

**LXV MEETING ON NUCLEAR SPECTROSCOPY
AND NUCLEAR STRUCTURE**

**LXV INTERNATIONAL CONFERENCE
NUCLEUS 2015**

**NEW HORIZONS IN NUCLEAR PHYSICS,
NUCLEAR ENGINEERING,
FEMTO- AND NANOTECHNOLOGIES**

***DEDICATED TO 60th ANNIVERSARY
OF THE JOINT INSTITUTE FOR NUCLEAR
RESEARCH***

BOOK OF ABSTRACTS

***June 29 – July 3, 2015
Saint-Petersburg
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2015**

Gridnev K.A. et al.

Properties of nuclei for wide range of Z in the neighborhood of neutron and proton drip lines. - 20 min. 49

Severyukhin A.P.

Structure of $2^+_{1,2}$ states in $^{132,134,136}\text{Te}$. - 20 min. 50

Volya A.

Features of the nuclear many-body dynamics: from pairing to clustering. - 20 min. 51

Artemenkov D.A.

Clustering features of light neutron-deficient nuclei in nuclear fragmentation. - 20 min. 52

July 1, Wednesday, 9:00
Semiplenary Session II

Chernyshev B.A.

Search for light neutron-rich isotopes in stopped pion absorption. - 20 min. 53

Gurevich G.M.

First measurement of the proton spin polarizabilities. - 20 min. 54

Skobelev N.K.

Influence of nuclear reaction mechanisms on population of excited nuclear states and isomeric ratios. - 20 min. 55

Varlamov V.V.

Data for photoneutron reactions from various experiments. - 20 min. 56

Lyashuk V.I.

Intensive hard neutrino source on the base of lithium. Variants of creation and accelerator conception. - 20 min. 57

Ryzhkov S.V.

Combined schemes of the magneto-inertia confinement of high temperature plasma. - 20 min. 58

July 1, Wednesday, 14:00
Section I

Experimental Investigations of Atomic Nucleus Properties

Novatsky B.G.

Search for nuclear stable multineutrons in the ternary fission of ^{232}Th induced by accelerated α -particles. - 15 min. 63

Izosimov I.N.
Isobar analogue states (IAS), double isobar analogue states (DIAS),
configuration states (CS), and double configuration states (DCS) in halo
nuclei. Halo isomers. - 15 min. 64

Danilov A.N.
Search for cluster rotational bands in ^{11}B . - 15 min. 65

Demyanova A.S.
Search for states with abnormal radii in ^{13}C . - 15 min. 66

Korotkova L.Yu.
Search for rare cluster configurations in the nucleus ^{14}C in the reaction
 $^{14}\text{C}(\pi^-, \text{pd})\text{X}$. - 15 min. 67

Dyachkov V.V.
The study of the phenomenon of "dissolution" of alpha-clusters
and the formation of the mean field in the transition from light to medium
nuclei. - 15 min. 68

Joint talk:
Evolution of $N = 40$ neutron subshell at $20 \leq Z \leq 30$ within the dispersive
optical model. 69
Neutron single-particle structure of Mo isotopes within the dispersive
optical model. 70
Reporter *Klimochkina A.A.* - 15 min.

Govor L.I.
Investigation of ^{164}Dy in $(n, n'\gamma)$ reaction. - 15 min. 71

July 1, Wednesday, 14:00

Section II

Experimental Investigations of Nuclear Reactions Mechanisms

Sobolev Yu.G.
Modern methods of total reaction cross section studies, features, results
and perspectives. - 20 min. 84

Bystritskii V.M.
Study of the pd- and dd-reaction mechanisms in the deuterides of metals
in astrophysical energy region. - 15 min. 85

Zelenskaya N.S.
Angular correlations in $^{27}\text{Al}(p, \alpha_1\gamma)^{24}\text{Mg}$ reaction
at $E_p = 7.4$ MeV. - 15 min. 86

July 3, Friday, 12:30
Plenary Session IV

Shlomo S.

A novel method for determining the mean-field directly from the single particle matter density: Application to the measured charge density difference between the isotones $^{206}\text{Pb} - ^{205}\text{Tl}$. - 30 min. 59

Urin M.H.

Gamow-Teller resonances in the compound-nucleus ^{118}Sb : puzzles of the Sarov's experiment. - 30 min. 60

Lutostansky Yu.S.

Superheavy nuclei synthesis in high intensive pulsed neutron fluxes. - 30 min. 61

Karpov A.V.

