

Instability during debunch

Michael Blaskiewicz

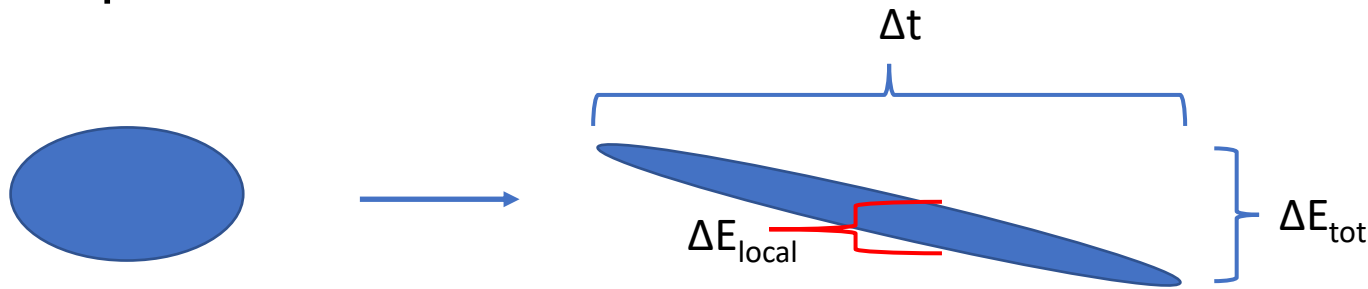
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Electron-Ion Collider

Basic idea

- Suppose you have a single bunch in the accelerator and turn the RF quickly to zero.
- As the beam debunches the local energy spread drops.



- Microwave stability scales as $ZI_{\text{peak}}/\sigma_E^2 < K$
- When one is well beyond threshold a narrow band impedance gives a growth rate

$$\frac{\text{Im}\Omega}{\omega_r} \simeq \left(\frac{Ne^2\omega_0|\eta|}{16\pi E_0} \frac{R_{sh}}{Q} \right)^{\frac{1}{2}}$$

Shaposhnikova, PAC01

Experimental Plan

- title: resonant impedance measurement
- spokesperson: Mike Blaskiewicz
- Team: Mike, MCR, Kevin Mernick, RF to insert FMD of 197s
- goal: measure narrow band longitudinal impedance
- benefits: helpful for EIC planning
- description:
 - Inject a single bunch into 9 MHz. (197 is off and fundamental mode damper inserted?)
 - reduce voltage until bunch length is maximum.
 - snap off voltage
 - take turn by turn data on wcm every 5 or so turns. Make sure to measure the whole bunch.
 - Impedance will cause longitudinal instability eventually.
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- Hazards: no hazards
- resources: wall current monitor
- applications: wall current monitor, rf ramps
- time: 2 hours if everything works
- personnel: MCR, Mike, Kevin Mernick, RF
- Analysis
 - Mike will do calculations and write a tech note.