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COMPTON GAMMA-RAY SOURCE BASED ON 500 MEV ELECTRON ACCELERATOR: UNIQUE PARAMETERS AND POSSIBLE APPLICATIONS

Friday, 15 July 2022 10:00 (20 minutes)

The perspectives and the program of experimental research in the field of nuclear physics on the projected source of monoenergetic gamma-quanta based on the Compton backscattering effect of laser radiation from a linear electron accelerator with an energy of 500 MeV are discussed. It is planned to create a facility with a high-intensity beam of monoenergetic gamma-quanta with energies from a few to 30 MeV.
The outstanding parameters of the facility, primarily in terms of monochromatization and beam intensity, will make it possible to obtain new unique data in the field of the structure of atomic nuclei, the physics of photonuclear reactions, including the photofission reaction, and will make it possible to implement methods of both direct measurements and induced activity at a qualitatively new level. New data obtained using monoenergetic photons will make it possible to obtain new reliable information about a number of fundamental problems of electromagnetic interactions of atomic nuclei, primarily, such as the collective modes of nuclear excitations, the relationship between various decay channels of highly excited states of nuclei, the mechanisms of reactions with the emission of various the number of nucleons. The main problems that will be studied at the facility are the structure of the giant dipole resonance (GDR), the parameters of nuclear deformation, and the characteristics of such GDR formation processes as isospin and configurational splitting of the GDR. The implementation of the induced activity method with the beam parameters that are planned to be achieved will make it possible to obtain data on the cross sections of partial photoneutron reactions with high accuracy and reliability and solve the long-standing and well-known problem of significant discrepancies in the results of different photonuclear experiments.
The unique parameters of the gamma-quantum beam at the facility will also make it possible to advance significantly in the field of research in nuclear astrophysics. For the first time, it will be possible to measure the cross sections of photonuclear reactions in the region of the corresponding energy thresholds on bypassed nuclei, which are necessary for studying the currently unresolved scientific problem of the origin of such nuclei. A separate program of research on the projected gamma-radiation source will be devoted to the study of nuclear photofission. Using a beam of quasi-monoenergetic photons with high resolution, mass, charge, and energy dependences of photofission fragments corresponding to decays of well-defined excited states in different minima between fission barriers will be studied.

The speaker is a student or young scientist

No

Section

1. Design and development of charged particle accelerators and ionizing radiation sources

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