IoLaser Update

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ioLaser Group Meeting

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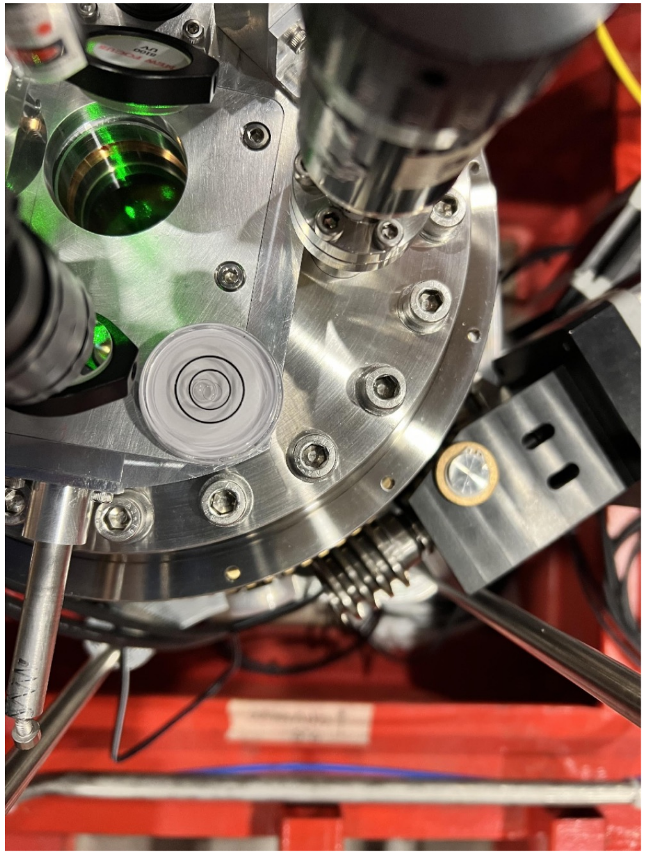
P2 feedthrough

- A small, ~1 degree tilt can be observed when scanning the laser vertically (using linear actuator)
- Preliminary tests suggest that it is the P2 feedthrough onto which the periscope is mounted, which is not perfectly level w/ the field cage
- P1 feedthrough has a port aligner feature, which can compensate for small tilts like this
- May need something similar for P2
- The angle will be measured more precisely using inclinometers.



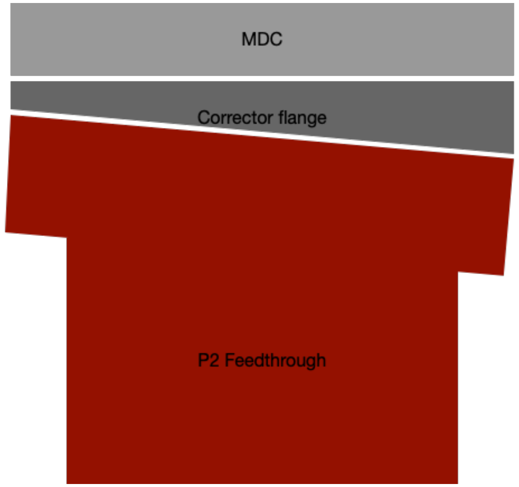
Next round of tests @CERN

- Install Periscope 1 onto its feedthrough in the fully retracted position
- Verify the clearance into the field cage while slowly driving the translation stage
  - Adjust the port aligner if needed
- Verify clearance w/ full rotation of P1
- Perform detailed alignment tests for P1
- Uninstall and store P1 Steel and Torlon

- Attempt to read out Pindiodes w/ visible alignment laser
- Measure P2 feedthrough inclination
  - Explore options to best compensate for the relative angle

Workarounds

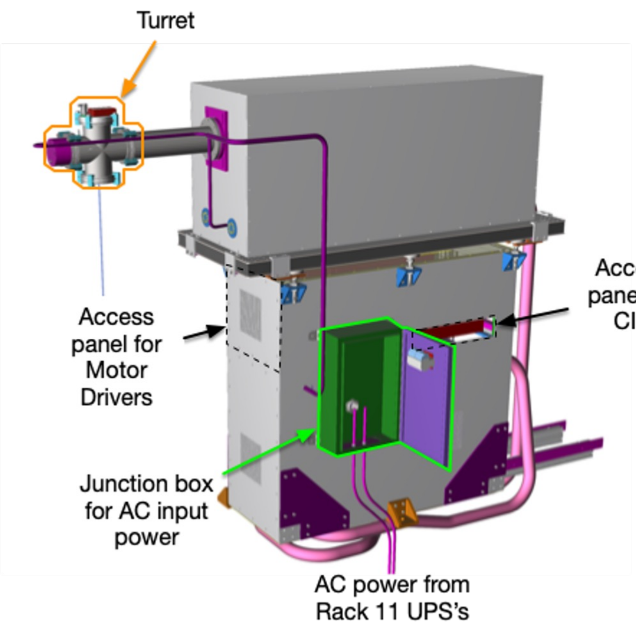
- Possible solutions:
  1. Machine the top nipple for P-2, to correct for the angle
     - No spares
  2. Design a corrector flange
     - Must not add significant height to the feedthrough stack
     - 1” double-sided flange?
     - 0.5° on each side to avoid issues w/ bolt-holes



