Development of Pcal Tx module 20170731

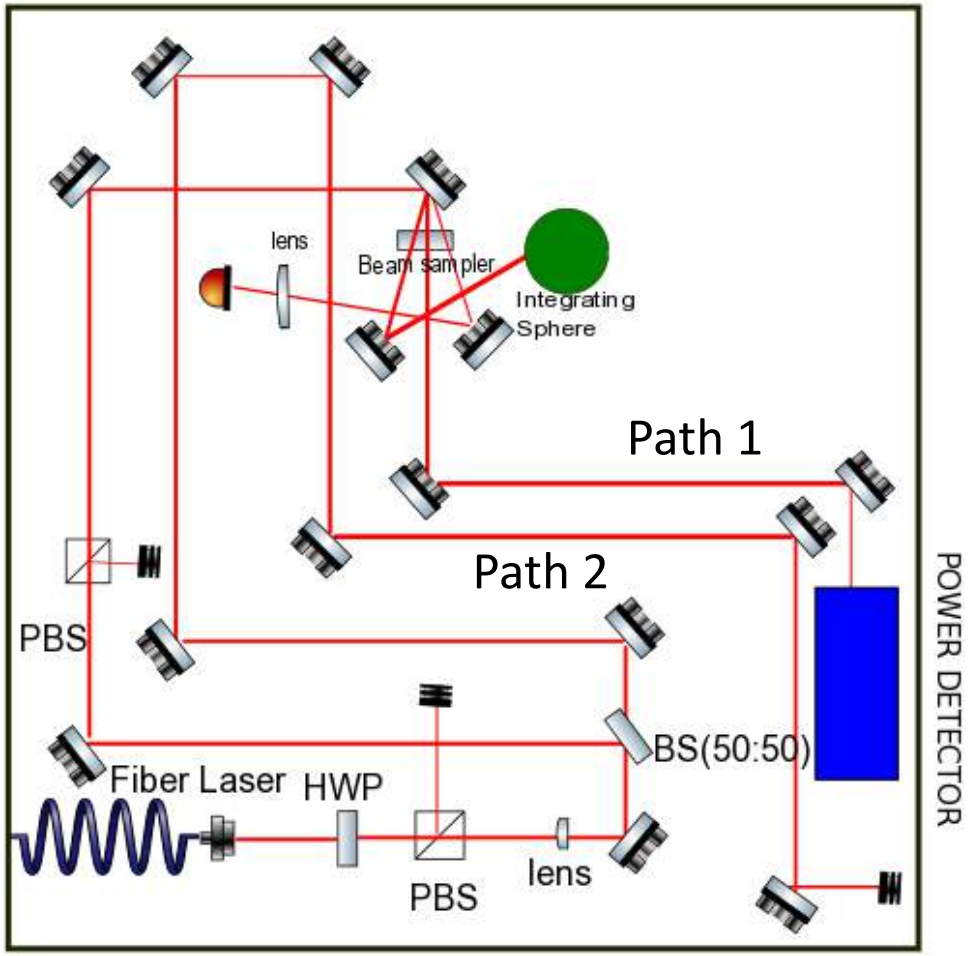
Bin-Hua Hsieh

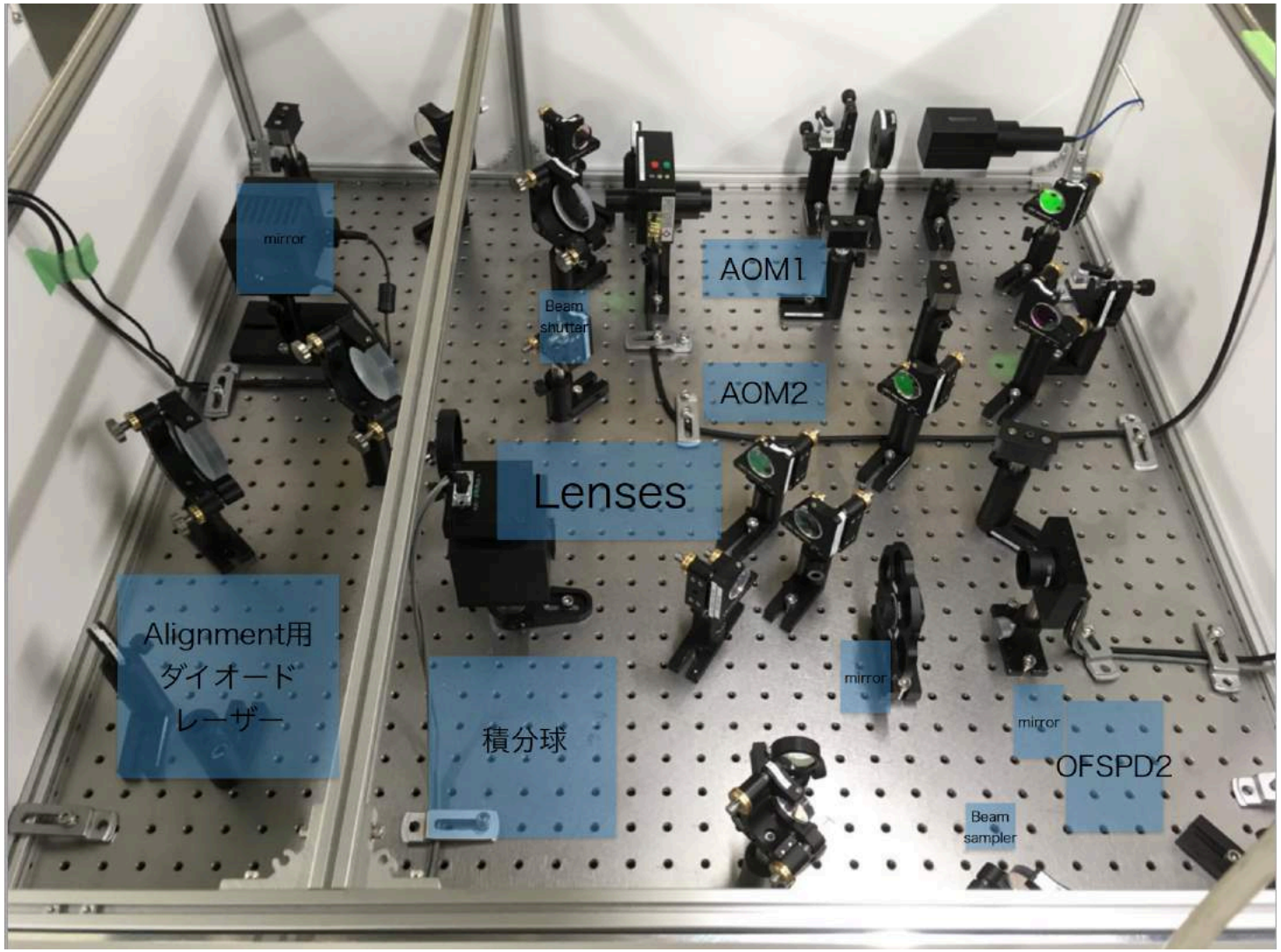
Outline

- Tx module optical setup
- Output measurement
- Beam Shutter
- Optical Follower Servo
- LabJack DAQ box

