



Contribution ID: 133

Type: Oral Presentation

Experimental program of the Super-FRS Collaboration of the FAIR project and developments of the related instrumentation

Thursday, 14 May 2015 12:00 (20 minutes)

The physics program at the superconducting fragment separator Super-FRS, being operated in a multiple-stage, high-resolution spectrometer mode at radioactive-beam energies up to 1500 MeV/u for the heaviest projectiles [1], will be presented. This versatile spectrometer, coupled to the heavy-ion synchrotrons SIS18/SIS-100, will be a backbone facility of the NuSTAR collaboration of the FAIR project for research with exotic nuclei. The Super-FRS will be used for production and transmission of separated isotopes to three experimental areas, but it can also be used as a stand-alone experimental device together with ancillary detectors. Various combinations of the magnetic sections of the Super-FRS can be operated in dispersive, achromatic or dispersion-matched spectrometer modes which are suited for measurements of momentum distributions of secondary reaction products with high resolution and precision. Taking advantage of the multiple stages and flexibility of ion-optical modes, the Super-FRS is a worldwide unique instrument in the high-energy range, which allows for a variety of novel experiments in atomic, nuclear and hadron physics as well as an extension of preceding experiments at the existing fragment spectrometer FRS [2].

Among the planned experiments are the search for new isotopes and measurements of their production cross sections, studies of hypernuclei, Delta-resonances in exotic nuclei and spectroscopy of atoms characterized by bound mesons. Rare decay modes like multiple-proton or neutron emission and the nuclear tensor force observed in high-momentum components of the nucleons can also be addressed. The in-flight radioactivity measurements in the picosecond range, pioneered at the FRS, will be extended with the proposed program. Fusion, transfer and deep-inelastic reaction mechanisms with the slowed-down and energy-bunched fragment beams are proposed for the high-resolution and energy buncher modes at the Low-Energy Branch of the Super-FRS.

Examples of the related experimental setups, pilot experiments and developments of the ancillary detectors will be presented.

REFERENCES

[1] "Scientific program of the Super-FRS Collaboration: Report of the collaboration to the FAIR management", GSI Report 2014-4, doi:10.15120/GR-2014-4.

[2] H.Geissel et al., Nucl. Phys. A701 (2002) 259c.

Primary author: Dr MUKHA, Ivan (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany)

Co-authors: Dr PROCHAZKA, Andrej (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany); Dr FOMICHEV, Andrey (Flerov Laboratory of Nuclear Reactions, JINR, Dubna, Russia); Prof. BRACCO, Angela (Istituto Nazionale di Fisica Nucleare, Milano, Italy); Prof. JOKINEN, Ari (University of Jyväskylä, Jyväskylä, Finland); Dr NOCIFORO, Chiara (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany); Prof. SCHEIDENBERGER, Christoph (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany); Dr SI-

MON, Haik (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany); Prof. GEISSEL, Hans (GSI); Dr WEICK, Helmut (GSI Helmholtzzentrum); Dr TOKI, Hiroshi (Research Center for Nuclear Physics, Osaka University, Osaka, Japan); Dr ONG, Hooi Jin (Research Center for Nuclear Physics, Osaka University, Osaka, Japan); Prof. LENSKE, Horst (Justus-Liebig-Universität Giessen); Prof. TANIHATA, Isao (Beihang university, Beijing, China and RCNP, Osaka University, Osaka, Japan); Dr WINFIELD, John (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany); Dr BENLLIURE, Jose (Universidad de Santiago de Compostela, Santiago de Compostela, Spain); Prof. ÄYSTÖ, Juha (Helsinki Institute of Physics, Helsinki, Finland); Mr BEHR, Karl-Heinz (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany); Dr ITAHASHI, Kenta (RIKEN Nishina Center, Wako, Japan); Dr GRIGORENKO, Leonid (Flerov Laboratory of Nuclear Reactions, JINR, Dubna, Russia); Dr TRACHE, Livius (Horia Hulubei National Institute of Physics and Nucl. Engineering, Bucharest, Romania); Prof. PFÜTZNER, Marek (Faculty of Physics, University of Warsaw, Warsaw, Poland); Dr WINKLER, Martin (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany); Prof. HARAKEH, Muhcin N. (KVI Center for Advanced Radiation Technology, Groningen, The Netherlands); Prof. KALANTAR-NAYESTANAKI, Nasser (KVI Center for Advanced Radiation Technology, Groningen, The Netherlands); Prof. EGELHOF, Peter (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany); Dr KANUNGO, Rituparna (Saint Mary's University, Halifax, Canada); Dr HAYANO, Ryugo (Department of Physics, University of Tokyo, Tokyo, Japan); Dr TERASHIMA, Satoru (Beihang University, Beijing, China); Dr PURUSHOTHAMAN, Sivaji (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany); Dr HEINZ, Sophia (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany); Dr PIETRI, Stephane (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany); Prof. GALÈS, Sydney (Institut de Physique Nucléaire Orsay, Orsay, France); Dr SAITO, Takehiko (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany); Prof. ZAMFIR, Victor (Horia Hulubei National Institute of Physics and Nucl. Engineering, Bucharest, Romania); Prof. PLASS, Wolfgang (GSI Helmholtzzentrum für Schwerionenforschung)

Presenter: Dr MUKHA, Ivan (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany)

Session Classification: Session 13