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Implementation of a software defined radio (SDR) based beam current monitor for Schottky detectors in heavy ion storage rings

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With the increasing sensitivity and precision of resonant Schottky detectors, this technology becomes more valuable in the determination of masses and lifetimes of the yet unstudied nuclei inside heavy ion storage rings but also in general storage ring physics. At present, information from these detectors is gained by high-end units with software and hardware interface that are not versatile and / or not suitable for applications where scalability is indispensable. Here, software-defined radio (SDR) based data acquisition systems come in handy, mainly due to their low cost and relatively simple hardware but also due to the fact that their functionality is almost entirely software-defined/programmable. If calibrated, Schottky detectors can facilitate beam current measurements that are orders of magnitude more sensitive compared to existing DC current transformers (DDCT). In this work, we report on the implementation of an SDR-based online beam current monitor for use with Schottky detectors in heavy ion storage rings such as ESR in GSI/FAIR.

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