Status and commissioning of the Helium Supply Plant (HeSu) and the Series Test Facility (STF)

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The Helium Supply Plant (HeSu)

For the FAIR Project a standard helium liquefier with a capacity of approx. 20 l/h has been installed at GSI. The liquefied helium is stored in 3000 l stationary Dewar vessel and transferred to mobile vessels using a decant station. A recovery line has been installed connecting the testing hall via the UHV lab to a 20 m^3 storage balloon. The HeSu will be used for LHe consumers on laboratory scale. At a later stage of the FAIR project the whole liquefier plant will be used for experiments with no direct connection to the campus distribution system.

The contract with Air Liquide was signed in 2013. The installation on site was performed in summer 2014 and the commissioning started in September and was successfully completed in November 2014. The first users appeared already in the same year. Main customers in the next years are supposed to be the CW-Linac, beam diagnostics, and the UHV group.

Figure 1: The HeSu plant. From right to left: purifier cold box and LHe storage

The Series Test Facility (STF)

In order to test the 108 fast-ramped superconducting dipole magnets of the SIS100, a cryogenic test facility has been specified by GSI and manufactured and installed by Linde KT. It is currently under commissioning at GSI with a site acceptance test (SAT) in late spring of 2015.

The overall cooling capacity of the cryo plant is about 1.5 kW (4.5 K equivalent) and can be distributed to four test benches individually. The capacity of the cryogenic system is designed to simultaneously cool down one magnet while another one is being operated at cold state for the cryogenic and magnetic measurements. The other two test benches serve for warming up and for magnet exchange, respectively. Beyond the SIS 100 dipoles, the high flexibility of the setup allows also the testing of other FAIR magnets, like the SIS100 quadrupole modules, the operation of a string configuration or even SuperFRS magnets. The plant is designed for subcooling to 4.4 K at 1.8 bar. The overall capacity is divided into 690 W cooling power at 4.4 K, a liquefaction rate of 6 g/s, and 2 kW cooling power at 50 K to 80 K for shield cooling.

The magnet is placed between feed and end box. The magnet and the end box are moveable on a rail system. The magnet extends into the feed and end box. By using large flanges on both sides of the boxes easy access to the interface area is guaranteed. This design saves space and avoids bellows for the insulation vacuum cryostats.

The magnet is fixed in space on the rail system, while feed and end box have to be flexible to compensate the mechanical tolerances. This is realized by rubber compensators, such as normally used for compressors. Also the jumper line to the feed box is flexible.

The planning started already in early 2012, after the tendering process the kick-off with the contractor took place mid of 2013. After finishing the new annex building SH5 all components were delivered during spring to summer 2014. The first component was the helium cycle compressor with an electrical power consumption of 465 kW, followed by the oil removal system, the gas management panel and the main cold box together with a 3000 l liquid helium Dewar. All this components were placed in the annex building. In front of SH2/SH5 3 buffer tanks were installed, one 100 m³ gaseous helium storage tank for the helium inventory, one 50 m³ gaseous helium storage tank for quench gas and one 40 m³ liquid nitrogen tank for the precooling of the helium in the cold box. In SH2 the cold end of the cryo plant was installed. On a 2nd floor two distribution boxes and the so called string box were placed, left and right hand side two test benches on a rail system with feed and end boxes, see figure 2. In December 2014 all installation work was finished and the point of mechanical readiness was reached and the commissioning phase was started. In spring 2015 the commissioning will be complete and it will end with the side acceptance tests (SAT).

Figure 2: Ground floor: The two right-hand test benches. First floor: The two distribution boxes and the multi-purpose terminal.

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