# opo

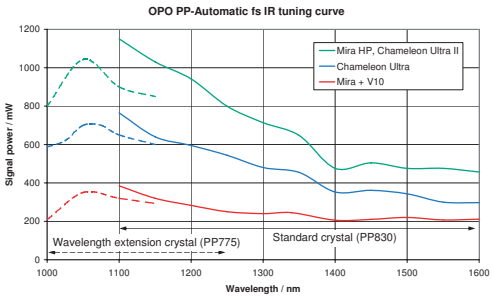
APE

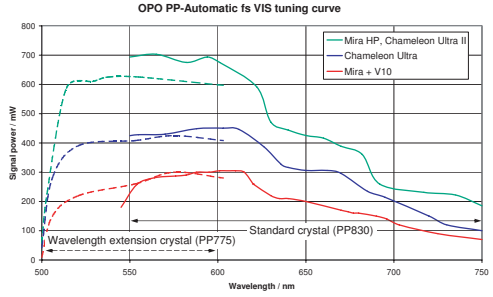
## PP Automatic


The **OPO PP Automatic** is a synchronously pumped Optical Parametric Oscillator, designed for operation with modelocked Ti:Sapphire lasers. It is based on periodically poled crystals offering high conversion efficiency and wide tuning ranges with a fixed pump wavelength. Optical Parametric Oscillation is a nonlinear process converting a short wavelength pump beam into two tuneable beams (Signal + Idler) of longer wavelengths.

The exceptional tuning ranges of 1000-1600 nm (IR) and 505-750 nm (VIS-SHG) are covered with a single mirror set. An integrated spectrometer and the electronic tuning mechanism allow complete computer controlled operation of the OPO.

The **OPO PP Automatic** is supplied in different versions which are convertible and upgradeable.



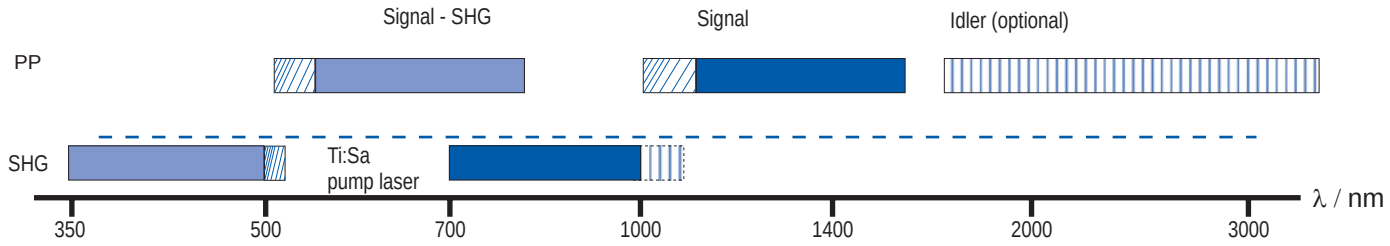

Typical fs-OPO PP Automatic tuning curves, obtained with one optics set only at a fixed pump wavelength

- **Wide wavelength range**
- **Computer controlled tuning and wavelength stabilization with integrated spectrometer**
- **Femto- and picosecond mode**
- **Low threshold**
- **High conversion efficiency**
- **Wavelength independent pulse duration**
- **Low jitter - high stability**
- **Ease of alignment**

