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Development of the neon-helium Turbo-Brayton cryogenic refrigerator for the FCC-hh

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The proton-proton Future Circular Collider (FCC-hh) is a concept of the high energy accelerator being considered as a successor of the Large Hadron Collider. It is being designed to reach the centre-of-mass energy of 100 TeV in the ring with the circumference of 100 km, which is approximately 7 times higher than the energy of the Large Hadron Collider. To build this accelerator, the existing technologies have to be improved in many fields including cryogenics. Thus, the state-of-the-art cryogenic system has to be upgraded. A new efficient system is required to provide cooling of the beam screen and thermal shield at the temperature level between 40 and 60 K. The neon-helium Turbo-Brayton cryogenic refrigerator has been designed at the TU Dresden for this purpose and improved within the EASITrain project.

Within the workshop, the requirements for the cryogenic system of the FCC-hh will be summarized. The basics of the cryogenic refrigerator design will be introduced. The improved design of the Turbo-Brayton refrigerator and the developed strategies of the efficient part-load and cool-down operation will be demonstrated.

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