Pulsed amplification of continuous wave (cw) radiation is an ideal source for single mode laser pulses. Sirah’s new design for such an amplifier gives high peak powers while amplified spontaneous emission (ASE) is ultra low. The system consists of five amplification stages and a phase conjugated mirror based on the Stimulated Brillouin Scattering (SBS) process. As the phase conjugated mirror is only efficient for single frequency pulses the ASE and the cw seed beam are dramatically suppressed by this process resulting in a unique performance of the amplifier system.

**Design**

Either a Titanium-Sapphire or a dye based cw system can be used as a seed source for the single mode radiation. The input power should be in the range of some hundred milliwatts. The complete amplifier set-up is integrated into a single housing. The pump beam path provides optimum timing of the pump pulses for the five amplification stages. Two circulator systems are used with rectangular dye cells. An extra circulator is used for the final capillary amplifier cell. To match beam diameters and to discriminate the broadband ASE from the signal a telescope with a diaphragm is used between amplifier stages.

**SBS Cell**

Before the pulse is finally amplified it is focused into a cell that holds a special SBS active fluid. The phase conjugated mirror formed in the liquid reflects only single mode radiation that is above threshold intensity. This means that neither ASE, cw- and pulsed multimode, nor cw-single mode radiation is reflected back by the SBS process. However, single mode pulses with energy above approximately 1 mJ are reflected back with a reflectivity of about 40...45%.

**Performance**

Using 300 mW of seed radiation and 400 mJ of pump laser energy it is possible to generate 30 mJ pulses at 730 nm (Pyridine 2). However, results depend on wavelength, seed laser and pump laser details.

The SBS cell efficiently suppresses ASE by several orders of magnitude, and at the same time filters the cw seed beam from the pulsed amplifier output.

The graph shows the spectral profile of the pulses. The linewidth is determined by the pulse duration and shape (Fourier-limit) of the pump laser, in this case a non-seeded YAG laser.
Optical Layout

Sirah
Pulsed Amplifier

Dimensions

Pulsed Amplifier (side view)

Pulsed Amplifier (pulse output end)

Pulsed Amplifier (seed & pump laser input end)

All Dimensions in mm
Specifications are subject to change without notice

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