User experience, processes, lessons learned from FY22, and improvements for FY23

FACET-II

Facility for Advanced Accelerator Experimental Tests

FACET-II PAC Meeting 2022

Christine Clarke / FACET-II User Manager / Test Facilities

October 25-27, 2022

SLAC NATIONAL ACCELERATOR LABORATORY

Stanford University | U.S. DEPARTMENT OF ENERGY

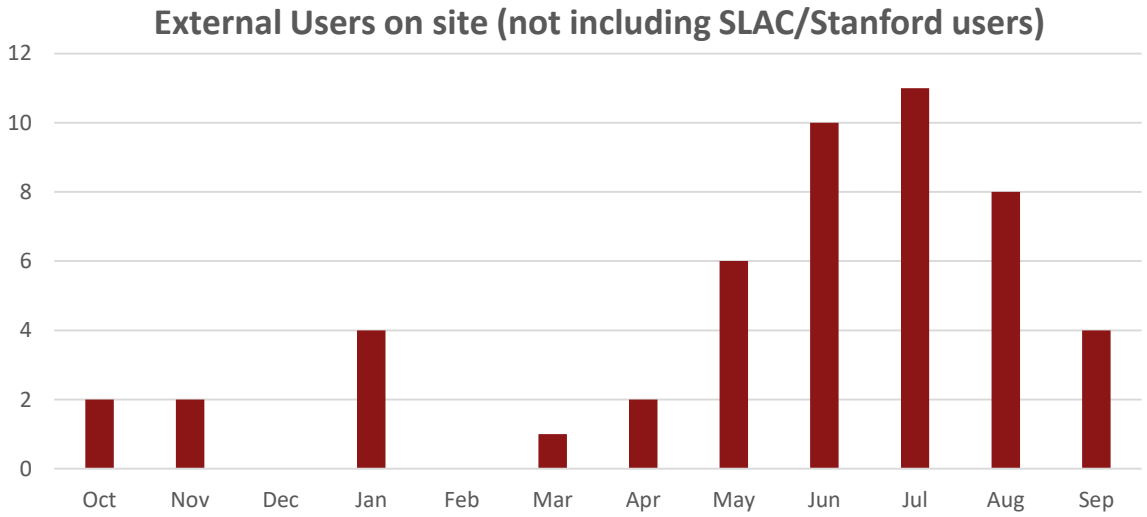
Outline

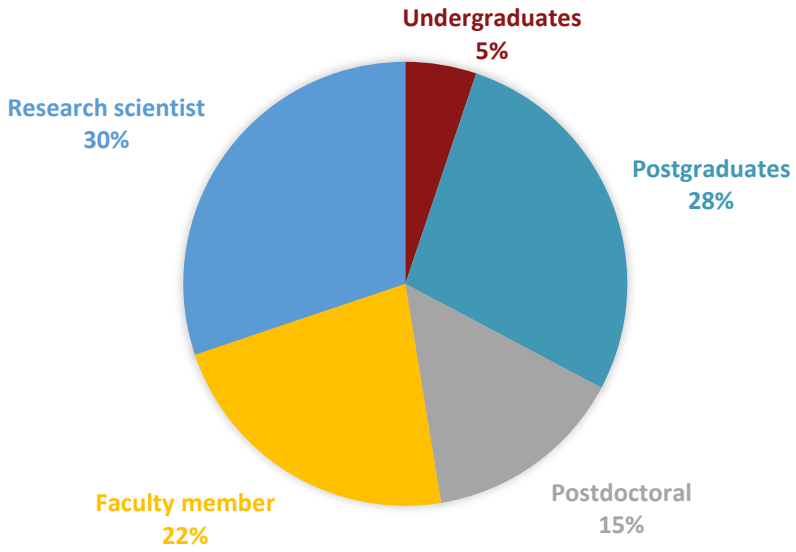
- Preliminary FY22 User statistics
- FY22 Experiment beam time breakdown
- User registration and onboarding process
- User training
- Experiment invitation and safety review process
- Installation work planning
- Beam time work planning
- User end of run feedback

On-site and total User demographics

Provisional FY22 numbers – official data collection is done in November for the annual DOE data call

- 12 experiments engaged in installation work, 10 experiments had beam time → ~120 users in FY23
- ~40% of users are on-site → 47 in total, 19 of which are from SLAC or Stanford
- 28 users from institutions other than SLAC/Stanford came on-site over the course of FY22 (Oct 2021- Sept 2022)
  - New arrivals peaked in June with 10 people arriving coincident with an extended access period and objective KPPs being attained
  - ~11 users stayed for at least 1 month
- Users participated in experiments remotely using zoom and remote access to control system
  - These users typically came on site for a short period to learn the set-up in situ and then participated remotely so these are recorded as on-site users





