Wedge-M Amplifier

Multipass Ti:sapphire Amplifier

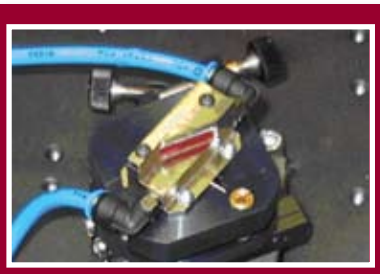
The Wedge-M multipass amplifier system has been designed as an effective device for the amplification of femtosecond pulses from a Ti: sapphire femtosecond laser. It comprises a seeding laser (Trestles-20 Mini), stretcher, faraday isolator, Pockels cell, multipass amplifier (MPA), and a compressor in one compact box. External pump lasers are needed for the operation of the Wedge-M amplifier system: a CW pump laser (Verdi, Millennia, or MonoDisk are recommended) and a Q-switch pump laser (Nd:YLF pulsed laser at 527 nm is recommended).

The Wedge-M Ti:sapphire multipass amplifier is designed to amplify single pulses from a CW mode-locked Ti:sapphire laser. Typically an input pulse with an energy of only a few nanojoules can be amplified to over 1 mJ. This represents an overall amplification of greater than 10^6. The amplification takes place as the optical pulse passes through a Ti: sapphire laser rod, which has been optically excited by a laser pulse from the Q-switch pump laser. We use a Brewster cut Ti:sapphire laser rod with a high-resistant mirror on the back side (HR 490-550 nm and HR 740-860 nm). It allows for the most effective use of the pump energy and the selection of the length of active medium for maximal gain.

Normally, the damage threshold of the optical elements limits the maximum energy that can be amplified. However, through the use of the powerful technique of Chirped Pulse Amplification (CPA) the Wedge-M is designed to operate without risk of optical damage.

The technique involves temporally stretching the pulse, amplifying at reduced peak power, and then recompressing the amplified pulse close to its original duration.

Typical output energies from the Wedge-M and its associated pulse stretcher/compressor are more than 1 mJ @ 50 Hz and 0.5 mJ @ 1 kHz (depending on pump energy and wavelength).



Features:

- Brewster cut wedge design
- 8-pass configuration
- Amplification of 20 fs pulses
- Pulse energies up to 1 mJ
- Gigawatt peak power

