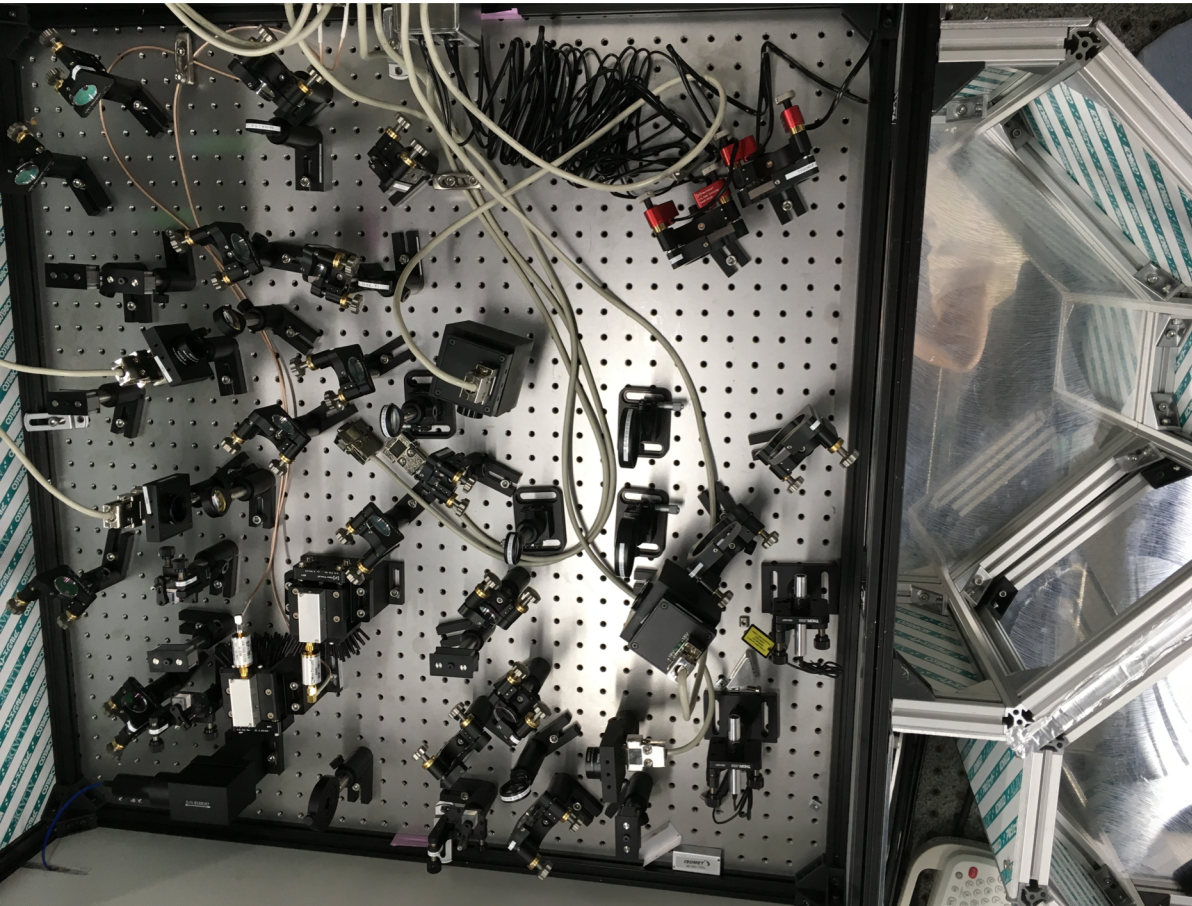


X-end PCal review

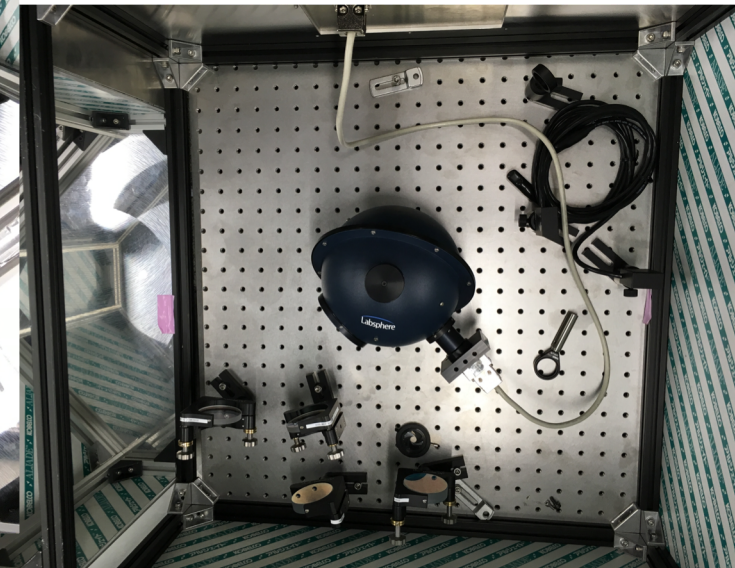
Chihiro Kozakai, Yuki Inoue

Setup in KEK by picture

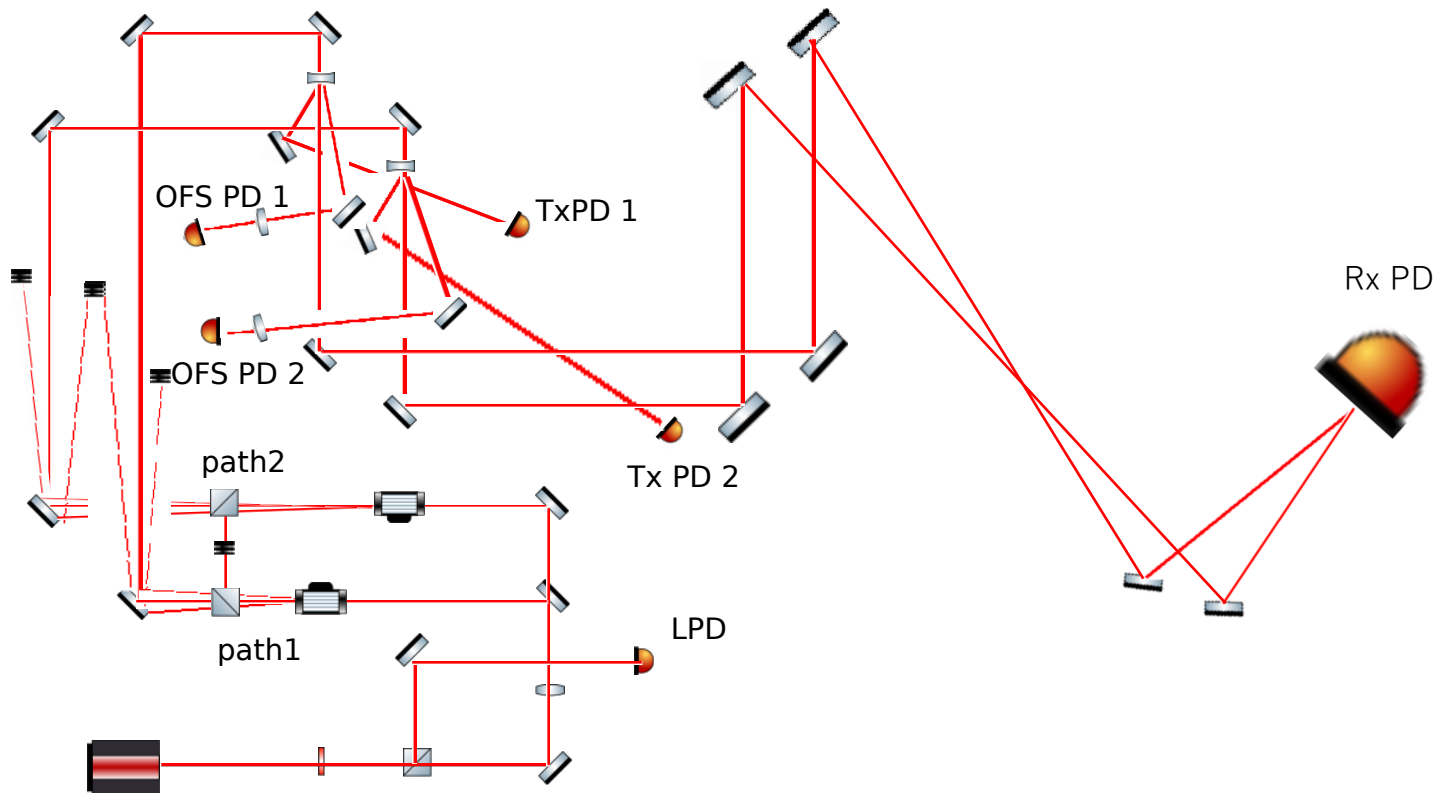
Tx module



Rx module



Setup in KEK by schematic



Main difference from Y-end

- Laser Photodetector (LPD) is added
 - Currently just monitoring, but it will be used to stabilize the laser.
- PD gains are changed.
- For mirrors used for diffracted beam by beam sampler, layout is dedicated to make the incident and reflection angle to be ~45 deg.
 - The reflection efficiency degrades if it is far from 45 deg.