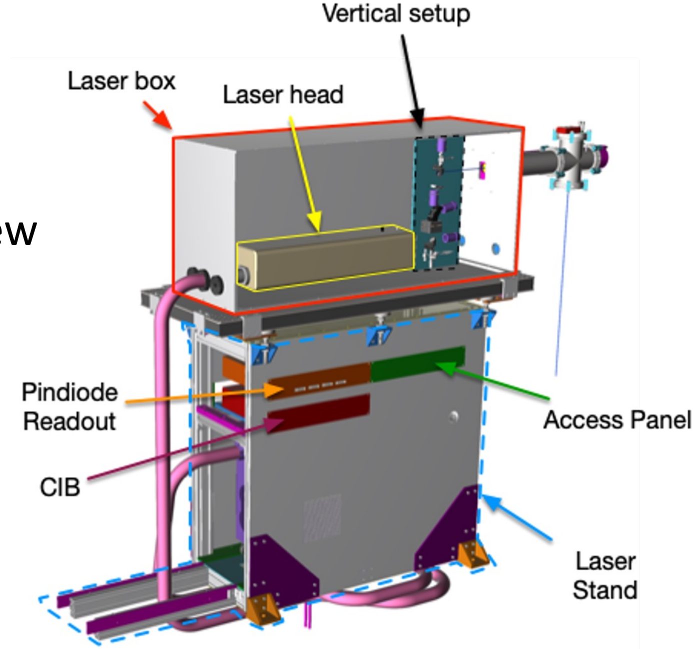
Cartoon depicting role of corrector flange. The tilt here is exaggerated for illustrative purposes.

Next steps

- Ship remaining parts of the laser systems
  - including: lasers, laser stands, and turrets
- Assemble and install laser tents for P1 and P2
  - Awaiting tent material
- Assemble and install the laser systems:
  - Interlock safety system
  - Electrical components and control devices
  - Vertical setup for guiding and conditioning the UV and alignment lasers
  - Cable routing and shielding
- Integrate w/ the Slow Controls and DAQ
  - See [Nuno's talk] on the Calibration Interface Board (CIB)



