

"This number is dedicated to the memory of Professor Ion Agarbiceanu"

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CONSTANTIN UDRISTE, DEAN OF FACULTY OF APPLIED
SCIENCES***

LOSSES MEASUREMENT OF $\text{Er}^{3+}:\text{Ti}:\text{LiNbO}_3$ OPTICAL WAVEGUIDES

Georgiana C. VASILE, Nicolae N. PUSCAS, Ion M. POPESCU

Based on optical methods in this paper we report some experimental results concerning the losses measurement of $\text{Er}^{3+}:\text{Ti}:\text{LiNbO}_3$ optical waveguides. Using interferometric method (Fabry-Pérot optical waveguide resonator) we evaluated the attenuation coefficient for a laser radiation having $\lambda=1.55 \mu\text{m}$. Also, we evaluated the insertion, polarization dependent and coupling with the external losses.

Keywords: $\text{Er}^{3+}:\text{Ti}:\text{LiNbO}_3$ optical waveguides, attenuation coefficient, insertion loss, polarization depending loss.

SYNCHRONIZATION AND CONTROL IN THE DYNAMICS OF DOUBLE LAYER CHARGE STRUCTURES. AUTONOMOUS STOCHASTIC RESONANCE

Cristina STAN, Constantin P. CRISTESCU, Dan ALEXANDROAEI

In this paper we present experimental observations and computational results on autonomous stochastic resonance in a double layer (DL) charge structure. The DL under investigation is generated in the inter-anode space of a twin electrical discharge. We investigate the dynamics of this structure as reflected in the light emission from the DL area of the plasma. In a restricted range of the

inter-anode biasing, the DL shows a transition between steady state and periodical dynamics. The superposition of Gaussian noise can induce such a transition without any periodic signal being injected into the system. With increasing of the biasing, the signal to noise ratio versus the noise level is a curve with a maximum, characteristic of stochastic resonance. As computational model, we consider a modified van der Pol oscillator perturbed by a Gaussian noise. This model is found to well reproduce the experimentally observed dynamics.

Keywords: autonomous stochastic resonance, van der Pol oscillator, double layer

OPTIMIZATION OF THE RECONSTRUCTION PARAMETERS IN COMPUTER GENERATED HOLOGRAMS AND DIGITAL HOLOGRAPHY

Mona MIHAILESCU, Alexandru M. PREDA, A. SOBETKII,
Eugen I. SCARLAT, Liliana PREDA

The phase retrieval algorithm based on the fast Fourier transform was used either to design computer generated hologram (CGH) or for numerical reconstruction of the object starting from the experimental holograms recorded on the CCD in digital holography (DH) subjected to different sets of constraints in the input and output planes. The influence of the initial phase, acting as a command parameter in CGH design, is presented in terms of the mean square error, diffraction efficiency, and contrast in the desired spots. The ideal CGH obtained is imprinted on a glass and its image is then physically reconstructed. Different parameters of the experimentally image are presented. The influence of the experimental conditions (intensity of the laser radiation and the distance between the source and the object) in the digital in-line hologram and its reconstruction is also presented.

Keywords: digital holography, numerical reconstruction, computer generated holograms, diffractive optical elements.

MULTIFRACTAL ANALYSIS OF THE DYNAMICS OF THE ROMANIAN EXCHANGE RATE ROL-USD DURING THE TRANSITION PERIOD

Constantin P. CRISTESCU, Cristina STAN, EugenI. SCARLAT

In this work we present a study on the conditions that a time series has to fulfil in order that a multifractal analysis produces reliable results. The analysis of this type is very important because in many practical situations, particularly the present case of a financial time series, the first usually addressed question is whether the data under study are monofractal or multifractal. The results for short time series (as limited by practical constraints) can be (and indeed are) affected by errors leading to a broadening and a translation of the singularity spectrum. We find that our multifractal analysis gives reliable results for a time series longer than 4000 points. If the available time series is (much) shorter, considerably improved results are expected via a lengthening procedure consisting in the repeating of the available time series. Clearly, a carefully detrended procedure has to be previously applied in order to avoid artificially introduced fluctuation that might alter the singularity spectrum.

