

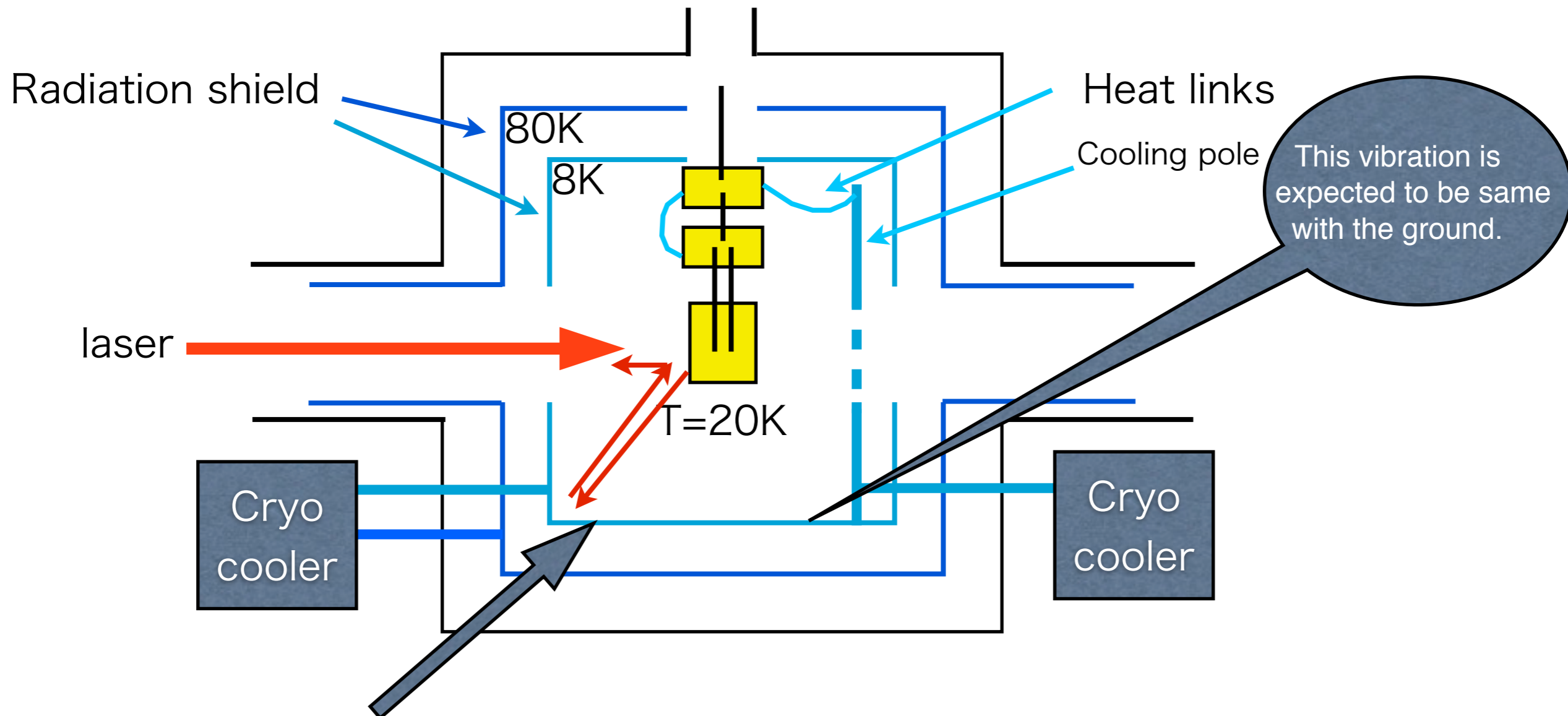
Measurement of vibration of radiation shield

