

## Methods for studying reaction cross-sections with neutron-rich nuclei

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The method [1] for measuring the total  $\sigma_R$  and partial cross-sections of nuclear reactions and the results of applying the method in studying the energy dependence  $R(E)$  in reactions with neutron-rich isotopes He, Li, Be and B [2-4] are presented. Secondary beams of the studied nuclei were obtained at the fragment separator ACCULINNA of the accelerator U400M, FLNR JINR.

A comparative analysis of the developed methodology with other methods is provided.

The created method is based on the registration in a solid angle close to the total  $\Omega = 4\pi$  of cascades of  $\gamma$ -quanta accompanying nuclear reactions and includes: taking into account the dependence ( $M$ ) - the efficiency of registration by the spectrometer of cascades of  $\gamma$ -quanta of multiplicity  $M\gamma$  and its distribution from  $k$  the number of detectors that have worked  $wM\gamma(k)$ . The characteristics were measured using the  $\gamma$ - $\beta$ - $\gamma$  coincidence method using a  $^{60}\text{Co}$  source.

The presented technique allows obtaining the values of the dependences of the total reaction cross-sections on the energy  $R(E)$  and on the number of triggered detectors  $R(k)$ .

For the first time,  $R(E)$  and  $R(k)$  were measured for the reactions  $^{6,8}\text{He}$ ,  $^{8,9,11}\text{Li}$ ,  $^{10,11,12}\text{Be}$ ,  $^{14}\text{B}+^{28}\text{Si}$ ,  $^{59}\text{Co}$ ,  $^{181}\text{Ta}$  in the little-studied beam energy range  $E_{LAB} = 5+50$  MeV/nucleon. Analysis of the results obtained using the new method for measuring  $R(E)$  made it possible to determine the contributions of the partial cross sections of reaction channels accompanied by cascades of low-multiplicity  $M\gamma$   $\gamma$ -quanta.

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### References

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