Calibration runs with SHMS at negative polarity

1. $\boxed{p(e,e')p}$ Hydrogen elastic singles, and associated Dummy target runs.

   Set up the following configuration:

   (a) HMS and SHMS angles and momenta as specified in the table below. Both spectrometers should be at negative polarity and will have to be cycled initially.

   (b) Record all TV angle values on run sheets and hclog. Update *standard.kinematics* with the new settings.

   (c) 10 cm LH2 and "thick" dummy target data should be taken with the HMS large and SHMS collimators.

   LH2 target runs:

   - Set the PS1(SHMS-3/4) and PS4(HMS-ELREAL) target rates to 1000 Hz, all others disabled (i.e. -1). As a guide, projected rates and PS factors are given in the table below.

   - Projected beam currents are listed below, we desire to keep the SHMS-3/4 rate below 600 kHz so adjust accordingly. Stable beam with 2×2 **raster on.**

   - We want at least 10,000 elastics (in both spectrometers). The total event estimate in right-most column includes inelastics (times below are only a guide).

   Thick Dummy target runs:

   One run for each angle and momentum setting, current limit: 40 μA.
   To be efficient, please minimize target changes and do LH2, Dummy for first setting, followed by Dummy, LH2 for second setting, etc.

8.487 GeV Heep-check singles runs											
θ_{HMS}	P_{HMS}	θ_{SHMS}	P_{SHMS}	Current	$Rate_{HMS}$	$\frac{PS4}{HMS}$	$Rate_{SHMS}$	$\frac{PS2}{SHMS}$	$\frac{Time}{LH2run}$	$\frac{Time}{ALrun}$	Evt_{SHMS}
15.050	-6.477	9.45	-7.559	10 μA	0.98 kHz	0	57.6 kHz	8	10 min	6 min	266k
15.630	-5.878	11.90	-7.106	25 μA	4.55 kHz	3	28.6 kHz	7	10 min	6 min	261k
17.970	-5.878	13.85	-6.720	80 μA	1.80 kHz	0	30.5 kHz	7	12 min	6 min	334k
20.385	-5.878	14.75	-6.538	80 μA	0.13 kHz	0	18.6 kHz	6	12 min	6 min	400k
Total Time (including overhead): 4.3 hrs											

2. [Carbon-Sieve Optics] at -5.878 GeV/c for HMS

Set up the following configuration:

(a) Ensure HMS magnets are set to –5.878 GeV/c.

(b) Set HMS angle = 13.00 deg (from TV).

(c) Insert HMS sieve collimator. Leave SHMS collimator unchanged.

(d) Insert the Carbon 0.5% target.

(e) Stable 40 μA beam with 2×2 raster on. Adjust beam current as needed to both maximize pTRIG4 (H-EL_REAL) rate to 2000 Hz and **ensure that pTRIG1 (SHMS 3/4) is under 600 kHz and SHMS S1X rate is under 2 MHz.**
Carbon Target Current Limit = 80 μA.

(f) Set the PS4(HMS-ELREAL) target rate to 2000 Hz, all others disabled (i.e. -1). Note that no SHMS trigger should be enabled. Estiamted prescale values are below.
Prescale GUI settings:

PS1(SHMS-3/4)	–1
PS2(SHMS-ELREAL)	–1
PS3(HMS-3/4)	–1
PS4(HMS-ELREAL)	0
PS5(HMS-ELREAL×SHMS-3/4)	–1
PS6(HMS-3/4×SHMS-3/4)	–1
EDTM Target Prescale Rate	10 Hz
cermode10	ON

(g) Update *standard.kinematics* with the new settings.

(h) Run the 50k analysis script as normal. Note that there should only be HMS events. The statistics goal is 200 electron events per sieve hole. The 50k replay should be used to determine the event rate. **Jacob Murphy should be called to remotely determine the event rate. His phone number is on the whiteboard, available regardless of the hour.** If need be, there are instructions on how to estimate these cuts in root in the file "Carbon_Optics_README.txt" (located in the hallc_replay_lt directory), however Jacob should be tried to be contacted first to complete the estimate. Continue data taking until rate goal is reached based on the 50k analysis.

(i) Once data taking is complete based on the rate estimate, insert Optical ±8 Carbon target. **Limit beam current to 50 uA on this new target. Lower as needed.** Adjust the prescale as needed to keep the target rate to 2000 Hz. Repeat the previous step with the new target.

Estimated Running Time (combined both targets): 2.0 hours at 50% efficiency.

To be completed if time allows:

3. $p(e, e')p$ Hydrogen elastic singles, and associated Dummy target runs PART 2

   Set up the following configuration for the HMS (leave SHMS alone):

   (a) HMS and SHMS angles and momenta as specified in the table below. Both spectrometers should be at negative polarity and will have to be cycled initially.

   (b) Record all TV angle values on run sheets and hclog. Update *standard.kinematics* with the new settings.

   (c) 10 cm LH2 and "thick" dummy target data should be taken with the HMS large and SHMS collimators. **Ensure HMS collimator is moved off of "sieve" and set to "large".**

   LH2 target runs:

   - Set the PS1(SHMS-3/4) and PS4(HMS-ELREAL) target rates to 1000 Hz, all others disabled (i.e. -1). As a guide, projected rates and PS factors are given in the table below.

   - Projected beam currents are listed below, we desire to keep the SHMS-3/4 rate below 600 kHz so adjust accordingly. Stable beam with 2×2 **raster on.**

   - We want at least 10,000 elastics (in both spectrometers). The total event estimate in right-most column includes inelastics (times below are only a guide).

   Thick Dummy target runs:

   One run for each angle and momentum setting, current limit: 40 μA.
   To be efficient, please minimize target changes and do LH2, Dummy for first setting, followed by Dummy, LH2 for second setting, etc.

8.487 GeV Heep-check singles runs											
θ_{HMS}	P_{HMS}	θ_{SHMS}	P_{SHMS}	Current	$Rate_{HMS}$	$\frac{PS4}{HMS}$	$Rate_{SHMS}$	$\frac{PS2}{SHMS}$	$\frac{Time}{LH2run}$	$\frac{Time}{ALrun}$	Evt_{SHMS}
* Beam current may need to be lowered if deadtime >15%											
17.24	-5.587	16.10	-6.265	80 μA	6.80 kHz	3	9.90 kHz	5	12 min	6 min	412k
19.505	-5.587	19.20	-5.646	80 μA	0.90 kHz	0	2.63 kHz	3	18 min	6 min	554k
21.875	-5.587	23.20	-4.902	80 μA	0.07 kHz	0	0.65 kHz	0	30 min	6 min	738k
Total Time (including overhead): 3.8 hrs											