TASCA 09

8th Workshop on
Recoil Separator for Superheavy Element Chemistry
October 14, 2009, GSI, Darmstadt, Germany

Studies of the reaction ^{244}Pu(^{48}Ca,3-4n)^{288,289}114 at TASCA

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(The E114-Physics-TASCA Collaboration)

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In the past few years, the new gas-filled TransActinide Separator and Chemistry Apparatus TASCA was installed and commissioned at the GSI in Darmstadt. The year 2008 marked the transition from commissioning towards a science-driven program. As a first highlight experiment in the region of the heaviest elements, the reaction ^{244}Pu(^{48}Ca,xn)$^{292-x}$114 was studied in the Summer of 2009.

During the past decade, the Dubna Gas-Filled Recoil Separator (DGFRS) group reported the discovery of new elements up to 118. Only a minor part of these claims has been independently verified so far.

The main goal of our experiment was broader than pure replication of published data. The studied reaction is claimed to lead to the superheavy element 114 with a rather large cross section of about 5 pb. The isotopes produced in the 3n and 4n channel of this reaction, ^{289}114 and ^{288}114, respectively, are reported to be long-lived enough for gas-phase chemical experiments with reported half-lives of $T_{1/2}$ (^{289}114) = $2.6^{+1.2}_{-0.7}$ s and $T_{1/2}$ (^{288}114) = $0.80^{+0.27}_{-0.16}$ s. As an experiment on the chemistry of element 114 is scheduled at TASCA for September 2009, a preceding experiment verifying the cross section and lifetimes of the foreseen isotopes was paramount. Even more so as all of the independent verification experiments reported cross sections lower than those reported from Dubna.

Measurements of an (at least partial) excitation function to reliably determine the maximum cross section of the ^{48}Ca+^{244}Pu reaction as well as of the magnetic rigidity of the produced element 114 isotopes in pure He with good statistics together with the desire for more accurate nuclear data of the evaporation residues were most important in the design of the experiment.

At the workshop, a preliminary account of the experiment will be given.