

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

FACET-II PAC Meeting 2022

Christine Clarke / FACET-II User Manager / Test Facilities

October 25-27, 2022



Facility for Advanced
Accelerator Experimental Tests

Outline

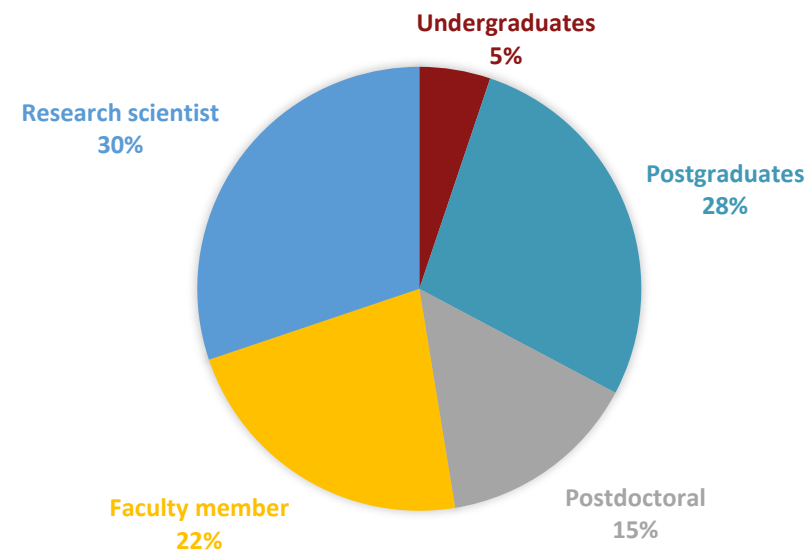
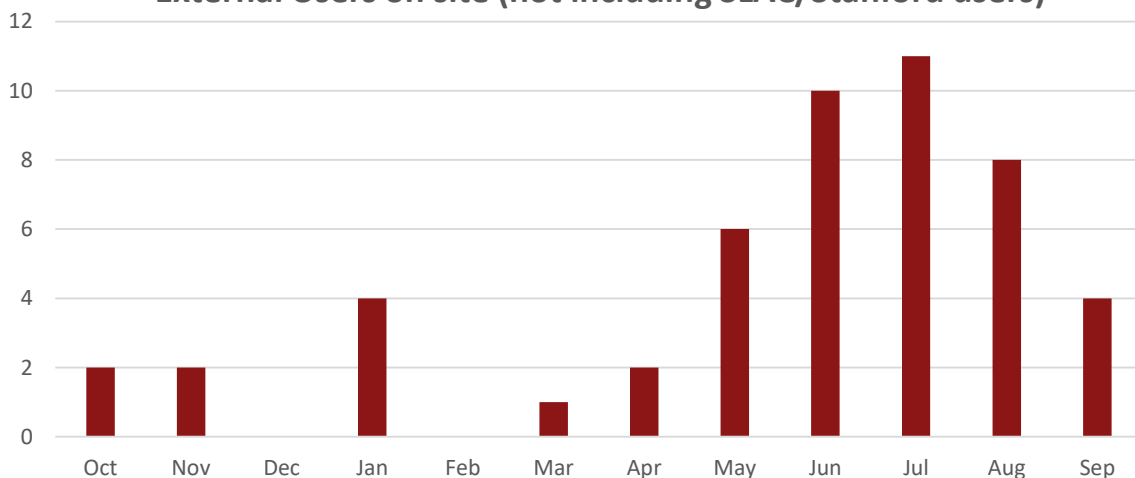
- Preliminary FY22 User statistics
- FY22 Experiment beam time breakdown
- User registration and onboarding process
- User training
- Experiment invitation and safety review process
- Installation work planning
- Beam time work planning
- User end of run feedback

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

External Users on site (not including SLAC/Stanford users)



