Acta Phys. Hung. A 22/1 (2006) 000–000

HEAVY ION
PHYSICS

QUASIELASTIC ELECTRON SCATTERING ON ^{65}Cu

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Received 1 November 2005

Abstract. The pioneer method for extraction of quasielastic part from the spectrum of scattered electrons is proposed. The essence of the method is in simultaneous multipole analysis of the mix of quasielastic and resonant formfactors. The identification of resonant peaks and quasielastic part of the formfactor have been held not in scattered electron spectra but in the transition probability energy dependence of each multipolarity where there difference between resonant and quasielastic processes is clear. The pure quasielastic spectrum for ^{65}Cu with the electron energy $E_0 = 225$ MeV and scattered angle $\theta = 65^0$ was obtained as a result of the application of this method.

Keywords: Proton Beam; Coulomb Multiple Scattering; Computed Tomography
PACS: 87.59.Fm; 87.62.+n; 87.90.+y; 34.50.-s; 34.50.Bw

1. Introduction

The results of the investigation of giant resonances (**GR**) by means of inelastic electron scattering depend strongly from the quasielastic background extraction. At the same time one can measure experimentally only the sum of Giant resonance and quasielastic background. The last one has its own angular and energy dependence which is unknown up to now. To found the multipolarity of **GR** it is necessary to separate correctly the **GR** formfactor from the quasielastic background at each angle and energy. Until the present time this process was carried out by means of phenomenological formulas of the quasielastic formfactor energy dependence. At the same time the energy dependence of pure quasielastic cross section is interesting in itself as an object for verification of different models of quasielastic electron

1219-7580/04/ $ 20.00

scattering. All testing of different theoretical quasielastic scattering models up to now were carried out at high excitation energies where there are any resonances.

In this work we first propose the method to divide an electron scattering spectrum into resonance and quasielastic parts. This method is based on the so-called "bin" technique, which has been successfully tested in the energy region where the quasielastic process is absent [1]. We have applied this method to electroexcitation of ^{65}Cu and represent here the pure quasielastic spectrum of scattered electrons obtained for the initial electron energy $E_0 = 225$ MeV and scattered angle $\theta = 65^0$.

2. Experiment and Data Treatment

The experiments were carried out at the LINAC-300 of NSC KIPT. The total resolution in these experiments was about 0.3%. 11 spectra were measured for initial electron energy $E_0 = 150$ and 225 MeV for scattered angles from 34^0 up to 74^0. The obtained spectra of inelastic scattered electrons were divided into bins of 0.5 MeV and averaged. These spectra were used for formfactor calculation. The multipole analysis was then carried out for each energy bin. In this analysis the total formfactor was considered as a sum of five Helm formfactors with different multipols. The least square fitting coefficients were recalculated into the reduced transition probability B(EL). The details of the experimental technique used may be found in [2] and references in it.

As a result the transition probability energy dependence was obtained for each multipolarity L (Figure 1A). It is clear that at high excitation energy ($\succ 50$ MeV) there are any resonances and we see energy dependence of quasielastic reduced probability. So we consider reduced probability energy dependence for each multipolarity as a sum of giant resonances and much broader high-energy maximum corresponding to quasielastic process. The Gaussian function was fitted to each experimental maximum by the least square method.

3. Results

The Gaussian shape obtained for each multipolarity (excepting **E2**) of the high energy maximum gives us energy dependence of the quasielastic process. The momentum transfer energy dependence for each multipolarity is given by the Helm formfactor. So the quasielastic cross section now may be represented as a sum of Helm formfactors with Gausian amplitudes. Figure 1B shows the result of such reconstruction process.

Comparing the obtained result with the previously used quasielastic curves it is clear that at the energy region of $10 - 30$ MeV the resonant formfactor was underestimated in all previous works of **GR** investigation. And the much bigger problem is that this effect may lead to another angular dependence of experimental multipole **GR** formfactor. In turn this causes wrong determination of the **GR** multipolarity.

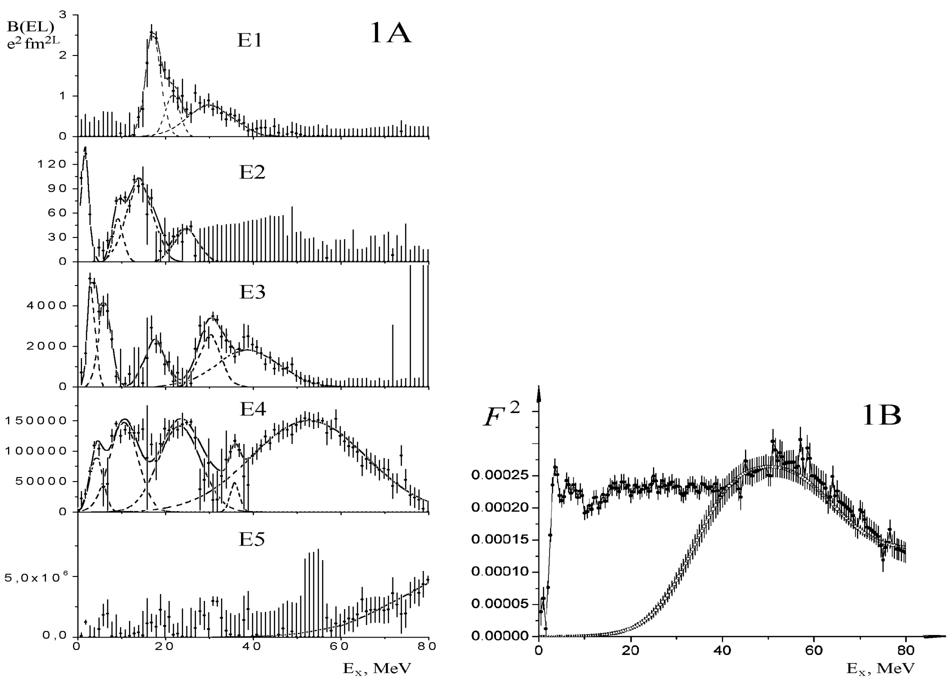

Figure 1. 1A - The reduced transition probability B(EL). Dash curves – result of Gaussian least square fitting. Solid line – sum of all Gaussians.
1B - The formfactof of ^{65}Cu, $E_0 = 225$ MeV, $\theta = 65^0$.

Acknowledgments

The authors are very thankful to the Brazilian agencies CAPES and Fundação ARAUCÁRIA for financial support of this work.

Notes

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