**PrimEx-D Commissioning Run Plan (November/December 2018)**

**Goal:**

1. **To commission the CompCal calorimeter with intense photon beam;**
2. **To measure the Compton cross section on Be-target using the CompCal and FCAL calorimeters in combination.**

**General conditions:**

- 5 mm primary collimator

- Solenoid magnet is switched off

- All sub-detectors are switched on, except FDC and CDC

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Time  (shifts) | Beam  Intensity (nA) | Radiator  (X0) | CCAL  position | TAC  position |
| Establish typical tagged  photon beam |  |  |  | retracted | retracted |
| Initial detector check out | 1 | 10-100 | 3⋅10-4 | inserted | retracted |
| Equalize CompCal gain | 3 | 30 | V-wire\* | Step scan | inserted |
| Calibrate CompCal | 2 | 30 | V-wire | Contin. scan | inserted |
| Study energy and  position resolutions | 1 | 30 | V-wire | Partial scan | inserted |
| TAC run | 1 | ~2 | 2⋅10-5 | retracted | inserted |
| Run with CompCal as TAC | 1 | ~2 | 2⋅10-5 | cell in beam | inserted |
| **Install Be target** |  |  |  |  |  |
| Luminosity scan,  rate studies | 1 | 10-150 | 3⋅10-4 | inserted | retracted |
| Check lumi scalers  PS/ST/(TOF) | 2 | 10-100 | 3⋅10-4 | inserted | retracted |
| Trigger and DAQ study  for physics | 1 | 10-100 | 3⋅10-4 | inserted | retracted |
| Compton run at low beam  intensity (Be target) | 5 | 30 | 3⋅10-4 | inserted | retracted |
| Compton run at high  beam intensity  (Be target) | 4 | 50-100 | 3⋅10-4 | inserted | retracted |
| Remove Be target | 1 | 0 |  |  |  |
| Compton run with  empty target | 2 | 150-200 | 3⋅10-4 | inserted | retracted |
| **Install LH2 target** |  |  |  | inserted | retracted |
| Establish beam, check  rates, measure Compton  cross section with LH2 target | 4 | 50-100 | 3⋅10-4 | inserted | retracted |
| Run with an empty target | 4 | 150-200 | 3⋅10-4 | inserted |  |

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

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

(2⋅10-5 X0) and the current below 2 nA. If this condition cannot be provided by

the accelerator, we can use the V-wire radiator and the beam current of about

30 nA. Tuning the V-wire may require a couple of extra hours of beam time.

This time is not included in the table

\*\* We assume, that the inner part of the FCAL is calibrated

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.

1. **Compton Cross Section Measurement**
2. All tagger counters are switched on

**Phase** I Small beam intensity (30 nA, 3⋅10-4 X0 radiator)

Total rate of the TAGH counters in the energy range

6-12 GeV, ~36 MHz

The fraction of accidental hits in the TAGH in a 4 ns time

window: 15 %

Compton rate for counters around 6 Gev (100 MeV window):

3 Hz, based on Liping studies

**Phase** II PrimEx D production luminosity (100 nA, 3⋅10-4 X0 radiator)