Workshop Outline and Goals

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Support:

Outline:

- Beyond the 12 GeV upgrade ?
- Goals for this workshop.

JLab beyond the 12 GeV upgrade

- Jlab community hopes to articulate a comprehensive physics program using an electron ion collider that will complement, extend, and complete (?) our current physics program and our plans for 12 GeV.

- The community, together with the Lab is having a series of workshops to assess the physics potential of such a facility

- An important part of this effort will be a clarification of the machine and detector specifications that are optimal for completing this program.

- Deliverables for each workshop: Parts of a white paper that will be put together after the June 07-09 JLab Users Meeting to produce a white paper.

- Time scale: Summer 2010.

Physics Areas Under Investigation and Workshops

- Study group on Hadronic Physics
  - Nucleon spin and quark-gluon correlations: Transverse spin, quark and gluon orbital motion, semi-inclusive processes
    Partonic Transverse Momentum in Hadrons: Quark Spin-Orbit Correlations and Quark Gluons Interactions: workshop at Duke U., March 12-13, 2010

  H. Gao et al.

  http://michael.tunl.duke.edu/workshop
  - 3D mapping of the glue and sea quarks in the nucleon
    Electron-Nucleon Exclusive Reactions workshop at Rutgers U., March 14-15, 2010

  R. Gilman et al.

  http://www.physics.rutgers.edu/np/2010rueic-home.html
- Study group on Nuclear Physics
  - 3D tomography of nuclei, quark/gluon propagation and the gluon/sea quark EMC effect
    (EIC Nuclear Chromodynamics workshop at Argonne National Lab, April 7-9, 2010

  K. Hafidi, et al.

  http://www.phy.anl.gov/mep/EIC-NUC2010/
- Study group on Electroweak Physics
  - Electroweak structure of the nucleon and tests of the Standard Model
    workshop at the College of W&M , May 17-18, 2010

  K. Kumar, D. Armstrong et al.
- Study group on interaction region and detectors
  - EIC Detectors/Instrumentation
    workshop at JLab, June 03-04, 2010

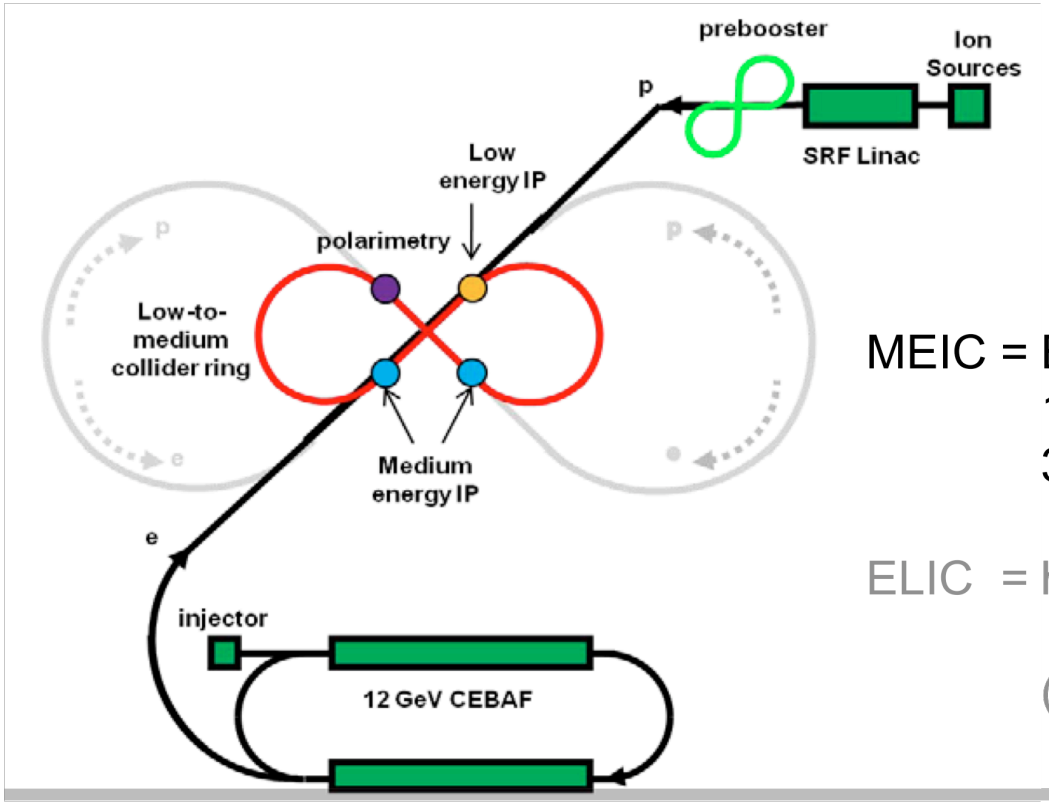
  C. Hyde et al.

