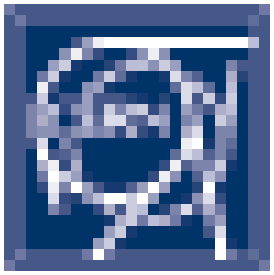

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Transient Microphonic and Ponderomotive Effects In Superconducting Cavities

Wednesday, 12 October 2005 10:50 (20 minutes)

Transient microphonic and Ponderomotive effects have been observed and measured under a number of different operating conditions. Microphonic effects are those sources that are external to the cryomodule, or by devices such as piezo tuners and mechanical tuners. Ponderomotive effects are changes in frequency due to changes in
rf field through the Lorentz force. This talk will give a brief summary of some of these effects. Of particular interest is recovery from an arc in the region of the cold window on a 5-cell CEBAF structure. Closed loop gradient control was employed during arc recovery experiments conducted in the CEBAF accelerator at Jefferson Lab.
During this test, instabilities were observed in the cavity forward power signal, which were determined to be ponderomotive in nature. These ponderomotive effects were quantified using a cavity resonance monitor and a VCO_PLL RF system. Two types
of ponderomotive effects were observed depending on the type of arc event. If the arc occurred in the vacuum space between the warm and cold windows, the transient frequency shift was about 75 Hz peak-to-peak. If the arc occurred on the cavity side
of the cold window the transient frequency shift was about 400 Hz peak-to-peak. The
background microphonics level for the tested cavity was approximately 30 Hz peak-to-peak. Other data relating to dynamic Lorentz force and piezo tuner transient effects will also be presented. Experimental results, analysis of the resultant klystron power transients, the decay time of the transients, and the implications with respect to fast reset algorithms will be presented.

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