

JEMNÁ MECHANIKA A OPTIKA

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Laboratory of optical micro-manipulation techniques – new directions of research

(P. Zemánek, A. Jonáš, J. Ježek, P. Jákl, M. Šerý, T. Čižmár, V. Karásek, M. Šiler, O. Brzobohatý, J. Trojek) 6

The paper presents brief overview of the history and modern trends of optical micromanipulations techniques and their applications in the group of Optical micromanipulation techniques at the Institute of Scientific Instruments of the ASCR, v.v.i. The presented results deal especially with integration of optical micromanipulations and microanalytical systems „lab-on-a-chip” (delivery and separation of microobjects and nanoobjects suspended in the fluid, usage of photopolymerization to manufacture some parts of the above mentioned systems, combination of optical manipulations with optical spectroscopy) and with the study of interaction between light and mass demonstrated by the phenomenon of optical binding of objects.

Writing System with Shaped Electron Beam (V. Kolařík, F. Matějka, B. Lencová, S. Kokrhel, M. Horáček, T. Radlička, M. Urbánek, L. Daněk) 11

The paper describes an improvement of electron-beam lithograph BS 600 working with a fixed accelerating voltage of 15 kV and a rectangular-shape variable-size electron beam. The system has undertaken an important upgrade during last few years. Main goal was to increase the resolution and the writing speed. Achieved parameters and characteristics of the system are described as well as few examples of prepared structures.

Key-words: E-beam lithograph, shaped electron beam, electron-optics column, electron scattering, writing speed.

Laboratory of interferometry and high coherence lasers

(J. Lazar, O. Číp, P. Jedlička, B. Mikel, B. Růžička, Z. Buchta, J. Hrabina, R. Šmíd, M. Čížek) 16

We present an overview of the new results of the group of Coherent lasers and interferometry of the Institute of Scientific Instruments AS CR, v.v.i. The new results deal with stabilized semiconductor lasers for hyperpolarization of noble gases, design of new laser systems for metrology of optical frequencies based on molecular

iodine, the application of optical comb synthesizer in the metrology of lengths and interferometric measurements with high resolution. The article also reports about the main topics of investigation of the group at present and in near future.

Some results of the Group of cryogenics and superconductivity at the Institute of Scientific Instruments (P. Urban, P. Hanzelka, J. Jelínek, T. Králík, V. Musilová, Aleš Srnka) 20

The paper shows some results of the group of cryogenics and superconductivity, where low temperature devices are developed and realized. The group has built several cryostats and superconductivity magnets for NMR and other experimental systems. Nowadays radiative heat transfer at low temperatures is studied and the results are applied in cryogenics. Another subject of the present study is the cryopumping for ultra-high vacuum applications.

Nuclear magnetic resonance in the Institute of Scientific Instruments – tradition and prospects

(Z. Starčuk jr., J. Starčuková) 24

The paper introduces the group of nuclear magnetic resonance, its historic roots and prospects. The topics studied are represented by two examples. One is methodological – a successful method for single-voxel proton MR spectroscopy at high field with extremely short echo-time is described, as a milestone on the way to high-quality spectroscopic imaging. The other example demonstrates an application – the analysis of MR compatibility of dental alloys.

Desktop electron beam welder EBWM-60/2

(I. Vlček, M. Zobač, L. Dupák, J. Dupák, P. Kapounek) 27

A new prototype of micro electron beam welder MEBW-60/2 was designed and manufactured. The device is improved version of former welder developed in ISI Brno during last 20 years. A vacuum chamber volume is 7 liters. An electron gun power is up to 2 kV and beam energy is up to 60 keV. A two axis motor-driven manipulator is embedded. The welder is completely numerical controlled. All user functions are accessible by a hand-panel. The device is equipped with large workbench necessary for work-piece preparation. Arrangement of the workbench is variable and can fit to customer demands.

Ing. František Petrů, DrSc. deceased (J. Lazar) 30

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