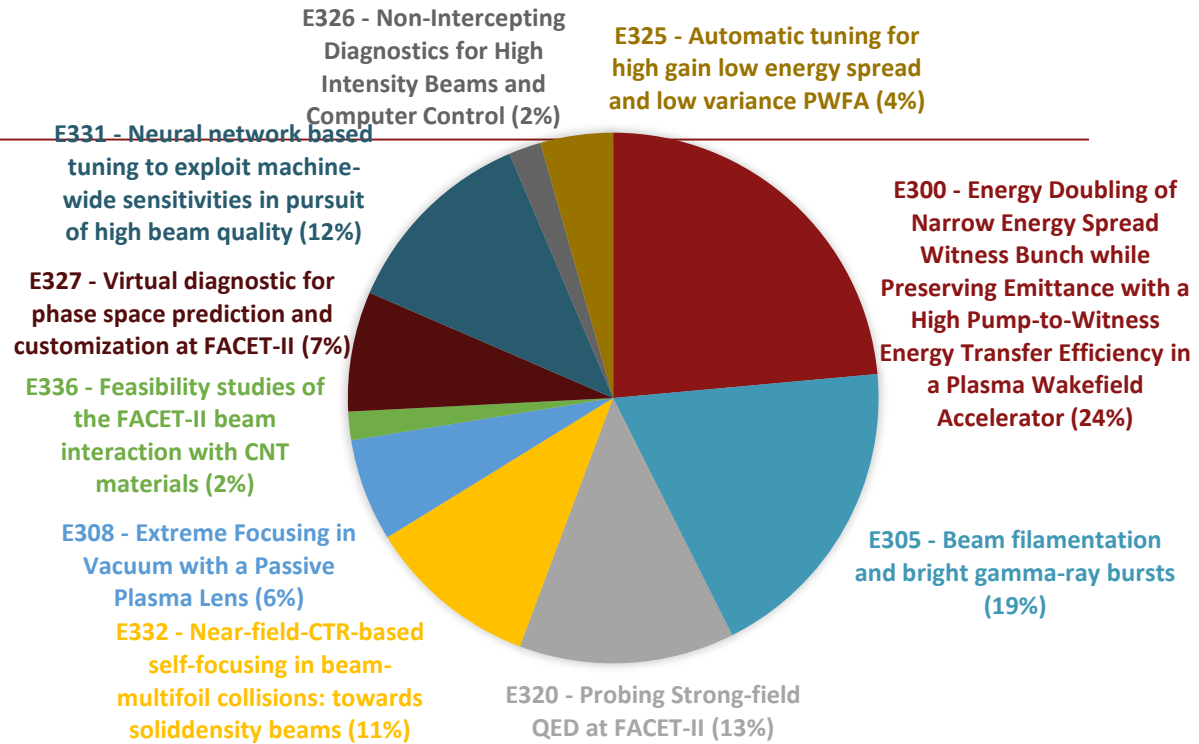
Nearly half of all FACET-II users are students or postdocs

FY22 Beam time

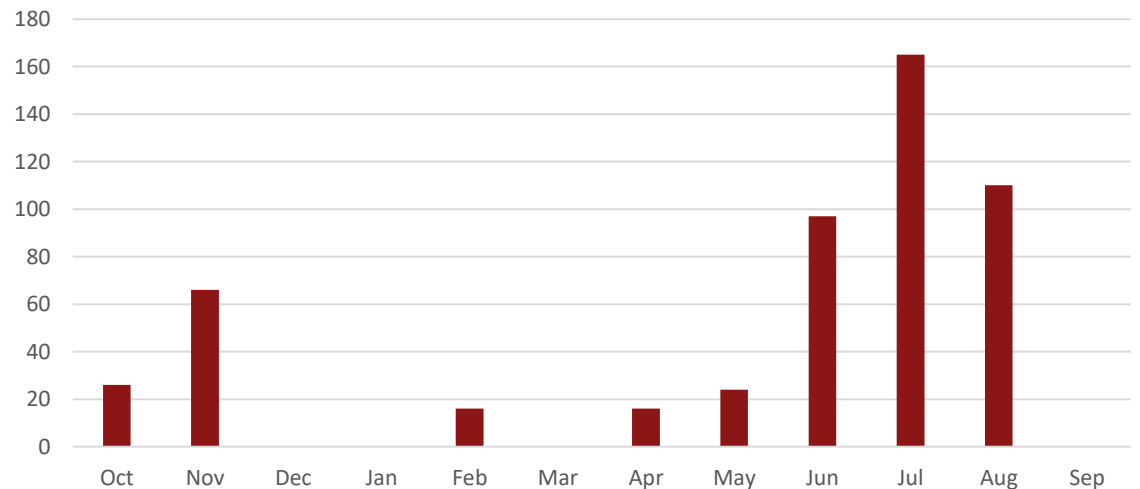
- 520 hours of beam time delivered to experiments
- 25% delivered to ML/AI and diagnostics
- Q1: Primary focus of Q1 was commissioning towards the objective KPP. Blocks of dedicated User time for ML/AI experiments.
- Q2: . Objective KPP values for beam emittance and bunch length are now routinely achieved. 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)



