A photo sensor to monitor the motion of the recoil mass during the suspension assembly

Since we do not have OSEM sensors on the mirrors, we do not have any local sensor for the last stage until the suspension system is installed into the chamber, where the length sensing OpLev can be used.

This document describe a photo sensor to monitor the recoil mass motion during the assembly work so that we can measure transfer functions to the last stage of the suspension to confirm nothing is touching

2016/11/16 Y. Aso

JGW-D1605845

# Mechanical Design

Overview of the system

photo sensor

XYZ stage

clamp

fixed to the base plate
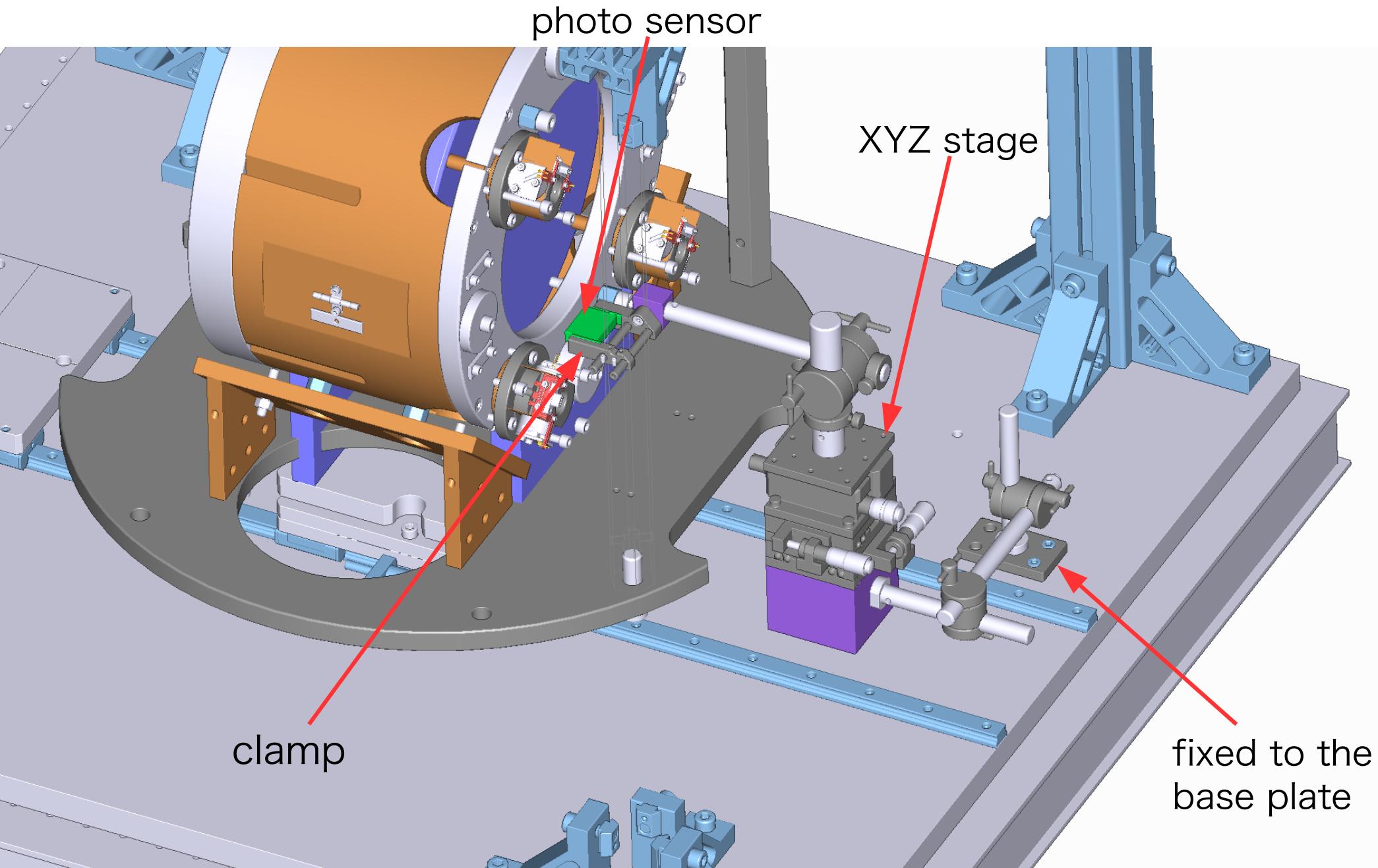
Purple colored parts need to be manufactured
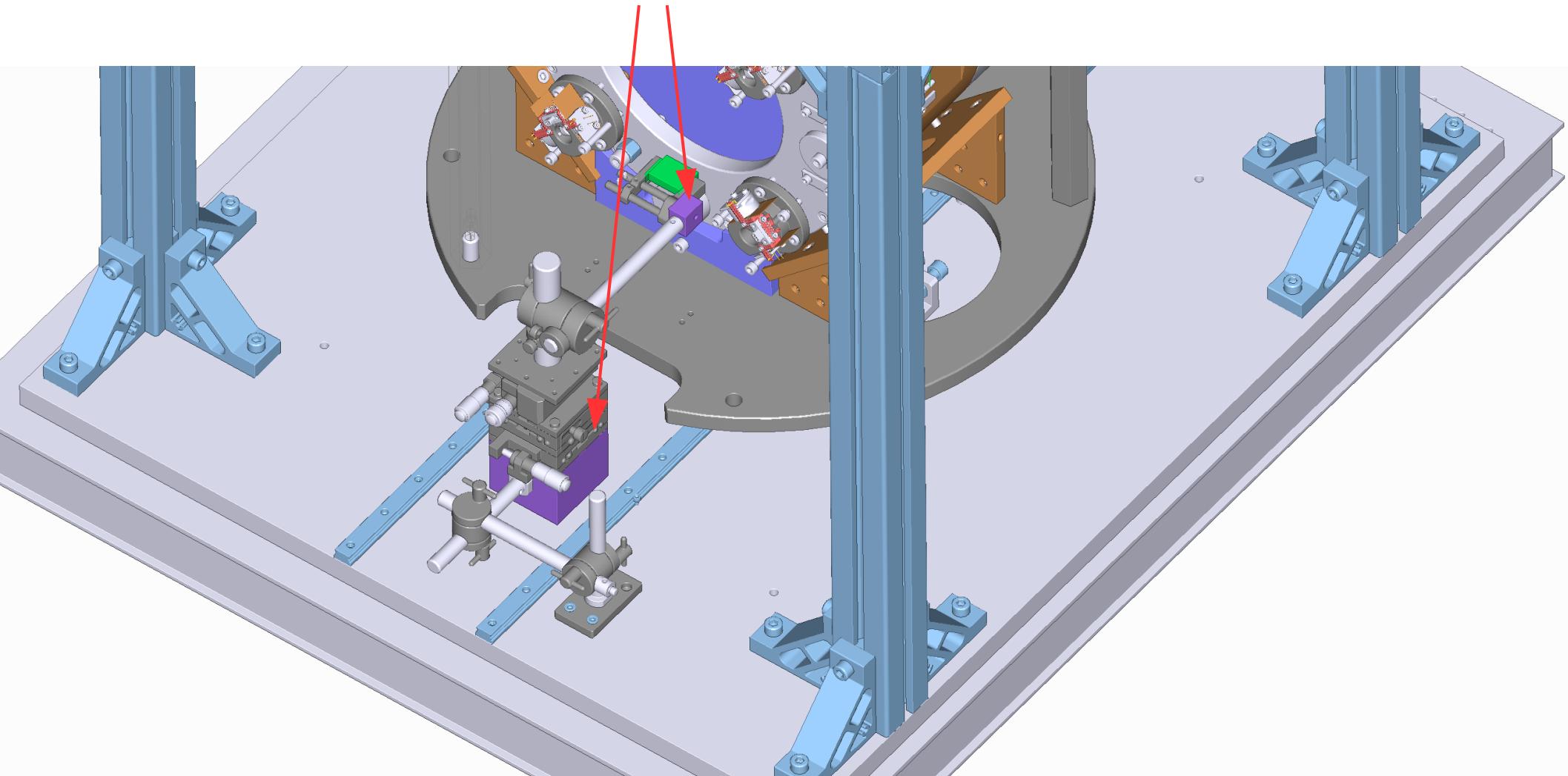
Everything else are off-the-shelf opto-mechanical parts

