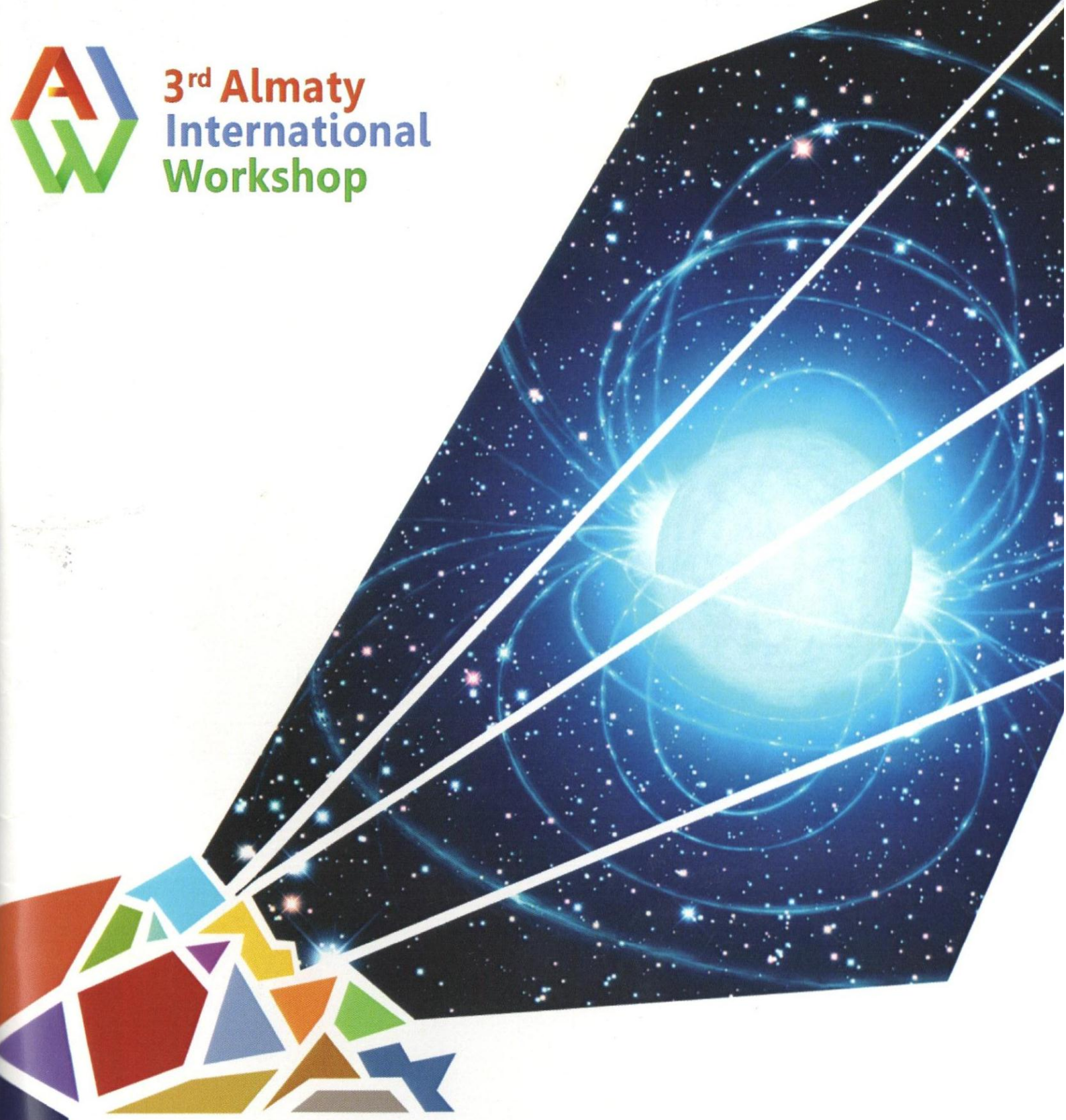
3rd Almaty International Workshop



Nuclear Physics & Astrophysics Book of Abstracts

14-16 April, 2016

al-Farabi KazNU

Program and abstracts

The 3rd International Workshop «Nuclear Physics and Astrophysics»

14-16 April, 2016
al-Farabi Kazakh National University
Almaty, Kazakhstan

Organizers
al-Farabi Kazakh National University
Physical-Technical Faculty
Institute of Experimental and Theoretical Physics

