Meetings in Physics 2011 – Abstracts
(in alphabetical order of the names of the presenting authors)

1.

Title: Coherent population trapping resonances in cells with micrometric and centimetric thicknesses filled with Cs vapor

Authors: A. Krasteva [1,2], D. Slavov, S. Cartaleva[2]

Abstract: Coherent population trapping (CPT) resonances prepared in Hanle configuration are investigated for Cs atoms contained in optical cells with thicknesses L=700 μm and L=2.5cm. For the L=700 μm cell and F_g = 4 set of transitions, the bright CPT resonance amplitude suffers fast reduction with laser intensity and even at low intensity, the resonance sing reversal takes place. Under the same conditions, no transformation of the resonance sign was observed, for the L=2.5cm cell. The reasons for different behavior of the CPT resonance in the two types of cells will be discussed.

Keywords: CPT, Bright resonance, ETC, depolarization excited levels

PACS: 42.62.Fi, 42.50.Gy

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2.

Title: Are the surface conditions "responsible" for the difference in lightning activity over land and sea?

Authors: Boryana Markova[1], Rumjana Mitzeva[2], Savka Petrova[2]

Abstract: The work is directed to investigate the impact of surface characteristics on lightning activity over maritime and land areas.

The lightning activity over Bulgaria and Black sea is analyzed. The lightning data are provided from the ZEUS network operated by the National Observatory of Athens (NOA). The surface data are taken from proximity sounding obtained by the numerical model GFS. The available lightning data for 74 days during June - August 2006 are used. The territory of investigation includes maritime area - Black sea and continental area – Bulgaria. The flash density and the number of recorded flashes at 3-hour time interval in grid boxes of 0.25x0.25 degrees are calculated. The diurnal distribution of the mean flash density over the whole area shows a clear peak at 1200 UTC time interval (10:30-13:30 UTC). The analysis also reveals that the difference between lightning activity over sea and over land is largest at this interval. For this reason the detailed analyses using data for 1200 UTC is carried out. The statistical analyses indicate that the differences in several surface characteristics over land and sea are statistically significant General and stepwise discriminant analysis reveale that surface data are able to discriminate the thermodynamical conditions related to lightning over Black sea from the corresponding conditions related to lightning over land. This results demonstrate the "vitality" of thermal hypothesis for the explanation of difference in lightning activity over maritime and land areas.

Keywords: thunderstorm; lightning; thermal hypothesis; discriminant analysis

PACS: 92.60.Pw – Atmospheric electricity in Earth's atmosphere, 92.60.Qx – Storms atmospheric, *92.60.N-, 92.60. Nv – Clouds meteorology

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3.

Title: Study of the influence of nuclear quadrupole moments on the transitional matrix elements in the coulomb excitation reaction 12C(94Mo;94Mo*)

Authors: N. Pietralla[1], C. Bauer[1], L. Coquard[1], and J. Leske[1], G. Rainovski[2], M. Danchev[2], K. Gladnishki[2], D. Karagyozov[2], A. Damyanova[2], R. Topchiyska[2], M. Carpenter[3], R.V.F. Janssens[3], K. Lister[3] and S. Zhu[3]

Abstract: Understanding the basic mechanisms of how the interactions between protons and neutrons lead to the formation of complex nuclear structures is a prime interest of modern nuclear structure physics. The structure proton-neutron (pn) mixed-symmetry states (MSSs) is particularly sensitive to a certain parts of the proton-neutron interaction which cannot be observed in the structure of fully-symmetric states. In this work we report on a data analysis of two Coulomb excitation experiments in inverse kinematics, devoted to study the MSSs of ^{94}Mo. The experiments were performed at Argonne National Laboratory with Gammasphere. These experiments are the first step towards the identification of two-phonon 2^+ MSSs in this nucleus. The main aim is to determine the quadrupole moments of the known one-phonon MSSs. Details about the experiment, the data analysis and some preliminary results will be shown and discussed.

Keywords: Coulomb excitation reactions, B(E2) transition strenghts, Collective models – IBM-1

PACS: 25.70.De, 21.10.Re, 21.60.Ev, 23.20.Js

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4.

Title: Four-wave mixing of optical vortex beams

Authors: G. Maleshkov, P. Hansinger, G. G. Paulus, A. Dreischuh

Abstract: We study theoretically and experimentally the four-wave mixing and coherent white light generation by pump beams carrying spatial phase dislocations in the form of singly-charged optical vortices (OVs). Accompanying nonlinear processes of self- and induced phase modulation are accounted for. With pump OV beams with identical topological charges, in an agreement with the experiment, the model indicates generation of signal beams carrying OVs of the same charge in a broad spectral range.

Keywords: singular optics, optical vortex, femtosecond pulse, four-wave mixing, white light generation

PACS: 42.65.Ky, 42.65.Jx, 42.65.Sf, 42.25.Hz

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5.

Title: Глобално движение на адвективните пръстени

Authors: Krasimira Yankova

Abstract: The results of 2D-structure of the disc present short-live formation-rings with enhanced density. Advection controled them entropy , it keeps (kept) her constant in time. And rings can be treated locally. Built a model of such a formation based on the basic equations, but consistent with local physical conditions. We are obtaining local heating and wave numbers depending on it: ω (K) and kφ (K), and kr (K) of an orbit r.Local heating describes the physical effect - expression of direct connection. Localized heating in the annular region K together with ∂ ts carries information about the dependence and the development of the instabilities from the energetics of the disc. Negative entropy gradient creates conditions energy absorption of the instabilities - stimulates feed-back.