# opo

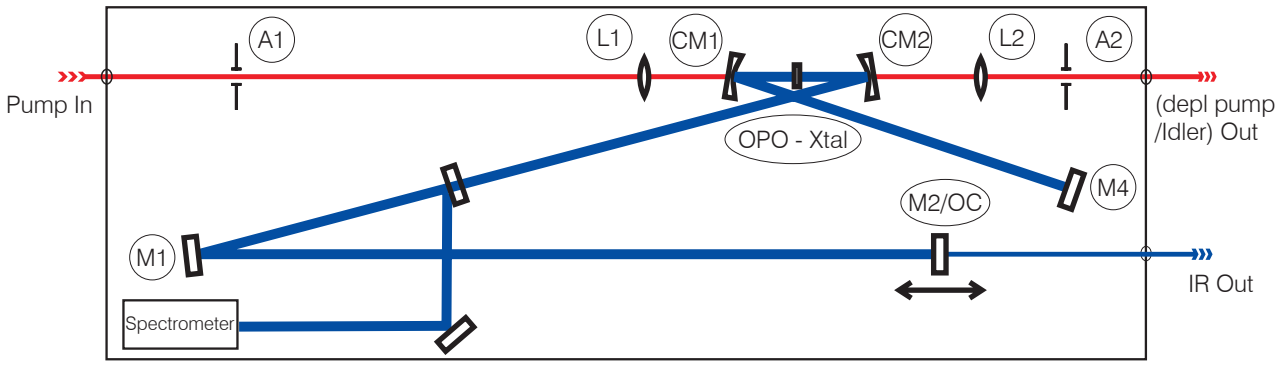
## SYNCHRONOUSLY PUMPED OPTICAL PARAMETRIC OSCILLATOR

The APE **OPO** covers a wide wavelength range and allows further wavelength extension using frequency mixing schemes.

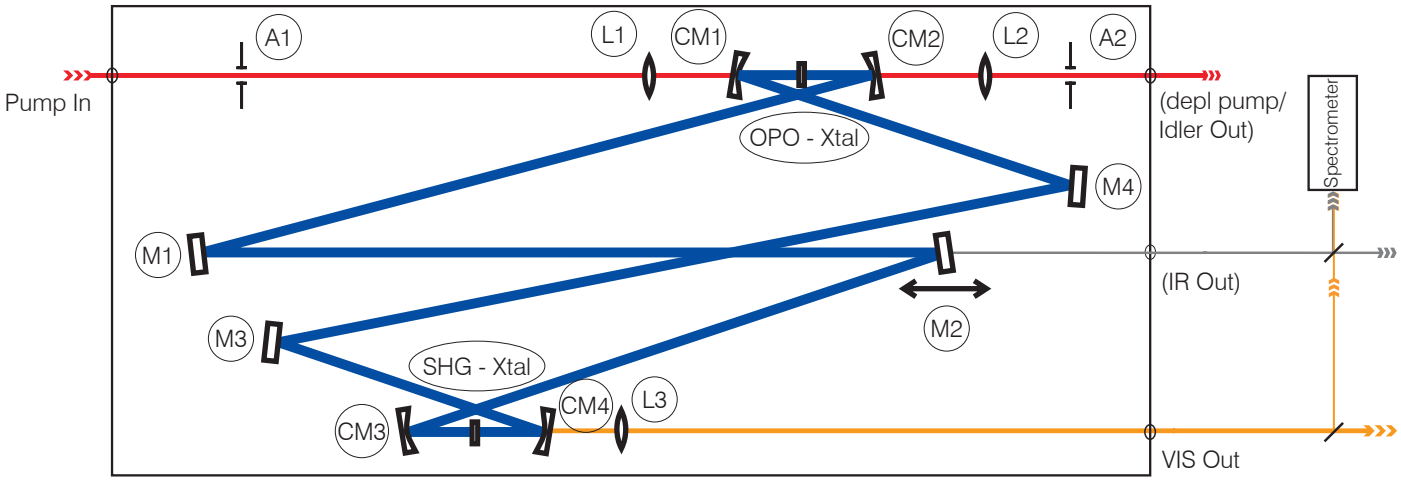



## CAVITY CONFIGURATIONS

The Linear IR - OPO version is a singly Signal resonant system with a 5-mirror standing wave cavity. It is used for highly efficient IR-generation and covers the 1,0…1,6 $\mu$m wavelength range and up to 3 $\mu$m with the non-resonant Idler branch (optional).




The Ring configuration is a singly Signal resonant IR/VIS **OPO** version employing an additional intracavity SHG module in an 8-mirror Ring cavity. This unit which is based on temperature tuned non-critically phasematched SHG is used for highly efficient visible output generation. It covers the 505 … 750 nm wavelength range which fills the gap between the Ti:Sapphire Fundamental beam and its frequency doubled Signal (SHG). All Ring systems include the linear IR operation.