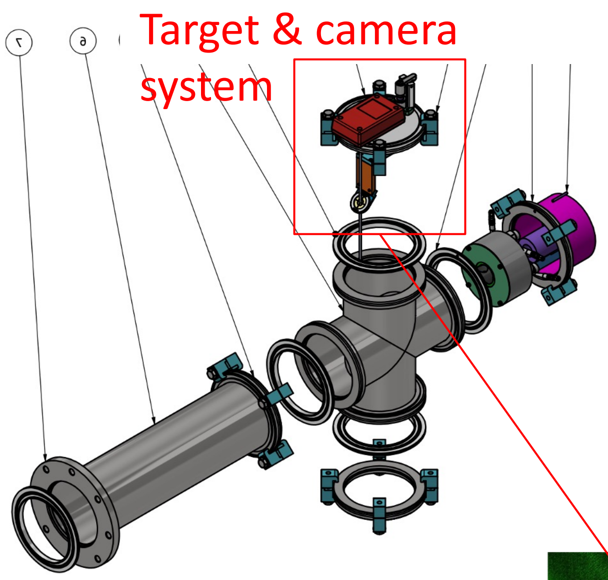
Laser stand view 1

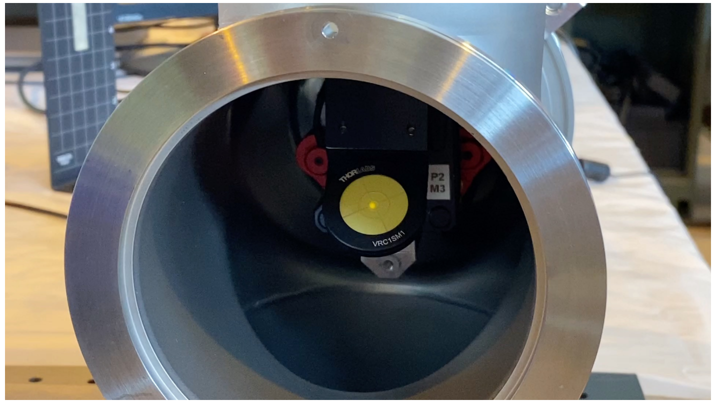


Laser stand view 2

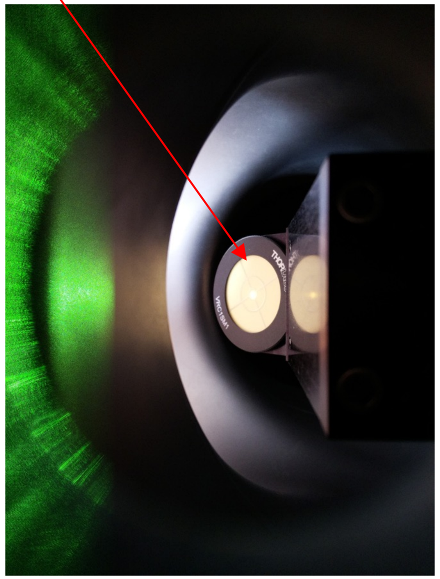
Ongoing work @LANL

- Turret target alignment system tests (bottom)
- Control code development and integration
- Planning cable shielding and routing for instrumentation
- Packing and shipping
  - Second set of plywood assembly bases to help w/ staging the periscopes
  - 80/20 frame for Power and Controls Box
  - Blank 8” flange
- Laser work (slide 9)





Target swings into place and can be used to check UV/Vis. Alignment, w/ 45° mirror remotely



Turret alignment RPi V2 camera view

Turret alignment plate

- Designed, ordered, and received mounting plate for the 4-way cross
  - Used to simplify the process of aligning the 4-way cross to a reference laser
  - Reference laser used to pinpoint the central axis of the the turret to then adjust the position of the movable target

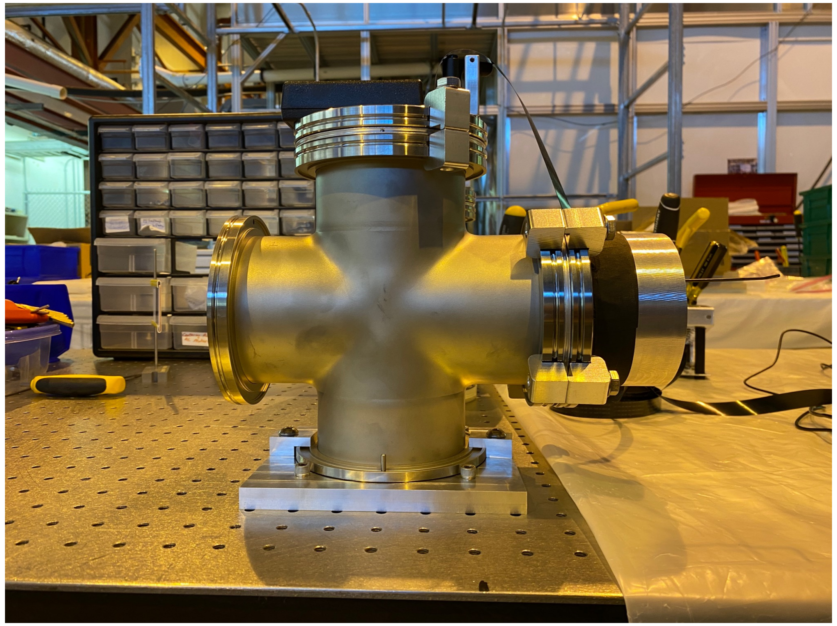
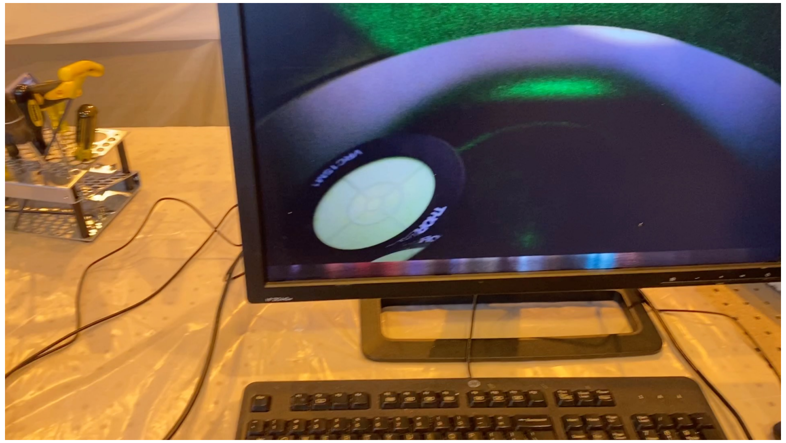


