Mott Experiment

Run 1 Plan (Gold @ 6.3 MeV)

Version 1

Source Setup

* **Photocathode**
  + SLSP-5247-1 has been a good performer with polarization 85-90%.
  + Likely will heat/activate over the winter shutdown.
* **Laser Configuration**
  + We’ll run at both 499 and 31 MHz, using 998/2^n RF generation
  + Plan A: new pulse picking laser – will be scheme during summer run, should provide stable bunch length vs. rep rate, but first time using
  + Plan B: digital gain switching – used previously OK, but bunch length varies w/ rep rate
* **Laser Synchronization**
  + Our TDC synchronization frequency is half the bunch frequency.
  + How do we get a bunch frequency into the TDC?

Beam Setup

* **Injector Setup**
  + Plan A: “standard” setup (gun=130keV, final=6.3MeV, dE~larger)
  + Plan B: “crested” setup (gun=130keV, final=6.3MeV dE~smaller)
* **6.3MeV Beam Measurements**
  + Momentum using the 5D line (use IPM0L02,0L03,5D00,5D01)
  + Energy spread using the 2D line (use IHA2D00)
  + Emittance using the 0L line (use MQJ0L02 + IHA0L03)
* **Mott Optics Setup**
  + Plan A: optics model (Elegant) + emittance => predict & view shape
  + Plan B: empirical tuning of two quads => view shape

Polarization Setup

* **Helicity Pattern**
  + Suggest we run in 30Hz quartet delayed w/ line-sync.
  + Reduce transition window from 500 to 100 usec ?
* **Spin Rotators**
  + Initial: Set Px~Py until chance to null/test instrumental asymmetry
  + Final: Pick Px or Py, then null the other and Pz
* **Insertable waveplate**
  + Equal # of runs with wave plate IN/OUT
  + Calibrate PITA coefficients in advance

Data Acquisition

* **DAQ Acquisition Mode**
  + Plan A (~2kHz): FADC 250MHz Sample + TDC + Scalers (S1 and S2 ?)
  + Plan B (? kHz): internal FADC timing, maybe low priority for gold…
* **Operation**
  + Repair or replace bad/intermittent channels
  + Streamline acquisition + decoding + eliminate unnecessary input
  + Need detailed checkout plan
* **Analysis**
  + Streamline analysis + output option to logbook
  + Easy way to move between 499 and 31 MHz (eliminate re-making)
  + Scaler analysis on output

Calibration and Setup Tests

* BCM calibration against FC2
* PITA/charge asymmetry null points for wave plate IN/OUT
* PMT high voltage adjustment to set similar gain
* Asymmetry vs. rate (dead time) to test for max rate
* Physics and (null) instrumental asymmetries vs. beam size or position
* Statistical stability to test for un-measured systematic

Physics Run

* **Goal 1: asymmetry vs. target thickness at 6.3 MeV @ 31MHz**
  + 9 unique thicknesses 0.05-1 um
  + rectangular mounts 0.225-0.870 um
  + circular mounts 0.07-1 um
  + mount aperture: 5v10, 10v25
  + different batches: 0.05, 0.07
  + different siblings: 0.35-5613
* **Goal 2: 31MHz vs. 499MHz performance**
  + Operate at 499MHz
  + Integrate 31MHz
* **Run Times**
  + Short ~ 30-60 min
  + Lots of over head starting/stopping runs
* **Target List**

