

HPS Beyond 2019

S. Stepanyan HPS Collaboration Meeting Jefferson Lab, May 22 to 24, 2018





Outline

- Why to discuss HPS beyond 2019
- Boundary conditions for scheduling a run
- Competitions, beam time and physics reach
- PACs, remaining time and jeopardy
- Open discussions





Why to discuss HPS beyond 2019

- Summer runs may become a reality (low energy machine)
- Beam time request for the upcoming 2019 run has been submitted back in summer of 2017
- In order to be scheduled, experiments must submit their beam time request at least year before
- There might be an opportunity to run in summer of 2020 (or 2021)
- HPS must be ready to submit a beam time request next year (spring/summer)
- Request includes: beam time/beam energy/detector/target(s)/other resources





Boundary conditions for scheduling a run

- Summer runs will be short, ~4 PAC-weeks
- Low energy machine, so beam energy E < 6 GeV</p>
- When aiming for the summer of 2020 (or 20121), no big upgrades should be considered (no time)
- Must have at least one physics publication (heard a lot about that)
- Any motivation for the run (beam time) should be tightly connected to what E-11-006 proposed!
- Should show that we can do what is proposed





Competition: for beam time in Hall-B

New experiments for Hall-B/CLAS12 submitted to PAC 46:

- "Short Range Correlations in Nuclei and the EMC Effect" 5 GeV, 25 PAC days
- 2. "Electrons for Neutrinos"

Energy (GeV)	⁴ He	$^{12}\mathrm{C}$	¹⁶ O	40 Ar	Sn	Total
1	0.5	0.5	0.5	0.5	0.5	2.5
2.2	1	1	1	1	1	5
4.4	1	1	0	1	1	4
6.6	2	2	0	2	2	8
Total (days)	4.5	4.5	1.5	4.5	4.5	19.5





Competition: for physics impact (reach)

John already told us about this:

• data taking SeaQuest-now; NA62, LHCb-2021; Ship-2026; FASER-?



• Note, we not only need to run, but also analyze data and present results





Evolution



January 2011 Proposal: PR12-11-006

Scientific Rating: Unrated

Recommendation: C2, i.e. the PAC conditionally approves this proposal contingent on the success of the test run. It feels that the test run should be carried out as early as possible (ideally before the 6 GeV shutdown), so that the full experiment can be carried out in a timely manner.

June 2012

Proposal: C12-11-006

Scientific Rating: A Recommendation: C1 Conditionally Approved

between the measured rates and the simulations. Although there is still a substantial amount of work needed to get from this first test run to a full operation of the experiment, the view from the PAC is that the experiment should be promoted to the next level: Conditional Approval 1, which does not require a return to the PAC, but leaves it to the laboratory management to conduct a technical review of the experiment and to schedule beam

April 2014

Dear John and Stepan. Thank you for submitting the document we requested regarding your response to the July 2013 DOE review of HPS and planting your run plans. We have studied your document and are generally pleased with the efforts you are making to address updating your run plans. We have studied your document and are generally pleased with the efforts you are making to address the comments from the review panel. The full rate test of review and monitor your progress in this area. Rolf and Volker will be in personnel from the JLab experimental physics division to review and monitor your progress in this area. Rolf and Volker will be in

contact with you about this.

Nevertheless, we agree that HPS has sufficiently satisfied the requirements to remove the C1 conditional approval. With the concurrence of the Lab Director, Hugh Montgomery, (see below) we will grant HPS full approval for the engineering run currently envisioned for FY15. Approval for future running beyond this engineering run will be contingent on successful demonstrated

performance of the HPS apparatus during the engineering run.

We look forward to working with you to successfully realize the potential of the HPS experiment. Best regards, Bob

2015

2019

Engineering run & Final Approved for full 180 days, used 15 days

Run I

Run II

?? 204*

?? 202*

Run Run Run





What we have been showing past year or so







What will happen if

- HPS will not be scheduled to run within 2 years after 2019
- Will not produce results within 2 years after 2019 run
- Most likely we will be pushed into jeopardy
- Going back to PAC may not produce the same results

Note:

- HPS has 165 PAC days left on the books (180 approved -15 for engineering runs)
- The 2019 run is 28 PAC days (56 days on the floor)
- 137 PAC days in disposal will be left after 2019 summer run
- only 39 PAC days were approved as "High Impact"





PACs - E-11-006

PAC39

NUMBER	CONTACT PERSON	TITLE	HALL	DAYS REQUESTED	DAYS AWARDED	SCIENTIFIC RATE	PAC DECISION	TOPIC*
PR12-12-013	Claudio Ugalde	Measurement of 19F(g,a)15N with a bubble chamber and a bremsstrahlung beam	INJ				Defer	
<u>C12-11-006</u>	Stepan Stepanyan	Status of the Heavy Photon Search Experiment at Jefferson Laboratory	В			А	C1	6
<u>C12-11-008</u>	Peter Fisher	A Proposal for the DarkLight Experiment at the Jefferson Laboratory Free Electron Laser	FEL			A	C1	6
C12-11-102	Tania Horn	Measurement of the Ratio R=L/T in Exclusive and	C				Defer	4

PAC41

Similarly, there is complementarity with respect to the parameter space. We consider both the full APEX run and the early running of HPS as high impact experiments. APEX will carve out a large unexplored area in the mass/coupling parameter space, with $\alpha'/\alpha \ge 10^{-7}$ and masses between 60 and 500 MeV. HPS would extend this region to somewhat lower masses, albeit with less sensitivity to the coupling, and also add an entirely new region with $2 \times 10^{-8} \le \alpha'/\alpha \le 4 \times 10^{-10}$. Probing all of this parameter space which covers the non-excluded part addressing the muon g-2 would have impact **TOPIC 6 : FUNDAMENTAL SYMMETRIES**

<u>E12-11-006</u>	HPS : Status of the Heavy Photon Search Experiment at Jefferson Laboratory (Update on PR12_11_006)	В	H/180	(155) approved ★39	А	non-CLAS12 experiment, HPS ★25 pre-CLAS engr + 14 physics @ 4.4 GeV
<u>E12-10-009</u>	APEX : Search for new Vector Boson A1 Decaying to e+e-	A		34	А	Requires new septum and target system

<<< SUMMARY of "HIGH IMPACT" DAYS >>>

This shows that HPS and APEX are extremely timely experiments and should be executed as soon as possible.





New targets, territory for future runs

- 137 PAC days in disposal, in chunks of ~30 PAC days (4 runs, if year a part – program for ~8+ years)
- Targeting specific regions in (m_A, ε) with optimized configuration is probably our best way to move forward, e.g.

Can we made a dent in the region of ⁹Be 17 MeV anomaly by running at ~0.8 GeV

Can we move low energy vertexing towards higher ε