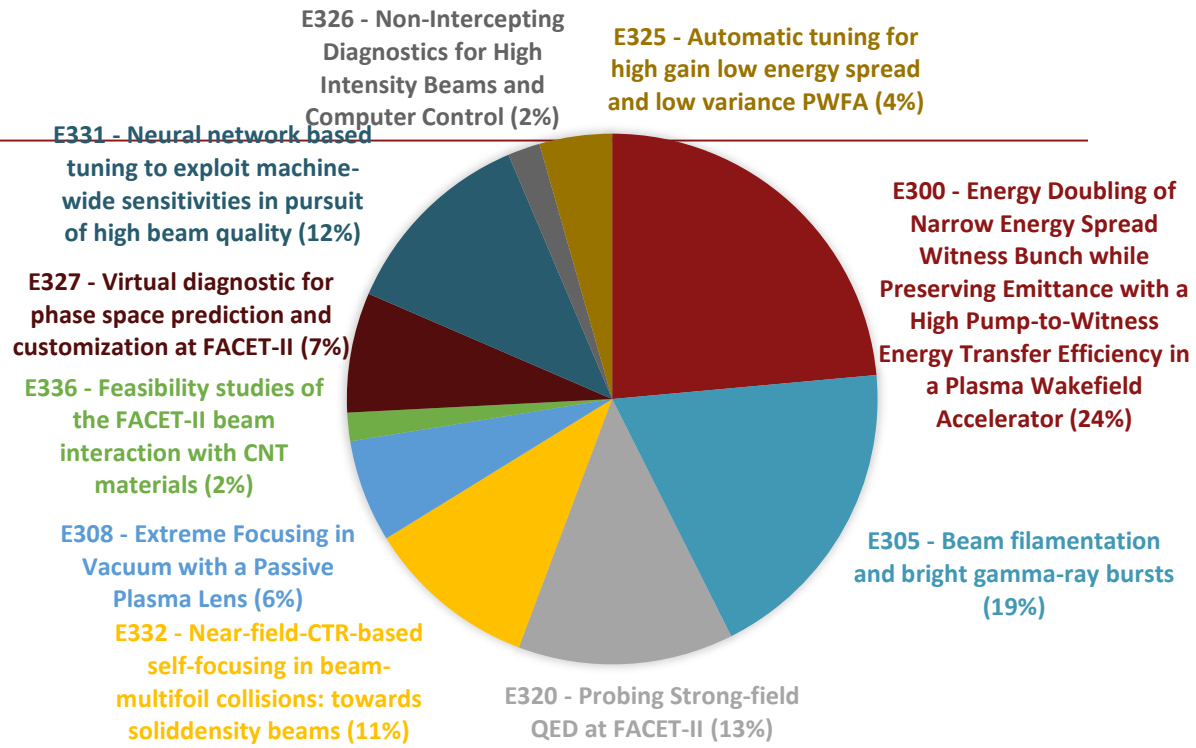
Nearly half of all FACET-II users are students or postdocs

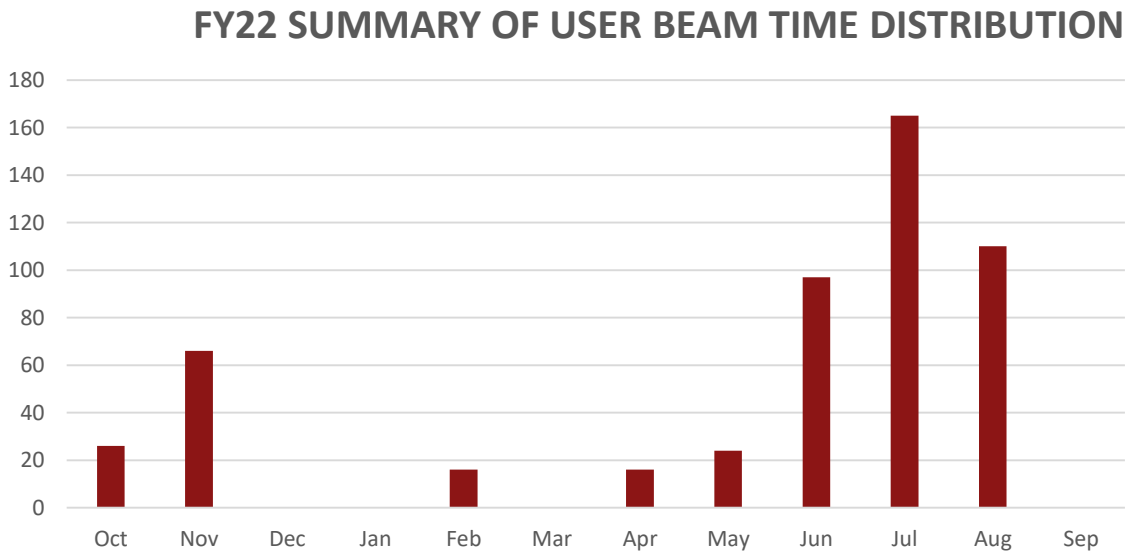
FY22 Beam time

- 520 hours of beam time delivered to experiments
- 25% delivered to ML/AI and diagnostics
- Q1: Primary focus of Q1 was commissioning towards the objective KPP. Blocks of dedicated User time for ML/AI experiments.
- Q2: . Objective KPP values for beam emittance and bunch length are now routinely achieved. ML/AI experiments continued, hardware installation of gas-jet, E-300 and E-320 tool and procedure development.
- Q3: Objective KPP values all achieved- holes in beryllium windows created!

Pivoted program: Differential Pumping System (DPS) partial installation. E-305/308 teams successfully laser ionized the gas jets, non-invasive Electro Optical Sampling (EOS) development.

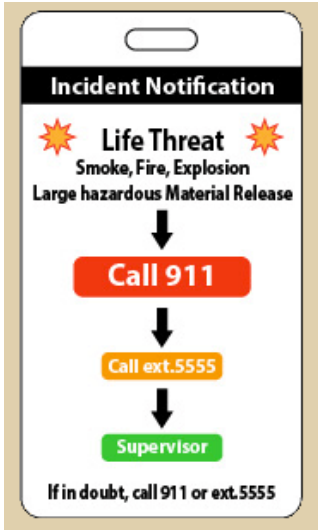
- Q4: Full DPS installation of pumps. Experiments ramp up: see Compton scattering, helium and hydrogen plasmas, commissioning DPS (Doug's talk)





User registration and onboarding

- User registers following step by step instructions on our website: https://facet-ii.slac.stanford.edu/user-resources/registration
- VUE Center (Human Resources and ESH Security)
  - Assigns SLAC ID
  - Manages DOE User Facility User Agreements
  - Ensures compliance to DOE O 142.3A Chg 1 (Unclassified Foreign Visits and Assignments Program)
  - Issues badge and dosimetry
- User Manager assigns User training and is the supervisor of non-SLAC users
  - E.g. Incident/Injury reporting process
  - Also UVFA (Unclassified Foreign Visits and Assignments) host to non-SLAC foreign national users
- User tells User Manager of travel plans ~a month before travel and User Manager relays this to the VUE Center



