

Carbon Monoxide Laser Emitting Nanosecond Pulses with 10 MHz Repetition Rate

Andrey A. Ionin¹, Yurii M. Klimachev, Andrey A. Kotkov,
Andrey Yu. Kozlov, Leonid V. Seleznev and Dmitry V. Sinitsyn

Lebedev Physical Institute of Russian Academy of Sciences, 53 Leninsky prospect, 119991 Moscow, Russia

Actively mode-locked electron-beam-sustained-discharge CO-laser producing ~10 ns (FWHM) pulses following with repetition rate 10 MHz for both single-line and multiline mode of operation was experimentally studied. Specific output energy for multiline CO-laser mode of operation was up to 20 J/(1 Amagat), the laser efficiency being 3.5%.

Actively mode-locked electron-beam-sustained-discharge CO-laser producing a train of 10ns (FWHM) pulses with repetition rate 10MHz for both single-line and multiline mode of operation in the mid-IR range of ~5 micron was experimentally studied. Total laser train duration was ~0.5 ms for both mode-locked and free running mode of operation. Specific output energy for multiline CO-laser mode of operation was up to 20 J/(1 Amagat), the laser efficiency being 3.5%. For single-line CO-laser, active mode-locking was achieved in spectral range 5.2-5.3 micron. Two-pass 15 m long laser cavity consisted of totally reflecting mirror or diffraction grating and 50% output coupler. The active medium length was 1.2 m. 8.0 mm aperture germanium acoustic-optical modulator driven by RF voltage with quartz-stabilized frequency of 5 MHz was situated near the rear mirror. This radiation can be used for laser ablation [1], for pumping an optical parametric amplifier for optical-stochastic cooling in Relativistic Heavy Ion Collider [2], and for studying vibrational and rotational relaxation of molecules, for instance, NO molecule [3].

[1] Eliseev P., Ionin A., Klimachev Yu. et al, *Proc. SPIE*, **4760**, 143 (2002)

[2] Babzien, I. Ben-Zvi, I. Pavlishin, I. et al, *Phys. Rev. ST Accel. Beams*, **7**, 012801 (2004)

[3] Andrusenko R.P., Ionin A.A., Klimachev Yu.M. et al, *Proc. SPIE*, **6729**, 672923 (2007)

¹ E-mail: aion@sci.lebedev.ru