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Cryogenic Operation on the R3B-Glad Large Acceptance Superconducting Dipole Spectrometer at CEA Saclay.

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The R3B-Glad superconducting Magnet is a large acceptance dipole dedicated to the analysis of Reactions with Relativistic Radioactive ions Beams on the future FAIR facility at GSI Darmstadt. The original shape of the cryogenic tank and fluid distribution was imposed by the compact design of the six tilted and trapezoidal racetrack coils. The coils, electrically connected in series in a butterfly-like magnet, provide the field integral of 4.8 T.m required for the experiments while ensuring the active shielding. They are imbedded into the coil casings with their covers as in sarcophagi, and are indirectly cooled by means of copper braids fixed to the casings made of aluminium alloy. The very efficient two-phase helium tw thermosiphon keeps the magnet cold mass under 4.8 K. Its original features lie in the low slope (5°) of the heat exchanger tubes glued directly to the casings as well as in its compact geometry. The whole magnet cold mass, weighing 21 tons, is thermally protected by a stainless steel screen superinsulated and cooled down thanks to 50 K helium flowing in pipes brazed thereon. It is supported by three cold-to-warm feet, each one being thermalized at 60 K, half-height, with dedicated cryogenic circuits.
For the operation during the cryogenic test at CEA Saclay, the cold mass was adapted and connected at the W7X Test Facility in order to get close to the real conditions in its final configuration at GSI. The cooling down to liquid helium temperature, as well as the rise of the current up to the nominal value of 3584 amperes were successfully achieved in December 2013. This paper presents the cryogenic fluid distribution process, and shows the more relevant cooling results.

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