CaFe 2022 Experimental Run Plan, BEAM Energy 10.6 GeV

August / September 2022

1 Optics Checkout / Hydrogen H(e, e') Elastic Singles

This part of the CaFe experiment run plan will be taken during the pionLT run period some time → Aug 08 Owl shift (before the accelerator pass change on Aug 08 Day Shift)

Prescale GUI settings for both Optics / H(e,e') studies:

COIN DAQ		
TRIGGER	PRE-SCALE	TARGET RATE
PS1 (SHMS-3/4)	-1	- -
PS2 (SHMS-ELREAL)	?	5 KHz†
PS3 (HMS-3/4)	-1	- -
PS4 (HMS-ELREAL)	? (used by pionLT)	- -
PS5 (HMS-ELREAL x SHMS-3/4)	-1	- -
PS6 (HMS-3/4 x SHMS-3/4)	-1	- -
EDTM Target Prescale Rate	- -	10 Hz

NOTE: PS = -1 (trigger disabled) PS = 0 (accepts all triggers, i.e., no pre-scales). †Set a target rate of 5 kHz ONLY for H(e, e') (to keep computer live time > 90%), and if trigger rates exceed this threshold, a pre-scale factor will be automatically determined by the DAQ. For Optics, since Sieve Slit will be inserted, the rates will be significantly lower so there is no need to pre-scale (nor should the live time be of relevance for optics). **PionLT group will simultaneously be doing their studies with HMS singles trigger enabled**.

Helpful Hint (Optics): During mid-run, do (1) to extrapolate events collected and predict remaining time to collect desired counts/hole/foil, then towards end of run do (2) for full event analysis. See Shift Instructions for more details.
1) (optional 100k sample) `./run_cafe_sample.sh <run_num> optics`
2) (full analysis) `./run_cafe_prod.sh <run_num> optics`

SHMS Optics Checkout at small angle setting ($\theta_{\text{SHMS}} = 6.8°$, $\delta_{\text{SHMS}} = 15\%$) Priority: MUST

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to Carbon-12 Optics-1 +/- 8cm (2-foil) (**operational limit:** 50 uA)
3. **Ensure SHMS polarity is negative.** Follow the magnet cycling procedure if needed.
4. SHMS momentum = -8.55 GeV/c (negative polarity and magnets cycled)
5. SHMS Angle = 6.8 deg
6. Insert SHMS Sieve Slit
7. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings.
8. Ensure raster is set to 2x2 mm^2, request 50 μA beam
9. Take data for ∼10 minutes (beam-on-target), verify 200 counts / hole / foil
10. Repeat all steps above with Carbon 0.5% (1-foil) (**operational limit:** 80 uA)

H(e,e') Elastics Kin-Setting 2 ($\theta_{\text{SHMS}} = 6.8°$, $\delta_{\text{SHMS}} = 15\%$) Priority: MUST

1. Ensure beam is OFF (request MCC to mask the target) and SHMS momentum is set to -8.55 GeV/c
2. Remove SHMS Sieve Slit (Insert SHMS Collimator)
3. Change target to 10 cm LH2
4. SHMS angle = 6.8 deg (from TV camera)
5. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings.

6. Take data for $\sim$ 10 min. of beam-on-target at 60 uA to collect $\sim$1.5 million good H(e, e') elastics singles events (based on simulation elastic rates estimates of $\sim$2700 Hz @ 60 uA)

7. (optional) Execute: `./run_cafe_sample.sh <run_num> heep_singles` once 100k DAQ events reached to check rates / make extrapolations based on the output report file that automatically pops-up

8. Execute: `./run_cafe_prod.sh <run_num> heep_singles` $\sim$ 2-3 min. before run ends to begin full replay (save time)

H(e,e') Elastics Kin-Setting 1 ($\theta_{\text{SHMS}} = 7.5°$, $\delta_{\text{SHMS}} = 13\%$)
Priority: MUST

1. Ensure beam is OFF (request MCC to mask the target) and SHMS momentum is set to -8.55 GeV/c

2. Remove SHMS Sieve Slit (Insert SHMS Collimator)

3. Change target to 10 cm LH2

4. SHMS angle = 7.5 deg (from TV camera)

5. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings.

