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Combined thermohydraulic and superconductive issues in FAIR SIS 100 BPL

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Facility for Antiproton and Ion Research (FAIR) is the particle accelerator facility currently being under construction by at GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany.
The SIS100 ring accelerator has a circumference of 1,100 meters and can accelerate the ions of all the natural elements in the periodic table to speeds as high as 99% of the speed of light. The SIS 100 accelerator by-pass line (BPL) bypasses warm magnets with cold helium in different thermodynamic states and high current in superconductive Nuclotron-type cables with superconducting strands wrapped around a cooling tube. The BPL characteristic feature, not common in other accelerator cryogenic distribution systems, is the integration of both helium transfer lines and superconducting cable in a single vacuum envelope characterized by a very tight geometry. The paper addresses design, construction and exploitation challenges of the BPL, like impact from fast dump magnets on the line structure, discontinuities in helium and current flows, high magnetic forces and the cables cross-talking. The experience from the BPL elements production and reception tests will be presented.

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