RF Confinement Using an Induction Cell in UMER
(University of Maryland Electron Ring)

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K. Hamilton, "RF Confinement Using an Induction Cell in UMER"
Increasing UMER’s longitudinal confinement capabilities will allow multi-bunch electron operations and improve its overall research performance.

K. Hamilton, "RF Confinement Using An Induction Cell In UMER"
Implementation of a new longitudinal confinement system involved installation, calibration, current analysis, and phase space investigation.

K. Hamilton, "RF Confinement Using An Induction Cell In UMER"
Performing FFT and NAFF techniques on multiple voltage sweep data sets yielded reasonable average revolution and synchrotron frequencies.

\[
\omega_l = \frac{\beta c}{R} \sqrt{\frac{V (\gamma^{-2} - \alpha_c)}{2\pi \beta^2 E}}
\]

Legend:
- \(\omega_l\) = synchrotron frequency
- \(\beta, \gamma\) = Lorentz relativity factors
- \(c\) = speed of light
- \(R\) = synchrotron radius
- \(V\) = RF voltage
- \(\alpha_c\) = momentum compaction
- \(E\) = energy

K. Hamilton, "RF Confinement Using An Induction Cell In UMER"
Previously, UMER employed ear fields once every few turns, but the new system confines every turn and reveals more beam information.

K. Hamilton, "RF Confinement Using An Induction Cell In UMER"
The induction cell & RF amplifier system is successfully calibrated for future experiments, like multi-bunch mode and phase space exploration.

\[ \Delta E_{n+1} = \Delta E_n + eV (\sin \phi_n - \sin \phi_s) \]

\[ \phi_{n+1} = \phi_n + \frac{2\pi\hbar\eta}{\beta^2 E} \Delta E_{n+1} \]

Legend:
- \( E \) = energy
- \( e \) = electron charge
- \( \phi_n \) = phase of particle
- \( \phi_s \) = phase of synchronous particle
- \( \hbar \) = harmonic number of RF freq
- \( \eta \) = phase slip factor
- \( \beta \) = Lorentz relativity factor

K. Hamilton, "RF Confinement Using An Induction Cell In UMER"
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