Dan Chen

Cryogenic meeting 26th Sep 2012

Purpose

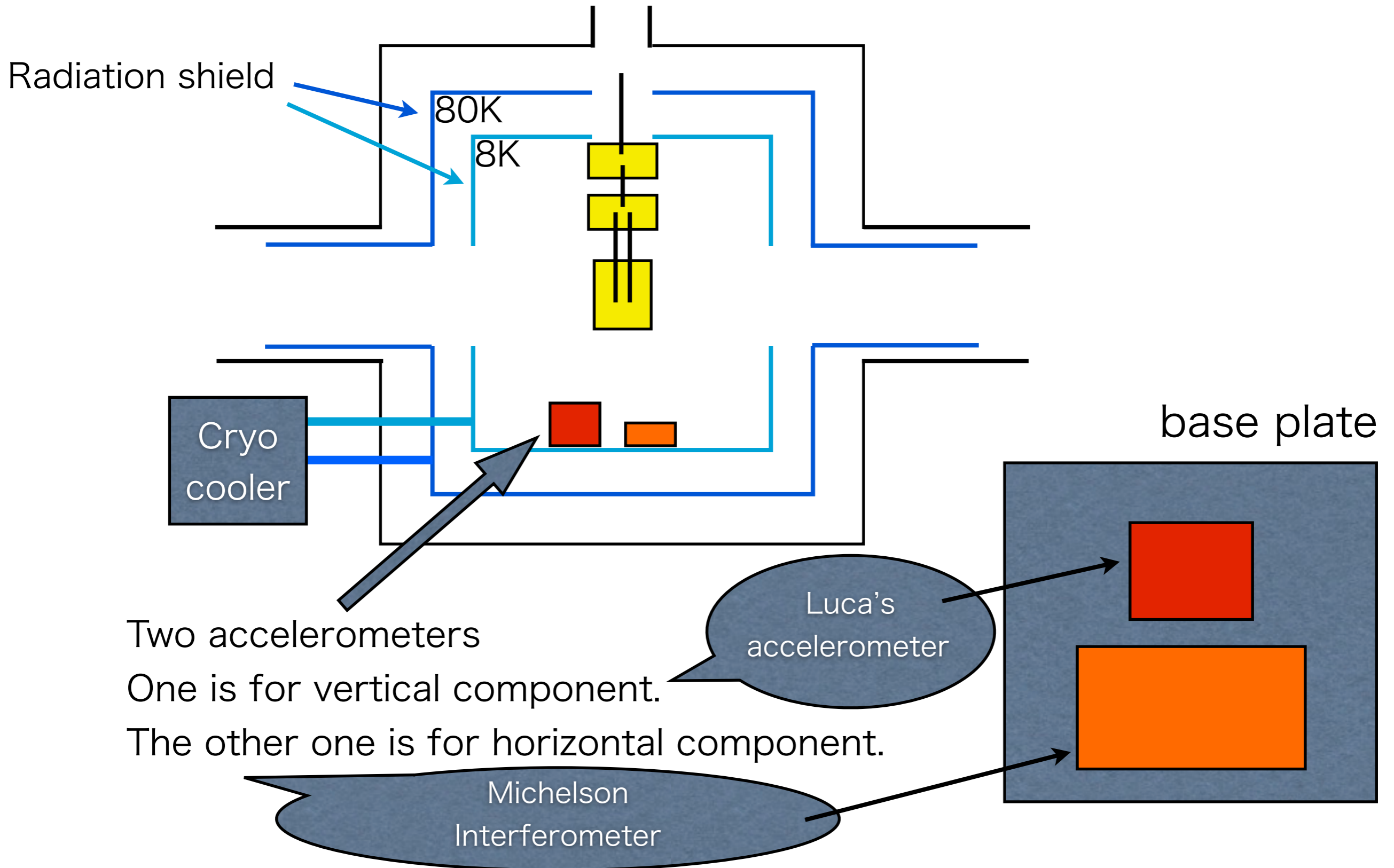
Measurement of the vibration on the radiation shield.