6. Take data for $\sim$ 15 min. of beam-on-target at 60 uA to collect $\sim$1.5 million good H(e,e') elastics singles events (based on simulation elastic rates estimates of $\sim$1500 Hz @ 60 uA)

7. (optional) Execute: `./run_cafe_sample.sh <run_num> heep_singles` once 100k DAQ events reached to check rates / make extrapolations based on the output report file that automatically pops-up

8. Execute: `./run_cafe_prod.sh <run_num> heep_singles` $\sim$ 2-3 min. before run ends to begin full replay (save time)

SHMS Optics Checkout at large angle setting ($\theta_{\text{SHMS}} = 8.3°$, $\delta_{\text{SHMS}} = 10\%$)
Priority: SHOULD

1. Ensure beam is OFF (request MCC to mask the target)

2. Change target to Carbon-12 Optics-1 +/- 8 cm (2-foil) (**operational limit:** 50 uA)

3. **Change SHMS polarity to negative.** Follow the magnet cycling procedure.

4. SHMS momentum = -8.55 GeV/c (negative polarity and magnets cycled)

5. SHMS Angle = 8.3 deg

6. Insert SHMS Sieve Slit

7. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings.

8. Ensure raster is set to 2x2 mm^2, request 50 μA beam

9. Take data for $\sim$10 minutes (beam-on-target), verify 200 counts / hole / foil

10. Repeat all steps above with Carbon 0.5% (1-foil) (**operational limit:** 80 uA)

H(e,e') Elastics Kin-Setting 0 ($\theta_{\text{SHMS}} = 8.3°$, $\delta_{\text{SHMS}} = 10\%$)
Priority: SHOULD

1. Ensure beam is OFF (request MCC to mask the target) and SHMS momentum is set to -8.55 GeV/c

2. Remove SHMS Sieve Slit (Insert SHMS Collimator)

3. Change target to 10 cm LH2

4. SHMS angle = 8.3 deg (from TV camera)

5. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings.

6. Take data for $\sim$ 30 min. of beam-on-target at 60 uA to collect $\sim$1.5 million good H(e,e') elastics singles events (based on simulation elastic rates estimates of $\sim$800 Hz @ 60 uA)

7. (optional) Execute: `./run_cafe_sample.sh <run_num> heep_singles` once 100k DAQ events reached to check rates / make extrapolations based on the output report file that automatically pops-up

8. Execute: `./run_cafe_prod.sh <run_num> heep_singles` $\sim$ 2-3 min. before run ends to begin full replay (save time)

H(e,e')p Elastics Kin-Setting 0 (SHMS HODO HV TEST)
Priority: WANT

NOTE: Due to time constraints, even if our goal of 1.5 million events is not reached (we may take data for less time, use your best judgement), for this particular test, the relevant observable is charge-normalized counts: `Counts / charge [mC]`

The **TEST PASSED** if the charge-normalized H(e, e') counts (W integral counts divided by charge) is the same (maybe to within ∼1-2%) for both SHMS HV ON/OFF configurations of Kin-Setting 0.

1. Ensure SHMS is at Kin-Setting 0
2. Turn OFF SHMS Hodoscope PMTs High-Voltage for Planes S1X[1-6]+/- and S2X[1-6]+/- (Please refer to: Shift Instructions: SHMS HV OFF for instructions)
3. Take data for ∼ 30 min. of beam-on-target at 60 uA to collect ∼1.5 million good H(e,e'p) elastics singles events (based on simulation elastic rates estimates of ∼800 Hz @ 60 uA)
4. (optional) Execute: `./run_cafe_sample.sh <run_num> heep_singles` once 100k DAQ events reached to check rates / make extrapolations based on the output report file that automatically pops-up
5. Execute: `./run_cafe_prod.sh <run_num> heep_singles` ∼ 2-3 min. before run ends to begin full replay (save time)
6. Turn back ON the SHMS Hodoscope PMTs High-Voltage for pionLT group to continue their studies.