User training

- Course 219 - Environmental Safety and Health
- Course 115 - General Employee Radiation Training
- Course 120 - Work Planning and Control Overview
- Course 116+PRA - Radiation Worker 1 Training
- Course AD103 – FACET Orientation
- Course AD112 - Accelerator Control Room Orientation for non-Operators

To use class 4 laser:

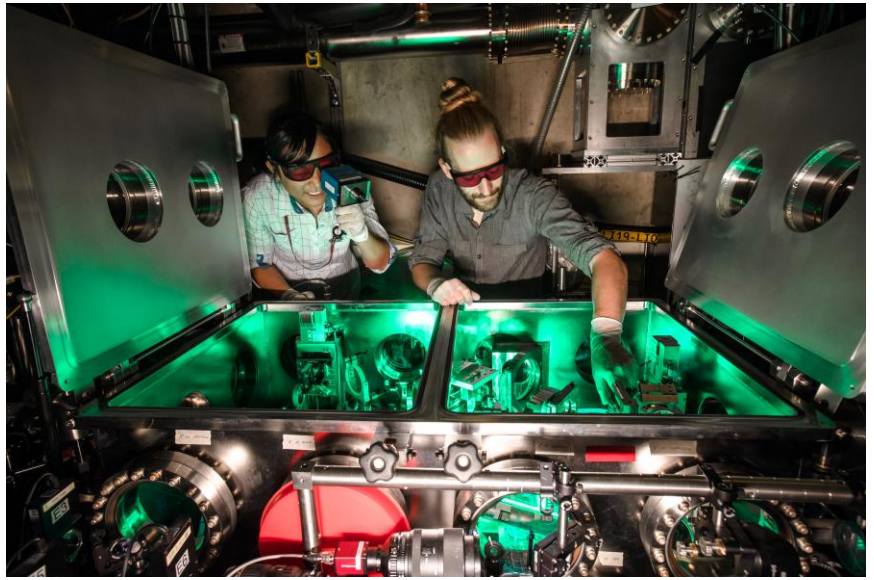
- Course 253 - Laser Worker Safety Training
- Course 131 - Laser Accidents/Lessons Learned
- Course 253ME - Laser Worker Baseline Medical
- Course 253PRA - Laser Alignment Safety Practical

To handle gas bottles:

- Course 122 - Pressure System Operator (plus in situ walk-through)

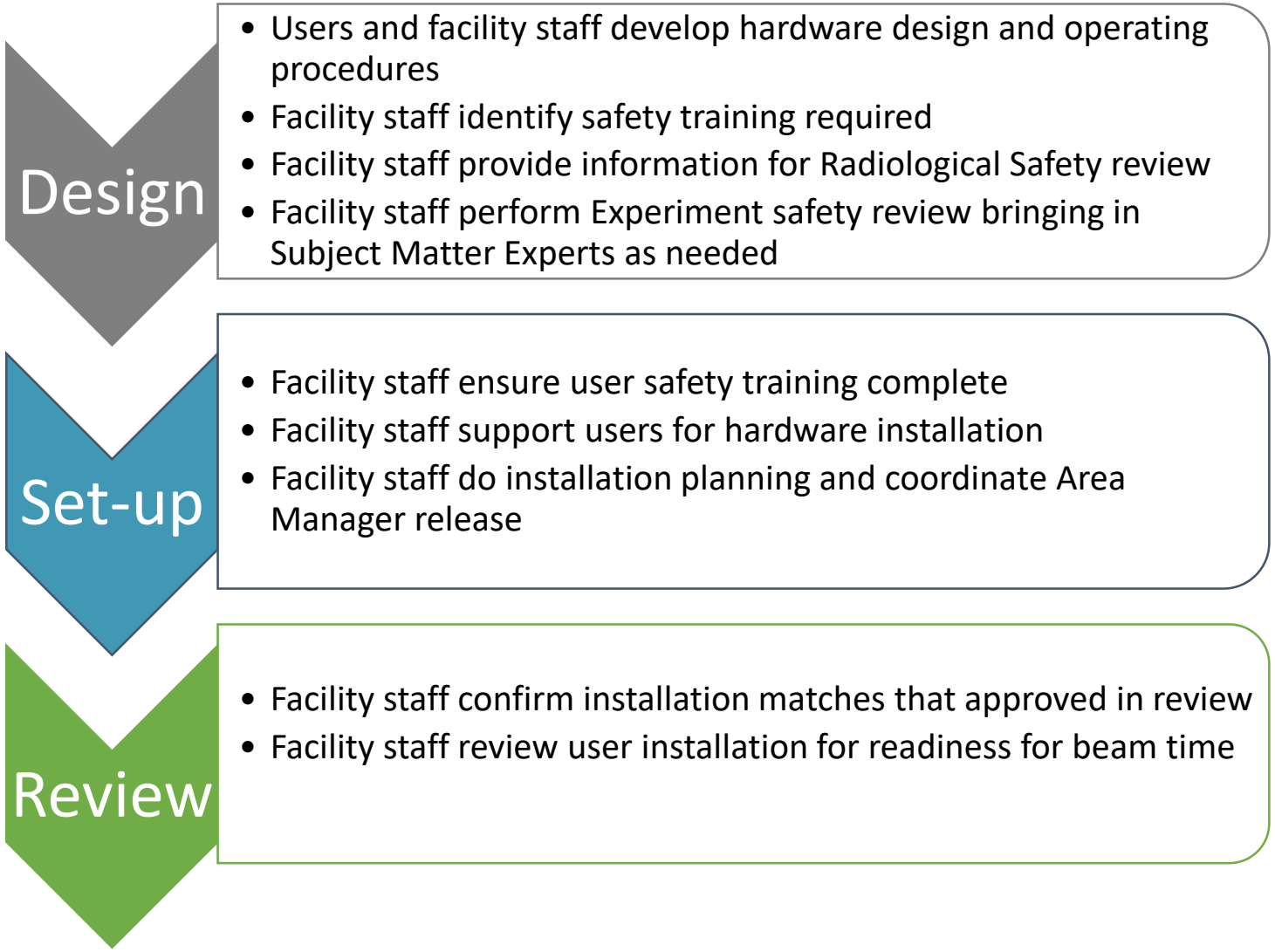
Note: For FY22, this course was required but will now be voluntary:

- Course 100 – COVID-19 Training for Onsite SLAC Employees and Users



Experiment invitation, safety review, approval and release

- PAC performs critical scientific merit review for proposals but other criteria come into play when considering whether to invite an experiment to participate:
  - Ability of the facility to support the needs of the experiment (staff, hardware, beam configuration)
  - Readiness of the experiment to staff and perform the experiment safely
  - Compatibility of the experiment with the broader FACET-II program
- Experiments need to go through a safety review prior to being installed and operated



Tunnel Work Planning

- Accesses are planned across the accelerator facility in coordination with accelerator operations and safety division
  - Synchronized across the three programs: FACET-II, LCLS-II and LCLS
- We list planned access opportunities on our access planning spreadsheet
- Any user can add jobs to this google spreadsheet
- We want to plan ahead as much as possible – usually for the full run
- All jobs are required to have a procedure
  - There is a specific format being developed for laser work
  - Procedures are often in google docs (one off), or confluence or formal documents as they mature and are repeatedly used
- The coordinator develops a schedule for the work
  - We switch between two coordinators approximately every month to allow for vacations and other work commitments
- Urgent jobs or requirements for unplanned access go direct to the coordinator via slack/email/cell phone

FACET User PAMM Requests

File Edit View Insert Format Data Tools Add-ons Help Last edit was made on October 27 by anonymous

	Point of Contact / Coordinator	Experiment	CATER	Job Released / Approved?	Task	Task Lead	Personnel Working in Tunnel	Total Number of Workers	Job Du (Ho
High-Priority Experiments for the week(s) after PAMM:									
Goal: all picnic basket motors connected, telescope installed, probe line established to picnic basket, new laser windows installed									
10/16/2015	Christine	Plasma experiments	127187 - Rolled	Yes	Connect motors to pico controllers and test	Doug McCormick	Doug, Christine	2	
10/16/2015	Christine	Plasma experiments	127889 - Closed	Yes	Lift mechanism for the compressor box lid	Keith	Keith	1	
10/16/2015	Christine	Plasma experiments	127499 - Closed	Yes	Install new vacuum windows for laser	Doug	Doug	1	
10/16/2015	Christine	All experiments	127890 - Rolled	Yes	Install platform riser	Keith	Carl	1	
10/16/2015	Christine	All experiments	127553 - Closed	Yes	OTR camera installation and troubleshooting	Christine	Christine	1	
10/17/2015	Christine	Plasma experiments	127891 - Complete	Yes	Dump table diagnostics	James	James	1	
10/17-10/18	Christine	Plasma experiments	127117 - Complete	Yes	Optics installation and CLASS 4 laser work for probe set up in picnic basket	Mike Litos	Brendan, Paul, James, Mike, Navid	5	
High-Priority Experiments for the week(s) after PAMM: E-210 Plasma Ionisation, E-200 (OTRs, ELanex, WLanex, Cher, sYAG), E-21									
Goal: E-210 ready for plasma ionisation tests, all E200 beam diagnostics ready									
10/23/2015	Selina	Plasma experiments	127187 Closed	Yes	Connect motors to pico controllers and test	Doug McCormick	Doug, Christine	2	

Guidelines | FY19 downtime | FY16 PAMM Archive | FY15 PAMM Archive

PAMM August 15-16

Organizer: Spencer Gessner sgess@slac.stanford.edu (914) 438-5934

Before Access

8:30	1	Update beam marks. Pre-align green laser. Check USHM and DSHM	Spencer, Lauren		

Day One (Monday, August 15)

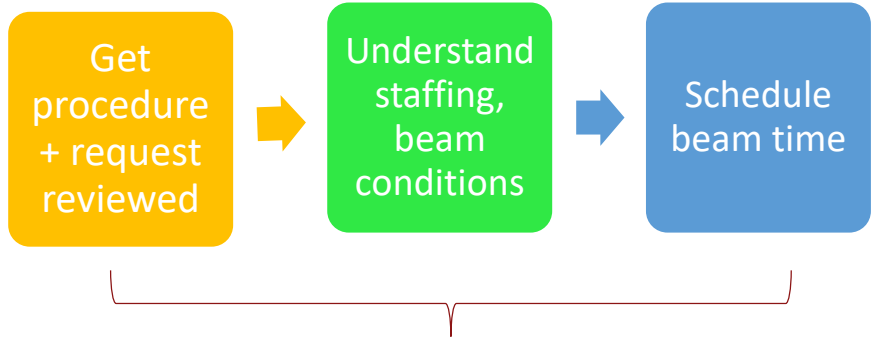
Start Time	Duration (hrs)	Activity	Personnel	Work Location	Hazard Control / Comments
12:00	1	Vent IP	Doug, Spencer	IP Area	
13:00	2	Replace manual valve in FF. Replace gauge in dumpline	Doug	IP Area	
13:00	2	GreeNe alignment. Verify DSHM position. Adjust oven limit switches. Break vacuum at IPOTR1 if necessary.	Spencer, Sam, Christine	IP Area	
13:00	1	Replace IPOTR2 with non-color camera? Install camera with H2 filter on middle port of bypass? Replace B4. Replace B6	Ken, James, Spencer, Henrik	IP Area	
13:00	1	Planning work around EDC	Robert H, Claudio, Rafi	EDC	
15:00	5	Axicon alignment work	Brendan et al	IP Area	Class 4 laser work. QLO only. PPE required.
20:00	2	E320 work	Elias et al	IP Area	Class 4 laser work. QLO only. PPE required.
22:00	2	E308 work	Henrik and Alex	IP Area	Class 4 laser work. QLO only. PPE required.