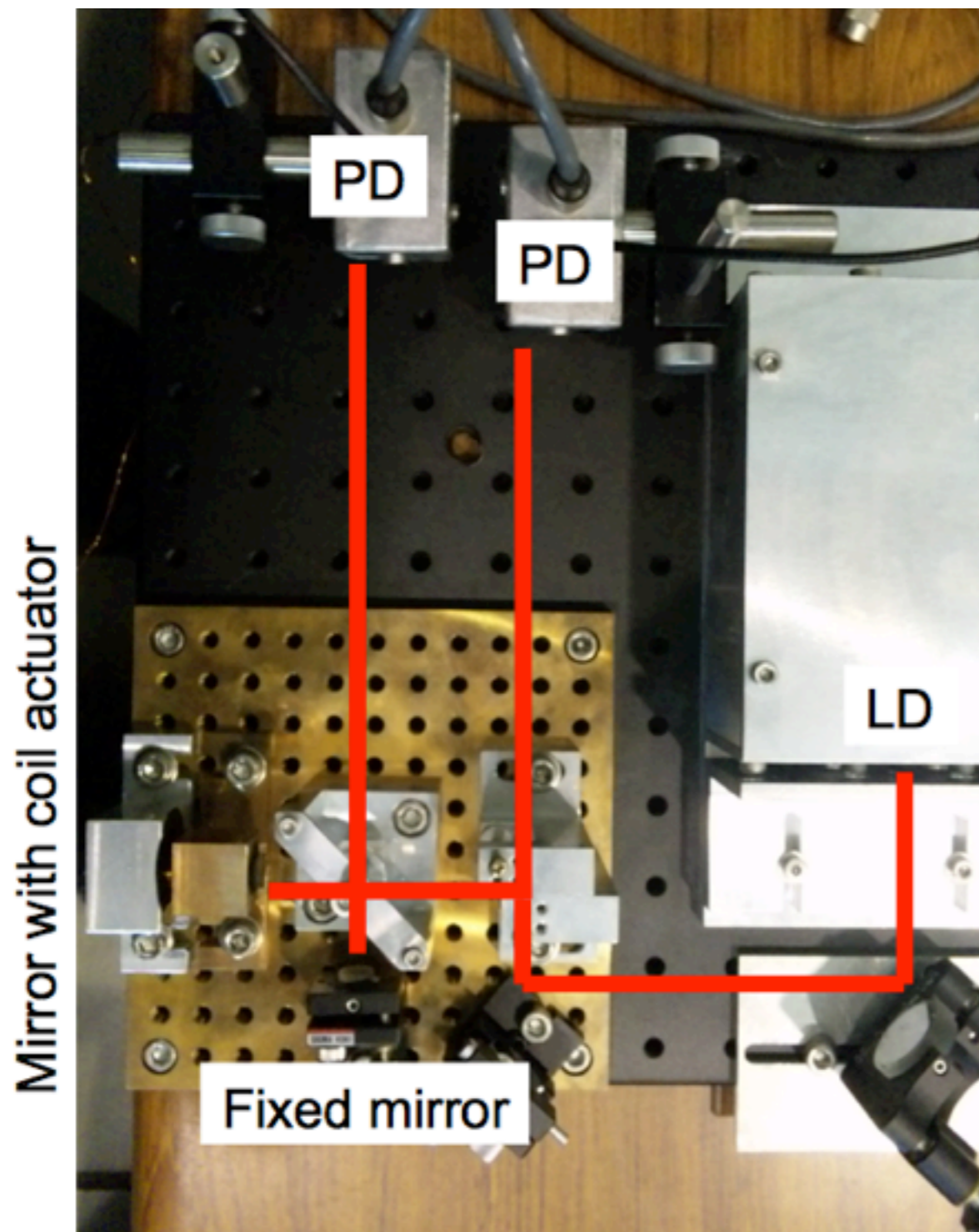
The vibration of the radiation shield may swing the test mass through the heat links. The scattering laser may be reflected by the shield and recombine into main laser.

➔ We will measure the vibration on this radiation shield with cryocooler ON. The real measurement will be run in Toshiba(Yokohama-shi) in autumn.