AOM diffraction efficiency



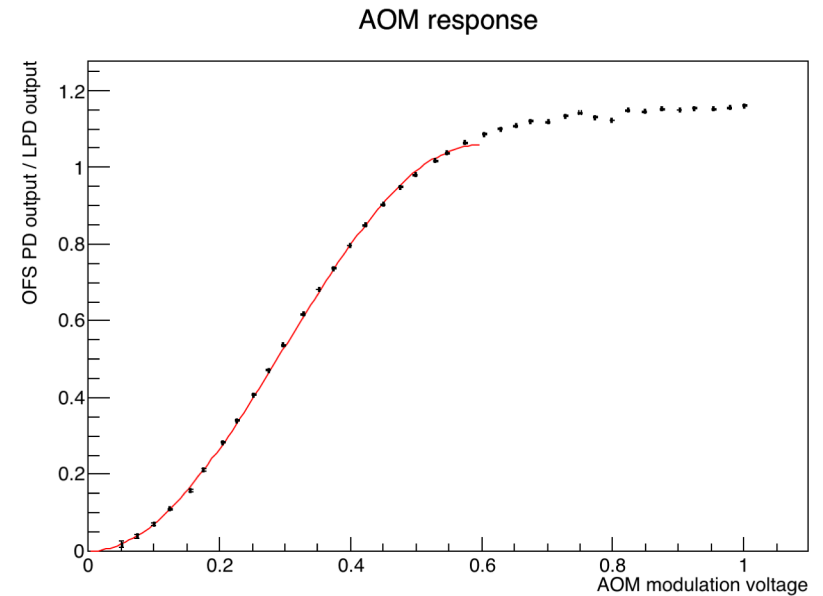
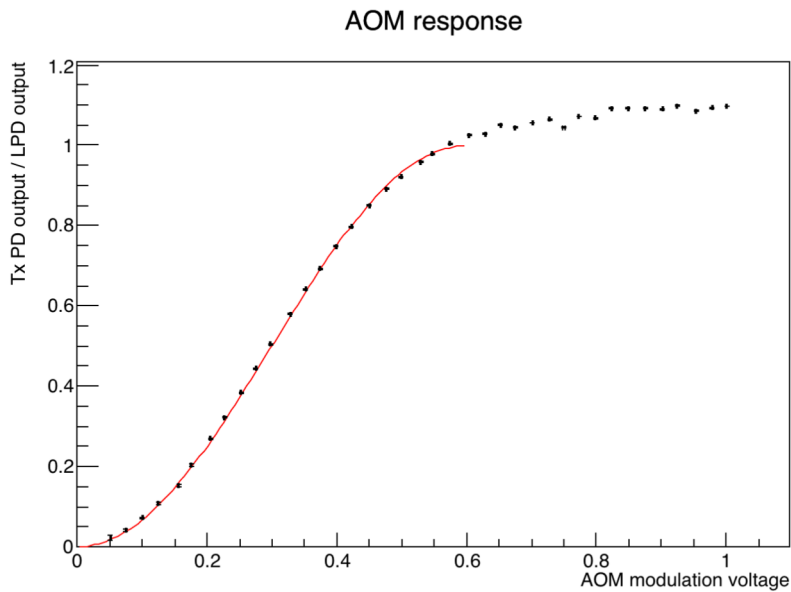
	Path1	Path2
A	1.534 W	1.455 W
B	1.502 W	1.416 W
C (0th) ($V=0$)	1.471 W	1.370 W
C (1st) ($V=V_{max}$)	1.317 W	1.265 W
AR eff. (B/A)	98%	97%
Polarization efficiency (C/B)	98%	97%
Diffraction eff. (C(1st)/C(0th))	90%	92%
Total efficiency (C(1st)/A)	86%	87%

AOM response

- Path1

Tx Vmax=599 +/- 1 mV

OFS Vmax = 597 +/- 0.9 mV



The working point is 299 mV.

