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**

Foil 1	Rectangular	Au-0.225-7029-A-25
Foil 2	Rectangular	Au-0.625-7028-A-25
Foil 3	Rectangular	Au-0.870-3057-A-25
Foil 4	Rectangular	Au-0.750-5134-A-25
Foil 5	Rectangular	Au-0.500-5275-A-25
Foil 6	Circular	Au-0.070-6405-A-10
Foil 7	Circular	Au-0.070-4605-A-05
Foil 8	Circular	Au-0.350-5613-B-25
Foil 9	Circular	Thru
Foil 10	Circular	Viewer
Foil 11	Circular	Au-0.040-6457-A-05
Foil 12	Circular	Au-0.050-6845-A-25
Foil 13	Circular	Au-0.050-6809-A-25
Foil 14	Circular	Au-0.350-5613-C-25
Foil 15	Circular	Au-1.000-5385-A-25
Foil 16	Circular	Au-1.000-5383-A-10