Long-term Planning Meeting

August 2024

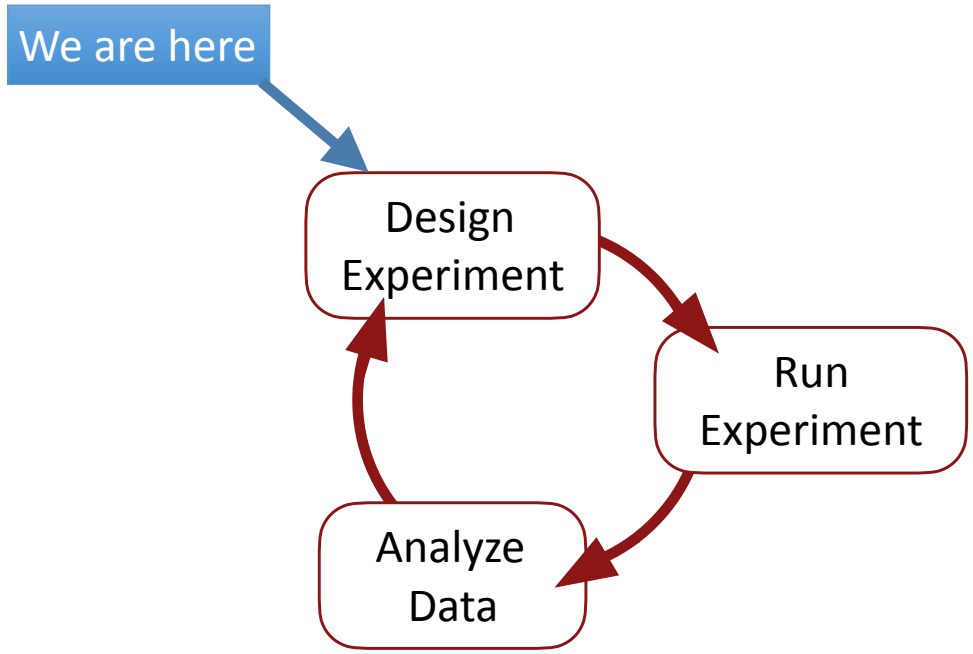
Brendan O’Shea

SLAC NATIONAL ACCELERATOR LABORATORY

Stanford University | U.S. DEPARTMENT OF ENERGY

What is this meeting?

- Discuss what we have done with beam time since January 2024, the publications it might lead to
  - Focus on process and how
- Then identify
  - The next measurements for each experiment
  - The tools and process needed to make the next measurement
- Identify opportunities and plan them
  - Software we need
  - Measurements we need



Long-term planning January 2024 Results

Feedback	*What could be the cause?*	*Can we measure the problem?*	*Is there a fix?*	*Which Experiments brought it up?*	*What are we doing about it?*
DAQ can be inscrutable	Lack of comments and output from software	Only in the number of "DAQ is broken" comments in the logbook	Update comments and output when fixing DAQ errors	Spencer	
IP beam shifts transversely when changing waist location	FF Quad alignment	Yes, the spectrometer can measure transverse offsets in X. Pencil beam + screens?	BBA/Move the FF quads	E300, E301, E304, E308, E310, E320, E332	
	Dispersion not zero	Not until dispersion GUI is working. The orbit GUI can do this, it "kinda works"	Get the dispersion GUI working		*Dispersion GUI is working. There are reasons why dispersion is not usually zeroed. Dispersion is used to cancel other (unknown) correlations.*

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Feedback	***What could be the cause?***	***Can we measure the problem?***	***Is there a fix?***	***Which Experiments brought it up?***	***What are we doing about it?***
IP beam size changes when changing waist location, even though beta star is the same	Dispersion not zero	Not until dispersion GUI is working	Get the dispersion GUI working	E300, E301, E304, E308, E310, E320, E332	*Dispersion GUI is working. There are reasons why dispersion is not usually zeroed. Dispersion is used to cancel other (unknown) correlations.*
	Energy Stability	Yes, BPM 2445.	Get transverse feedbacks going to allow better resolution for BC20 energy		*We had someone working the transverse feedbacks, we need to fill this gap*
	Chromaticity not corrected	Probably…	Get better at steering the sextupoles		*These seem to be hard to get repeatable. When the sextuples move, do we only care about spot size?*

