# pulseSelect

## Low Dispersion Pulse Picker with Full Pulse Picking Rate Flexibility Down to $f_{rep}/2$

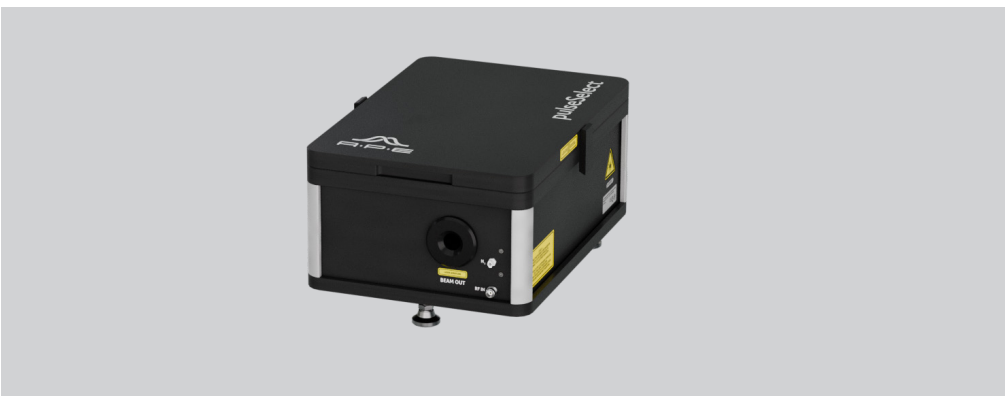
### Optimal Repetition Rate

APE's pulseSelect is a single-pulse acousto-optical selector designed specifically for the requirements of femtosecond laser microscopy. Pulse broadening, which can blur microscopic images, is avoided by the low dispersion design of the pulseSelect. Our pulse picker is therefore an optimal solution for reducing the repetition rate of ultrashort pulse lasers while maintaining short pulses.

The pulse repetition rate can be adapted to the experiment or sample using the internal frequency divider or an external trigger source. Output repetition rates between single shot and $f_{rep}/2$ are possible, for example to measure the decay curves of florescence. For maximum stability, the phase of the RF carrier frequency is synchronized to the repetition rate of the used laser.

Versions are available for different wavelength ranges and laser repetition rates for both fs and ps lasers. Models outside the specified ranges are available on request.

Two variants are available for particular demands: pulseSelect Dual serial provides an even higher contract ratio while pulseSelect Dual parallel is able to simultaneously select two synchronized laser beams.



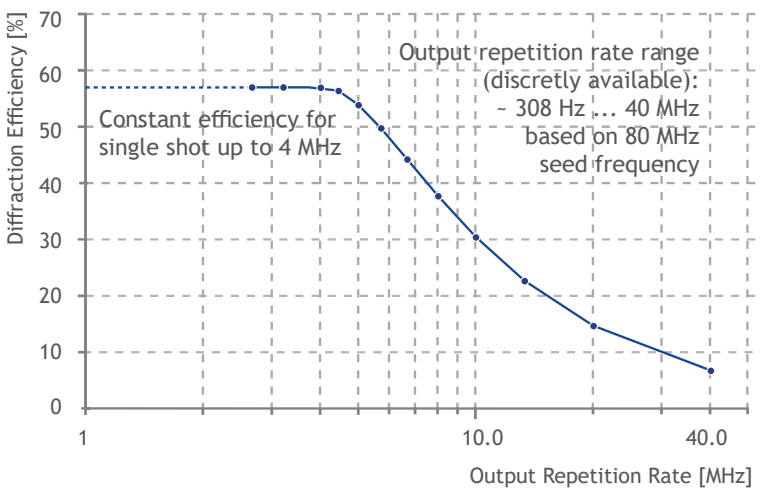

- Easily reduce the repetition rate of mode-locked lasers
- Low dispersion for clear microscopic images
- Customizable output rates from single shot to $f_{rep}/2$
- Suitable for femtosecond and picosecond lasers
- Different versions tailored to requirements