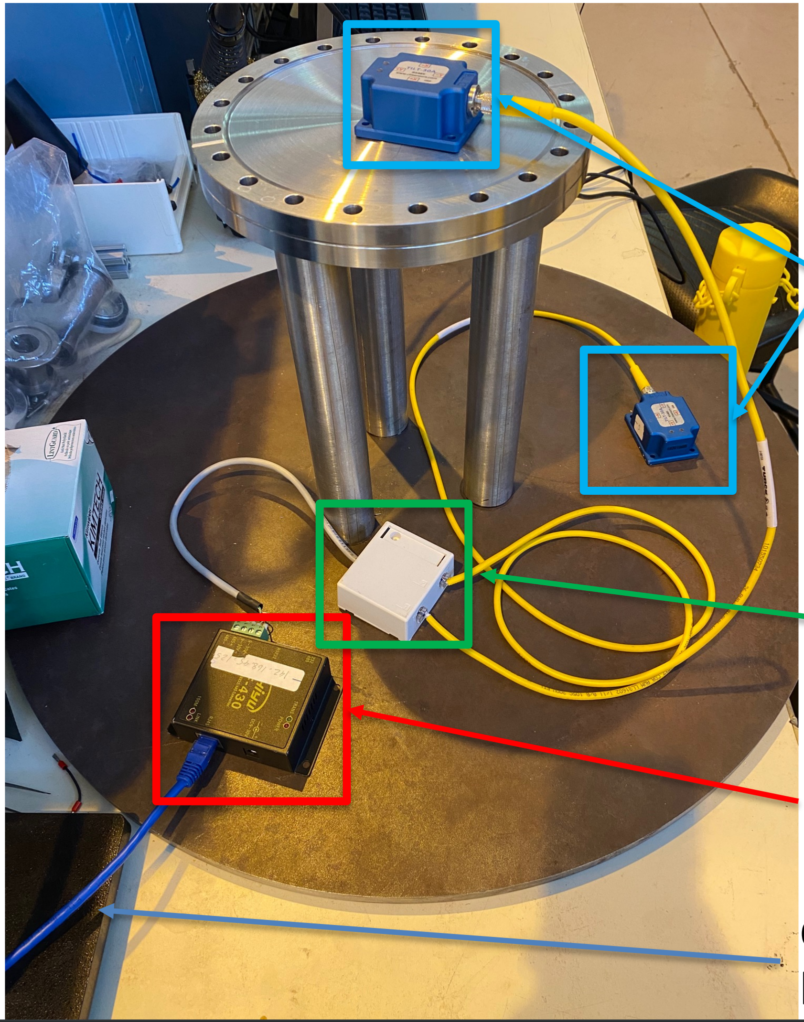
Plate mounts onto optical breadboard and has a matching alignment pin to fix turret orientation

RPi camera view



Tiltmeters

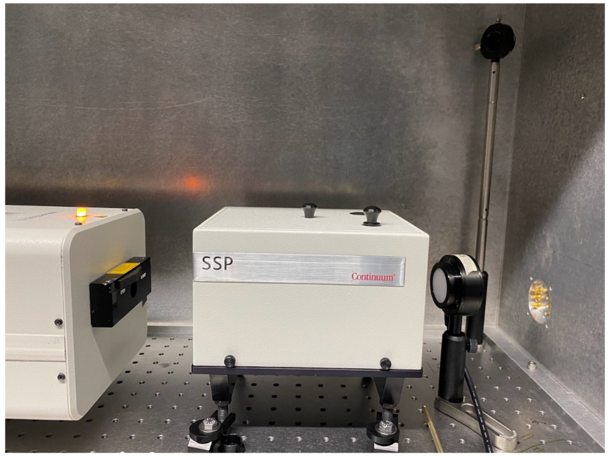
- Incorporated TCP/IP converter (BF-430)
  - Socat used to create virtual serial device over network
  - No Beagle Bone required for readout
  - Can also read out sensors directly via USB (RS485-USB cable)
- Leon Tong reworked/improved existing readout code
  - Titlmeter class defined within the IoLaser controls library repo
  - Configurable through JSON



t (s)	N	Acc	x (milli-g)	Acc	y (milli-g)	Acc	z (milli-g)	Inc	x (degrees)	Inc	y (degrees)	Rot	z (degrees)		TempxChecksum
1675179264.6	5	7.74	0.287054	0.7	0.409878	1000	0	0.442	0.0172047	0.042	0.0231517	5.32	2.85125	19	0
1675179269.6	25	7.572	0.326827	0.692	0.305837	1000	0	0.4332	0.0189145	0.0392	0.01853	5.228	2.29879	19	0
1675179274.8	25	7.58	0.313688	0.604	0.212565	1000	0	0.4344	0.0185645	0.0348	0.012687	4.58	1.56895	19	0

