NFU 732

LED.white

The LED.white is part of the UNILAB LED range of products. It is designed to be a superior alternative to a traditional ray box, being able to replace it in almost any experiment.

Safe
- Low voltage
- Runs cool

Practical
- Mimimum 10,000 hour life
- Fixed voltage supply
- No additional power required
- Small footprint

Performance
- Very bright
- Blackout not required
- Better spectrum
- “Whiter” light

Safety

The LED.white should be used under the supervision of a qualified teacher, with the plug-top power supply provided. A risk assessment is recommended before use.

The LED in the product is “ultra bright”, and the unit is a class II LED product. Do not look directly at the LED at close range when it is turned on. Do not stare at any bright light source.

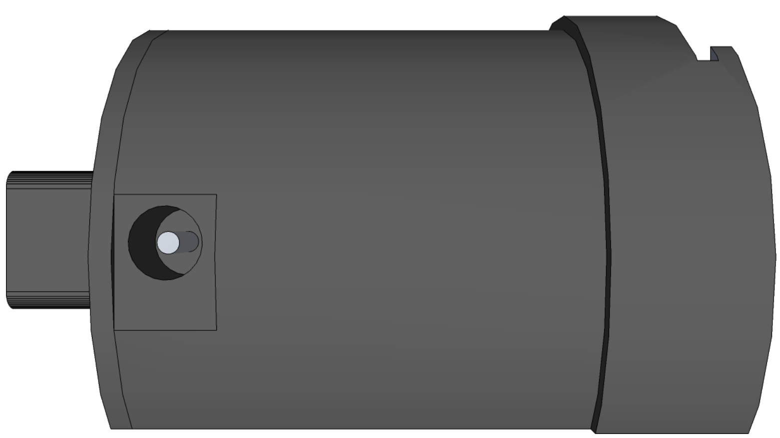
Most experiments involve looking at objects illuminated by the LED.white, rather than looking at the LED directly. When working in low ambient light levels, extra caution should be taken. Advise pupils not to stare at the LED. Try to keep experiment times to a minimum. An audience to an experiment should be at least a metre away from the source.

UNILAB can not accept responsibility for injury or damage caused by misuse of the LED.white.

Basic operation

The LED.white is supplied with a 5V 1A regulated plug-top power supply. Only this power supply should be used with the device.

To turn the light on, simply plug the power supply into a mains socket, and insert the plug into the socket on the left hand side of the LED.white.



The unit is fitted with a 45mm slit plate holder which can be slid on and off.