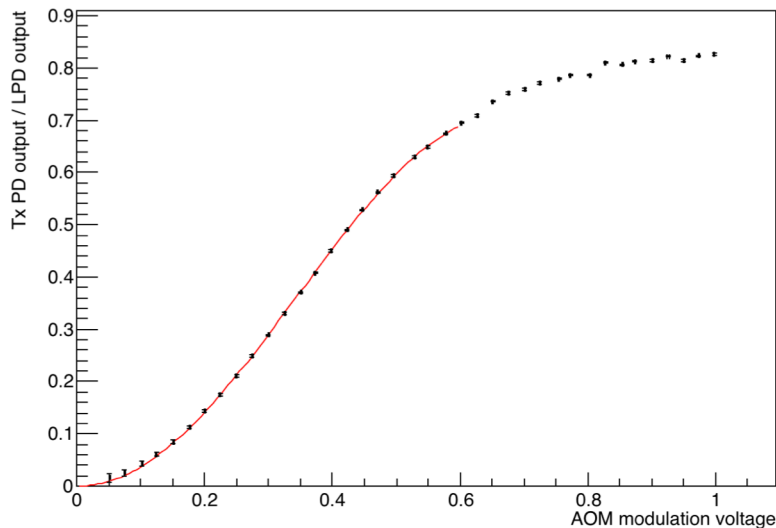
AOM response

● Path2

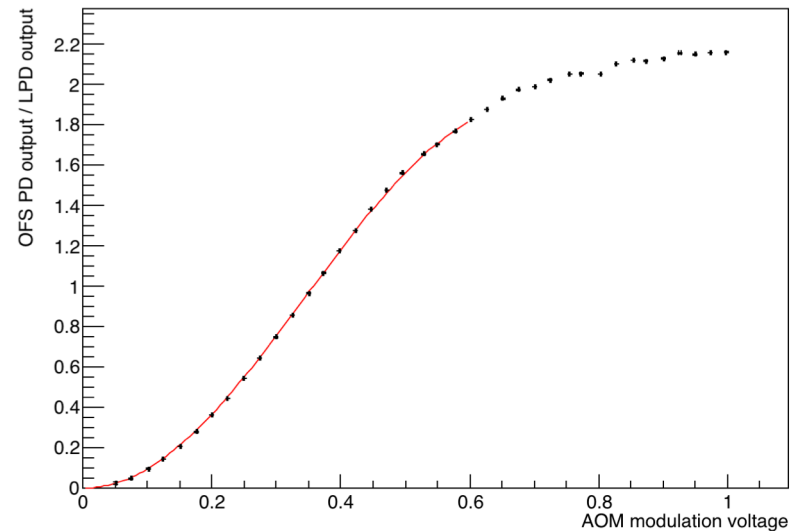
Tx Vmax = 682 +/- 2 mV

OFS Vmax = 691 +/- 2 mV

AOM response



AOM response

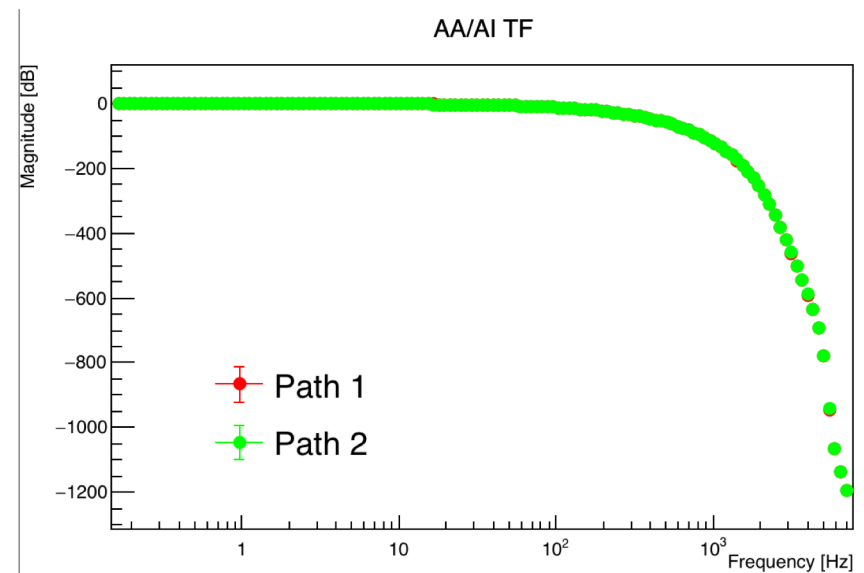
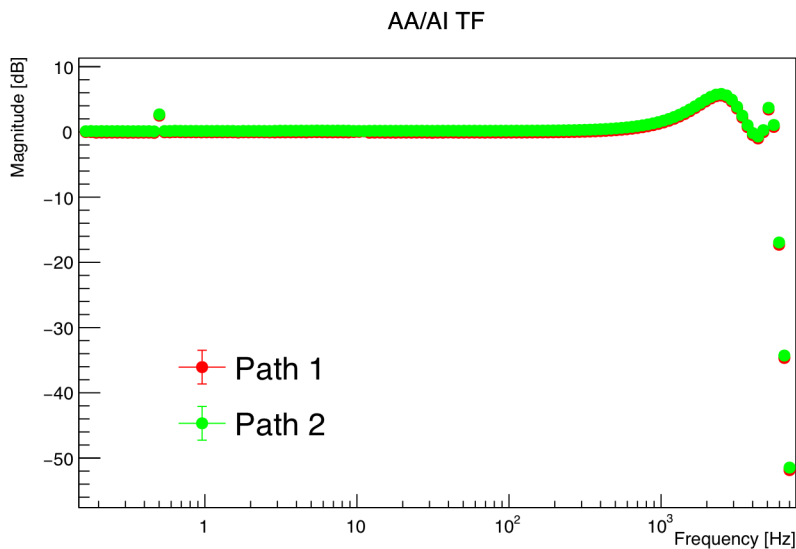


The working point is 343 mV.

*It depends on combination of driver. We chose the combination which has smaller working point difference between path 1 and path 2.

AA/AI TF measurement

- Measured by connecting DAC and ADC directly by D-sub connector.
 - It will be subtracted from all the following TF to remove AA/AI effect.
 - The decrease in phase is due to butterworth filter.

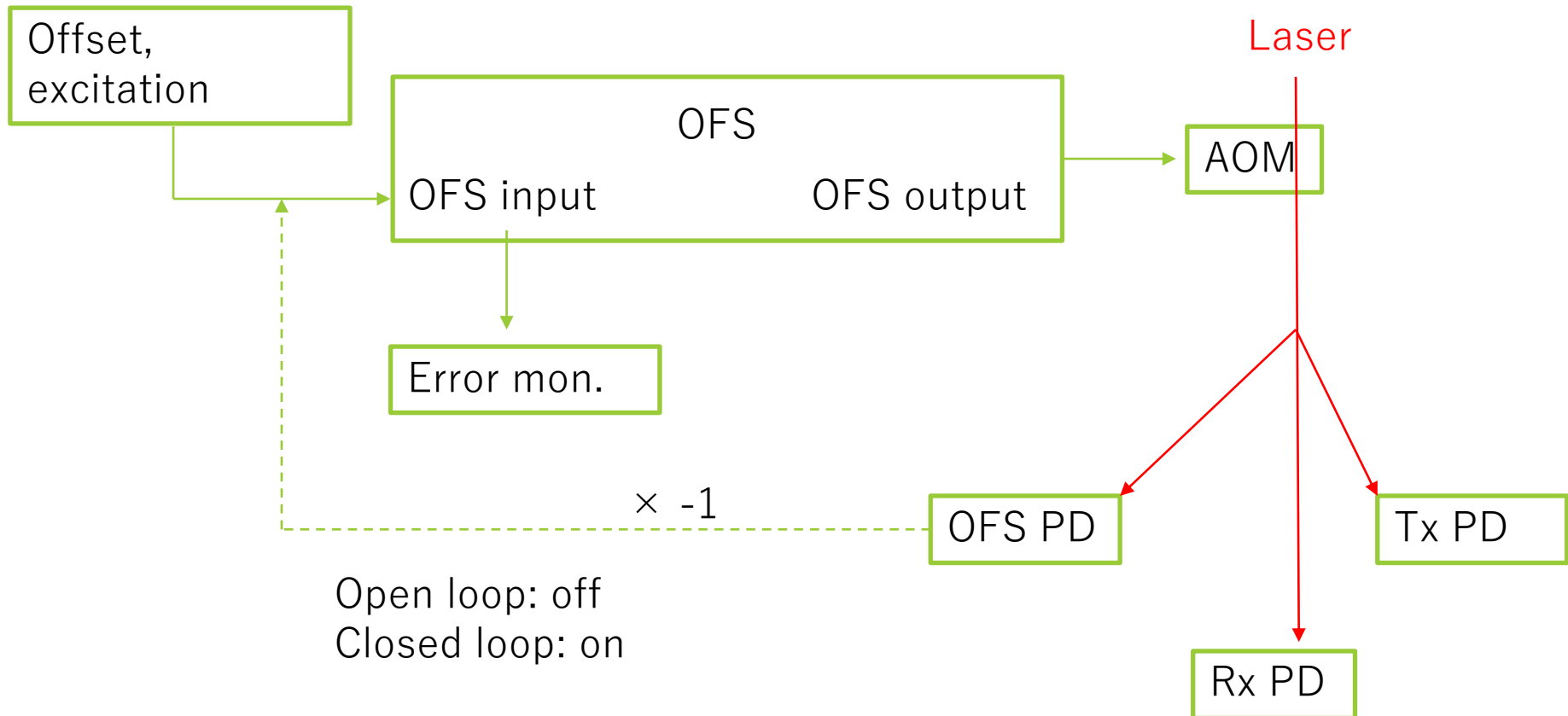


Working point information

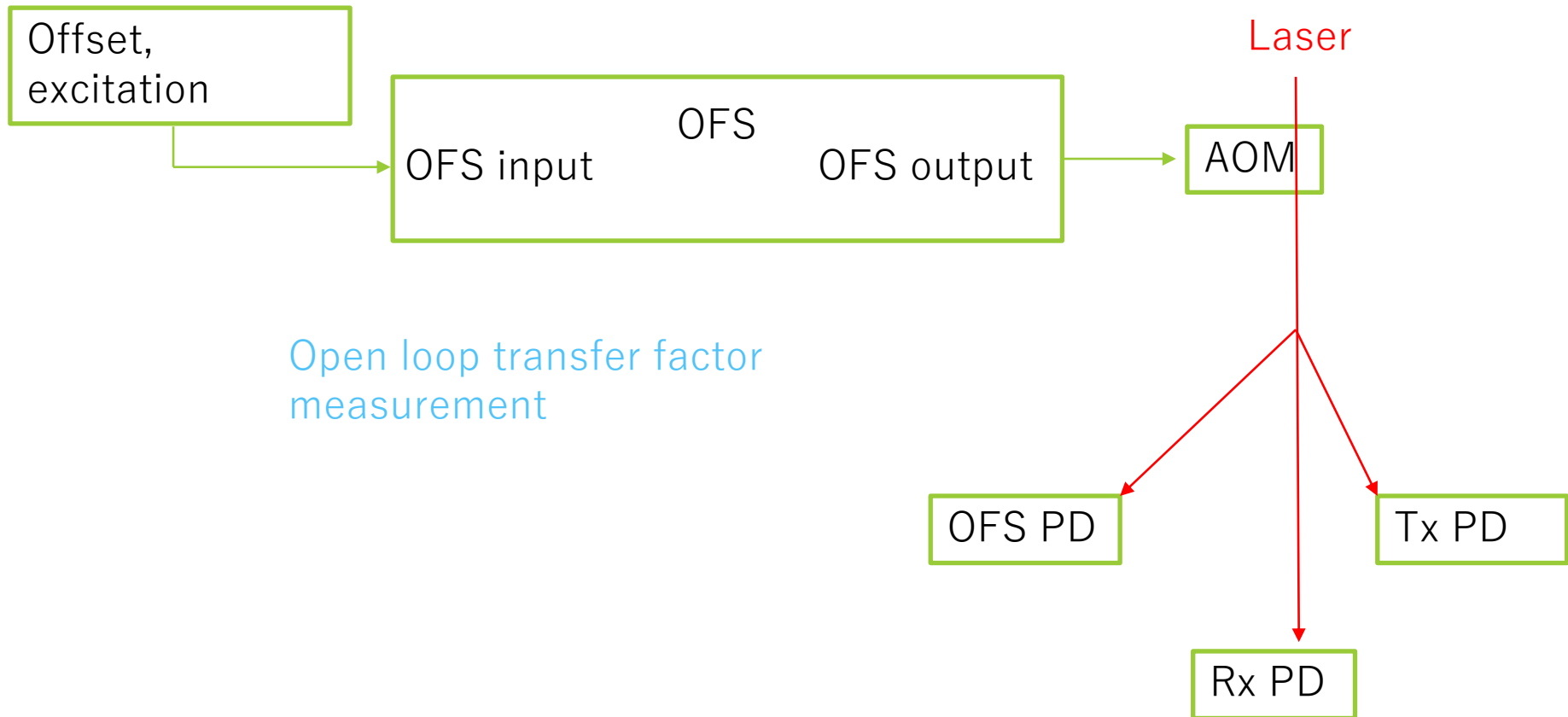
- OFS gain 15.5 dB = 25 dB (VGA) -9.5 dB (1/3 in final amp.)

