LEReC 05/28/2015
Instrumentation Meeting

By Toby Miller

Minutes

ENERGY MEASUREMENTS

Bruce and Ivan encouraged us to have more than one method of energy measurement. They suggested a time of flight (ToF) measurement system based on BPMs (as they use) in conjunction with either of our spectrometry techniques.

180 DIPOLE + PM'S

1. Peter's slides on angle sensitivity were presented, showing how the upstream BPM for angular measurement requires less accuracy than the BPM near the Dipole. Thus, only the two BPMs near the Dipole will be fitted with YAG screens.

2. Peter's suggestion of using a slit in the upstream BPM+PM and an additional PM downstream of the Dipole to improve energy spread measurements was presented but discouraged due to lack of need over current use of strong focusing solenoid and PM after the Dipole.

SA SPECTROMETER + PM'S

Igor's design of small-angle air-core-dipole energy spectrometer beamline with two YAG screens for position measurement was presented and met with encouraging nods.

TIME OF FLIGHT

1. Cornell uses standard CEASER BPMs that are clocked @ ~12.5MHz and give relative phase information for all BPMs relative to the clock. Bruce sent slides by email & explained that we should calibrate the cavity at low energy using ToF at measurement and extrapolate up to 1.6 and 2MeV.

2. Bruce & Ivan stated that 1 - 2° of phase measurement is easy and 0.1° is possible with high bunch charge and averaging over many bunches.

3. Rob Michnoff can talk with John Dobbins at Corness about BPM electronics.

4. Alexei stated that 7ps at 1.6MeV is required instead of 0.03ps (as previously suggested by Igor).

5. Jorg suggested to use Frist & Last BPM buttons in the Yellow & Blue cooling sections (respectively) to have a 20m separation. Turning off the accelerating cavities propagates a 400keV beam from the gun; which is 1Ž4 the 1.6MeV energy. Reducing all the magnets to 1Ž4 of their setpoints should allow the 400keV beam to propagate all the way through these two BPMs with 20m separation. Measuring the relative phase between the two with a dedicated electronics provides a dedicated instrument in one place to measure the beam energy by time of flight for both 400keV and 1.6MeV energies with high resolution afforded by the long 20m separation.

GUN INSTRUMENTATION

Position Measurement

It was discussed in the earlier meeting to install a large button BPM at the Gun solenoid (instead of the stripline BPM).

Profile Measurement

Bruce explained that it is necessary to have a profile monitor before the SRF booster. It was decided to fit it into the laser-cross chamber.

Laser & Cathode Monitoring

1. Bruce explained that they needed to scan the cathode surface with a pinhole sized laser spot while measuring the beam produced on the YAG screen to make a "pin cushion" map to find the charge center. This requires automated steering of the laser beam.

2. In addition to the camera imaging the cathode, monitoring the laser beam reflected off of the cathode surface was very important. This will require special optics to separate the reflected laser beam from the cathode view.

Gun Shielding

1. As the cathode is sensitive to stimulated emission, stray X-Rays & UV from the SRF cavity or beam loss can reach the cathode and produce more halo. Bruce suggested a couple of sheets of lead be added to the face of the SRF cavity cryostat to provide shielding for the gun.

2. Bruce claimed that 50pC of beam loss would produce 1R/hr of background radiation that can swamp PMT BLMs. He had to abandon the use of PMT BLMs due to their oversensitivity to background radiation.