FY22 SUMMARY OF USER BEAM TIME DISTRIBUTION



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



The screenshot shows the SLAC website header with a search bar and navigation menu. The navigation menu includes: HOME, VISITORS, USERS, NEW EMPLOYEES, USEFUL INFORMATION, VUE CENTER, and FAQ. Below the navigation menu, there is a section titled "What brings you to SLAC?" with three columns of text and images. The first column is for "Visitor" (I am coming to SLAC as a sub-contractor or temporary worker...), the second is for "EM or FACET/Test facilities" (I want to perform experiments...), and the third is for "I would like to find out what resources are available to help me get started." A prominent link <https://vue.slac.stanford.edu> is displayed in the center. To the right, there is a "QUICK LINKS" section with links for Foreign Nationals, LCAs for H-1B/H-1B1/E-3 Holders, and Transportation. At the bottom right, there are links for Facility User Portal, SLIO, SLAC Site Security, and Emergency Information.



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:

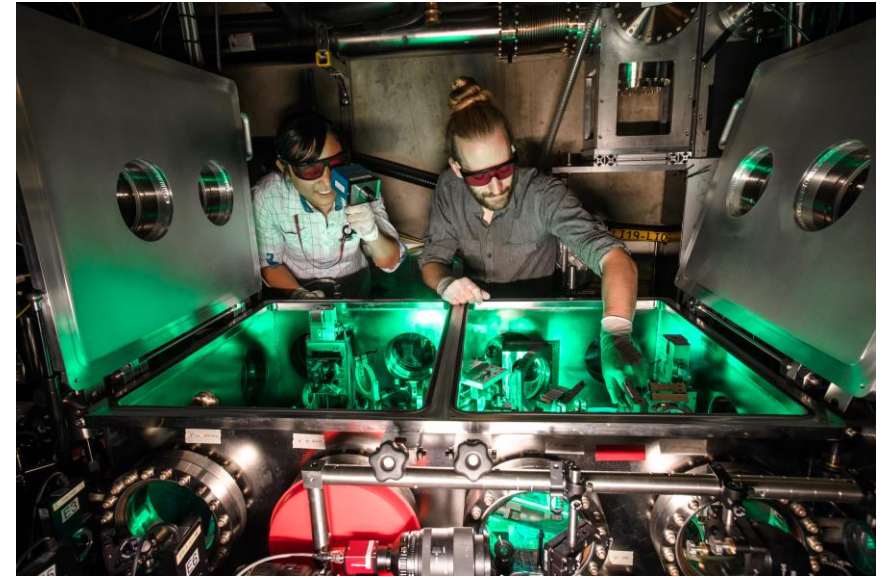
- Course 253 - Laser Worker Safety Training
- Course 131 - Laser Accidents/Lessons Learned
- Course 253ME - Laser Worker Baseline Medical
- Course 253PRA - Laser Alignment Safety Practical

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

Design

- Users and facility staff develop hardware design and operating procedures
- Facility staff identify safety training required
- Facility staff provide information for Radiological Safety review
- Facility staff perform Experiment safety review bringing in Subject Matter Experts as needed

