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

Milestones

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Year 1

- Q1:
  1. HV condition gun at 350 kV and commission k_2CsSb preparation chamber
  2. Design beamline to locate magnets and diagnostics at optimum positions
  3. Design gun solenoid magnet or Helmholtz coil-pair
  4. Design skew quad magnets and slits
- Q2:
  1. Commission exiting beamline
  2. Measure photocathode lifetime at 5 mA and 350 kV (with zero field)
  3. Relocate old CEBAF arc dipole power supply to GTS
  4. Procure gun solenoid magnet or Helmholtz coil-pair
  5. Procure skew quad magnets and slits
- Q3:
  1. Assemble new beamline and commission with beam
  2. Install gun solenoid magnet or Helmholtz coil-pair
- Q4:
  1. Measure mechanical angular momentum vs magnetization and laser size

Year 2

- Q1:
    1. Measure mechanical angular momentum vs magnetization and laser size
    2. Benchmark simulation against measurements
- Q2:
    1. Measure mechanical angular momentum vs bunch charge and bunch length
    2. Benchmark simulation against measurements
- Q3:
    1. Generate very high currents magnetized beam and study beam transport vs electron bunch charge
- Q4:
    1. Generate flat beam with three skew quads – RTFB Transformer – and measure horizontal and vertical emittances using slit method

Year 3

- Q1:
  1. Measure RTFB transformation versus electron bunch charge
  2. Use simulation to quantify how good or complete RTFB transform
- Q2:
  1. Measure photocathode lifetime vs solenoid field at 5 mA and 350 kV
  2. Study beam halo and beam loss vs magnetization
- Q3:
  1. Change to 32 mA and 200 kV HV supply
- Q4:
  1. Measure photocathode lifetime vs solenoid field at 32 mA and 200 kV
  2. Study beam halo and beam loss vs magnetization