E00-007 Run Plan

Setup:

- 1 *Set spectrometers*: The right arm should be surveyed in at $\theta_0 = 26.718°$; set p_0 = -2.775 GeV/c, where the "-" sign indicates negative polarity. The left arm might be surveyed in at $\theta_0 = 38.348°$; set $p_0 = 2.011$ GeV/c. Check with RC about changing angles if the arms are not as listed above.

- 2 *Cosmics*: Take cosmic data to check detectors while waiting for beam.

Checkout at 4-pass 4.056 GeV:

- 1 *FPP straight throughs*: raster on, $\approx$ 1 M events. Time: $\approx$ 4 hours. This can be done with LD_2, or $^{12}C_{optics}$, and in unstable beam or spectrometer magnet conditions. If LD_2 is used, check that the target is stable.
- 2 *Analyzer access*: close carbon doors, enter left arm to setup CH_2 analyzer. Call X Jiang or R Gilman. Do any convenient time during the checkout cycle, through item 6. Time: $\approx$ 1 hour.
- 3 *Luminosity / target boiling check*: Goal: basic test of target functionality. If LD_2 was not used for the straight throughs, put beam on the cryotarget and see that target stabilizes. Do three 10 minute runs with currents of 5 – 10 μA, maximum, and in the middle, checking that trigger rates/current is about stable. (David Armstrong / Kent Paschke / Riad Suleiman can independently do a more detailed check, have RC call them in advance.) Time: 0.5 hour.
- 4 *Bullseye scan:* Goal: BPM / HARP / SPOT cross calibration, and check of FB BPM readout. Call A Saha and B Reitz. Raster off, $I \approx 2 - 3$ μA. BeO target. CODA configuration: WITHROC14. Check apparent position of beam on BeO, spot, EPICS BCM screen, Do HARP scan with CODA run, 5 k events, for beam nominally centered and offset to center/corner edges of raster (8 positions, 1 mm offset.) Turn raster on and take 20 k events. Save results to HALOG. Time: 1 hour.
- 5 *Moeller polarization*: Call Eugene Chudakov. During this we should take a run with $Q_{asymmetry}$ intentionally set large, and check that the HAPPEX, Moeller and spectrometer DAQs measure the same. Time 2 hours.
- 6 *Compton polarization*: Call Sirish Nanda, when setting up Moeller. Time: none, parasitic.

ep calibrations at 4.056 GeV:

The ep calibration kinematics are listed below. Cycle through the ep calibrations from e1 to e3. Kinematics e4 should be run to fill up the beam time until the pass change, it can also be run if needed at 2 GeV (though with reduced efficiency). Standard beam conditions are maximum current consistent with stable beam, fast feedback on in absolute mode, on both position and energy, 2×2 mm raster on, centered. Target is LH_2 without radiator.

setting	θ_R (deg)	p_R (GeV/c)	θ_L (deg)	p_L (GeV/c)	Q^2 (GeV^2)	rate (Hz)	$\frac{\delta A}{A}/day$ (%)
ep4-1	26.718	2.775	38.348	2.011	2.40	54	7
ep4-2	30.136	2.560	34.909	2.246	2.81	15	7
ep4-3	32.970	2.391	32.410	2.428	3.12	6	8
ep4-4	22.317	3.064	43.604	1.687	1.86	363	3

For each kinematics, do the following:

- a *Optics check*: raster off, multi ^{12}C foil target, $\approx$ 50 μA. Time: 15 min.
- b *Analyzing power calibration*: ep coincidences and proton singles in left arm. LH_2 target. Time: $\approx$12 hours for each kinematics - but Krishni Wijesooriya and Olivier Gayou will be providing us more accurate estimates during the runs, from quick replays of the data.
- c *Angle reconstruction check*: During analyzer power calibration, for one run, put in the right arm sieve slit collimator and set trigger to prescale away singles (we want T5s), to provide an optics / reconstruction check. Time: 15 min.

Data at 2.056 GeV: left arm singles

The data settings for 2 GeV are listed below. Do settings d1 through d4, if there is enough time. If setting d4 does not have an adequate *ep* calibration, supplement it with the calibration point ep2-4 below. Setting d5 will only be run if we have high efficiency and if data points come in faster than expected, so we do not exceed our PAC days; an *ep* calibration for it also needs to be run. The right arm may be used parasitically, as per directions of the run coordinator, prescaled so that dead time $< 5\%$. The data settings follow:

setting	θ_{cm} (deg)	p_L (GeV/c)	θ_L (deg)	ΔC_x (abs)	Δp_y (abs)	ΔC_z (abs)
d1	37	2.428	19.873	0.04	0.05	0.05
d2	53	2.246	29.131	0.04	0.04	0.10
d3	70	2.011	39.754	0.04	0.03	0.15
d4	90	1.687	53.951	0.04	0.03	0.10
d5	110	1.358	70.701	0.04	0.04	0.07

For each kinematics, do the following:

- a *Pointing check*: raster off, multi ^{12}C foil target, ≈ 50 μA. Time: 15 min.
- b γd *data*: Target: LD_2 *with radiator*. Default beam condition: FFB on, absolute mode, energy and position. $I \approx 50$ μA. 2 $\times$2 mm raster on. OTRs may be left in for parasitic checkout, but shift crews should ignore them. Beam through Compton chicane, Compton measuring polarization. Start and stop runs every hour. Time: about 1 day for each point (at 50 μA, 100 % efficiency).
- c *Background data*: Some radiator out and LH_2 running will be done in same conditions, as per directions of run coordinator, to check relative rates of backgrounds. Time: about 10% of γd time.

The 2 GeV *ep* calibration settings are the following:

setting	θ_R (deg)	p_R (GeV/c)	θ_L (deg)	p_L (GeV/c)	Q^2 (GeV^2)	rate (Hz)	$\frac{\delta A}{A}/day$ (%)
ep2-4	54.939	1.064	31.079	1.687	1.86	24	6
ep2-5	40.706	1.344	40.188	1.358	1.34	355	1