Set-up

- Facility staff ensure user safety training complete
- Facility staff support users for hardware installation
- Facility staff do installation planning and coordinate Area Manager release

Review

- Facility staff confirm installation matches that approved in review
- Facility staff review user installation for readiness for beam time

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

	A	B	C	D	E	F	G	H	I	J
		Point of Contact / Coordinator	Experiment	CATER	Job Released / Approved?	Task	Task Lead	Personnel Working In Tunnel	Total Number of Workers	Job D (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										
4	10/16/2015	Christine	Plasma experiments	127187 - Rolled	Yes	Connect motors to pico controllers and test	Doug McCormick	Doug, Christine	2	
5	10/16/2015	Christine	Plasma experiments	127889 - Closed	Yes	Lift mechanism for the compressor box lid	Keith	Keith	1	
6	10/16/2015	Christine	Plasma experiments	127499 - Closed	Yes	Install new vacuum windows for laser	Doug	Doug	1	
7	10/16/2015	Christine	All experiments	127890 - Rolled	Yes	Install platform riser	Keith	Carl	1	
8	10/16/2015	Christine	All experiments	127553 - Closed	Yes	OTR camera installation and troubleshooting	Christine	Christine	1	
9	10/17/2015	Christine	Plasma experiments	127891 - Complete	Yes	Dump table diagnostics	James	James	1	
10	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										
13	10/23/2015	Selina	Plasma experiments	127187 - Closed	Yes	Connect motors to pico controllers and test	Doug McCormick	Doug, Christine	2	

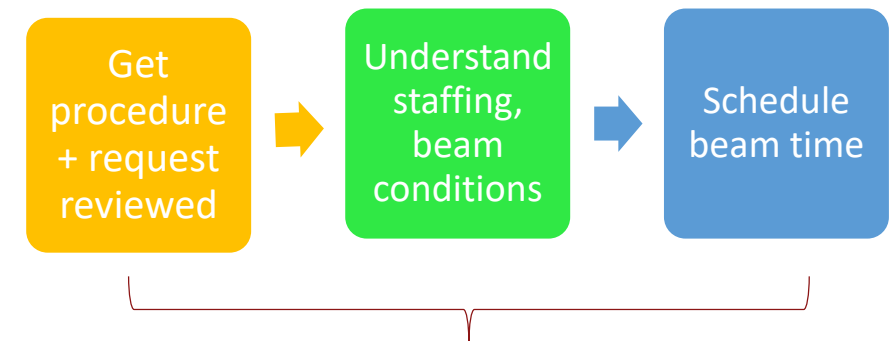
PAMM August 15-16					
Organizer:	Spencer Gessner sgess@slac.stanford.edu (914) 438-5934				
Before Access					
8:30	1	Update beam marks. Pre-align green laser. Check USHM and DSHM	Spencer, Lauren		
Day One (Monday, August 15)					
Start Time	Duration (hrs)	Activity	Personnel	Work Location	Hazard Control / 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

