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The observation of Element 117: Opportunity for next generation experiments with the new ALBEGA multi-coincidence detection setup

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{\large \bf The observation of Element 117: Opportunity for next generation experiments with the new ALBEGA multi-coincidence detection setup}
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{\em for a HIM, Germany; GSI, Germany; Mainz U., Germany; LBNL+UC Berkeley, USA; ORNL+UT Knoxville USA; JAEA, Japan; Liverpool U., UK; ANU, Australia; Lund U., Sweden; LLNL, USA; Vanderbilt U., USA; SINP, India; Oslo U., Norway; Bern U.+PSI, Switzerland; Jyv\"askyl\"a U., Finland; ITE Warsaw, Poland; IITR, India collaboration
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(the TASCA and ALBEGA Collaborations) }
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The present knowledge of the nuclear structure of superheavy nuclei (SHN) is still scarce, in spite of
large experimental and theoretical efforts devoted to this problem in the last decades.
This is mainly due to the low production rate of these nuclei.
The synthesis of SHN can be achieved preferably by heavy-ion
induced fusion-evaporation reactions and can easily require a day, a week, or several months of beam time for single event observation [1].

Such measurements are typically performed with in-flight recoil separators in combination with a detection setup.
I will present the results of a recent experiment on the production of the element with
Z=117 [2] as an example of a SHN program conducted at the upgraded gas-filled
recoil separator TASCA (the TransActinide Separator and Chemistry Apparatus).
%The element Z=117 was produced as an evaporation residue in the $^{48}\mathrm{Ca} + ^{249}$ Bk fusion reaction.
Experiments on $^{294}117$ performed at TASCA [2] and DGFRS (the Dubna Gas-Filled Recoil Separator) [3] both report that
many decay products along the decay chain feature half-lives longer than 1 s.
This offers, as a complementary approach, opportunities to chemically isolate these isotopes,
as was done, e.g. in [4].

It has been experimentally shown that physics experiments can benefit from a chemical isolation [5].
In particular, the application of chemical isolation to the ions
selected with a recoil separator
has significantly improved the background conditions, as described in Refs. [4-7].
So far, e.g., the gas-thermochromatography detector setups like COMPACT [5] or COLD [7] were successfully used.
A next generation setup, ALBEGA (for measurements of ALpha-BEta-GAmma decays after chemical isolation) was recently developed at GSI.
ALBEGA is dedicated to collect spectroscopic data by detecting simultaneously
α-particles, electrons, photons, and fission fragments.
I will present the current status of ALBEGA and an outlook on its future applications.

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