# pulseSelect Single

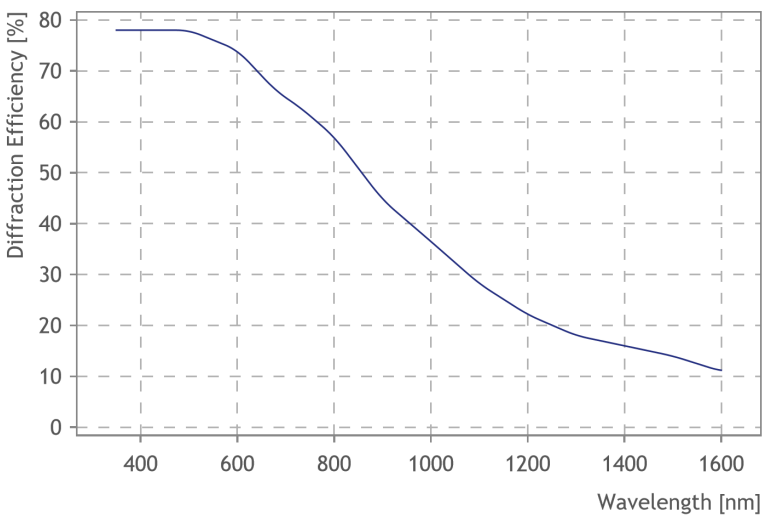
## Single pulseSelect

APE's pulseSelect Single consists of an optical module and control electronics. The principal part of the optics is a Bragg cell, which selects single pulses from the laser beam based on the acousto-optical effect. Focusing and collimating mirrors and a beam stop for the zero-order beam complete the setup. The driver electronics provide the modulated RF signal to the Bragg cell with a carrier frequency that is a multiple of the laser repetition rate.

Typical Diffraction Efficiency over Repetition Rate
at 800 nm laser wavelength




Typical Diffraction Efficiency over Wavelength
for Output Repetition Rates up to 4 MHz

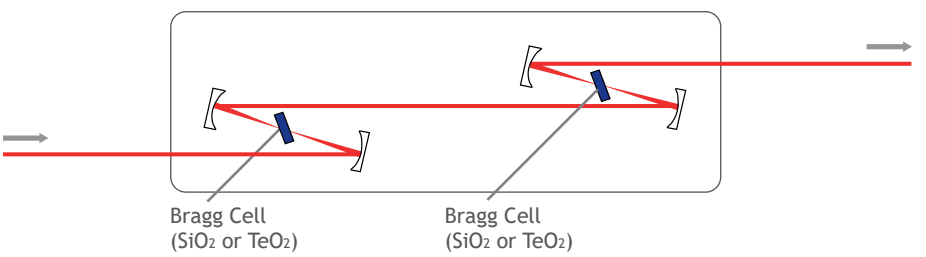


# pulseSelect Dual

## pulseSelect Dual Serial

Certain applications require a high contrast ratio between the zero-order pulses, which are suppressed at the laser repetition rate, and the diffracted first-order pulses at the desired repetition rate. The pulseSelect dual serial combines two pulse pickers in one housing and is controlled by one controller. Both units select the same pulse at the same division ratio. This increases the pulse contrast considerably. APE also offers this version of the pulseSelect for different wavelength ranges and laser repetition rates.

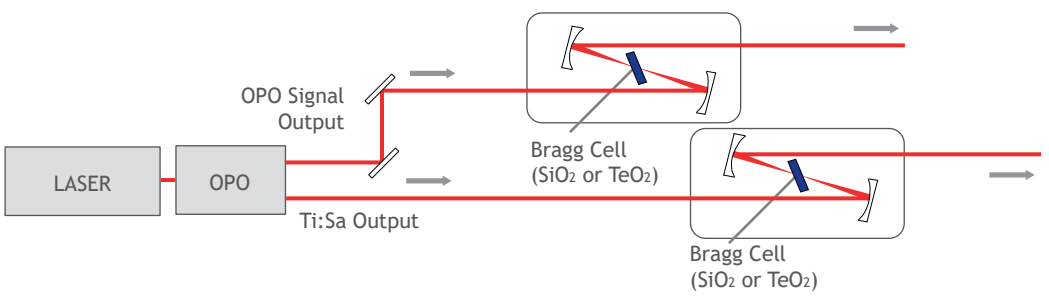
***pulseSelect Dual Serial:*** This version is designed to provide the highest contrast ratio of over 200,000:1 for non-adjacent pulses (5000:1 for adjacent pulses) by placing two Bragg cells in series. Both are synchronized to one common clock (in serial configuration; i.e. one beam through two Bragg cells).




## pulseSelect Dual Parallel

APE's pulseSelect Dual parallel is ideal for applications which require a reduction of the laser repetition rate at once of two pulsed laser beams of different wavelengths. It combines two optical units equivalent to the pulseSelect Single and is controlled by a single controller with individual delay settings. The wavelength ranges can be set individually for each optical unit.

***pulseSelect Parallel:*** This variant is designed for simultaneous picking of pulses from two synchronized laser sources. The system is equipped with two synchronized Bragg cells. Independent setting of picking parameters is possible for both Bragg cells.




* Sample input configuration (laser, OPO, and beam routing not included).