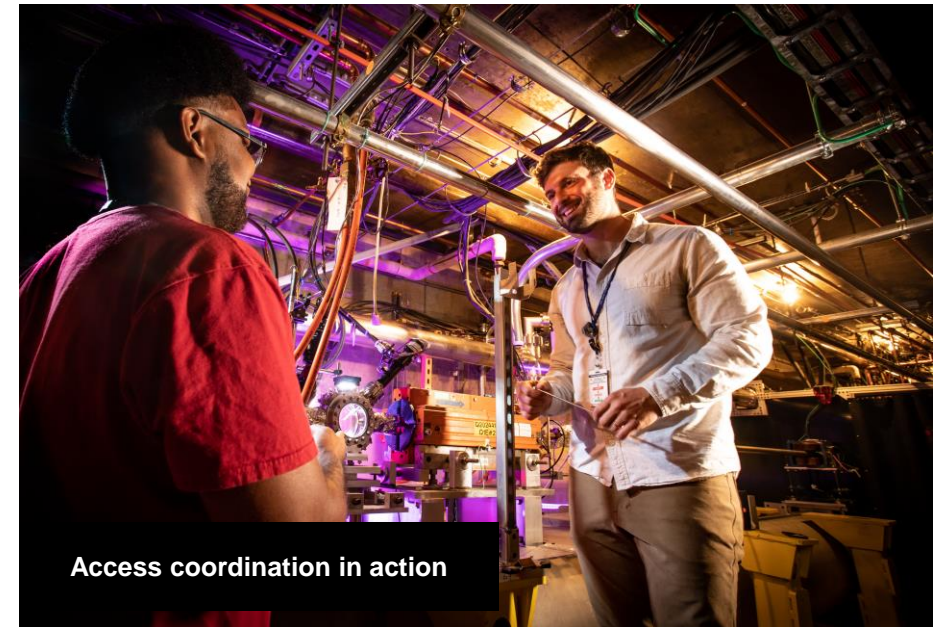
Experiment		SLAC POC	External POC
EOS/EOS-BPM	Duh	Spencer	Chris Doss
E-300	PWFA	Doug	Ken
E-305	Filimentation/Gamma	Henrik	Sebastien
E-308	Plasma lens	Henrik	Chris Doss
E-320	SFQED	Sebastian	
E-324	Plasma imaging	Henrik	Rafal
E-326	ML/AI ECA	Brendan	
E-327/331	ML/AI	Claudio and Auralee	
E-332	Near field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



Completed 2 weeks prior to anticipated beam time

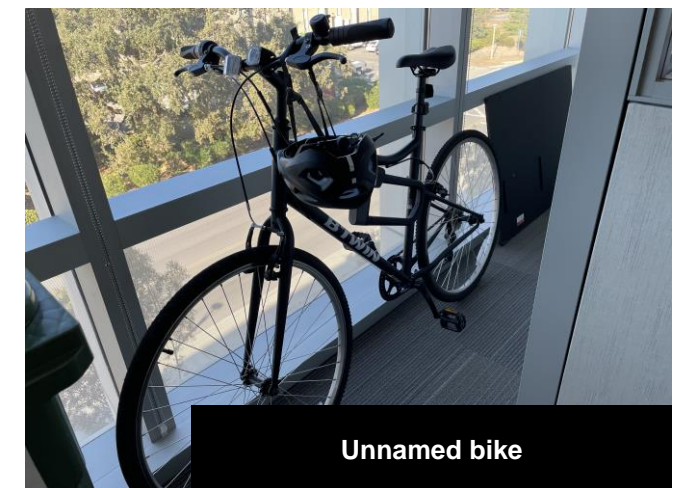
User experience: Work Planning

- 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



User experience: Coming on site

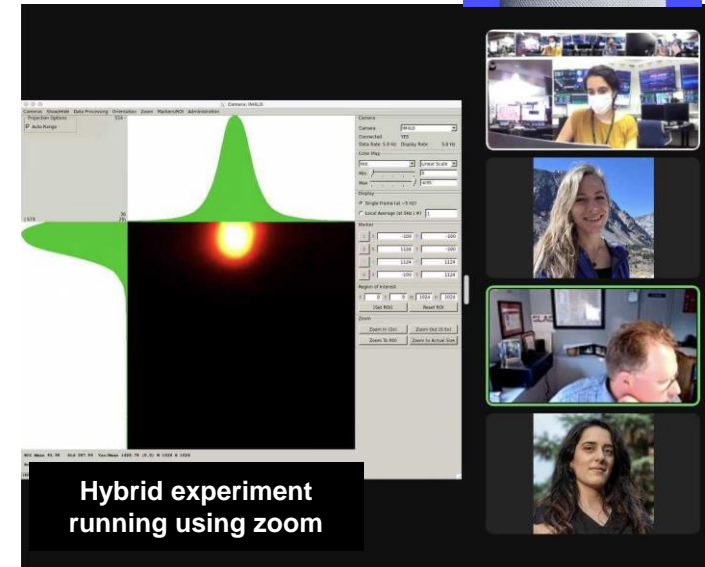
- Cubicles assignment – unclear process. Would be useful to have a FACET-II cubicle assigned and then have Nadya involved for overflow
 - Nadya has worked on this and reserved the large cubicle 315B.14 for FACET-II Users
- Bikes: one bike available – increase bikes. Neville (electric cart) also a hit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





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!