Installation Procedure 1
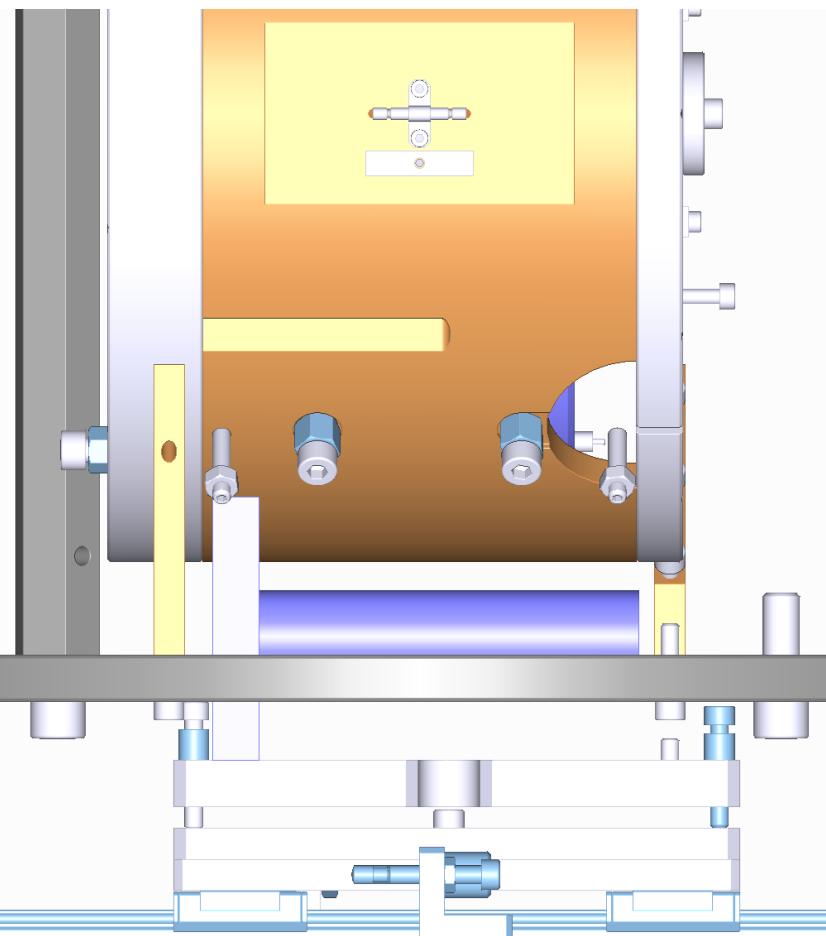
Retract the arm
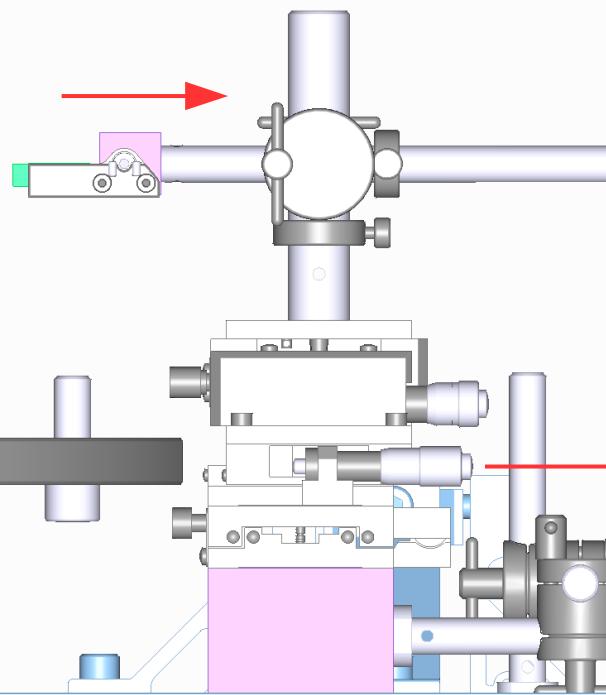
move the stage
back