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Dump beam location not stable when scanning spectrometer quads	Spec Quad alignment	Yes, the spectrometer can measure transverse offsets in X.	BBA+Coasting beam the spec quads	E300, E301, E320, E332	
	Non-repeatable orbit through IP	Measure transverse offset in the IP using spectrometer	BBA+coasting FF, dispersion GUI, energy stability		

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XTCAV needs more resolution	Voltage anomalously low	Not sure why we measure so low Should be able to measure 35 MV kick, measuring 15-20 MV resolution configuration makes sense to us Pencil beam + screens?	SLED can help	E300, E327, E338	Discovered SSA is too weak to drive klystron to saturation. Replaced with different SSA that is still to weak, though did take power from ~20 MW to ~30 MW. Current SSA putting out ~300 W. With 500+ W we should get 45+ MW. SLED adds another 2x in power. Optics changes gain 2x in resolution
	Emittance too large	Pencil beam needed to check linac alignment?	Work on linac emittances.		

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Chirp scan too slow, longitudinal setup is a bit of magic	Phase not repeatable in L2 + L3	Comments from users?	Revive BC20 bunch length monitor Get MDLFF working…better?	E300, E301, E327	There is a planned upgrade to L1 that brings L1 to modern hardware, which should improve the stability. That is highly likely to happen before the start of the Fall run. There is an upgrade to parts of hardware in L2, the parts that connect to the feedback, that is supposed to be done sometime in the Fall. The feedback software behaves in unexpected ways and since no one knows exactly what it is doing it can be hard to get working correctly. Right now the gain is set low to prevent it from randomly breaking out into uncontrolled oscillations. Finding out why and upping the gain can help. Currently not much work has gone into “find the origin of the drift”. I know I’ve seen data where BC11 correlates all the way to BC20, and data that shows that BC11 doesn’t contribute. Part of the issue is that time scales on which things go unstable are long compared to what the BSA GUI or DAQ usually do. S20 BLEN is back and BSA

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The probe needs a lot of work	Bad wavefront	Yes, wavefront sensor in tunnel	We need to measure the wavefront and find bad optics	E305, E308, E310	
	Poor collimation	Yes, shear plate	Measure collimation, correct		
	Too much B-integral	This has proven tricky	Thinner windows, in vacuum focusing, remote grating in		

Other improvements?

What measurements can we make?

- Jitter waist location
- Dispersion (DL, 11, 14, 20)
- Sextupole Centers w.r.t beams
- Energy Spread (DL, 11, 14, 20)
- TCAV + Dispersion (Pau/FLASH)
- EOS two-bunch separation
- Tomography w/SYAG

What can we script/automate?

- Beam characterization script - what can we DAQ+script in ~30 minutes?
- Generate table from PVs + print to logbook (emittance, bunch length, etc)
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We have about 8 weeks

Week	Beam Type	Measurement/Science	Notes
September 30th, 2024	Beam to TD11	Commission new L1 RF	
October 7th, 2024	Pencil Beam	• BBA/Coasting beam everything in the dump - 2 magnet moves • Sextupole alignment/repeatability • Feedbacks	
October 14th, 2024	Pencil Beam	• BBA/Coasting beam everything in the dump - 2 magnet moves • Sextupole alignment/repeatability • Feedbacks	
October 21, 2024	Single Bunch	E320, E305, E332, Energy Spread	
October 28, 2024	Single Bunch	E300 max efficiency, E302	
November 4th, 2024	Two Bunch	E300	
November 11th, 2024	Two Bunch	E300	
November 18th, 2024	Two Bunch		PAC Meeting 19/20/21
November 25th, 2024			Thanksgiving on 11/28