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LANSCE 805 MHz CCL resonance controller upgrade

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The Los Alamos Neutron Science Center uses 805 MHz in the Coupled Cavity Linac (CCL). The CCL is divided into 44 modules composed each of 2 to 4 tanks, with each tank consisting of 37 accelerating cell comprising the accelerating structure with a center fed topology using a bridge coupler. Here we present a prototype to upgrade the LANSCE CCL resonance controller. The tank Q increases with the length of the accelerator, and the resonance controller is manually tuned for each of these modules. There are two main actuators in the resonance controller, these are the RF source (the klystron), and the flow control valve which allows the cooling water to remove heat from the LINAC tank. The architecture developed here is a hybrid topology, with discrete conditioning for system resilience and an embedded controller system. The embedded system then evaluates using the classical closed loop for resonance control based dual feedback, i.e., reflected power and cavity field strength. This architecture enables a safer operation for the LANSCE CCL and avoids unstable modes that can have catastrophic effects due to thermal run-away.

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