Summary of the Hall D Fall 2019/Spring 2020 run

A. Deur Jefferson Lab

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A. Deur. GlueX collaboration meeting. 02/13/2020

Summary of the Hall D Fall 2019/Spring 2020 run

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Fall 2019/Spring 2020 run plan: https://halldweb.jlab.org/wiki/index.php/Run_Coordination_Meetings:Fall2019_Run

Fall 2019 run coordinator summaries: <u>https://halldweb.jlab.org/hdops/wiki/index.php/Summary_Fall_2019_Run</u> Spring 2020 run coordinator summaries: <u>https://halldweb.jlab.org/hdops/wiki/index.php/Summary_Spring_2020_Run</u>

Run period summaries: https://halldweb.jlab.org/hdops/wiki/index.php/Hall_D_Runs



A. Deur. GlueX collaboration meeting. 02/13/2020

Initial schedule:

1. Nov. 18th - 24th: Electron beam restoration.

2. Nov. 25th - Dec. 19th: Finalized DIRC Commissioning;

Take GlueX production data; High rate DAQ/cDAQ/trigger commissioning; Tagger accidental test, CPP test, other tests.



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Leadership: C. Meyer/J. Stevens, E. Chudakov/E. Smith Run Coordinators:

Nov 18th-Nov 24th: 7 days: Alexandre Deur (accelerator restoration) Nov 24th-Dec 4th, 11 days: Alexandre Deur Dec 4th-Dec 11th, 7 days: Naomi Jarvis https://halldweb.jlab.org/wiki/index.php/Run_Coordinator_report:_Fall_2019_w3 Dec 11th-Dec. 18th, 10 days: Wenliang Li https://halldweb.jlab.org/wiki/index.php/Run_Coordinator_report:_Fall_2019_w4 Dec 18th-Dec. 20th, 3 days: Alexandre Deur https://halldweb.jlab.org/wiki/index.php/Run_Coordinator_report:_Fall_2019_w5



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Physics Division Liaisons: Benedikt Zihlmann/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).



Actual schedule:

Dec. 3rd (due mainly to leak in North linac)

1. Nov. 18th - 24th: Electron beam restoration.

Dec. 4th

2. Nov. 25th - Dec. 19th: Finalized DIRC Commissioning;

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Fall 2019 run configuration

•Energy: 11.6 GeV

•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:

•Both DIRC boxes installed

- •Solenoid at 1350A.
- •Rep. rate 250 MHz.
- •Slit shared with C (as in Fall 18 and Spring 19. It was with B in Fall 17 and A in Spring 18)
- •Beam current 1 nA-2.1 µA.
- •Production Radiator: Start on Amorphous. Then 47 µm J70-105 diamond (already used during F2018 run).
- •5mm collimator hole;
- •LH₂ target.
- •GEM/TRD detectors in front on DIRC for extra-tracking
- •TPol on during DIRC runs for systematic studies, with 75 μm TPol convertor.



Fall 2019 run configuration

11.4 GeV

•Energy: 11.6 GeV

•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.

