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Measurements of the PSB LLRF multi-harmonic beam loading compensation system.

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The Proton Synchrotron Booster (PSB) produces a variety of proton beams covering a very large longitudinal parameter space, which are accelerated up to 2 GeV. This low-energy regime requires a significant frequency sweep of the RF system. Finemet-based cavities provide this large frequency range without the need of a tuning loop, but they introduce a significant longitudinal broadband impedance. An ensemble of digital feedback loops therefore compensates the beam-induced voltage at the revolution frequency harmonics. This contribution focuses on measurement techniques used to precisely characterise the signal processing of these loops. First comparisons with beam-based measurements of the transient and steady-state response of the full system are presented. These measurements contribute to a detailed understanding of the LLRF system, necessary to accurately model its behaviour. Moreover possible improvements to the cavity voltage amplitude and phase calibrations in the presence of strong beam loading are highlighted.

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