Contribution ID: **119** Type: **Poster**

Integrated Denoising for Improved Stabilization of RF Cavities

Typical operational environments for industrial particle accelerators are less controlled than those of research accelerators. This leads to increased levels of noise in electronic systems, including radio frequency (RF) systems, which make control and optimization more difficult. This is compounded by the fact that industrial accelerators are mass-produced with less attention paid to performance optimization. However, growing demand for accelerator-based cancer treatments, imaging, and sterilization in medical and agricultural settings requires improved signal processing to take full advantage of available hardware and increase the margin of deployment for industrial systems. In order to improve the utility of RF accelerators for industrial applications we have developed methods for removing noise from RF signals and characterized these methods in a variety of contexts. Here we expand on this work by integrating denoising with pulse-to-pulse stabilization algorithms. In this poster we provide an overview of our noise reduction results and the performance of pulse-to-pulse feedback with integrated ML based denoising.

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Session Classification: Poster session

Track Classification: Optimisation and Control