FACET Home Screen: Electron Beam Systems (on facet-srv01)

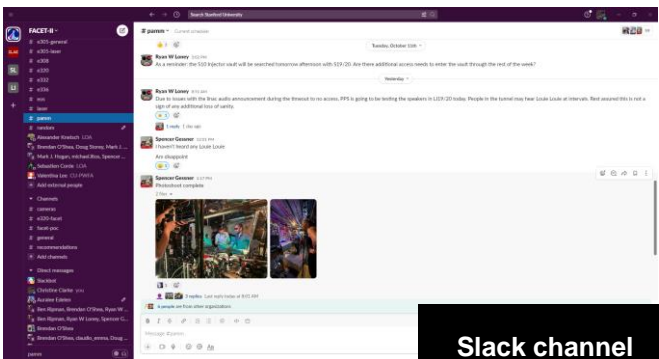
FACET Home Screen: Electron Beam Systems [Help] [Home Screen] [Exit]

Subsystems and Areas	All	Global	LI10	IN10	LI11	LI12	LI13	LI14	LI15	LI16	LI17	LI18	LI19	LI20	e+
BPM/Toro/FC/BLen															
Feedback	■														
Magnet			■	■	■	■	■	■	■	■	■	■	■	■	■
Profile Monitor			■	■	■	■	■	■	■	■	■	■	■	■	■
Wire Scanner			■	■	■	■	■	■	■	■	■	■	■	■	■
Collimator/Motion			■	■	■	■	■	■	■	■	■	■	■	■	■
Laser			■	■	■	■	■	■	■	■	■	■	■	■	■
RF			■	■	■	■	■	■	■	■	■	■	■	■	■
Event			■	■	■	■	■	■	■	■	■	■	■	■	■
Network			■	■	■	■	■	■	■	■	■	■	■	■	■
Watr/Pwr/Gas/Smok			■	■	■	■	■	■	■	■	■	■	■	■	■
Vacuum			■	■	■	■	■	■	■	■	■	■	■	■	■
Temperature			■	■	■	■	■	■	■	■	■	■	■	■	■
MPS			■	■	■	■	■	■	■	■	■	■	■	■	■
PPS			■	■	■	■	■	■	■	■	■	■	■	■	■
BCS			■	■	■	■	■	■	■	■	■	■	■	■	■
Experimenter			■	■	■	■	■	■	■	■	■	■	■	■	■