2 Pre-Beam Checkout (September 2022)

During change out from smaller to larger Hall C beamline (on September 2022), we will have a few days to prepare for CaFe.

- (contact: Bob Michaels) identify SHMS EL-REAL, HMS 3/4 trigger cables in Counting Room and input them in the proper coincidence module to form T5 coincidence. The cables already exist, and the timing was already set in the past, but will need to check
- ~~(contact: Jack Segal) SHMS will detect e- momenta up to 10.3 GeV/c, therefore if we want to use SHMS NGC for pion rejection, it will require 90:10 Ne:Ar gas mixture for said momentum. (However, NGC will be very inefficient if ran at this gas mixture, so is it worth it?)~~ **CANCELLED**
- Set HMS/SHMS to CaFe mean-field kinematic setting (beam/trigger checkout & special studies will be done at this setting as well)
  1. Set SHMS momentum = -8.55 GeV, SHMS angle = 8.3 deg
  2. Set HMS momentum = 1.820 GeV, HMS angle = 48.3 deg
- Update the `DBASE/COIN/STD/standard.kinematics` with the new settings.

3 Beam / Trigger Checkout

Follow instructions on: `https://hallcweb.jlab.org/wiki/index.php/Beam_Checkout_Procedures`

Prescale GUI settings for Beam / Trigger Checkout:

COIN DAQ		
TRIGGER	PRE-SCALE	TARGET RATE
PS1 (SHMS-3/4)	-1	- -
PS2 (SHMS-ELREAL)	0	- -
PS3 (HMS-3/4)	0	- -
PS4 (HMS-ELREAL)	-1	- -
PS5 (SHMS-ELREAL x HMS-3/4)	0	- -
PS6 (HMS-3/4 x SHMS-3/4)	-1	- -
EDTM Target Prescale Rate	- -	10 Hz

- carbon hole check (raster ON @ 2x2 mm^2, hole diameter $\sim$ 2 mm)
- do harp scans to check beam profile (raster OFF, tune beam)
  (BPM calibrations can be done using the results from the harp scans and BPM positions as input. Do we need to do BPM calibrations during on-line?)
  NOTE: Ensure MCC turns the raster back ON to 2x2 mm^2 when this study concludes.
- Ensure beam is OFF (request MCC to mask the target) and change target to 10 cm LH2
- look at the T5 coincidence signal on Oscilloscope, and make sure they are in time (i.e., one of the logic signals should be at least 8ns (ToF between HMS/SHMS) within the other signal, to make sure we get uniform accidentals across the coincidence time spectrum)
- do a 50k event replay on both spectrometers and check the coincidence time histograms as well as all detectors occupancy/multiplicity, etc. looks fine.

4 Special Studies

4.1 BCM Calibrations (delay until MCC is able to deliver stable 80 μA)

1. Whenever MCC is able to send up to 80 μA of stable beam, (contact/notify D. Mack) Follow instructions on:
   `https://hallcweb.jlab.org/DocDB/0011/001185/001/BCMCalibrationProcedureSept2022CaFe.pdf`
2. When MCC instructs shift crew that bcm study has concluded, please be mindful and use:
   `./run_cafe_prod.sh <run_number> bcm_calib`
   to replay only the scaler information as requested by D. Mack

4.2 (MUST) H$(e,e'p)$ normalization / Proton Absorption / SHMS Hodoscopes HV ON/OFF Test

Purpose: Verify similar H$(e,e'p)$ counts are obtained with part of the SHMS Hodo HV ON / OFF.

