Summary of the Hall D Spring 2019 run

A. Deur
Jefferson Lab

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Spring 2019 run plan: https://halldweb.jlab.org/wiki/index.php/Run_Coordination_Meetings:Spring2019_Run

Spring 2019 run coordinator summaries: https://halldweb.jlab.org/hdops/wiki/index.php/Summary_Spring_2019_Run

All the run summaries: https://halldweb.jlab.org/hdops/wiki/index.php/Hall_D_Runs

Spring 2019 run

Initial schedule:

1. Jan. 22nd - Feb 7th: Electron beam restoration;
2. Feb. 7th - Feb. 20th: DIRC Commissioning; (part 1: first optical box);
3. Feb. 20th: Charge Pion Polarizability (CPP) test;
4. Feb. 20th morning - Apr. 15th: PrimEx-η run, part 1.

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   DIRC commissioning page: https://halldweb.jlab.org/wiki/index.php/Spring_2019_DIRC_Commissioning
3. Feb. 20th: Charge Pion Polarizability (CPP) test; https://halldweb.jlab.org/wiki/index.php/CPP_Beam_Test_Feb._2019
   CCP test pages: https://www.overleaf.com/read/yzzgqtddbfmy
4. Feb. 20th morning - Apr. 15th: PrimEx-η run, part 1.
   PrimEx runplan page: https://halldweb.jlab.org/wiki/index.php/Spring_2019_Primex

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Leadership: C. Meyer/M. Shepherd, E. Chudakov/E. Smith

Run Coordinators:

Feb. 7th-Feb. 13th Alexandre Deur (accelerator restoration) } https://halldweb.jlab.org/wiki/index.php/Run_Coordinator_report:_spring_2019_w1-3
Feb. 7th-Feb. 13th, 7 days: Alexandre Deur
Feb. 13th-Feb. 20th, 7 days: Wenliang Li https://halldweb.jlab.org/wiki/index.php/Run_Coordinator_report:_spring_2019_w4
Feb. 20th-Feb. 27th, 7 days: Sean Dobbs https://halldweb.jlab.org/wiki/index.php/Run_Coordinator_report:_spring_2019_w5
Feb. 27th-March 6th, 7 days: Justin Stevens https://halldweb.jlab.org/wiki/index.php/Run_Coordinator_report:_spring_2019_w6
March 6th-March 13th, 7 days: Alexander Austregesilo https://halldweb.jlab.org/wiki/index.php/Run_Coordinator_report:_spring_2019_w7
March 13th-March 20th, 7 days: Colin Gleason https://halldweb.jlab.org/wiki/index.php/Run_Coordinator_report:_spring_2019_w8
March 20th-March 27th, 7 days: Richard Jones https://halldweb.jlab.org/wiki/index.php/Run_Coordinator_report:_spring_2019_w9
March 27th-Apr. 3rd, 7 days: Stuart Fegan https://halldweb.jlab.org/wiki/index.php/Run_Coordinator_report:_spring_2019_w10
Apr. 3rd-Apr. 10th, 7 days: Ilya Larin https://halldweb.jlab.org/wiki/index.php/Run_Coordinator_report:_spring_2019_w12
Apr. 10th-Apr. 15th, 5 days: Joshua Crafts https://halldweb.jlab.org/wiki/index.php/Run_Coordinator_report:_spring_2019_w11

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Physics Division Liaison: Lubomir Penchev.

Analysis Coordinator: Alexander Austregesilo.

Run coordination, subsystem status, data quality monitoring, offline analysis are discussed at daily RC meetings (8:45am, counting house).

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Spring 2019 run

Actual schedule:

1. Jan. 22nd - Feb ~~7th:~~ 9th Electron beam restoration;
2. Feb. ~~7th~~ 9th - Feb. 20th: DIRC Commissioning; (part 1: first optical box);
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Fall 2018 run

Initial schedule:

1. Aug. 21st - Oct. 28th: GlueX-I final run (11.6 GeV)
2. Oct. 28th - Nov 19th: DIRC and ComCal installations (accelerator still at 11.6 GeV until 11/16/2018)
3. Nov 20th - Dec. 12th: GlueX-II (DIRC) and PrimEx (ComCal) tests. E=10.3 GeV
4. Dec. 13th - Dec. 19th: GlueX-II and PrimEx tests. E=9.0 GeV

Also, take GlueX-I data at lower energy, to compare with CLAS

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Exploring the Nature of Matter

Fall 2018 run

Actual events:

Beam available for physics on Sept. 21st
Due to late start, ran GlueX production until Nov. 24th

1. ~~Aug. 21st - Oct. 28th:~~ GlueX-I final run (11.6 GeV)
2. ~~Oct. 28th - Nov 19th: DIRC and ComCal installations (accelerator still at 11.6 GeV until 11/16/2018)~~
3. Nov ~~20~~ 24th - Dec. 12th: ~~GlueX-II (DIRC) and~~ PrimEx (ComCal) tests. E=10.3 GeV
4. Dec. 13th - Dec. 19th: ~~GlueX-II~~ and PrimEx tests. E=9.0 GeV

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DIRC not ready for installation

ComCal installation mostly done opportunistically during beam down time (beam study, spin dance, etc.)