Beam time work planning

- Each experiment has a SLAC and External Point of Contact for the coordination of beam time
- POCs collect requirements, shift-plans/ procedures, channel request through review, negotiate schedule and staffing and shift start with operations
- All procedures/shift requests need to be reviewed by FACET-II science director, User Manager and Operations head (or designee/back up in case of absences)
- Shift requests/procedures should be submitted for review 2 weeks before anticipated beam time
- Note: SLAC POC is often involved in developing new functionalities, upgrades, maintenance etc. and also supporting the beam time of multiple experiments
  - External POC expected to drive process

FACET-II POCs May 2022

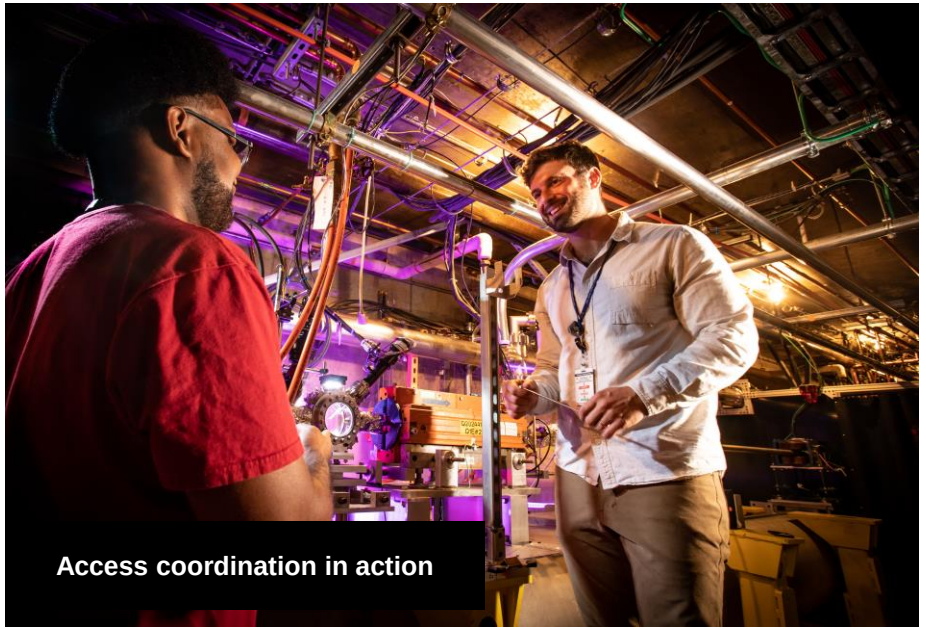
Experiment		SLAC POC	External POC
EOS/EOS-BPM	Duh	Spencer	Chris Doss
E-300	PWFA	Doug	Ken
E-305	Filimentation/Gamma	Henrik	Sebastien
E-308	Plasma lens	Henrik	Chris Doss
E-320	SFQED	Sebastian	
E-324	Plasma imaging	Henrik	Rafal
E-326	ML/AI ECA	Brendan	
E-327/331	ML/AI	Claudio and Auralee	
E-332	Near field CTR	Doug	Sebastien
E-336	XTAL	Henrik	Henryk
E-338	PAX	Claudio	Ago



Completed 2 weeks prior to anticipated beam time

User experience: Work Planning

- Access days:
  - Software work needs to be better integrated into the schedule, e.g. changes to servers impact access work especially
  - Last minute changes to schedules usually not good (nice to be flexible but usually a net bad). Respect invested time in work planning!
  - Limited laser shift time lead to attempts to do work in parallel but this usually meant slower overall, confusion etc.
- Beam time shifts:
  - POC role a little confusing- who was who and what their process is?
  - Last minute notice for beam time shifts, need to plan in advance (2-3 days minimum would be nice from user perspective, FACET-II staff request 2 weeks notice)
  - Need to do better to balance using FACET-II staff for staffing shifts vs capability improvements. Requests for new capabilities e.g. for DAQ, mean that FACET staff can't support shifts.
- FY23 improvements:
  - Implement better cycle of transmitting requirements to Ops- we are working on a standardized format for the requests.
  - External POCs need to ensure experimental procedures are reviewed 2 weeks ahead of experiment
  - Experiment schedule should be planned 2 weeks ahead of experiment by External and SLAC POC working together
  - Will have a meeting with all POCs before start of run to ensure expectations on process are understood



Access coordination in action

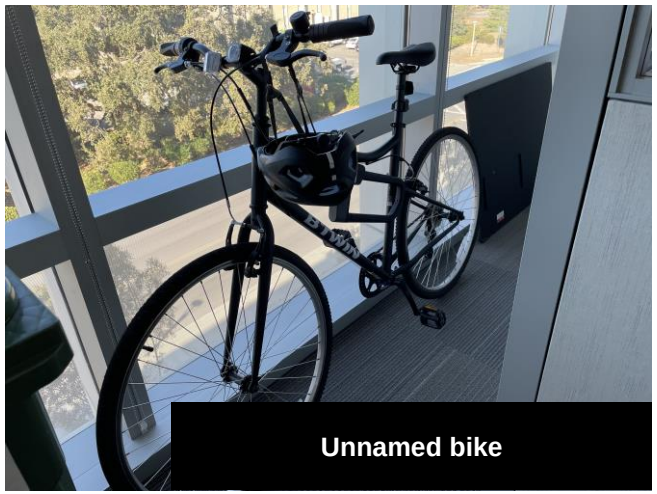
FACET-II Crew supporting beam time

User experience: Coming on site

- Cubicles assignment – unclear process. Would be useful to have a FACET-II cubicle assigned and then have Nadya involved for overflow
  - Nadya has worked on this and reserved the large cubicle 315B.14 for FACET-II Users
- Bikes: one bike available– increase bikes. Neville (electric cart) also a hit
- Due to increased use of ACR by LCLS-II (commissioning gets crazy!), experiments now more often operated from B244 without issues

