating side as a protection.

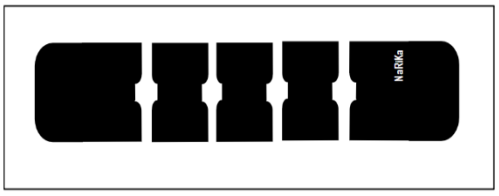


Fig. 2 Shield Sticker Sheet

Use as a reference process to stick the shield stickers on the Slit for Light Diffraction Grating (Fig. 3). Advice, you should start sticking the shield sticker on the face side from the edge end of the slit.

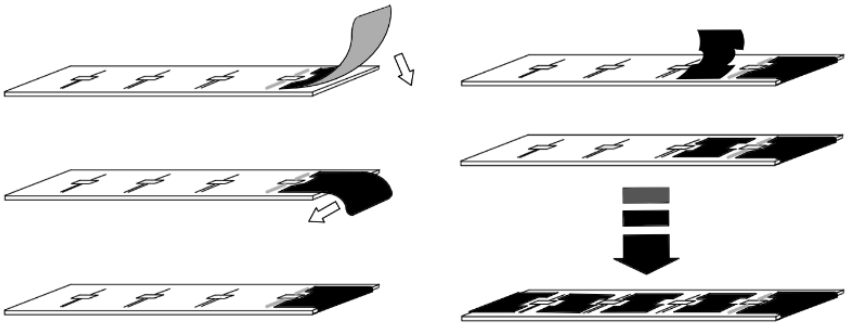
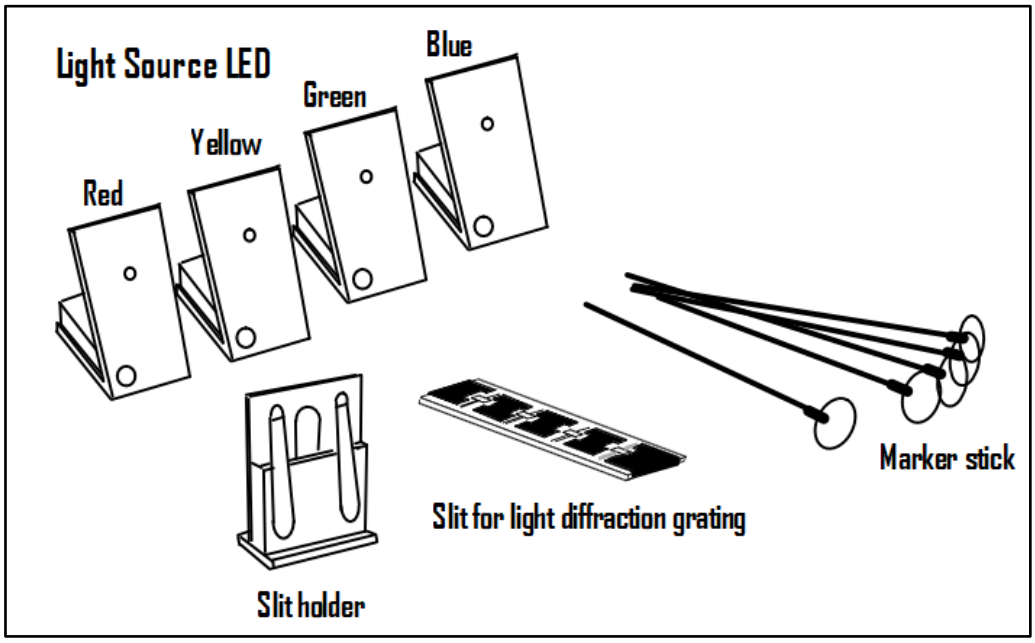


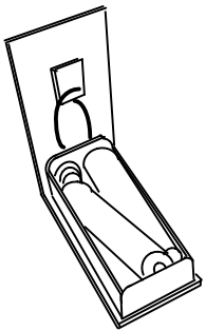
Fig. 3 Sticking steps of Shield Sticker on the slit glass