# pulseSelect
# Specifications

| pulseSelect | Broadband | Dualband |
|---|---|---|
| Wavelength range (others on request) | 500 nm … 1600 nm | 340 nm … 540 nm + 680 nm … 1080 nm |
| Maximum input power | 5 W at 800 nm | |
| Input frequency ($f_{rep}$) | 72 MHz … 81 MHz (others on request) to be specified with an accuracy of 0.5 MHz when ordering | |
| Input polarization | Linear, horizontal (polarization rotator optional) | |
| Division ratio (internal trigger) | 2 … 260,000 | |
| Output repetition rate | Internal trigger based: ~308 Hz … 40 MHz (based on $f_{rep}$ = 80 MHz) External trigger based: Single-shot … 3 MHz | |
| Contrast ratio (at 800 nm, $f_{rep}$/20) | >500 : 1 for non-adjacent pulses >75 : 1 for adjacent pulses | |
| Diffraction efficiency* (at 800 nm, $f_{rep}$/20) | >50% | |
| Interface | USB connection | |

## pulseSelect Dual Serial: High Contrast Performance

| | |
|---|---|
| Contrast ratio (at 800 nm, $f_{rep}$/20) | >200,000 : 1 for non-adjacent pulses >5000 : 1 for adjacent pulses |
| Diffraction efficiency* (at 800 nm, $f_{rep}$/20) | >25% |

## pulseSelect Dual Parallel: Simultaneous Picking of Pulses from Two Synchronized Laser Sources

| | |
|---|---|
| Contrast ratio (at 800 nm, $f_{rep}$/20) | >500 : 1 for non-adjacent pulses >75 : 1 for adjacent pulses |
| Diffraction efficiency* (at 800 nm, $f_{rep}$/20) | >50% |

## Options

| | |
|---|---|
| Input frequency ($f_{rep}$) | 35 MHz … 100 MHz to be specified with an accuracy of 0.5 MHz when ordering |
| High diffraction efficiency* | >60% (36% for pulseSelect Dual Serial), only available for max. average input power of 0.5 W at 800 nm |
| Polarization rotator | Changing input polarization to horizontal |

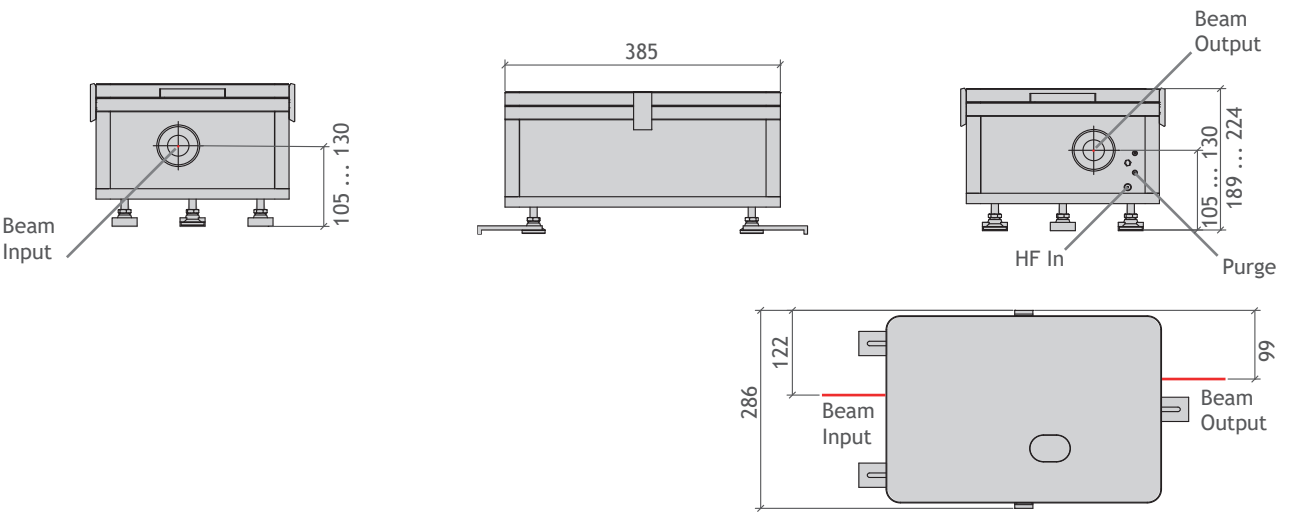
All values depend on a certain system configuration, e.g. laser spot diameter or mirror coating.
* Ratio of the diffracted pulse energy to the pulse energy incident into Bragg cell.

# Appendix Technical Drawings

*All dimensions in mm*

## *pulseSelect*

- pulse picker

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