Prescale GUI settings for SHMS Hodoscopes HV ON/OFF Test

COIN DAQ		
TRIGGER	PRE-SCALE	TARGET RATE
PS1 (SHMS-3/4)	TBD	100 Hz
PS2 (SHMS-ELREAL)	TBD	100 Hz
PS3 (HMS-3/4)	TBD	100 Hz
PS4 (HMS-ELREAL)	-1	- -
PS5 (SHMS-ELREAL x HMS-3/4)	0	0
PS6 (HMS-3/4 x SHMS-3/4)	-1	- -
EDTM Target Prescale Rate	- -	10 Hz

SHMS HV ON:

1. Ensure beam is OFF (request MCC to mask the target) and change target to 10 cm LH2
2. Request MCC to deliver highest stable beam current
3. During beam-on-target, check PS1, PS2, PS3, PS5 rates from pre-scale GUI (preferably take snapshot and post log-entry on the HC-LOG)
4. Start run for $\sim$ 30 min. beam-on-target at 80 μA (may need to request lower current to keep good live time on PS5) to collect reasonable statistics (100k good T5 coincidences).
5. After a few minutes into the run, if statistics allow, do: `./run_cafe_sample.sh <run_number> heep_coin <evt_number>`; from the output file that pops-up, make note of the following: `heep_real_counts, beam_on_target [sec], BCM4A_charge [mC]` to estimate the number of good H($e, e'p$) coincidences per total charge (or similarly, per beam-on-target time).
6. When run is about to end, start full production analysis (`./run_cafe_prod.sh <run_number> heep_coin`) when the run has $\sim$ 1 min. left, to save time

SHMS HV OFF:

1. Ensure beam is OFF (request MCC to mask the target) and target is set to 10 cm LH2
2. Turn OFF SHMS Hodoscope PMTs High-Voltage for Planes S1X[1-6]+/- and S2X[1-6]+/-
3. Request MCC to deliver same beam current as with **SHMS HV ON:** above as well as same pre-scale values (we want consistency here!)
4. During beam-on-target, check PS1, PS2, PS3, PS5 rates from pre-scale GUI (preferably take snapshot and post log-entry on the HC-LOG)

   NOTE: PS1 (3/4) and PS2 (SHMS-ELREAL) singles rates should be smaller and PS5 (coincidence) rates should be similar when compared to the **SHMS HV ON** configuration
5. Start run for $\sim$ 30 min. beam-on-target at same beam current as **SHMS HV ON**
6. Repeat point (5) from **SHMS HV ON** procedure, and compare to those results. There should **NOT** be any difference within uncertainty, between the two results.
7. Start full production analysis (`./run_cafe_prod.sh <run_number> heep_coin`) when the run has $\sim$ 1 min. left, to save time

ANALYSIS:

To check that the test passed, please check from the automatic pop-up plots/output .txt file, that the charge-normalized elastic counts (i.e., divide counts by total charge from output file), from under the invariant mass peak W is similar between the two configurations (maybe not more than a $\sim$ 1% difference) This can be done even using the `./run_cafe_sample.sh <run_number> heep_coin <evt_number>` which is quicker than the full replay. If this study is successful, then leave the HV OFF and proceed.

4.3 Target Boiling Studies (delay until MCC is able to deliver stable 80 μA)

Once MCC is able to deliver 80 μA of stable beam, do the study after LD2 production concludes since we only use LD2 for these studies as well.

Prescale GUI settings for target boiling study

COIN DAQ		
TRIGGER	PRE-SCALE	TARGET RATE
PS1 (SHMS-3/4)	-1	- -
PS2 (SHMS-ELREAL)	TBD	2000 Hz
PS3 (HMS-3/4)	-1	- -
PS4 (HMS-ELREAL)	-1	- -
PS5 (SHMS-ELREAL x HMS-3/4)	-1	- -
PS6 (HMS-3/4 x SHMS-3/4)	-1	- -
EDTM Target Prescale Rate	- -	10 Hz

From Aug 08 data at SHMS (8.55 GeV, 8.295 deg) configuration, T2 rates were 67 kHz / 17 uA so will most likely need to pre-scale T2 down to 2 kHz even at 10 uA. Under this assumption, a $\sim$ 5 min. run at 2 kHz yields 600k events.

