

Procedure for measuring the beam polarization with the Möller polarimeter

Version 1.2

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1 Before start

- Reasonable quality beam must be already present for Hall-B
- Beam has to be terminated on the tagger yoke dump
- CLAS12 is OFF, especially sensitive detectors:

Drift Chamber High Voltage OFF

SVT/MVT High Voltage OFF

2 Setup

1. Notify MCC that you are about to do a Möller run and **request to take the beam to the tagger yoke beam dump** (they will need to take the beam way and energize the tagger magnet).
2. Wait for MCC to authorize change the BTA setting to “photon beam” and also beam position/current limits if necessary
3. Ask MCC to turn orbit locks off, and mask BOM and the Halo Counters in FSD
4. Turning on the epolarimeter is done from EPICS GUIs (for now multiple control GUIs in expert mode are used). The Möller setup GUIs can be launched from the **Moller** tab on the "*clascss*" GUI.
 - (a) the "Möller Asym - All" GUI contains all the helicity gated scalers, charge asymmetry, and the beam polarization¹. It has several controls for the measurement. The buttons "Start", "Reset" and "Stop" will start and stop acquisition of data or reset acquisition (clear scaler buffers). Two acquisition times control update frequency of scalers, measured polarization value, and charge asymmetry calculation. It is recommended to have Möller polarimeter acquisition time > 60 seconds, while time for change asymmetry update ~ 10 seconds. Both times can be set either by typing a value in the box or moving the slider. The "Attenuator Controls" are to control beam charge asymmetry. By changing voltage on intensity attenuators (IA) one can equalize intensity across helicity states. It is recommended to use "Global Offset" that will change voltage on all four IAs by the same amount.

¹The polarization and charge asymmetry have GUIs their own, but for now the main GUI will be used.

