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Commissioning progress of the first cryoplant for SHINE accelerator

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This paper presents the commissioning progress of the first accelerator cryoplant for Shanghai high repetition rate x-ray free electron laser and extreme light facility (SHINE). To fulfill the cooling needs for the superconducting cavities in the SHINE accelerator, three cryogenic plants were contracted to Air Liquide Advanced Technologies (ALAT) in 2020. Each cryoplant could provide 4 kW cooling power at 2 K and mainly consists of a warm compressor station (WCS), a 4.5 K cold box, and a 2 K cold box. Following the success delivery and installation, the WCS had been commissioned and the final 100 hours test were achieved at the middle of 2023. Afterwards, the commissioning of the 4.5 K cold box progressed as expected and the first drop of liquid helium was obtained at the end of 2023. The 2 K cold box commissioning were enabled when the installation of the cryogenic transfer line in between had been finished. At the beginning of 2024, the cold compressor had been successfully tested to achieve the 2 K super-fluid inside the 2 K cold box. The promising commissioning progress of the first cryoplant demonstrates the capability to deliver cryogenic cooling to the SHINE accelerator that are being constructed.

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