Installation Procedure 2

Move the stopper ring
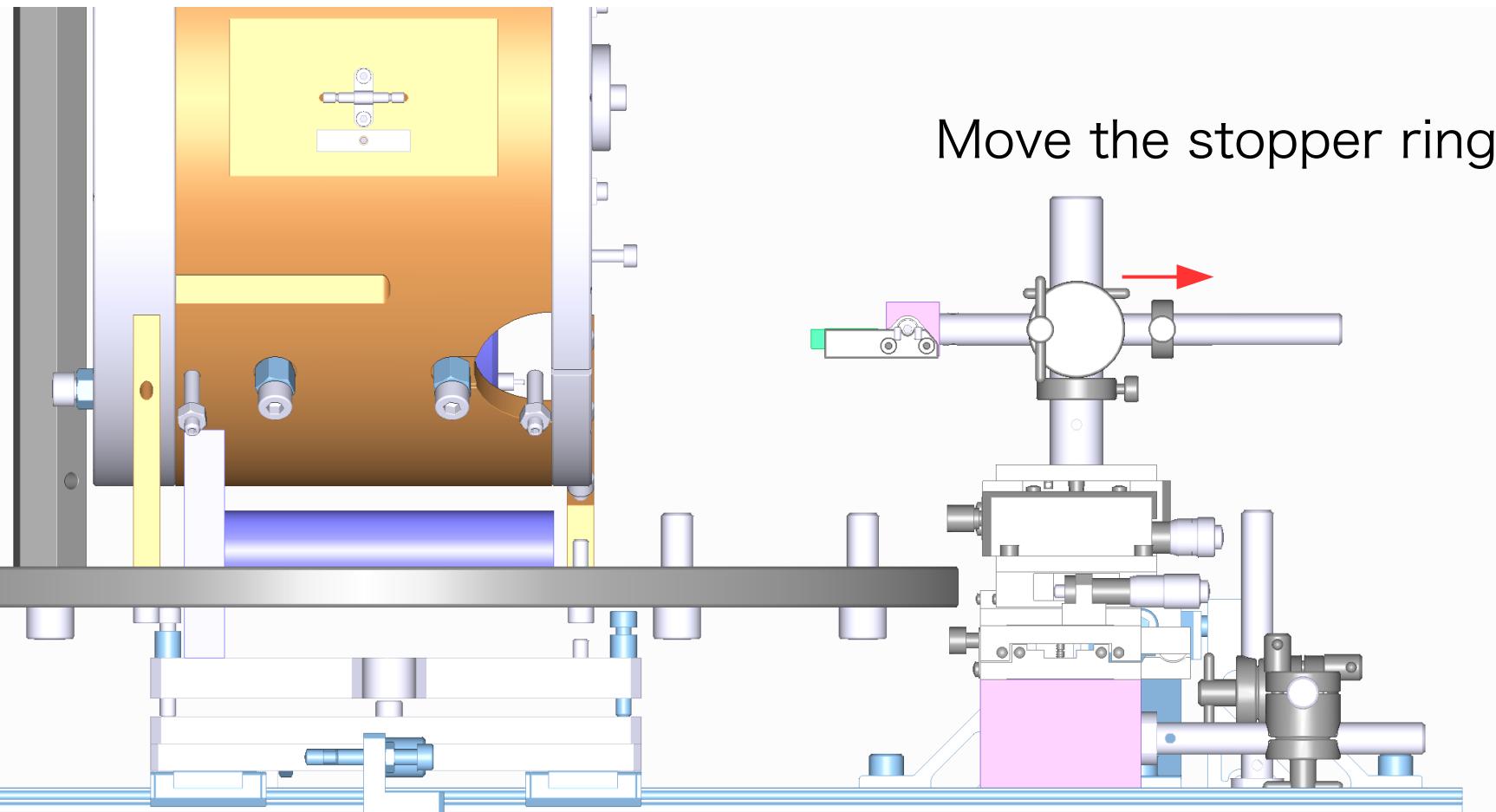
Installation Procedure 3
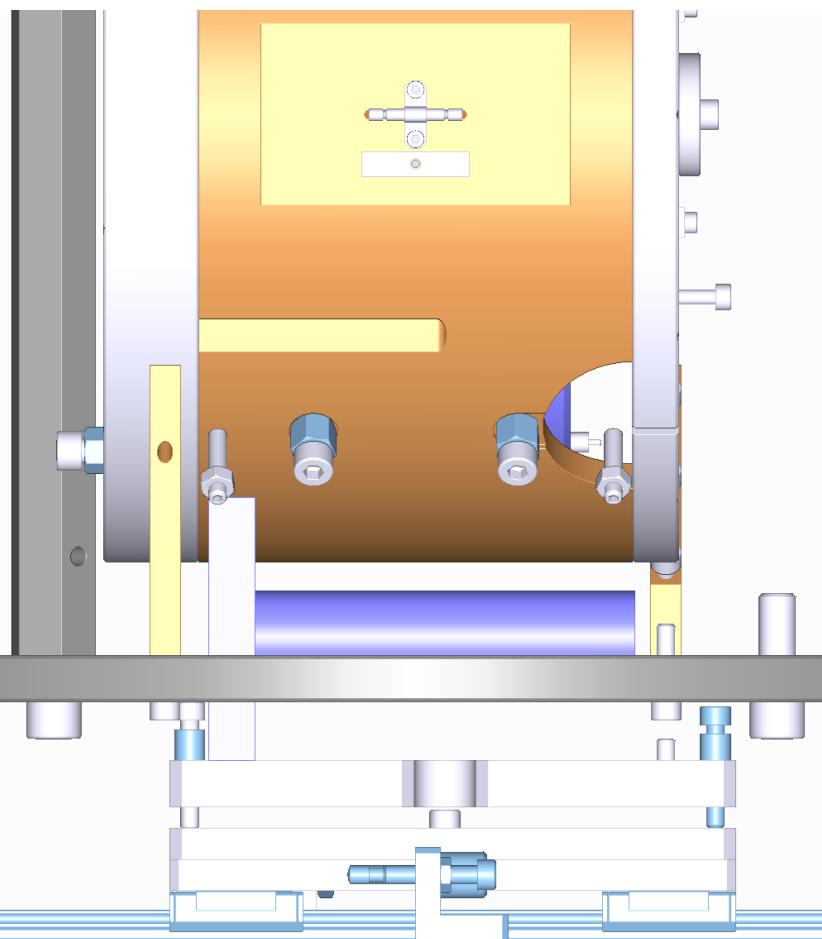
Move the arm forward
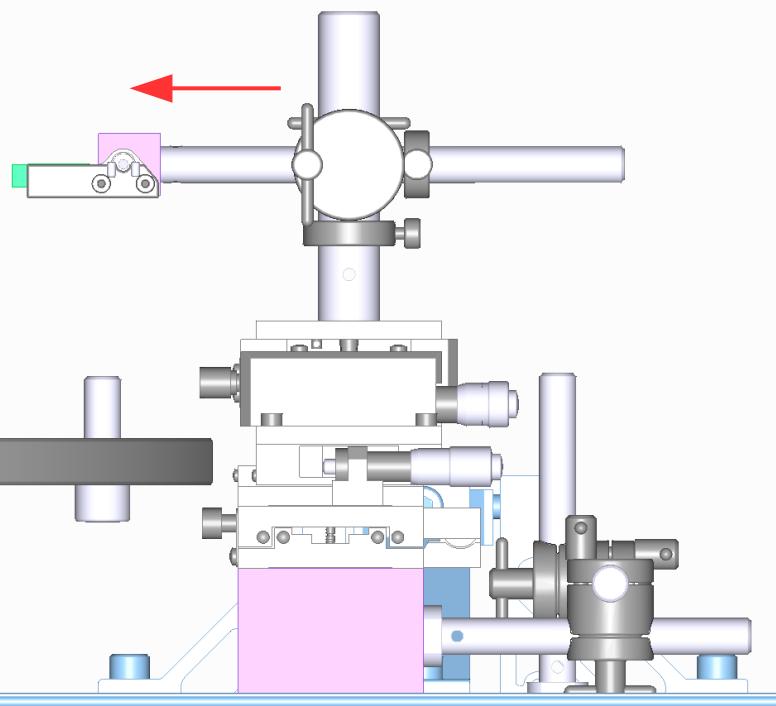
Installation Procedure 4

