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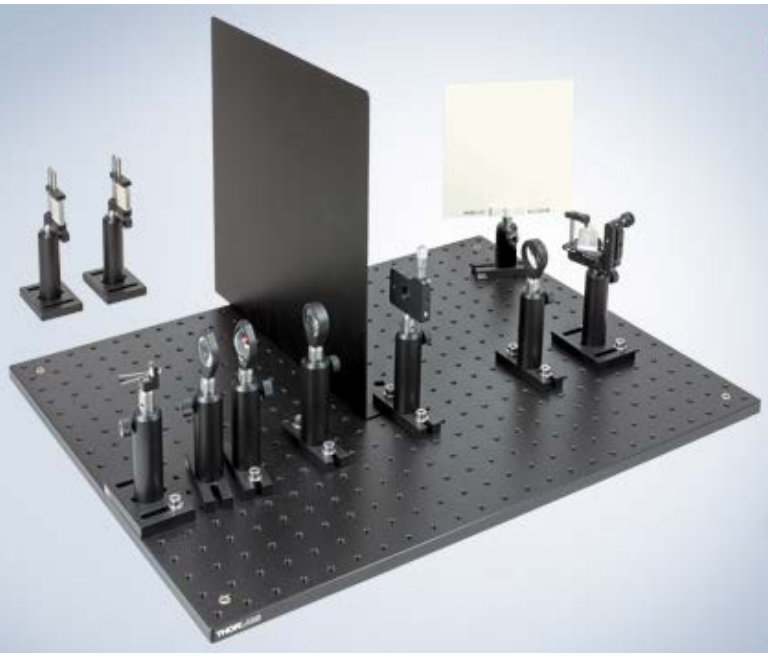
THORLABS

EDU-SPEB1 - July 30, 2020

Item # EDU-SPEB1 was discontinued on July 30, 2020. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

SPECTROMETER EDUCATIONAL KITS

- **Designed for Education, Demonstration, and Classroom Use**
- **Easy-to-Use Kits Include Components Plus Educational Materials**



Hide Overview

OVERVIEW

Choose Kit:

Basic Kit - EDU-SPEA1/M
or
Advanced Kit - EDU-SPEB1(/M)

(Close)

Click to Enlarge
EDU-SPEA1/M Educational Kit Showing the Spectrum of a White Light LED Source

Download Manual and Educational Materials

Spectrometer Educational Kits

- Designed for Educational, Demonstration, and Classroom Use
- Includes Extensive Manual for Easy Assembly and Use
- Choose from Educational Kits Containing Imperial or Metric Components

Experiment

- Study the Spectral Makeup of Various User-Provided Light Sources
- Basic Kit Includes Parts for a Grating-Based Spectrometer
- Advanced Kit Includes Parts for Grating- and Prism-Based Spectrometers

Thorlabs offers two spectrometer lab kits for educational use. The basic educational kit includes the components to build a grating-based spectrometer, while the advanced version contains components to build both a grating- and dispersing prism-based spectrometer. The advanced educational kit is

offered in both an imperial and metric version. Although grating- and prism-based spectrometers can both be used to observe the spectra of various light sources, they function using very different physical principles. The grating spectrometer provides insights into interference and the wave nature of light, while the prism spectrometer provides the opportunity to study various ray optics concepts, such as an optical material's index of refraction and dispersion.

Thorlabs Educational Products

Thorlabs' educational line of products aims to promote physics, optics, and photonics by covering many classic photonics experiments, as well as emerging fields of research. Each educational kit includes all the necessary components and a manual that contains both detailed setup instructions and extensive teaching materials. These lab kits are being offered at the price of the included components, with the educational materials offered for free. Technical support from our educational team is available both before and after purchase.

Purchasing Note: Both English and German language manuals/teaching information are available for our educational kits. The imperial version includes the English manual; please contact Tech Support to purchase it with the German manual. The appropriate manual will be included with the metric kit based on your shipping location. As with all products on our website, taxes are not included in the price shown below.

