**PrimEx-D Commissioning Run Plan (August - October 2021)**

**Duration of the run:** 55 days

**General conditions:**

- 10-4  R.L. radiator for production runs, 5 mm collimator

- All sub-detectors are switched ON

(see conditions for CDC / FDC below)

|  |  |  |
| --- | --- | --- |
| Solenoid Magnet OFF | | |
|  | | |
| CDC / FDC | OFF | 200 nA |
| CDC / FDC | ON | 50 nA, 100 nA |
|  |  |  |

|  |  |  |
| --- | --- | --- |
| Solenoid Magnet ON, run for . . . (TBD) days using He4 target | | |
|  | | |
| CDC / FDC | ON | 200 nA |

**Trigger type:** the same as in Spring 2019

(CCAL & FCAL, FCAL, PS, random, front panel LED)

**Concerns:**

* Beam quality may be very poor in the beginning of the run

(possible problems with the low-intensity runs, start with high luminosity for detector checkout, FCAL calibration, and proceed

with the snake scan afterwards)

* We will likely need to adjust FCAL HV for trigger

(more than 200 channels have been fixed, the detector was idle for long time). Need a calibration run

**Sequence of the planned work**: see the Table on the next page:

Start run with magnetic field switched off

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | Time  (shifts) | | Beam  current (nA) | Radiator  (X0) | | CCAL  position | | TAC  position | Solenoid  field | | CDC/FDC |
| **No target** | |  | |  |  | |  | |  |  | |  |
| -Tune beam to tagger Hall  -Ion chamber calibration  Radiation Monitor check  -Harp scan for the electron  beam  - Radiation Monitor check  - PS harp scan  - Active collimator check | | 3  0.6  0.3  0.2  0.2  0.5 | | 10-100  10-100 | 10-4  10-4 | | retracted | | retracted | off | | off |
|  | |  | |  |  | |  | |  |  | |  |
| Initial detector check out  - TAGH, PS voltage scan  - TAGM voltage scan,  CCAL, TAC | | 1 | | 10-100 | 10-4 | | inserted | | retracted |  | |  |
| Equalize CCAL gains  (calibrate CCAL) | | 8 | | ~2 nA | 2⋅10-5 | | Snake scan | | inserted |  | |  |
| TAC run | | 2 | | ~2 nA | 2⋅10-5 | | inserted | | inserted |  | |  |
| **Total** | | ~4 days | |  |  | |  | |  |  | |  |
| **Install Be target**  mount, install ST, align | | 3 | |  |  | |  | |  |  | |  |
| Trigger and DAQ study  for physics | | 2 | | 10-100 | 10-4 | | inserted | | retracted |  | |  |
| Detector checkout and  calibration  - TOF voltage scan  - raw mode for ADCs  Take data for FCAL gain equalization and calibration | | 3 | | 10-100 | 10-4 | | inserted | | retracted |  | |  |
| FCAL HV tuning | | 1 | |  |  | |  | |  |  | |  |
|  | |  | |  |  | |  | |  |  | |  |
| **Data production** | |  | |  |  | |  | |  |  | |  |
| FDC straight track run | | 0.5 | | 50 | 10-4 | | inserted | | retracted |  | | On |
| Compton run at low beam  intensity (Be target) | | 2  2 | | 50  100 | 10-4 | | inserted | | retracted |  | | (optional) |
| Compton run at the nominal  beam intensity | | 10 | | 200 | 10-4 | | inserted | | retracted |  | |  |
| **Total** | | ~6 days | |  |  | |  | |  |  | |  |
| **Remove Be target** | | 2 | |  |  | |  | |  |  | |  |
| Run with empty target | | 4 | | 200 | 10-4 | | inserted | | retracted |  | |  |
|  |  | |  | | |  | |  | | |  | |
| **Install LH4 target**  mount, install ST, align | | 3 | |  |  | |  | |  |  | |  |
| Run with empty target | | 4 | | 200 | 10-4 | | inserted | | retracted |  | |  |
| **Fill the target** | | 0.5 | |  |  | |  | |  |  | |  |
| Production run at the nominal luminosity | | 5 | | 200 | 10-4 | | inserted | | retracted |  | |  |
| Production run at small  Luminosity | | 2  2 | | 50  100 | 10-4 | | inserted | | retracted |  | | On  (optional) |