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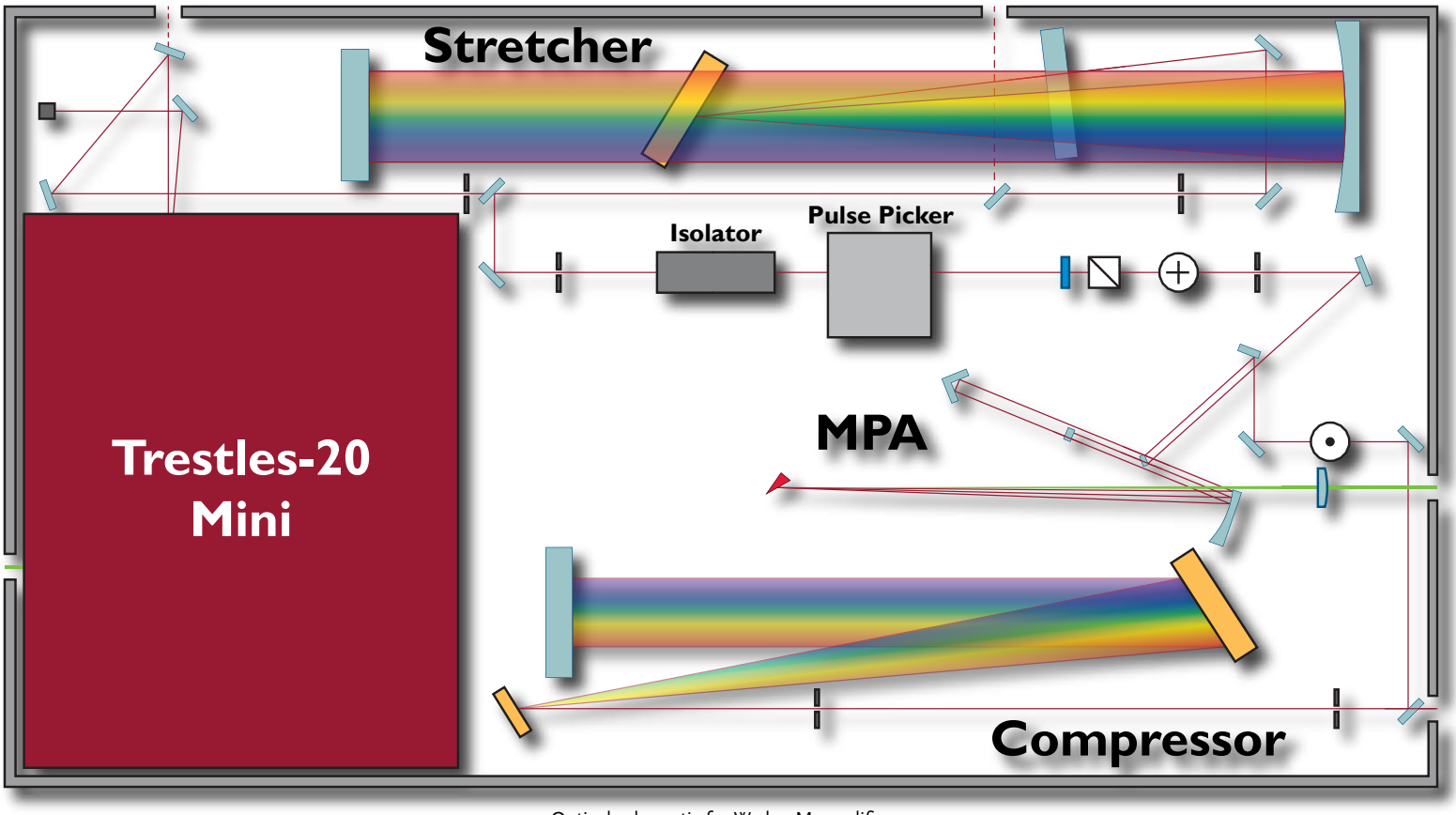
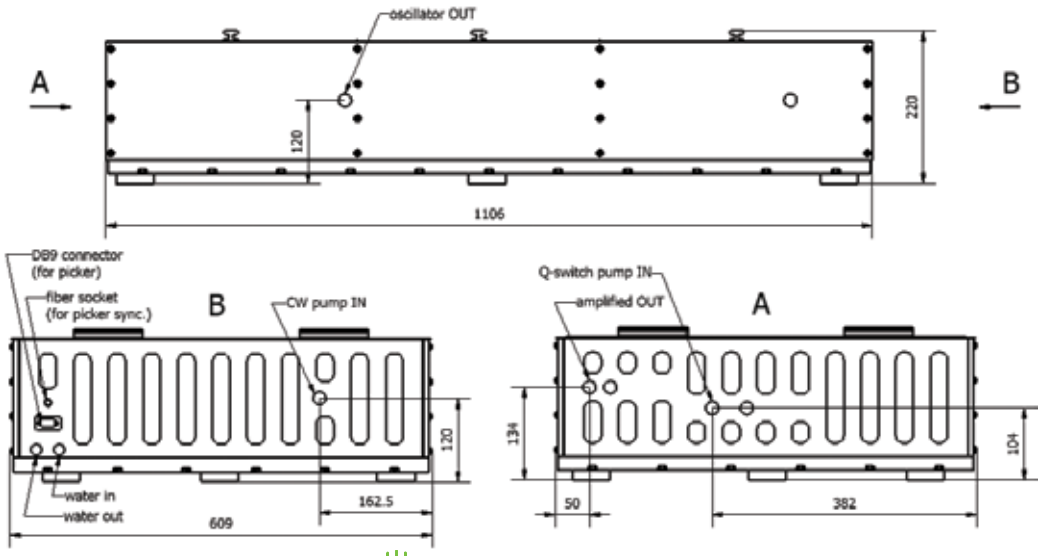


Optical schematic for Wedge-M amplifier

Multipass amplifiers offer less pulse broadening and a better contrast between the amplified pulse and amplified stimulated emission (ASE) than regenerative amplifiers. The compact beam path of our 8 pass amplifier allows for high pulse amplification in a minimum of table space. Because the pulse only makes one pass through the pulse picker, dispersion is reduced and >50 fs input pulses can be highly amplified with little or no pulse broadening. Pulse contrast measurements can be made with the new Rincon third order cross-correlator from Del Mar Photonics.

PHYSICAL LAYOUT



SPECIFICATIONS	
Pulse Width	30-100 fs
Pulse Energy	> 500 µJ @ 1kHz
Repetition Rate	Single shot - 1 kHz
Wavelength Range	780-820 nm
Contrast Ratio	1000:1
Beam Diameter	5 mm
Stability	< 3%

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