Experiments on EMMA Requiring Minimal or No Modifications

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18 March 2010

Outline of Existing Experiments

- Find linear parameters vs. energy
- Adjust lattice to desired configuration
- Accelerate beam from 10 to 20 MeV
  - Scan longitudinal phase space
  - Scan longitudinal parameters (frequency/voltage)
- Scan transverse phase space
  - Find variation in fixed-energy parameters
  - Study how acceleration changes with amplitude

Outline of Existing Experiments

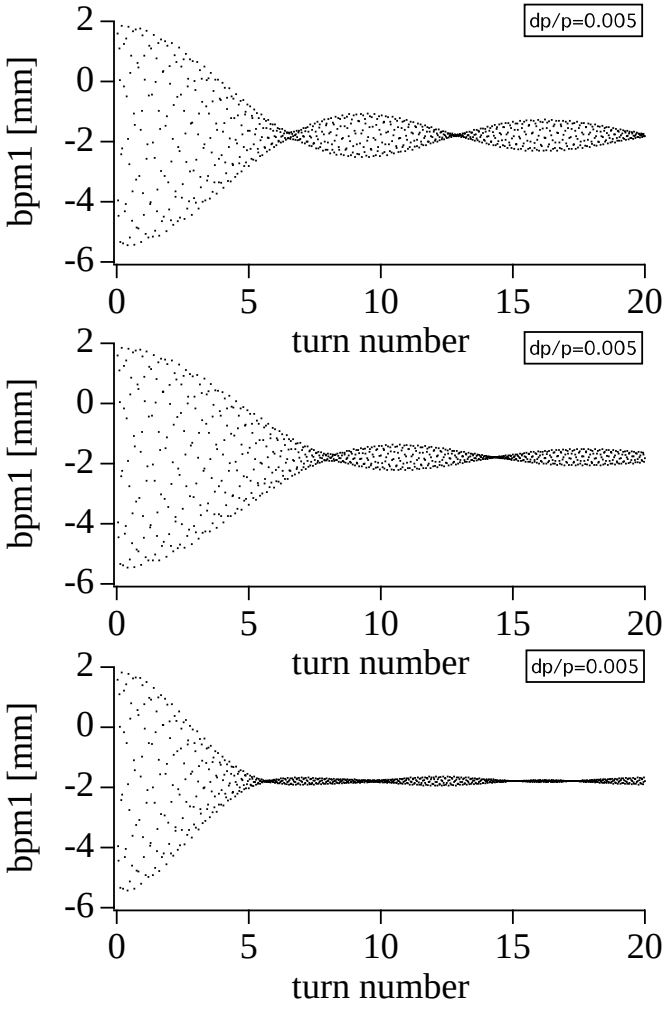
- Introduce errors, look at effects
- Set up additional lattice configurations
  - Different tune range
    - Effects related to resonances
    - Look for variation in emittance growth and beam loss
    - Verify expected effects on longitudinal dynamics
  - Different location of time of flight minimum
    - Look at variation in longitudinal dynamics
    - Expect similar behavior in transverse: verify

Single Resonance Crossing

- Acceleration over a limited range
  - Cross an individual resonance slowly
- Use a low voltage, vary to change rate
- Reduced range serpentine acceleration
  - Only works near ToF minimum
- Oscillation around stable fixed point
- Study fixed energy behavior near resonance
- Diagnostic need: accurate emittance

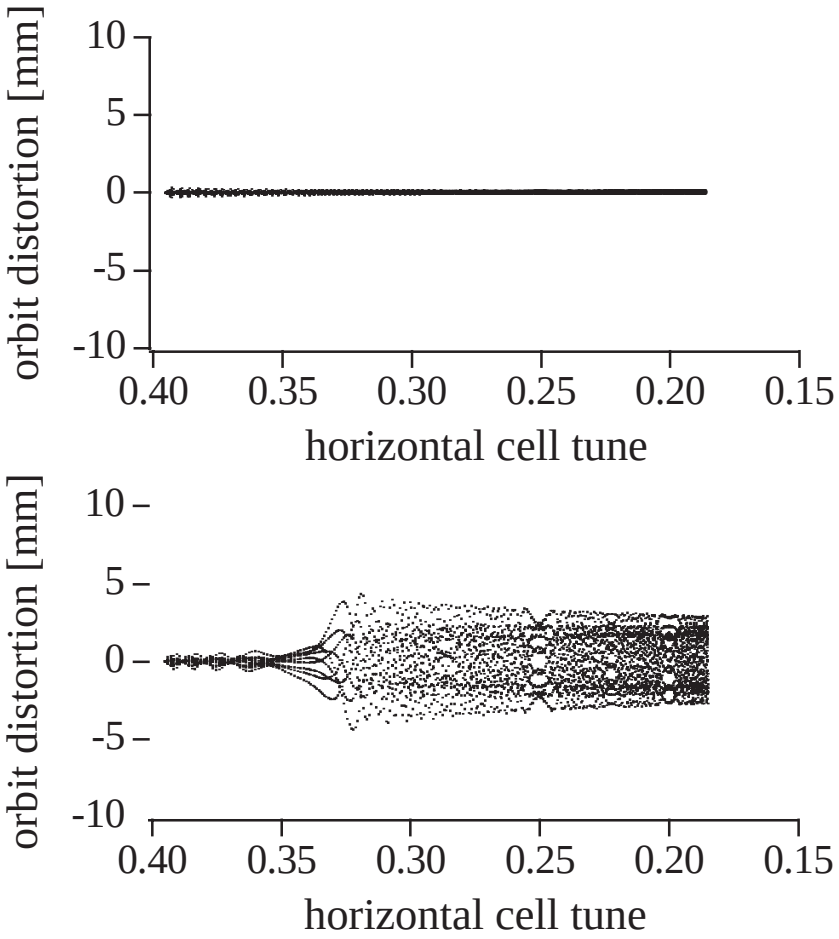
Measurement of Momentum Spread

- Chromaticity: beam signal decays
- Signal shape depends on momentum distribution
- Reconstruct distribution
- Take this data anyhow
- Compare to momentum distribution measured elsewhere



More Discrete Acceleration

- Machida: orbit distortion from fewer cavities
- Turn some cavities off and reproduce



Space Charge/Beam Loading

- Basic design is to look at single-particle dynamics
- Could look at weak current-dependent effects
  - Beam loading: just push current up
    - See effect on acceleration, try to correct for it
  - Space charge: make beam small if possible
    - Measure incoherent tune spread
    - Look at effect on acceleration

Diagnostics for Experiments

- We proposed many diagnostics, but
- Couldn't afford all of them
- Identify diagnostics needs/desires for experiments
- Helps us to
  - Justify request
  - Prioritize what to ask for/buy

Final Remarks

- Thanks to Shinji, Eberhard, Rob for suggestions
- Hopefully I didn’t miss anyone
- Continue making suggestions as you get ideas