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LCLS II dc magnet power supplies –an overview*

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The Linac Coherent Light Source II (LCLS-II) at the SLAC National Accelerator Laboratory represents a groundbreaking advancement in the realm of Free Electron X-Ray Laser (XFEL) science. This 1.3 GHz continuous-wave superconducting RF LINAC is designed to generate 4 GeV electron bunches up to one MHz, propelling the capabilities of XFEL sources. Achieving a significant milestone, the LCLS-II successfully reached its 2K operating temperature with the first electrons in October 2022, culminating in the generation of the first x-rays in September 2023. This paper offers an overview of the diverse array of DC magnet power supplies (PSs) employed in LCLS-II, which can be categorized into two sections: warm and superconducting. The warm section comprises of two crucial types of PSs-intermediate and trim. Notably, these PSs are subjected to tight stability requirements as low as 20 ppm. The warm section has close to 600 PSs. In the superconducting section, an extra level of complexity is added by including a quench protection circuit to protect the magnets in case of a sudden loss of superconductivity. PSs in this section also have a stability requirement of 0.02 %. The superconducting section has 105 PSs. This paper also discusses the system design and performance of these PSs.

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