Repeat the step 2 and 3 many times until the photo sensor head gets roughly 1cm from the recoil mass
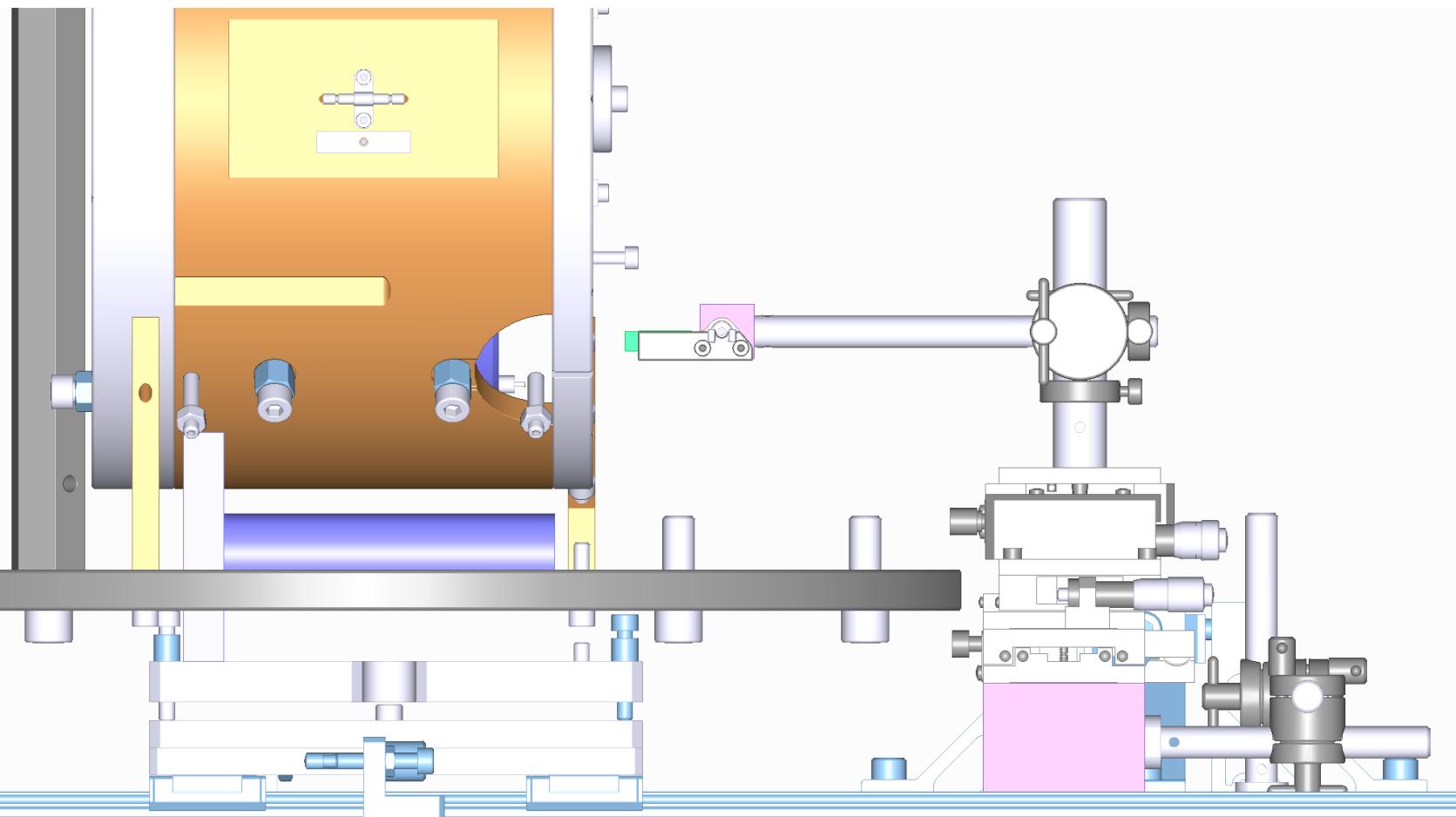
Installation Procedure 5