Editors
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III INTERNATIONAL WORKSHOP "NUCLEAR PHYSICS AND ASTROPHYSICS"

APRIL 14-16, 2016, Almaty, Kazakhstan
al-Farabi Kazakh National University
Physical-Technical Faculty,
The Chair of Theoretical and Nuclear Physics,
Institute of Experimental and Theoretical Physics

The International Workshop "Nuclear Physics and Astrophysics", organized by the Chair of Theoretical and Nuclear Physics, Physical-Technical Faculty and the Institute for Experimental and Theoretical Physics of the al-Farabi Kazakh National University will take place on April 14 – 16, 2016 at the Physical-Technical Faculty of the al-Farabi Kazakh National University, Almaty, Kazakhstan.

Co-organizers: Institute of Nuclear Physics of the Republic of Kazakhstan, National Center for Space Research and Technologies, Fesenkov' Astrophysical Institute, Almaty, Kazakhstan

Workshop Language - English. All reports, abstracts and papers accepted for publication are to be in English. The papers for publication in the journal abroad will be peer reviewed.

International Organizing committee: Bum-Hoon Lee (Asia Pacific Center for Theoretical Physics, Republic of Korea), Kiyoshi Kato (Hokkaido University, Japan), Shinsho Oryu (Tokyo University of Science, Japan), Roman Kezerashvili (New-York City University, USA), V.S. Vasilevsky (Bogolyubov Institute for Theoretical Physics, Ukraine), R. Ruffini (ICRANET Sapiensa, University of Roma, Italy), K. Spitaleri (University of Catania, Italy), Chingis Omarov (National Center of Space Researches and Technologies; Fesenkov' Astrophysical Institute, Almaty, Kazakhstan), S. Sakhiev (Institute of Nuclear Physics, Almaty, Kazakhstan), V.N.Melnikov (Russia, MSU, RUDN), T. S. Ramazanov, T.A. Kozhamkulov, A.E. Davletov, M.E.Abishev, N.Takibayev (al-Farabi KazNU, Almaty, Kazakhstan).

Local Organizing committee: Nurgali Zh. Takibayev (chair) E-mail: takibayev@gmail.com, V. Kurmangaliyeva (scientific secretary), M.E. Abishev, B. Abdykadyrov, K. Boshkayev, A. Duisebai, Zh. Omar (al-Farabi Kazakh National University, Almaty, Kazakhstan)

process of scattering of 13C ions on 12C nuclei at energies close to the Coulomb barrier"

16:40 – 17: 00 Daniyar Janseitov, N. Burtebayev, et al; "Elastic scattering of ^{3}He ions from ^{13}C nuclei in optical and folding models"

Program of III International Workshop
"Nuclear Physics and Astrophysics"
Date: 15 April

Time table **Section 5. Astrophysics**

09:00 – 09:30 Ernazar Abdikamalov, (Nazarbayev University); "Probing Core-Collapse Supernova Central Engine with Gravitational Waves"

09:30 – 10:00 Daniele Malafarina, (Nazarbayev University); "Bounces and exotic compact objects from gravitational collapse; Analytical insights into the strong field regime"

10:00 – 10:10 N. Burtebayev[1], Y. Mukhamejanov[1] "Elastic and inelastic ^{11}B+d scattering"

10:10 – 10:20 N. Burtebayev1, N.V. Glushchenko "Analysis of elastic and inelastic scattering of ^{3}He ions on ^{9}Be nuclei at energy 60 MeV"

10:20 – 11:00 Coffee-break

Section 6. Nuclear Physics (Theory)

11:00 – 11:30 P. Krasovitsky, F. Pen'kov (INP); "Phase shifts of molecular resonance transparence"

11:30 – 11:50 Zhusupov M.A., Ibraeva E.T., Kabatayeva R.S.; "Inelastic Proton Scattering on the Ground and Excited States of ^{9}Be Nucleus in the Framework of the Diffraction Multiple Scattering Theory"

11:50 – 12:20 M. Abishev (al-Farabi KazNU); "On cyclic reactions under thermal neutrons flux"

12:20 – 13:40 Break for Lunch

Section 7. Physics and Astropysics

13:40 – 14:00 V.N.Melnikov (Russia, MSU, RUDN) to be announced

14:00 – 14:10 S.Kumekov "The dynamics of electron-hole plasma in the semiconductor excited by high power light pulses"

