

Preliminary hydraulic layout of the beam screen cooling system for the FCC-hh

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The proton beams accelerated, bent and focussed in the FCC-hh will reach a centre of mass energy up to 100 TeV. During circulation each beam will emit synchrotron radiation and generate an image current, causing a heat transfer of about 31.4 W/m to each beam screen, which has to be extracted within a narrow temperature range (40 K–60 K). Additionally the beam screen cooling system is supposed to shield the FCC thermally. The technical segmentation of the collider foresees continuously cooled sections of up to 10.4 km; throughout the entire section length, more than 700 kW of heat has to be discharged at low temperature level. A cryogenic system of this size not only has to work dependably, but also calls for a high efficiency design to enable the operation economically. The reliable and efficient cooling of the FCC-hh beam screen in all possible operational modes requires a solid basic design as well as well-matched components in the final arrangement without unreasonably high investment costs and controlling effort. This poster presents the preliminary conceptual design of the FCC-hh beam screen cooling system based on exergetic, technical and economic considerations.

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