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Synchrotron frequency measurements using bunch by Bunch longitudinal feedback system in a storage-ring with higher harmonic cavity

Monday 11 August 2025 16:00 (2 hours)

The upgraded Advanced Photon Source (APS) features a 1408 MHz superconducting Bunch Lengthening System (BLS) to improve beam lifetime and emittance. The main RF system is significantly affected by ambient 60 Hz-harmonics noise, complicating the measurement of synchrotron frequency under varying higher harmonic cavity conditions. To address this, using Dimtel iGp12 processor-based longitudinal feedback system we developed two methods to measure synchrotron frequency effectively. Our approach involves driving multi-bunch beam modes by considering a span for synchrotron frequency sideband and analyzing mode amplitude changes across the sweep frequency range. The "slow" method scans fixed drive frequencies within a range, recording the beam response at each frequency. The "fast" approach drives the beam with a broadband chirp signal and analyzes the resulting single mode spectrum data. Both methods are tested during beam studies. Synchrotron frequency changes are measured in two setups: First, adjusting BLS voltage manually while keeping beam current constant. Second, BLS voltage varying as a function of decaying beam current. This paper presents, details of the measurement procedure and results from the beam-based machine studies.

Please consider my poster for contributed oral presentation

No

Would you like to submit this poster in student poster session on Sunday (August 10th)

No

Footnotes

Funding Agency

I have read and accept the Privacy Policy Statement

Yes

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