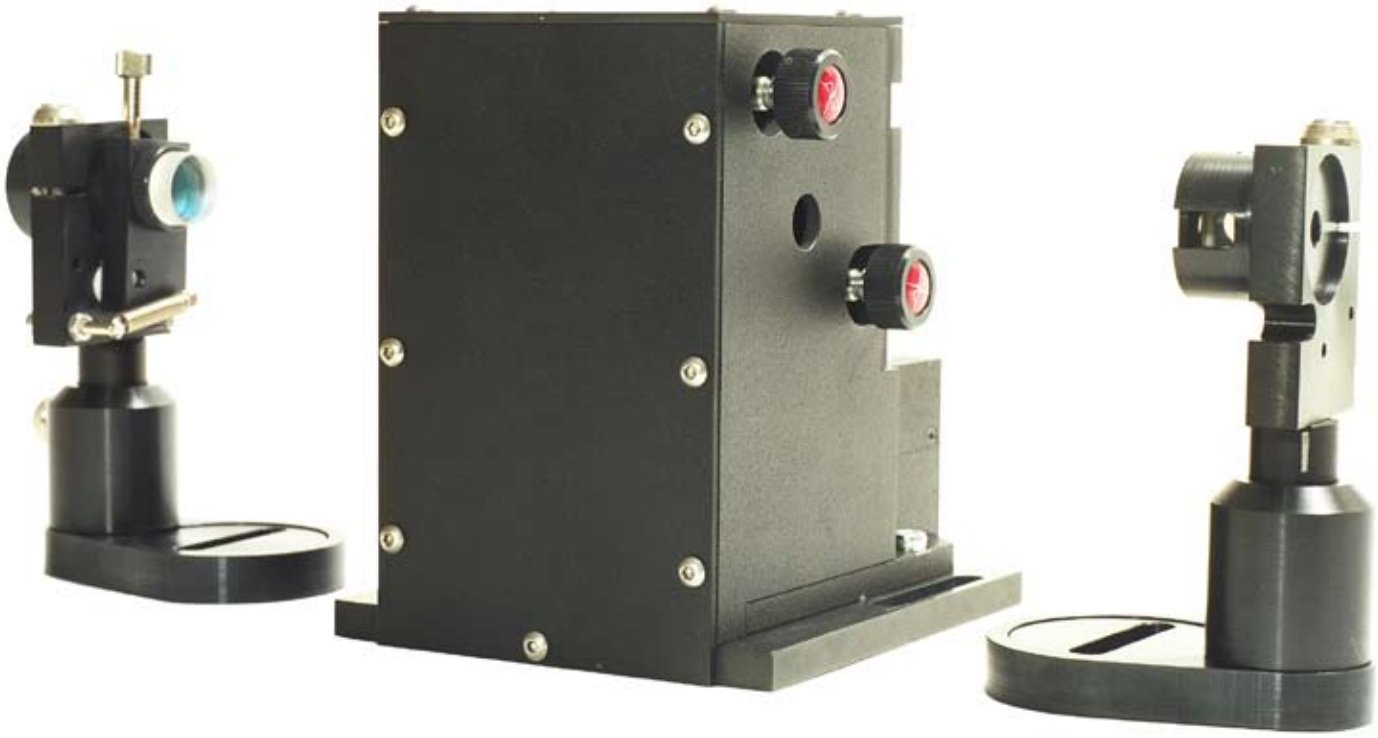
Pismo Pulse Pickers

Electro-optical Ultrafast Shutters



As the name implies pulse pickers are used to selectively pick off pulses from the pulse train of a femtosecond or picosecond laser. Pismo pulse picker models are available as stand-alone devices that use a Pockels cell as an ultrafast shutter. These pulse pickers allow a wide range of control over the repetition rate of the pulse train. A single pulse can be selected from the pulse train at a fixed frequency, increasing the contrast of the signal. All models include a Pockels cell and synchronization unit, delay generator, and high voltage driver unit. The pulse picker operation is based on the linear electro-optic effect (Pockels effect). Pockels cells use an applied electric field produces a birefringence in the cell that is proportional to the electric field. The Pockels cells included with the pulse pickers are made with a Deuterated Potassium Dihydrogen Phosphate (DKDP) crystal. DKDP is an optical material known for its wide transparency range and high optical damage threshold.

A pulse picker is used to pick out single optical pulses of picosecond or femtosecond duration from a sequence of pulses and for controlling femtosecond multipass and regenerative amplifiers.

