SYNTHESIS OF THE HEAVIEST ELEMENTS AND STUDY OF THEIR CHEMICAL PROPERTIES AT PSI-PHILIPS CYCLOTRON

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Since 1994 the K = 120 PHILIPS cyclotron of the Paul Scherrer Institute (PSI) is equipped with a CAPRICE (10 GHz) electron cyclotron resonance (ECR) ion source. This opened up new perspectives in the field of heavy element research.

An overview will be given on the research achievements in this field over the past five years. They may be summarised as follows:

1. Reaction studies were performed to investigate production of neutron rich isotopes of heaviest elements in asymmetric fusion reactions from xn and αxn channels. Examples are ^{248}Cm (^{19}F, 5n) ^{262}Db or ^{244}Pu (^{22}Ne, α3n) ^{259}No. The latter reaction type was used to search for ^{263}Rf from the ^{248}Cm (^{22}Ne, α3n) reaction.
2. An on-line chemical separator was developed (OLGA III) which is able to isolate volatile species within a few seconds and to detect decaying nuclides at a level of about one atom per day of beam time.
3. OLGA III was used to chemically isolate short-lived isotopes of Hf and W and then used to investigate chemical properties of the transactinide elements Rf (at FLNR, Dubna) and Sg (at GSI Darmstadt).
4. An outline will be given on ongoing experiments to search for the new isotopes (^{266,267}Bh from the 249BkNe; 4,5n) reactions and to perform first ever-chemical studies of the element Bh at PSI (in collaboration with LBNL, ORNL, GSI, FLNR).

SPIN PHYSICS AT RHIC

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PHENIX Spin is an approved experiment at the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory (BNL). The major goal of this experiment is a study of the spin structure of the proton and precision tests of the symmetries involved. RHIC offers a unique opportunity because of its ability to accelerate polarized protons up to $\sqrt{s}$ = 500 GeV and a high luminosity of 2 x 10^{32} cm^{-2} sec^{-1} with polarizations as high as 70%. This will probe the frontier of polarized proton-proton collisions. This talk will describe the experiment and its present status as it prepares to take its first data next year.

Measurements of the polarization, both absolute and relative, will be necessary. Preliminary work has been done on making a polarimeter and data have been taken (AGS E950). Results of this work will be presented.

UNITARITY IN HIGH ENERGY PHYSICS

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The central role of unitary in high energy physics could not be emphasised with sufficient strength as it can be argued that it dictates the main properties exhibited by the data.

STATUS OF LOW ENERGY NUCLEAR PHYSICS IN INP AS RU

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Over the last few years, low-energy nuclear physics has become an object of very intent attention both of nuclear physicist and astrophysicist in relation to discovering large spatial extended halo nuclei.

The rich experimental material for the radioactive beams processes accumulated, which is an excellent platform for theoretical reflections and ideas, as a new view on the nature of the exotic nuclear system is needed.

In the report the researches of our institute scientists working in the considered field are presented. These investigations are reviewed in the light of the new tendencies, which are characteristic in present time for the nuclear physics with the second beams and for astrophysics.

SPIN PHYSICS OF NUCLEON AND LIGHT NUCLEI

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