Keywords: Magneto-hydrodynamics, Accretion, Instabilities

PACS: 97.10.Gz Accretion and accretion disks
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6.

Title: Tuning femtosecond laser pulses and their correct autocorrelation measurement
Authors: N. Dimitrov, I. Stefanov, A. Dreischuh
Abstract: We show that controllable change of the penetration of one of the prisms constituting the intracavity prism compressor into the laser beam is a simple way to change the dispersion inside the laser cavity thus changing the duration of the emitted pulses. Using an additional set of chirped mirrors outside the cavity we compress the pulses down to 25fs. The correct interferometric autocorrelation with an inverted-field autocorrelator will be described and compared with the theory.
Keywords: femtosecond pulse, dispersion management, autocorrelation, pulse front tilt
PACS: 42.65.Re, 42.60.Lh, 42.65.Sf
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7.

Title: Search for nuclear interference in the Coulomb excitation reaction ^{12}C (^{138}Ce, ^{138}Ce*) at 480 MeV
Authors: R. Topchiyska[2], G. Rainovski[2], N. Pietralla[1], T. Ahn[1], C. J. Lister[3], R. V. F. Janssens[3], M. P. Carpenter[3], S. Zhu[3], C. J. Barton, III[3], M. Danchev[2], K. GLadnishki[2], A. Damyanova[2] and D. Karagyozov[2].
Abstract: Excited states in ^{138}Ce have been studied via the ^{12}C (^{138}Ce, ^{138}Ce*) reaction at 480 MeV [1] which corresponds to 84% of the respective Coulomb barrier [2]. In order to prove that the observed excited states of 138Ce result from electromagnetic interaction only, i.e. the chosen beam energy satisfies the conditions for a "safe" Coulomb excitation reaction, a second measurement at much lower beam energy of 400 MeV have been performed. Details about the analysis of these data will be presented and discussed. The obtained absolute transition strengths are in agreement with the ones reported in [1] proving that there is no nuclear contribution at the excitation processes at 480 MeV.
1] G. Rainovski et al., Phys. Rev. Lett. 96, 122501 (2006).
[2] Pelte&Schwalm formulas, Heavy Ion Collisions, vol. 3, page 1 (1982).
Keywords:
PACS: 21.10.Re, 23.20.Lv, 23.20.-g, 25.10.De
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8.

Title: Analysis of the Annual and Monthly Average Air Temperature and Rainfall Trends in Meteorological Stations Ahtopol, Burgas and Varna for the period of 1950 – 2009
Authors: Veneta Todorova
Abstract: The study focuses on the annual and monthly average air temperature and rainfall trends - actual measurements, minimum and maximum temperatures and rainfalls taken in three meteorological stations in Bulgaria - Ahtopol, Burgas and Varna. The data is collected from The National Institute of Meteorology and Hydrology of Bulgarian Academy of Sciences for the period of 1950 - 2009. The analysis shows future trends as well. The results are based on raw data gathered in the listed stations. Climate data homogenization will be developed at a later stage using the RHtestV2 software and GUI (graphical user interface). The calculation of some important statistical characteristics will be provided too. To study the

climate changes in Bulgaria and those on the east coast in particular, the research will continue with analysis of data collected from more weather stations and analysis of other climate change indicators such as sunlight, clouds and wind.
Keywords: average air temperature, rainfall, trend analysis
PACS: 92.60.Ry, 92.60.Wc
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9.

Title: The influence of ground-level ozone on air quality and the ecosystems in the Sofia-Plana region.
Authors: Ventsislav Danchovski, Evgeni Donev, Danko Ivanov
Abstract: Ground-level ozone directly addresses to air quality and the health of people and ecosystems (damages crops, trees and other vegetation). Our aim is to obtain information about ambient ozone levels, and related damage to agricultural crops and forests (both deciduous and coniferous) in the Sofia-Plana region. We are doing this by Instrumental monitoring of ozone concentrations and meteorological parameters, assessment of the AOT40 index (ozone concentrations accumulated over a threshold of X ppb) and modeling the stomatal flux of ozone AFstY (accumulated stomatal flux of ozone above a flux threshold of Y). In AFstY model we used a sub model for the SWP (Soil Water Potential) which was created for the purpose of this work.
Keywords: ozone, stomatal flux, soil water, evapotranspiration
PACS: 92.60.Sz ,92.60.hf, 92.40.Je, 91.62.Bf
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10.

Title: Discussion about the effects of Mössbauer source line broadening
Authors: V. Rusanov, V. Gushterov, L. Tsankov, L.H. Böttger, A.X. Trautwein
Abstract: Emission line broadening of Mössbauer sources with various effective thicknesses is calculated using two simpler classical models and the quantum mechanical theory of the emission spectrum proposed by Odeurs and Hoy, Nucl. Instrum. Methods Phys. Res. B, 254 (2007) 143–148, giving an account of the non-resonant absorption of the radiation. Two experimental tests are described, which unambiguously show that the broadenings calculated by Odeurs and Hoy are huge and unrealistic. Our conclusion is that the predicted observation of ‘‘hole burning’’ line profile is not possible in a real experiment.
Keywords: Mössbauer source, Line broadening, Age broadening, Self-absorption.
PACS: 25.20.Dc; 32.70.Jz; 31.15.-p; 76.80.+y; 68.37.Hk
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