The measurement in Toshiba

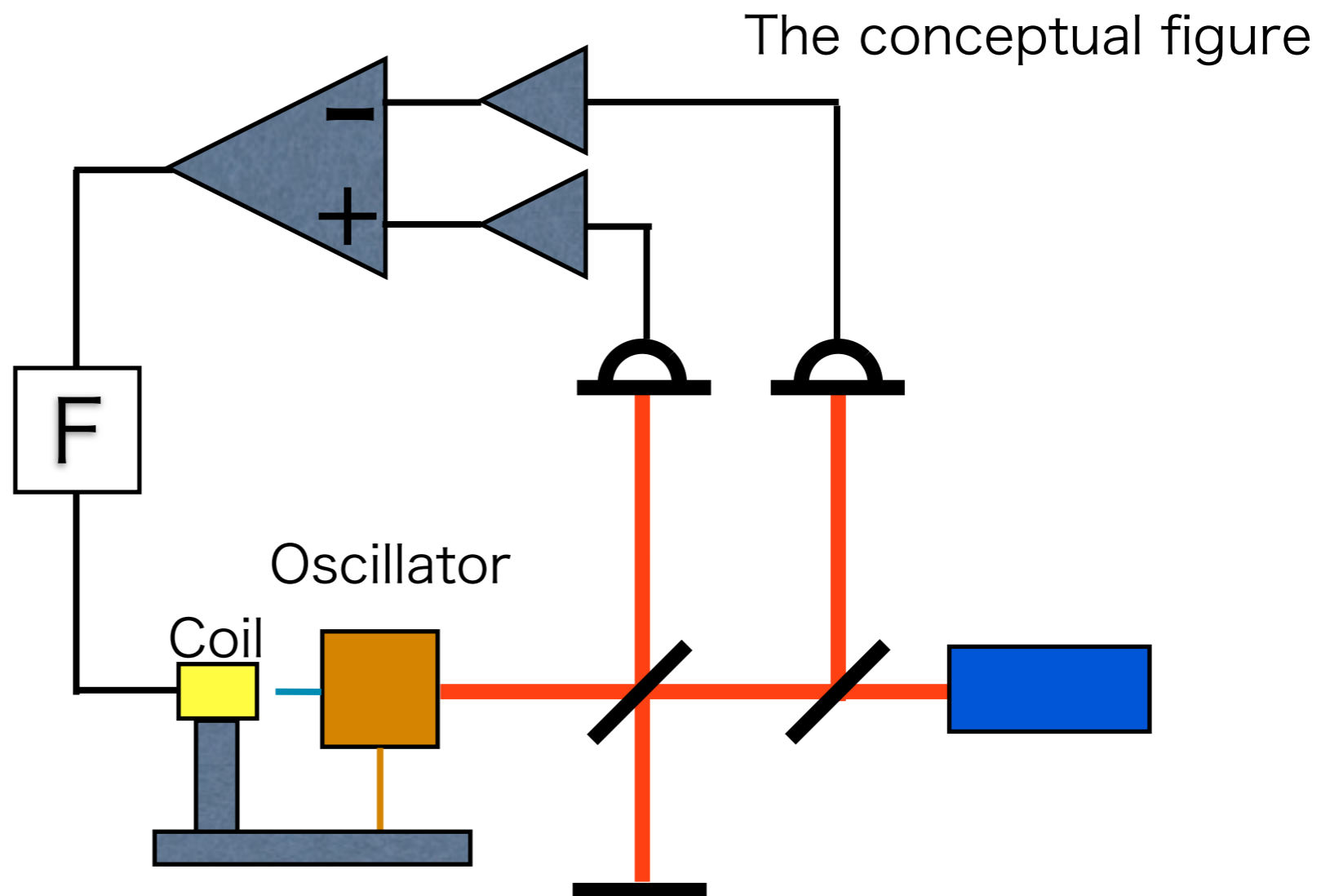
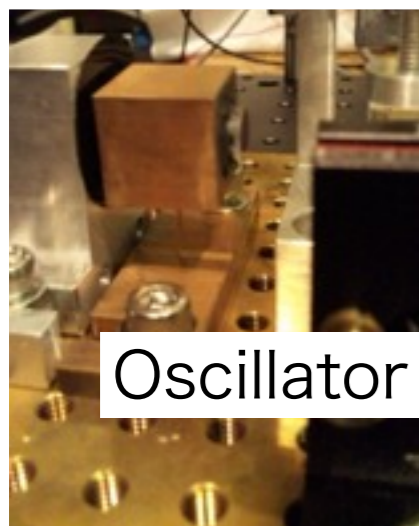
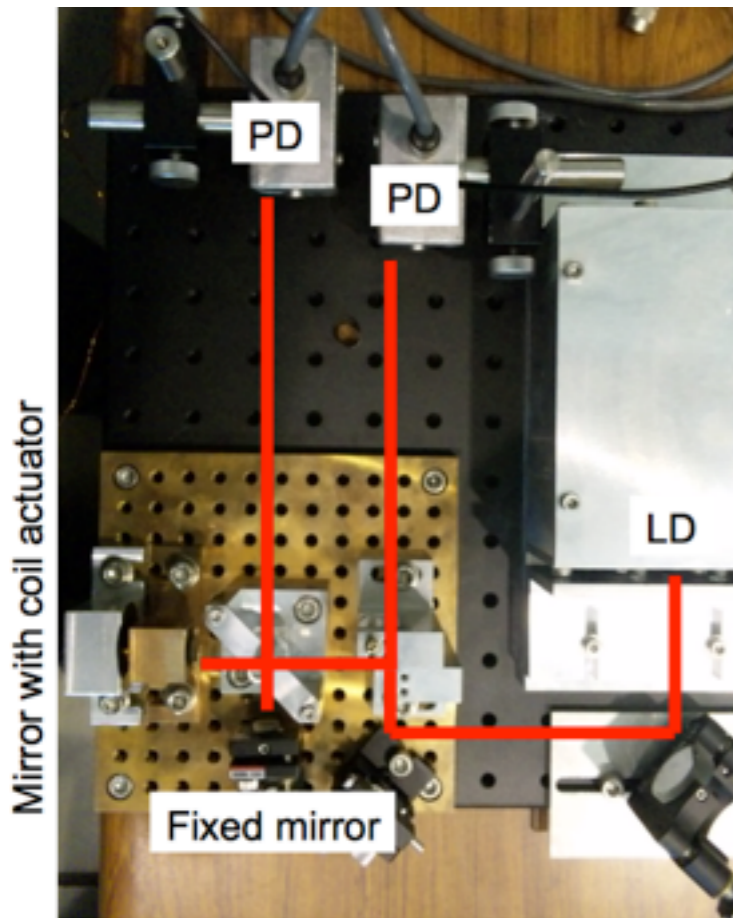