Young's Experiment Set LED Type

Components

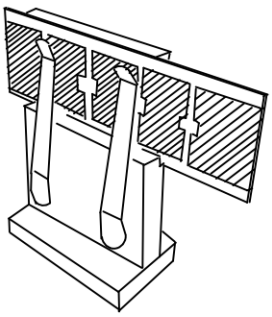


- Light Source



The light source is LED, which is designed to emit point light.
Light source: High brightness LED (Red, Yellow, Green, Blue)
Size: 28 x 63 x 60mm
Power Supply: AAA battery x 2 (not included)
* There is no on/off Switch

- Slit holder



This holder is to be used only with "Slit for light diffraction grating". Put and set the slit into two clips of the holder (see fig. on the right). During experiment, the slit in the holder can be adjusted by sliding depending on your preferences.

- Slit for light diffraction grating

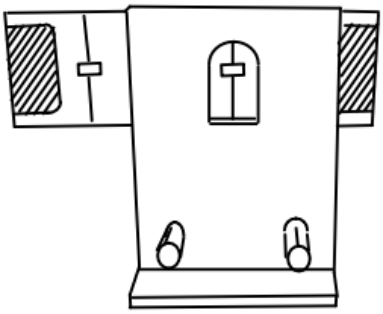
Please refer the description in the previous pages.

- Marker stick

The marker stick is a recorder of position of the fringe to confirm the interval of the interference fringe. You place the marker sticks on the position at each of the interference fringe by cooperation with your partner.

Young's Experiment

1. Put the slit into the slit holder
   Select which slit you want to use in the experiment (A to H). The slit in the holder can be adjusted by sliding depending on your using size of slit.

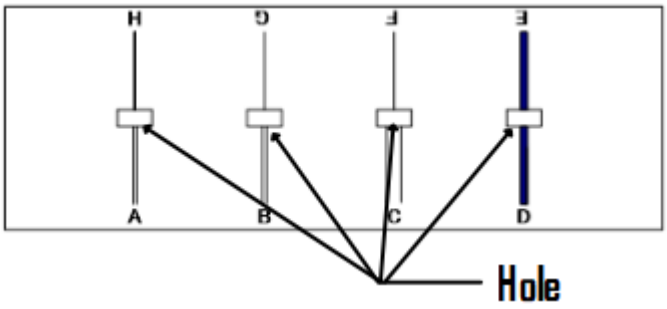


2. Set the holder with the slit around 1.5 ~ 2.0m away from the light source on a table. Measure the distance with 1cm accuracy.

3. Fix the slit holder and the light source on the table with a double-face tape, so that it will not move.

4. Turn the light source on.

5. Look through the slit the light of light source.
   There is a hole in the center of each slits on the slit. These holes are to find the light source out. When you find the light source in the hole, let your line of sight move up or down to look through the light source from the slit. You should see similar interference fringes like in a Photo 1.