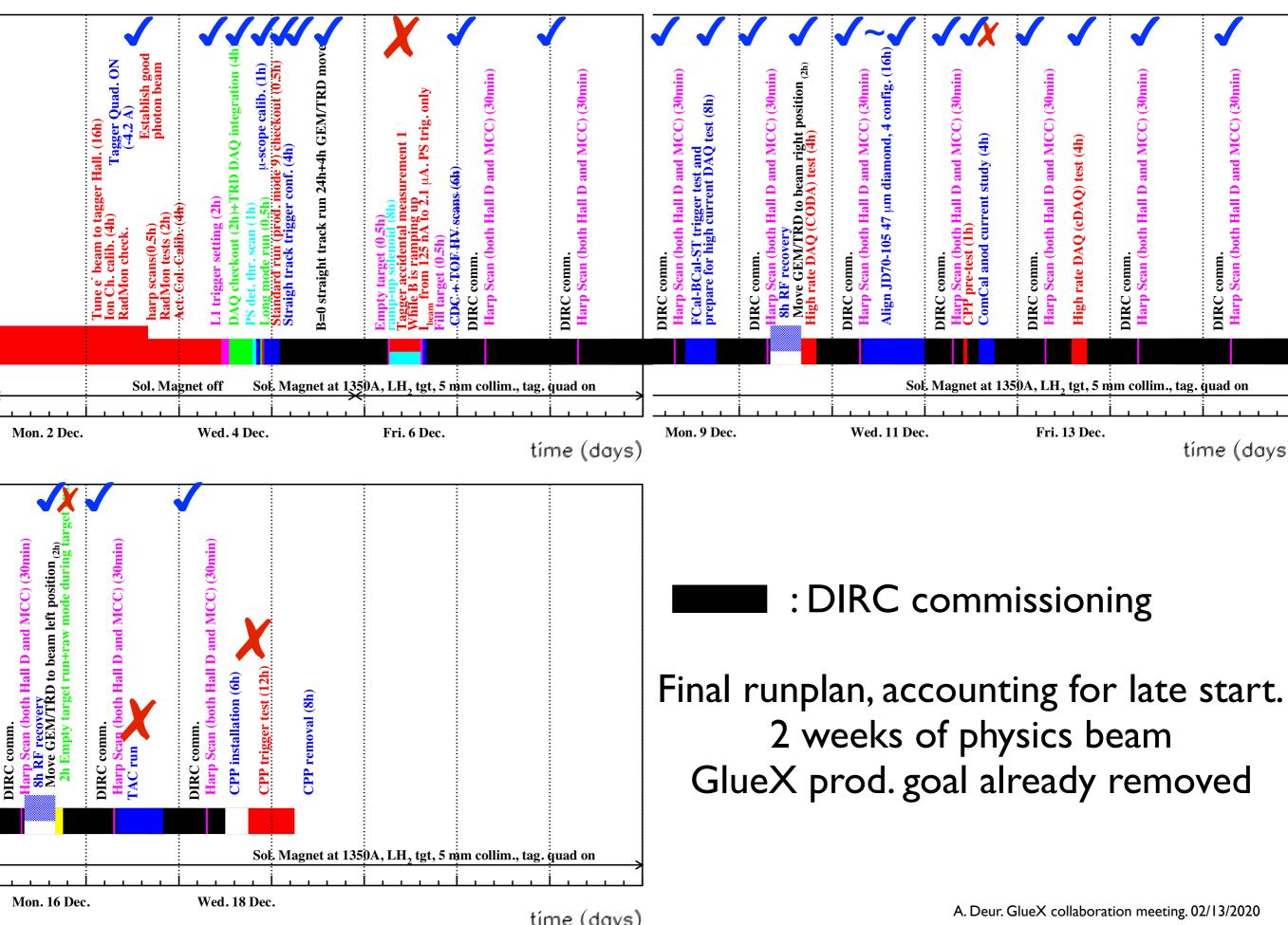
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 - •Beam current 1 nA- 2.1μ A.
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 - •5mm collimator hole;
 - •LH₂ target.
 - •GEM/TRD detectors in front on DIRC for extra-tracking
 - $\bullet TPol$ on during DIRC runs for systematic studies, with 75 μm TPol convertor.



Fall 2019 GlueX run/DIRC comm. Assume 50% eff. Fall 2019 runplan Fall 2019 GlueX run/DIRC comm. Assume 50% eff.

						_	-	_		
Mour 5 Decr Wour		Empty target (0.5h) Funp-up solenoid (8h) Tagger accidental measurement 1 While B is ramping up While B is ramping up Them. from 125 nA to 2.1 µA. PS trig. only Fill target (0.5h) Fill target (0.5h) DIRC comm. Harp Scan (6h) DIRC comm. Harp Scan (both Hall D and MCC) (30min)	DIRC comm. Harp Scan (both Hall D and MCC) (30min)	DIRC comm. Harp Scan (both Hall D and MCC) (30min) FCal-BCal-ST trigger test and prepare for high current DAQ test (8h)	 DIRC comm. Harp Scan (both Hall D and MCC) (30min) 8h RF recovery Move GEM/TRD to beam right position (2h) High rate DAQ (CODA) test (4h) 	DIRC comm. Harp Scan (both Hall D and MCC) (30min) Align JD70-105 47 µm diamond, 4 config. (16h)		DIRC comm. DIRC comm. Harp Scan (both Hall D and MCC) (30min) High rate DAQ (cDAQ) test (4h) List (4h)		DIRC comm. Harp Scan (both Hall D and MCC) (30min)
DIRC comm. Harp Scan (both Hall D and MCC) (30min) 8h RF recovery Move GEM/TRD to beam left position (2h) 2h Empty target run+raw mode during target ops. 2h Empty target run+raw mode during target ops. DIRC comm. Harp Scan (both Hall D and MCC) (30min) TAC run	DIRC comm. Harp Scan (both Hall D and MCC) (30min) CPP installation (6h) CPP removal (8h) CPP removal (8h) CPP removal (8h) CPP removal (8h)	50A, LH ₂ tgt, 5 mm collim., tag		Final	runpl	eeks o	count of phy oal al	ing fo vsics b	r late eam rem	e start. oved

Fall 2019 GlueX run/DIRC comm. Assume 50% eff. Fall 2019 runplan Fall 2019 GlueX run/DIRC comm. Assume 50% eff.