Method



We will use a MI to measure the vibration. (horizontal component)

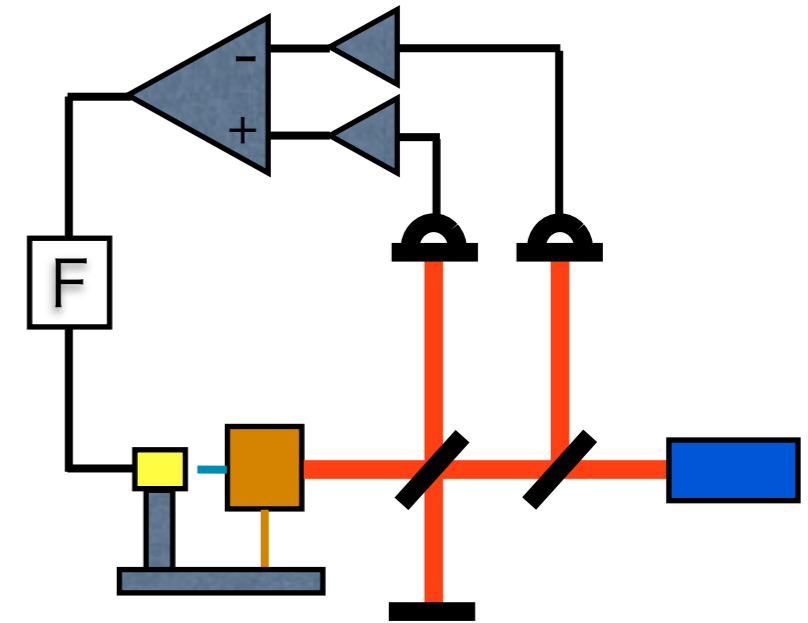
Method



One of the arms is a oscillator.

