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

Milestones

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Year 1 Milestones

- Q1 (Oct, Nov, Dec):
  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 (Jan, Feb, Mar):
  1. Connect existing beamline to gun and complete hot checkout
  2. Relocate old CEBAF arc dipole power supply to GTS
  3. Procure gun solenoid magnet or Helmholtz coil-pair
  4. Procure skew quad magnets and slits

- Q3 (Apr, May, Jun):
  1. Commission exiting beamline with beam
  2. Measure photocathode lifetime at 5 mA and 350 kV (not magnetized)

- Q4 (Jul, Aug, Sep):
  1. Assemble new beamline and commission with beam
  2. Install gun solenoid magnet or Helmholtz coil-pair

Year 2 Milestones

- Q1 (Oct, Nov, Dec):
    1. Generate magnetized beam
    2. Measure mechanical angular momentum vs magnetization and laser size
    3. Benchmark simulation against measurements
- Q2 (Jan, Feb, Mar):
    1. Measure mechanical angular momentum vs bunch charge and bunch length
    2. Benchmark simulation against measurements
- Q3 (Apr, May, Jun):
    1. Generate very high currents magnetized beam and study beam transport vs electron bunch charge
- Q4 (Jul, Aug, Sep):
    1. Measure photocathode lifetime vs magnetization at 5 mA and 350 kV
    2. Study beam halo and beam loss vs magnetization

Year 3 Milestones

- Q1 (Oct, Nov, Dec):
    1. Generate flat beam with three skew quads – RTFB Transformer – and measure horizontal and vertical emittances using slit method
- Q2 (Jan, Feb, Mar):
    1. Measure RTFB transformation versus electron bunch charge
    2. Use simulation to quantify how good or complete RTFB transform
- Q3 (Apr, May, Jun):
    1. Change to HV Supply of 32 mA and 200 kV
- Q4 (Jul, Aug, Sep):
    1. Measure photocathode lifetime vs magnetization at 32 mA and 200 kV
    2. Study beam halo and beam loss vs magnetization