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
Russia

SAINT-PETERSBURG
2015

July 1, Wednesday, 9:00
Semiplenary Session II

July 1, Wednesday, 14:00
Section I
Experimental Investigations of Atomic Nucleus Properties

July 3, Friday, 12:30
Plenary Session IV

Poster Sessions
Section I
Experimental Investigations of Atomic Nucleus Properties

Section II
Experimental Investigations of Nuclear Reactions Mechanisms

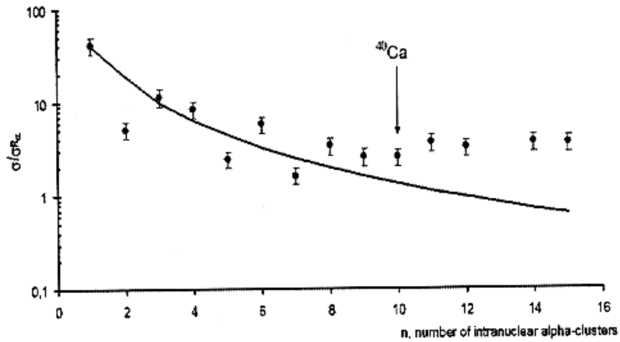
Section III
Theory of Atomic Nucleus and Fundamental Interactions

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]
[1] *St. Petersburg State University, St. Petersburg, Russia;*
[2] *Institute Experimental and theoretical physics, Almaty, Kazakhstan*
E-mail: slava_kpss@mail.ru

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 ^{40}Ca nuclei, which begins the formation of the average nucleon field.



1. G.A.Hakimbaeva. The study of nuclear reactions induced by alpha particles. M.: Nauka. 1975. P.105.
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

Gridnev K.A.[1], Dyachkov V.V.[2], Zaripova Y.A.[2], Yushkov A.V.[2]
[1] St. Petersburg State University, St. Petersburg, Russia;
[2] Institute Experimental and theoretical physics, Almaty, Kazakhstan
E-mail: slava_kpss@mail.ru

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 sign(β_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.

1. E.V.Inopin, A.V.Shebeko // JETP (Sov. Phys.). 1966. V.51. P.1761.
2. V.V.Kotlyar, A.V.Shebeko // Nucl. Phys. (Sov. Phys.). 1982. V.35. №4. P.912.

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Russia

Editor *A.K. Vlasnikov*

Computer make-up by *A.K. Vlasnikov and P.E. Filianin*

Издательство ВВМ

190000, Санкт-Петербург, ул. Декабистов, д. 6, литер А, пом. 10-н

Подписано к печати с оригинал-макета 23.06.2015. Формат 60 × 84 $^1/_{16}$.
Печать цифровая. Усл. печ. л. 18,77. Тираж 200 экз. Заказ № 017.

Отпечатано в Издательстве ВВМ.

198095, Санкт-Петербург, ул. Швецова, 41.