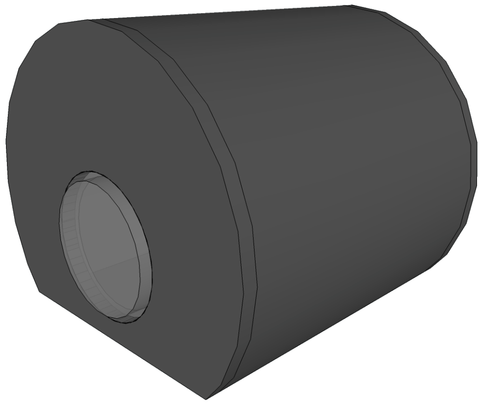


Plate holder removed

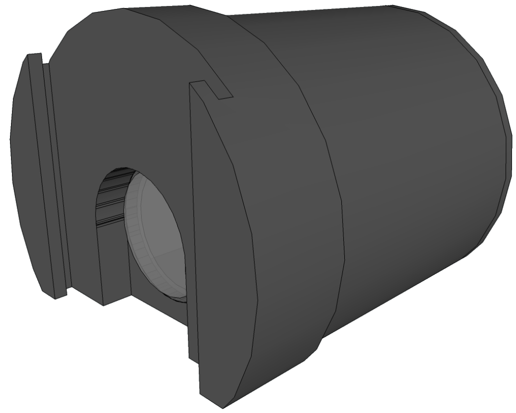
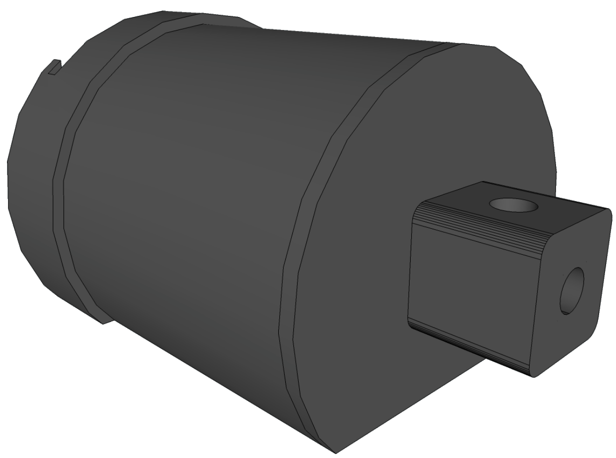


Plate holder attached

The rear of the unit has a block into which a support rod (included in the accessories set – see below) can be inserted, for mounting on an optical bench, or fitting to a clamp stand and boss.



Accessories Set

A set of accessories is available for the LED.white which enables a range of experiments. The kit contains two cylindrical, plano-convex +7D collimating lenses, five slit plate and holders, support rod, two EDF (extra dense flint) glass prisms and an experimental guide.

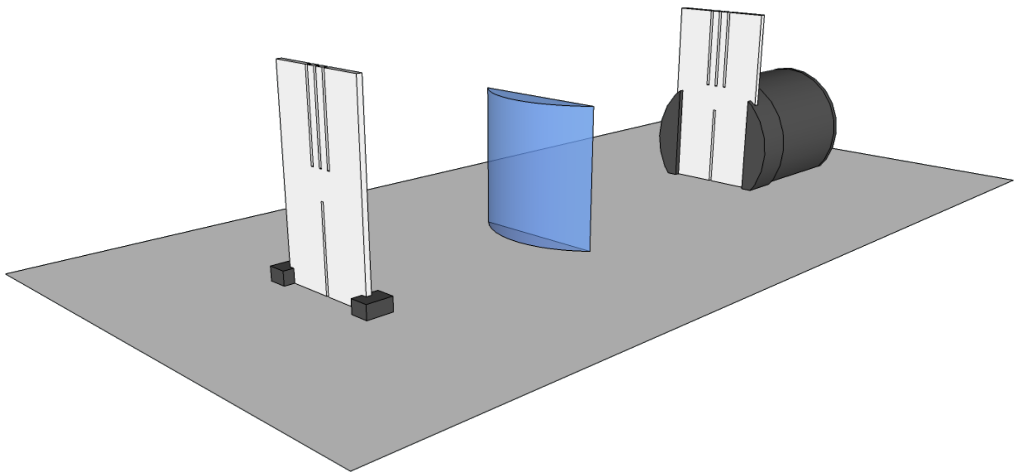
It is available from UNILAB under catalogue code F4L87359.

Producing a Parallel Beam

Ray optics experiments are best performed on a white surface. A large sheet of paper is suitable if no other surface is available.

Place a slit plate, with the single slit at the bottom, into the slit plate holder. Place a plano-convex lens in the path of the beam, and adjust the distance until the beam is parallel.