Medium Energy Electron Ion Collider

Map the spin and 3D quark-gluon structure of protons

Discover the role of gluons in atomic nuclei

Understand the creation of the quark-gluon matter around us



MEIC = EIC@JLab
1 low-energy IR (s ~ 200)
3 medium-energy IRs
(s < 2600)

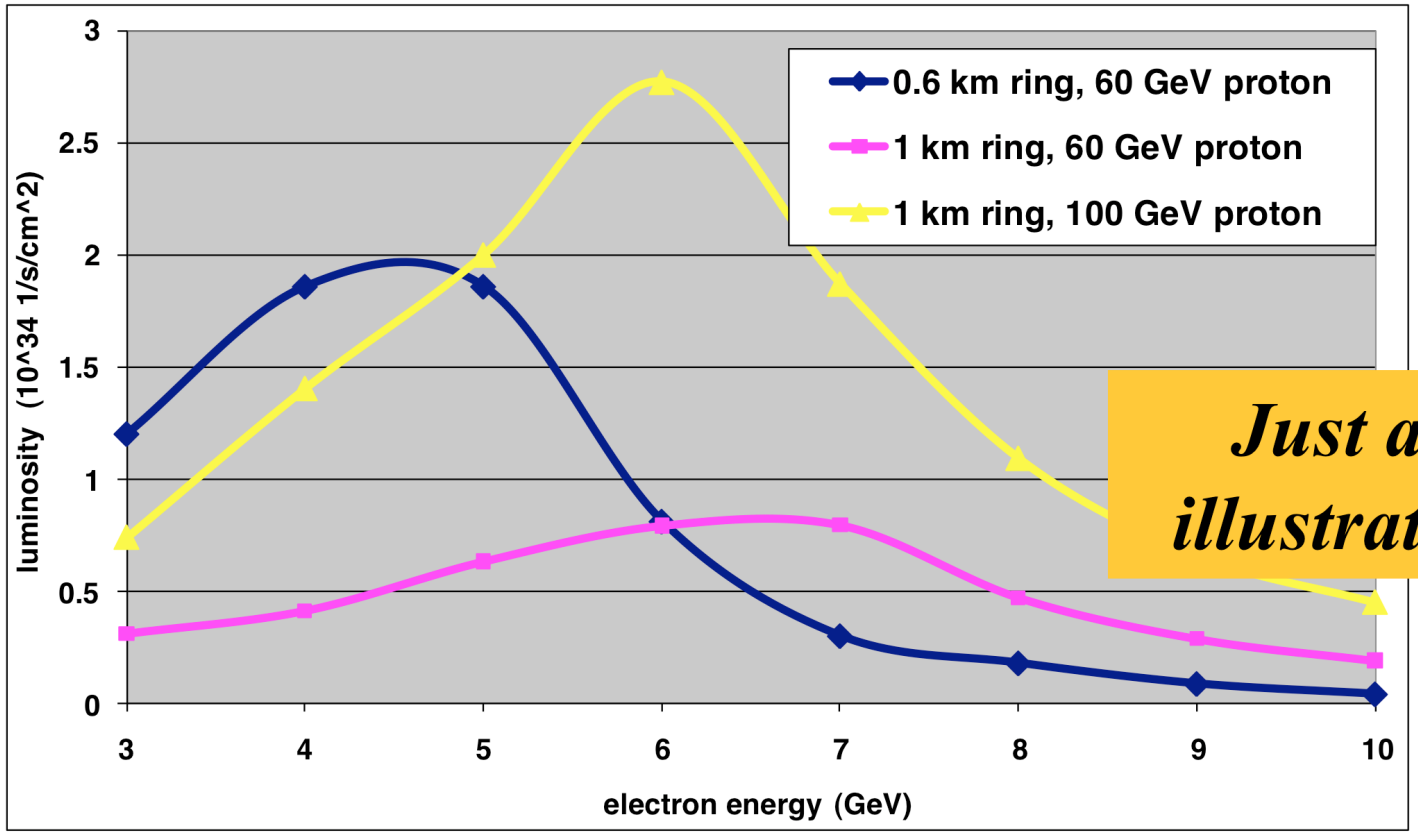
ELIC = high-energy EIC@JLab
(s = 11000)
(limited by JLab site)

Initial parameters of the machine

Parameter	Unit	Electron	Proton	Comments
Collision energy	GeV	3 – 11	20 - 60	Ion booster 3 – 12 GeV, ring accepts 12 GeV injection
Max Dipole Field	T		6	Not too aggressive after LHC
Max Synchrotron Radiation power	kW/m	20		Factor two beyond best achieved?
Max current	A	2	1	~ max B-factory current, HOM in component HERA 0.15 A (?) RHIC 0.3 A
RF Frequency	GHz	1.5	1.5	
Bunch length	mm	5 (20?)	5	6 mm demonstrated in B-factory 10 cm in RHIC (?)
Distance from IP to front face of 1st quad (l)	m	+/- 3 to 4	+/- 7	
Vertical β*	cm	2	2	Keep β_{max} below 2 km (achieved: about 1 km), with $\beta_{max} = l^2/b^*$
Crossing angle	mrad	100		50 to 150 range desired for potential detector advantages
Emittance		TBD	TBD	Electron: ~ B-factory parameters Proton: 1/10 achieved

MEIC Luminosity

- Back-of-envelope calculation, based on three main parameter limits
- Luminosity of 60 GeV protons in 1 km ring is lower than that in 0.6 km ring, since space charge effect is more servere in a large ring
- Luminosity of 100 GeV protons is much better since space charge effect is reduced with higher energy



Goals of the working group

- What physics within your topic of interest can *quantitatively be accomplished with the foreseen parameters?*

- *What physics within your topic of interest could quantitatively be accomplished with a change in the parameter space given, e.g. by a change in energies, a change in luminosity, a change in detector space?*

- *Agree on "flagship experiment(s)" to highlight and articulate its (their) physics importance in the executive summary of your white paper. Define the best parameters space for this (these) flag experiment(s).*

- *Start to prepare a white paper with a summary to be presented at the Jefferson Annual Users Meeting, June 7-9, 2010*