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SRF Cavity Emulator for PIP-II LLRF Lab and Field Testing

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There are many stages in the LLRF and RF system development process for any new accelerator that can take advantage of hardware emulation of the high power RF system and RF cavities. LLRF development, bench testing, control system development and testing of installed systems must happen well before SRF cavities are available for test. The PIP-II Linac has three frequencies of SRF cavities, 162.5 MHz, 325 MHz and 650 MHz and a simple analog emulator design has been chosen that can meet the cavity bandwidth requirements, provide tuning errors to emulate Lorentz force detuning and microphonics for all cavity types. This emulator design utilizes a quartz crystal with a bandwidth of 65 Hz at an IF of ~ 4 MHz, providing a Q of ~ 1.3×10^7 at 650 MHz. This paper will discuss the design and test results of this emulator.

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