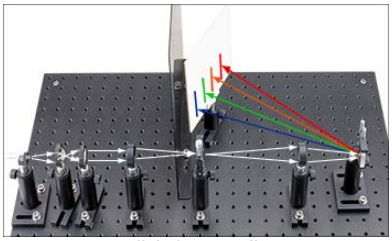
Hide Experiments

EXPERIMENTS

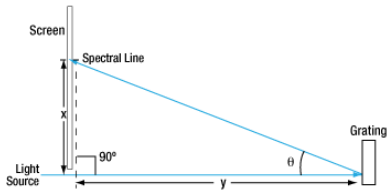
Thorlabs offers two spectrometer kits for educational use. The basic kit, EDU-SPEA1/M, includes the components to build a grating-based spectrometer, including a 1200 lines/mm diffraction grating. The advanced kit, the EDU-SPEB1(/M), contains all of the components of the basic kit, as well as an additional 600 lines/mm diffraction grating and equipment to build a dispersing prism-based spectrometer. The advanced kit is available with either imperial or metric versions of the kit components. Please note that the advanced kit contains a white LED while the basic kit does not include a light source. Other LEDs, lasers, gas discharge tubes, light bulbs, and many other light sources can all be analyzed with these kits.

Grating-Based Spectrometer

The grating-based spectrometer, included in both kits, uses a reflective ruled diffraction grating to separate the spectral components of light. As seen in the photo to the right, the light is focused on an adjustable slit using a series of lenses. The light exiting the slit passes through another lens and is incident on a 1200 lines/mm ruled diffraction grating. Light is diffracted off of the grating and is incident on the viewing screen. Since the angle of diffraction is wavelength dependent, light diffracting off of the grating is separated into different wavelengths and appears at different locations on the screen. Both emission line and broadband sources can be analyzed, and the wavelength of spectral components can be calculated.



Click for Details
Grating-Based Spectrometer Setup
Note: An LED Light Source is not included with the EDU-SPEA1/M basic spectrometer kit.



Click for Details
A drawing illustrating how students can determine θ_n by measuring the location of a spectral line.

The experiment is set up so that the simple grating equation can be used:

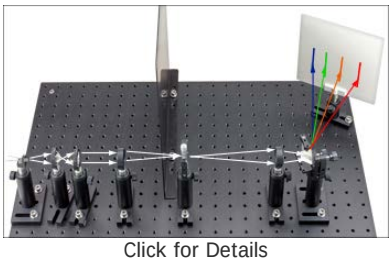
$$\sin\theta_n = \frac{n\lambda}{g} \qquad n = 1, 2, \ldots$$

where θ_n is the angle at which the light incident on the grating leaves the grating, λ is the wavelength of the light forming the spectral line, and g is the grating spacing. Students can calculate θ_n by measuring the distance between the grating and the plane of the slit and the distance between the light path entering the slit and first order spectral line, as shown in the figure to the left. They can then use this number to determine the wavelength of the spectral lines visible on the screen.

Additionally, the interference properties of the diffraction grating can be studied with this spectrometer.

Prism-Based Spectrometer

The prism-based spectrometer, included in the EDU-SPEB1(/M) advanced kit, uses an equilateral dispersing prism to separate the spectral components of light. As seen in the photo to the right, light is focused on an adjustable slit using a series of lenses. The light exiting the slit passes through another lens, which focuses it onto the viewing screen after passing through the equilateral dispersing prism. Light of different wavelengths is refracted at different angles through the prism, so the light is



Click for Details
Prism-Based Spectrometer Setup

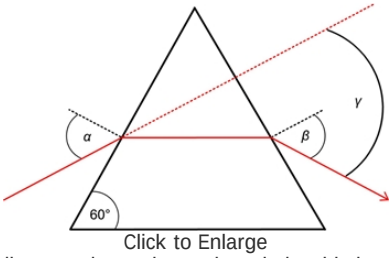
separated into its spectral components when viewed on the screen. As with the grating-based kit described above, both emission line and broadband sources can be analyzed.

Additionally, the refractive properties of the prism can be studied. For example, the index of refraction of the prism can be found by measuring the angle of minimum deviation. The angle of minimum deviation is represented by *γ* in the figure to the lower left. It is defined as the angle between the light entering and exiting the prism when the light passing through the prism is parallel to the prism's base. For the prism used in this experiment, the angle of minimum deviation is related to the refractive index by the following equation:

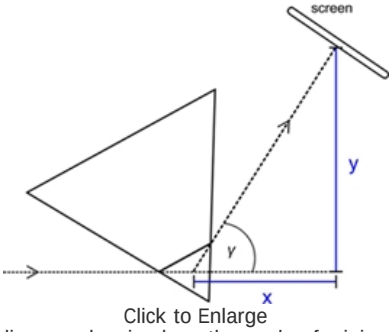
$$n = \frac{\sin\left(\frac{\gamma+60^\circ}{2}\right)}{\sin 30^\circ}$$

Students can measure the angle of minimum deviation by adjusting the position of the screen and prism angle to produce the sharpest possible image of the incident light source. The x and y distances shown in in the figure to the right can be measured to determine γ, which is then used to calculate the refractive index of the prism.