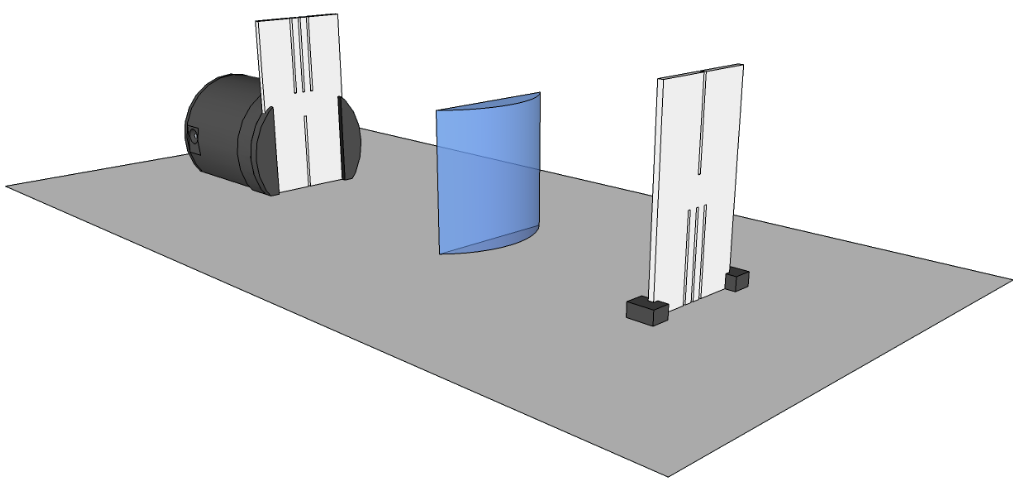
Place a second slit plate in the path of the light to produce a narrow ray.



Producing Three Parallel Beams

This is useful for investigating lenses and mirrors. The setup is similar to a single ray, but the second slit plate is inverted so the three slits are at the bottom.