	Path 1	Path 2
AOM	299 mV	343 mV
OFS PD	4.360 V	7.525 V
Tx PD	4.079 V	2.881 V
Rx PD	4.269 V	
LPD	12.52 V	
Input offset	0.056 V	0.07 V

TF measurement setting

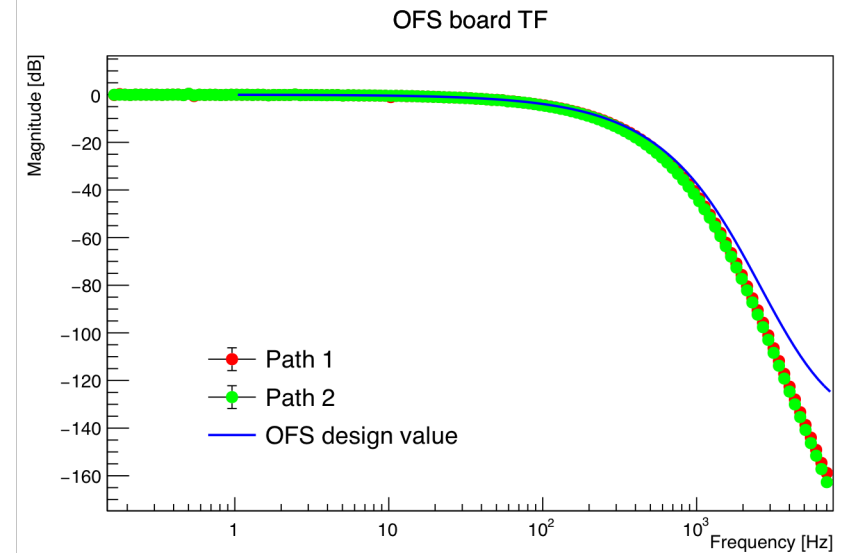
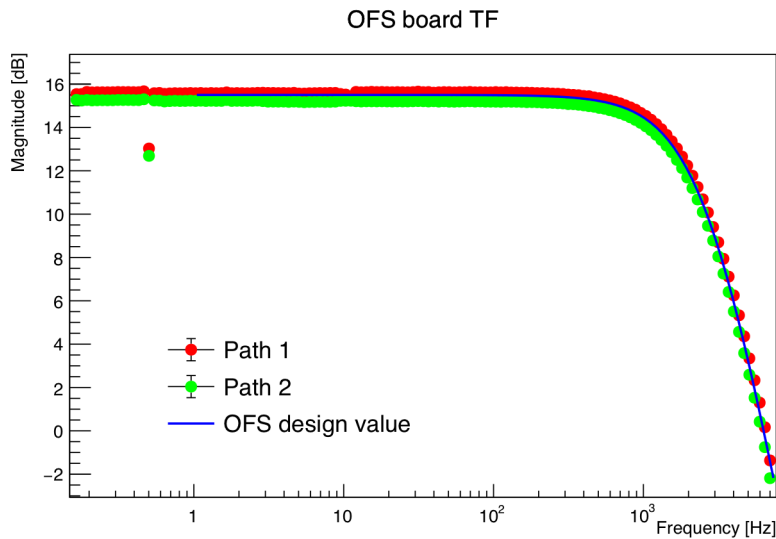


Open loop TF setting



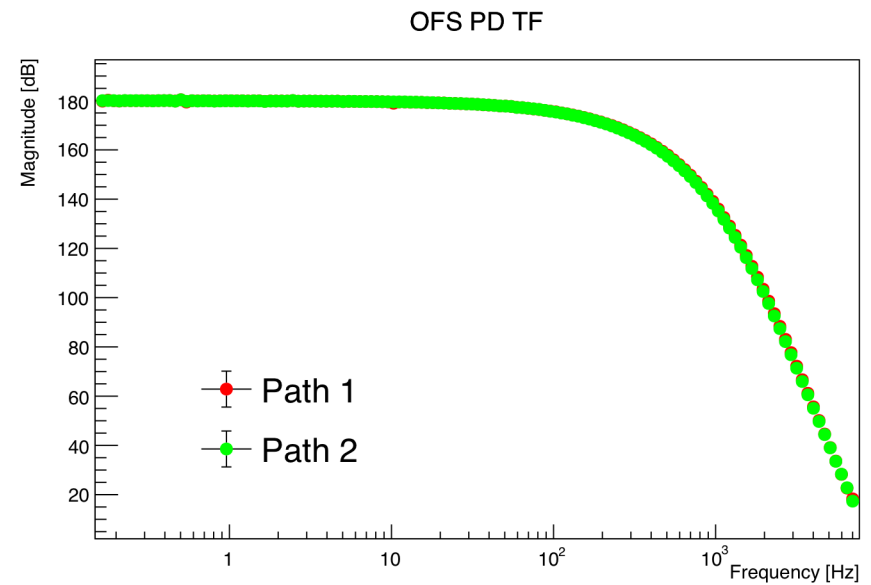
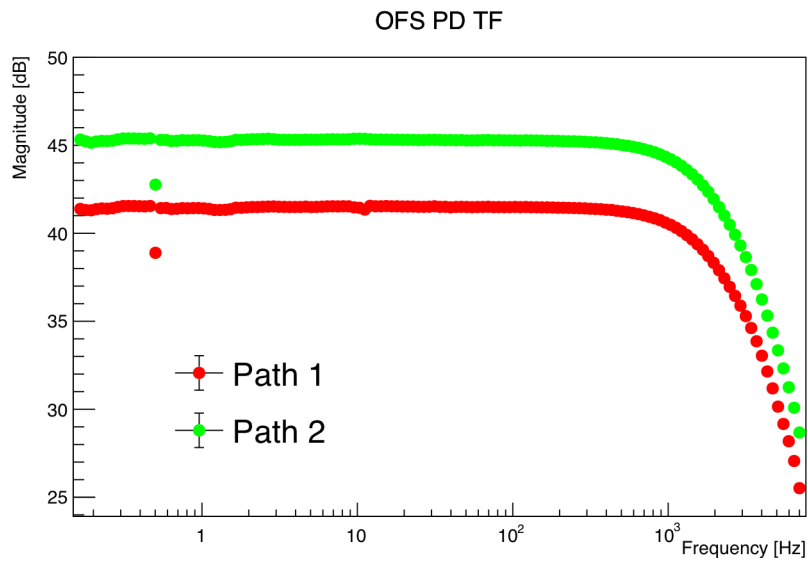
Open loop transfer factor

- OFS board TF (measured by “To AOM” in open loop)
 - Expected gain in low frequency is
 $15.5 \text{ dB} = 25 \text{ dB (VGA)} - 9.5 \text{ dB (1/3 in final amp.)}$