Fall 2019 runplan

- Straight track runs for each of the 3 positions of GEM/TRD
- DIRC commissioning (with TRD/GEM)
- Align diamond (JD-70-105)
- GlueX production
- TAC run
- Empty target run
- DAQ tests:
 - Test new CODA at up to 450 nA
 - cDAQ at up to 450 nA
 - Data consistency check (non-invasive)
- Trigger tests:
 - FCal-BCal-ST trigger test
 - Preparation for high current DAQ test
- HV scans for TOF's new counters
- Tagging accidentals beam tests
- ComCal test: anode current studies with special trigger
- Pair. Spec. test area (non-invasive tests):
 - Right arm (facing downstream): FCal Pb-W cristal quality and detector checks
 - Left arm:
 - EIC/Hall C aerogel tests.
 - Test of Hall C 3×3 block glass-scintillator prototype
- CPP trigger tests

as Jefferson National Accelerator Facility

Jefferson Lab

Exploring the Nature of Matter

Fall 2019 runplan

- Straight track runs for each of the 3 positions of GEM/TRD
 DIRC commissioning (with TRD/GEM)
 Alticult (ID 70 105)
- Align diamond (JD-70-105) ~ (only two directions aligned)
- GlueX production $\sim \chi_{\text{(took 3h of data at 350nA, i.e. in GlueX-II condition)}} \Rightarrow Good shape for GlueX-II$
- TAC run
- Empty target run X
- DAQ tests:
 - Test new CODA at up to 450 nA
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 - Data consistency check (non-invasive)
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Jefferson Lab

Exploring the Nature of Matter

- EIC/Hall C aerogel tests.
- Test of Hall C 3×3 block glass-scintillator prototype
- CPP trigger tests $\sim \chi$ (did useful "pre-CPP" test)

production in spring 2020

Statistics for Fall 2019 run

Scheduled run time: 600h (24 days): Nov 25th-Dec 20th Acceptable beam used: 192h ⇒ Running efficiency for Fall 2019 period: 32%



Initial schedule:

1. Jan. 3rd - 9th: Electron beam restoration.

2. Jan. 10th -May 6th: GlueX-II production data;

Tagger accidental test, ComCal anode test.

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- 1. Jan. 3rd 9th: Electron beam restoration.
- **2.** Jan. 10th -May 6th: GlueX-II production data;

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Leadership: C. Meyer/J. Stevens, E. Chudakov/E. Smith

Run Coordinators:

- Jan 3rd-Jan 9th: 7 days: Alexandre Deur (accelerator restoration)
- Jan 9th-Jan 15th, 7 days: Alexandre Deur
- Jan 15th-Jan 22nd, 7 days: Jonathan Zarling https://halldweb.jlab.org/wiki/index.php/Run_Coordinator_report:_Spring_2020_w3
- Jan 22nd-Jan 29th, 7 days: Alexander Austregesilo
- Jan 29th-Feb 5th, 7 days: Alexander Ostrovidov https://halldweb.jlab.org/wiki/index.php/Run_Coordinator_report:_Spring_2020_w5
- Feb 5th-Feb 12th, 7 days: Daniel Lersch
- Feb 12th-Feb 19th, 7 days: Richard Jones
- Feb 19th-Feb 26th, 7 days: Colin Gleason
- Feb 26th-March 4th, 7 days: Wenliang Li
- March 4th-March 11th, 7 days: TBD
- March 11th-March 18th, 7 days: Richard Jones
- March 18th-March 25th, 7 days: Mark Dalton
- March 25th-Apr 1st, 7 days: Werner Boeglin
- Apr 1st-Apr 8th, 7 days: TBD 🙁
- Apr 8th-Apr 15th, 7 days: Naomi Jarvis
- Apr 15th-Apr 22nd, 7 days: Kenneth Livingston
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Physics Division Liaisons: Benedikt Zihlmann/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).

Actual schedule: Jan. 7th (due to short break between Fall and spring runs: RF stayed on, babysitted by dedicated MCC ops)

- 1. Jan. 3rd 9th: Electron beam restoration.
- 2. Jan. 10th May 6th: GlueX-II production data;

Jan. 8th Tagger accidental test, ComCal anode test.



Spring 2020 run configuration

•Energy: 11.4 GeV

•4-hall ops, 1-pass for Hall A, 1-5 pass for Hall B, 1-5 pass for Hall C. D: 5.5-pass. High currents for A & C.