14:10 – 14:20 S. Kunakov "To the theory of electrostatic probe in dusty plasma, generated by a volume source of fission fragments"

14:20 – 14:30 F.Sagimbaeva "Application of sum coincidence corrections for study of reaction rate of residual nuclei in fission and spallation"

14:30 – 14:40 B.Baimurzinova "Analyzing power of Inverse Diproton Photodisintegration at Intermediate Energies"

14:40 – 14:50 V. Dzhunushaliev, Makhmudov A., Urasalina A.; "Phantom compact and extended objects in astrophysics"

14:50 – 15:00 Z.Zh.Zhanabaev "Fractal - geometric description of the "distance - speed" chart for antigravitating galaxies"

15:00 – 18:00 **Excursions along Esentai river, The region of Theaters and Sport Palaces, Visiting Kasteev museum**

Program of III International Workshop
"Nuclear Physics and Astrophysics"
Date: 16 April

Time table **Section 8 Round-Table (Part 1)**

09:30 – 10:00 M. Abishev (al-Farabi KazNU), S. Kumekov (KazNTU), A. Davletov, K. Kato (Hokkaido University), et al.

Skype-section (Part 1)

10:00 – 10:40 H. Quevedo (National Autonomous University of Mexico and University of Rome) "Multipole structure of compact objects"

10:40 – 11:00 K. Boshkayev (al-Farabi, KazNU) "Observational and theoretical constraints on the mass-radius relations of neutron stars"

Lightest Kaonic Nuclear Clusters

Roman Ya. Kezerashvili[1,2], Shalva M. Tsiklauri[3], N. Takibayev[4]
[1)] Physics Department, The City University of New York, Brooklyn, NY 11201, USA; [2)] The Graduate School and University Center, New York, NY 10016, USA; [3)] Borough of Manhattan Community College, New York, NY 10007, USA; [4)] Al-Farabi Kazakh National University, 480078, Almaty, Kazakhstan

We present our study of kaonic three-body KNN, KKN and KKK and four-body KNNN, and KKNN clusters within the framework of a potential model using the method of hyperspherical functions in momentum representation. To perform a numerical calculations for the bound state energy of the light kaonic system, we use a set of different potentials for the nucleon-nucleon and KN interactions, as well as for the kaon-kaon interaction. The calculations show that a quasibound state energy is not sensitive to the NN interaction, and it shows very strong dependence on the KN potential. We also compare our results with those obtained using different theoretical approaches.

The theoretical discrepancies in the binding energy and width for the lightest kaonic system related to the different NN and KN interactions are addressed.

Phantom compact and extended objects in astrophysics

V.Dzhunushaliev, A.Makhmudov, A.Urasalina
Al-Farabi Kazakh National University

We investigate localized and extended objects for gravitating, self-interacting phantom fields. This study covers phantom boson stars, phantom cosmic strings, phantom domain walls and phantom traversable wormholes. These four systems are solved numerically and we try to draw out general, interesting features in each case. In each of the four systems we find regions of the parameters where there is a balancing between the tendency of gravity to collapse the system and the tendency of the phantom fields to disperse the system.

Fractal - geometric description of the "distance - speed" chart for antigravitating galaxies

Z.ZH. Zhanabaev, S.A. Khokhlov, A.T. Agishev*
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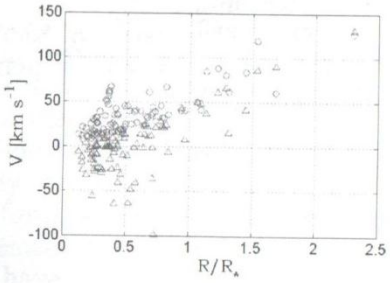
Current astrophysical observations demonstrate expansion of the universe. It can be considered as anti-gravity effect, which is observed as "Scatter" of galaxies from each other with increasing acceleration. This effect has been described in detail in a number of papers, such as [1,2]. Physical nature of antigravity is intensively studied by using the concept of "dark energy." On the other hand the cosmological laws have long studied with fractal theory [3].

