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## **C1Po1D-01: Commissioning of the cryogenic distribution system of the ESS superconducting linac**

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The European Spallation Source (ESS) is a neutron-scattering facility being built with extensive international collaboration in Lund, Sweden. An essential part of the project is the linear 2.0 GeV proton accelerator. Its superconducting part is designed to comprise 13 spoke and 30 elliptical cryomodules that are cooled at 2K. The cryogenic distribution system (CDS) connects the refrigeration plant with the cryomodules via multi-transfer lines, individual valveboxes for every cryomodule and an endbox. It is designed, manufactured and installed under the responsibility of two ESS in-kind partners. The CDS for the spoke cryomodules (CDS-sp) is supplied by IJCLab, France, the CDS for the elliptical cryomodules (CDS-el) is supplied by WUST, Poland. Pre-commissioning, commissioning and operation is done by ESS whereby IFJ PAN contributed with valuable advice.

Pre-commissioning activities like loop checks, temperature curve validation, pressure sensor calibration or valve initialization and leak tightness tests followed after mechanical or electrical completion of the respective CDS parts and started in summer 2022. Eventually, the system was ready for commissioning and a first cooldown was performed in December 2022. Goal of this commissioning was to acceptance test and check of the system before the cryomodule installation in the tunnel starts in March 2023.

The paper describes diverse challenges regarding valves, sensors and system control. Preliminary test results and lessons learnt are discussed as well as an outlook of the upcoming plans are given.

Keywords: helium liquefaction, refrigeration, 2K, cryogenic valves, heat load measurements, temperature measurements, controls, sensors, calibration

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