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•Both DIRC boxes

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- •Beam current 1 nA-2.1 µA.
- •Production Radiator: 47 μ m J70-105 diamond; then 47 μ m J70-106.
- •5mm collimator hole;
- •LH₂ target.
- •TPol with 75 μ m TPol convertor.



Spring 2020 runplan

Production

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Spring 2020 runplan Spring 2020 GlueX II run. Assume 50% eff.

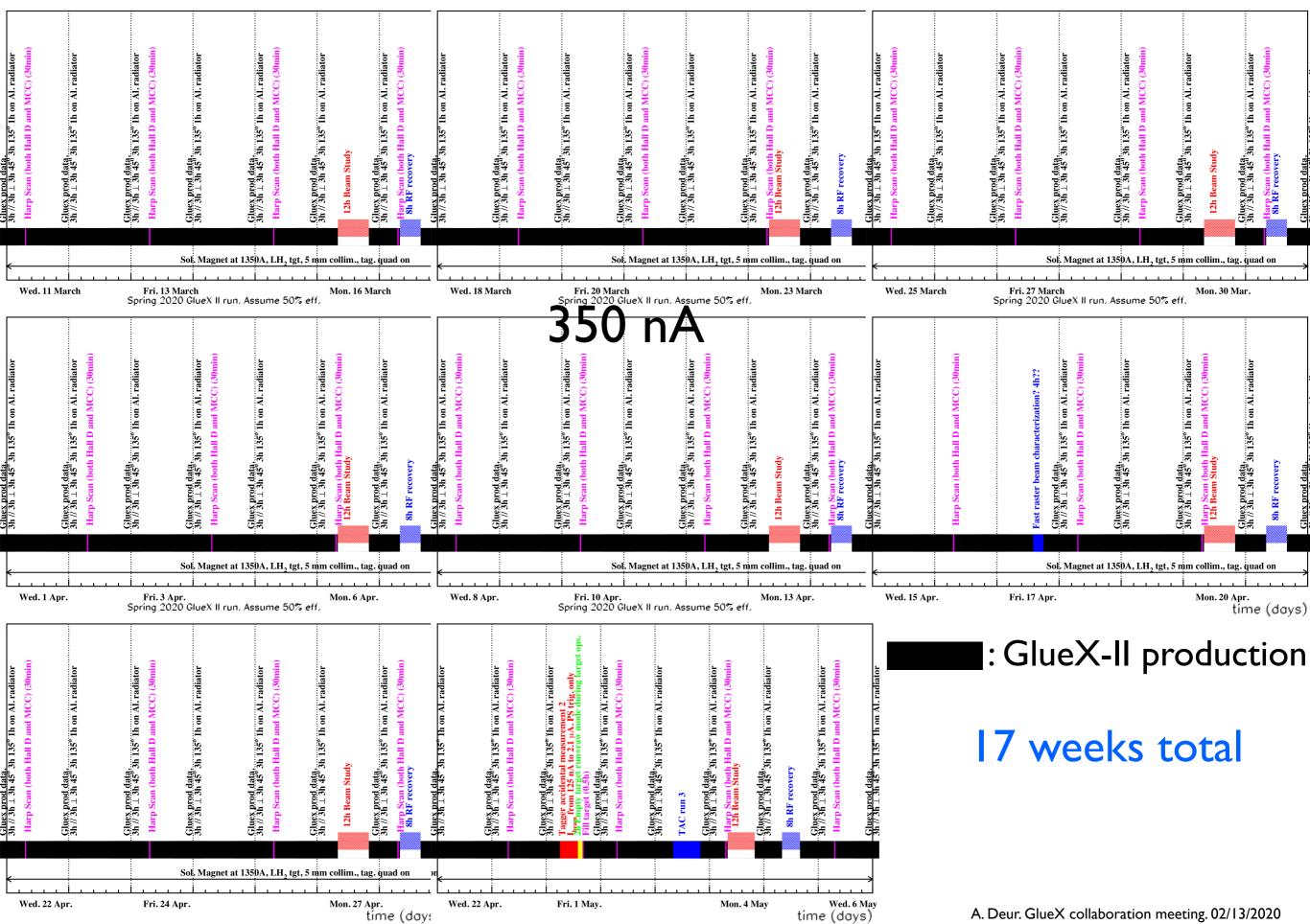
Spring 2020 GlueX II run. Assume 50% eff. Staggered tasks are accelerator responsibility		Spring 2020 GlueX II run. As	ssume 50% eff.	Spring 2020 GlueX II run. Assume 50% eff.					
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Align JD70-103 So µm new diamond, 4 config. (16h) Align JD70-103 So µm new diamond, 4 config. (16h) Align JD70-103 So µm new diamond, 4 config. (16h) Align JD70-103 So µm new diamond, 4 config. (16h) Align JD70-103 So µm new diamond, 4 config. (16h) Align JD70-103 So µm new diamond, 4 config. (16h) Align JD70-103 So µm new diamond, 4 config. (16h) Align JD70-103 So µm new diamond, 4 config. (16h) Align JD70-103 So µm new diamond, 4 config. (16h) Align JD70-103 So µm new diamond, 1 config. (16h) Align JD70-103 So µm new diamond, 1 config. (16h) Align JD70-103 So µm new diamond, 1 config. (16h) Align JD70-103 So µm new diamond, 2 config. (16h) Align JD70-103 So µm new diamond, 2 config. (16h) Align JD70-103 So µm new diamond, 2 config. (16h) Align JD70-103 So µm new diamond, 2 config. (16h) Align JD70-103 So µm new diamond, 2 config. (16h) Align JD70-103 So µm new diamond, 3 config. (16h) Align JD70-103 So µm new diamond, 4 config. (16h) Align JD70-103 So µm new diamond, 4 config. (16h) Align JD70-103 So µm new diamond, 4 