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

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At the 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 restart activities from October-December 2023. The PAR vacuum pressure was unexpectedly high when first powering the fundamental and harmonic 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 APS-U Injection Extraction Timing system. We demonstrated APS-U commissioning performance goals: a stable, 5-nC bunch charge with a bunch length short enough for injection into the Booster.

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