Optical setup

Transmitter module





Steps

- Align the optical components and test the output power of two paths (should be a half of the input power).
- Test the relation between HWP plate and output power
- Use beam profiler measure the beam radius and calculate the beam waist
- Using Mode matching decide the position of AOM

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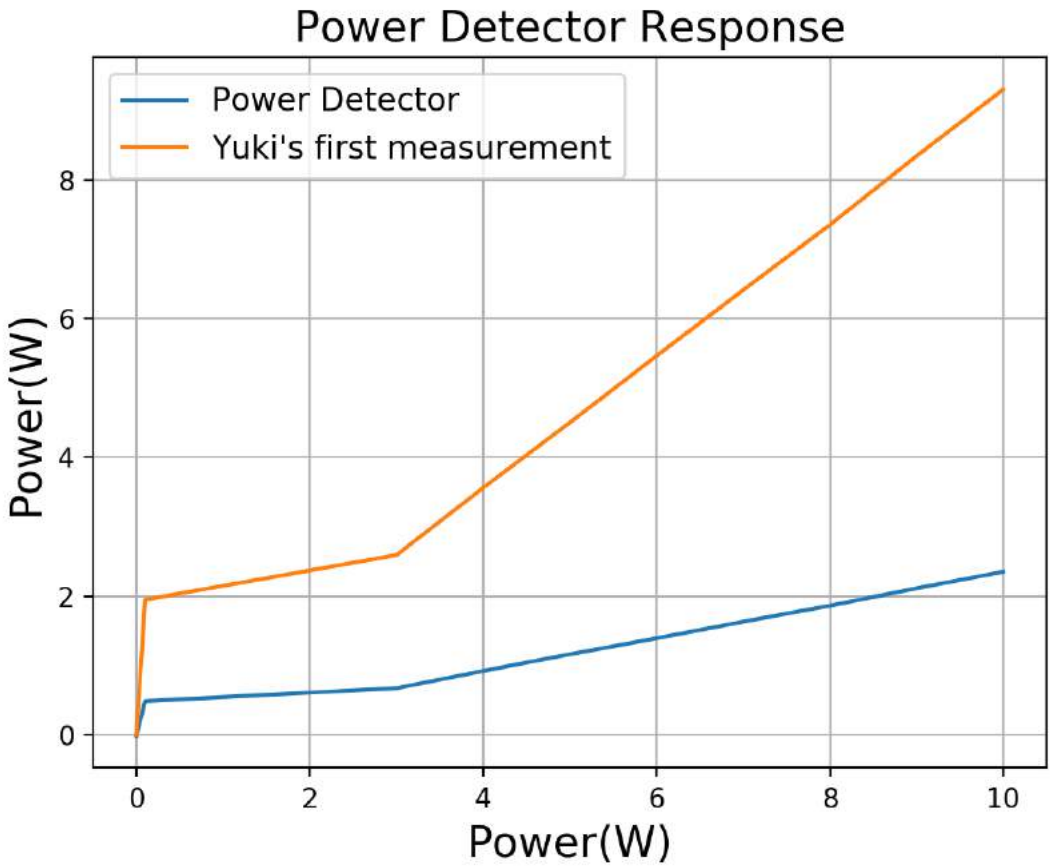
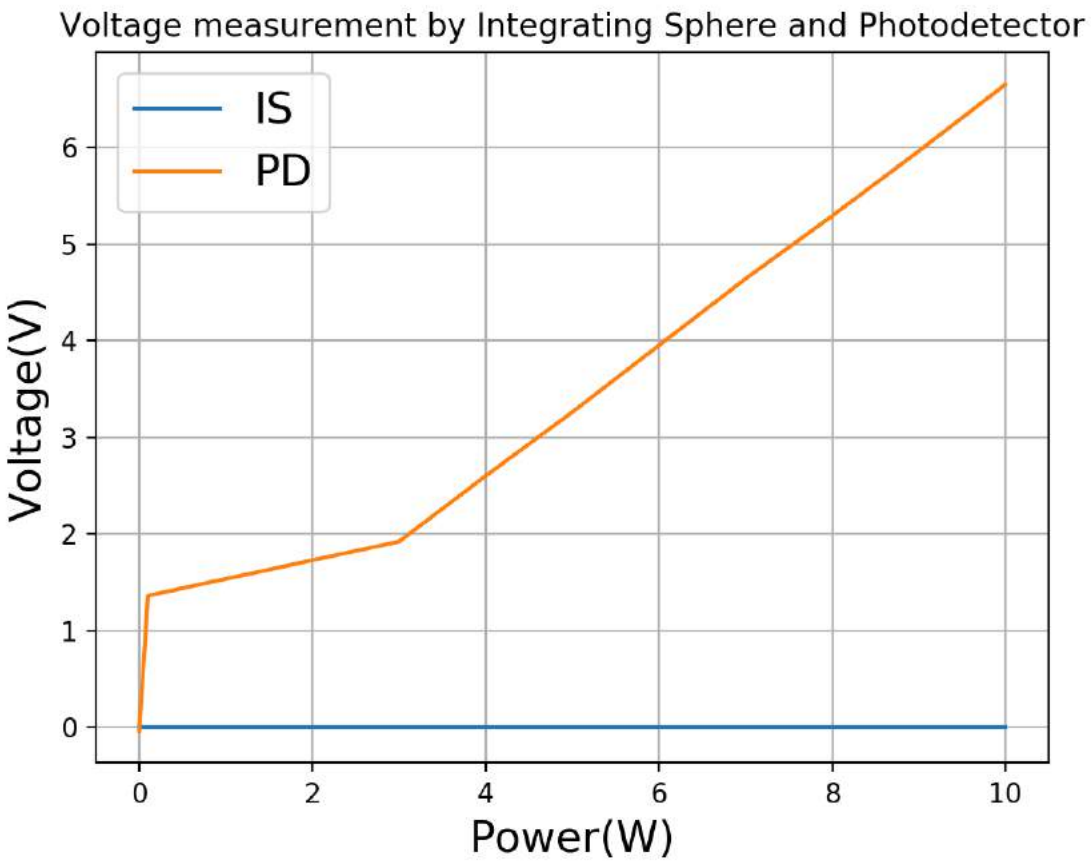
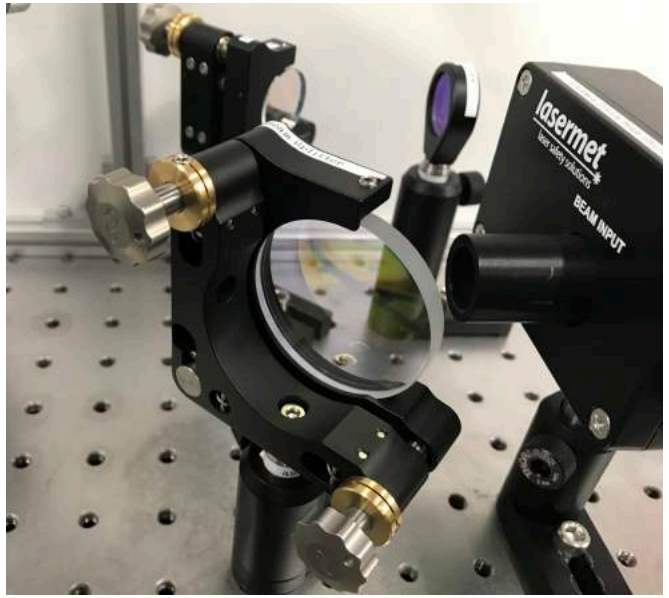
Result


