A Test Facility for An ERL-Circulator-Ring Based Electron Cooler

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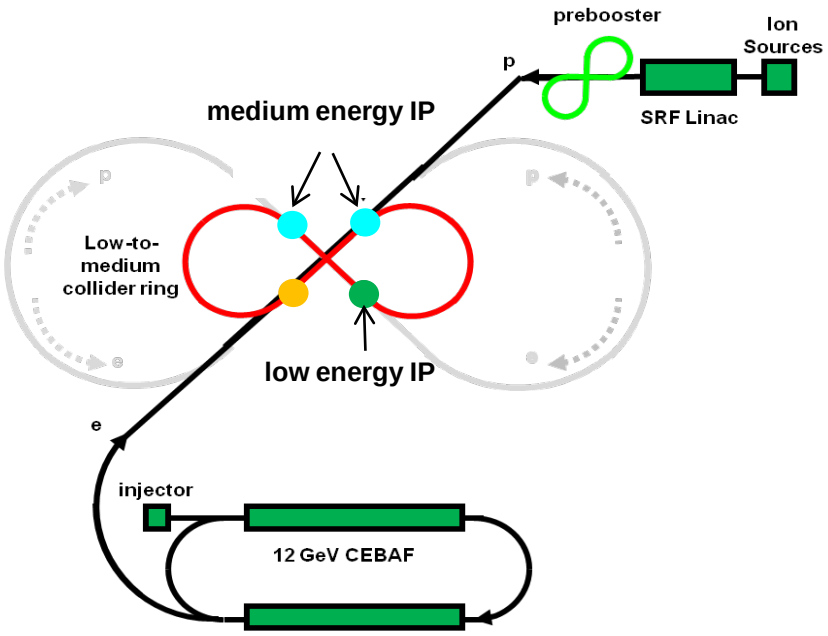
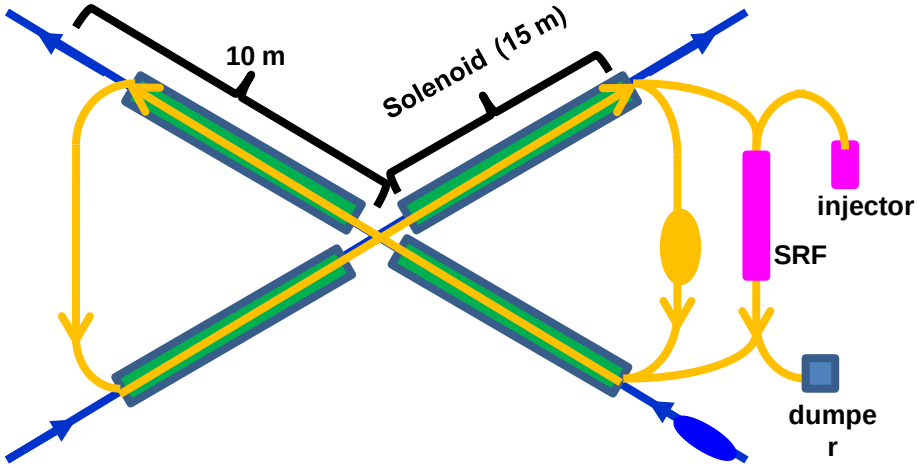




