Observation, Control and Modal Analysis of Coupled Bunch Longitudinal Instabilities[*],

R. CLAUS, J. FOX, H. HINDI, I. LINSCOTT, S. PRABHAKAR, W. ROSS, D. TEYTELMAN, Stanford Linear Accelerator Center; A. DRAGO, M. SERIO, INFN Frascati; G. STOVER, LBL - The operation of a longitudinal multi-bunch damping system using digital signal processing techniques is shown via measurements from the LBL Advanced Light Source. The feedback system (developed for use by PEP-II, ALS and DAPHNE) uses a parallel array of signal processors to implement a bunch by bunch feedback system for sampling rates up to 500 MHz. The programmable DSP system allows feedback control as well as accelerator diagnostics. Results are presented showing the action of the system to stabilize the full current (400 mA) fully populated (320 buckets, 2 ns spacing) ALS machine. A diagnostic technique is illustrated which uses the DSP system to excite and then damp the beam. The resulting 12 ms time domain transient is Fourier analysed to provide the simultaneous measurement of growth rates and damping rates of all coupled-bunch beam modes.

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