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# FAIR SIS100 Accelerating RF System - Modeling and Analysis of the Coupled LLRF Control Loops

*Thursday, 11 May 2023 16:30 (2 hours)*

The SIS100 heavy ion synchrotron as core part of the Facility for Antiproton and Ion Research (FAIR) will be equipped with 14 accelerating RF stations in the first stage of realization. Each RF station consists of a tunable ferrite-loaded cavity powered by a tetrode amplifier. Further key components are a solid-state pre-amplifier, a power supply unit, and dedicated Low-Level Radio Frequency (LLRF) feedforward and feedback systems to control amplitude and phase of the cavity gap voltage as well as the resonance frequency. Each cavity has to provide up to 20 kV peak gap voltage in the frequency range from 1.1 to 3.2 MHz. While all components of the system have been successfully tested in the factory acceptance tests and transferred to the FAIR storage, the First-of-Series (FoS) RF station is still persistently operated at GSI to gain experience. For further insight into the LLRF part, especially the stability of the control loops, the inter-coupling of the three local control loops was analyzed with methods from control theory based on simplified but realistic models, which have been developed based on extensive measurements and analysis of the systems'behavior. In this contribution, the modeling as well as the analysis of the coupling between the LLRF control loops are discussed and the results are presented in comparison with measurements on the FoS system.

## Funding Agency

## Footnotes

## I have read and accept the Privacy Policy Statement

Yes

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