Applications

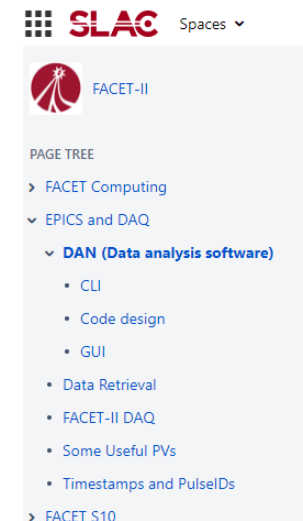
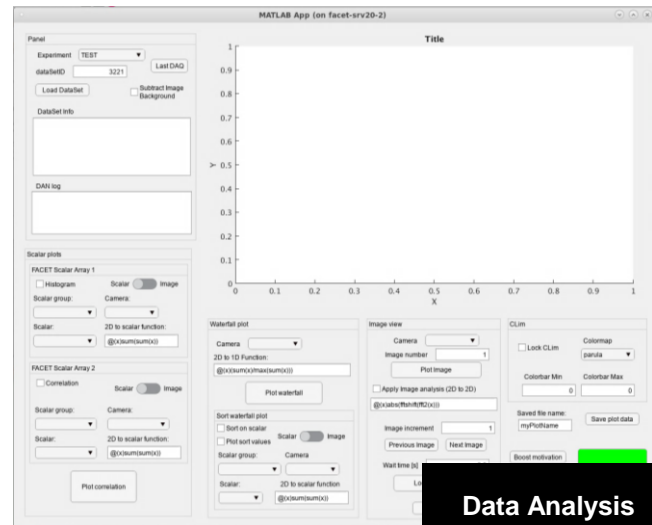
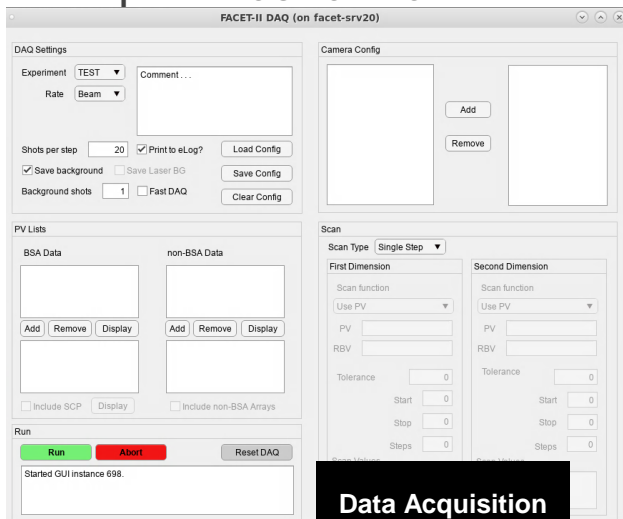
- User Dev Displays...
- Matlab GUIs...
- Operator Tools...
- Global Displays...
- SCORE...
- Archive Viewer...
- Strip Tool...
- Alarm Handler Tree...
- SCP...
- Message Log...
- Text Matlab...
- Terminal...
- MCC EPICS Knobs...
- Multiknobs - Java...

PRODUCTION Currently logging FACETHOME



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

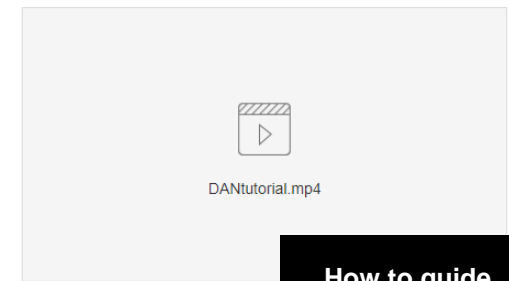


[Pages / FACET-II Home / EPICS and DAQ](#)

DAN (Data analysis software)

Created by Henrik Peter Ekerfelt, last modified by Christine I Clarke yesterday at 11:03 PM

The main purpose of the DAN software is to provide a quick way to visual Command Line Interface (CLI). The software is based on three main functi



How to guide

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



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

SLAC Spaces

FACET-II

PAGE TREE

- > FACET Computing
- > EPICS and DAQ
- > FACET S10
- > FACET User Area
- > FACET Sector 20
- > FACET-II Accelerator Physics and Op
- Supporting people external to FFACE
- Zoom information
- Experiments
- Miscellaneous
- How-to articles
 - **How to DPS with Gas Jets**
 - How to restart DPS after IP and TI
 - How to use gas jet
 - Restarting DPS pumps
 - Turning off Differential Pumping !
- Troubleshooting Guides
- FACET Confluence Editors
- User Management section

Pages / FACET-II Home / How-to articles

How to DPS with Gas Jets

Created by Storey, Doug Wesley, last modified by Henrik Peter Ekerfelt on Jul 29, 2022

Updated for all DPS pumps being installed, but no apertures except for the holey upstream window.

Gas jet max rep rate (updated 7/15/2022):

THIS IS NOT CORRECT. NEED TO REPLACE WITH NEW DATA WITH NEW GAS JET WIDTH

There are various ways to define the max gas jet, but it is some combinations of keeping the PB pressure low, and keeping the pressures low at either end of the DPS. If the pressure in US4 stays in the 3073 (TCAN) is less than a 1e-9 Torr.

