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

Goal:

a) **To commission the CompCal calorimeter with intense photon beam;**
b) **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 (X_0)	CCAL position	TAC position
Establish typical tagged photon beam				retracted	retracted
Initial detector check out	1	10-100	$3 \cdot 10^{-4}$	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	$2 \cdot 10^{-5}$	retracted	inserted
Run with CompCal as TAC	1	~2	$2 \cdot 10^{-5}$	cell in beam	inserted
Install Be target					
Luminosity scan, rate studies	1	10-150	$3 \cdot 10^{-4}$	inserted	retracted
Check lumi scalers PS/ST/(TOF)	2	10-100	$3 \cdot 10^{-4}$	inserted	retracted
Trigger and DAQ study for physics	1	10-100	$3 \cdot 10^{-4}$	inserted	retracted
Compton run at low beam intensity (Be target)	5	30	$3 \cdot 10^{-4}$	inserted	retracted
Compton run at high beam intensity (Be target)	4	50-100	$3 \cdot 10^{-4}$	inserted	retracted
Remove Be target	1	0			
Compton run with empty target	2	150-200	$3 \cdot 10^{-4}$	inserted	retracted
Install LH2 target				inserted	retracted
Establish beam, check rates, measure Compton cross section with LH2 target	4	50-100	$3 \cdot 10^{-4}$	inserted	retracted
Run with an empty target	4	150-200	$3 \cdot 10^{-4}$	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)
   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)

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 LH_2 target.

8. **Compton Cross Section Measurement**

a) All tagger counters are switched on

Phase I Small beam intensity (30 nA, $3 \cdot 10^{-4}$ X_0 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, $3 \cdot 10^{-4}$ X_0 radiator)