NRV Web knowledge base on low energy nuclear physics. - 30 min. 62

Conference closing.

Poster Sessions

Section I

Experimental Investigations of Atomic Nucleus Properties

Egorov O.K.

On new electron conversion lines from existing γ -transitions in ^{160}Dy . 80

Klimochkina A.A.

Single-particle characteristics of ^{208}Pb within the dispersive optical model. 81

Kornegrutsa N.K.

Clustering features of the ^7Be nucleus in relativistic fragmentation. 82

Zaycev A.A.

Study of ^{11}C fragmentation in nuclear track emulsion. 83

Section II

Experimental Investigations of Nuclear Reactions Mechanisms

Mukhamejanov Y.S.

Study of elastic scattering protons from ^{14}N nuclei at energies near the coulomb barrier. 115

| | |
|---|-----|
| <i>Boboshin I.N.</i> Global features of shell structure of the $Z = 20 - 50$ nuclei. | 116 |
| <i>Drnoyan J.R.</i> Investigation of isomeric states in the reaction $d + {}^{197}\text{Au}$ at 4.4 GeV energy. | 117 |
| <i>Gikal K.B.</i> Proton induced fission of ${}^{232}\text{Th}$ at intermediate energies. | 118 |
| <i>Hovhannisyan G.H.</i> Some features of isomeric ratios in nuclear reactions induced by p, d, and α . | 119 |
| <i>Kattabekov R.R.</i> Investigation of cluster structure ${}^{12}\text{N}$ nuclei in a coherent dissociation. | 120 |
| <i>Kattabekov R.R.</i> Exposures of nuclear track emulsions to neutrons and heavy ions. | 121 |
| <i>Mazur V.M.</i> Investigation of the excitation of the $11/2^-$ isomeric state in the $(\gamma, n)^m$ reactions on the ${}^{138}\text{Ce}$ nucleus in the 10 – 20 MeV region. | 122 |
| <i>Mazur V.M.</i> On the contribution of the partial cross sections of the (γ, n) and $(\gamma, 2n)$ reactions into the total photo-neutron cross section for the ${}^{142}\text{Ce}$ isotopes. | 123 |
| <i>Zheltonozhska M.V.</i> Excitation of ${}^{179m2}\text{Hf}$. | 124 |
| <i>Strekalovsky A.O.</i> Study of spectrometric characteristics of the diamond detector at the beam of heavy ions. | 125 |
| <i>Strekalovsky A.O.</i> Testing of the Si pin diode on heavy ions. | 126 |
| <i>Kuterbekov K.A.</i> Determination of neutron and proton components of nuclear substance for weakly bound nuclei from a comparative analysis of (ee^-) -scattering and measurement of total reaction cross-sections. | 127 |

| | | |
|--|--|-----|
| <i>Dyachkov V.V.</i> | | |
| Measuring shifts Blair and Fresnel phases is as a method for determining the magnitudes and signs of deformation even-even and odd nuclei. | | 128 |
| <i>Kotov D.O.</i> | | |
| Strange mesons in p+p, d+Au, Cu+Cu and Au+Au collisions at 200 GeV in PHENIX experiment. | | 129 |
| <i>Morzabaev A.K.</i> | | |
| Elastic scattering cross section measurement of ^{13}C nuclei on ^{12}C at energy 22.75 MeV. | | 130 |
| <i>Palvanov S.R.</i> | | |
| Excitation of isomeric states in the reactions (γ, n) and $(n, 2n)$ on $^{85,87}\text{Rb}$. | | 131 |
| <i>Palvanov S.R.</i> | | |
| Investigation of the excitation of isomeric states in the reactions (γ, n) and $(n, 2n)$ on ^{45}Sc , ^{82}Se and ^{81}Br . | | 132 |
| Section III | | |
| <i>Theory of Atomic Nucleus and Fundamental Interactions</i> | | |
| <i>Akinsov N.S.</i> | | |
| Energy characteristics of relativistic charged particle in a circularly polarized phase-frequency modulated electromagnetic wave and in the constant magnetic field. | | 160 |
| <i>Isakov V.I.</i> | | |
| Gamma-decay transition rates and configuration splitting in the two-group shell model. | | 161 |
| <i>Isakov V.I.</i> | | |
| On the properties of $N = 50$ even-even isotones from ^{78}Ni to ^{100}Sn . | | 162 |
| <i>Kartashov V.M.</i> | | |
| Probabilities of magnetic toroidal mono-fields in the non-stationary processes of radioactive lutetium oxide. | | 163 |
| <i>Khomenkov V.P.</i> | | |
| Study of penetration effects in 69.7 keV $M1$ -transition in ^{153}Eu . | | 164 |
| <i>Kolomiytsev G.V.</i> | | |
| Damping of deep-hole states in medium-heavy-mass spherical nuclei. | | 165 |