Features:

- Single pulse selection from train of pulses
- External RF or optical signal trigger synchronization
- High voltage electrical pulse with adjustable delay
- High voltage electrical pulse with adjustable amplitude
- Two additional delayed pulses for measurement purposes
- Easy installation and alignment
- High efficiency and contrast ratio
- Rugged design

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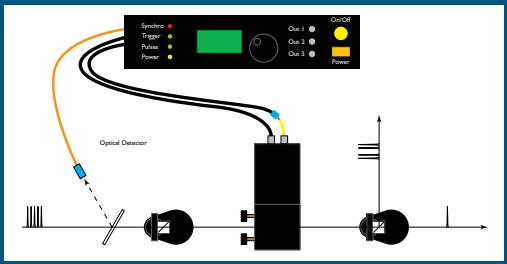
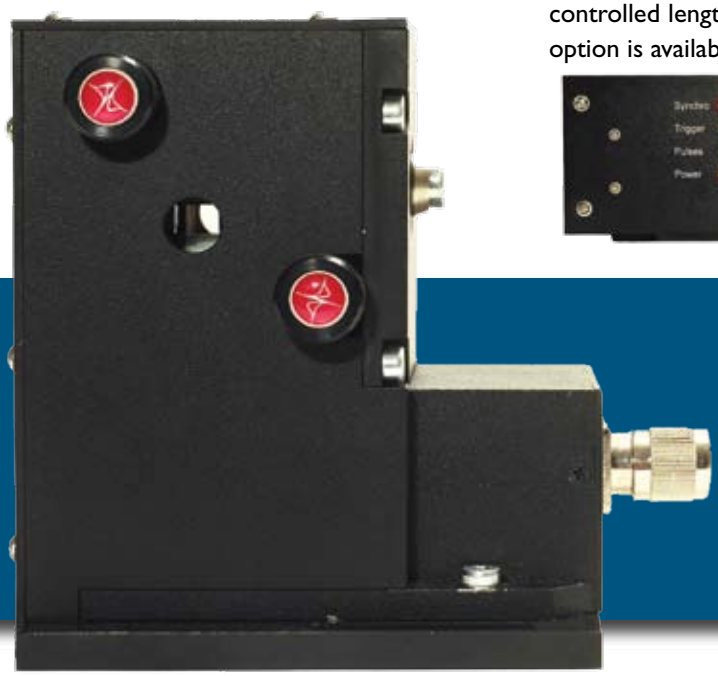


An electro-optical crystal (DKDP) is placed between two polarizers oriented at a 90° angle to one another. Linearly polarized light passes through the first polarizer. By applying a high voltage (~ 10 kV) to the electro-optical crystal an induced birefringence occurs. When the birefringent phase difference reaches /2, polarization is rotated by 90° and linearly polarized light freely passes through the second polarizer. When no voltage is applied the polarization does not rotate and the second polarizer blocks the light.

Technical Data	
Output Voltage	4-8 kV or 8-12 kV (depending on model)
Rise Time	< 1ns
Pulse WIdth	< 4 ns
Jitter	< 0.2 ns
Trigger Imput	Optical or TTL Electrical
RF Synch Input	50-100 MHz
Adjustable Delay	0-4 μs

The Pismo control unit provides five output pulses with precise timing delays that can be synchronized with various signals. Each delay channel consists of a 12 bit digital delay with 50MHz clock frequency and an approximately 40 ns range of continuous delay. 50 MHz delay oscillator is phase-triggered, so that no one period jitter occurs. In addition to the five delay channels, the control box contains two 12-bit frequency dividers with prescalers. All delays have a common start. The triggering signals for starting the delay can be chosen from two external inputs (TTL and wide range adjustable) and frequency dividers. This triggering signal can be synchronized with an optical signal (built-in Si or InGaAs sensor with fiber-optic input), one of two external sources of RF, an internal 100MHz crystal or can stay unsynchronized. Delays function in one of five modes: free running, skipped, enabled, single shot asynchronous and single shot synchronous. In the free running mode every triggering pulse causes a delayed output pulse at every channel, except when there is a frequency overrun. If the time between two triggering pulses is less then admissible, the second pulse will be ignored. In skipped mode some channels act every time, and some act only after a skipping signal edge takes place at the nearest subsequent triggering pulse. Enabled mode is like skipped mode, but output pulses are present if skipping signal has high level. In the single shot asynchronous mode delay, output pulses appear at the nearest subsequent to single shot command triggering pulse. The command can be given from an on-screen menu, from an external button (optional) or a trough RS-232C interface. Single shot synchronous mode, in contrast to asynchronous mode, gives output pulses only after first skipping signal following single shot command. Any delay channel can be separately turned into both skipped (behavior according to mode) and unskipped mode (output pulse at every triggering pulse). The control unit can also produce output pulse bursts with controlled length at every skipping signal edge or single pulse command. This option is available only in skipped and single pulse modes.

External View of Control Unit



Almost all of the device settings for the Pismo control unit are controlled with one knob on the front of the unit. Parameters of interest are selected with the help of hierarchical menus, which appears at LCD display.

The electro-optic Pockels cell is driven by high voltage pulses (duration ~ 6 ns at level 10% of maximum) controlled by the electronics synchronization unit.

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