Use the micro-meter to put the sensor head very close to the recoil mass surface
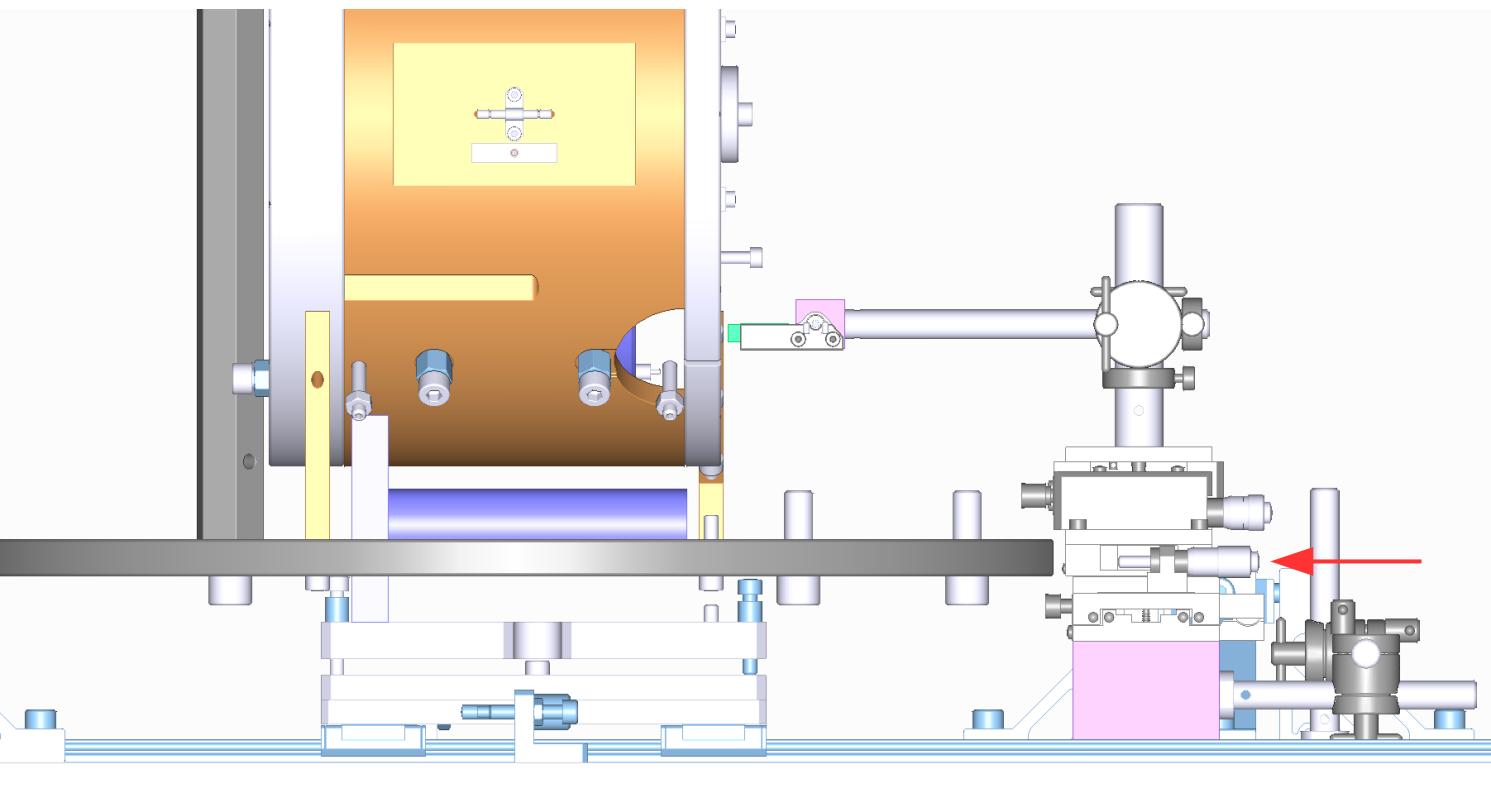
Two Photo-Sensor Configuration
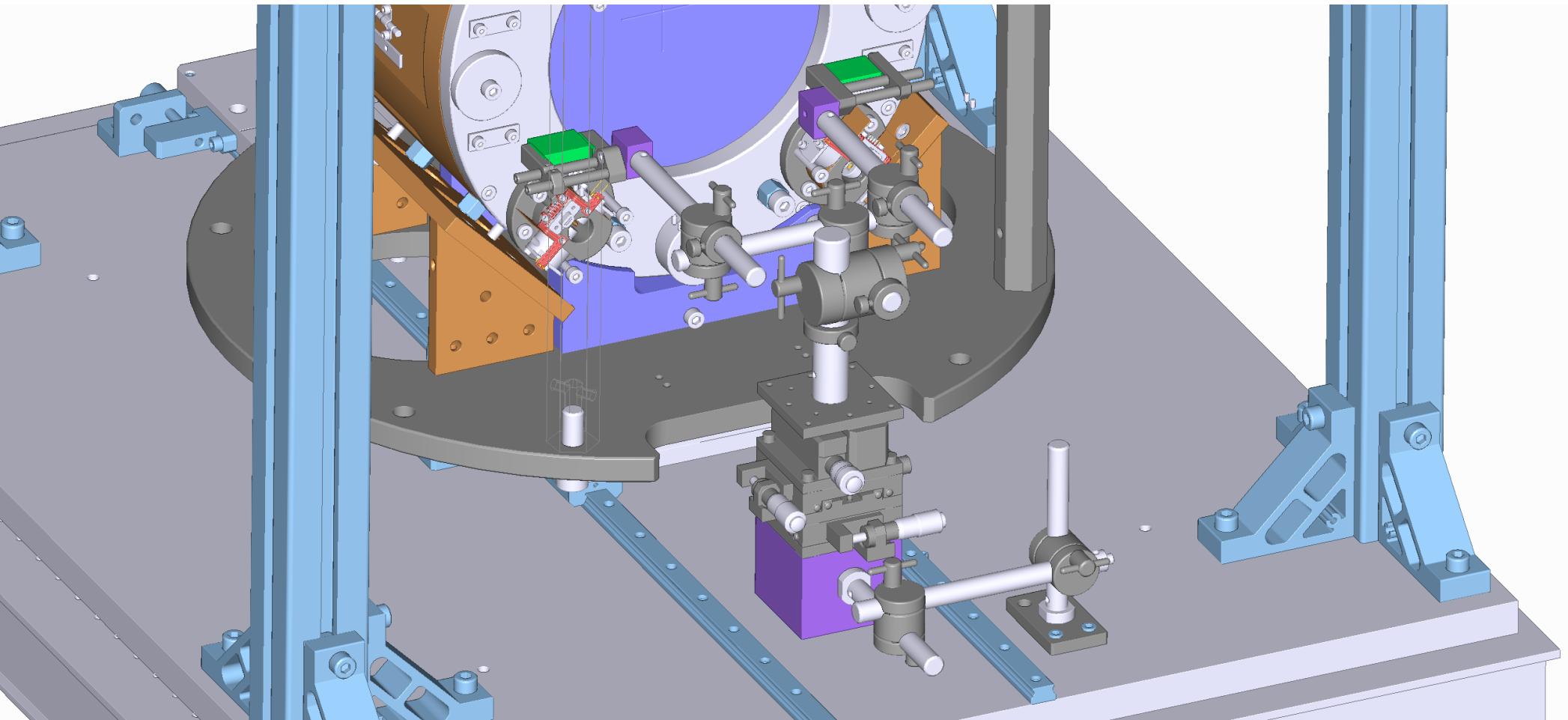
Two Photo-Sensor Configuration
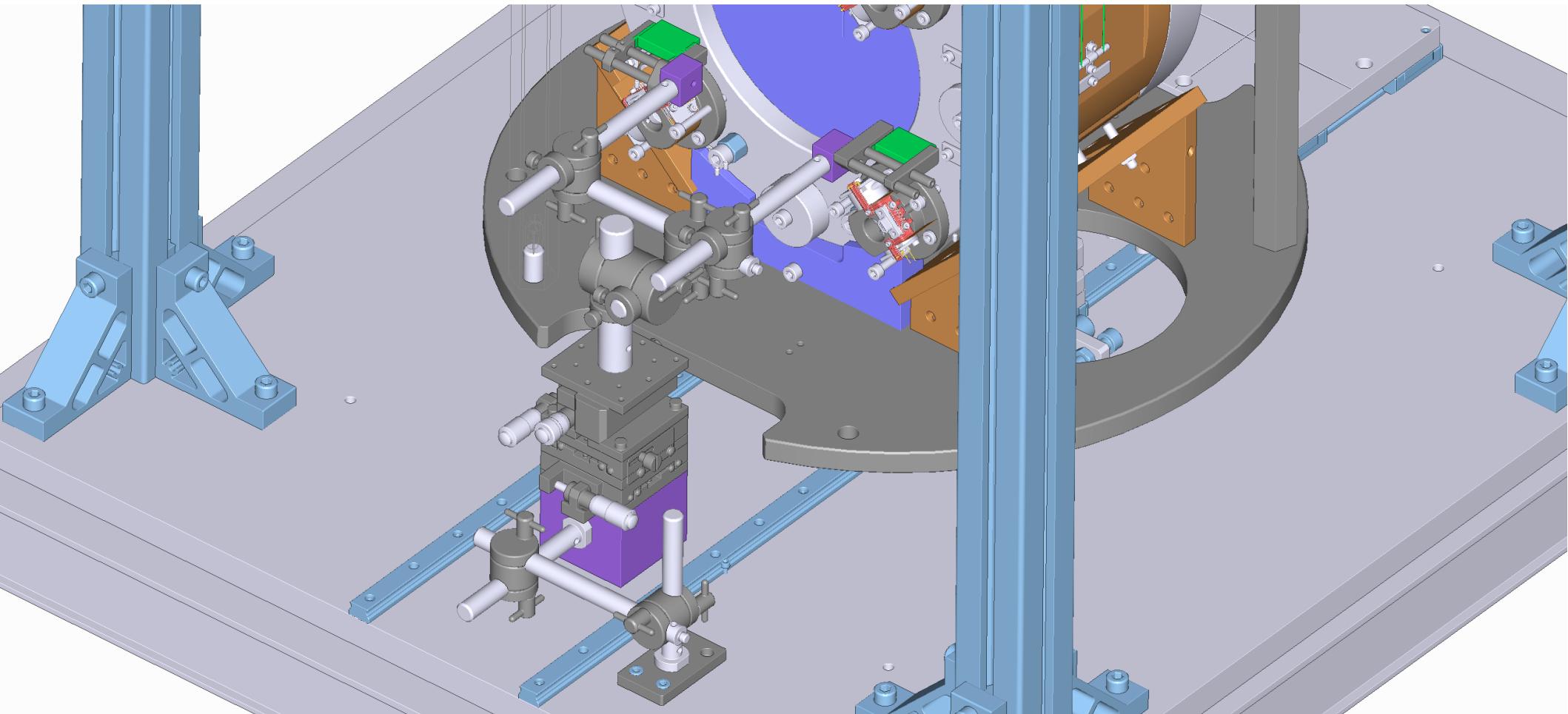