The fractal theory suggests an independent choice of minimal measurement scale of measures on values of the determined measures. Geometric measures in theory of gravity must depend on spatial distribution of matter and relevant minimum geometric scale. For this purpose, we can choose a typical distance R_* and use the nonlinear equation of fractal measures [4].

$$X_{i+1} = R\left(\left|1 - \frac{R_*}{X_i}\right|\right)^{-\gamma} \qquad (1)$$

where R_* is radius of zero gravity, γ is the difference between topological and fractal dimensions of matter distribution, R is distance from the observer, X is the minimum deviation from R.



Positive speed values can be found from (1) as $V_{i+1} = {dX_{i+1}}/{dR} = {dX_{i+1}/dt}/{dR/dt}$ and negative values from the Kramers – Kronig relations as

Figure 1 – Diagram "distance - speed" for the local group, $\gamma = 0.194$, $R_* = 0.89$ Mpc.

$$\frac{dX''(R)}{dR} = -\frac{1}{\pi}\frac{X'(R)}{R_* - R} \qquad (2)$$

where $X'(R)$ is real part of $X(R)$ and $X''(R)$ is imaginary part of $X(R)$. Absolute values of the velocities as [km s^{-1}] we can find via the Hubble constant: V = Vi * Hx * R, where Hx = 72 [km s^{-1} Mpc^{-1}] (Fig.1.)

The present theory can be considered as a scale – invariant approach. So, via this theory, we have obtained the same results correctly describing observations of another clusters.

In this paper we propose a new idea for the description the behavior of a physical quantity near its critical value in the form of non-linear fractal measures. As a critical distance from the viewpoint we have adopted sizes of the galaxies groups and distance from the zero gravity barycenter's. This approach to the problems of cosmology is different from other modern research that it`s the simplest way for realization of the basic idea of the general theory of relativity, which is the relationship of space structure with distribution of matter.

References

[1] I. D. Karachentsev, O. G. Kashibadze, D. I. Makarov, and R. B. Tully, The Hubble flow around the Local Group // MNRAS (2009) Vol. 393, 1265-1274.

[2] A. D. Chernin et al., Dark energy domination in the Virgocentric flow // A&A **Vol.** 520, A104 (2010).

[3] Baryshev Y., Teerikorpi P., "Discovery of Cosmic Fractals" – World Scientific Press (2002).

[4] Z. Zhanabayev, S. Khokhlov, Non-linear geometric model of the structure of the ensemble antigravitating galaxies, Vestnik KazNU, seriya Fizicheskaya, 2015.

Calculation of neutron resonances parameters of scattering by system of two heavy nuclei

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Al-Farabi Kazakh National University
**Abai Kazakh National Pedagogical University*

Neutron scattering processes in two heavy nuclei system belong to the class of quantum-mechanical problems, which are becoming more and more interesting. This interest is connected not only with explanation of nuclear interactions details, but also a manifestation of extraordinary events, the inherent problems of three or more bodies. The examples of this are Thomas [1] and Efimov [2] effects, which describe the "fall of particles to the center" and "increase in the number of bound states" in the three-particle systems. New developments in three-particle systems have been identified, concerning "movement of Efimov levels to threshold or from threshold" when you change interaction forces, while the main ("not Efimov") levels are moving in the opposite direction [3]. This phenomenon has been used in experiments to identify the Efimov levels [4]. These effects are amazing and unusual features of quantum problem of three (and more) interacting bodies, which have been confirmed in a number of unique and subtle experiments [4].

Two-particle processes of neutron scattering on a system of two heavy nuclei were considered in this paper. The resonance amplification mechanism of interaction between the heavy nuclei was investigated. The problem of neutrons scattering at crystal structures, in which nuclei are fixed in the crystal lattice was also considered. The use of crystal lattice allows get nucleus "heavier" as well as in Messbauera effect. Two-body interaction of neutron with nucleus was taken in the Breit-Wigner form, which allows the use of analytical expressions for two-enforcement amplitudes of neutron scattering at the nucleus. Calculations have shown that two-particle amplitudes have a resonant dependence not only on energy but also on the distance between the nuclei lattice.Calculations of three-particle type resonances were conducted for ^{103}Ag, ^{52}Cr, ^{51}V, ^{157}Gd and other nuclei.

References:

[1] Landau L.D., Lifshic E.M. «Kvantovaja mehanika», Nauka, M., 1989

[2] Efimov V., Nucl. Phys. A, V 210, 157, 1973