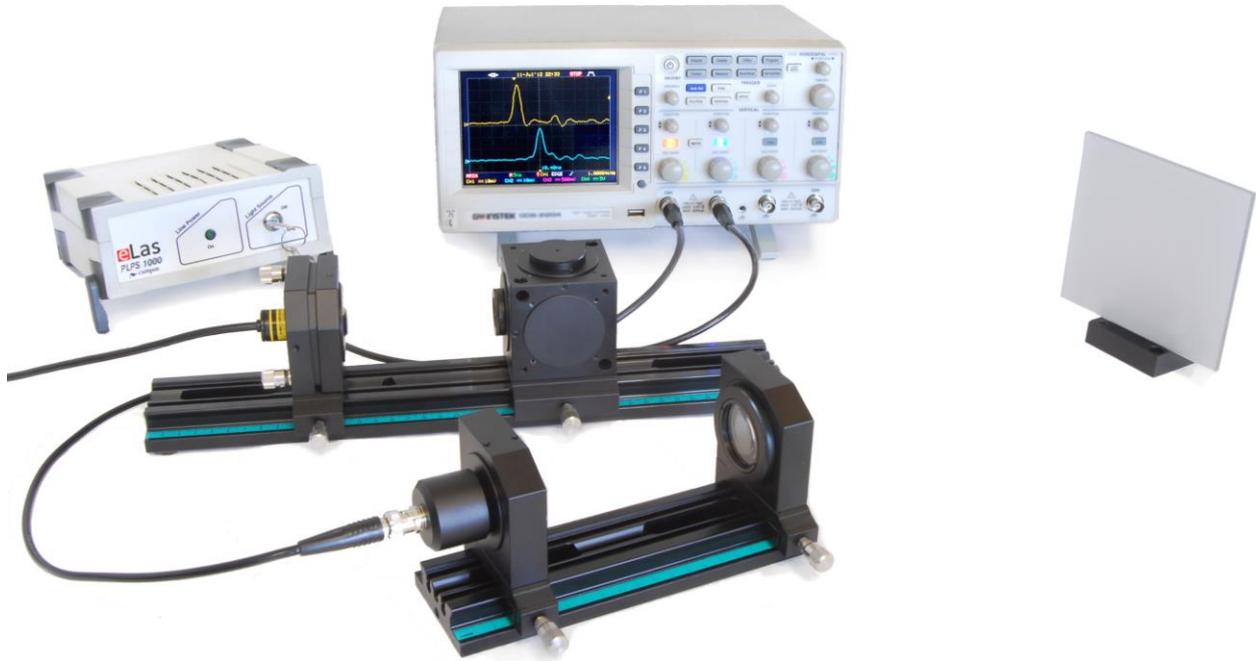


Laser Rangefinder Basic (CA-1345)



This educational kit shows the basics of distance measurement with pulsed lasers. The application, also known as LIDAR (**L**ight **D**etection **A**nd **R**anging), works like RADAR (**R**adio **D**etection **A**nd **R**anging), but uses light instead of radio waves. The LIDAR system sends light to a target which scatters the light back. Hereby the pulse energy and the focusability as well as the amount of scattered light define the maximum detection range. On the other hand, the laser pulse width limits the resolution of the measurement system.

After assembling the range finder kit distance measurements can be performed. The pulsed laser module sends short and intensive pulses towards the provided target or an object of interest. A trigger signal generated by

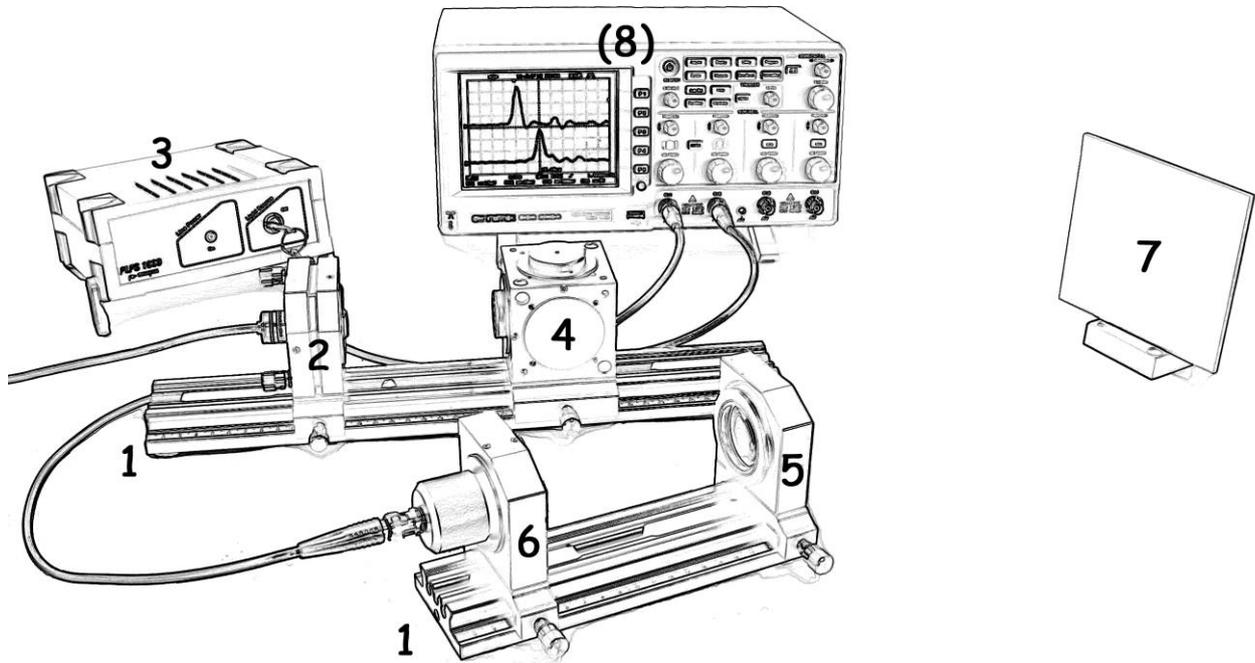
reference pulses starts the measurement and synchronizes one channel of an oscilloscope (optionally available). The time of flight of the backscattered laser pulses determine the distance of the measured object. The pulse temporal width reaches below 5 ns and distances of less than 40 cm can still be measured in the laboratory environment. High peak power and low beam divergence allows the measurement of targets in distances of several tens of meters, still with a standard InGaAs detector. Since the laser module emits at 1535 nm, the laser radiation lays in the eye safe wavelength range.

