

**DETERMINATION OF MASSES OF THE SUPER HEAVY ELEMENTS IN THE
EXPERIMENTS ON SYNTHESIS OF 112 AND 114 ELEMENTS USING THE
REACTIONS $^{48}\text{Ca}+^{242}\text{Pu}$ AND $^{48}\text{Ca}+^{244}\text{Pu}$**

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Traditionally, in experiments on synthesis and properties investigation of transuranium and superheavy elements methods are applied, based either on the properties of α -decay radioactive chains ending at well-known nucleus or on radiochemical identification. Thanks to the long lifetimes of most superheavy nuclei (between 0.1 ms and 30 s), high efficiency kinematic separators which can reliably separate the fusion reaction products from the target-like products and from the primary beam are used. However, these separators do not measure the masses of separated atoms. At the FLNR it was shown that the lifetime of the synthesized isotopes of 112 and 114 elements is higher than 0.5 s and both elements are volatile at room temperature. Thus, experiments on mass measurements of the isotopes of these elements by mass-spectrometer technique with ECR ion source and hot catcher can be carried out. For the first time, such a technique was proposed by the FLNR, JINR and the appropriate mass-spectrometer MASHA (Mass-Analyzer of Super Heavy Atoms) has been planned and realized. 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. In the first experiment on synthesis we plan to determine the masses of the super heavy elements 112 and 114 using the reactions $^{48}\text{Ca}+^{242}\text{Pu}$ and $^{48}\text{Ca}+^{244}\text{Pu}$ at beam energy $E_{\text{beam}} \sim 5 \text{ MeV/n}$.

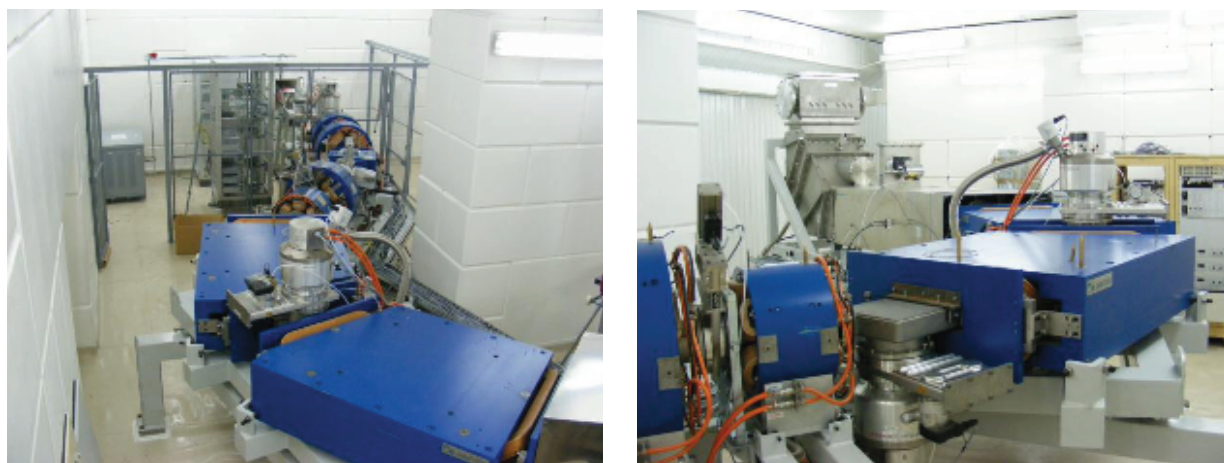


Fig. 1 Mass-spectrometer “MASHA” at the beam line of the cyclotron U-400M

Summer practice: Familiarization with experimental setup. Study the papers concerning the synthesis of superheavy elements induced by heavy ions beams. Active participation in controlling and testing the mass-spectrometer “MASHA”.

Goals: Acquisition of practical experience in preparation the experiments on synthesis of superheavy elements.

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

Number of students: 2