Laser work

- Ramping back up on laser activities. Current plan includes the following for Laser 3:
  - Measure raw 1064 nm yield
  - Re-tune the Harmonic Generators (HGs) and measure 532 and 266 nm yields
    - Following the methods defined for Laser 2 in 8/2022-9/2022, using the Surelite Separation Package (SSP)
  - Optimize the pump voltage for target energy of 50-60 mJ of 266 nm
  - Measure laser energy stability (4 hour test)
- Re-align w/ vertical setup and test the fast shutter w/ UV
- Measure the level of EMI produced by the laser
  - Ordered E-field and B-field probes
  - Minimize EMI using cable shields and/or common-mode chokes where applicable
- Study the heat produced by the laser (using thermal imager)
  - Mount fan modules to properly dissipate heat

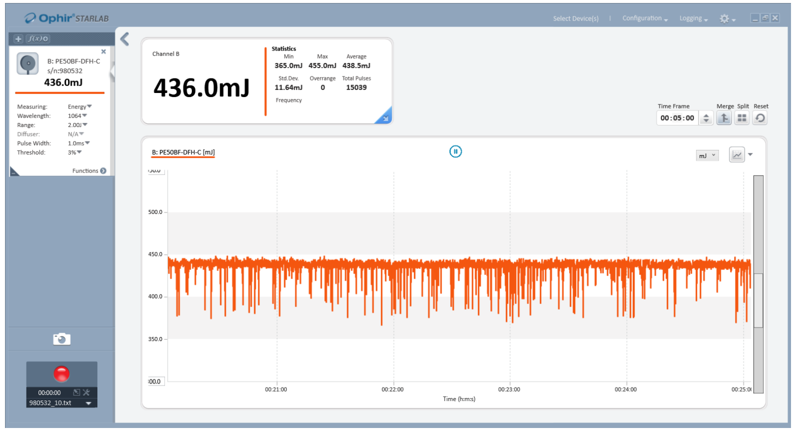


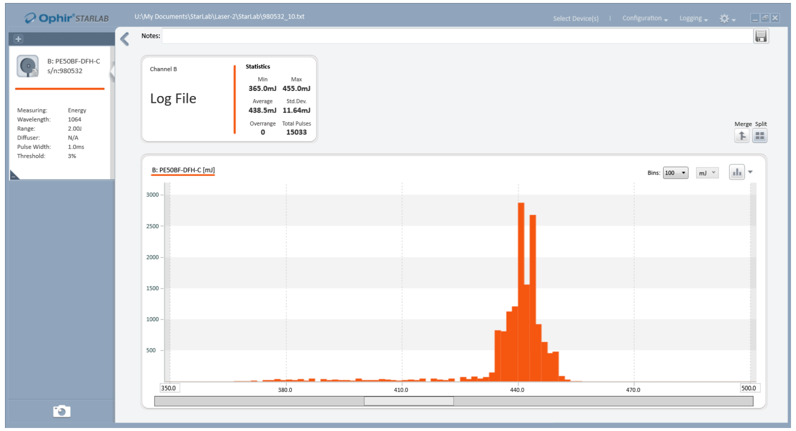
Wavelength separator module used to measure 1064nm, 532nm, and 266nm yields

Laser 3

- Used for periscope commissioning tests in 2022
  - Originally tuned to yield 70 mJ
  - Some 532nm contamination may have been present
- Water was removed during long period of inactivity
  - Re-filled last week
- Removed second and fourth HGs to measure the raw 1064 yield for L3 at nominal settings
- 1.29 kV pump voltage, 190 us Q-Switch (QS)
  - originally 185 us, but changed during tech visit in 2022 to 190 us

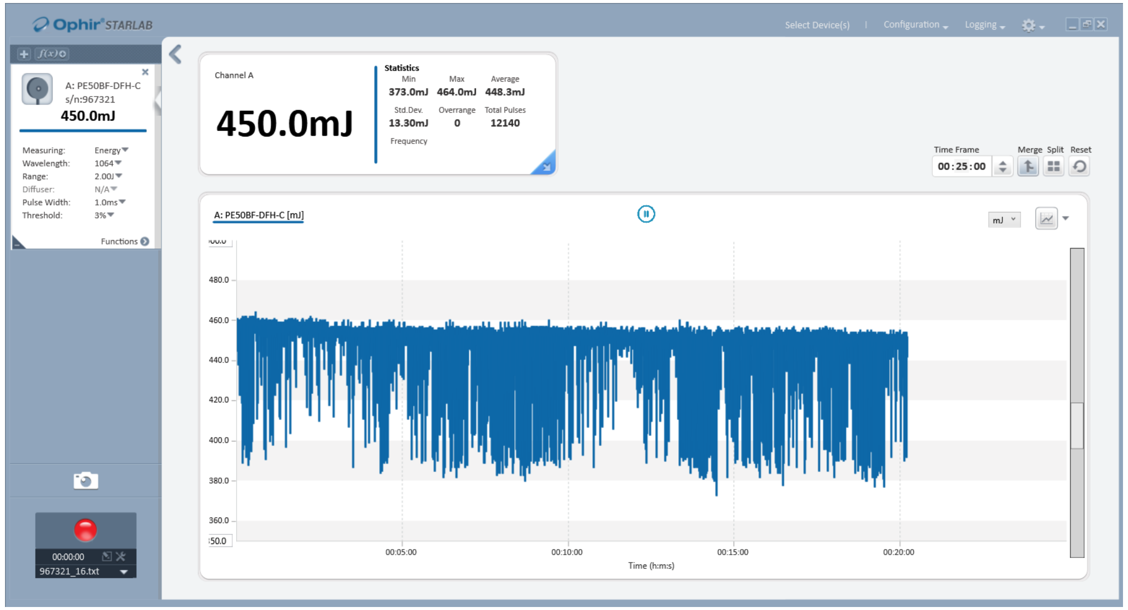
- 440 mJ measured but with large, negative deviations…

