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The feedback LMS resonance control for the SRF cavities in CW/LP

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Future development in the LLRF system is needed to suppress the microphonics disturbances to drive SRF cavities in the EUXFEL within CW/LP field stability.
The current CW LLRF system implements a narrowband Least Mean Square (LMS) Active Noise Controller (ANC) to compensate for sinusoidal microphonics disturbances.
The major limitation of using narrowband LMS ANC is that it can reject only sinusoidal disturbances.So, if the noise source frequency changes over time, the narrowband ANC cannot track and cancel the disturbance. Therefore wideband LMS ANC can be considered for compensating for the disturbances over a broad range of frequencies. Compared to the feedforward LMS ANC, the feedback LMS ANCs can correct the disturbances regardless of whether they originate outside or inside the controlled system. Hence the feedback LMS ANC can improve the resonance control of a high Ql cavity system.
This poster discusses the proposed Feedback LMS ANC algorithm implementation in FPGA with offline verification results. The implemented design is compact and pipelined, CPU accessible, operates at 100 MHz, and can implement a filter with an order of up to 1000.

Summary

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