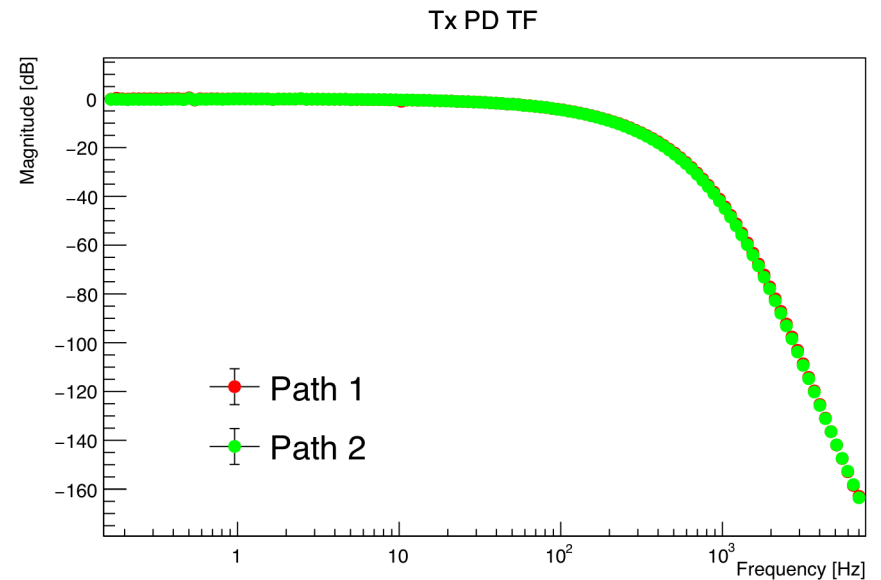
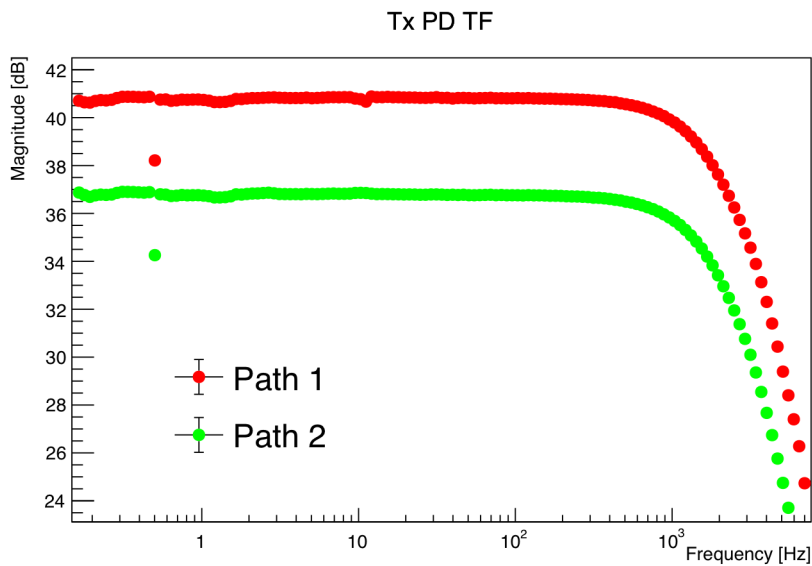