We also offer similarly priced compact CCD-based spectrometers, which can be used for demonstration and provide quantitative spectral measurements.



Click to Enlarge
The diagram above shows the relationship between the angle of minimum deviation and the light entering the prism.



Click to Enlarge
A diagram showing how the angle of minimum deviation can be measured using the advanced educational spectrometer kit.

Hide Kit Components

KIT COMPONENTS

Spectrometer Kit Components

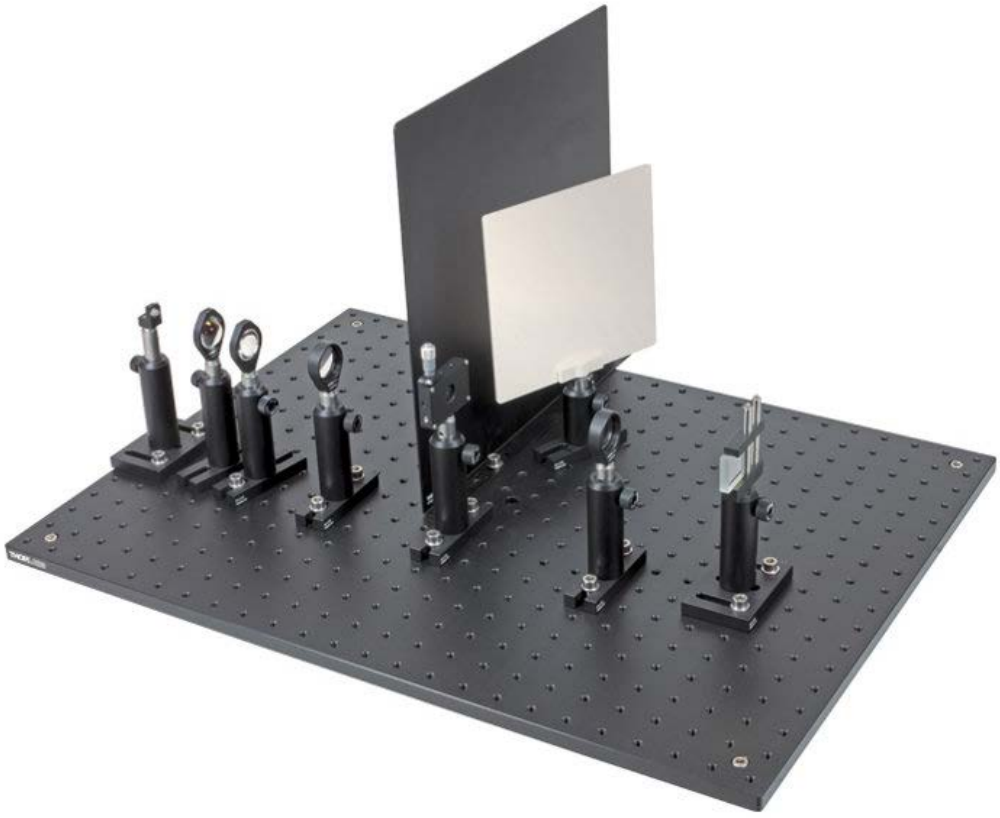
Thorlabs' Spectrometer kits have been carefully engineered to be easy to set up and to give clear, reliable results. The kits is built using stock Thorlabs components, making it possible to expand the scope of the experiment by purchasing additional components.

Light Sources Note: The LEDWE-15 white LED is included in the advanced spectrometer kit and is available separately for use with the basic spectrometer kit. Many other light sources including LEDs, lasers, gas discharge tubes, and light bulbs can be analyzed. If you would like to use a lamp with the spectrometer, the QTH10 Quartz Tungsten-Halogen Lamp provides a compact, economical option. The lamp's 10 W bulb has a lower intensity than the LEDWE-15 LED, but still produces a detectable spectrum.

Diffraction Gratings Handling Warning: Optical gratings can be easily damaged by moisture, fingerprints, aerosols, or the slightest contact with any abrasive material. Gratings should only be handled when necessary and always held by the sides. Latex gloves or a similar protective covering should be worn to prevent oil from fingers from reaching the grating surface. No attempt should be made to clean a grating other than blowing off dust with clean, dry air or nitrogen. Solvents will likely damage the grating's surface.

