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CONTENTS

The use of a speckle correlation method for measuring in mechanics (P. Šmíd, P. Horváth, I. Vašková, M. Hrabovský).....3

On the occasion of 75th anniversary of optical industry establishment in Přerov there was presented one optical method used for measurement in mechanics. The application potential of this method based on the speckle correlation is investigated in the Joint Laboratory of Optics of Palacky University and Institute of Physics of Academy of Sciences of the Czech Republic.

Keywords: speckle, contactless measurement, correlation method

Compact optical system for generation of nondiffracting beams with adjustable axis (V. Kollárová, Z. Bouchal, R. Čelechovský, T. Medřík, V. Chlup, A. Pochylý, M. Kalman, T. Kubina).....5

In the paper, a design, implementation and optical parameters of a system transforming Gaussian laser beam into a nondiffracting Bessel beam are described. The construction of the proposed laser beam convertor enables a phase modulation of the spatial spectrum of the created beam. It is used for the transversal adjustment of the beam spot into the desired position by a maintainance of propagation direction. In the contribution, the possible usage of the laser convertor in optical micromanipulation is discussed and the achieved experimental results are demonstrated.

Keywords: laser beams, nondiffracting beams, optical manipulation

Laser surface treatment of the material surfaces

(H. Chmelíčková, H. Lapšanská)..... 11

Laser surface treatment possibilities were tested on the metal and non-metal materials. Work parameters of the infrared pulsed Nd:YAG laser were optimised for the low-carbon steel surface followed by the heat affected regions microanalysis. Surface texturization, marking and laser scribing were examined on the silicon wafers 0,3 mm – 0,8 mm thick. Results displaying and measuring was realized by the inductive profilometer Talysurf and laser confocal microscope LEXT.

Keywords: Surface treatment, Nd:YAG laser, melting, steel, scribing, silicon, confocal laser microscopy, inductive profilometer.

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Transverse electron wave modes in an electrically conducting mesoscopic thin layer (J. Pospíšil, K. Šafařová)..... 14

The basic quantum equations for transverse electron wave modes in an electrically conducting metallic or semiconductor homogeneous mesoscopic thin layer are formulated and interpreted in dependence on the adequate static transverse parabolic extend of the interior electric potential energy and operated external tuning homogeneous magnetostatic field. The starting point is the modified non-temporal Schrödinger equation of one electron with chosen normalized monowave number wavefunction and relevant transverse eigenfunctions and eigenenergies. Their analysis is then directed successively towards the transverse electric, magnetic and magneto-electric electron wave modes. The established separated transverse wave modes in electron waveguides under discussion are analogous to the transverse wave modes of electromagnetic waveguides. The problems mentioned above are topical and important in practice for development of integrated electronical, opto-electronical and electro-optical systems.

Czech Metrology Society events for the first quarter 2009

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