Generation and Characterization of Magnetized Bunched Electron Beam from DC Photogun for MEIC Cooler

Milestones

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Year 1

- Q1:
  1. Design beamline to locate magnets and diagnostics at optimum positions
  2. Design gun solenoid magnet or Helmholtz coil-pair
  3. Design skew quad magnets and slits
- Q2:
  1. Relocate old CEBAF arc dipole power supply
  2. Procure skew quad magnets and slits
  3. Procure skew quad magnets and slits
- Q3:
  1. Assemble new beamline
  2. Commission beamline with beam
  3. Measure photocathode lifetime with zero solenoid field at 5 mA and 350 kV
- Q4:
  1. Measure mechanical angular momentum vs magnetization and laser spot size

Year 2

- Q1:
    1. Measure mechanical angular momentum vs magnetization and laser spot size
    2. Benchmark simulation (of different operating scenarios of bunch charge, magnetization, bunch shape etc.) against measurements
- Q2:
    1. Measure mechanical angular momentum vs magnetization and laser spot size
    2. Benchmark simulation (of different operating scenarios of bunch charge, magnetization, bunch shape etc.) against measurements
- Q3:
    1. Generate very high currents magnetized beam and study beam transport versus electron bunch charge
- Q4:
    1. Generate very high currents magnetized beam and study beam transport versus electron bunch charge

Year 3

- Q1:
  1. Generate flat beam with three skew quads – RTFB Transformer – and Measure horizontal and vertical emittances using slit method
  2. Use simulation to quantify how good or complete RTFB transform
- Q2:
  1. Study RTFB transformation versus electron bunch charge
- Q3:
  1. Measure photocathode lifetime versus solenoid field at 5 mA and 350 kV
  2. Study beam halo and beam loss versus magnetization
- Q4:
  1. Measure photocathode lifetime versus solenoid field at 32 mA and 200 kV
  2. Study beam halo and beam loss versus magnetization