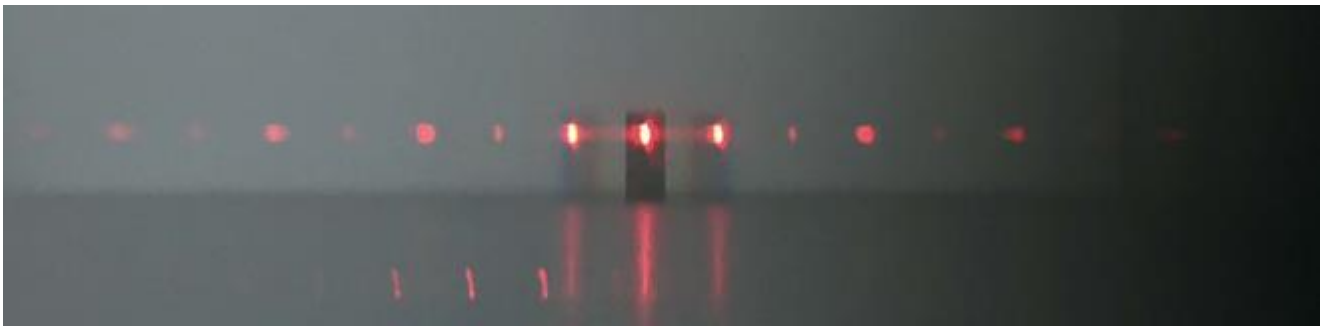
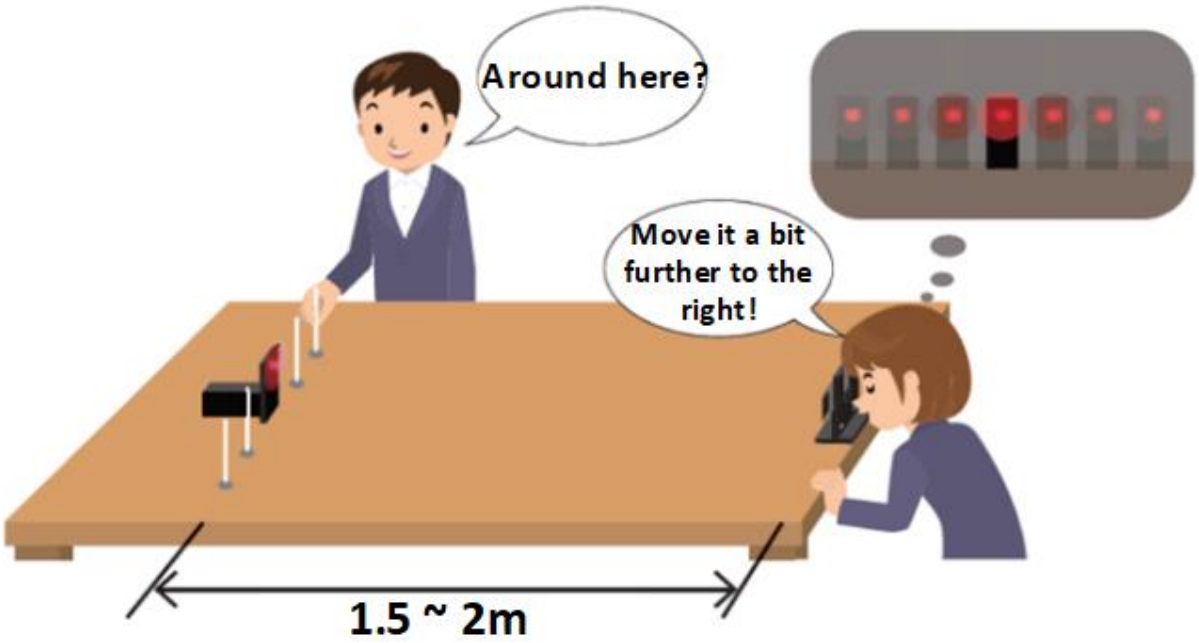


Photo 1: Red light source, D slit and Distance 1.5m

6. Measure distance of the interference fringe.
   Make a pair, and one of you should look through the slit, the other one should put the marker sticks on the interference fringe. Measure the interval distance of sticks with 0.1cm accuracy.



7. Calculate the wavelength of the light source
   If you want to get the wavelength of the light source from your data results, calculate the wavelength following the equation below. However, as the experiment is simple, the results of calculation have low accuracy.

   The purpose of the equipment is to let students understand the concept of diffraction and interference of light by their experience through hands on scientific experiments, not measuring or calculating the wavelength of light.

$$\lambda = \frac{xd}{mL} \qquad (m = 0, 1, 2, \ldots\ldots)$$

Storage Tips

- Put the batteries out from the light sources for storage.
- Put Slit for Light Diffraction Grating back into its case for storage.