Cresting Algorithm Using Fourier Analysis of Beam Position for CEBAF Accelerator[1] RYAN ROUSSEL, YVES ROBLIN, None, JEFFERSON LAB CENETER FOR ADVANCED STUDIES OF ACCELERATORS COLLABORATION — The Continuous Electron Beam Accelerator Facility (CEBAF) accelerator contains two linear accelerators with Radio frequency (RF) cavities to accelerate electrons. For this to happen, the maxima of the sinusoidal electric fields in each cavity must be precisely matched to the timing of the particle's trajectories. Optimization of the beam energy is achieved by modulating the phase of cavities one at a time until the electrons are observed have the maximum energy. The focus of this project is to improve the process of finding the crest (maxima) phase of multiple cavities by modulating several cavities simultaneously. This was done by modulating the phase of each cavity at a different frequency and observing the position of the beam. The position of the beam over the period of modulation was then Fourier Transformed, producing peaks at the frequencies that corresponded to the different cavities. This was repeated with different amplitudes of modulation to fit a relationship between the amplitude of modulation and the Fourier Transform spike amplitude, which contained phase information. It has been shown that multiple cavities can be crested at the same time through the phase modulation of cavities at different frequencies and Fourier transforming the positions of the resulting beam. This has ramifications for accelerator operation because it dramatically decreases tuning time needed for beam optimization.

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None

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