Purchasing Note: The EDU-SPEA1/M basic spectrometer kit ships from stock with metric components only; to purchase this kit with imperial components, contact Thorlabs' Tech Support. The EDU-SPEB1 advanced kit includes imperial components, while the EDU-SPEB1/M advanced kit includes metric components. Both English and German language manuals/teaching information are available for these products. The appropriate manual will be included based on your shipping location.

Basic Kit - EDU-SPEA1/M



EDU-SPEA1/M Grating-Based Spectrometer

EDU-SPEA1/M Kit Components[a]		
	Description	Qty.
	LED Mount	1
)U	Condenser Lens	2
	Ø1" Optic Mount	2
	Focusing Lens	1
	Ø1" Lens Mount	2
	Variable Slit	1
	Collimating Lens	1
05	1200 lines/mm Diffraction Grating	1
	Diffraction Grating Mount	1
1/M	Viewing Screen	1
M	Optical Breadboard	1
	Breadboard Feet	4
	75 mm Long Optical Post	7
	75 mm Long Post Holder	7
	50 mm Long Optical Post	1
	50 mm Long Post Holder	1
	Post Holder Base, 25 mm x 75 mm x 10 mm	6
	Post Holder Base, 50 mm x 75 m x 10 mm	2
TPS5	Laser Safety Screen, 305 mm x 305 mm	1

- All required hex keys are included with this kit.

Metric Kit: Included Hardware and Screws

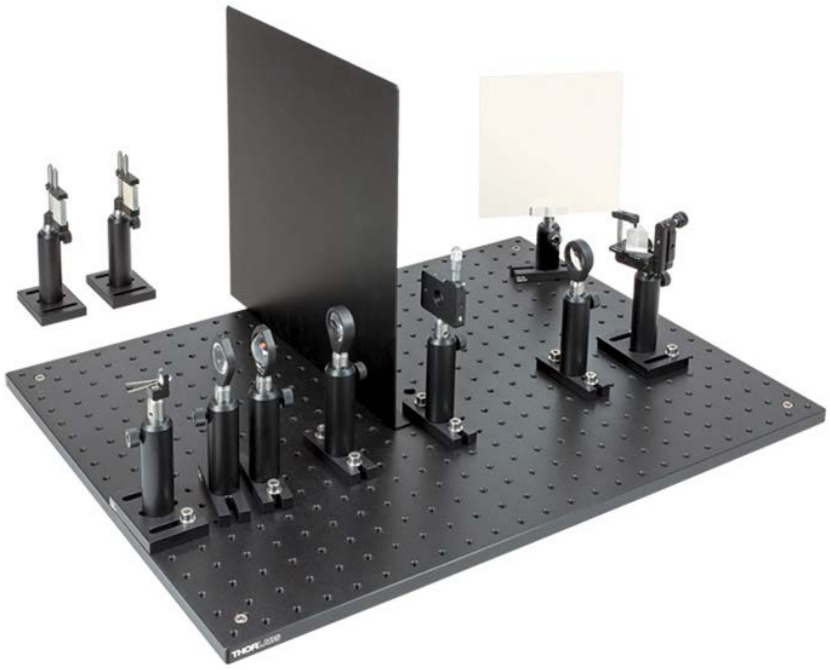
Item #	Description	Qty.
SH4MS06[a]	M4 x 6 mm Long Cap Screw	1
SH6MS12[b]	M6 x 12 mm Long Cap Screw	8
SH6MS16[b]	M6 x 16 mm Long Cap Screw	10
SH6MS20[b]	M6 x 20 mm Long Cap Screw	4
-	M6 Washer	10
-	M6 Nuts	4
BD-5ML	5 mm Balldriver	1
-	1.3 mm Hex Key	1
-	2.0 mm Hex Key	1
-	3.0 mm Hex Key	1

- This kit contains the number of screws indicated in the Qty. column. Replacement screws, which are sold in packages of 50, are available by ordering the Item # listed.
- This kit contains the number of screws indicated in the Qty. column. Replacement screws, which are sold in packages of 25, are available by ordering the Item # listed.

Advanced Kit - EDU-SPEB1(/M)

EDU-SPEB1(/M) Kit Components[a]

This advanced spectrometer kit is offered in both an imperial (EDU-SPEB1) and a metric version (EDU-SPEB1/M). For components listed in the table to the right that have a different part number in the imperial and metric kits, the metric part number and dimensions are indicated by parentheses. The advanced kit includes all of the components in the basic kit, plus an equilateral dispersing prism, an additional grating, five white LEDs, and extra mounting hardware. This kit can be configured as either a grating- or prism-based spectrometer, and it includes diffraction gratings with two different line spacings.