THE STUDY OF THE PHENOMENON OF "DISSOLUTION" OF ALPHA-CLUSTERS AND THE FORMATION OF THE MEAN FIELD IN THE TRANSITION FROM LIGHT TO MEDIUM NUCLEI

Gridnev K.A.¹, Dyachkov V.V.², Zaripova Y.A.², Yushkov A.V.²

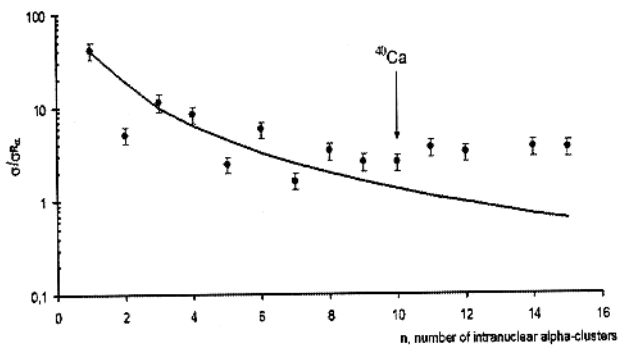
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Historically, alpha-cluster structure of nuclei was the first and was first used by the founders of nuclear physics E.Rutherford and L.Meitner [1]. However, the effect of a sharp rise in the differential cross sections of Rutherford at small angles, understood recently authors [2], allowed to find the desired method.

The figure shows the evolution of the "disappearance" of the raising the cross sections for the 4n-nuclei at energies comparable probing particles of 10 MeV/A, which clearly points to the phenomenon of "dissolution" of alpha-clusters. The x axis represents the number of hypothetical intranuclear alpha clusters. The ordinates represent the ratio of quasi-integrated cross sections (differential cross sections integrated from Coulomb angle, that is, to the trajectory tangent to the surface of angle, to 90 deg. in which the ends of the Fraunhofer diffraction pattern) to the cross section of Rutherford on alpha-particles. Points – collisions with the nucleus as a whole. The solid curve – collisions with intranuclear alpha clusters. The coincidence of the theoretical solid curve with the experimental data clearly indicates the existence of spatially separate alpha-clusters (cross section of the Rutherford on alpha-particles is much smaller than the nucleus as a whole). The discrepancy between the theoretical curve and the experimental points in the area comes from the region ⁴⁰Ca nuclei, which begins the formation of the average nucleon field.



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2. K.A.Gridnev, V.V.Dyachkov, A.V.Yushkov // Bulletin of National Academy of Sciences of Kazakhstan. 2014. V.2. P.95.

MEASURING SHIFTS BLAIR AND FRESNEL PHASES IS AS A METHOD FOR DETERMINING THE MAGNITUDES AND SIGNS OF DEFORMATION EVEN-EVEN AND ODD NUCLEI

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Group of Kharkov Institute of Physics made the discovery phase shifts Blair at Fraunhofer diffraction in the medium angles and phase shifts Fresnel nuclear diffraction at small angles [1, 2]. In the experimental determination Blair phase shift problem was only in increasing the experimental angular resolution of the spectrometer and the precision step in the corner. A significant problem was the experimental determination of the Fresnel shifts. The fact that the Fraunhofer diffraction there exists a reference point shift angle. The reference point is extremum of elastic scattering, measured at the same time inelastic scattering. But Fresnel diffraction such obvious reference point is not visible.

In this paper, the authors propose the comparison Fresnel diffraction extrema for the nucleus as a "reference" point of use Fresnel diffraction theory calculations [2] under the assumption that this nucleus is spherical nucleus ($\beta_2 = 0$). Deviation of the experimental angular distributions of the differential cross sections for elastic scattering of alpha particles in the nucleus with respect to this theoretical curve to the right or to the left will give a phase shift on which determines β_2 and $\text{sign}(\beta_2)$.

On the other hand, and Fraunhofer elastic oscillations have been used as reference in the following procedures. Experimental oscillations described theoretically by the parameterized phase analysis. Then, the theoretical calculation applies to the Fresnel region. And finally, such theoretical Fresnel extremes compared with the experimental, which gives the desired changes to the deformed nucleus.