Power Detector Response
Power Detector
Yuki's first measurement
Power(W)
Power(W)
0
2
4
6
8
0
2
4
6
8
10


Voltage measurement by Integrating Sphere and Photodetector
IS
PD
Voltage(V)
Power(W)
0
1
2
3
4
5
6
0
2
4
6
8
10

Output Power Test

- Problem 1: No signal on Integrating Sphere
  - The BNC to banana connector was broken
  - Solution: Change the connector
- Problem 2: Output power was much lower than Yuki's first measurement
  - The beam splitter was a non polarized one, and the quality is not good, which split the beam on both surfaces of the beam splitter, generating two beams.
  - Solution: Change beam splitter into p-polarized beam splitter
- Result
  - We measured the power of both two beams were around 0.9W, which corresponds to the input power.



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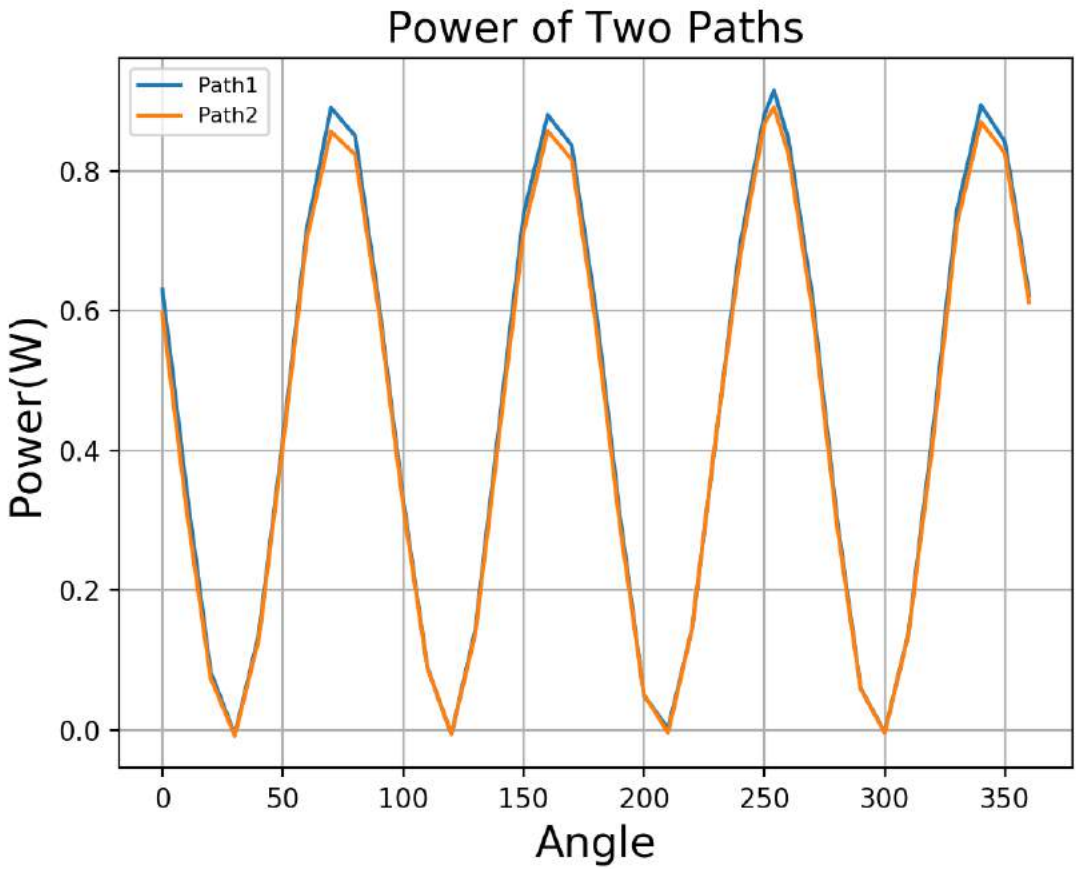
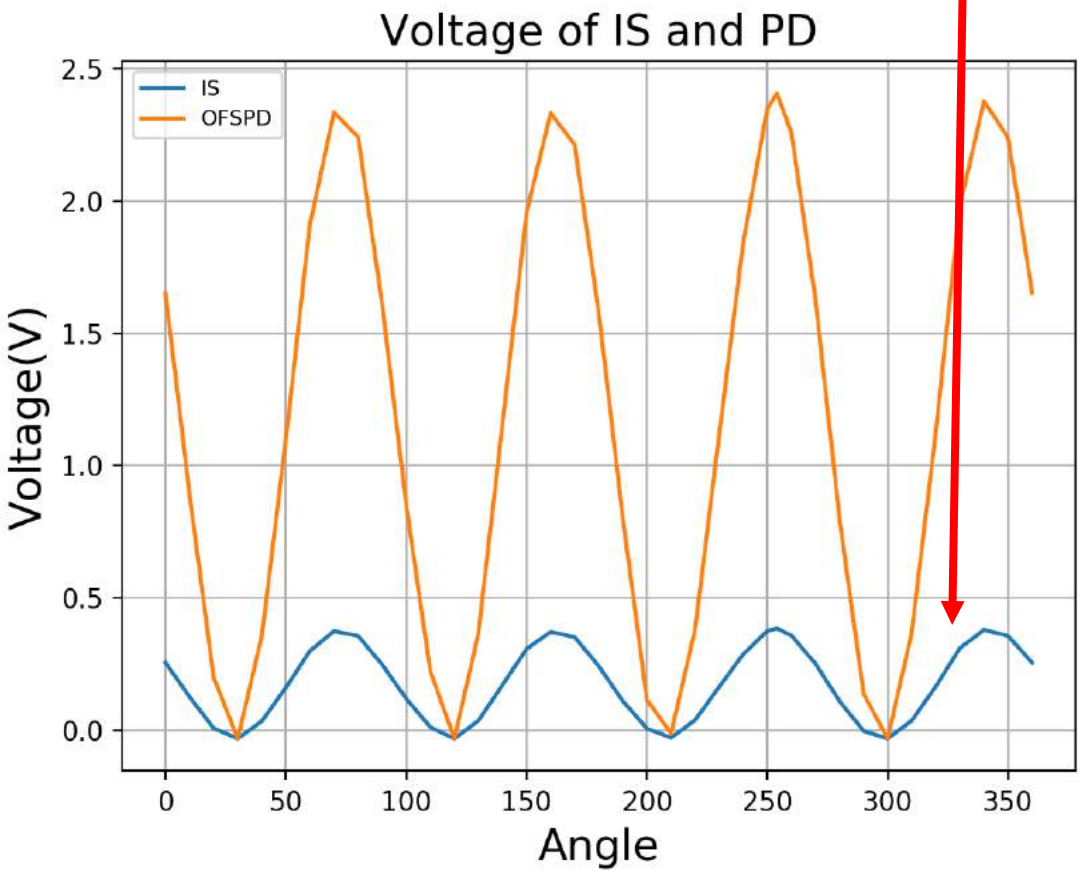
Result