config. (16h) Align JD70-103 So µm new diamond, 4 config. (16h) Align JD70-103 So µm new diamond, 4 config. (16h) Align JD70-103 So µm new diamond, 4 config. (16h) <td< td=""><td></td><td></td><td>3h///3h L 3h 45th 3h 135° Ih on AL radiator 3h///3h L 3h 45th 3h 135° Ih on AL radiator 3h//3h L 3h 45th 3h 135° Ih on AL radiator 3h //3h L 3h 45th 3h 135° Ih on AL radiator The provided that 13h Beam Study CPP tripger test (12h) CPP removal (8h) An 23h 45° 3h 135° Ih on AL radiator 13h //3h 135° Ih on AL radiator 13h //3h 13h 45° 3h 135° Ih on AL radiator 14 15 16 17 18 19 19 10 10 11 13 14 15 16 17 18 19 10 10 10 10 10 11 11 11 11 11 12 13 14 15 16 17 18 19 <td>Wed. 12 Feb. Fri. 14 Feb.</td><td>Inter provided tage 3h // 3h ± 5¹⁰ 3h 135° 1h on Al. radiator 3h // 3h ± 3h 45° 3h 135° 1h on Al. radiator 3h // 3h ± 3h 45° 3h 135° 1h on Al. radiator 3h // 3h ± 3h 45° 3h 135° 1h on Al. radiator 3h // 3h ± 3h 45° 3h 135° 1h on Al. radiator and wcC) (30min) Harp Scan (both Hall D and MCC) (30min) 8h RF recovery 8h RF recovery</td></td></td<>			3h///3h L 3h 45 th 3h 135° Ih on AL radiator 3h///3h L 3h 45 th 3h 135° Ih on AL radiator 3h//3h L 3h 45 th 3h 135° Ih on AL radiator 3h //3h L 3h 45 th 3h 135° Ih on AL radiator The provided that 13h Beam Study CPP tripger test (12h) CPP removal (8h) An 23h 45° 3h 135° Ih on AL radiator 13h //3h 135° Ih on AL radiator 13h //3h 13h 45° 3h 135° Ih on AL radiator 14 15 16 17 18 19 19 10 10 11 13 14 15 16 17 18 19 10 10 10 10 10 11 11 11 11 11 12 13 14 15 16 17 18 19 <td>Wed. 12 Feb. Fri. 14 Feb.</td> <td>Inter provided tage 3h // 3h ± 5¹⁰ 3h 135° 1h on Al. radiator 3h // 3h ± 3h 45° 3h 135° 1h on Al. radiator 3h // 3h ± 3h 45° 3h 135° 1h on Al. radiator 3h // 3h ± 3h 45° 3h 135° 1h on Al. radiator 3h // 3h ± 3h 45° 3h 135° 1h on Al. radiator and wcC) (30min) Harp Scan (both Hall D and MCC) (30min) 8h RF recovery 8h RF recovery</td>	Wed. 12 Feb. Fri. 14 Feb.	