

CEPC Cryogenic system design and R&D

The Circular Electron Positron Collider (CEPC), with the low Higgs mass of ~ 125 GeV as a Higgs Factory, has the advantage of higher luminosity to cost ratio and the potential to be upgraded to a proton-proton collider to reach unprecedented high energy and discover New Physics. Technical Design Report (TDR) of CEPC has almost finished this year. This report focuses on the design and optimization of the CEPC cryogenic system, which are summarized and progressed as follows.

(1) For the CEPC superconducting cavity cryogenic system side, the cooling scheme of the superconducting radio frequency (SCRF) cryomodules of both booster and collider has been modified, from parallel to series, to improve the cavity performances while reducing cost. The design of both cryomodules has been reviewed and improved based on the growing experience of the IHEP cryogenics group. Prototypes for booster and collider have been built in collaboration with the domestic qualified companies and has been tested in the Platform of Advanced Photon Source (PAPS) infrastructure with the aim of further improvements.

(2) The new design of the SC-magnet cryogenic system, following the progress of a multiple technology strategy under development for the interaction region (IR) magnets, with normal-conducting sextupoles. The choice of the use of large refrigerators for operational stability and cost was appreciated.

(3) PAPS infrastructure was presented in some detail. The PAPS has been installed and commissioned successfully, which has passed the performance test on June, 2021. the PAPS cryogenic test facility can serve other major national science and technology facilities, to prompt the progress of the national cryogenics and superconductivity research.

(4) Several key technologies (JT heat exchanger platform/cryo-circulating pump/multi-channel Transfer line test platform/Virtual system establishment and automatic control strategy research) are introduced.

All in all, further EDR design is going on. Every member needs to work together to greatly push forward the work, and complete the EDR design on time.

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