HIGH-POWER TUNABLE LASER SYSTEMS

Description
Laser systems based on tunable (dye, Ti:Sa) lasers pumped by high-power ion lasers and a second-harmonic generator are unique sources of CW narrow-band radiation covering the entire optical spectrum including UV, visible and IR ranges. Automated control of parameters with a PC interface is integrated into the system, which offers data processing as well as control of laser parameters during the research or technological process.

Fig.1. INVERSIYA argon laser

Fig.2. Overall view of the laser spectrometer

Fig.3. SPECTROMED medical unit.

Technical specifications
The modular structure of the system allows the user to configure it according to the problem/process under study. The basic system configurations have the following parameters:

- Ion lasers with CW output power up to 70 W in blue-green, 15W red and 10W in UV spectra;
- Resonant frequency doubler for CW deep UV operation (up to 0.5W at 203–257 nm).
- SPECTROMED medical unit with AMETIST dye laser (up to 4 W at 630-660 nm).
- Dye amplifier for laser guide star excitation (up to 10 W at 589 nm).
- Ti:Sa - laser with single-frequency (1 W CW) and femtosecond (30 fs) options.

Technical appraisal and economic benefits
The main advantages of ion lasers are:

- Long lifetime, reliable structure based on a segmented-metal plasma tube.
- High output power (up to 70 W at 438-529 nm) with high efficiency.
- Easy-to-repair modular structure.
- Multi-gas (replaceable Ar/Kr/Ne) operation with the same laser.
- High performance-to-price ratio.
A broad range of options and exploitation accessories is available:

- Active cavity alignment: lasing search and power/beam-pointing stabilization.
- Remote control with overall automation / PC interface.
- Integrated closed-loop cooling system.

**Application areas**
- Medicine: photodynamic therapy.
- Astronomy: artificial laser star creation at the mesospheric sodium layer.
- Research and development in fundamental physics: nonlinear optics and spectroscopy.

**Technologies:**
- fiber-optic communications (fiber Bragg gratings writing by UV laser);
- holography: embossed (with violet laser) and polymer (with RGB laser);
- rapid prototyping with a photopolymer (with UV laser);
- material processing: semiconductor etching (with UV laser);
- large-screen displays (with RGB laser).

**Development stage**
Operating prototypes have been developed, small series of lasers and laser systems have been delivered to customers in Russia and abroad, namely, to:

- Institut fuer extraterrestrische Physik, Garching, Germany
- Jilin University, Changchun, China
- Siberian Center for Laser Medicine, Novosibirsk
- Research Institutes: Lebedev Physical Institute of the Russian Academy of Sciences, Ioffe Physicotechnical Institute, Institute of Organic Chemistry of the Siberian Branch of the RAS, Institute of Inorganic Chemistry of the Siberian Branch of the RAS, Institute of Semiconductor Physics of the Siberian Branch of the RAS, Institute of Automation and Electrometry of the Siberian Branch of the RAS.

**Patent situation**
There is an Author’s Certificate of the USSR (1991) and a patent of the Russian Federation (1996).

**Commercial offers**
Production and procurement contracts for lasers and laser systems.

**Estimated cost**
Ion lasers: 30,000-60,000 USD.

**Contacts**
Tadeush N. Mantush, Cand.Sc., Scientific Secretary
Institute of Automation and Electrometry, Siberian Branch of the Russian Academy of Sciences
1, Prosp. Akademika Koptyuga, Novosibirsk, 630090, Russia
Phone: (383) 333-35-86
Fax: (383) 333-38-63
E-mail: mantush@iae.nsk.su
http://www.iae.nsk.su