This educational kit requires a two channel 100 MHz oscilloscope (optional available).

Educational Objectives of Investigation

- Pulsed Laser Module
- Light Echoes
- Time of Flight
- LIDAR
- Velocity of Light
- InGaAs Photo Detector

Setup and Components of the basic kit



- 1 Flat rail 200 mm and flat rail 400 mm with scales
- 2 Pulsed laser module in θ/φ adjustment holder
- 3 Pulse laser power supply PLPS 1000
- 4 Rotatable beam scattering plate in holder, with collimation lens and reference pulse detector
- 5 Imaging optics for measurement pulse
- 6 Detector for measurement pulse in holder
- 7 Scattering screen for distance measurement
- 8 Optionally available: Two-channel oscilloscope 100 MHz
- 9 IR detector card 800 nm – 1600 nm (not shown)
- 10 2 BNC cables with BNC T pieces and 50 Ω shunts (not shown)
- 11 User manual (not shown)

Ordering Information

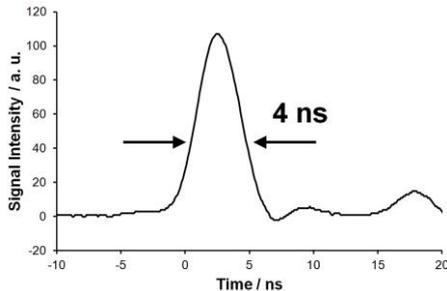
For ordering the Laser Range Finder Basic kit (CA-1345)

use ordering number: 490091345

Measurements and Handling

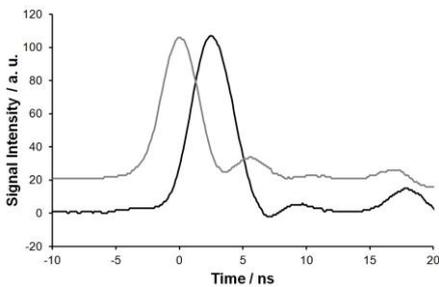
Some of the possible measurements are presented in the following list:

- **Pulse width of q-switched laser module**



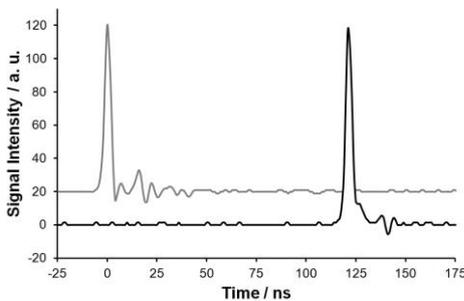
The laser in use is a q-switched laser module with a pulse width of less than 5 ns. With an oscilloscope of 100 MHz or better, the pulse width can be displayed and measured on the oscilloscope screen. It must be taken care, not to saturate the detector. Otherwise the measured pulse width is too large. With its radiation wavelength of 1535 nm the laser is in the eye safe emission region.

- **Resolution of range sensing**



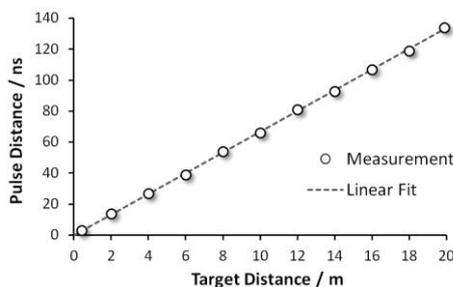
With a pulse width of less than 5 ns, target distances of as short as 40 cm can easily be resolved. Especially for such short distances it must be taken care, not to saturate the measurement detector. A saturated signal may show a pulse elongated by several hundreds of nanoseconds. In the example on the left picture the pulse distance is 2,3 ns which corresponds to a target distance of 35 cm.

- **Long distance measurements**



Due to the high peak power and low beam divergence of the laser module, measurements of several tens of meters can be performed. In the example on the left picture the pulse distance is 120 ns which correspond to a target distance of 18 m.

- **Evaluation of speed of light**



A measurement of time of flight values for a series of distances can be performed. The slope of a linear fit of the data points is related to the speed of light. If big bodies of transparent materials are available, the index of refraction of these materials can be determined (note: the laser emits in the infrared range).

- **Possible extension**

The kit can be used for a measurement of the length of a glass fiber. A suited fiber and mechanics for coupling laser light in the fiber is offered by eLas and can be ordered optionally.

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