Move the collimating lens back and forth to make the three beams as near parallel as possible for investigations with lenses.



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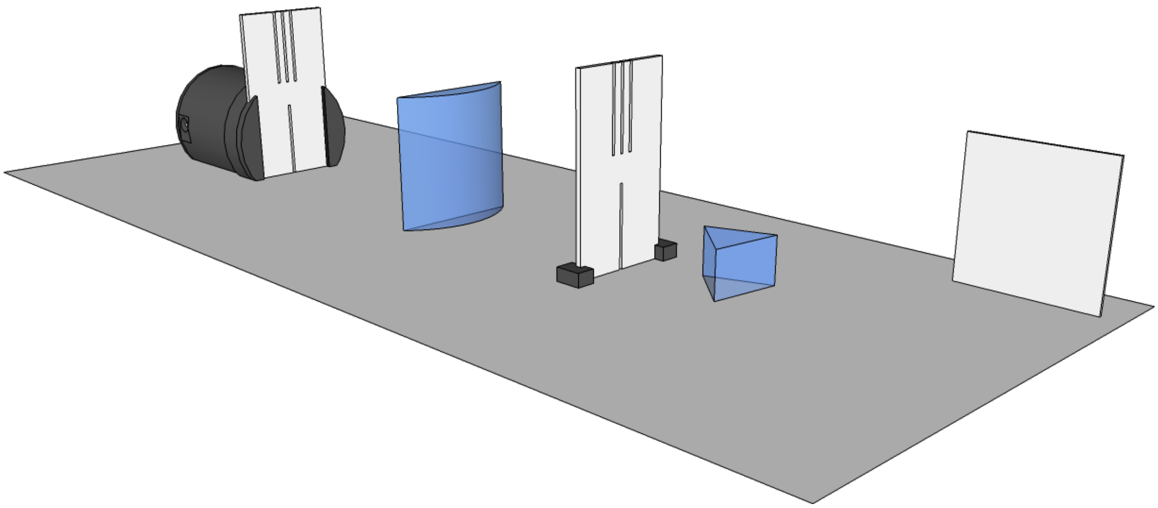
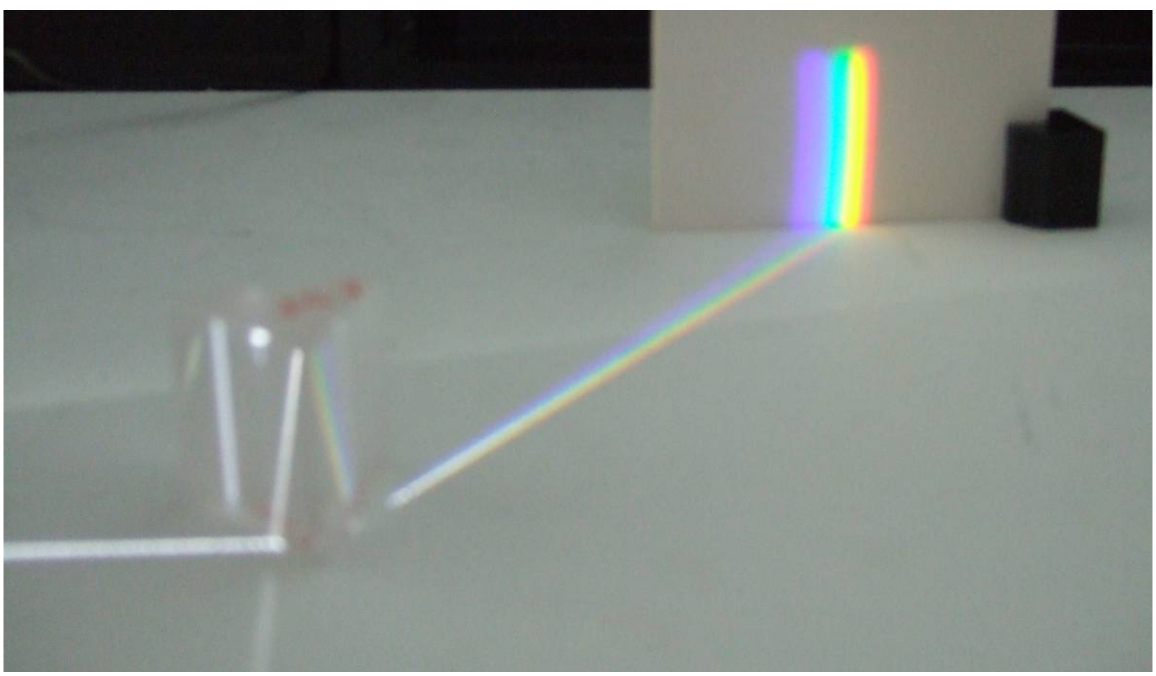
Producing a Spectrum

