IPAC'24 - 15th International Particle Accelerator Conference



Contribution ID: 1990 Contribution code: TUPG06

Type: Poster Presentation

Particle accumulator ring restart and readiness for Advanced Photon Source upgrade commissioning

Tuesday, 21 May 2024 16:00 (2 hours)

At the Argonne (ANL) Advanced Photon Source (APS), a 425-MeV Particle Accumulator Ring (PAR) is used to stack 1-nC electron pulses from the linac and inject a single bunch into the booster at a 1-Hz repetition rate. All the APS injectors, including PAR, were shut down in April 2023 at the start of the APS Upgrade Dark Time. In this paper, we report on PAR re-start activities starting in Oct. 2023. The PAR vacuum pressure was unexpectedly high when first powering the fundamental and harmonic radiofrequency (rf) systems, as well as when first injecting the beam, which initially limited both the beam charge and rf gap voltage. These limits were overcome through many weeks of systematic rf and vacuum conditioning. Additional restart activities include commissioning two new kicker chambers with a special low-impedance, eddy-current-suppressing coating, commissioning of the digital low level rf system, and tests with the Injection Extraction Timing and Synchronization (IETS) system. We demonstrated initial APS-U commissioning performance goals: a stable, 5-nC injected bunch charge with a bunch length short enough for injection into the booster.

Footnotes

Funding Agency

Work supported by U. S. Department of Energy, Office of Science, under Contract No. DE-AC02-06CH11357.

Paper preparation format

Word

Region represented

North America

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Session Classification: Tuesday Poster Session

Track Classification: MC2: Photon Sources and Electron Accelerators: MC2.A05 Synchrotron Radiation Facilities