FACET-II Users running experiments

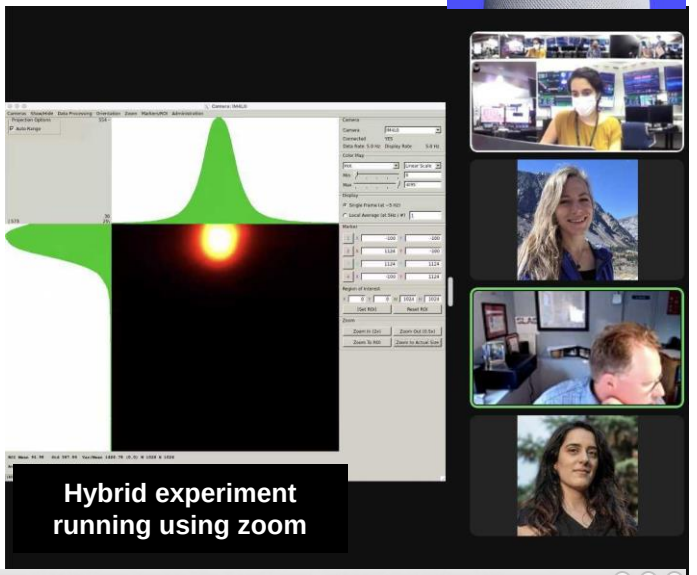
Neville

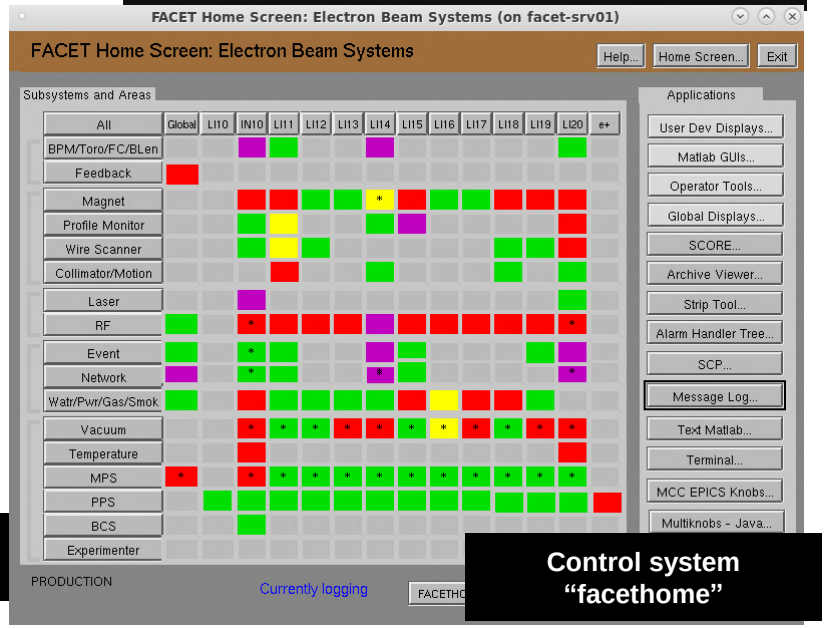

Unnamed bike

User experience: Remote

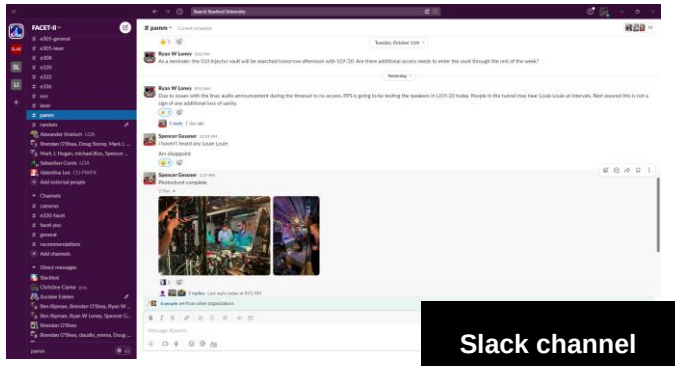
- Remote shift work is another way of participating *once you have been there* else very frustrating
  - Remote does not replace on the job training
  - Cannot operate all aspects remotely e.g. laser, differential pumping, need some on-site presence
- *Can* run experiments remotely (eg through control system) but some lagging from Europe especially so somewhat better on site. Still, feel should be possible to run completely remote.
- Zoom would be more useful on the controls computers so the screens can be shared (this is working in ACR but not in B244)
  - It is now working on the B244 controls computers!


Meeting owls


Hybrid experiment running using zoom



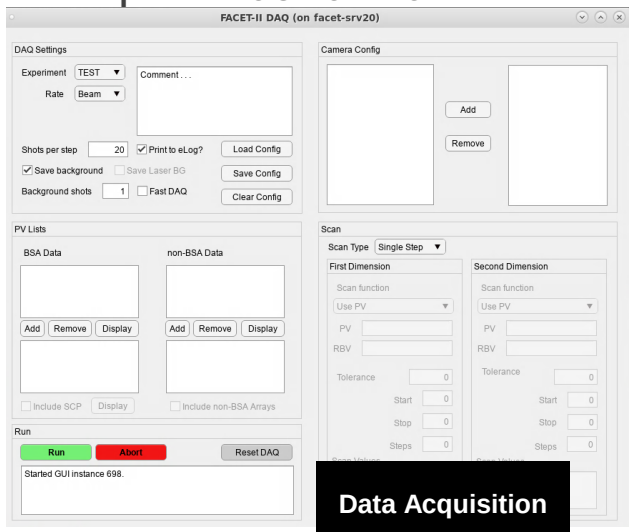
Control system "facethome"