We can control the oscillator with the output of the MI to know the vibration.

present status



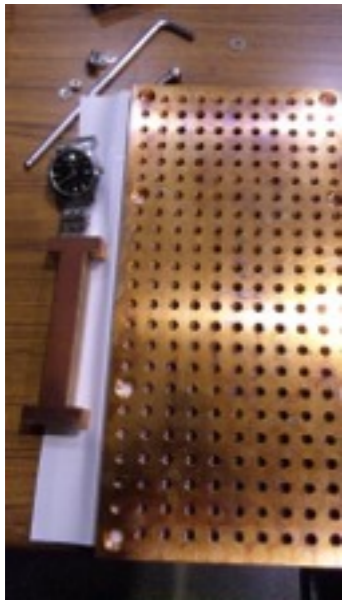
We will have a cooling test before the real measurement in Toshiba.

We need...

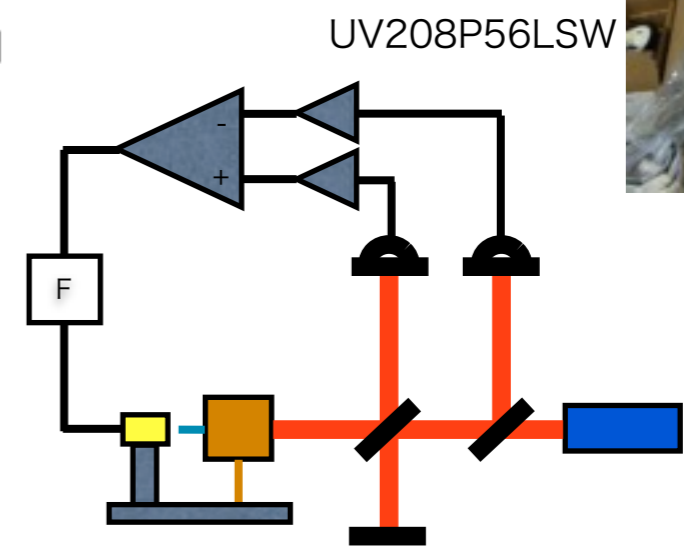
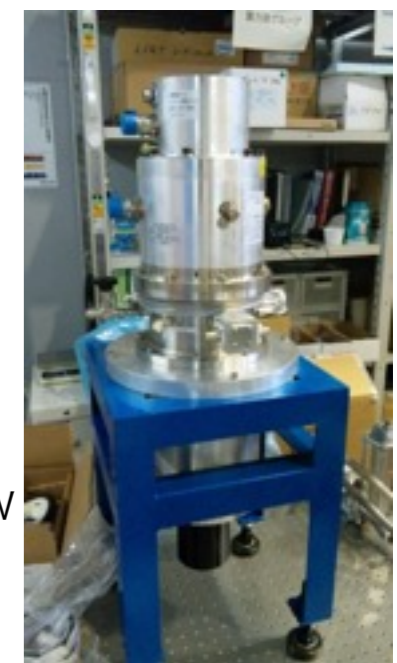
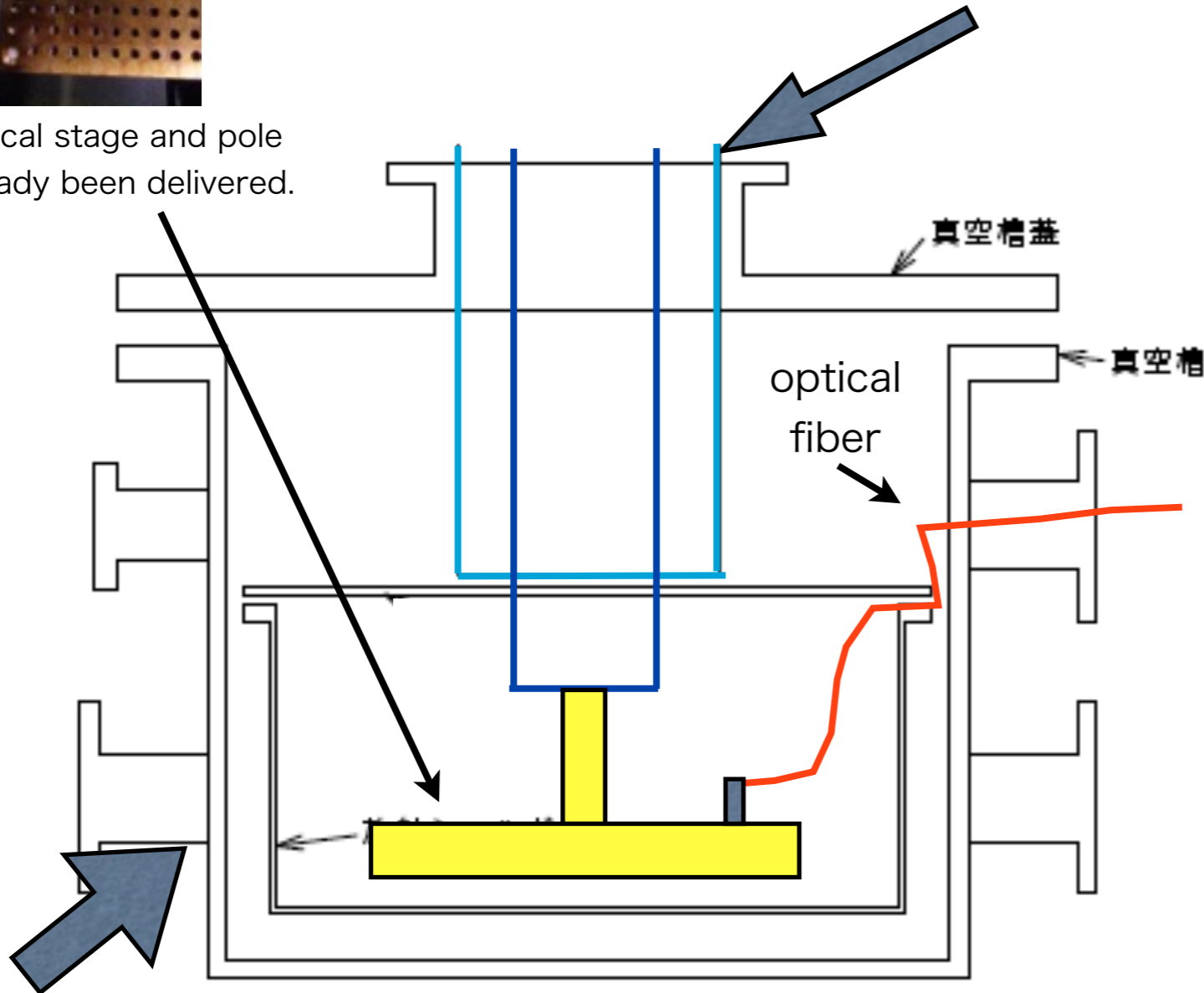
1. Chamber
 2. Optical fiber
 3. Interferometer control test
 4. Laser
- • •