EDU-SPEB1(/M) Configured as a Prism-Based Spectrometer

Item #	Description	Qty.
LEDMF	LED Mount	1
LEDWE-15[b]	White LED, Pkg. of 5	1
ACL2520U	Condenser Lens	2
FMP1 (FMP1/M)	Ø1" Optic Mount	2
LB1471	Focusing Lens	1
LMR1 (LMR1/M)	Ø1" Lens Mount	2
VA100 (VA100/M)	Variable Slit	1
LB1676	Collimating Lens	1
GR25-1205	1200 lines/mm Diffraction Grating	1
GR25-0605	600 lines/mm Diffraction Grating	1
CH1A	Diffraction Grating Mount	2
PS858	Equilateral Dispersing Prism	1
KM100PM (KM100PM/M)	Adjustable Prism Mount	1
PM3/M	Clamping Arm for Prism Mount	1
EDU-VS1 (EDU-VS1/M)	Viewing Screen	1
MB1824 (MB4560/M)	Optical Breadboard	1
RDF1	Breadboard Feet	4
TR3 (TR75/M)	3" (75 mm) Long Optical Post	9
PH3 (PH75/M)	3" (75 mm) Long Post Holder	9
TR2 (TR50/M)	2" (50 mm) Long Optical Post	1
PH2 (PH50/M)	2" (50 mm) Long Post Holder	1
BA1 (BA1/M)	Post Holder Base, 1" x 3" x 3/8" (25 mm x 75 mm x 10 mm)	6
BA2 (BA2/M)	Post Holder Base, 2" x 3" x 3/8" (50 mm x 75 m x 10 mm)	4
TPS5	Laser Safety Screen, 12" x 12" (305 mm x 305 mm)	1

Imperial Kit: Included Hardware and Screws

Item #	Description	Qty.
SH8S025[a]	8-32 x 1/4" Long Cap Screw	1
SH25S050[b]	1/4"-20 x 1/2" Long Cap Screw	10
SH25S063[b]	1/4"-20 x 5/8" Long Cap Screw	12
SH25S075[b]	1/4"-20 x 3/4" Long Cap Screw	4
W25S050[c]	M6 Washers	12
-	1/4" Nuts	4
BD-3/16L	1/4"-20 Ball Driver	1
-	3/32" Hex Key	1

- All required hex keys are included with this kit.
- The LED requires a simple, user-provided circuit to operate, including a battery or DC power supply, and a resistor. See the operating manual for more details.

Metric Kit: Included Hardware and Screws

Item #	Description	Qty.
SH4MS06[a]	M4 x 6 mm Long Cap Screw	1
SH6MS12[b]	M6 x 12 mm Long Cap Screw	10
SH6MS16[b]	M6 x 16 mm Long Cap Screw	12
[b]	M6 x 20 mm Long Cap Screw	4

-	0.050" Hex Key	1
-	5/64" Hex Key	1
-	1/8" Hex Key	1

- a. This kit contains the number of screws indicated in the Qty. column. Replacement screws, which are sold in packages of 50, are available by ordering the Item # listed.
- b. This kit contains the number of screws indicated in the Qty. column. Replacement screws, which are sold in packages of 25, are available by ordering the Item # listed.
- c. This kit contains the number of washers indicated in the Qty. column. Replacement washers, which are sold in packages of 100, are available by ordering the Item # listed.

SH6MS20		
W25S050[c]	M6 Washers	12
-	M6 Nuts	4
BD-5ML	M6 Ball Driver	1
-	1.3 mm Hex Key	1
-	2.0 mm Hex Key	1
-	3.0 mm Hex Key	1

- a. This kit contains the number of screws indicated in the Qty. column. Replacement screws, which are sold in packages of 50, are available by ordering the Item # listed.
- b. This kit contains the number of screws indicated in the Qty. column. Replacement screws, which are sold in packages of 25, are available by ordering the Item # listed.
- c. This kit contains the number of washers indicated in the Qty. column. Replacement washers, which are sold in packages of 100, are available by ordering the Item # listed.

