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Study for cryogenic testing the Super-FRS magnets of FAIR in a new test facility at CERN

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A new cryogenic test facility is currently under construction at CERN for future needs of the laboratory. This facility will be at first used for the cryogenic testing of the Super-FRS magnets of the International Facility for Antiproton and Ion Research (FAIR) being built at GSI in Germany. In total 57 magnets will be tested of which the largest magnets have a cold mass of 45'000 kg. The magnet test rate will be 27 magnets per year and each magnet test will take about 46 days.

To obtain the required test rate, the test facility has to consist of three test benches. The cryogenic system of the test facility needs to cool-down the magnets to their operating temperature of 4.5 K, maintain the required temperature during the tests and warm-up the magnets after the tests. Two pre-cooler and heater units with a power of 15 kW will be needed for pre-cooling the magnets to 80 K and for warming-up the magnets after the tests. These units need to provide a gaseous helium flow up to 50 g/s at about 10 bar at the required temperature. A Sulzer TCF200 cold box will produce liquid helium up to a flow rate of 6 g/s to cool down the magnets to 4.5 K and maintaining the operating temperature during the tests.

This paper will cover the cryogenic study of the main components of the test facility to match the needs for testing the Super-FRS magnets. The calculation results to define the main operational parameters for the various operating modes will be presented in detail. Also, flow schemes and the design of some of the main components will be discussed.

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