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Research Details :

Research Title : *STUDY OF GAMBHIR-PATIL NUCLEON DENSITY FORM FACTOR*
دراسة عامل الشكل لكثافة النيكليونات لجامبير و باتل

Descriptipn : The present thesis is devoted to a study of the momentum space characteristics of the semi-phenomenological proton and neutron density distribution as proposed by Gambhir and Patil (1986). This density model has only one free parameter namely, the half-density radius which can be fixed using the measured charge rms radius. Once is known the neutron density distribution is automatically predicted. The main emphasis, in this work, is on the computation of nucleon density form factor, , determination of its zeros and locating the maximum of , where denotes the momentum in unit of . A C++ computer program has been developed to calculate the form factors of the semi-phenomenological proton, neutron and (their average) nucleon density distributions for a large number of nuclei. Subprograms have also been developed for calculating the form factor zeros and the maxima of . From these characteristics of the form factor we obtain information about two main characteristics of the Gambhir-Patil (GP) density, namely its extension (or diffraction minimum radius) and the diffusion (or variance) parameters. These parameters are determined with reference to the Helm's density model as has been done by Friedrich and Voegler (1982) in their study of the momentum space characteristics of experimental nuclear charge distributions. It is found that the behaviour of the zeros of GP proton density form factor is similar to that of the experimental charge form factor. This finding enhances the credibility of the semi-phenomenological GP model density. The zeros of GP neutron and nucleon factors, which we have studied, show similar behaviours. It is also found that the minimum diffraction radii of the proton, neutron and nucleon density distributions are very well described by the simple relation , where is the neutron number and and are constants. The present study gives the parameter values of the Helm's model for the nuclear densities which can be used to study the nuclear observable which depends upon the gross features of nuclei such as the nuclear total reaction cross section

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