The EDF glass prism in the accessories set can be used to produce a spectrum from a ray of white light. Set up a single ray as described above. The prism has one frosted face, the apex *opposite* to the frosted face should be placed in the path of the ray.

A spectrum should leave the prism at an angle of about 45° from the incident ray. You may need to rotate the prism slightly to obtain the best spectrum. You should see the spectrum on the table, and it can be projected on to a small screen.



The spectrum is produced by refraction of light. Blue light is refracted more than red light, so they arrive at different positions on the screen.



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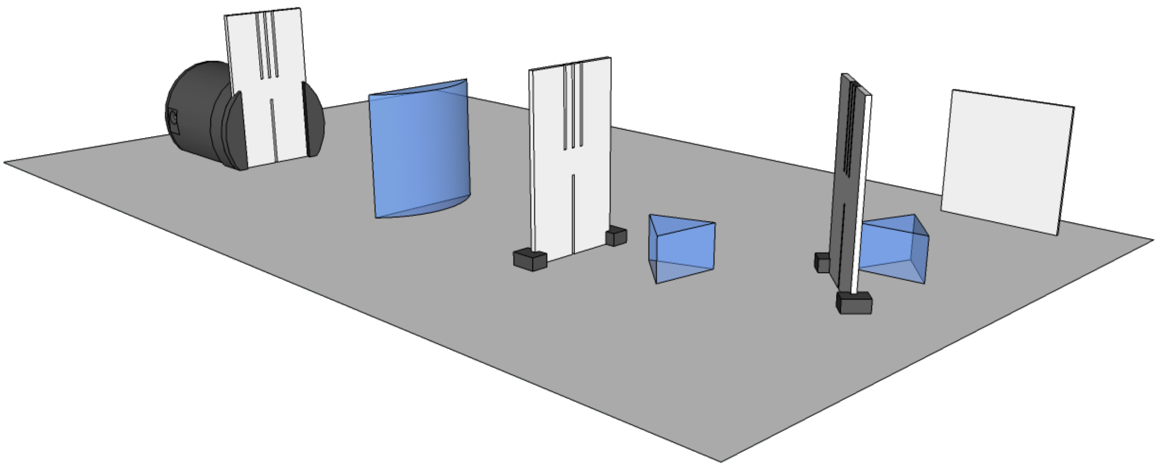
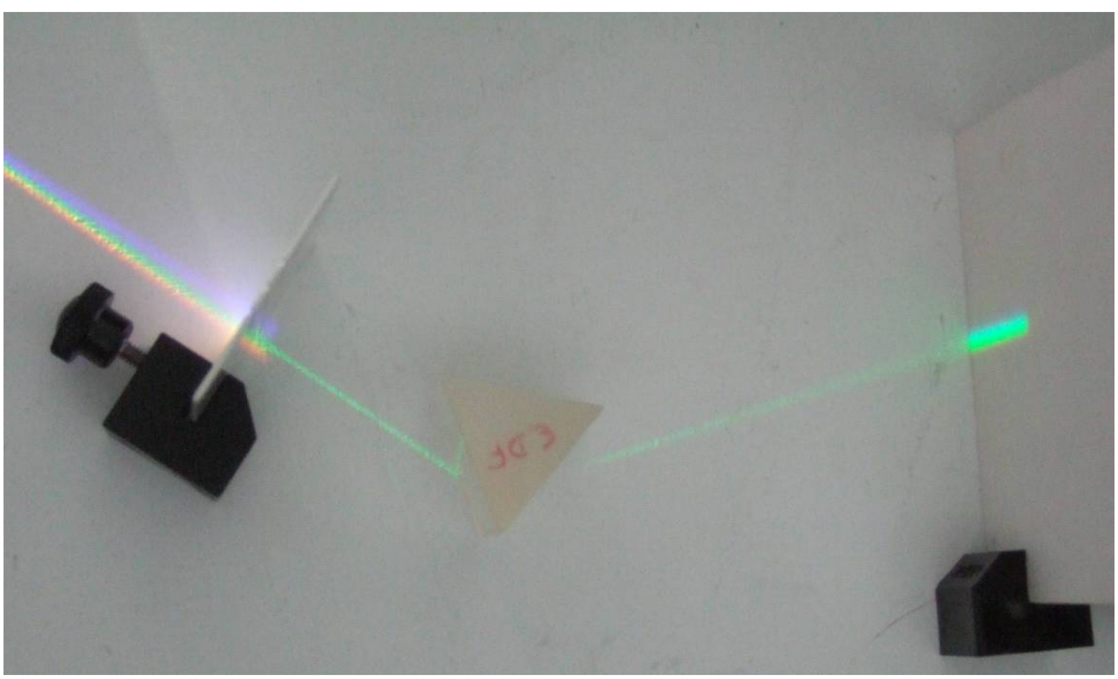
Newton's *Experimentum Crucis*

Set up a spectrum as described previously. The result: white light in, coloured light out. Is the prism adding the colour, or is the colour already there and the prism is simply sorting it out? Newton believed the latter, and his *experimentum crucis* demonstrated it.

Use another single slit to "select" one of the colours from the spectrum. Green is good, as it is in the middle. Now, place another prism in the path of this green ray in a similar fashion to the prism in the original white ray.



Place a screen to receive the light that comes out from this second prism. This time, the light that comes out is the same colour as the light that goes in. We have shown that the prism adds nothing to the light, it only bends it. Try "selecting" other colours from the spectrum and passing them through the prism to observe similar results.



