should be of the order of a few tens of percent. The probability of populating unbound states by radiative transitions is reduced by the factor E^3 (dipole term in multipole expansion), but the probability for further γ-ray deexcitation is additionally reduced due to the high probability of particle emission.

The experimentally observed values of σ_{act} are up to 20 times higher than the σ_{int}. In contrast with the σ_{int}, which shows a smooth mass dependence saturating in the region of medium nuclei where the cross section is about 1,2 mb, the values of σ_{act} are scattered between 0,5 mb and 20 mb. The two cross sections roughly agree only for nuclei in the vicinity of closed neutron shells. Probably the most convincing explanation for this discrepancy is that based on the suposition that the σ_{act} observations are severely contaminated by events due to the slowed down neutrons (for which the capture cross sections tend to be larger). This conjecture is supported by the similarity of the observed A dependence of σ_{act} for 1 MeV and 14 MeV neutrons, i. e. both show the same extreme dependence on shell structure.

References

1) J. Zimanyi, I. Halpern and V. A. Madsen, Phys. Lett. **33B** (1970) 205 and references citied therein;
2) F. Cvelbar, A. Hudoklin, M. V. Mihailovič, M. Najžer and M. Petrišič, Nucl. Phys. **A130** (1969);
3) F. Cvelbar and A. Hudoklin, Nucl. Phys. **A159** (1970) 555;
4) F. Cvelbar, A. Hudoklin and M. Potokar, Nucl. Phys. **A158** (1970) 251.

6.2. The radiative capture of 10 MeV neutrons in heavy nuclei

M. POTOKAR, F. CVELBAR and M. BUDNAR, *J. Stefan Institute, and Faculty for Natural Sciences and Technology, University of Ljubljana*

In an attempt to remove considerable discrepancies between the early experimental data on fast (10—30 MeV) nucleon capture and the predictions of the statistical theory and the simple direct theory of nucleon capture the so-called direct-semi direct (DSD) theory arose. The spectra of prompt gamma-rays following the radiative capture of 14 MeV neutrons have been recognized as an effective tool for testing the new theory. The agreement between the experimental spectra and the spectra calculated by using this theory has been good in the case of light and medium nuclei[1]. The integrated cross sections obtained by summing all counts in the spectrum corresponding to gamma-ray transitions to bound states have been found to exhibit smooth mass dependence, the cross sections being between 300 μb and 1200 μb, increasing with A. This observation is in contradiction with the cross section data obtained by the activation technique, but does not contradict DSD theory[2].

The investigation of the capture process has now been extended to the heavy nuylei. The experimental spectra of Ba, Pb and Bi are presented for the first time. These spectra are reasonably reproduced by the theory, so confirming at least the general correctness of the present day state of DSD theory for the radiative

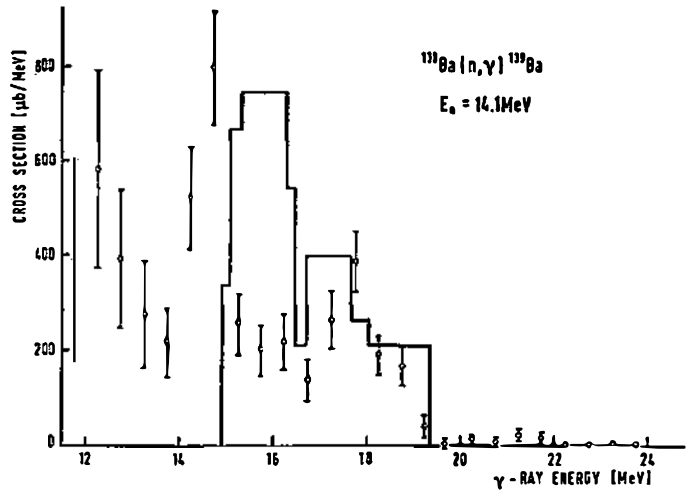

Fig. 1 Comparison of experimental (circles) and theoretical (solid line) spectrum of γ-rays from the radiative capture of 14,1 MeV neutrons in barium.

capture process. Fig. 1 presents the measured spectrum for ^{138}Ba in comparison with the spectrum calculated according to Zimanyi, Halpern, and Madsen formulation[3] of DSD theory. The integrated cross sections agree with our previously found smooth mass dependence, the values being 1600 ± 300 μb, 1150 ± 200 μb, and 1150 ± 200 μb for Ba, Pb and Bi, respectively.

References

1) F. Cvelbar, A. Hudoklin, M. V. Mihailović, M. Najžer and M. Petrišič, Nucl. Phys. **A130** (1969) 413;
2) F. Cvelbar, A. Hudoklin and M. Potokar, Nucl. Phys. **A158** (1970) 251 (other references contained therein);
3) J. Zimanyi, I. Halpern and V. A. Madsen, Phys. Lett. **33B** (1970) 205.

6.3. ^{9}Be(^{3}He, p)^{11}B reaction at low ^{3}He energy

D. M. STANOJEVIĆ, K. M. SUBOTIĆ, B. Z. STEPANČIĆ, R. V. POPIĆ and M. R. ALEKSIĆ, *Institute of nuclear sciences »Boris Kidrič«, Beograd*

We report on the measurements of excitation functions for twelve groups of protons emerging from the reaction ^{9}Be(^{3}He, p)^{11}B for $0.5 < E_{^3He} < 1.1$ MeV. This energy region corresponds to the excitation of ^{12}C nucleus from 26.78 up to 27.38 MeV where the data on ^{12}C are scarse and inadequate. From the reaction