LD2 10 μA:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to 10 cm LD2
3. Request MCC to deliver 10 μA of beam current
4. Check PS2 rates and ensure they are <2 kHz, otherwise set target rate to 2 kHz
5. Start a run for $\sim$ 5 min. of beam-on-target to collect reasonable statistics ($\sim$ 600k T2 triggers)

LD2 30 μA:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to 10 cm LD2
3. Request MCC to deliver 30 μA of beam current
4. Check PS2 rates and ensure they are <2 kHz, otherwise set target rate to 2 kHz
5. Start a run for $\sim$ 5 min. of beam-on-target to collect reasonable statistics ($\sim$ 600k T2 triggers)

LD2 50 μA:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to 10 cm LD2
3. Request MCC to deliver 50 μA of beam current
4. Check PS2 rates and ensure they are <2 kHz, otherwise set target rate to 2 kHz
5. Start a run for $\sim$ 5 min. of beam-on-target to collect reasonable statistics ($\sim$ 600k T2 triggers)

LD2 80 μA:

1. Ensure target is set to 10 cm LD2
2. Request MCC to deliver 80 μA beam current
3. Check PS2 rates and ensure it is <2 kHz, otherwise set target rate to 2 kHz
4. Start a run for $\sim$ 5 min. of beam-on-target to collect reasonable statistics ($\sim$ 600k T2 triggers)

5 Production Run Plan

Prescale GUI settings for CaFe MF/SRC Production

COIN DAQ		
TRIGGER	PRE-SCALE	TARGET RATE
PS1 (SHMS-3/4)	-1	- -
PS2 (SHMS-ELREAL)	TBD	100 Hz
PS3 (HMS-3/4)	TBD	100 Hz
PS4 (HMS-ELREAL)	-1	- -
PS5 (SHMS-ELREAL x HMS-3/4)	0	- -
PS6 (HMS-3/4 x SHMS-3/4)	-1	- -
EDTM Target Prescale Rate	- -	10 Hz

NOTE: SHMS/HMS singles and coincidence (PS2, PS3, PS5) triggers will be taken simultaneously for the remainder of the CaFe production run plan. With beam-on, set the singles (PS2, PS3) target rate to 100 Hz before starting a run and the proper pre-scale factor will be automatically determined. **DO NOT** pre-scale PS5.

5.1 Mean-Field (MF) Production

LD2 @ MF Kinematics:

1. Ensure target is set to 10 cm LD2 and raster is set to 2x2 mm^2
2. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings
3. Request MCC to deliver 80 μA beam current
4. Set PS2 and PS3 target rates to 100 Hz
5. Start a run for $\sim$ 30 min. (0.5 hr) of beam-on-target at 80 μA:
   - statistical goal: $\sim$250,000 MF counts
   - estimated `SIMC` coincidence rate: 139 Hz @ 80 μA

C12 @ MF Kinematics:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to Carbon-0.5 % r.l. (C12)
3. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings
4. Request MCC to deliver 80 μA of beam current
5. Set PS2 and PS3 target rates to 100 Hz
6. Start a run for $\sim$ 30 min. (0.5 hr) of beam-on-target at 80 μA:
   - statistical goal: $\sim$52,000 MF counts
   - estimated `SIMC` coincidence rate: 29 Hz @ 80 μA

Ca48 @ MF Kinematics:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to Ca48
3. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings
4. Request MCC to deliver 80 μA of beam current
5. Set PS2 and PS3 target rates to 100 Hz
6. Start a run for $\sim$ 30 min. (0.5 hr) of beam-on-target at 80 μA:
   - statistical goal: $\sim$53,000 MF counts
   - estimated `SIMC` coincidence rate: 29.4 Hz @ 80 μA

Ca40 @ MF Kinematics:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to Ca40
3. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings
4. Request MCC to deliver 80 μA of beam current
5. Set PS2 and PS3 target rates to 100 Hz
6. Start a run for $\sim$ 30 min. (0.5 hr) of beam-on-target at 80 μA:
   - statistical goal: $\sim$53,000 MF counts
   - estimated `SIMC` coincidence rate: 29.4 Hz @ 80 μA