Need to change the impedance of the integrating sphere





Steps

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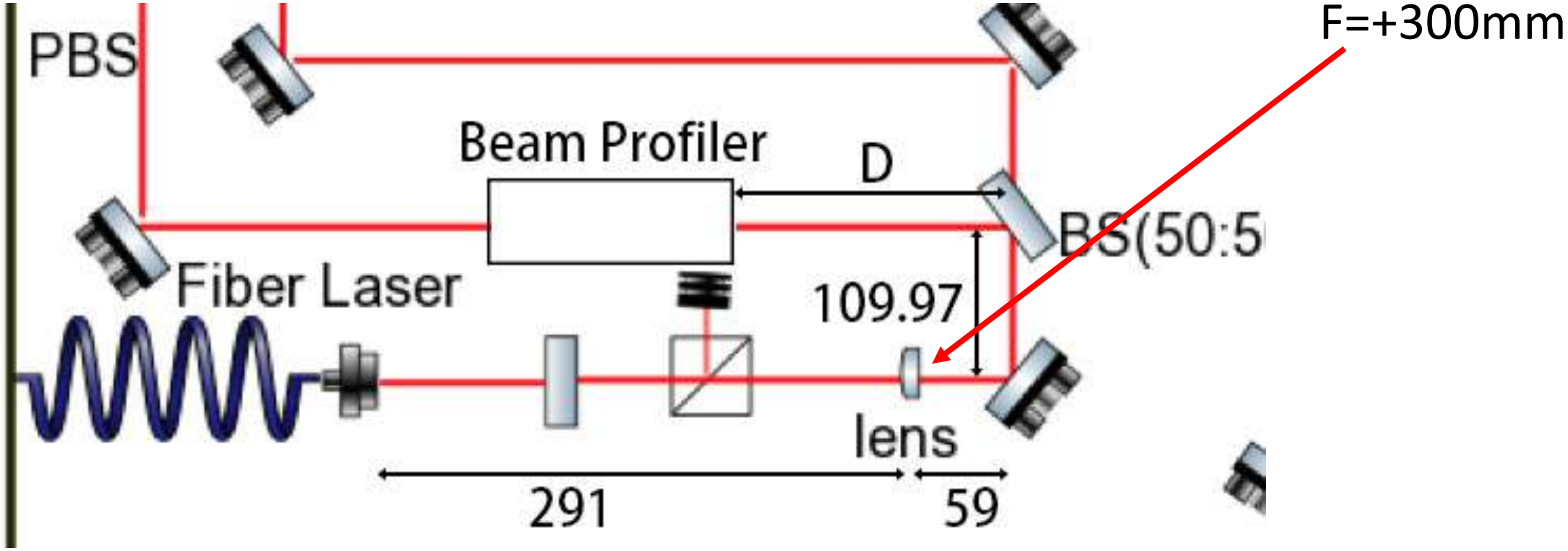
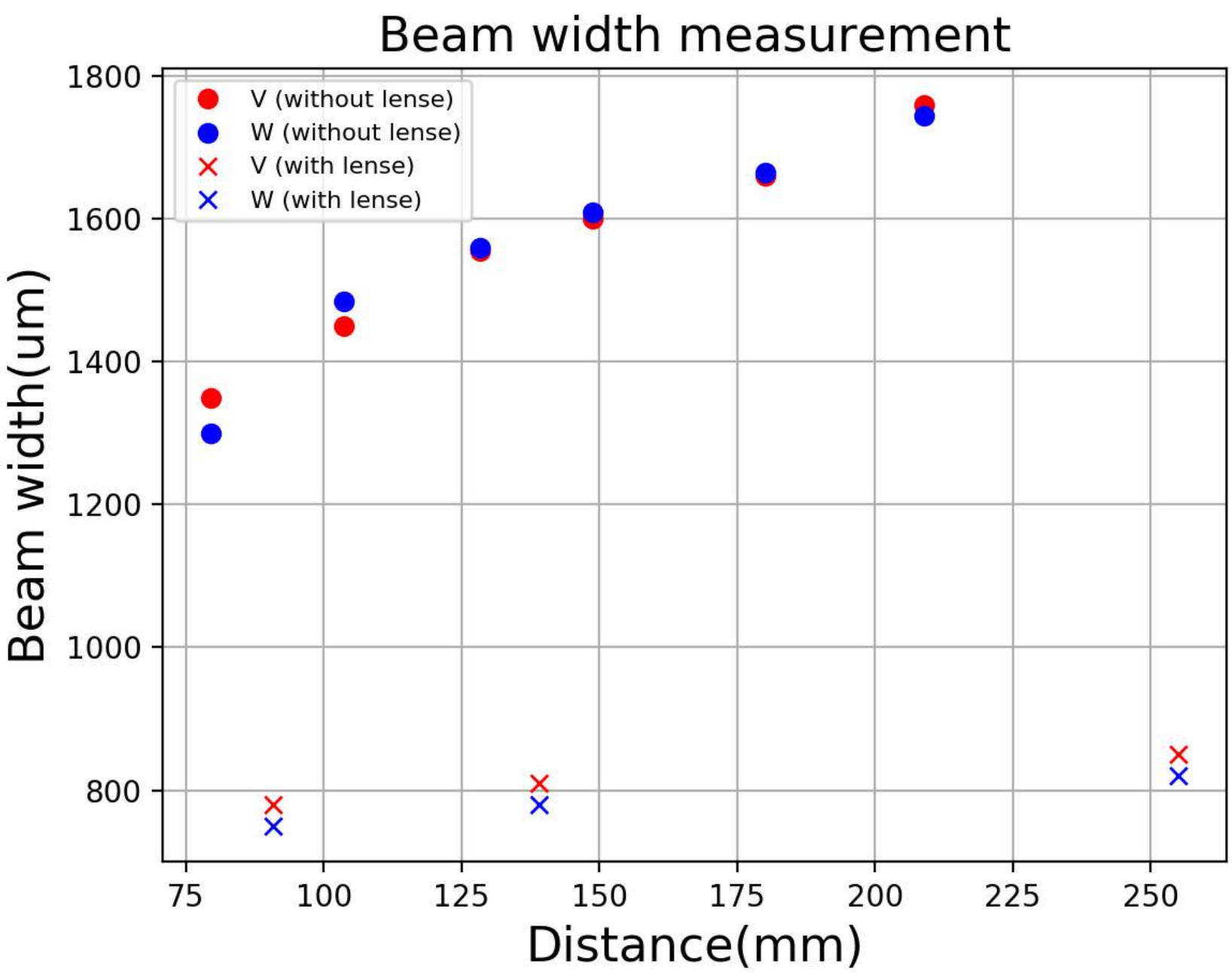
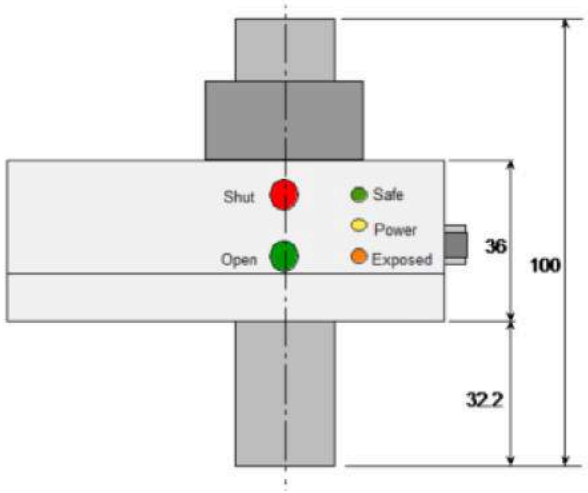
Beam width measurement




Beam width measurement
V (without lense)
W (without lense)
V (with lense)
W (with lense)
Beam width(um)
Distance(mm)
1800
1600
1400
1200
1000
800
75
100
125
150
175
200
225
250

Beam Shutter



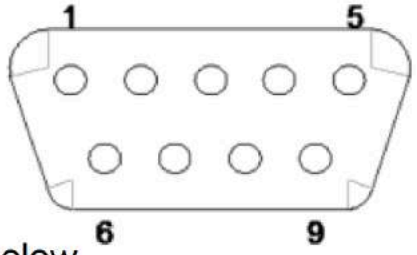
Indicator Lamps.

