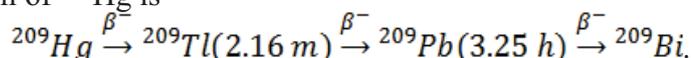


PRODUCTION AND SPECTROSCOPIC INVESTIGATION OF NEW NEUTRON-RICH ISOTOPES NEAR THE NEUTRON N = 126 SHELL CLOSURE USING THE MULTINUCLEON TRANSFER REACTIONS

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The mass-spectrometer MASHA (Mass-Analyzer of Super Heavy Atoms) was designed for determination of the masses of superheavy elements. The unique property of this mass-spectrometer is his ability to measure masses of the synthesized super heavy isotopes ($m/\Delta m \sim 1300$) simultaneously with registration of their α -decay or spontaneous fission. The mass-spectrometer is connected to the U-400M cyclotron of the Flerov Laboratory for Nuclear Reactions (FLNR) JINR, Dubna. The position-sensitive quantum counting hybrid pixel detector MEDIPIX provide high spatial resolution and single-quantum detection. This device has an array of 256x256 square pixels of pitch size 55 μ m for full sensitive area 14x14 mm². It is planned to use the MASHA+MEDIPIX setup in the investigation of neutron rich nuclei produced in multinucleon transfer reactions. MASHA can measure any nucleus from helium up to superheavy elements and MEDIPIX detects with high efficiency the beta particles. Nuclei in this region decay mainly by β^- . We propose to carry out the experiments on the production of new neutron-rich isotopes near the neutron shell closure N = 126 using the multinucleon transfer reactions: ^{40}Ar , $^{48}\text{Ca} + ^{208}\text{Pb}$, ^{205}Tl , ^{204}Hg . $E_{\text{beam}} = 5-7$ MeV/n. The candidates are $^{209,210}\text{Hg}$ and $^{211,212}\text{Tl}$. For example the decay chain of ^{209}Hg is



By measuring the mass, lifetime, energy spectrum of beta particles and by using the position sensitivity of MEDIPIX one can identify these neutron rich nuclei with high accuracy. The cross sections for these isotopes, using the beam ^{40}Ca [13], range from 10 μ b up to 10mb which is enough to obtain sufficient statistics. In the case of ^{48}Ca the yield should be even higher, since ^{48}Ca is more neutron rich.

Summer practice: Familiarization with experimental setup. Study the papers concerning the transfer reactions induced by heavy ions beams. Active participation in controlling and testing the mass-spectrometer "MASHA".

Goals: Acquisition of practical experience in preparation the experiments using the heavy ion beams.

Results: Data processing and analysis of the last experiments on MASHA using the ion beam ^{40}Ar . Preparation of presentation on MASHA and results obtained on this experimental setup.

Number of students: 2