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LANSCCE Digital Low Level RF Upgrade Overview

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Incremental upgrades of the legacy low level RF (LLRF) equipment—50 years for the Los Alamos Neutron Science Center (LANSCCE)—involves challenges and problems not seen with new and total replacement opportunities. The digital LLRF upgrade at LANSCCE has deployed 30 of the 53 required systems as of September 2022. This paper describes the performance of the digital upgrade, current status, and future installations along with the technical challenges, including unexpected challenges, associated with deploying new digital systems in conjunction with legacy analog equipment. In addition, this paper discusses the operational details of simultaneous multi-energy beam operations using high energy re-bunching, beam-type specific set points and simultaneous multi-beam operations at LANSCCE. The adaptability of the digital LLRF systems is essential as the design is able to accommodate new control and beam parameters associated with future systems without significant hardware modifications such as the expected LANSCCE Modernization Program. This adaptability of the digital LLRF technology was recently demonstrated with the Module 1, 201.25-MHz high-power RF upgrade completed in 2021.

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