Open loop transfer factor

- Measured at OFS PD

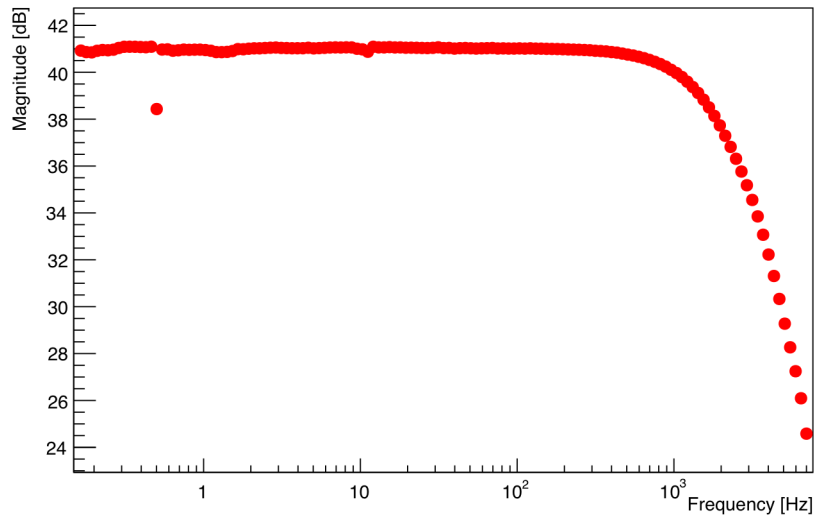


Open loop transfer factor

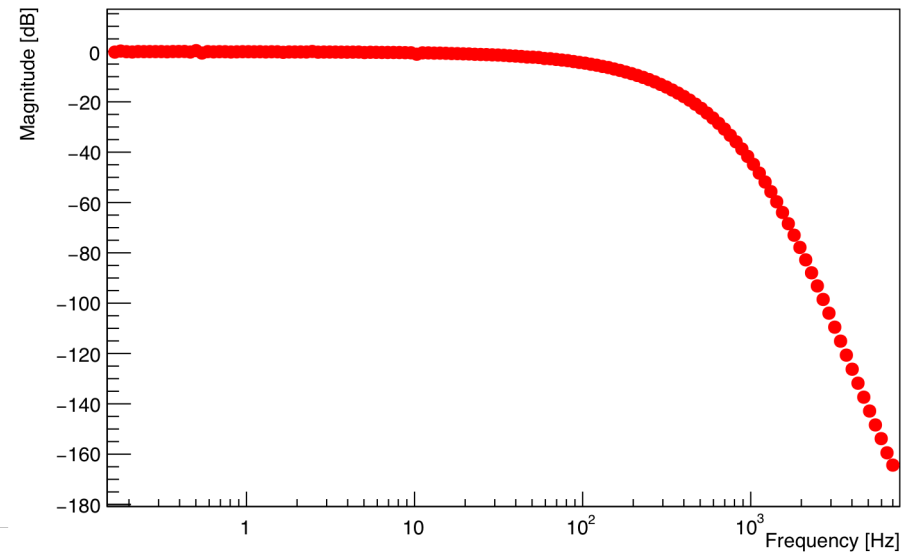


Open loop transfer factor

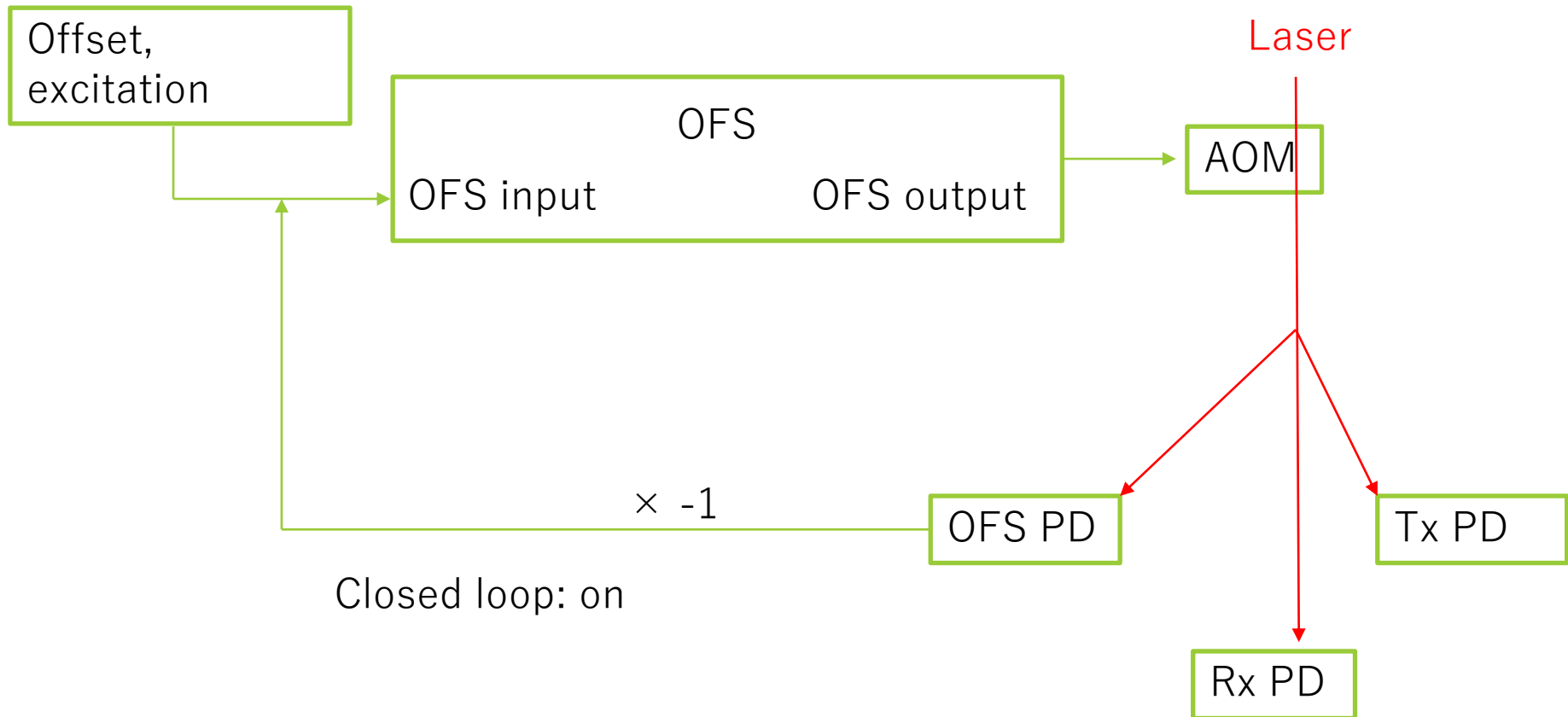
Rx PD TF



Rx PD TF

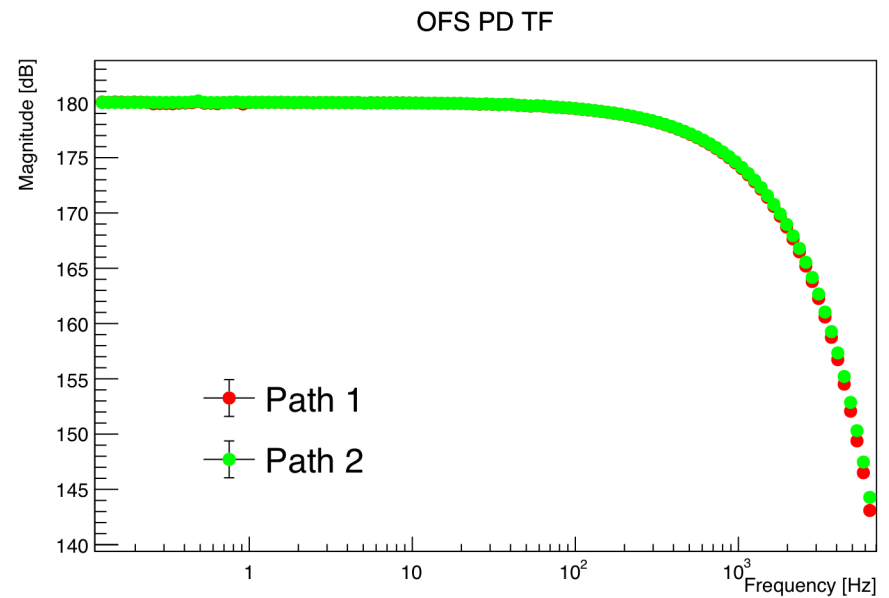
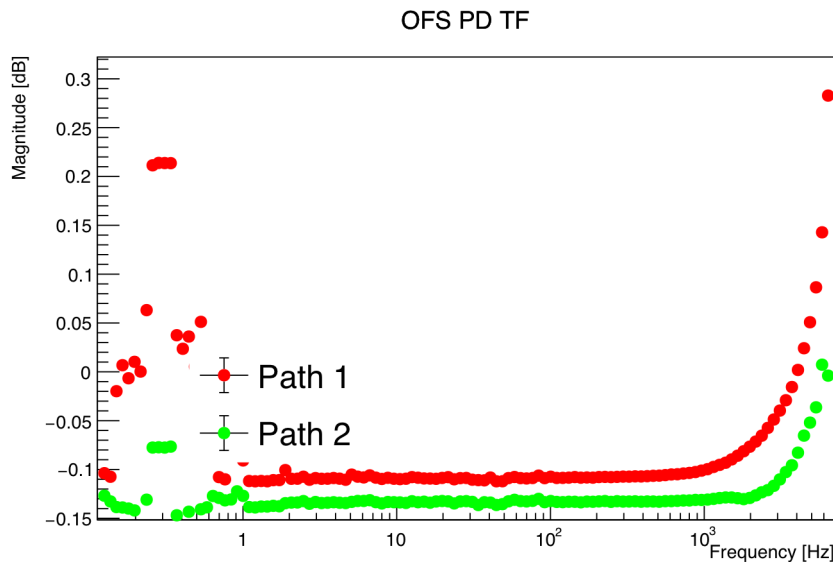


Closed loop TF setting



Closed loop transfer factor

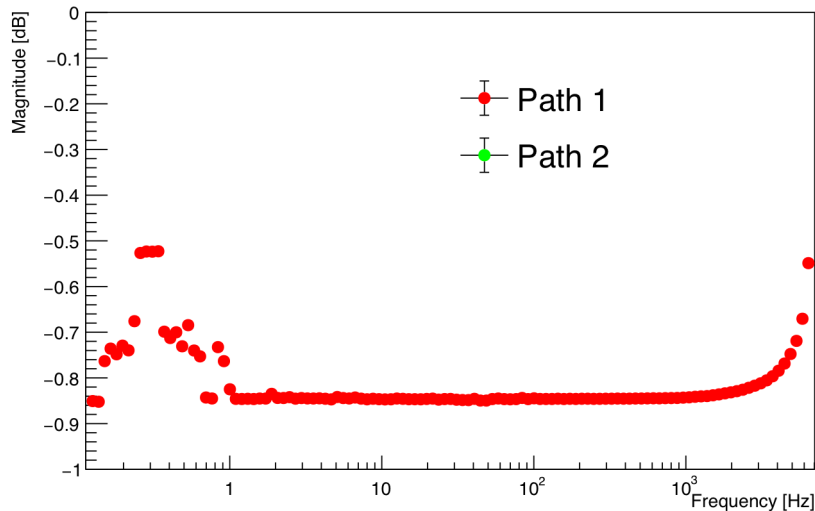
- CLTF = $OLTF/(1+OLTF)$ = -0.12 dB for path1 and -0.20 for path2 in low frequency.