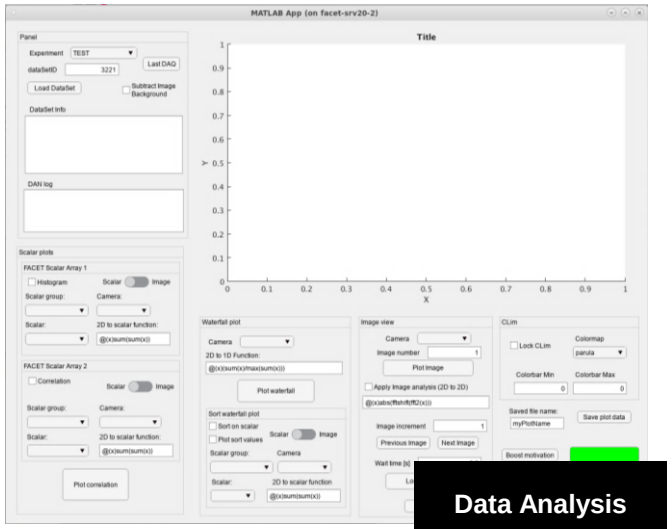

Slack channel

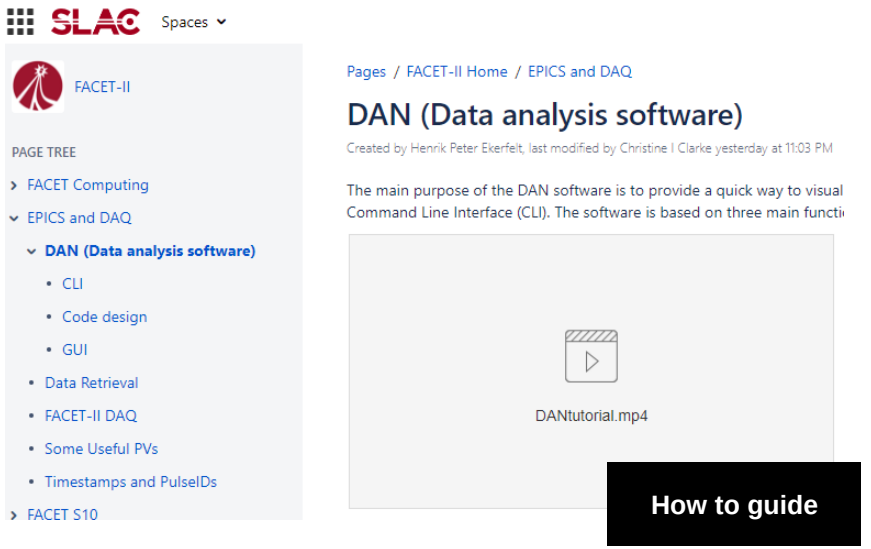
FACET elog

User experience: DAQ and DAN

- FACET-II DAQ built upon E-200 DAQ developed during FACET
- DAN is an excellent tool to perform data analysis on shift, new for FACET-II
- Training sessions on using DAQ and data access would be useful
  - We held training sessions on DAQ and DAN over the year
  - Got a recording for Henrik's DAN and uploaded it to our confluence site
  - Will hold another DAQ tutorial session and record it too
- DAQ allows for on the fly changes but this flexibility can also introduce quirks and changes need to be conveyed to the users (e.g. what is stable version?)
- Weird errors that needed SME intervention at the start- error handling improvements? Seemed to improve as run ran on







Talk later by Brendan on S20 laser

User experience: S20 Laser

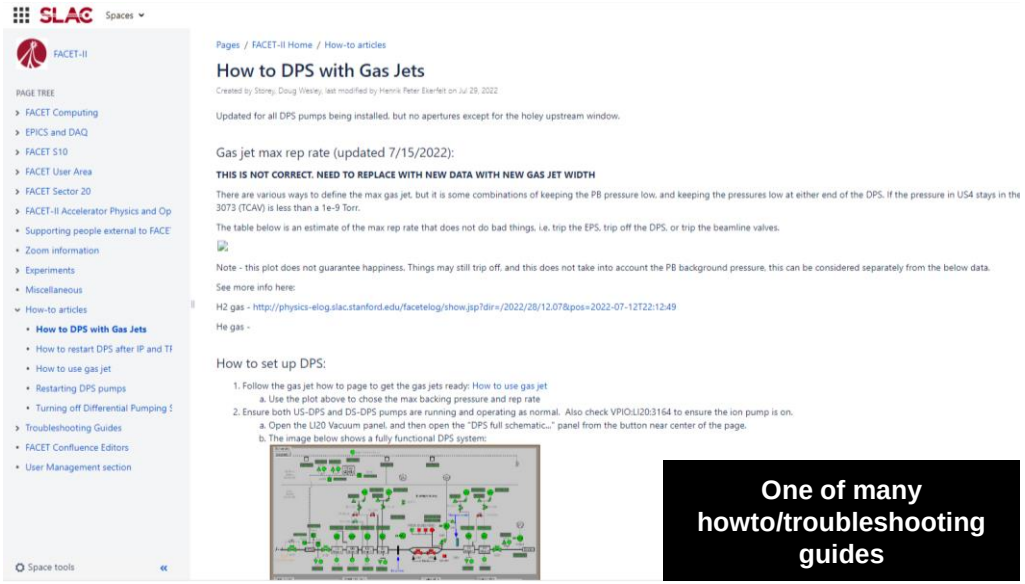
- FACET-II staff set up laser for experiment
- The planning was good enough such that laser was turned on for the experiment a couple of hours before it was needed so it was typically ready in time
  - Some issues with auto-aligner tool that were later resolved
  - Improvements seen over time (comment specifically on probe line)
- On the job training of users so they can use the laser takes time but it is done such that people feel more safe and confident
- In-situ laser training during access time is good (need to see the set up in person else complicated to follow)
- Lesson learned/improvement: Build/test setup in laser room or B244 (especially helps to identify the right sized parts e.g. posts prior to the access)
- FYI Improvement to work planning for laser work in progress- a questionnaire that aims to cut down on time reiterating work in the tunnel in development


