Super-FRS Design Status Report

M. Winkler[1,#], F. Amjad[1], K.-H. Behr[1], C. Betz[1], T. Blatz[1], A. Breidert[1], A. Brünle[1], F. Garcia[2], H. Geissel[1,3], M. Gleim[1], C. Karagiannis[1], B. Kindler[1], O. Kiselev[1], K. Kopp[1], E. Kozlova[1], A. Krämer[1], A. Kratz[1], H. Leibrock[1], B. Lommel[1], H. Müller[1], C. Mühle[1], G. Münzenberg[1], I. Mukha[1], C. Nociforo[1], L. Orona[1], S. Pietri[1], A. Prochazka[1], C. Scheidenberger[1,3] C. Schlör[1], B. Sitar[4], H. Simon[1], M. Tomut[1,5], H. Weick[1], A. Wiest[1], C. Will[1], J.S. Winfield[1] and Y. Xiang[1]

[1]GSI, Darmstadt, Germany; [2]HIP Helsinki, Finland; [3]JLU Giessen, Germany; [4]CUB Bratislava, Slovakia; [5]NIMP, Bucharest, Romania.

System and building design

A modular design of vacuum chambers for beam detectors at the focal planes of the Super-FRS has been developed. Such a design allows adapting the Super-FRS operation either to a separator or to a spectrometer mode.

Various modifications of the NUSTAR buildings occurred during the execution planning phase, mainly due to fire protection or radiation safety requirements. In particular the access as well as emergency exit schemes needed replanning. An important milestone was achieved in October 2012 when we got the construction permit for the target building including the hot cell complex.

In view of the optimization of the building size and the opportunities for the future research program, the layout and design of the Energy-Buncher Spectrometer of the Low-Energy Branch of the Super-FRS has been revisited. In this investigation a dispersion-matched operation has been added to the energy bunching and large acceptance operation. A new layout possibility for the Energy Buncher with the first dipole bending to the right is under investigation. With this "S-shaped" configuration and an additional intermediate x-focus between the dipole magnets, it is possible to reduce significantly the dispersion and the general horizontal beam envelope while still maintaining the required resolving power of 600.

Detector development

The GEM-TPC is considered as next generation particle tracking detector at Super-FRS. Two prototypes with single-strip and integrated digital GEMEX electronics readout were built with two different pad plane configurations in collaboration with HIP Helsinki, Finland and CUB Bratislava, Slovakia. Both prototypes were successfully tested during a S417 beam time at the FRS [1].

Si strip detectors are possible candidates for Time-of-Flight measurements at the Super-FRS. Two dedicated beam tests with several single Si samples (active area ≈ 25 mm^2) provided by PTI, St. Petersburg, demonstrated that it is possible to achieve a time resolution of 20-40 ps for Au (E = 600 MeV/u) and U ions (E = 350 MeV/u). The signals have been digitized by using a fast oscilloscope. No deterioration of timing properties was found after irradiating the detectors up to 1kGy (equivalent 1-3 weeks running at Super-FRS).

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m.winkler@gsi.de

Remote handling

The development of large size (1200x200 mm^2) pillow seals is underway. These are inflatable seals and will be used in the target area where no direct human access is possible. These pillow seals are essential to guarantee the sealing between the large area dipole magnet chambers and beam catcher chambers.

A hot cell test stand was planned and will be build up in 2013. It will basically consist of a simple frame and two master-slave manipulators. It is of importance to have such a tool available in a very early project phase not only to start training on remote handling but especially to test the designs of RH components under realistic conditions.

Magnets

At the FAIR Council meeting in December 2012 it was decided that the superferric dipole magnets shall be purchased via a FAIR call for tender. The necessary specifications are under preparation and shall be ready until summer 2013.

The superferric multiplets are already assigned as German (GSI) In-Kind contribution to the FAIR-Project. The specifications for the various individual magnets, as well as the integrated modules (Fig. 1) are finished and the call for tender is in preparation. It is planned to have a signed contract for the first pre-series modules in mid 2013.

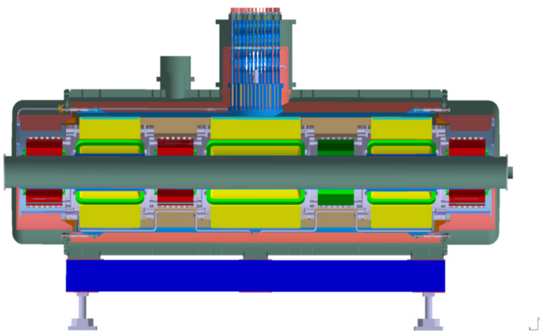

Figure 1: Design of the SC multiplet. Overall length: ≈7m; Total weight: ≈50 ton.

References

[1] F. Garcias *et al.*, this report.