



MT 26
International Conference
on Magnet Technology
 Vancouver, Canada | 2019

Contribution ID: 687

Type: **Poster Presentation**

Tue-Af-Po2.17-05 [29]: Preliminary Test Results of the First of Series Multiplet for the Super-FRS at FAIR

Tuesday 24 September 2019 14:00 (2 hours)

The Superconducting FRagment Separator (Super-FRS) at FAIR being built in Darmstadt, Germany, foresees a significant increase of momentum acceptance and angular acceptance of the secondary particle beams compared to the current facility of Fragment Separator (FRS). This requires dipoles and multipole magnets with a large aperture. Consequently, superferric magnets will be installed except for high radiation area. The multipole magnets are arranged in a common cryostat and this cryogenic module is called a multiplet, which is the focus of this paper. In total, 32 multiplets need to be constructed. However, they will be configured differently in order to be adapted to the requirement of beam optics. This paper presents design and preliminary test results of the first of series (FoS) multiplet containing one quadrupole magnet and one sextupole magnet. The two magnets are assembled together as a cold mass column and will be cooled in a He bath by up-to 800 liters of liquid helium, while the beam pipe remains at room temperature. The features of the magnets are a warm bore radius of 192 mm, vacuum impregnated racetrack coils made of Nb-Ti conductor and a maximum gradient of 10 T/m for the quadrupole magnet and 40 T/m² for the sextupole magnet, respectively. The required magnetic field quality of the quadrupole magnet was reached by introducing saturation control holes despite of its strong iron saturation. The design pressure of the He vessel is 20 bars absolute. Its design, material selection, and welding process were thoroughly verified and a final pressure test was performed at 22 bars. The construction of the FoS multiplet was completed and the site acceptance test is now underway at a CERN cryogenic magnet test facility in the frame of a GSI/CERN collaboration work.

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Session Classification: Tue-Af-Po2.17 - NbTi Accelerator Magnets I