

2025 Status Report —MYRRHA/MINERVA LLRF System

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At SCK CEN in Belgium, the MYRRHA project aims to build the world's first Accelerator-Driven Subcritical reactor (ADS). The initial phase centers on implementing a 100MeV, 4mA CW superconducting linear proton accelerator –with the unique technical challenge: the maximum allowable beam trip duration is less than 3 seconds. The accelerating field stability requirement is $\leq 0.1\%$ and ≤ 0.1 degrees to avoid excessive beam loss. The SRF cavities operate at a high loaded quality factor ($Q_L=2.3e6$) and close to the beam optimal value to minimize power consumption. The beam current can be modulated at 250Hz. This contribution presents the past work and the strategy used to achieve the project's objectives. Recognizing DESY's world-leading expertise in building and operating LLRF systems, a collaboration was established to share particle accelerator-related firmware and software modules. Leveraging DESY's Framework (FWK) capability to integrate multiple board support packages (BSPs) within a single project, the team developed its LLRF system using the RealDigital RFSoc4x2 prototype board. This parallel development path allows for rapid prototyping while the MTCA.4 AMC design, the DAMC-DS5014DR, is finalized.

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