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2. V.V.Kotlyar, A.V.Shebeko // Nucl. Phys. (Sov. Phys.). 1982. V.35. №4. P.912.

| | |
|--------------------|----|
| Bystritskii V.M. | 85 |
| Bystritskii Vit.M. | 92 |
| Bystritsky V.M. | 92 |

C

| | |
|-------------------|---------------|
| Chavlikov V.I. | 160 |
| Cheredov A.V. | 211 |
| Chernyaev A.P. | 280, 281, 282 |
| Chernyshev B.A. | 53, 67, 112 |
| Chilap V.V. | 251 |
| Chirskaya N.P. | 264 |
| Chubarian G. | 45 |
| Chuluunbaatar O. | 237 |
| Churakova T.A. | 294 |
| Chushnyakova M.V. | 47, 212 |
| Chuvilskaya T.V. | 270 |

D

| | |
|-------------------|------------------------|
| D'yachenko A.T. | 194 |
| Dadakhanov J.A. | 72, 263, 268, 288, 295 |
| Dalehankyzy A. | 136 |
| Dalelkhankyzy A. | 135 |
| Danagulyan A.S. | 119 |
| Danilenko V.A. | 134 |
| Danilov A.N. | 65, 66 |
| Daurenbekov D.H. | 293 |
| Davaa S. | 98 |
| Davidovskaya O.I. | 218 |
| Davids B. | 45 |
| Davydov A.I. | 110 |
| Demekhina N.A. | 104, 117 |
| Demidov A.M. | 71 |
| Demyanova A.S. | 65, 66, 96 |
| Denikin A.S. | 62, 95, 188 |
| Denisov V.Yu. | 218, 219, 220 |
| Derbov V.L. | 237 |
| Derechkey P.S. | 122, 123 |
| Di Toro M. | 193 |
| Dikiy N.P. | 271, 272 |
| Dmitriev S.N. | 38 |
| Dmitriev V.F. | 107 |
| Dolgodorov A.P. | 276 |
| Dolgoplov M.A. | 294 |
| Donskoi E.N. | 79 |
| Dovbnya A.N. | 271, 272 |
| Drapey S.S. | 164 |
| Drnoyan J.R. | 117 |
| Drozhhova T.A. | 33 |
| Dubovichenko S.B. | 221, 229 |

| | |
|-----------------------------|-----------------|
| Dudkin G.N. | 85, 92 |
| Duisebayev A. | 87, 88, 93, 97 |
| Duisebayev B.A. | 87, 88, 97, 216 |
| Dukhovskoy I.A. | 103 |
| Dusaev R.R. | 106, 107 |
| Dyachkov V.V. | 68, 128 |
| Dzhazairov-Kakhramanov A.V. | 221, 229 |
| Dzhilavyan L.Z. | 108, 109, 269 |

E

| | |
|----------------|------------------|
| Edomskiy A.V. | 118 |
| Efimov A.D. | 137 |
| Egorov O.K. | 80 |
| Egorov V.G. | 40, 78, 113, 304 |
| Erdemchimeg B. | 98, 193 |
| Ermakova T.A. | 69, 70 |

F

| | |
|------------------|-------------------------------------|
| Fadeev S.N. | 222 |
| Fajt L. | 304 |
| Fedorchenko D.V. | 217 |
| Fedorets I.D. | 271, 272 |
| Fedorkov V.G. | 257, 259 |
| Fedorov N.A. | 144 |
| Fedotkin S.N. | 155 |
| Feofilov G.A. | 33, 169, 255 |
| Fetisov A.A. | 256 |
| Filikhin I.N. | 287 |
| Filipowicz M. | 85, 92 |
| Filippov, A.V. | 85 |
| Filosofov D.V. | 72, 113, 114, 263, 268, 288, 295 |
| Finkel F.V. | 262 |
| Fomina M.V. | 78, 113, 304 |
| Frolko P.A. | 58 |
| Frolov P.A. | 172 |
| Fu C. | 45 |

G

| | |
|-----------------|--------------|
| Galanina L.I. | 86, 189, 190 |
| Galoyan A.S. | 201 |
| Ganev H.G. | 133 |
| Garistov V.P. | 80 |
| Gasaneo G. | 247 |
| Gassanov A.G. | 91 |
| Gauzshtein V.V. | 106, 107 |
| Gavrilov G.E. | 256 |
| Gazetdinov A.S. | 277 |

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