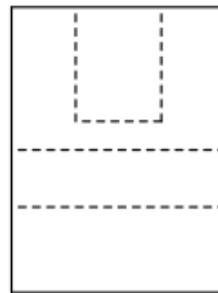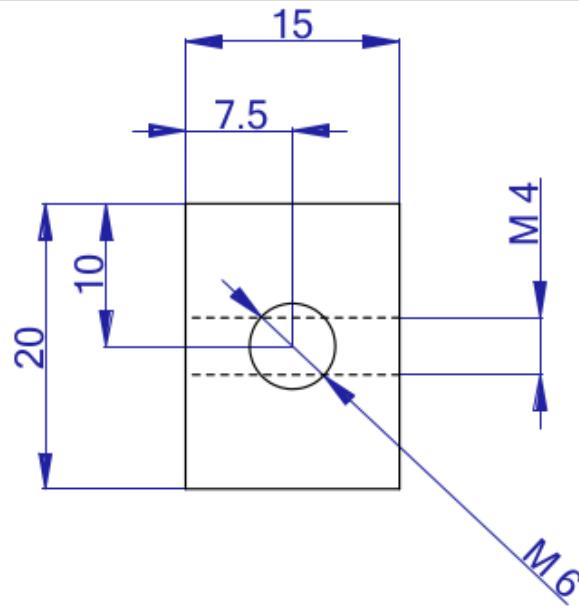
Drawing #	JGW-D1605845 part 1	Description	
Material	Aluminum (Al5052)	Tolerance	JISB0405-1991 m
Quantity	2	Assembly No.	
Author	Yoichi Aso	Date	11/15/16
Scale	5:1	Name	Photo Sensor Mount

