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PIP-II 650 MHz Cryomodule Test Stand LLRF System

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The Fermilab 650 MHz Cryomodule Test Stand is a facility for independently testing HB/LB 650 MHz and SSR2 (325 MHz) cryomodules without beam. The first cryomodule tested will be the HB 650 which consists of six cavities. The LLRF system is built with the same LLRF controller as the LCLS-II project with mostly identical firmware and software components allowing for the small differences in system architectures. The EPICS user interface includes a number of test, analysis and logging features that provide comprehensive test documentation for characterizing all cavities and the cryomodule. Cavity bandwidth and loaded Q measurement, SSA linearity, Cavity resonance finding, Piezo transfer function and capacitance measurements, Detune frequency are some of the test features available with the LLRF system. The LLRF system is installed and has been tested with a cavity emulator to exercise system features. The first 650 MHz HB cryomodule is expected to arrive in October, 2022. The LLRF system and the test stand measurement features are described in this paper.

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