**Project Name: The Cornell/BNL electron test accelerator (C-eta)**

**Project Description (1-2 paragraphs):**

As part of the risk retirement strategy for eRHIC, BNL and Cornell are proposing to build a prototype accelerator to evaluate the efficacy of building an energy recovery linac (ERL) machine using a non-scaling FFAG (fixed-field, alternating gradient) lattice design. This technique is currently proposed as the best solution for the electron accelerator for eRHIC.

The prototype machine will be at much lower total energy (and smaller size) than eRHIC, but will be designed to test the riskiest items of the FFAG-ERL concept for eRHIC. The two highest risk items are: (1) demonstrating a factor of four energy acceptance for an FFAG-ERL; and (2) demonstrating 4-pass beam recirculation with energy recovery for high beam currents. The prototype will be built and experiments performed at Cornell, with the assistance and guidance of BNL.

**Project type** – R&D with construction project

**Principal Investigator (Cornell):** Georg Hoffstaetter

**Project Manager (Cornell):** Bruce Dunham

**Project Manager (BNL)**: Dejan Trbojevic

**Project Monitor (BNL)**: Wolfram Fischer

**Project Deliverables:**

**Key Performance Parameters** list which, when achieved, signal the project’s end:

KPP #1: demonstrate a factor of 4 momentum acceptance in the FFAG

KPP #2: demonstrate 4-pass recirculation with energy recovery at an average current of 1 mA

KPP #3: demonstrate resonant extraction for the highest energy pass

UPP #1: demonstrate 4-pass recirculation with energy recovery at an average current of 40 mA, with resonant extract of the highest energy.

**Subsystem Groups/Departments involved** (add/delete as needed):

Safety (Personnel Safety, Radiation Safety)

RF

SRF

Accelerator Physics

Design

Mechanical

Electrical

Cryogenics

Instrumentation & Controls

Injector (Gun, cathodes, laser)

Facilities (power, water, building)

Magnets

Operations/Commissioning

**Expected Project Horizon** (project duration, in months):

The project should be completed in 3 year, with approximately 2 years for construction and 1 year for commissioning and experiments.

**Key personnel and expected percentage of time per month:**

Project Manager (CU) – 50% over 3 years

Assistant Project Manager (CU) – 50% over 3 years

Project Engineer (CU) – 30% over 3 years

Vacuum Scientist/Engineer (CU) – 50% over first year, 25% years 2&3

Instr. & Controls Engineer (CU) – 100% over 3 years

Mechanical Engineer (CU) – 100% over 1 year, 30% over years 2&#

Cathode Scientist (CU) – 0% year 1, 10% year 2, 20% year 3

Laser Scientist (CU) - 0% year 1, 25% year 2, 50% year 3

RF Engineer (CU) – 50% over 3 years

SRF Scientist/Engineer(CU) – 50% over 3 years

Magnet Scientist/Engineer (BNL) – 50% year 1&2, 25% year 3

Accelerator Physicist (CU) – 100% over 3 years (2 people)

Accelerator Physicist (BNL) - ?

**Major Milestones:**

#1 - complete construction

#2 – beam through 1 loop, low current, energy recovered

#3 - beam through all four passes, low current energy recovered,

#4 - high current recirculation with 1 pass, up to 10 mA

#5 - high current recirculation for passes 2 through 4

#6 – recirculate 40 mA through all 4 passes

#6 – demonstrate resonant extraction of highest energy beam

**Decision points:**

**TBD**

**Major Risks:**

TBD