Fe54 @ MF Kinematics:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to Fe54
3. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings
4. Request MCC to deliver 80 μA of beam current
5. Set PS2 and PS3 target rates to 100 Hz
6. Start a run for $\sim$ 60 min. of beam-on-target at 80 μA:
   - statistical goal: $\sim$55,000 MF counts
   - estimated `SIMC` coincidence rate: 15.3 Hz @ 80 μA

Be9 @ MF Kinematics:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to Be9
3. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings
4. Request MCC to deliver 80 μA of beam current
5. Set PS2 and PS3 target rates to 100 Hz
6. Start a run for $\sim$ 30 min. (0.5 hr) of beam-on-target at 80 μA:
   - statistical goal: $\sim$98,000 MF counts
   - estimated `SIMC` coincidence rate: 54.4 Hz @ 80 μA

B10 @ MF Kinematics:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to B10
3. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings
4. Request MCC to deliver 80 μA of beam current
5. Set PS2 and PS3 target rates to 100 Hz
6. Start a run for $\sim$ 30 min. (0.5 hr) of beam-on-target at 80 μA:
   - statistical goal: $\sim$57,000 MF counts
   - estimated `SIMC` coincidence rate: 32 Hz @ 80 μA

B11 @ MF Kinematics:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to B11
3. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings
4. Request MCC to deliver 80 μA of beam current
5. Set PS2 and PS3 target rates to 100 Hz
6. Start a run for $\sim$ 30 min. (0.5 hr) of beam-on-target at 80 μA:
   - statistical goal: $\sim$63,000 MF counts
   - estimated `SIMC` coincidence rate: 35 Hz @ 80 μA

(optional) Aluminum Dummy at @ MF Kinematics:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to Al. Dummy
3. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings
   (set target mass to LD2, to analyze dummy run as if it were deuterium for background subtraction, i.e., under exact same conditions as the MF LD2 setting, then offline it is simply a matter of subtracting the dummy run from the MF LD2)
4. Request MCC to deliver 40 μA of beam current (**operational limit:** 40 μA)
5. Set PS2 and PS3 target rates to 100 Hz
6. Start a run for $\sim$ 10 min. of beam-on-target at 40 μA:
   - statistical goal: $\sim$10,400 MF counts
   - estimated `SIMC` coincidence rate: 17.4 Hz @ 40 μA

5.2 Short-Range Correlations (SRC) Production

1. Ensure beam is OFF (request MCC to mask the target) for spectrometer kinematic change
2. Verify SHMS momentum = -8.55 GeV, SHMS angle = 8.3 deg
   (should be same since the start of the run period)
3. Set HMS momentum = 1.325 GeV, HMS angle = 66.4 deg
   (going to lower momentum; HMS magnets should **NOT** have to be cycled)

Ca40 @ SRC Kinematics:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to Ca40
3. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings
4. Request MCC to deliver 80 μA of beam current
5. Set PS2 and PS3 target rates to 100 Hz
6. Start consecutive 1-hour long runs at 80 μA until statistical goal is achieved
   (beam-on-target time may be <1 hr due to beam trips) :
   - statistical goal: $\sim$8,700 SRC counts
   - estimated `SIMC` coincidence rate: 0.2 Hz @ 80 μA
   - estimated total beam-on-target time: 12 hrs

Ca48 @ SRC Kinematics:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to Ca48
3. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings
4. Request MCC to deliver 80 μA of beam current
5. Set PS2 and PS3 target rates to 100 Hz
6. Start consecutive 1-hour long runs at 80 μA until statistical goal is achieved (beam-on-target time may be <1 hr due to beam trips) :
   - statistical goal: ∼8,700 SRC counts
   - estimated `SIMC` coincidence rate: 0.2 Hz @ 80 μA
   - estimated total beam-on-target time: 12 hrs