Dimensions shown: 15, 7.5, 20, 10, M 4, M 6, 20, 8, 8, 10
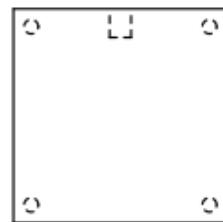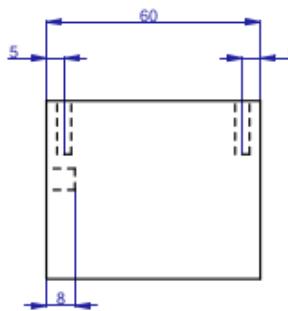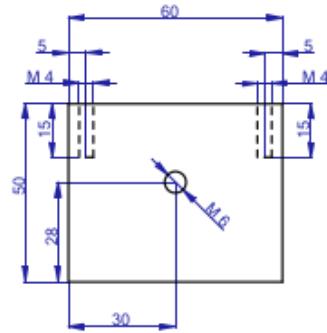
Drawing #	JGW-D1605845 part 2	Description	
Material	Aluminum (Al5052)	Tolerance	JIS B0405-1991 m
Quantity	1	Assembly No.	
Author	Yoichi Aso	Date	11/16/16
Scale	3:1	Name	Stage base

Off the shelf components

XYZ stage
駿河精機 B76-60C

Photo sensor clamp
Thorlabs CH1A

Other components from SIGMA Koki
PO-20-100 x 1
PO-12-100 x 2
CCHN-12-12 x 5
CCHN-20-12 x 1
RO-12-100 x 2
RO-12-150 x 4
TR-12 x 3
TR-20 x 1
SP-109-1 x 1

Circuit Design

Original Photo Sensor Driving Topology

PS driver

(on universal board)
15V → 5V conversion
- SIG-REF subtraction

±15V Power

HIROSE 4-pin

HIROSE 4-pin

LEMO OUT (6ch)

Voltage signal

D-sub 9pin
To PS (6ch)

Photo-reflective sensor

- LED
- 2 x PD (SIG) + 2x PD (REF)
- Trans-impedance opamp

Mass

D-sub 9pin

D-sub 9receptacle cable

*PS pin assignment

PD_SIG
LED_PWR (+5V)
PD_MON
LED_CTRL
PD_PWR (+5V)
NC
NC
LED_GND
PD_GND
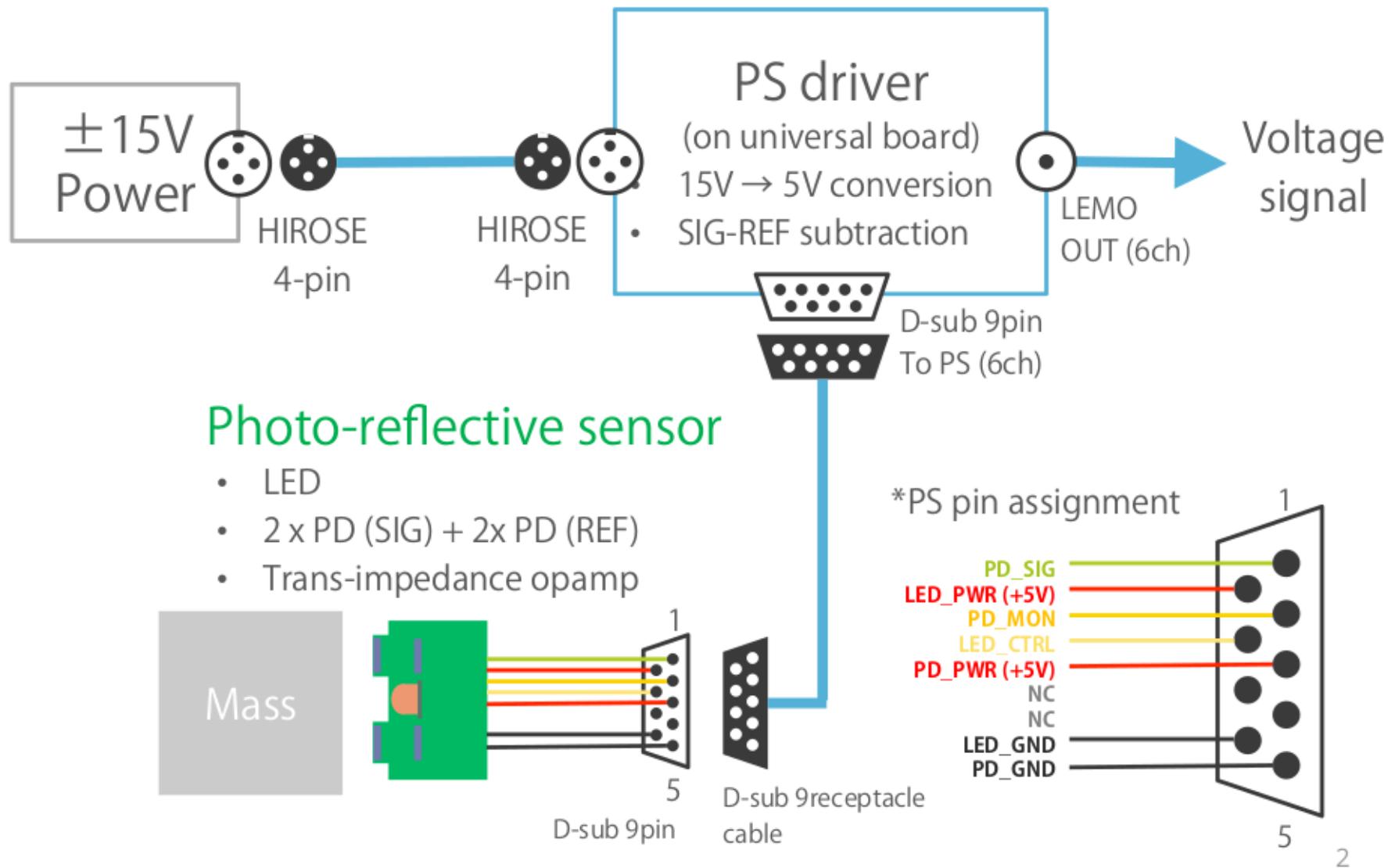
We need to make an interface box for KAGRA

To ADC (DB9)
Analog Out (BNC)
+/-18V
3pin DSUB
To PS (DB9)
signal
+5V/GND
18V->5V