Inter provided tage 3h // 3h ± 5 ¹⁰ 3h 135° 1h on Al. radiator 3h // 3h ± 3h 45° 3h 135° 1h on Al. radiator 3h // 3h ± 3h 45° 3h 135° 1h on Al. radiator 3h // 3h ± 3h 45° 3h 135° 1h on Al. radiator 3h // 3h ± 3h 45° 3h 135° 1h on Al. radiator and wcC) (30min) Harp Scan (both Hall D and MCC) (30min) 8h RF recovery 8h RF recovery				
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	Spring 2020 GlueX II run. Assume 50% eT. 50 nA spring 2020 GlueX II run. Assume 50% eff. 250 nA spring 2020 GlueX II run. Assume 50% eff. 250 nA spring 2020 GlueX II run. Assume 50% eff. 250 nA spring 2020 GlueX II run. Assume 50% eff.																						
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						7	UI		1			š				Ζ.	50						
Tune c ⁻ beam to tagger Hall. (16h) Ion Ch. calib. (4h) Tagger Quad. ON RadMon check. (4.2 Å) . Establish good	harp scans(0.5h) Detauran good RadMon tests (2h) photon beam Act: Col: Calib: (4h)	L1 trigger setting (2h) PAQ checkeut (2h5h) Standard run (prod. mode 9) checkout (0.5h) Gluex mod data, on amorphous radiator	Align JD70-105 47 µm diamond, 2 config. (8h)	Gluex prod data, 3h // 3h ⊥ 3h 45" 3h 135° Th on Al. radiator Harp Scan (both Hall D and MCC) (30min)	Gluex prod data. 3h // 3h ⊥ 3h 45" 3h 135° Th on Al. radiator Harp Scan (both Hall D and MCC) (30min)	Gluex prod data. 3h // 3h ⊥ 3h 45° 3h 135° 1h on Al. radiator Harp Scan (both Hall D and MCC) (30min)	TAC run 1 Gluex prod data. 3h // 3h 1. 