Subbarrier Fusion of ^{9}Be + ^{209}Bi

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The subbarrier fusion of the system ^{9}Be + ^{209}Bi has been studied. There are two main motivations for the choice of this system:

(a) A comparison with the halo system ^{11}Be + ^{209}Bi studied at RIKEN [1];

(b) Search for an influence on the excitation function of a possible breakup of ^{9}Be into $n + \alpha + \alpha$ since the last neutron is bound in this nucleus only by 1.67MeV (one of the lowest neutron binding energies for stable nuclei).

The total fusion cross section has been deduced by observing in beam the α-particles emitted by the ground state decays of the evaporation residues populated via 2n, 3n, 4n emission following the fusion process. The α-lines observed have the following characteristics:

1. 2n: $E_\alpha = 9.00$ MeV, $T_{\frac{1}{2}} = 700$ ns
2. 3n: $E_\alpha = 9.36$ MeV, $T_{\frac{1}{2}} = 120$ ns
3. 4n: $E_\alpha = 8.43$-8.55 MeV, $T_{\frac{1}{2}} = 5.0$ ms and 3.35 ms

For the experiment, four silicon detectors have been utilized: two with $\sim 400\,\mathrm{mm}^2$ surface in backward directions 7cm from the target for the detection of the alpha activities and two monitors at $\pm 20°$. A target of $220\,\mu\mathrm{g/cm}^2$ was utilized with a carbon catcher $150\,\mu\mathrm{g/cm}^2$ thick for stopping the evaporation residues at the target position. The preliminary results are presented in figure 1. From a first analysis of the cross section data, it seems that:

(a) the excitation function falls down in the low energy region much less rapidly than predicted by standard CCFUS calculations.

(b) this excitation function is surprisingly very similar to the one measured for the halo system ^{11}Be + ^{209}Bi [2].

Both these facts call for more detailed measurements of this excitation function as already planned by this collaboration.

References

[1] A. Yoshida *et al.*, Phys. Lett. **B389** (1996) 457
[2] C. Signorini, International Nuclear Physics Conference INPC'95, Beijing 1995, China, Proceedings p. 375

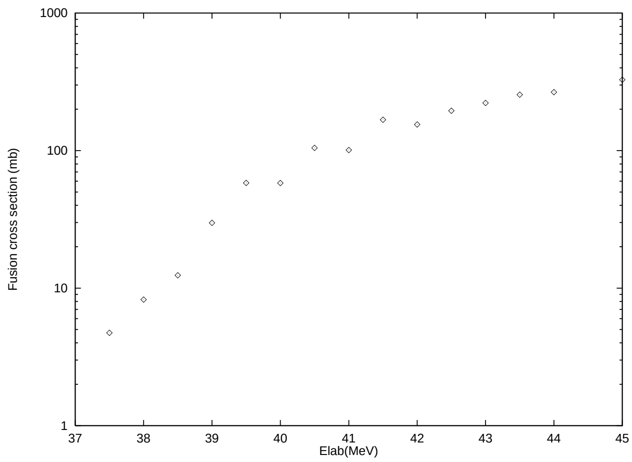

Fig. 1: Preliminary results of the measured fusion cross sections of ^{9}Be + ^{209}Bi as function of E_{lab} (MeV) without error bars