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Spring 2019 run configuration

- Energy: 11.61 GeV until March 5th then 11.17 GeV (Fall 16-Spring 18: 11.64 GeV. Energy was lowered to 11.17 due to high RF trip rate and end of critical high-energy requirement by Hall C program.)
  - 4-hall ops, 1-pass for Hall A, 5-pass for Hall B, 3-5 pass for Hall C. D: 5.5-pass. High currents for A & C.

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  - 4-hall ops, 1-pass for Hall A, 5-pass for Hall B, 3-5 pass for Hall C. D: 5.5-pass. High currents for A & C.
- Hall D configuration:
  - Solenoid at 1350A (DIRC commissioning) or ramped-down (PrimEx-eta run).
  - Rep. rate 250 MHz.
  - Slit shared with C (as in Fall 18. It was with B in Fall 17 and A in Spring 18)
  - Beam current 1 nA-1.5 μA. 225 nA for most of DIRC commissioning. Up to 900 nA for high intensity tests. 200 nA for standard PrimEx production.
  - Radiators: DIRC comm.: old (degraded) 17 μm J70-104 diamond. Then PrimEx: 10 μm Al. radiator;
  - 5mm collimator hole;
  - LH_2 target (DIRC comm.), then PrimEx: no target, solid Be foil target, then empty and filled L^4He target interspersed.
  - TPol on during DIRC runs for systematic studies, with 75 μm TPol convertor. Off during PrimEx, with 750 μm TPol convertor for the PS.
  - CDC & FDC: on for DIRC comm. Off at start of PrimEx. Then CDC on (March 8th) to provide vertex monitoring and background diagnostic for little DAQ performance cost. FDC off except for short time during low lumi. runs.

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Hall D goals:

- Commission DIRC's first optical box;
- DAQ and Trigger high-intensity tests during DIRC commissioning;
- CPP tests during last day of DIRC commissioning;
- PrimEx production on Be and ^4He targets;
- TAC runs during PrimEx run;
- (TRD non-invasive runs).

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2. Detector and beamline checkout.
3. Check 17 μm diamond (JD70-104) alignement.

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    1. Standard configuration: 17 μm diamond, 225 nA, 5 mm hole, TPol on (for syst. studies. Not necessary for DIRC) 75 μm TPol convertor. Solenoid at 1350 A.
    2. Luminosity scans on amorphous radiator. 50-900 nA on 10 μm Al ($1.12 \cdot 10^{-4}$ R.L.)
    3. Harp scan: Only once in the middle of the DIRC commissioning (beside the ones done during beam set-up).
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5. CPP (Charged pion polarizability) tests
    1. Move downstream platform downstream
    2. Install passive shielding in front of TOF.
    3. Set-up and check specific CPP trigger.
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    1. Standard configuration: 10 μm Al ($11.2 \cdot 10^{-5}$ R.L). Beam current depends on target. 750 μm TPol convertor. Solenoid off.
    2. Snake scans for ComCal calibration.
    3. Production on no target, solid Be foil target, then ^{4}He target (full and empty).
    4. Two TAC runs (to be done with the TAC detector, not with ComCal).
    5. HARP scan (only Hall D harp): 10 min. Every two days.
    6. Long mode 10 min runs to monitor neutron radiation damage to ST due to nuclear target higher neutron yield. Twice or Thrice a week.

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1. Verify electron beam quality and establish photon beam. ✓ Started 2 days late due to CEBAF cooling issues. Initially, feared a longer delay, but physics quality beam ("commissioning quality" for Hall D) was very quickly established.
2. Detector and beamline checkout. ✓
3. Check 17 μm diamond (JD70-104) alignement. ✓ Not the greatest coherent peak ever seen (used-up diamond good enough for commissioning).
4. DIRC commissioning ✓
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   3. Harp scan: Only once in the middle of the DIRC commissioning (beside the ones done during beam set-up). ✓ Done more than once (thrice), due to concern after long beam down time.
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   5. End of test: ramp down solenoid, remove shielding. ✓
6. PrimEx-η
   1. Standard configuration: 10 um Al ($11.2 \cdot 10^{-5}$ R.L). Beam current depends on target. 750 μm TPol convertor. Solenoid off. ✓ Solenoid warmed up on March 26th
   2. Snake scans for ComCal calibration. ✓ Done at the start and end of Spring run period.
   3. Production on no target, ✓ solid Be foil ✓ target, then ^{4}He ✓ target (full and empty). ✓
   4. Two TAC runs (to be done with the TAC detector, not with ComCal). ~✓ Only one done w/ TAC, + one done w/ ComCal
   5. HARP scan (only Hall D harp): 10 min. Every two days. ~✓ Not done every two days. Only after long beam down times.
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List of problems during Spring 2019 run (not importance ordered)