3h 45° 3h 135° 1h on Al. radiator Harp Scan (both Hall D and MCC) (30min)	Gluex prod data.	3h // 3h 3h 45° 3h 13°° 1h on Al radiator Harp Scan (both Hall D and MCC) (30min) High rate scans (trigger+DIRC) 3h High rate scans (cDAQ) 1h	Glues prod data, 3h // 3h ⊥ 3h 45° 3h 135° 1h on Al. radiator Harp Scan (both Hall D and MCC) (30min)	Gluex prod data, 5, 135° 1h on Al. radiator 3h () 3h 1 3h 45 3h 135° 1h on Al. radiator Empty target (0.5h) Tagger accidental measurement 1 Jeens from 125 nA to 2.1 µA. PS trig, only	Zu Empty arger fun+raw mode during target o Fill target (0.5h) Gluex prod data. 3h // 3h ⊥ 3h 45° 3h 135° 1h on Al. radiator Harp Scan (both Hall D and MCC) (30min)	Gluex prod data, in 135° th on AI. radiator 3h // 3h ⊥ 3h 45° 3h 135° th on AI. radiator Harp Scan (both Hall D and MCC) (30min)	Glues prod data, in 135° Th on AI, radiator 3h // 3h ⊥ 3h 45° 3h 135° Th on AI, radiator Harp Scan (both Hall D and MCC) (30min)	12h Beam Study Gluex prod data. 3h // 3h ⊥ 3h 45° 3h 135° 1h on Al. radiator Harp Scan (both Hall D and MCC) (30min) 8h RF recovery	Gluex prod data. 3h // 3h ⊥ 3h 45° 3h 135° 1h on Al. radiator Harp Scan (both Hall D and MCC) (30min)	Gluex prod data 3h // 3h ⊥ 3h 45° 3h 135° 1h on Al. radiator Harp Scan (both Hall D and MCC) (30min)	ComCal anod current study (4h) Gluex prod data. 3h // 3h ⊥ 3h 45° 3h 135° 1h on Al. radiator Harn Scan (both Hall D and MCC) (30min)	Gluex prod data. 3h // 3h ⊥ 3h 45 ⁰ 3h 135° 1h on Al. radiator	Harp Scan (both Hall D and MCC) (30min) Gluex prod data, 3h // 3h L 3h 45 ⁵ 3h 135° Th on Al. radiator Harn Scan (both Hall D and MCC) (30min)	1 data 3h 45° 3h 135° 1h on Al. radiator n (both Hall D and MCC) (30min)	12h Beam Study Guest programa 3h // 3h ⊥ 3h 45° 3h 135° Th on Al. radiator	Harp Scan (both Hall D and MCC) (30min) 8h RF recovery Gluex prod data.
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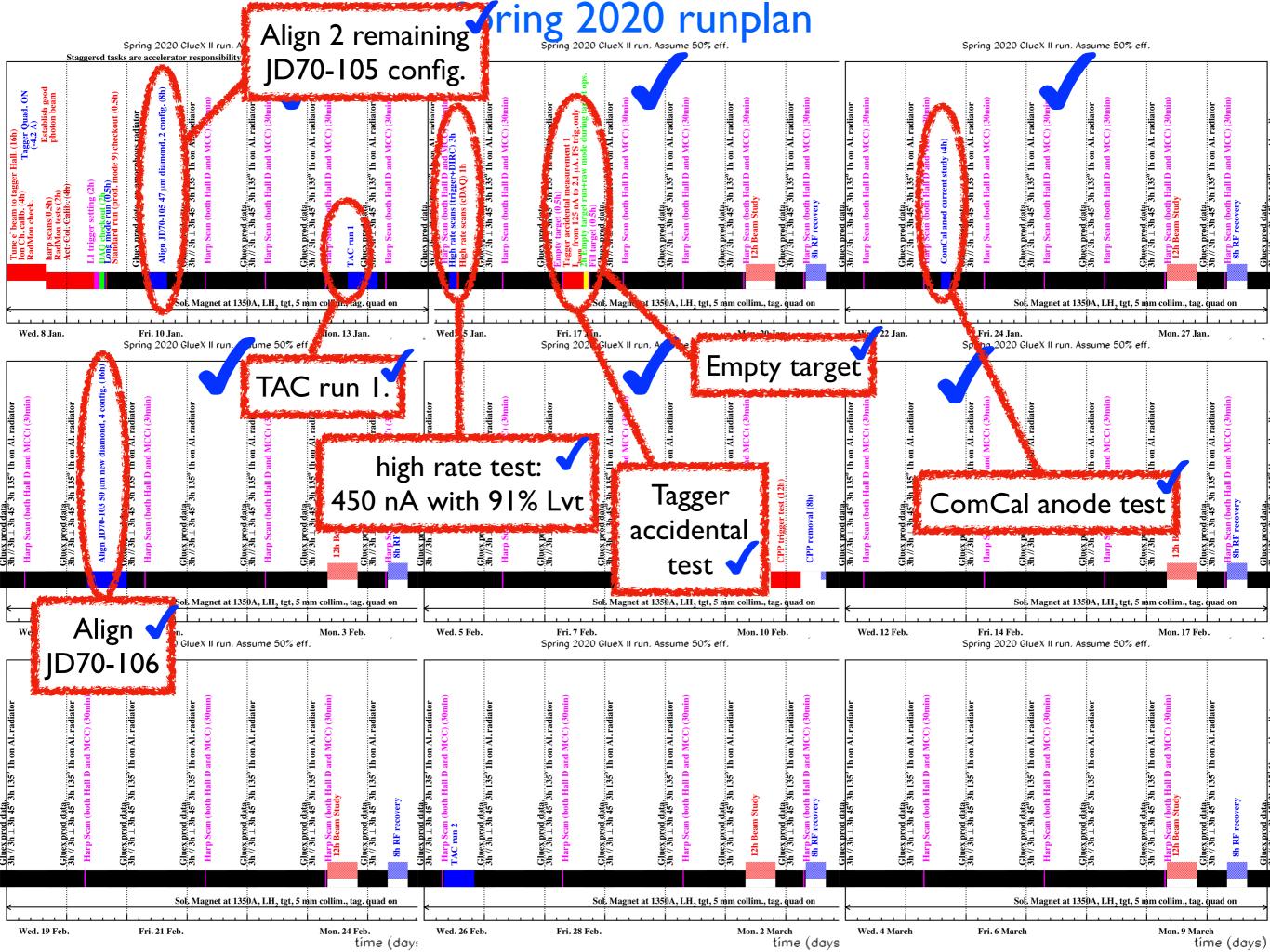
Spring 2020 runplan