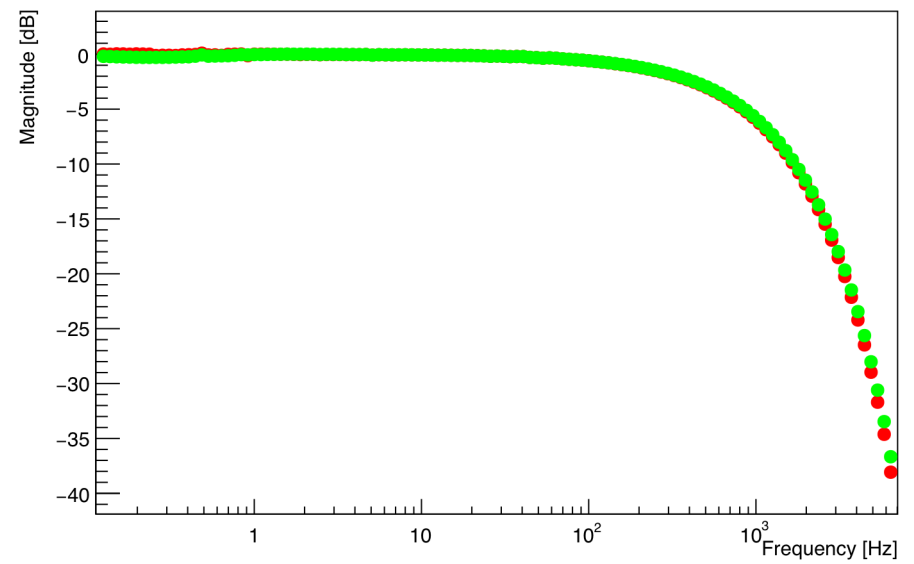
Closed loop transfer factor

● Tx PD

Tx PD TF

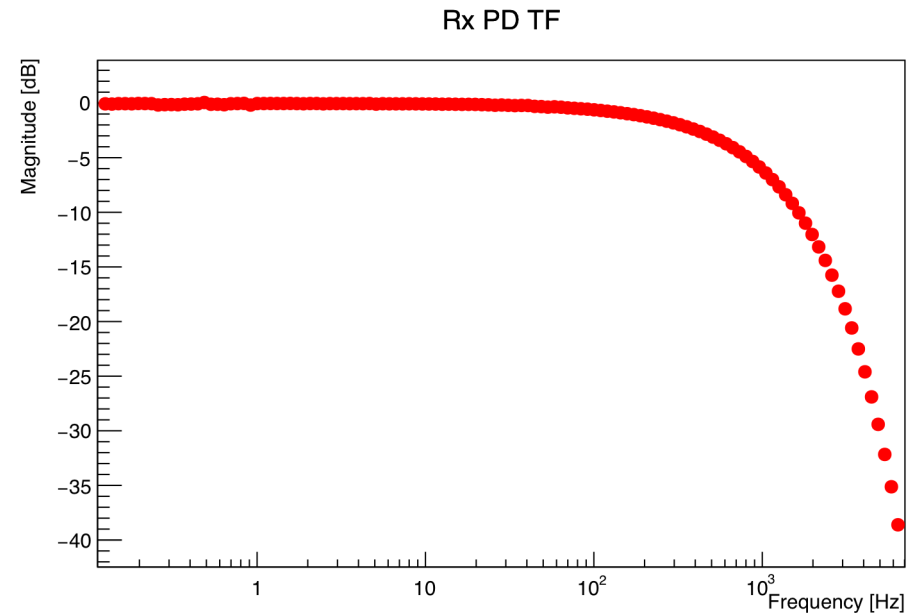
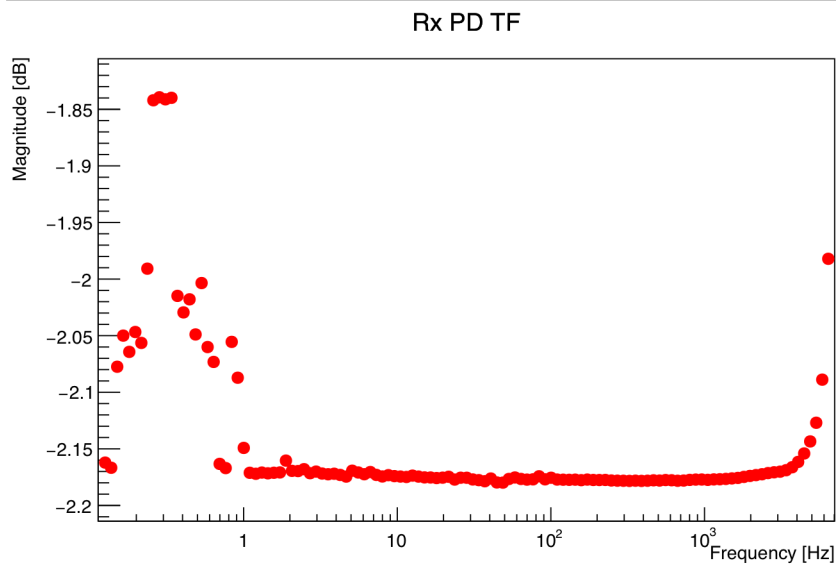


Tx PD TF

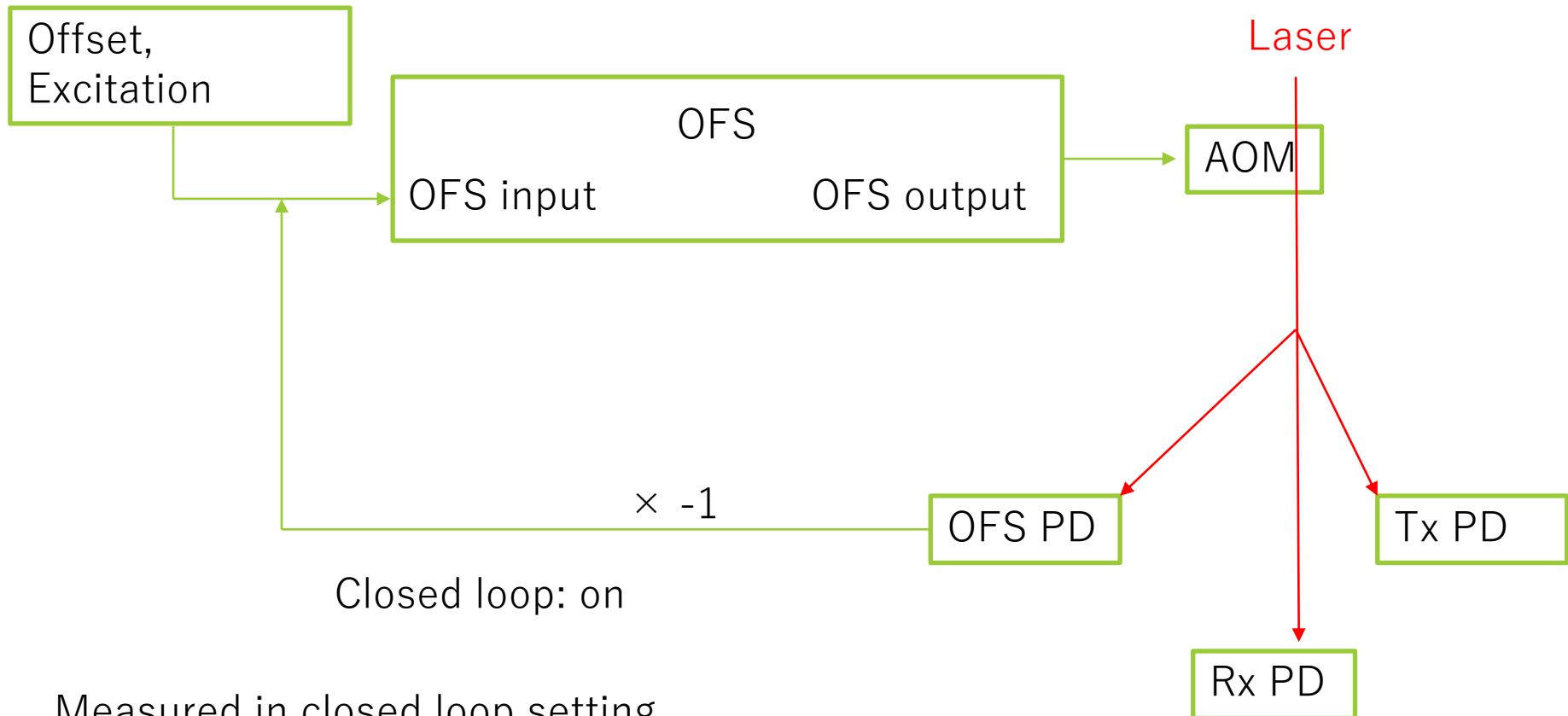


Closed loop transfer factor

● Rx PD



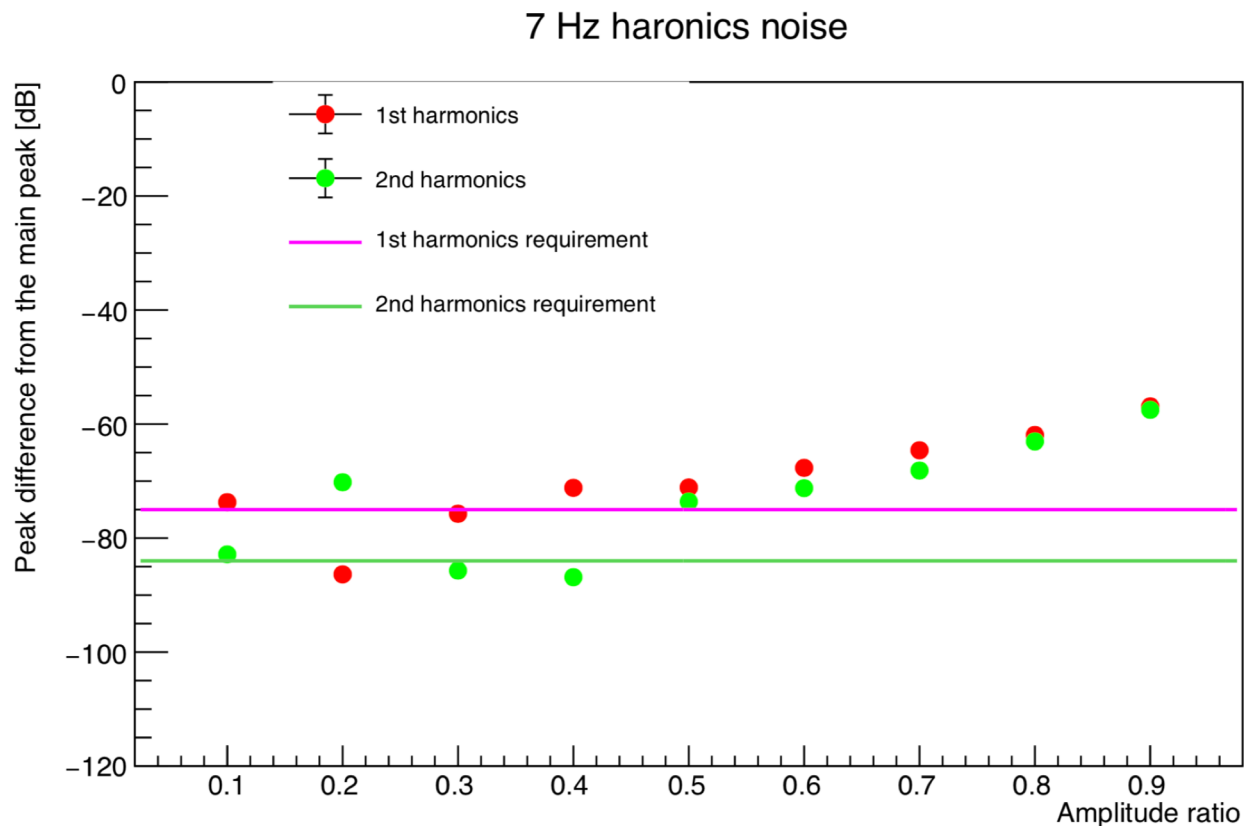
Harmonics noise setting



Measured in closed loop setting.
Each harmonics peak size is measured against main peak.