The table below is an estimate of the max rep rate that does not do bad things, i.e. trip the EPS, trip off the DPS, or trip the beamline valves.

Note - this plot does not guarantee happiness. Things may still trip off, and this does not take into account the PB background pressure, this can be considered separately from the below data.

See more info here:

H2 gas - <http://physics-ellog.slac.stanford.edu/facetelog/show.jsp?dir=/2022/08/12/078pos=2022-07-12T22:12:49>

He gas -

How to set up DPS:

1. Follow the gas jet how to page to get the gas jets ready: How to use gas jet
 - a. Use the plot above to choose the max backing pressure and rep rate.
 2. Ensure both US-DPS and DS-DPS pumps are running and operating as normal. Also check VPIQI1203164 to ensure the ion pump is on.
 - a. Open the U20 Vacuum panel, and then open the "DPS full schematic..." panel from the button near center of the page.
 - b. The image below shows a fully functional DPS system:

Space tools

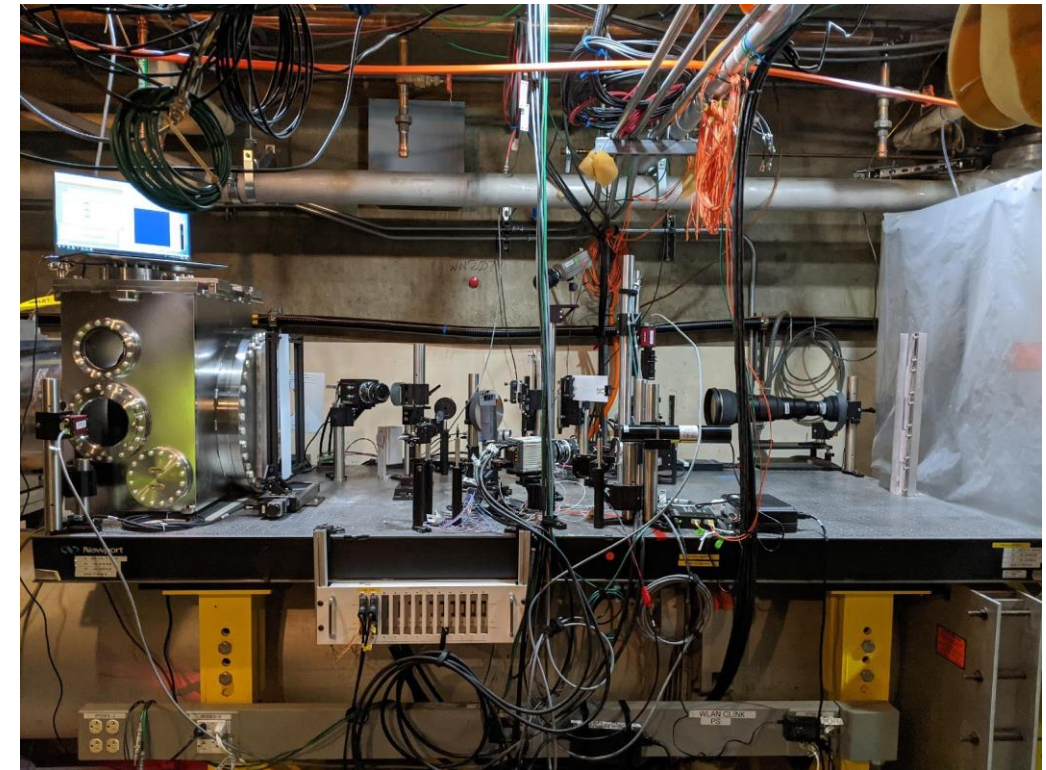
One of many howto/troubleshooting guides

Need stable operation > week
for lithium oven operation



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



Questions?

FACET-II PAC Meeting 2022

October 25-27, 2022