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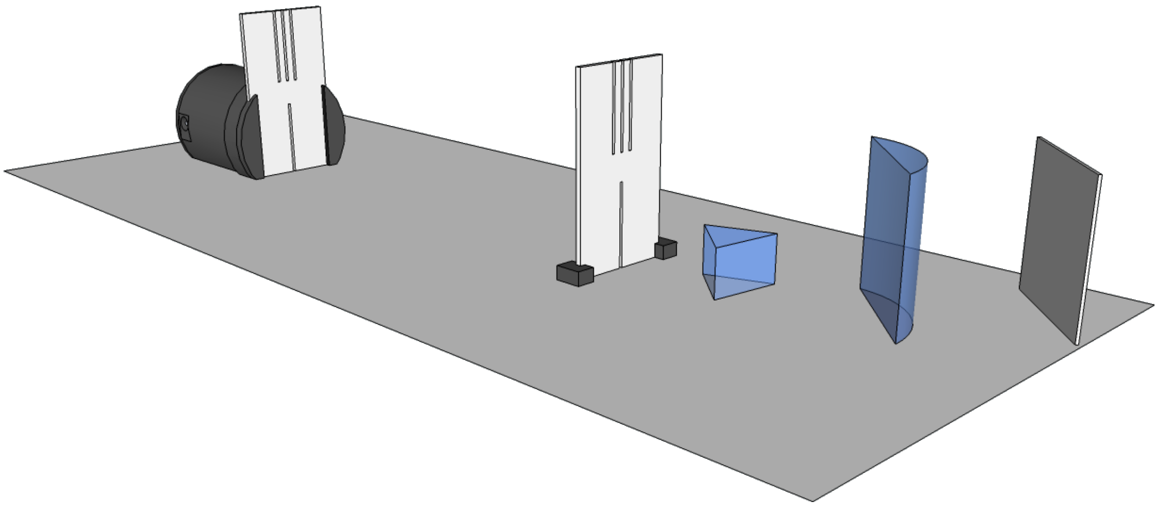
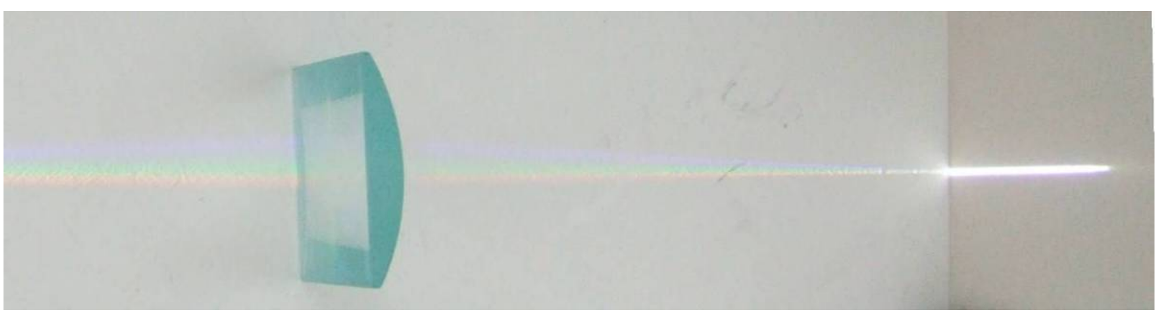
Newton showed that the prism was not adding any colour to the light, so the colours must have been present already in the white light. It is possible to take the colours and recombine them to make white light again.

Produce a spectrum as described previously, and place another plano-convex lens in the path of the spectrum. This should focus the colour beams to a single point, where the light should appear white again.



These simple experiments have shown that white light is made from all colours of light. In fact, white is not a colour, but a combination of all colours. Its opposite, black, is the absence of any colour.



