LETTERS TO THE EDITOR

E2-FISSION DECAY OF ^{232}Th

By J. D. T. Arruda-Neto*

Instituto de Física, Universidade de São Paulo, São Paulo, Brazil

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Conclusions drawn from a measurement of ^{232}Th $(\alpha, \alpha' f)$, regarding the fission decay of the isoscalar Giant Quadrupole Resonance, are shown to be inconsistent with recent electro- and photofission data.

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A coincidence hadron-induced fission experiment $(\alpha, \alpha' f)$ on ^{232}Th and ^{238}U [1] presented a striking conclusion: the fission branching ratio of the isoscalar Giant Quadrupole Resonance (GQR) is severely inhibited for both ^{232}Th and ^{238}U. However, the conclusions from Ref. [1], for the ^{238}U, were challenged by two other hadron-induced fission works [2, 3].

We would like to comment on the ^{232}Th $(\alpha, \alpha' f)$ results [1] in the light of recent new facts; in particular, two experiments dealing with electro- [4] and photofission [5] angular distributions of ^{232}Th. According to these independent experiments, $\sim 8\%$ of one E2 energy-weighted sum-rule unity (EWSR) is concentrated in the fission decay channel between 5.5 and 7 MeV (around the fission barrier); the E2 photofission cross sections deduced from São Paulo [4] and Catania [5] data agree nicely (see Fig. 1 of Ref. [6]).

Therefore, one is led to cast doubt on the correctness of the conclusions presented by the authors of Ref. [1]. The $(\alpha, \alpha' f)$ spectrum measured at Groningen shows only that the E2-fission strength of ^{232}Th (or, the underlying continuum plus the E2 strength) is structureless above ~ 7 MeV. It is worth remembering that the E2-fission strength, corresponding to $\sim 8\%$ of the EWSR, was found between 5.5 and 7 MeV (the low-energy tail of the GQR); so, it represents a lower limit for the total E2-fission strength in ^{232}Th. Figure 1 shows, with the purpose of illustrating, the $(\alpha, \alpha' f)$ spectrum of ^{232}Th [1] and the E2-photofission cross section [4, 5] in arbitrary units; the dashed line is a pictorial represen-

* Present address: Nuclear Physics Laboratory, University of Illinois, Champaign, Illinois, USA.

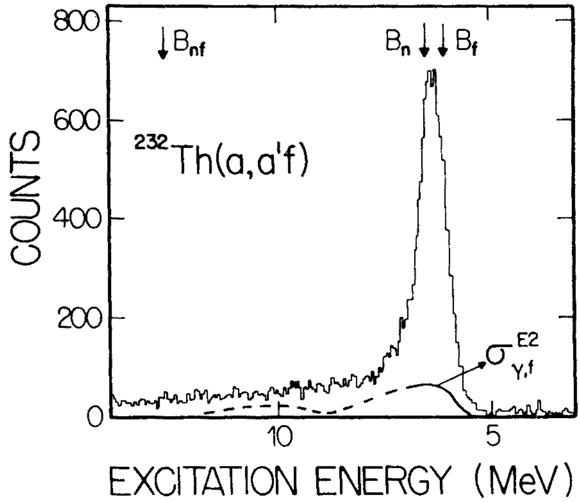

Fig. 1. Coincidence fission spectrum (α, α'f) of ^{232}Th at $\theta_{lab} = 18°$ and $E_\alpha = 120$ MeV (Ref. [1]), and E2 photofission cross section, $\sigma^{E2}_{\gamma,f}$ (details in the text)

tation of what $\sigma^{E2}_{\gamma,f}$ should be above ~ 7 MeV if we assume that P_f(E2) decreases fast as excitation energy ω increases (see the discussion below).

Other conclusions drawn by the authors of Ref. [1] are: (1) The fission probability of the underlying continuum is 27 ± 5 % for the interval $6.0 \leqq \omega \leqq 6.4$ MeV, and 5.5 ± 1.5 % between 9 and 13 MeV. (2) In the decay of the GQR a statistical equilibrium is never reached; it mainly decays by direct neutron emission. (3) It is possible that, the similar fission probability of the Giant Dipole Resonance (GDR) and the compound nucleus is *accidental.*

Conclusion (1) is in clear disagreement with the photofission results from Livermore [7]; see Fig. 15d of Ref. [7]. Conclusion (2) is certainly not true. The photofission study performed by the Catania group [5] concluded that there are strong evidences supporting the fact that $P_f(E1) \approx P_f(E2)$ for ^{232}Th, at least for low excitation energies. Around 6 MeV $P_f(E1) \approx 40\%$ [7], so, we come to the obvious conclusion that $P_f(E2) \approx 40\%$ too (near the fission barrier, which corresponds to the low-energy tail of the GQR). About conclusion (3) we would like to remember the record of another *accident* which happened recently: the fission decay of the Giant Monopole Resonance (GMR) in ^{238}U with a probability similar to the one for the GDR and the compound nucleus [8]. We believe that the present status of the GQR fission decay calls, at least, for data interpretation based on a much more firm nuclear physics basis.

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