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ODH simulations: benchmark and access conditions to RF sector

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The SRF cryomodules of the FCC-ee rely on liquid helium to reach their superconducting state. The 400 MHz cavity cryomodule will be cooled using 115 kg of helium at 4.5 K (He-I), whereas the 800 MHz cryomodule will use 55 kg of superfluid helium (He-II) at 2 K. Following a risk assessment, a few accident scenarios were identified as potential sources of helium release in the FCC tunnel. Such a release poses considerable risks for people working underground. A performance-based design approach, using numerical simulations in the form of computational fluid dynamics (CFD), provided an analysis of the ODH in the RF section of the FCC-ee accelerators.

Envelope studies were made for the feasibility study showing that with the cryomodules at nominal conditions (i.e., maximum inventory), the access to the RF section of the tunnel is restricted when the risk of such accident events is present. During the pre-TDR phase more precise studies are carried out to optimize the risk assessment and scenarios for the simulations, in view of revisiting the access conditions in the RF sectors. It is intended to extend these studies, for the further design of the FCC study to include the use of the emergency (smoke) extraction duct and measure the impact on the extent of the helium plug and cloud propagation, in view of iterating on the access conditions to the RF sector. This study will present the results of new studies as well as a benchmark validation case study with the controlled helium spill test data performed in the LHC.

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