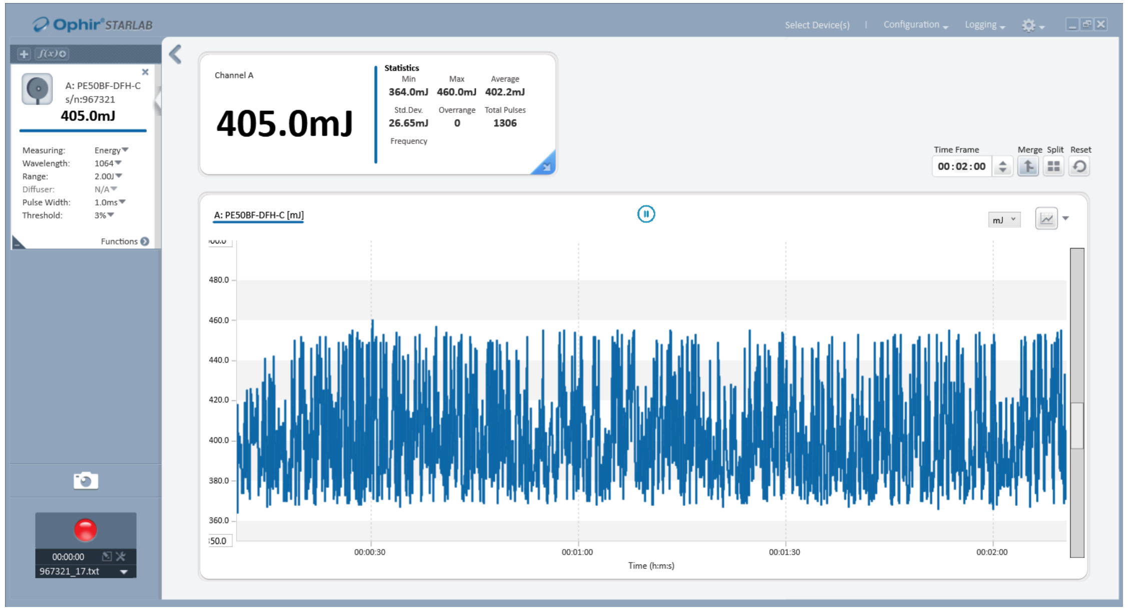




185us QS

- Same behavior observed w/ another energy meter (top) w/ the nominal setting of QS=190 us
- Changed back to the original QS of 185 us and noticed a much larger RMS (bottom)
  - Consistent w/ observation during tech visit of a large RMS yield for 266 nm (we did not acquire 1064 for any long period of time during visit)