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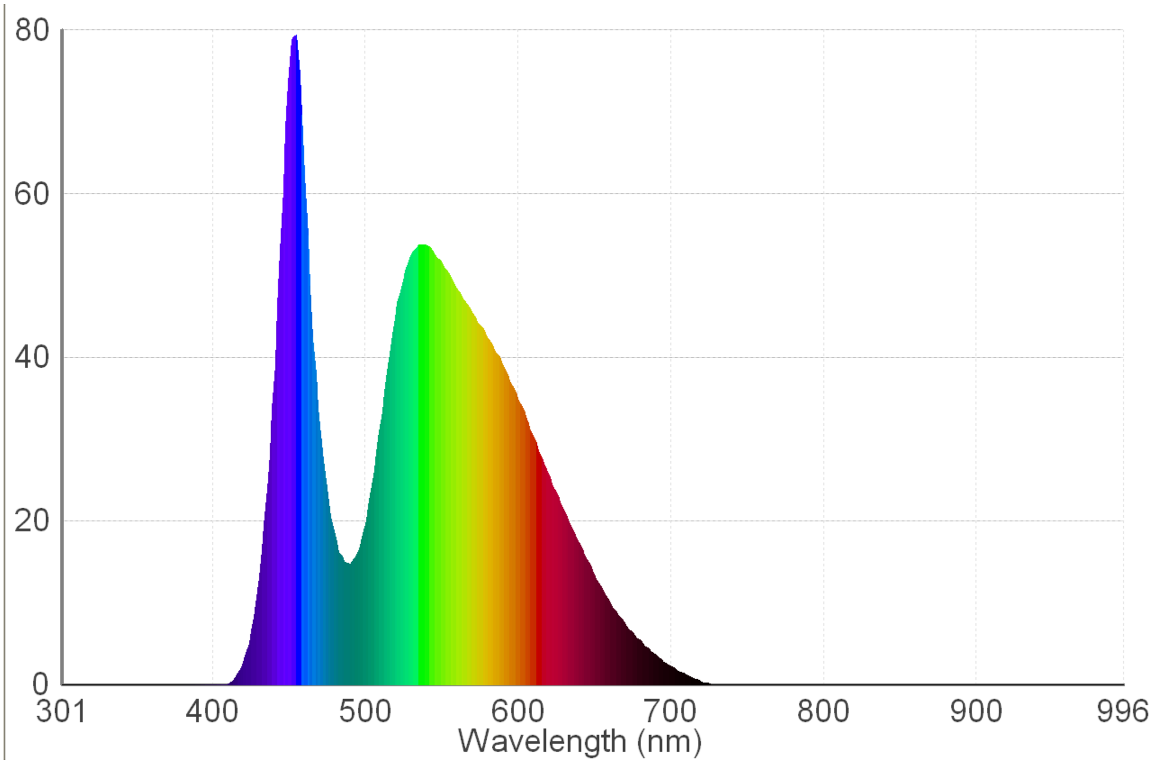
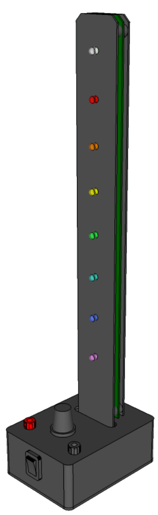
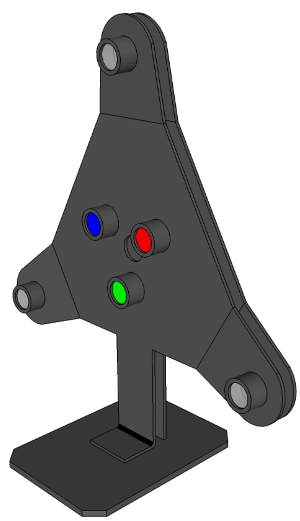
Below is a graph of the spectrum produced by the LED.white.



Other products in the UNILAB LED.range



LED.line F4J73433
A robust and attractive device for exploring the properties colour filters, measuring wavelengths of light and determining the relationship between photon energy and wavelength.



LED.mixer F4L75267
Investigate colour perception by mixing primary colours to make any colour you like, and give ordinary objects an eerie appearance!

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