Green	Shutter closed
Yellow	Power on
Orange	Shutter open - beam exposed

Function: Control the laser beam on or off

When the shutter is open, the power supply voltage is output on connector pin 5. When the shutter is closed, the power supply voltage is output on connector pin 6.

Pin	Function
1	+12 to 24V DC power to shutter
2	0V
3	Remote open input
4	Not Used (Internally connected to pin 1)
5	'Open' status output
6	'Closed' status output
7 - 9	Optional electrical Interlock option - see below.

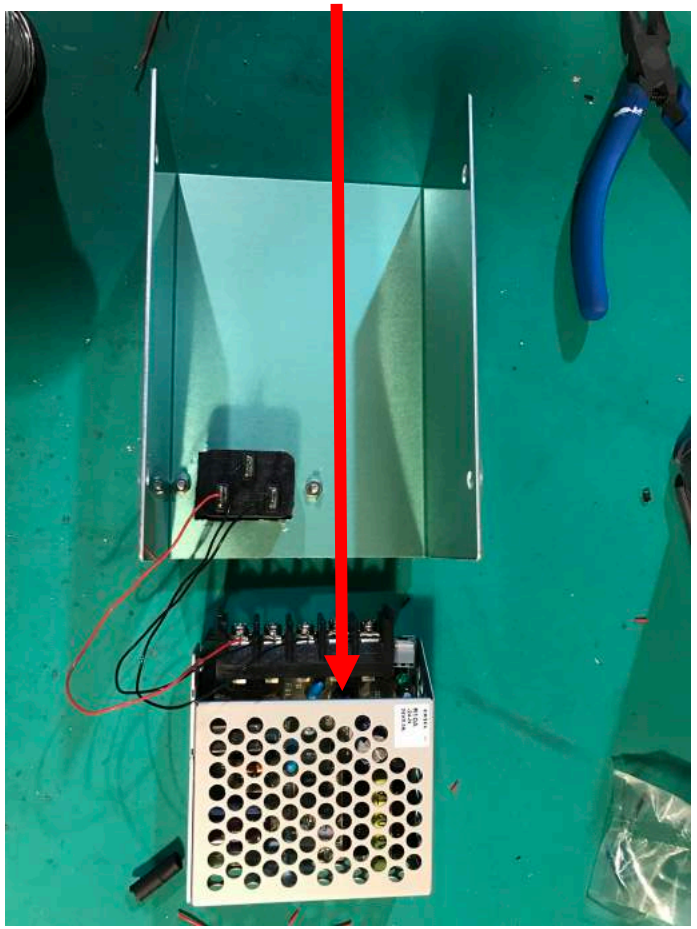


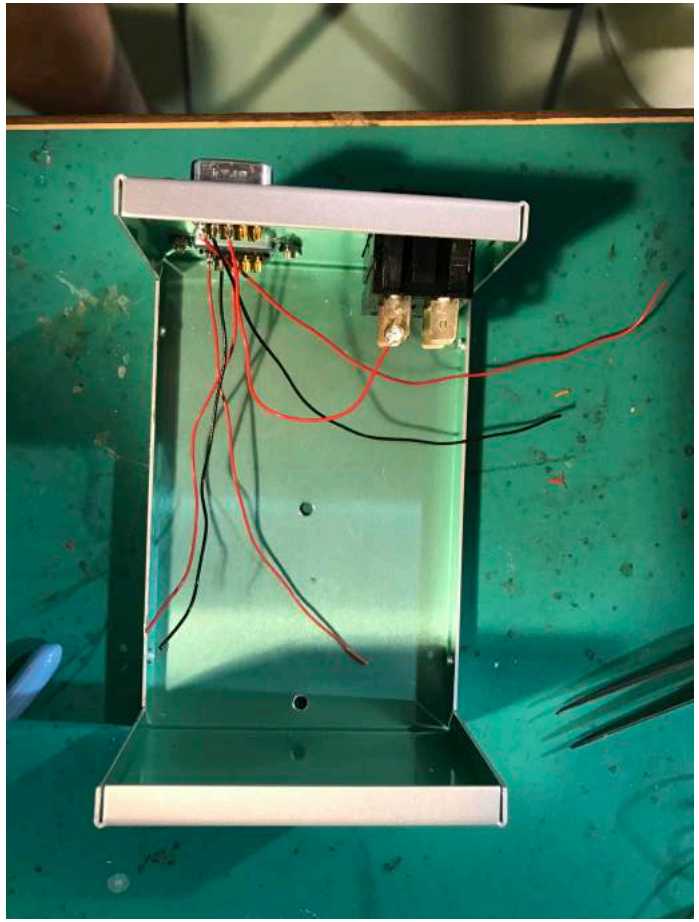
Power Supply Box

Switch

Two D-subs for two beam shutter

24V Power Supply

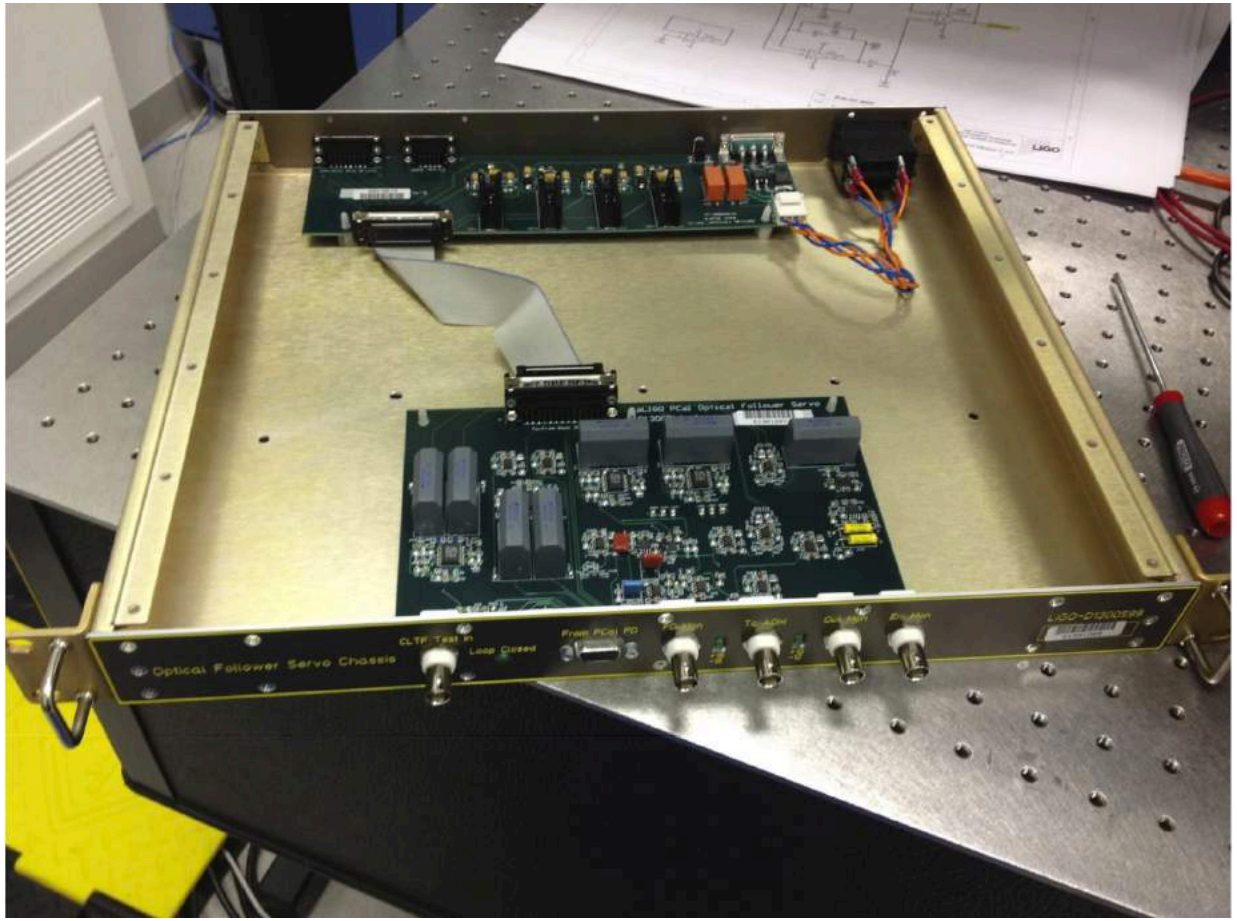




OFS(Optical Follower Servo)

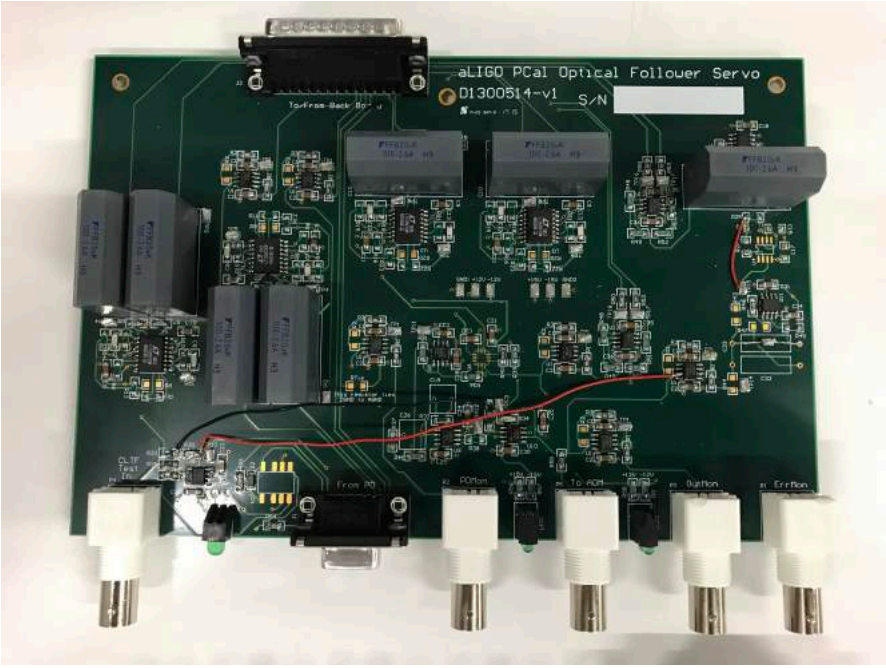
- A dynamic electric devices which can control a signal using feedback system