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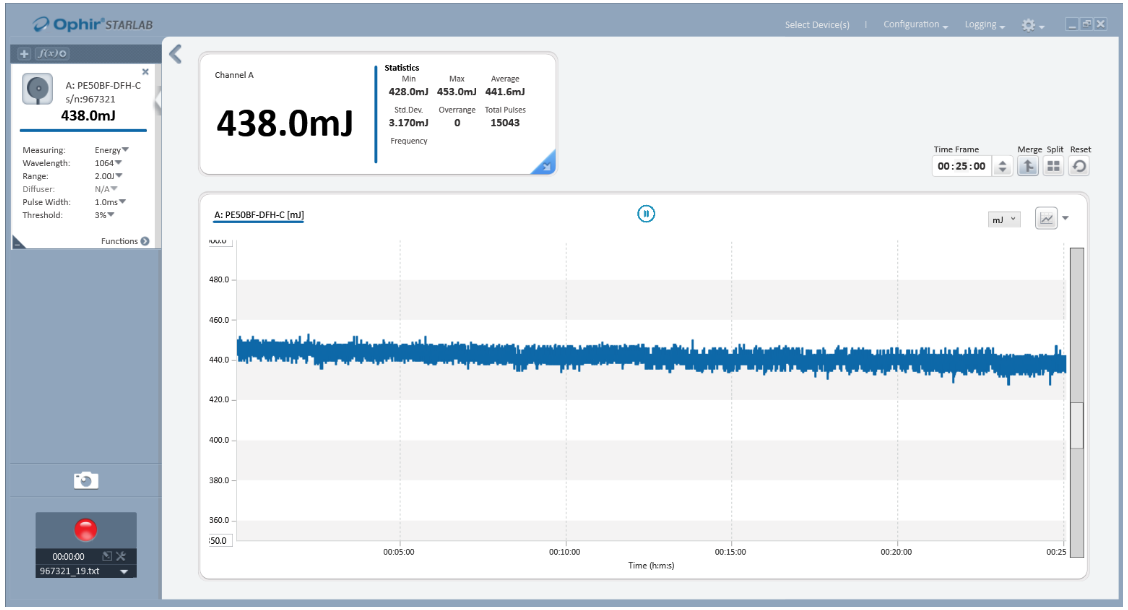
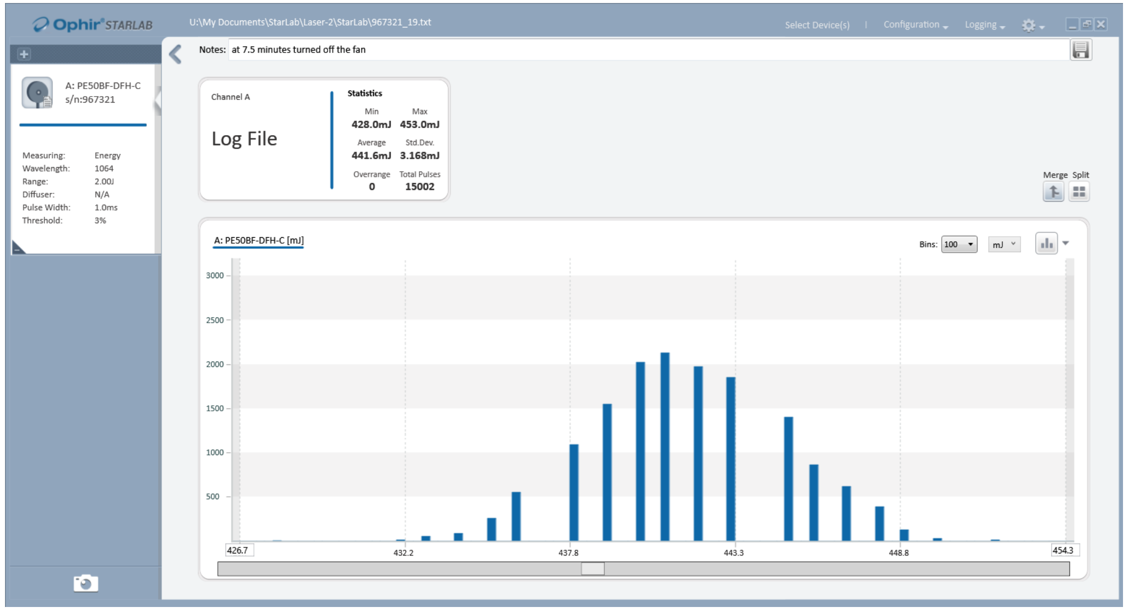
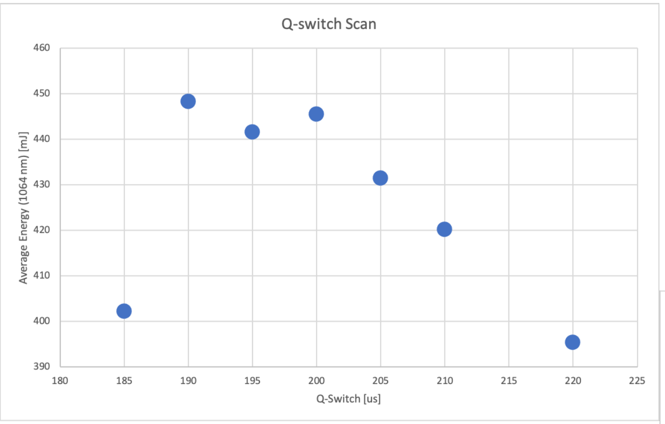
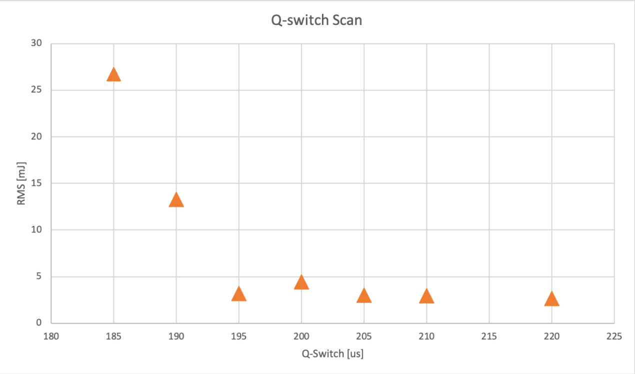
195us QS

