ISOMER RATIOS FOR PRODUCTS OF PHOTONUCLEAR REACTIONS ON ^{121}Sb

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Using of high energy gamma-quanta as projectiles in nuclear reactions has some essential advantages for study of nuclear structure and nuclear reaction mechanisms. Indeed, gamma-quanta do not introduce large angular momentum and do not cause an additional contribution to excitation energy of compound nucleus due to absence of projectile's binding energy. In addition, the precise non-discrete control of the incident gamma-quanta energy is possible. Very limited experimental data for photonuclear reactions in the energy range 30-100 MeV for testing newly developed and available theoretical models was the the major motivation for the present work.

Experimental measurements and deriving isomer ratios for products of photonuclear reactions with multiple particle escape on antimony have been performed using bremsstrahlung with end point energies 38, 43 and 53 MeV. We used metallic antimony targets of natural isotopic abundance to study reactions ^{121}Sb(γ,3n)^{118m,g}Sb and ^{121}Sb(γ,5n)^{116m,g}Sb. For the products of (γ,5n) reaction one had to take into account an interfering contribution of ^{116m,g}In nucleus from ^{121}Sb(γ,nα)^{116m,g}In reaction. Method of induced activity measurement was utilized and for acquisition of instrumental gamma spectra we used HPGe spectrometer with 20% relative efficiency and energy resolution 1.9 keV for 1332 keV gamma line of ^{60}Co. Linear accelerator of electrons LU-40 was a source of bremsstrahlung. Energy resolution of electron beam was about 1% and mean current was within (3.8 – 5.3) μA. The reactions used (first column), isomer ratios (second column) and the endpoint energy of bremsstrahlung spectrum (last column) are given in the table below.

Reaction	$Y_h(E_\gamma)/Y_l(E_\gamma)$	$E_{\gamma\max}$, MeV
^{121}Sb(γ,3n)^{118m,g}Sb	0.14 ± 0.04	38
	0.15± 0.01	43
^{121}Sb(γ,5n)^{116m,g}Sb	0.25 ± 0.03	53

These new isomer ratio results obtained are compared with theoretical predictions and discussed in the frame of mechanisms of nuclear reactions.