

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
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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 (X_0)	CCAL position	TAC position	Solenoid field	CDC/FDC
No target							
-Tune beam to tagger Hall	3			retracted	retracted	off	off
-Ion chamber calibration	0.6						
Radiation Monitor check							
-Harp scan for the electron beam	0.3						
- Radiation Monitor check	0.2	10-100	10^{-4}				
- PS harp scan	0.2	10-100	10^{-4}				
- Active collimator check	0.5						
Initial detector check out	1	10-100	10^{-4}	inserted	retracted		
- TAGH, PS voltage scan							
- TAGM voltage scan, CCAL, TAC							
Equalize CCAL gains (calibrate CCAL)	8	~ 2 nA	$2 \cdot 10^{-5}$	Snake scan	inserted		
TAC run	2	~ 2 nA	$2 \cdot 10^{-5}$	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	3	10-100	10^{-4}	inserted	retracted		
- TOF voltage scan							
- raw mode for ADCs							
Take data for FCAL gain equalization and calibration							
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	50	10^{-4}	inserted	retracted		(optional)
	2	100					
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	50	10^{-4}	inserted	retracted		On (optional)
	2	100					

~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 (X_0)	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	2 - 3 shifts						

changes							
Runs to evaluate trigger efficiency (TDB)							

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)
 - a) Perform electron beam harp scan
 - b) Tune electron beam parameters based on the collimator transmission measurements using PS (lock beam positions on the 5C11B BPM, and active collimator)
 - c)
2. **Trigger and DAQ studies**
 - a) Check CompCal triggers (energy sum). Readout CompCal with the GlueX DAQ (raw and production modes)
3. **CompCal gain equalization and calibration**
 - a) Beam conditions: ~5 nA electron current, V-wire
 - b) Procedures are described in Ashot's file
 - c) We'll also need to check CompCal alignment (using scalers) during scans
4. **Luminosity scans, rate studies**
 - a) Measure CompCal module rate and trigger rates
 - b) Trigger types: FCAL, FCAL & CCAL
5. **Study energy and position resolution (*may not be possible based on "plarform" condition*)**
 - a) Beam conditions: 30 nA electron current, V-wire

6. TAC runs

- a) Standard GlueX procedure (trigger: TAC/CCAL, PS)
Convertor 750 um Be

7. Check lumi scalers PS/ST/(TOF)

- a) 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.