- Solenoid power supply motherboard failed. Delayed the solenoid ramp up. Did not cost us time (thanks to accelerator ops who used the time to tune the beam to other halls). https://logbooks.jlab.org/entry/3649136

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- Energy lowered by ~450 MeV due to unsustainable RF-trips (March 5th). Also, the Hall C program requiring highest energy had ended. Lower f.o.m for PrimEx. https://logbooks.jlab.org/entry/3679070
- Short term beam energy drift of up to 10 MeV (CEBAF path length changes, or no energy lock when Hall C was down: Hall A at 1-pass). Overall energy drift during 11.2 GeV period was small (5 MeV). Compare with 12 MeV in Fall 2018. https://logbooks.jlab.org/entry/3679070

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- Rapid transmission degradation (days). Not a critical issue with unpolarized beam, but need to be better understood. https://logbooks.jlab.org/entry/3675433
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Will be discussed in beamline talk

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- Active collimator signal decay. (Still under investigation. Unclear impact, if any.) https://logbooks.jlab.org/entry/3675240

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- Tagger field changed by MCC without notice to Hall D. https://logbooks.jlab.org/entry/3672359 https://logbooks.jlab.org/entry/3672308

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- Usual FCal base maintenance, and DAQ, ROC, IOC, Network (slow/unresponsive CSS)… griefs.

Statistics for Spring 2019 GeV run

Scheduled run time: 1583h (66 days): Feb. 8th-April 15th

Acceptable beam used: 875h

⇒ Running efficiency for overall Spring 2019 period: 55%

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⇒ Physics run efficiency: 36% (MCC eff.: 45%)

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commissioning

Jefferson Lab

Thomas Jefferson National Accelerator Facility

Exploring the Nature of Matter

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11.6 GeV run

Scheduled run time: 366h (15 days): Feb.8th-Mar.5th
ABU: 137h (beam available for 190h)
⇒ Physics run efficiency: 37% (MCC eff.: 52%)

11.2 GeV run

Scheduled run time: 366h (15 days): Mar.5th-Apr.15th
ABU: 619h (beam available for 663h)
⇒ Physics run efficiency: 68% (MCC eff.: 73%)

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Effect of not pushing CEBAF energy

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Not accounting for lower figure of merit

Comparison with other GlueX runs

Spring 2019
Actual Run time: 312h
Running efficiency: 36%
Production triggers: 0.

commissioning

Getting ready…

Fall 2018
Actual Run time: 788h
Running efficiency: 52%
Production triggers: 8×10^{10}

Spring 2018
Actual Run time: 1111.8h
Running efficiency: 55%
Production triggers: 1.5×10^{11}

Fall 2017
Actual Run time: 10.5h
Running efficiency: 3%
Production triggers: 0

Spring 2017
Actual Run time: 354.1h
Running efficiency: 56%
Production triggers:4.7×10^{10}

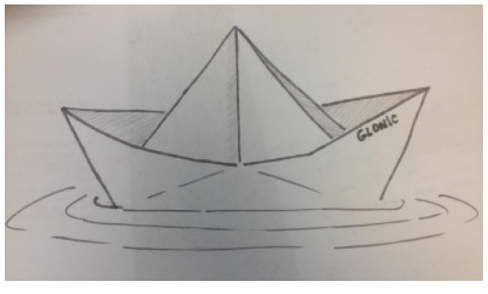
Fall 2016
Actual Run time: 84h
Running efficiency: 5.4%
Production triggers: 0

Spring 2016
Actual Run time: 458h
Running efficiency: 41%
Production triggers:6.9×10^{9}

Fall 2015
Actual Run time: 30.2h
Running efficiency: 20%
Production triggers: 0

Partly commissioning

Spring 2015
Actual Run time: 122h
Running efficiency: 20%
Prod. triggers: 0 (5.5 GeV run)



commissioning

Fall 2014
Actual Run time: 324h
Running efficiency: 34%
Production triggers: 0

Comparison with other GlueX runs

Spring 2019 +PrimEx
Actual Run time: 312h
Running efficiency: 36% (55%)
Production triggers: 0.

commissioning

Getting ready…

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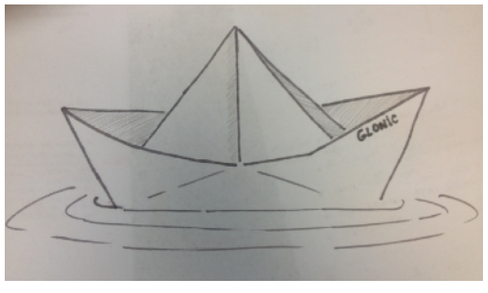
Partly commissioning



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commissioning

Summary of the summary

- Run started nearly on time.
- Good CEBAF performance at 11.6 GeV, then excellent at 11.2 GeV.
- Performance in line with Spring 17-18 and Fall 18 runs.
- Successful DIRC and CPP commissioning.
- Successful first part of PrimEx-η run.
- No significant problems.

Getting ready for high-luminosity GlueX run in Fall.

Thank you