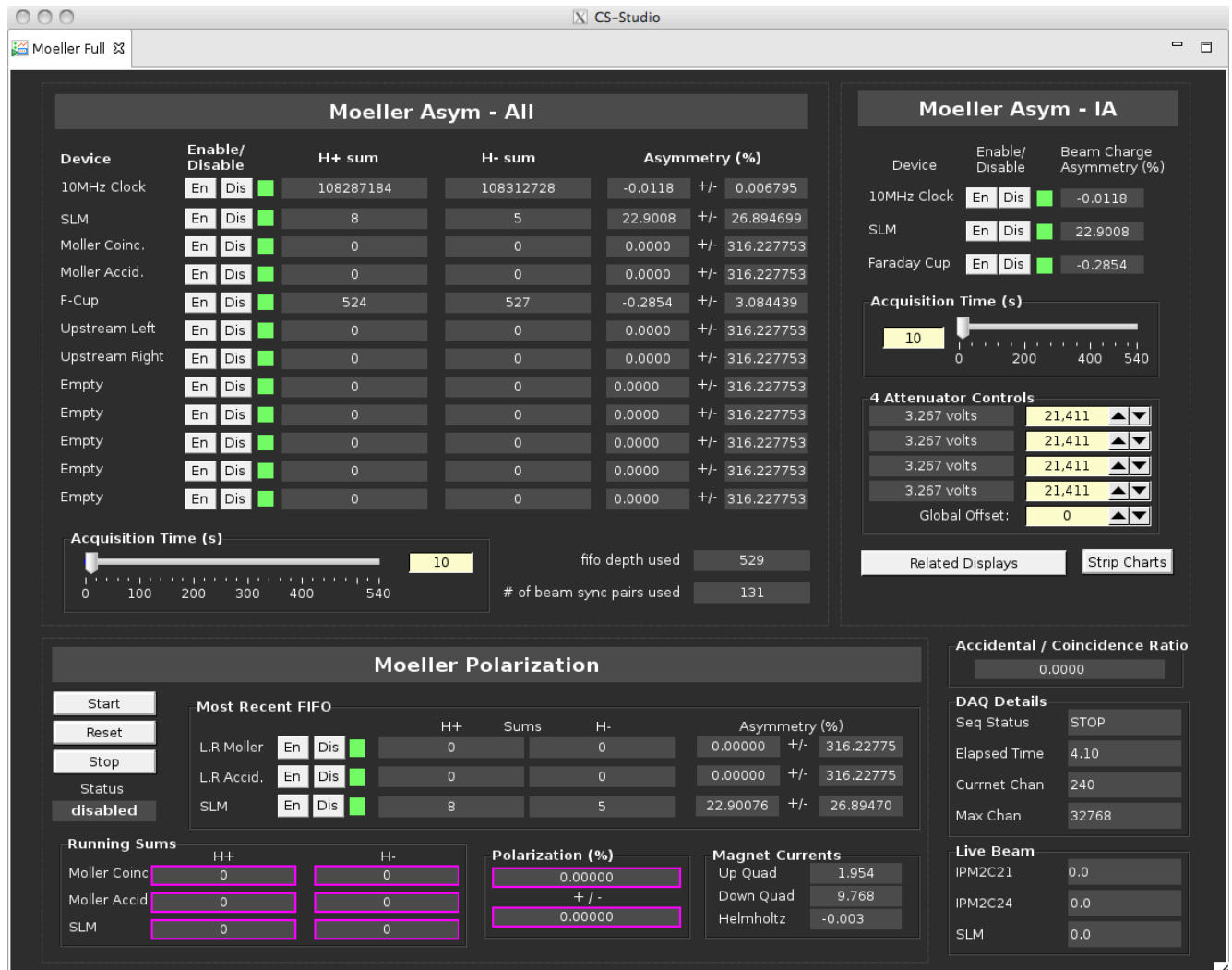


Figure 1: The main Möller Epics expert GUI.

- (b) The control for Möller quadrupole power supplies are provided in "Moeller Quadrupoles" GUI. Power supplies will be turned on and in remote before hall closing. From GUI one should first turn them on by pushing the "PS ON" buttons, then set the desire value for currents in "Current Setpoint" window. For 10.7 GeV the suggested value for the quadrupoles is 3050 A (however, due to change in the detector apertures this must be studied).
 - (c) The target polarization is generated by a longitudinal (along the beam) magnetic field generated by a pair of Helmholtz coils. It is expected that the target will be saturated at ~ 1.8 A current in the coils. The recommended current for Möller measurement is 3 A. A GUI for power supply of Helmholtz coils, "Moeller Helmholtz PS", has two controls, button "STATE" defines state of the power supply. Typically it will be in "STANDBY" state when is not used. To energize coils first from the menu in "STATE" choose PS on, then in "Current Setpoint" white window write the value, either 3 or -3 . Beam polarization measurements with both orientations the Helmholtz field is recommended to check systematics.
 - (d) a target control GUI allows to position desired target on the beam. Left target is the recommended target for the measurements.
5. Once the tagger magnet is energized, request the beam current as specify for the given energy Møller measurements to be delivered², as measured by 2C21 nA BPM and/or SLM. Do not use 2C24A since that BPM is located downstream of the Möller setup

²The optimal beam current is a function of beam energy. More specific information may be available on the white board in the counting house or in the run period specific documentation on the run wiki. Regardless of what currents are specified on the white board or in this document, the ratio $Left \otimes Right$ accidentals to the true coincidence rate should be kept below 5%. It may be necessary to adjust the HV on the Left and Right PMT's to achieve a low accidental rate, while maintaining a reasonable true rate.