Cooling test -chamber-

pulse tube cooler head



This optical stage and pole have already been delivered.



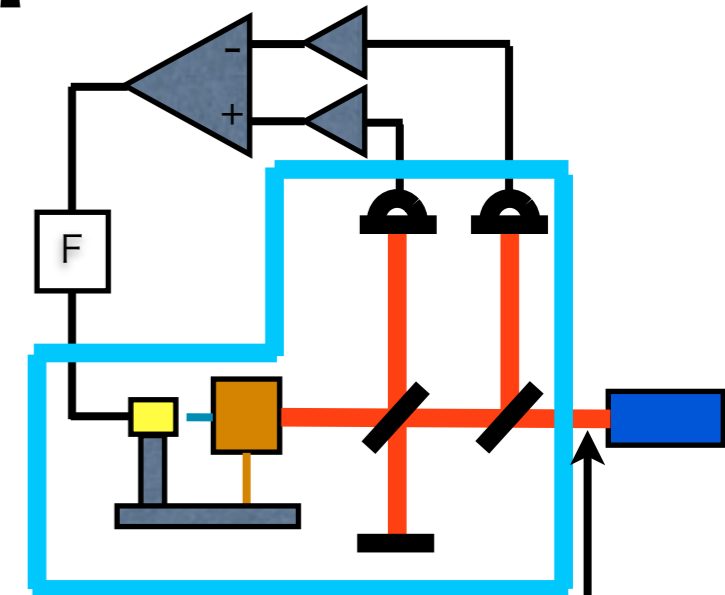
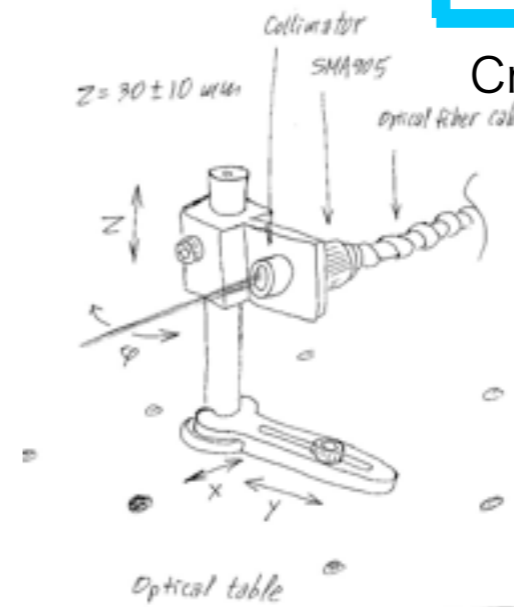
We will use this chamber to test PD, MI control and so on.

