ANSWER TO THE COMMENT BY J.D.T. ARRUDA-NETO AND S.B. HERDADE

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In this note we would like to answer the critical comment by J. D. T. Arruda-Neto and S. B. Herdade *Acta Phys. Pol.* **B13**, 157 (1982) (preceding paper) concerning our paper *Acta Phys. Pol.* **B11**, 691 (1980).

The first and main objection refers to the reliability of our experimental data in consideration of their normalization to the cross sections of the ^{238}U (e, e'f) reaction measured by Aschenbach et al. [3]. We would like to state that the values of the cross sections for ^{238}U, used by us for normalization, are in good agreement with the results obtained by Ströher et al. [4] and Arruda Neto et al. [5]. By the way, one should emphasize that Ströher's results [4] have been obtained by a technique completely different from the one used in the experiments of [3] and [5]. The values of the cross section for the ^{237}Np (e, e'f) reaction obtained by us are in good agreement with Shotter's values [6] for electron energies of 20 and 33 MeV. The fact that the experimental data reported by Aschenbach [3] have been interpreted with the assumption of the electric dipole excitation only, cannot influence the analysis of our experimental data, because the reaction ^{238}U (e, e'f) was used by us as the electron monitor only. A substantial difference is observed between the measurements of the ^{238}U (e, e'f) reaction cross section reported by Arruda-Neto et al. [5] and [7]. The ratio of the cross section values measured for electrons of energy 28 MeV in [7] and [5] is about 1.4. The great amount of the sum rule exhaustion in the fission decay of the GQR 70% obtained in Ref. [7] has not been confirmed in works [3] and [5]. The normalization of our data to the values reported by Arruda Neto et al. [7] would result in approximately 180% EWSR for both isovector and isoscalar GQR, which is an unreasonable value.

The second reproach refers to the evaluation of the contribution of quadrupole excitations in the reaction ^{237}Np (e, e'f).

Our results are based on the assumption of the excitation of both isovector and

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isoscalar GQR, because there are no physical reasons to account for one type excitation only [8]. This assumption and the generally used GQR sum rules [9] are the basis of our analysis. The 50% of the EWSR exhaustion taken to the analysis has been grounded on the results obtained by Pitthan in this older work [10]. Our results have been chosen as the best fit of our calculations to the experimental data for electron energies above 25 MeV, because for lower energies the calculations are practically insensitive to the percentage E2 contribution change. In their new work Pitthan et al. [8] report a (70±11) %EWSR exhaustion for isovector GQR and (77±20) % for isoscalar GQR in the case of the ^{238}U (e, e'f) reaction. An enlargement of the EWSR exhaustion to 70% and 80% for the

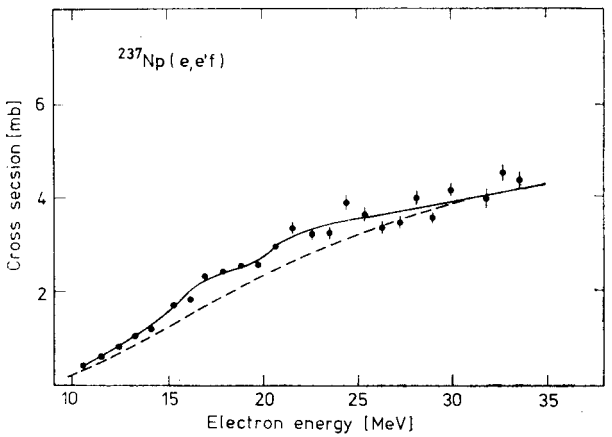

Fig. 1. Electrofission cross section for the ^{237}Np versus electron energy. The solid circles represent our results, the dashed curve represents our theoretical calculations as described in the Ref. [2], the solid line serves to explain the excitation curve slope variation mentioned by us

isovector and isoscalar resonances, respectively, gives the worse agreement with our experimental data. The theoretical curve lies above our experimental points for energies above 25 MeV and demonstrates a greater slope than the experimental one.

As we suppose, the objection to the interpretation of the excitation curve "maxima" at the energies 17 and 21.5 MeV has been caused by an insufficiently comprehensive explanation of our conclusions. Obviously, the integral character of the measured effect excludes the electrofission cross section decrease, but if to continue the argument of the authors of the comment, the assumption $\sigma_{(\gamma,f)} = 0$ in some range of energy would cause the measured (e, e'f) reaction excitation function to have zero slope as well the variations of $\sigma_{(\gamma,f)}$ to influence the change of the σ(e, e'f) curve slope. The well marked increase of the experimental curve slope observed at energies of about 17 and 21.5 MeV may be evidence of the rapid increase in the quadrupole fission. On the background of the increasing curve with the almost constant slope (our theoretical curve) these, so unfortunately named by us, maxima can be observed (Fig. 1). Quoting paper [11] and [12] was to present the works in which the *effects* of the rapid increase of the E2 contribution in the vinicity of the fission thresholds have been considered, despite the different types of experiments. The cross

sections of the ^{235}U (e, e'f) reaction measured by us [13] and the fission fragment angular distribution obtained recently seem to confirm the interpretation presented in Ref. [2]. The excitation curve for the ^{235}U (e, e'f) reaction does not represent such slope changes as in the case of ^{237}Np (e, e'f) reaction, but simultaneously, the relative quadrupole fission contribution obtained from the angular distributions is considerably smaller for ^{235}U than for ^{237}Np. Apart from this, the maxima in the energetic dependence of the lower limit of the relative quadrupole contribution coincides with the regions of bumps in the ^{237}Np (e, e'f) reaction excitation curve. We hope that future investigations will judge the correctness of our arguments.

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