Keywords: multifractal analysis, singularity spectrum, fractal dimension, Hurst exponent

IMPROVEMENT OF A LASER PHOTOACOUSTIC INSTRUMENT FOR TRACE GAS DETECTION

Dan C. DUMITRAS, Doru C. DUTU, Consuela MATEI, Ana-Maria MAGUREANU, Mioara PETRUS, Cristina POPA

The paper presents the latest results obtained with a perfected system for trace gas detection based on laser photoacoustic spectroscopy. Technical details of the setup together with the performance parameters are presented. The laser source of the system is a CO₂ laser highly stabilized in frequency so we have obtained the

today most accurate absorption coefficients for ethylene at 57 rotation-vibration lines in the branches P and R, at 9.4 and 10.4 μ m bands. The high sensitivity of the sistem is proved by real-time monitoring of ethylene emission as plant hormone from tomatoes and pears, and as result of lipid peroxidation from human breath.

Keywords: CO₂ tunable laser, photoacoustic spectroscopy, spectrophone, trace gas detection, ethylene absorption coefficients, plant physiology, lipid peroxidation, breath test.

EIGENVALUE PROBLEM FOR SCHRÖDINGER EQUATION USING NUMEROV METHOD

C. TATU, Mihai RIZEA, Nicolae N. PUSCAS

In this paper we present an original method to solve the one-dimensional Schrödinger equation in Wood Saxon potential, with both an inner and outer classical turning point which can be used in other fields (for example molecular spectroscopy) and also the its numerical solution. These involve choice of a step size, changing step size, iteration on the eigenvalue, setting upper and lower bounds on the eigenvalue, determining a useful range of the coordinate for the numerical integration, a numerical example with Wood-Saxon potential and a comparison between Numerov method and other methods.

Keywords : one-dimensional Schrödinger equation, Wood Saxon potential, eigenvalue, Numerov method, classical turning point.

HYDRODYNAMIC AND THERMODYNAMIC ASPECTS OF DIFFUSION COEFFICIENTS IN THE TERNARY SYSTEM WATER-CHLOROFORM-ACETIC ACID AT 25°C

Daniela BUZATU, Ana-Maria POPOVICI, Florin Dorian
BUZATU, Luigi PADUANO, Roberto SARTORIO

The theoretical and experimental investigation for phase separation in partially miscible liquids it is important for their applications in pharmaceutical or biotechno-logical fields. In this paper we studied the ternary system water- chloroform-acetic acid at 25°C, in the diffusion process. We determined the four diffusion coefficients for five average compositions of this ternary system; we calculated the determinant for this experimental points and we determined, by extrapolation from homogenous to heterogeneous zone, the point of the spinodal curve; we compared this point with the theoretical one obtained from the equivalence between the Wheeler-Widom model and the spin $\frac{1}{2}$ Ising model for magnets [1,2].

Keywords: ternary system, diffusion coefficients, spinodal curve

THE INFLUENCE OF SPOT DIAMETER, FLUENCE AND WAVELENGTH OF THE NANOSECOND LASER PULSES ON THE ABLATION RATE OF ALUMINUM

Ionut VLADOIU, Mihai STAFE, Ion M. POPESCU

In this work we analyse the dependence of the ablation rate of aluminum on laser-spot diameter and laser fluence in visible (VIS) and infrared (IR) nanosecond-pulses irradiation regimes. Experimental results indicate that, for a constant flux of energy, the ablation rate decays linearly with increasing the laser spot diameter, both in VIS an IR regime. The linear decay of the ablation rate with spot diameter leads to the inverse-proportional increase of the ablation rate with square root of the laser fluence. Additionally, the results indicate lower threshold fluence and a much higher efficiency of the ablation in the case of using VIS pulses as compare to the IR pulses.

Keywords: ablation rate, laser fluence, spot diameter, laser wavelength

THERMODYNAMICS VERSUS ECONOMICS

Constantin UDRISTE

In this paper we discuss the applicability of concepts and techniques of thermodynamics in economics and viceversa via isomorphism. We use this idea to improve our understanding of the nature of thermodynamic-economic evolution and development.

Mathematics Subject Classification 2000: 80A99, 91B74