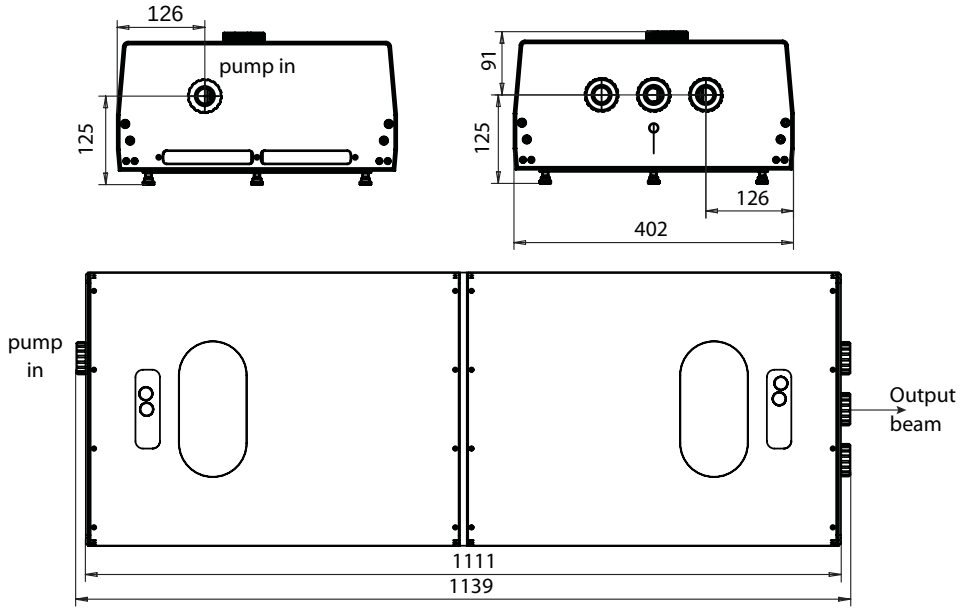
## PULSE DURATION

All versions of the **OPO** system can be operated in both femto- and picosecond mode depending on pump pulse duration.

## COMPONENTS

Control Electronics:

Optical Unit:




## OPTIONS AND MODIFICATIONS

The APE **OPO** can be provided with several options and modifications:

- Autocorrelator
- Idler output (in addition to Signal output)
- Depleted pump output
- Customized wavelength ranges
- Adaptation to various pump laser cavity lengths and pump pulse durations
- Synchronization of different output beams (internal delay line) for use in frequency mixing devices and multicolor applications
- Frequency mixing devices (SumFrequencyMixing for extension to blue range, DifferencyFrequencyGeneration for Mid-IR generation)

## SPECIFICATIONS

| Tuning range (nm) | Pump | Signal (resonant) | Signal SHG[1)] | Idler (non-resonant) |
|---|---|---|---|---|
| Standard crystal PP830 | 830±10 | 1100 - 1600 | 550 - 750 | 1750 - 3300 |
| Standard PP830+ | 830±10 | | | |
| Extension crystal PP775 | 775±10 | 1000 - 1600 | 505 - 750 | 1750 - 3300 |

| | Mira + Verdi 5W | Mira + Verdi 10W | Mira HP/Cham. Ultra II |
|---|---|---|---|
| Signal output power @ 1300 nm | 60 mW | 180 mW | 550 mW |
| Ring SHG output power @ 600 nm | 40 mW | 150 mW | 500 mW |

| | |
|---|---|
| Threshold | 500 mW[2)] |
| Pulse duration | typ. 200 fs @ 130 fs pump pulse<br>typ. 1.6 ps @ 1.4 ps pump pulse |
| Time-bandwidth product | typ. 0.6 |
| Polarization | horizontal for Signal and Idler, vertical for VIS-SHG |
| Noise | <0,5 % RMS[3)] |
| Repetition rate | appr. 76 / 80 MHz,<br>subject to pump laser repetition rate (others on request) |
| Beam height | 125 … 140 mm |

| Spectrometer | IR version | IR/VIS version | resolution |
|---|---|---|---|
| | integrated into optics unit | external | |
| | 700 ... 1640 nm | 500 ... 1640 nm | 0.2 nm |

| Beam Parameters (typical values @ 1300nm) | |
|---|---|
| Spatial mode | $TEM_{00}$ |
| $M^2$ | 1.2 |
| Beam diameter | 2 mm |
| Divergency | 1 mrad |

| Size (W*L*H in mm) | | |
|---|---|---|
| | Optical unit | 402 x 1139 x 200 (see p. 3) |
| | Control electronics | 267 x 312 x 180 |

1) Ring-OPO with intracavity - SHG
2) low power systems; optimized for Mira + 5 W Verdi pump
3) RMS noise-measured in 10 Hz to 1 MHz bandwidth



**Distributors**
see APE website www.ape-berlin.com

APE GmbH Plauener Straße 163-165 Haus N / 13053 Berlin Germany
Phone +49.30.986.01130 Fax +49.30.986.011333 / Web www.ape-berlin.com Email ape@ape-berlin.de