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Conceptual design of the FCC-ee vacuum and pumping system

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The Future Circular Collider electron-positron accelerator (FCC-ee) is one of the many proposals under study by an international collaboration under the framework of the Future Circular Collider study. The aim is to produce a conceptual design report (CDD) by end of 2019, to be used by CERN management and its governing bodies as an input to the next European Strategy for particle physics research and funding plan. The FCC-ee is a 100 km twin-ring machine hosting 2 large experiments. It is designed to collide electron against positrons at 4 different main beam energies, 45.6, 80, 120, and 185 GeV, corresponding to the energies of the Z, W, and H bosons, and the T (top) quark resonances, respectively. The total synchrotron radiation power is limited to 50 MW per beam. This makes the Z machine running at 1.4 A beam current, while the T runs around 5 mA only. Each machine has its own photon flux and spectrum, going from the 20 keV critical energy of the Z to the 1.2 MeV of the T. The corresponding photon-induced molecular desorption rates are expected to vary over several orders of magnitude, making the design of a common vacuum system quite challenging. The proposed conceptual design of the vacuum and pumping system of FCC-ee will be discussed in this paper, showing the expected pressure profiles and main challenges ahead.

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