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Gradient descent optimization and resonance control of superconducting RF cavities

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Presently, superconducting radio frequency (SRF) cavities with high intrinsic quality factors are used in particle accelerators, as a high intrinsic quality factor allows for increased energy efficiency. As such, this technology benefits new research into light source linacs such as in the new LCLS-II system. However, due to the narrow bandwidth attributed to large quality factors, the use of these SRF cavities requires more accurate control to mitigate the effects of vibrations within the cavity and maintain a fixed frequency. In a paper by Banerjee et al., it was proposed that the current practice of actively suppressing such vibrations using fast tuners may be improved through the implementation of a narrowband active noise control algorithm (NANC) that makes use of gradient descent. It is the aim of this research to explore which gradient descent methods work best for active resonance control

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Footnotes

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