Hide Acknowledgements

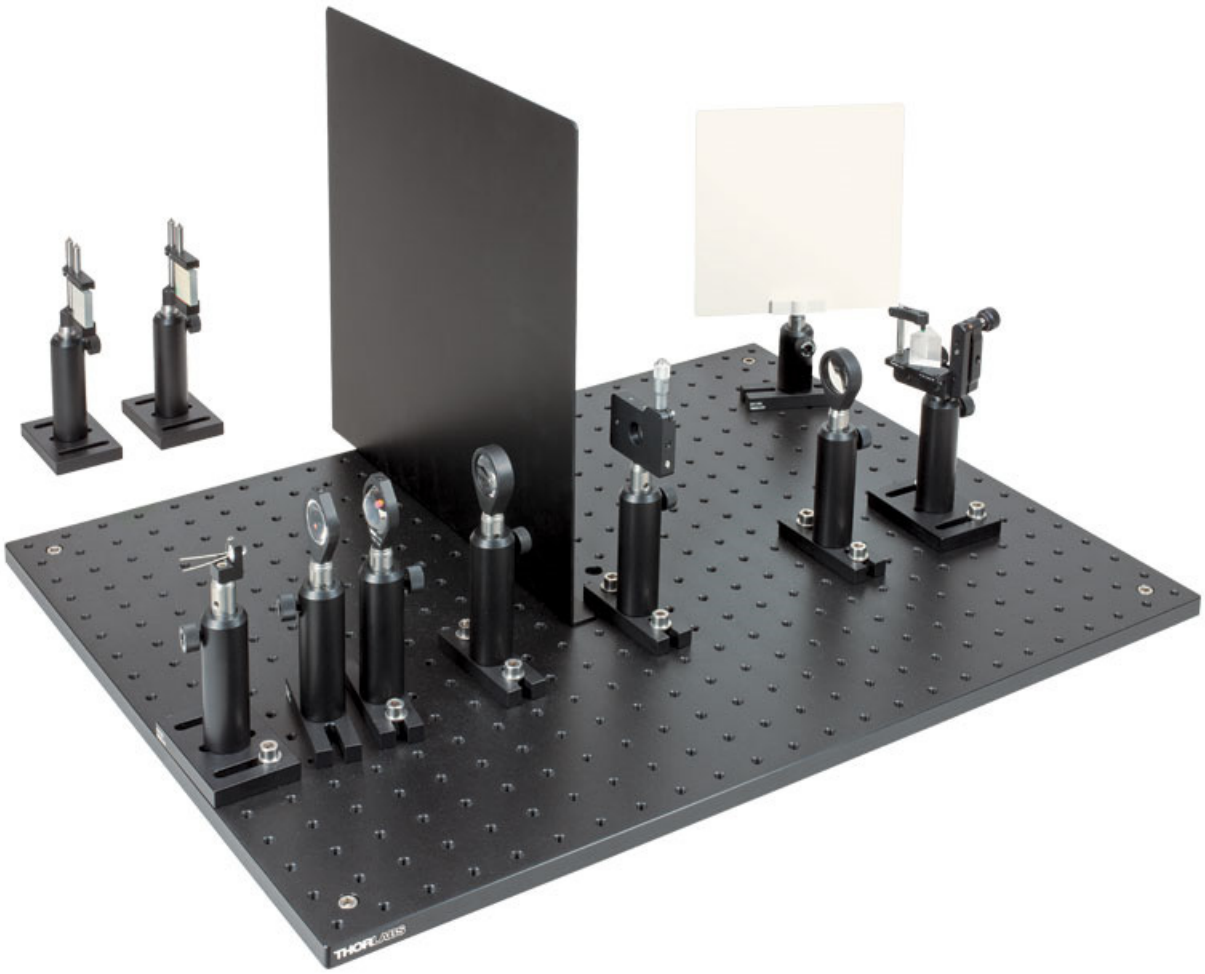
ACKNOWLEDGEMENTS

We cordially thank Antje Bergmann and Stefan Reich (Karlsruhe Institute of Technology) for sharing their design for an educational spectrometer.

Do you have ideas for an experiment that you would like to see implemented in an educational kit? Contact us at techsupport@thorlabs.com; we'd love to hear from you.

Hide Part Numbers

Part Number	Description	Price	Availability
EDU-SPEA1/M	**Basic Educational Spectrometer Kit, Metric**	**$1,297.11**	**5-8 Days**
EDU-SPEB1/M	**Advanced Educational Spectrometer Kit, Metric**	**$1,740.82**	**Today**
EDU-SPEB1	**Advanced Educational Spectrometer Kit, Imperial**	**$1,740.82**	**Today**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