Search for isomeric state in ^{216}Fr at the Warsaw IGISOL system

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In the translead region ^{216}Fr is known as the lightest isotope to have a band structure with interleaved states of alternating parities connected by enhanced B(E1) transitions [1]. Its bandhead is believed to be a 9^- isomeric state. While the existence of an alpha decaying isomers in odd-odd nuclei is common, a helium-jet based study performed by Sheline et al. [2] on the ^{224}Pa→^{220}Ac→^{216}Fr→^{212}At alpha chain did not yield any information on the excitation energy of the postulated 9^- state nor on its half-life [2]. In this presentation we shall report on the attempts to search for the missing 9^- state in ^{216}Fr with use of the Warsaw IGISOL system.

The ^{220}Ac activity ($T_{1/2}$ = 26 ms) was produced in the heavy-ion reaction ^{14}N + ^{209}Bi, with target placed inside the helium gas cell of IGISOL system [3]. The cell with a volume of 400 cm^3, for which the gas flow simulations were performed using FLUENT code [4], was off-line tested with an alpha-decay recoil source ^{223}Ra [5]. In the on-line experiment an ion extraction efficiency of a gas catcher/ion guide system was optimized for the heavy-ion reaction product ^{213}Rn ($T_{1/2}$ = 25 ms) and the maximum efficiency of about 3% was determined. For the physics experiment four silicon alpha detectors were placed at the collection point of the IGISOL magnet. The digital electronics (DGF) was tested in the α-α-t correlations and pile-up modes with the ^{223}Ra alpha source and the heavy-ion reaction product ^{220}Ac (low spin alpha decay chain, see Fig. 1), respectively.

Details of the gas flow simulations, off-line and on-line tests of a gas catcher/ion guide system, digital electronics tests and the preliminary results of the physics experiment will be reported.

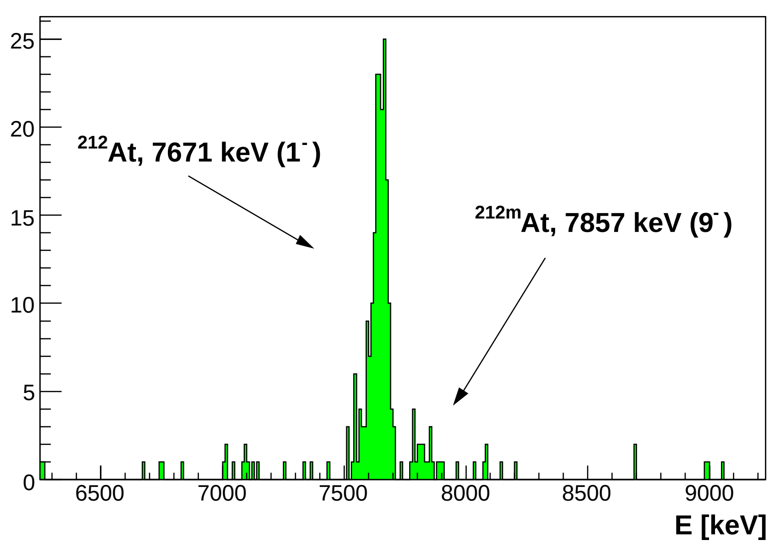

Figure 1: *Time-correlated alpha spectrum obtained for ^{220}Ac setting. Events collected within 1 s after registration of the 9004 keV alpha line from ^{216}Fr →^{212}At decay.*

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