~5.5 days

Switch the Solenoid Magnet ON (CDC / FDC chambers are ON)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Ramping up solenoid field | 1.2 | 200 |  | inserted | retracted | on | on |
| CDC / FDC calibration  (HV scan, ) | 1.2 | 200 | 10-4 | inserted | retracted | on | on |
| Empty target run | 4 (?) | 200 | 10-4 |  |  |  |  |
| Production run | 8 (?) | 200 | 10-4 |  |  |  |  |
| Ramping down solenoid magnet (TDB) | 1.2 | 200 | 10-4 |  |  |  |  |

~4 days

Switch the Solenoid Magnet OFF

(come back to production without magnetic field)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Time  shifts | Beam current  (nA) | Radiator  (X0) | CCAL  position | TAC  position | Solenoid field | CDC/FDC |
| Alternate production runs with the empty target runs 60 % / 40 % | run for  2 weeks | 200 | 10-4 | same | same | off | off |

Make the decision regarding magnetic field

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Study systematics** |  |  |  |  |  |  |  |
| Take Compton data with the reduced PS magnetic field. A TAC run will be needed when the field is changes  Runs to evaluate trigger efficiency (TDB) | 2 – 3  shifts |  |  |  |  |  |  |

Time is estimated assuming that the accelerator beam efficiency is better than 50 %.

One shift corresponds to 6 hours

\* For the TAC runs and calibration of the CCAL we require the thinnest radiator

(2⋅10-5 X0) and the current below 2 nA.

**Detector preparation:**

Start run coordination meetings during next week (wiki page set up by Mat)

https://halldweb.jlab.org/wiki/index.php/Run\_Coordination\_Meetings:Summer2021

|  |  |
| --- | --- |
| TAGM / TAGH | Richard / Sasha |
| PS | Sascha |
| BCAL / FCAL | Zisis / Mark |
| CCAL | Sasha |
| TOF | Beni |
| ST | Mark / Beni |
| CDC / FDC | Naomi / Lubomir / Beni |
| DAQ / Trigger | Sergei / Sasha |

Power on the detector and start taking calibration and cosmic data

(end of July, beginning of August)

Detector survey, have started coordinating with Tim

(survey FCAL, beamline components, CCAL, …)

1. **Establish typical tagged photon beam** (standard GlueX procedure)
2. Perform electron beam harp scan
3. Tune electron beam parameters based on the collimator transmission measurements using PS (lock beam positions on the 5C11B BPM, and active collimator)
4. **Trigger and DAQ studies**
5. Check CompCal triggers (energy sum). Readout CompCal with the GlueX DAQ (raw and production modes)
6. **CompCal gain equalization and calibration**
7. Beam conditions: ~5 nA electron current, V-wire
8. Procedures are described in Ashot’s file
9. We’ll also need to check CompCal alignment (using scalers) during scans
10. **Luminosity scans, rate studies**
11. Measure CompCal module rate and trigger rates
12. Trigger types: FCAL, FCAL & CCAL
13. **Study energy and position resolution (*may not be possible based on “plarform” condition)***
14. Beam conditions: 30 nA electron current, V-wire
15. **TAC runs**
16. Standard GlueX procedure (trigger: TAC/CCAL, PS)

Convertor 750 um Be

1. **Check lumi scalers PS/ST/(TOF)**
2. Check scalers implemented on the GTP level, required to monitor

luminosity (relative target thickness). Some of these scalers can be checked during GlueX operation using a LH2 target.