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All solid-state diode pumped Nd:Yag MOPA with stimulated Brillouin phase conjugate mirror

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At the Nederlands Centrum voor Laser Research (NCLR) a 1kHz diode-pumped Nd:YAG Master Oscillator Power Amplifier (MOPA) chain with a Stimulated Brillouin Scattering (SBS) Phase Conjugate mirror has been designed and operated. A small Nd:YAG zig-zag slab (1.8 by 1.7 by 10mm) is side pumped with $200\mu\text{s}$ diode pulses in a stable unidirectional ring oscillator. The oscillator is Q-switched and injection seeded with a commercial diode pumped single frequency CW Nd:YAG laser. The output consists of 25ns FWHM-pulses at 1064nm in a single-transverse, single-longitudinal mode. The oscillator slab is imaged on a square aperture that transmits about 80% of the energy. The aperture is subsequently imaged four times in the amplifier. The amplifier is a 3 by 6 by 60mm Brewster angle zig-zag slab, pumped by an 80-bar diode stack with pulses up to $250\mu\text{s}$. After the second pass the light is focused in two consecutive cells containing freon-113 for wave-front reversal in an oscillator/amplifier-setup with a reflectivity of 60%. The light then passes through the amplifier twice more to produce 40W output with near diffraction limited beam quality. The zig-zag slab in the oscillator effectively reduces thermal lensing effects and the Brillouin scattering reverses any aberrations originating from the amplifier.

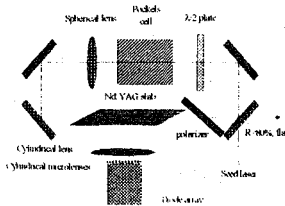


Figure 4: Schematic of the oscillator