Calculation of Impedance from Multibunch Synchronous Phases: Theory and Experimental Results*, J. FOX, H. HINDI, S. PRABHAKAR, D. TEYTELMAN, A. YOUNG, SLAC - A novel beam-based method for measuring the longitudinal impedance spectrum is demonstrated using experimental data from the PEP-II HER. The method uses a digital longitudinal feedback system from which the charge and unique synchronous phase is measured for every bucket. Calculation of the transfer function from fill shape to synchronous phase yields the impedance seen by the beam at revolution harmonics. The theory of the multibunch synchronous phases is developed and quantitative results are presented from measurements of the PEP-II High Energy Ring. The experimentally-derived longitudinal impedance function and lab measurements of the impedance of parked RF cavities are compared to suggest a mechanism for the occasional instability of low-order coupled-bunch modes oberserved during commissioning in October 1977.

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