

Low-energy RHIC electron Cooler (LEReC) progress updates

August 8, 2016:

Physics Support:

- Optimization of beam dynamics in simulation with electron beam produced off center of the cathode continues. Gun has strong spherical aberration. Offset of 6mm from cathode center with large laser spot size maybe not practical. For the offset of 3mm, the effect of asymmetry could be mitigated with a proper setup of gun line correctors and solenoids.
- Developed strategy for e-beam trajectory alignment inside the CS and respective beam-based alignment of the CS solenoids.
- DC gun beam commissioning plan under development

DC gun and cathode system:

- DC gun conditioning at Cornell is delayed due to an air conditioning system failure in their clean room, where the gun is assembled. The new schedule will be for the week of August 15. Arrival to BNL is expected around mid-September.
- Delivered a complete set of the heating jackets for the gun chamber bake out at Cornell.
- Finished the LESH/PCSS safety review on the DC gun mechanical system. Continued working on the action items from the meeting.
- Conducted initial review meetings on the SF6 gas handling system and on the pressure vessel lifting fixtures.
- Fabricating major components for the cathode puck insertion system in the shop. Associated hardware are on order. Design work on the transporter cart will be finalized as soon as the designer comes back from his vacation on August 8.
- Ordered critical components for the two additional simplified version puck insertion systems and for the puck deposition system.

Cathodes:

- Both cathode growth process and the hardware for R&D deposition system are coming along well.

Laser:

- Laser is being moved to R&D area to allow implementation of civil construction for laser trailer. Work on laser trailer during August-September.

RF cavities:

- **2.1 GHz Warm RF Cavity**
 - Cavity has been delivered
 - The custom copper vacuum waveguide delivery has been delayed
 - Tuner actuator has been delivered
 - Tuner plunger is scheduled to ship 8/9/16
 - We plan to retest the RF windows at 2.1 GHz and 14KW during the summer.
 - The waveguide components for 2.1 GHz are being shipped as they become available. A few components on the amplifier side still need to be ordered.
 - The custom waveguide transition from Jlab C100 dimension to WR430 has been delivered.
 - Design of the cavity support is underway
- **704 MHz Warm RF Cavity:**
 - Work continues on the detailed design of the cavity. The design changes on the cooling system layout delayed the final design review by 10 days.
 - The tuner actuator PO has been placed.
 - Design of the tuner is done. Drawings are being checked.
 - Design of the vacuum FPC waveguide is underway
 - Estimated delivery 10/15/16
- **704 MHz Deflecting Cavity**
 - Design of the tuner is underway
 - Drawings for the bid package is underway

Magnets:

- DC gun test beamline correctors under construction. First article should be ready for measurements August 15.
- Mu-metal shields for the cooling section test bench were received. Test bench for magnetic measurements is under construction.

Vacuum elements:

- The bellows, custom gaskets and pumps orders are placed and about 8 week delivery. There are some custom gaskets sizes not ordered yet but will be soon. The dipole chamber is not ordered.
- Still need to order gauges cables and controllers. Also need to order heating jackets for the gun to Booster and the transfer system which are about 4-6 week delivery.

Power Supplies:

- PO for the 6 new CAEN 12V 1A corrector power supplies for the gun injection section has been completed. All these power supplies arrived about 2 weeks ago. We now have all of the dc magnet power supplies we need for the gun injection test. The others are from ERL.
- Testing the 180 degree magnet PS and are making good progress.
- Holes in the racks were punched. Will be installing the ac power for the racks.

Beam Instrumentation:

- **Profile Monitors:** Design complete for 2 of 3 in injection section, drawings in checking, fabrication quotes pending and 1 of 3 fully assembled & surveyed.
- **Emittance Slit:** Design started for the one mask in the injection section.
- **BPMs:** 1st articles due in this week with the balance of chambers & buttons due in early August. Electronics on order & development of local amplifiers underway.
- **Current Transformers:** Shields for ready for ICT & DCCTs. Four FCTs will be installed (one upstream & one in front of each dump). The two in the injection section are on order.
- The **NMR probe** for the 180 degree dipole has been ordered and is due in early October.
- A bulk **cable order** was placed last week for the large majority of instrumentation cables.

Controls:

- Development of the DC Gun remote software interface has begun.
- Some initial design work on the LEReC FCT Zynq hardware platform is underway.
- Discussion of requirements for the motion controls and laser systems.
- Various controls systems are now under development and progress is being documented on Controls Wiki page.

Cryogenics:

- IP2 Cryogenics transfer lines
 - a. Drawings were completed and under sign off.
 - b. SOW/Specs are routed for sign-off.

2K/4K Recovery heat exchanger procurement bid returned.

- 704MHz SRF Booster Cavity Cryostat

Layout for modifying the internal cryogenics lines routing for 704MHz SRF Cryostat is underway and will be finalized by end of August.

Commissioning:

- Commissioning plans presented at RHIC Retreat

Installation and other Design work summary:

- PO for Gun-to-Booster transport line placed. Delivery date last week of October.
- Welded stand assemblies: delivery date October 3rd week
- Stand top plates and all the mounting hardware for the solenoids and vacuum chambers. Vacuum chambers: delivery date October 4th week. Stand top plates and mounting hardware: delivery date September 4th week.
- Profile monitor vacuum drive assemblies from KL: delivery date October 3rd week
- Laser mirrors and adjustment bellows assembly that attaches to it: delivery date October 2nd week.
- Other work: Work Platform; Power for DC Gun PS & Cleanroom fans & lights; 1002D power and cable tray requirements, Finalized magnet/power supply specifications; Tunnel cable tray layout; Tunnel penetration for laser transport; Custom shield blocks for laser optics table; 1002F Vibration mitigation.