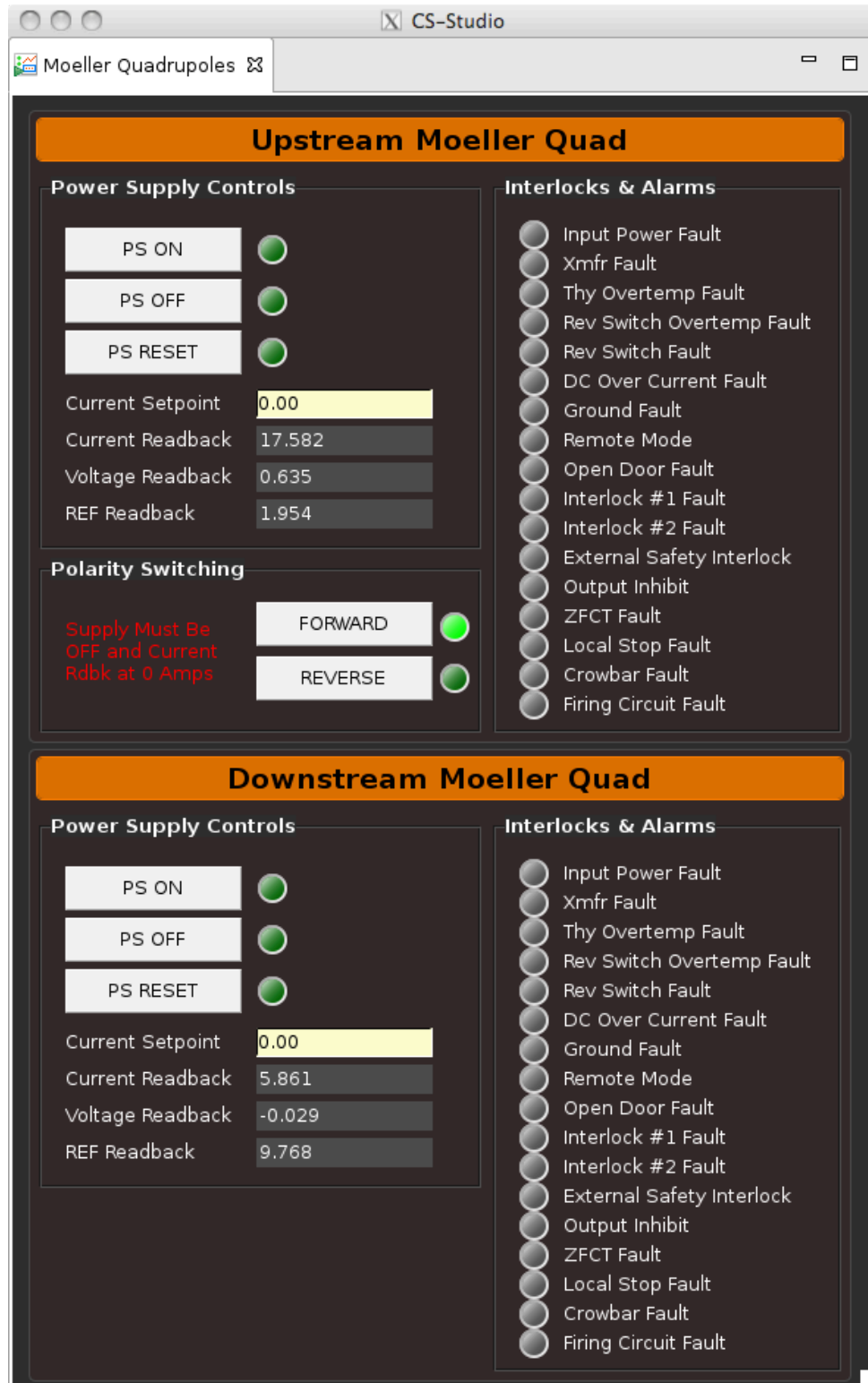


Figure 2: Control GUI for the Möller quadrupole power supplies.

