

# JEMNÁ MECHANIKA A OPTIKA

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## OBSAH

**Vyšetrovanie dvojjadrového mikroštruktúrneho optického vlákna ako potenciálneho polarizačného deliča**  
(L. Čurilla, P. Stajanča, I. Bugár, R. Bucziński, F. Uherek)..... 127

**Dvoufázová aplikace vlnkové transformace pro filtraci šumu a fázovou analýzu ESPI korelogramů s využitím intenzitního prahování** (L. Stanke, P. Šmíd, P. Horváth)..... 133

**Vektorová teorie difrakce elektromagnetických vln**  
(A. Mikš, P. Novák)..... 137

**Nanoobrábanie** (M. Mikloška)..... 144

**Délkové indukční snímače se rychle mění**  
(J. Kůr, M. Chamrád, M. Weigl)..... 146

**Rozměrové limity mikro EDM obrábění** (J. Hošek) ..... 147

**Evropská komise vydala rozhodnutí týkající se bezpečnosti spotřebitelských laserových výrobků**  
(M. Miler)..... 150

**Pneumatické pohony – není válec jako válec** ..... 151

**Kolimátor a jeho zobrazovací vlastnosti**  
(A. Mikš, J. Novák, P. Novák) ..... 153

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## CONTENTS

**Examination of dual-core microstructured optical fiber as potential polarization splitter**  
(L. Čurilla, P. Stajanča, I. Bugár, R. Bucziński, F. Uherek)..... 127

**Two stage application of wavelet transform for denoising and phase analysis of ESPI correlograms with use of intensity threshold** (L. Stanke, P. Šmíd, P. Horváth) ..... 133

**Vector diffraction theory of electromagnetic waves**  
(A. Mikš, P. Novák)..... 137

**Nanomachining** (M. Mikloška)..... 144

**Inductance linear sensors are rapidly innovated**  
(J. Kůr, M. Chamrád, M. Weigl)..... 146

**Dimensional Limits of micro EDM** (J. Hošek)..... 147

**European Commission issued a directive on the safety of consumer laser products** (M. Miler)..... 150

**Pneumatic drives** ..... 151

**Collimator and its imaging properties**  
(A. Mikš, J. Novák, P. Novák) ..... 153

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# CONTENTS

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## **Examination of dual-core microstructured optical fiber as potential polarization splitter**

(L. Čurilla, P. Stajanča, I. Bugár, R. Bucziński, F. Uherek).....127  
The following article presents the results of an examination of special type of dual-core microstructured optical fiber as a potential polarization splitter in near infrared region. Polarization splitter can separate on output two orthogonal signals, therefore it is ideal component for fast signal redirection within information transfer. With the aim of polarization division optimization we were working with different fiber lengths, utilized single and dual-core excitation and varying spectral properties of excitation radiation. Utilizing the dual-core excitation we showed increase of extinction ratio between cores from 11 dB to 16 dB. Utilizing the broadband spectrum source we showed optimization of polarization splitter by choosing suitable wavelength of 1588 nm, when extinction ratio between cores raised to 25 dB compared to narrowband spectrum source.

**Keywords:** microstructured optical fiber, dual-core fiber, fully optical switching, polarization splitter, femtosecond laser

## **Two stage application of wavelet transform for denoising and phase analysis of ESPI correlograms with use of intensity threshold**

(L. Stanke, P. Šmíd, P. Horváth) .....133  
Paper presents data processing of correlograms acquired by an electronic speckle pattern interferometry (ESPI). Speckle pattern causes that correlograms are highly noised. Consequently special care have to be taken for correlogram denoising before the calculation of demanded phase map or profile. Paper shows a process that utilizes two stage application of the wavelet transform (WT) for either denoising and phase retrieval. Correlogram denoising is performed in the first stage by the thresholding of the wavelet transform coefficients. Unlike the typical usage, WT phase retrieval process is not directly utilized to the denoised correlogram, but rather to its intensity thresholded image, which is done in the second stage. Proposed algorithm is verified by its application to the artificially created correlograms and in the final step also to the experimentally acquired correlograms.

**Keywords:** phase retrieval, wavelets, speckle interferometry, digital image processing, speckle imaging, instrumentation, measurement, metrology

## **Vector diffraction theory of electromagnetic waves**

(A. Mikš, P. Novák) .....137  
This work is focused on a problem of vector diffraction of electromagnetic waves. Relations for vector solution of a diffraction of electromagnetic waves at an aperture in a planar opaque screen using the Green's function and Sommerfeld boundary conditions are derived. Several approximations are further adopted for electromagnetic waves of very high frequencies resulting in simplified relations

that are suitable for computations in optics. Finally an influence of numerical aperture value on the resulting electromagnetic field in the image (focal) plane is demonstrated on a simple example of transformation of linearly polarized plane electromagnetic wave by an aplanatic optical system.

**Keywords:** electromagnetic wave, diffraction theory, vector diffraction

## **Nanomachining** (M. Mikloška) .....144

**Keywords:** CNC, nanomachining, ultraprecision machining, SPDT, flycutting, RTG monochromator

## **Inductance linear sensors are rapidly innovated**

(J. Kůr, M. Chamrád, M. Weigl) .....146  
Inductance linear sensors are the most abundant elements used for electrical length measurements in mechanical engineering. Advantage of both sensors and register units is an excellent price/performance ratio. Such systems innovated for decades without interruption exhibit outstanding reliability. The half-bridge circuits with two coils and the middle core established themselves in the Central Europe including the Czech Republic.

## **Dimensional Limits of micro EDM** (J. Hošek) .....147

The paper deals with the topic of realizing very small details of mechanical parts using micro-Electro Discharge Machining (EDM). The article briefly introduces the principle of EDM machining and its advantages and limitations, especially in relation to the processing of very small mechanical parts. This paper also presents an experiment looking for the limits of the slimmest size feature of mechanical component made of molybdenum produced by the Sodick APIL EDM machine. It was found out that, it is possible to machine details of components with a minimum feature size of 12 microns under optimal machining conditions.

## **European Commission issued a directive on the safety**

**of consumer laser products** (M. Miler) .....150

## **Pneumatic drives** .....151

## **Collimator and its imaging properties**

(A. Mikš, J. Novák, P. Novák) .....153  
This work represents a theoretical analysis of imaging properties of a collimator with a large number of applications especially for optical measuring purposes. Collimators are mainly used as sources of plane light wavefront or for imaging the test pattern to infinity. Our work reveals the relation between aberrations of the collimator's objective lens and quality of transformed output light wavefront.