

LEReC 12/3&17/2015
Instrumentation Meeting
By Toby Miller

Minutes

- 1st diag. B/L magnet needs to be an ERL 30 degree dipole, 20 degree is shown in this layout.
- ERL aperture is actually smaller... maybe choose the larger aperture dipoles in the ERL dump. George to advise...
- Discussion of running without booster: need corrector every 1m, or 2 layers of mumetal, or use long helmholtz coil...
- New goal to run beam without booster, through all planned instrumentation (mostly from ERL) to the FC in the first diagnostic beam line.
 - Alexei would like to install 8kW CeC beam dump to test gun next year.
 - Plan to move the YAG (just before 704MHz warm cavity) upstream to just after the 1st diag. beam line for next year's test.

- Need to take care to run magnet cables so as not to generate stray fields! Don Burno will look for twisted pair power cable for magnets <20A.
- It was suggested to eliminate last dipole before the beam dump. However, this will increase back shine to the instruments.
 - We may change the dump over- focusing quadrupole to a solenoid. Dmitry will look into this. will discuss during design in 2 months...

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- It was suggested to elongate the laser box and incorporate the two new ports into the box instead of a cross to provide a plunging cathode imaging mirror.
 - A back-up plan shall be to image the cathode through the laser entry port and steering mirror using a mirror in air on axis with the laser with an aperture for the laser to pass through.
 - A better alternative is to simply add a fixed mirror and viewport to avoid the plunging mechanism and also allow for cathode imaging simultaneous to beam production.
- Request for quotation for a magnet power supply was sent today to Caylar to work with the NMR probe for feedback on the magnetic field.

- Concerning the Flying wire scanner, Igor suggested a carbon sheet to thermally image the profile of the beam. Peter commented that this works for beam finder but suffers from nonlinearities for an accurate profile? Could we back out the nonlinearities?
 - need to model device for impedance
 - Need to ask Cornel about results with titanium, is it any better than carbon?
- Optics studies from Dmitry show the same optics as presented to DOE in Nov. (shown here).
 - Open question is whether or not to add BPMs to this portion of the beam line and is any MuMetal shielding required.
 - John Hock is involved to apply eLens BPM & drift tube designs toward the deflector and kicker designs for LEReC.

- Concerning the Electrostatic Energy Spectrometer, the deflector voltage will be increased toward 5kV so that the 2cm gap can be enlarged to accommodate the beam. The gap will be increased to 4cm.
- Concerning the recombination monitor, the open issue here is the choice of detector to install inside the cryostat and whether or not to make the detector moveable. A warm motion feedthrough like what is being installed on the CeC 700MHz tuner may be a candidate.

12/17/15

- The LEReC gun will be commissioned with a fiber laser transport.
 - Fear of nonlinearity in the fiber suggests an inability to reproduce the “beer can” shipped laser pulses & macro pulses.
 - Based on experience at the JLAB FEL, we are preparing for the likelihood of needing an evacuated (or dry nitrogen filled) laser transport pipe system.
- Concerning the BPMs in the gun-to-booster section, current test data suggests requiring averaged data over 1 – 10 us long trains of macro bunches to provide 100um position resolution using the 9mm buttons.
 - A small meeting may be held with Michiko, Dave, Rob & Alexei to decide if buttons will be sufficient.
 - We are ready to request a quote for MPF to redesign their 15mm buttons (used at CeC) with a much shorter depth.
 - We may plan to center the beam using many turns of beam for good position measurement followed by profile, emittance, energy & energy spread measurements in the single macro bunch mode.
- We need two BPMs between the 180 dipole and the solenoids to make an accurate beam angle measurement.
 - We need to calculate how accurate of an angle measurement can be made adding a BPM between the hybrid device and the solenoid.
- To synchronize the laser to booster RF (with feedback loop)
 - we will add a photodetector to sample the laser just before entering the laser box
 - Kevin(s) Smith & Mernick requested to add a pair of button pick-up electrodes to the laser box to provide beam based feedback to LLRF as well.
- Concerning imaging of the cathode, a fixed mirror and viewport is cheaper & better than a plunging one as the cathode can be imaged while producing beam.
- The longitudinal phase monitor (in the commissioning beam line) needs 0.4 degree resolution for proper energy spread measurement. The current location provides roughly 5 degree resolution based on current optics simulation.
 - Michiko will re-evaluate the simulated data.
 - The entire beam line may need to move downstream of the 180 degree dipole.
 - The optics design is waiting on a firm design and impedance analysis of the beam kicker & dump.
 - The optics should be designed so that the beam at the center of the kicker is imaged onto the YAG screen