Spring 2020 GlueX II run. Assume 50% eff.

Spring 2020 GlueX II run. Assume 50% eff.



	Sorias 20)20 GlueX II run. Assu	ma 50% off	Spr	Spring 2020 GlueX II ru		olan		Series 2020 Clust II	run. Assume 50% eff.			
Sta	Spring 20 aggered tasks are accele	erator responsibility		- · · · · · · · · · · · · · · · · · · ·	Spring 2020 Gluex II ri				Spring 2020 Gluex II				
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Wed. 19 Feb.	Fri. 21	Feb.	Mon. 24 Feb. time (day:	Wed. 26 Feb.	Fri. 28 Feb.	Mo	on. 2 March tíme (days	Wed. 4 March	Fri. 6 March	Mo	m.9 March time (days)		



Statistics for Spring 2020 run (as of Feb. 12th 2020, 7am)

Scheduled run time: 2676h (120 days): Jan 10th-May 6th Acceptable beam used so far: 375h Time elapsed so far: 751h

- \Rightarrow Running efficiency for Spring 2020 period so far: 50%
- \Rightarrow We are 28% along in the run period.

We have gathered so far 69B triggers, split in:

- 22% at 0° diamond orientation;
- 22% at 45° diamond orientation;
- 21% at 90° diamond orientation;
- 22% at 135° diamond orientation;
- 13% on Al. radiator.

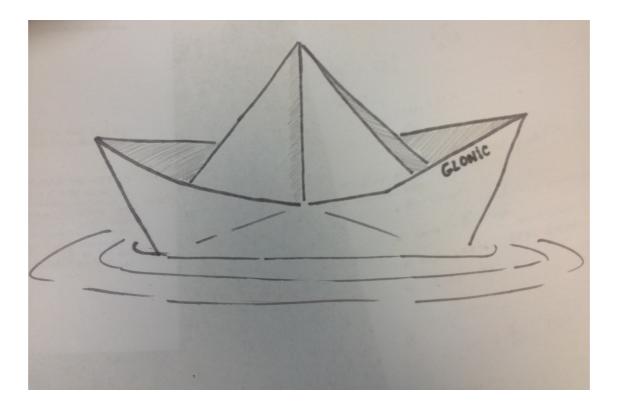


List of problems during Fall2019/Spring 2020 runs (not importance ordered)

- Solenoid trip 3 times (ground fault; compressor issue; power supply overheating. Also problems twice in ramping back-up due to power supply motherboard failures.)
- ~ 10 nA bleedthrough
 - Spray particles during radiator ops \Rightarrow dammaged electronics?
 - No TAC run unless one of the other halls is down
 - Cumbersome new procedure (dumplette insertion) for radiator ops
 - Bleedtrough beam characteristics different from main beam?
- Pair Spec power supply overheating (fixed before Spring run).
- Energy lowered by ~200 MeV due to unsustainable RF-tripsShort term beam energy drift of up to 10 MeV
- Latest firmware teething (including inducing data corruption).
- Frequent drops of PSS system.



Comparison with other GlueX runs





Spring: 3019 +PrimEx Actual Run time: 312h ↓ Running efficiency: 36% (55%) Production triggers: 0.

Preparation

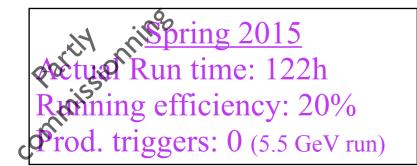
GiueX-II

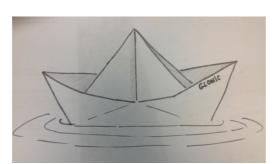
Spring 2018 Actual Run time: 1111.8h Running efficiency: 55% Production triggers: 1.5×10¹¹

Spring 2017 Actual Run time: 354.1h Running efficiency: 56% Production triggers:4.7×10¹⁰ 0- 0/770 0- 0/770

Spring 2016 Actual Run time: 458h Running efficiency: 41% Production triggers:6.9×109







Fall 2018 Actual Run tone: 192h Running efficiency: 32% Production triggers: 0.

<u>Fall 2018</u> Actual Run time: 788h Running efficiency: 52% Production triggers: 8×10¹⁰

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



Getting

ready...

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



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



<u>Fall 2014</u> Actual Run time: 324h Running efficiency: 34% Production triggers: 0



Spring 2020 so far (Feb. 12th) Actual Run time:751h (28% of tot. run time) Running efficiency: 50% Production triggers: 7×10¹⁰

Spring: 3019 +PrimEx Actual Run time: 312h Running efficiency: 36% (55%) Production triggers: 0.

Preparation

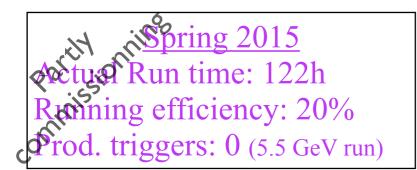
Spring 2018 Actual Run time: 1111.8h Running efficiency: 55% Production triggers: 1.5×10¹¹

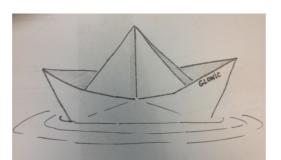
Spring 2017 Actual Run time: 354.1h Running efficiency: 56% Production triggers:4.7×10¹⁰

Spring 2016 Actual Run time: 458h Running efficiency: 41% Production triggers:6.9×109



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GlueX-II launched GlueX-II Production triggers: 0.

> Fall 2018 Actual Run time: 788h Running efficiency: 52% Production triggers: 8×10¹⁰

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



Getting

ready...

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



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<u>Fall 2014</u> Actual Run time: 324h Running efficiency: 34% Production triggers: 0