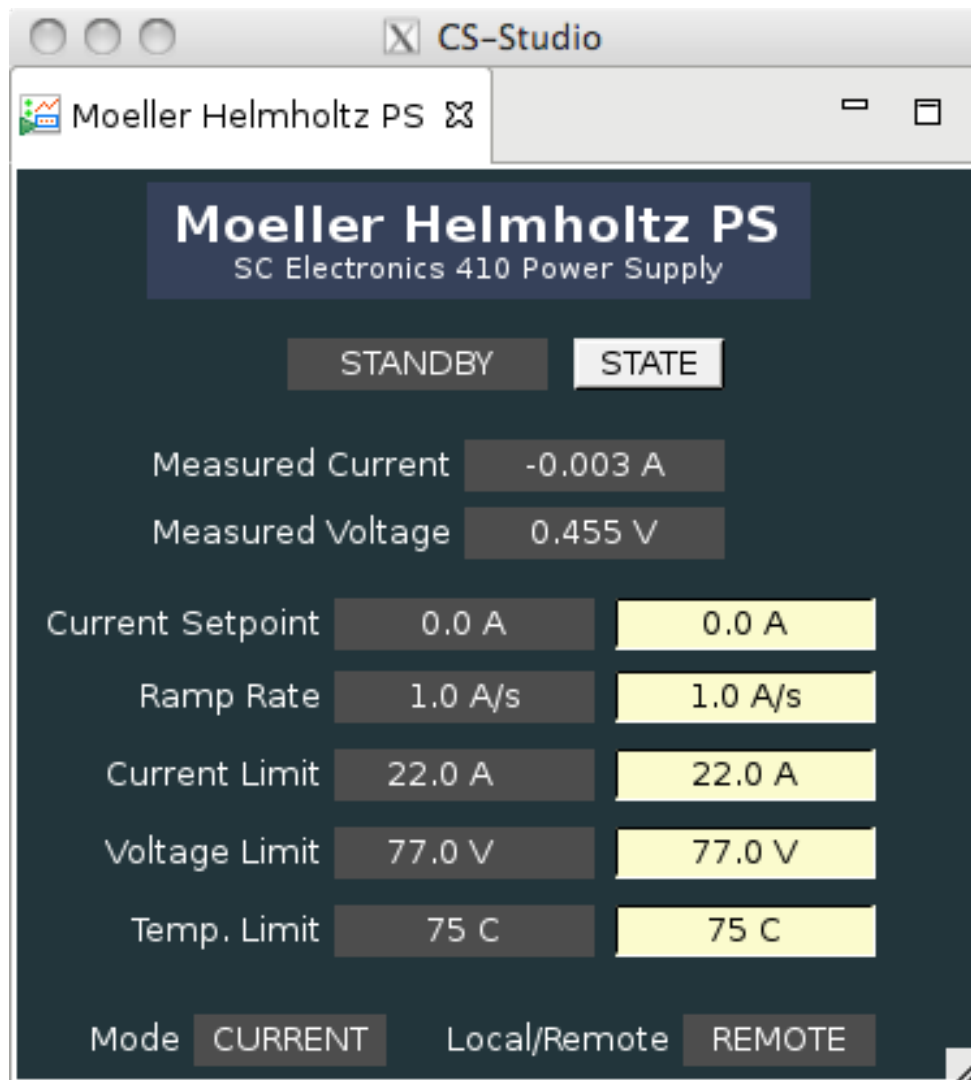


Figure 3: Control GUI for the Möller target Helmholtz coils power supply.

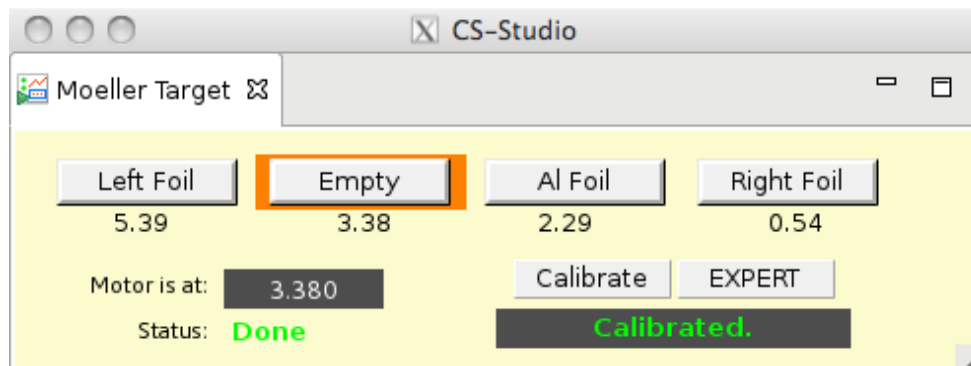


Figure 4: Control GUI for the Möller target.

3 Data Taking

To start a new run when DAQ is still running hit the "Reset" button on "Moeller Asym - All" GUI. If run was stopped hit the "Start" then "Reset". Run is complete when the error on the beam polarization on the GUI is below 2.% absolute. Typically it takes about 30 min to 40 min to get the required accuracy. Make measurements with both polarity of Helmholtz coils, and if needed with half-wave plate in "IN" and "OUT" states. Log every measurement by sending "Moeller Asym - All" GUI to logboog.

4 Backing off Möller setup out

When done with the measurements:

- Do not forget to make a log entry including all details and the GUI!
- Request MCC to take the beam away and **de-gauss the tagger magnet if the next step is sending the beam to Faraday cup.**
- Turn off quadrupoles by setting 0 in "Current Setpoint"s and then pushing "PS OFF" button
- Turn off Helmholtz coils by setting 0 the current and setting "STSTE" to "STANDBY"
- Retract the target by pushing "Empty" button
- Once tagger magnet is degaussed, restore the beam to Faraday Cup.
- Turn on DC and CVT HVs.