Compton Calorimeter (PrimEx D) Commissioning Run Plan (Novemeber/December 2018)

Goals:

a) **To commission the Compton calorimeter (CCAL) with intense photon beam;**
b) **To measure the Compton cross section on Be-target using the CCAL and FCAL calorimeters**

General conditions:

- 5 mm primary collimator
- Solenoid magnet is switched off
- All sub-detectors are switched on, except FDC and CDC

	Time (shifts)	Beam & Radiator (X_0)	CCAL position
Establish typical tagged photon beam			retracted
Initial detector check out	1	10-100 nA, $3 \cdot 10^{-4}$	inserted
Equalize CCAL gain	3	30 nA, V-wire	scan
Calibrate CCAL	2	30 nA, V-wire	scan
Study energy and position resolutions	1	30 nA, V-wire	scan
TAC run	1	30 nA, V-wire	retracted
Run with CCAL as TAC	1	30 nA, V-wire	cell in beam
Install Be target			
Luminosity scan, rate studies	1	10 – 150 nA, $3 \cdot 10^{-4}$	inserted
Check lumi scalers PS/ST/(TOF)	2	10-100 nA, $3 \cdot 10^{-4}$	inserted
Trigger and DAQ study for physics	1	10-100 nA, $3 \cdot 10^{-4}$	inserted
Compton run at low beam intensity (Be target)	5	30 nA, $3 \cdot 10^{-4}$	inserted
Compton run at high beam intensity (Be target)	4	100 nA, $3 \cdot 10^{-4}$	inserted
Install LH2 target			
Establish beam, check rates, measure Compton cross section with LH2 target	4	100 nA, $3 \cdot 10^{-4}$	inserted
Run with an empty target	4	150 nA, $3 \cdot 10^{-4}$	inserted
Total	30 (10 days)		

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

* 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 CCAL triggers (energy sum). Readout CCAL with the GlueX DAQ (raw and production modes)

3. **CCAL gain equalization and calibration**
   a) Beam conditions: 30 nA electron current, V-wire
   b) Procedures are described in Ashot's file
   c) We'll also need to check CCAL alignment (using scalers) during scans

4. **Luminosity scans, rate studies**
   a) Measure CCAL module rate and trigger rates
   b) Trigger types: FCAL, FCAL & CCAL

5. **Study energy and position resolution**
   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)