Laser jocks

Talk later by Doug on DPS

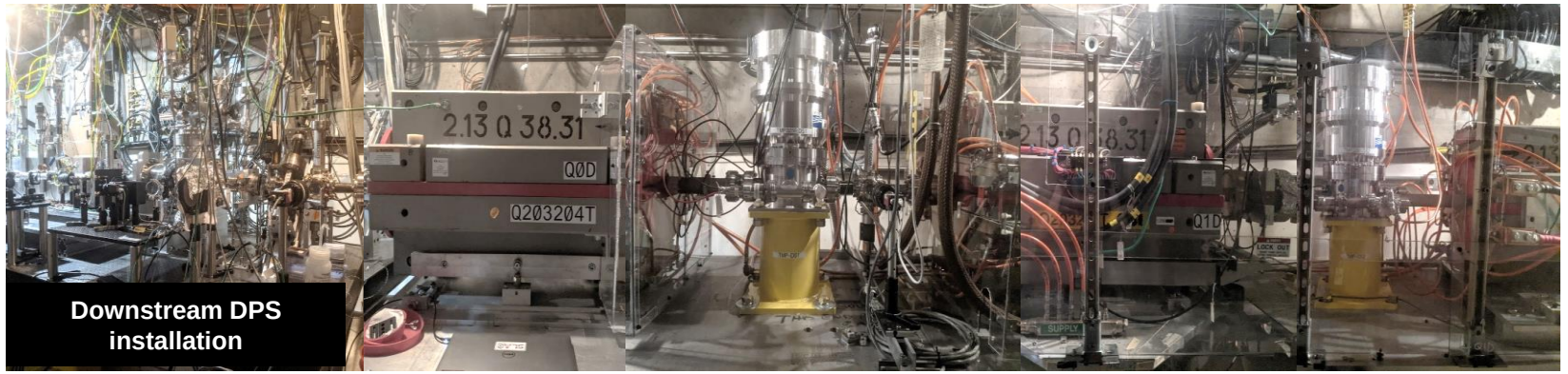
User experience: Vacuum/Differential Pumping System

- Operating well within the design parameters
- Until last couple of weeks, operated by expert Doug Storey
  - Procedures, watchdog etc. have been developed
  - Some limited user operation towards end of run
  - Expert on call by end of run rather than monitoring through shift
  - Hope to minimize failures that need expert intervention further
- FY23 improvements:
  - Building shielding around pumps. Deploy RADFETs for monitoring.
  - Training OPs on DPS system (session scheduled for November 3rd)
  - Adding N2 purge for improved pumping of H2
  - Remote gas control and regulator



One of many howto/troubleshooting guides

Need stable operation > week for lithium oven operation

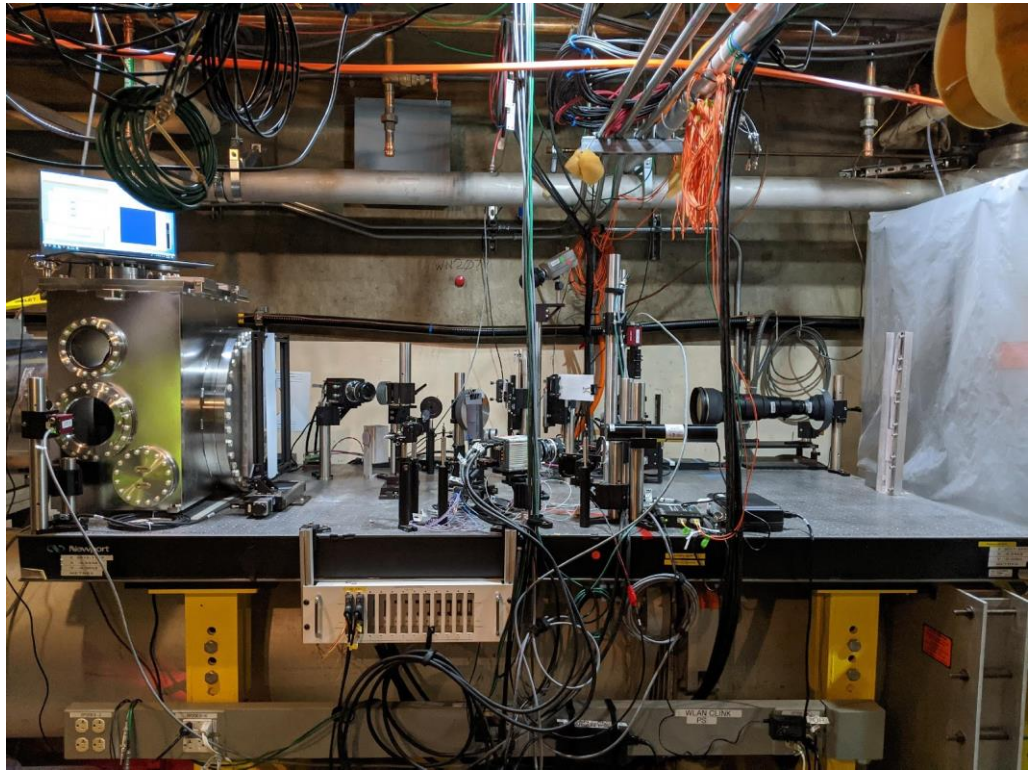


Downstream DPS installation

Talk later by Doug on diagnostics

User experience: Dump diagnostics, cameras

- Dump diagnostics were all set up with easy to follow instructions
- Cameras often stop responding due to radiation however there is a good job of automating and sharing a defined process for camera revival
- Huge increase in the number of cameras supported compared to FACET
  - Need to curtail growth and consider how to share/optimize the camera deployment to relieve maintenance efforts
- FY23 improvements:
  - BBA final focus and spectrometer
  - Deploy Matlab watchdog for cameras and foils.
  - Improve engineering of plasma oven table so OTR foils are in same location whether under vacuum or vented



>100 cameras installed!
~ 3 times number at FACET

FACET-II | Facility for Advanced Accelerator Experimental Tests

Questions?

FACET-II PAC Meeting 2022

October 25-27, 2022