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Heavy-Ion Synchrotron and Storage Ring LLRF Systems at GSI and FAIR: Status and Machine Development Experiment Results

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Besides the realization of the LLRF systems for the new heavy-ion synchrotron SIS100 and the storage rings CR and HESR, the FAIR project at GSI also includes an upgrade of the LLRF systems of the existing accelerator rings such as SIS18 and ESR. Although each accelerator and each type of RF system has its own specific requirements, the basic underlying concept and topology is the same for all machines. A central paradigm is the use of a modular setup with well-defined interfaces between standardized analog and digital hardware modules that can be reconfigured or recombined in order to fulfill the variety of specific requirements. This contribution illustrates the LLRF concept and presents measurement results from machine development experiments in the existing heavy-ion synchrotron SIS18 that demonstrate different features such as multi-harmonic operation and bunch compression. Finally, the status of the LLRF realization for FAIR is summarized and an outlook is given.

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