Fe54 @ SRC Kinematics:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to Fe54
3. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings
4. Request MCC to deliver 80 μA of beam current
5. Set PS2 and PS3 target rates to 100 Hz
6. Start consecutive 1-hour long runs at 80 μA until statistical goal is achieved (beam-on-target time may be <1 hr due to beam trips) :
   - statistical goal: $\sim$ 8,700 SRC counts
   - estimated `SIMC` coincidence rate: 0.12 Hz @ 80 μA
   - estimated total beam-on-target time: 20 hrs

C12 @ SRC Kinematics:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to Carbon-0.5 % r.l. (C12)
3. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings
4. Request MCC to deliver 80 μA of beam current
5. Set PS2 and PS3 target rates to 100 Hz
6. Start consecutive 1-hour long runs at 80 μA until statistical goal is achieved (beam-on-target time may be <1 hr due to beam trips) :
   - statistical goal: $\sim$ 5,000 SRC counts
   - estimated `SIMC` coincidence rate: 0.2 Hz @ 80 μA
   - estimated total beam-on-target time: 7 hrs

LD2 @ SRC Kinematics:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to 10 cm LD2
3. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings
4. Request MCC to deliver 80 μA of beam current
5. Set PS2 and PS3 target rates to 100 Hz
6. Start consecutive 1-hour long runs at 80 μA until statistical goal is achieved (beam-on-target time may be <1 hr due to beam trips) :
   - statistical goal: $\sim$ 5,300 SRC counts
   - estimated `SIMC` coincidence rate: 0.21 Hz @ 80 μA
   - estimated total beam-on-target time: 7 hrs

Be9 @ SRC Kinematics:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to Be9
3. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings
4. Request MCC to deliver 80 μA of beam current
5. Set PS2 and PS3 target rates to 100 Hz
6. Start consecutive 1-hour long runs at 80 μA until statistical goal is achieved (beam-on-target time may be <1 hr due to beam trips) :
   - statistical goal: $\sim$ 4,600 SRC counts
   - estimated `SIMC` coincidence rate: 0.32 Hz @ 80 μA
   - estimated total beam-on-target time: 4 hrs

B10 @ SRC Kinematics:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to B10
3. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings
4. Request MCC to deliver 80 μA of beam current
5. Set PS2 and PS3 target rates to 100 Hz
6. Start consecutive 1-hour long runs at 80 μA until statistical goal is achieved (beam-on-target time may be <1 hr due to beam trips) :
   - statistical goal: $\sim$ 4,500 SRC counts
   - estimated `SIMC` coincidence rate: 0.2 Hz @ 80 μA
   - estimated total beam-on-target time: 6.5 hrs

B11 @ SRC Kinematics:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to B11
3. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings
4. Request MCC to deliver 80 μA of beam current
5. Set PS2 and PS3 target rates to 100 Hz
6. Start consecutive 1-hour long runs at 80 μA until statistical goal is achieved (beam-on-target time may be <1 hr due to beam trips) :
   - statistical goal: $\sim$ 5,000 SRC counts
   - estimated `SIMC` coincidence rate: 0.21 Hz @ 80 μA
   - estimated total beam-on-target time: 6.5 hrs

(optional) Aluminum Dummy at @ SRC Kinematics:

1. Ensure beam is OFF (request MCC to mask the target)
2. Change target to Al. Dummy
3. Update the `DBASE/COIN/STD/standard.kinematics` with the new settings
   (set target mass to LD2, to analyze dummy run as if it were deuterium for background subtraction, i.e., under exact same conditions as the SRC LD2 setting for directly subtracting the dummy data from the SRC LD2 data)
4. Request MCC to deliver 40 μA of beam current (**operational limit:** 40 μA)
5. Set PS2 and PS3 target rates to 100 Hz
6. Start a run at 40 μA for 10% of the LD2 SRC beam-on-target time (i.e., 10% of 7 hrs)$\sim$ 42 min.