つくば不安定核セミナー

第２７回 ２０１０．１２．１３

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場所： 筑波大学応用加速器部門３階大会議室

講演題目

New approach to studying of nuclear exotic: measuring the radii of particle unstable states

概要

Measuring the dimensions of nuclei in particle-unstable states became especially important quite recently when different theoretical models predicted exotic cluster configurations with enhanced radii near the decay thresholds in light nuclei. For solving these problems a new method was developed. Our approach is based on studying the diffraction scattering and conjecture that the radius of the excited state can be determined from the difference of the elastic and inelastic diffraction radii as an increment to the “real” (say, rms) radius of the ground state. The relevant data on α-, ^{3}He-, d-, ^{6}Li- and ^{12}C-scattering on ^{11}B, ^{12}C, ^{13}C were analyzed. The obtained result confirmed numerous suggestions that the Hoyle state is dilute though not as large as the alpha-condensate model predicts. The abnormally large radii were observed also in some other high lying levels of ^{12} C and in some states of ^{13} C and ^{11} B located close to the thresholds of their decay to 3 α + n and 2 α + t correspondingly. Another part of this work is devoted to the observation of neutron halos in some excited states of nuclei. Until now neutron halos were observed only in the ground states of some radioactive nuclei located close to the neutron drip-line. We applied our method for search neutron halo phenomenon in excited states. We analyzed the available data on inelastic scattering to the $1/2^{+}$ levels in ^{13}C and ^{9}Be. All of them demonstrated patterns indicating to the radii enhancement. The halos exist not only in the drip-line nuclei but also in the stable ones where they can be formed in the excited states. We succeeded to determine the diffraction radii from the data on the elastic (quasielastic) and inelastic scattering of ^{11}Be, ^{12}Be, ^{14}Be on ^{12}C.

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