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Preliminary design of the FCC-ee vacuum chamber absorbers

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In the FCC-ee study, it is proposed that electron and positron beams circulate at high current and high energy in a 92-km circumference ring. The present operational scenario foresees a first running step at an energy of 45.6 GeV and around 1.4 A current, which would generate copious amounts of synchrotron radiation (SR) power and flux. To guarantee a quick decrease of the photon desorption yields and so a fast vacuum conditioning, it has been proposed to use localized SR absorbers along the vacuum chamber, spaced about 6 m apart. This would also help contain the high-energy Compton-scattered secondaries once the beam energy is increased up to 182.5 GeV, later in the experimental program.

In the preliminary design of FCC-ee vacuum chamber absorbers presented in this work, the SR thermal power is intercepted along around 100 mm of slanted surface. The temperature distribution in the adsorbers is estimated by Finite Element Analysis (FEA) and needs to be assessed to avoid any liquid-gas phase change within the water-cooling circuit. The cooling channels contain a twisted tape that increases the turbulence of water. This results in the desired heat transfer coefficient. The mechanical deformations due to the non-uniform temperature map are presented and analyzed as well.

Funding Agency

Footnotes

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Yes

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