- Reduce the relative power noise (RPN) of the laser

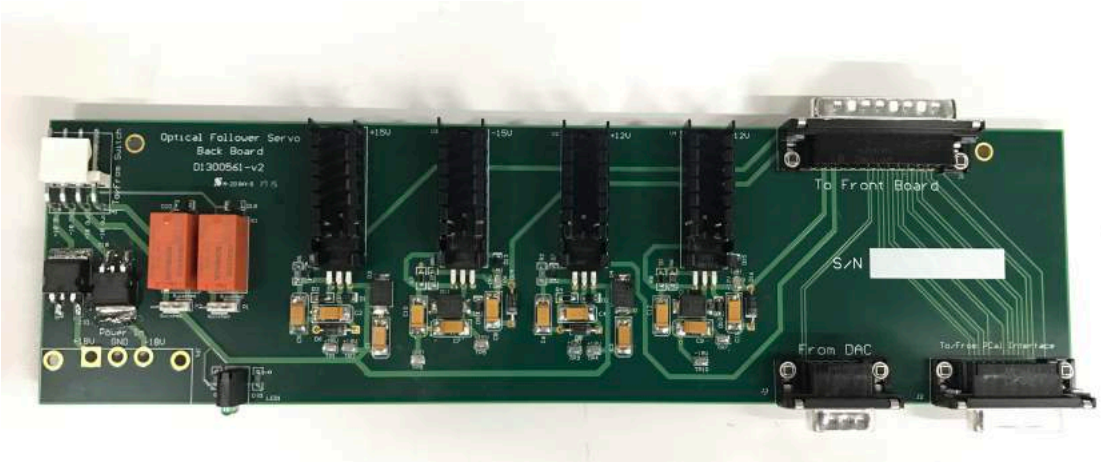


OFS made by LIGO

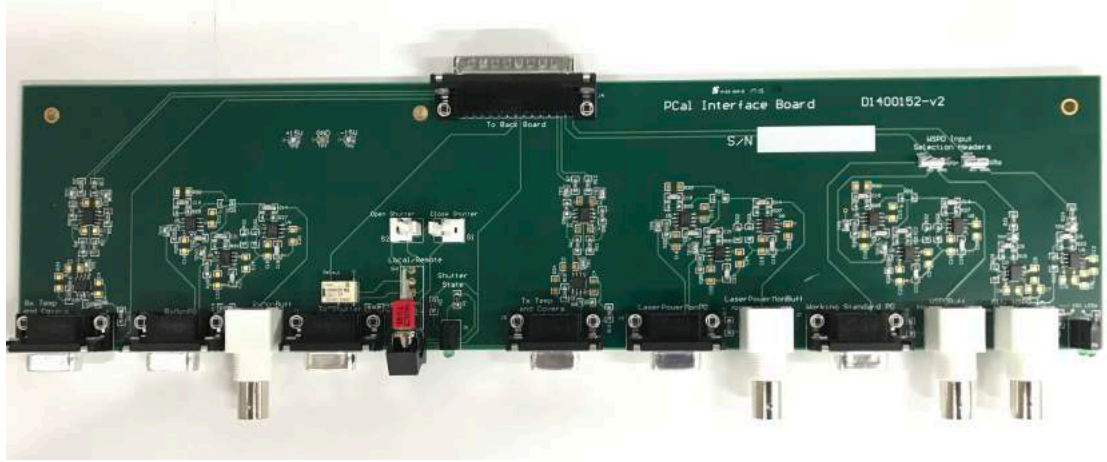
OFS front board



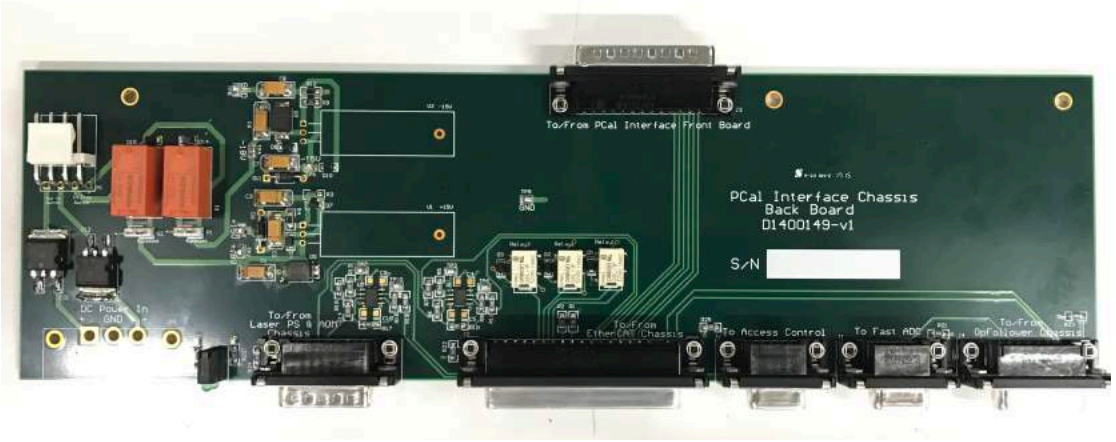
OFS back board



Interface front board



Interface back board



LabJack DAQ box

Start 2017-07-13 03:45:34.99

End 2017-07-13 09.45:34.84

Time Interval: 0.1s

Total time: 6 hours

Total data: 216000

Saved in .npy file

```
[xiebinghuadeMacBook-Pro:Pcal jeff820926$ python Pcal_data.py
configuring UE9 stream
start stream 2017-07-13 03:45:34.881415
2017-07-13 03:45:34.995753 0.000153784640133 , -0.0116107403301 , -0.0116107403
01 , -0.0116107403301
2017-07-13 03:45:35.095659 7.68923200667e-05 , -0.0116107403301 , -0.0116107403
01 , -0.0116107403301
2017-07-13 03:45:35.196022 0.0002306769602 , -0.0116107403301 , -0.011610740330
 , -0.0116107403301
2017-07-13 03:45:35.296106 0.0002306769602 , -0.0116107403301 , -0.011610740330
 , -0.0116107403301
```

```
2017-07-13 09:45:34.649418 0.000384461600333 , -0.0116107403301 , -0.0116107403
01 , -0.0116107403301
2017-07-13 09:45:34.748856 0.0004613539204 , -0.0116107403301 , -0.0116107403301
 , -0.0116107403301
2017-07-13 09:45:34.848856 0.0002306769602 , -0.0116107403301 , -0.0116107403301
 , -0.0116107403301
stream stopped.
216000 requests with 8.0 packets per request with 16 samples per packet = 276480
00 samples total.
0 samples were lost due to errors.
Adjusted number of samples = 27648000
The experiment took 21600.069658 seconds.
Scan Rate : 13824000 scans / 21600.069658 seconds = 639.997936066 Hz
Sample Rate : 27648000 samples / 21600.069658 seconds = 1279.99587213 Hz
```

Future Work

- Using Mode matching decide the position of AOM
- Using DAQ LabJack record the data from integrating sphere and the OFSPD