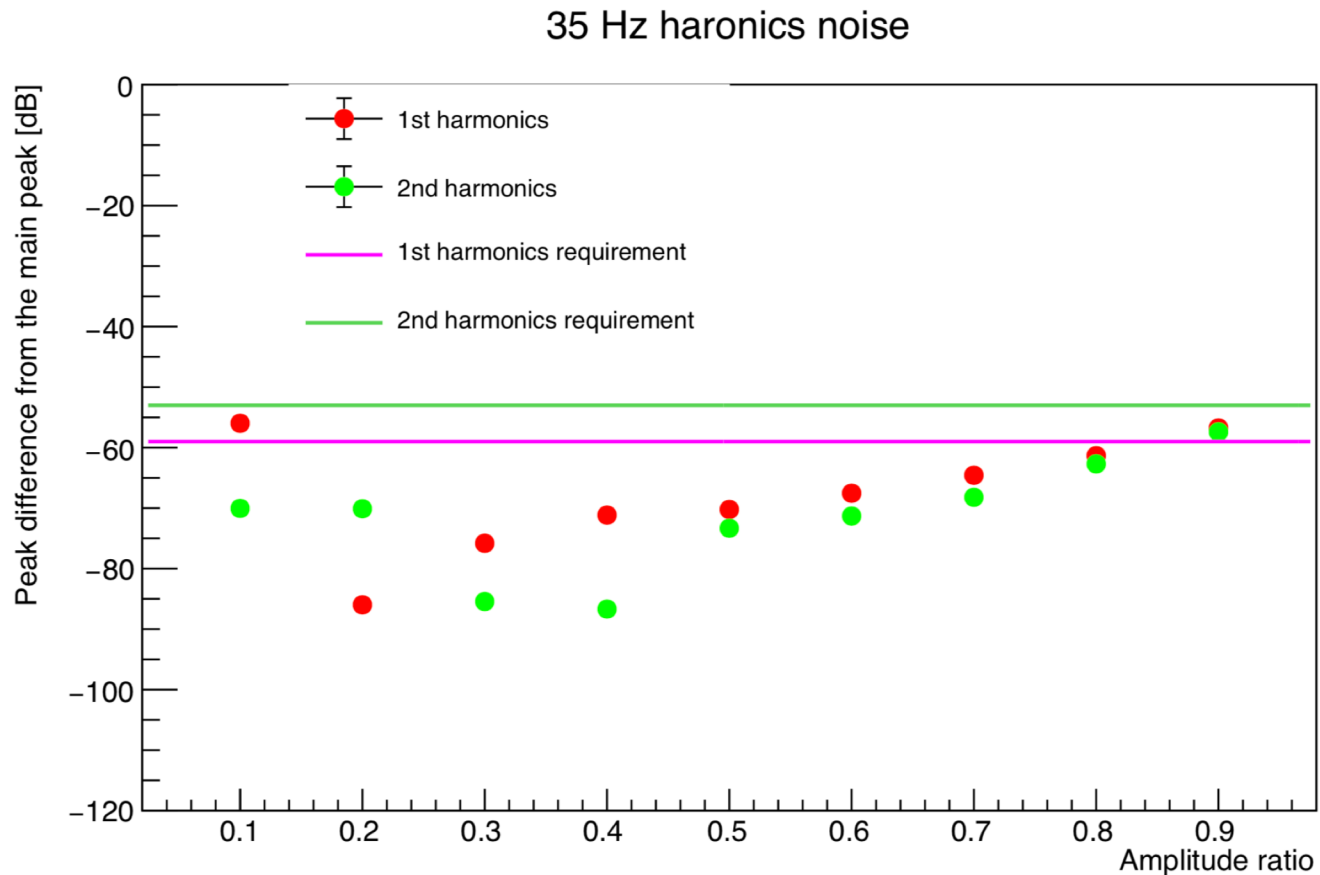
Harmonics noise

- Requirement is not satisfied, but it is no problem because we don't apply high amplitude in low frequency.



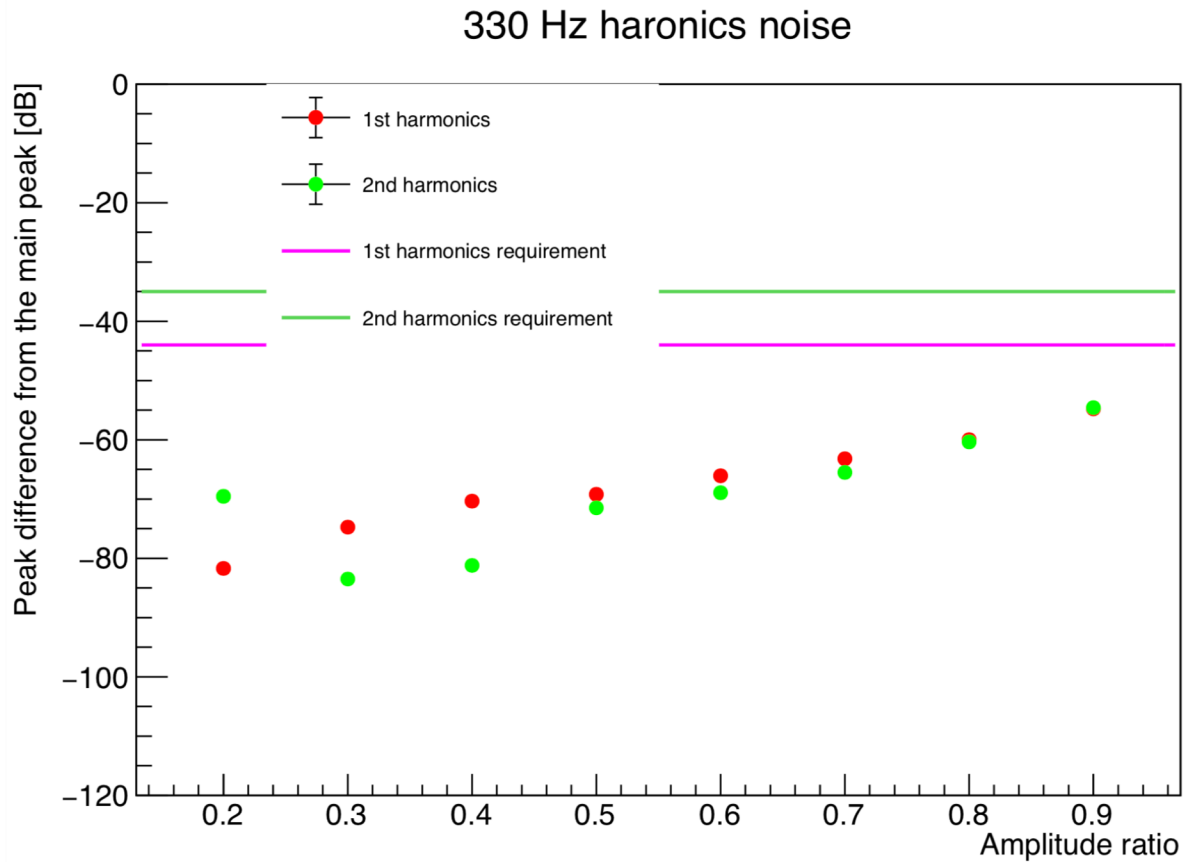
Harmonics noise

- OK in amplitude < 0.8 .



Harmonics noise

- Well below the requirement.



Installation in Kamioka site

- Installation is done last week !
- Remaining construction tasks
 - Patlight
 - Interlock
 - Missing lens, NDF
 - Cabling
 - Software
- Functional test of each component will start this week.