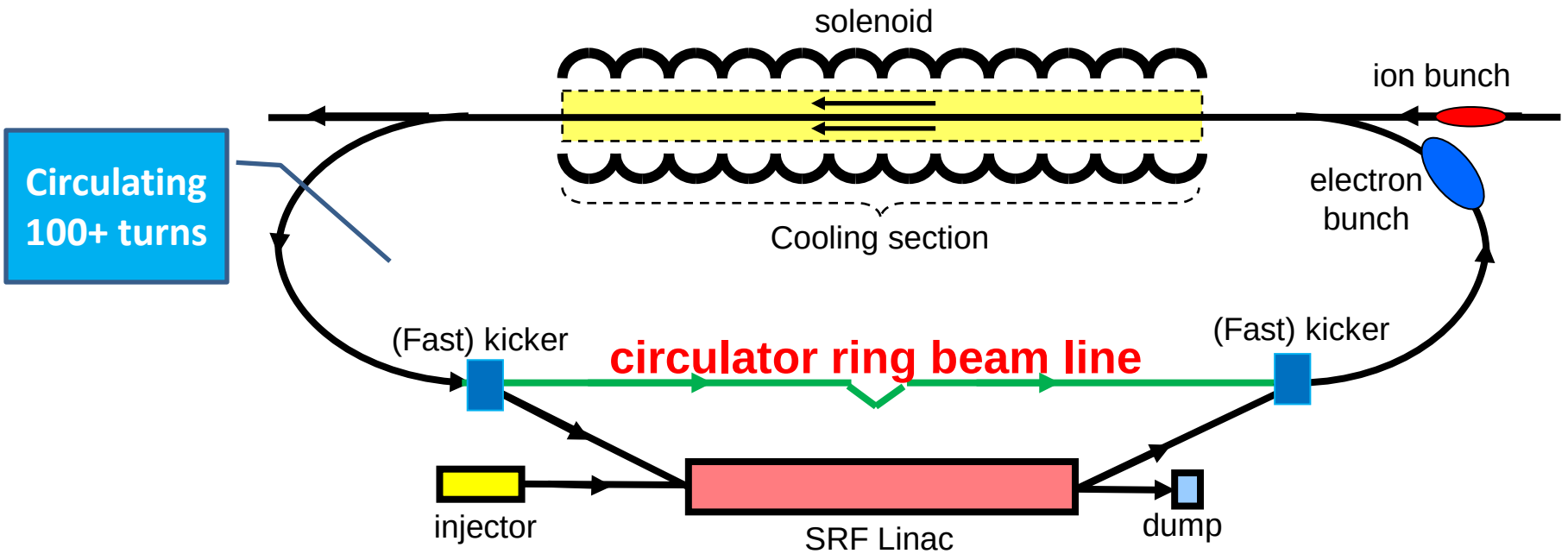
- **Proton/ion beam quality are usually poor in a storage ring**
  - Take a very long time to accelerate protons/ions
  - Can't afford a linac beyond 1 GeV (no CEBAF)
  - No synchrotron radiation damping at MEIC energy range
- **Electron cooling is vital to any EIC to reach high luminosity**
  - Reduce beam emittance and energy spread
  - Enable short bunches for MEIC

An Electron Cooing Facility based on ERL and Circulator-Ring Technologies

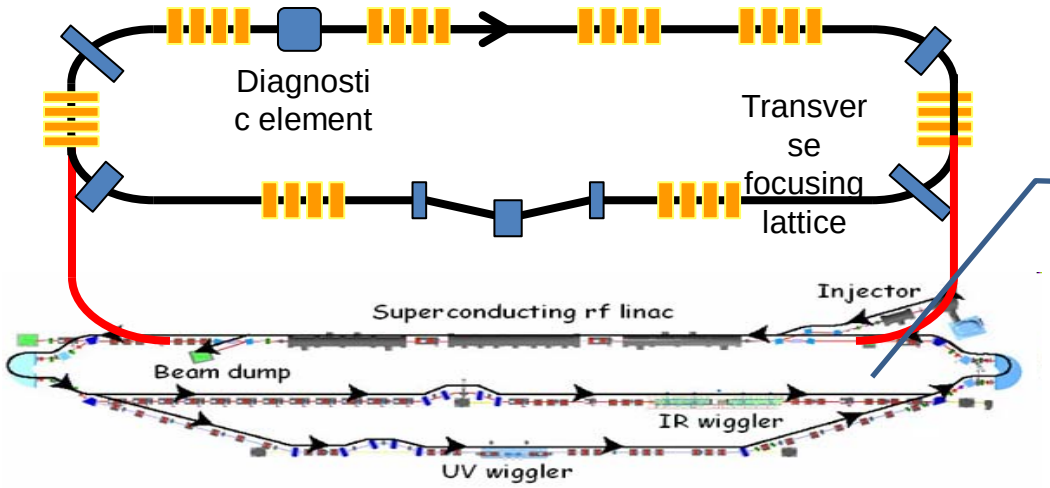
Requirement for the MEIC cooling electron beam

- Current: up to 1.5 A CW beam at 750 MHz, 2 nC bunch charge
- Charge from source: **173 kC/day** (state-of-art photo-cathode source ~0.2 kC/day)
- Energy: up to 54 MeV for cooling protons at collision energy (100 GeV/c)
- Beam power: up to **81 MW** for cooling 100 GeV/c protons

Design Choice: *ERL-CRC*



A Test Facility Based on JLab FEL



Advantages of using JLab FEL

- Existing facility, requiring minimum new hardware
- Matched parameters
- Minimum cost

Goals:

- Proof-of-Principle test of the MEIC e-cooler design concept
- Proto-type of a high energy e-cooler with applications in other colliders
- Develop/test supporting technologies (bunch transfer, phase space manipulation, high brightness e-source, high current ERL, etc.)
- Beam physics studies
- Design/operation optimization studies (number of revolutions in the circulator ring)

Benefits:

- Support MEIC project
- Technology innovations
- Become a world leader in electron cooling (high energy, bunched beam, new parameter regime)
- Become an authority/provider of high energy bunched beam electron coolers (like Budker institute in low energy DC beam electron cooler)
- A potential new JLab core competence based on the existing core competence (SRF and ERL)