- Raised the QS to 195 us and repeated measurement
- Laser behaved much better!
- In progress: Scanning QS









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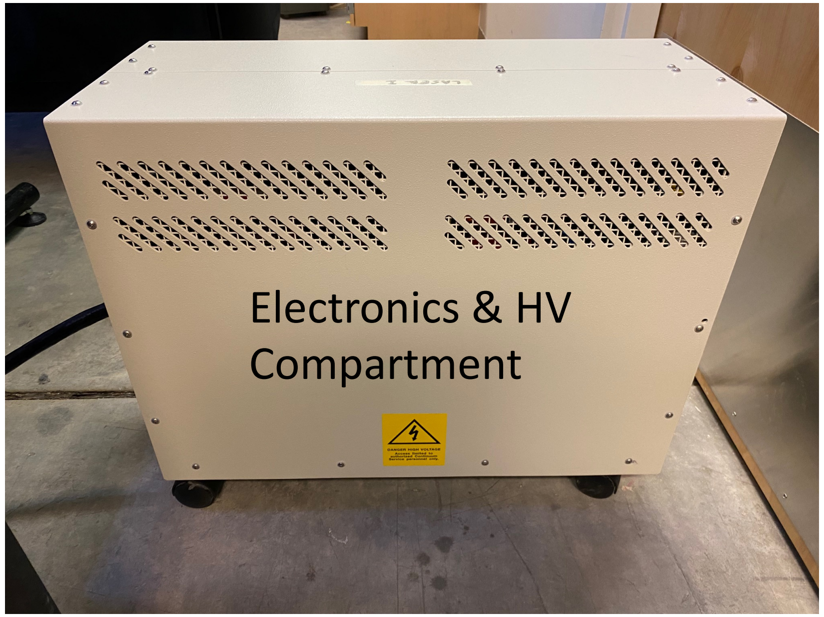
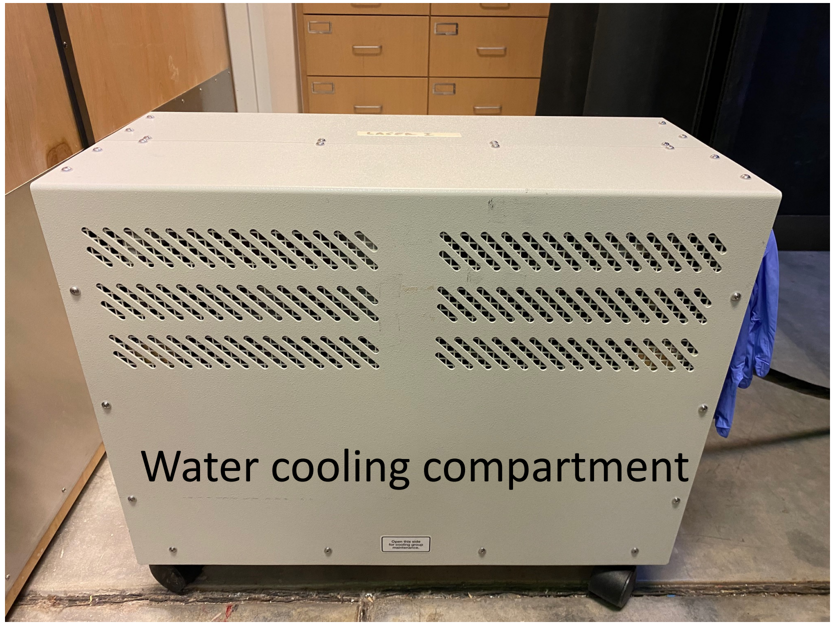
Back panel





Front panel

BACKUP

Electronic Shutter, 25 mm Aperture, 40 Hz Exposure Frequency

MODEL: 76994

$2,610

3 Weeks

1 Add to Cart

Compare Add to List

Product Series Overview

Electronic Fast Shutters

The 76994 is useful for detector protection and gating at frequencies of up to 40 Hz in burst mode. Burst frequency rating is specified for four seconds maximum with one minute minimum between bursts. In continuous mode (defined as the shutter minimum exposure pulse), the shutter operates at 10 Hz. This shutter features a 25 mm aperture.

– Specifications

Type	Electronic Shutter
Flange Series Size	1.5 Inch
Aperture Diameter	25 mm
Maximum Frequency	40 Hz (burst mode) 10 Hz (continuous)
Delay Time	3.9 ms
Rise Time	3.9 ms
Fall Time	6.5 ms
Minimum Pulse Width	13.0 ms
Damage Threshold	5 W/mm^2
Operating Temperature	0 - 80°C
Mounting Holes	1/4-20
Weight	0.4 kg