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The LCLS-II Gun & Buncher LLRF Controller Upgrade

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LCLS-II is currently in its commissioning phase at SLAC. It is an X-ray FEL driven by a CW superconducting LINAC. The beam injector plays a crucial role in the overall performance of the accelerator, and is critical to the final electron beam performance parameters. The LCLS-II injector comprises of a 185.7 MHz VHF copper gun cavity, and a 1.3 GHz two-cell L-band copper buncher cavity. The FPGA-based controller employs feedback and Self-Excited Loop logic in order to regulate the cavity fields. It also features several other functionalities, such as live detune computation, active frequency tracking, and waveform recording. The LLRF system drives the cavities via two 60 kW SSAs through two power couplers, and thus stabilizes the fields inside the plant. This paper describes the system architecture including the analog front-end, the FPGA logic, and shows performance results.

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