We will make this chamber and radiation shield.

➔ **We have already ordered.**

Optical fiber

UHV & Cryogenic



Cryogenic

Optical fiber

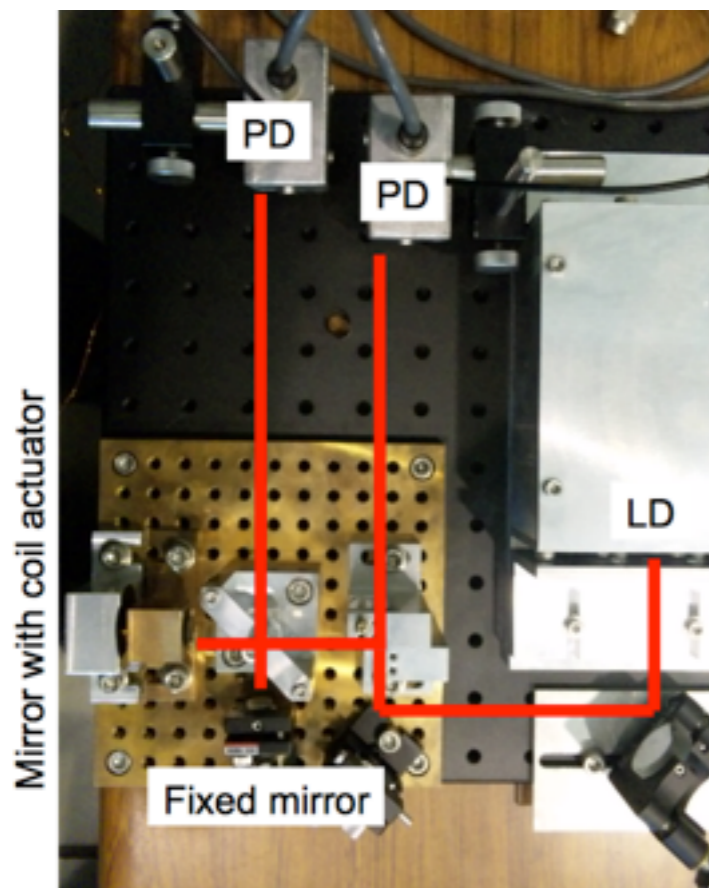
We have already ordered.

The fibers will be delivered until the end of this Sep.

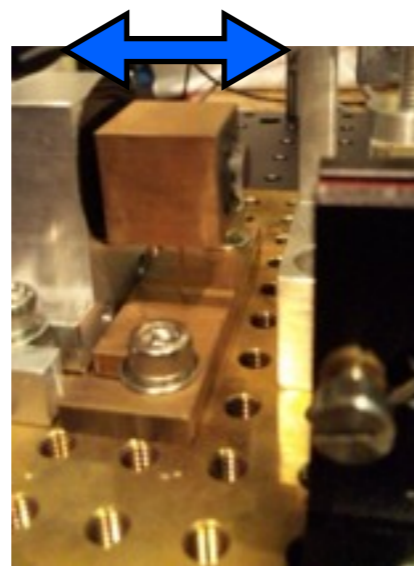
Interferometer control test

Eventually,
we need to use a 1550nm
laser

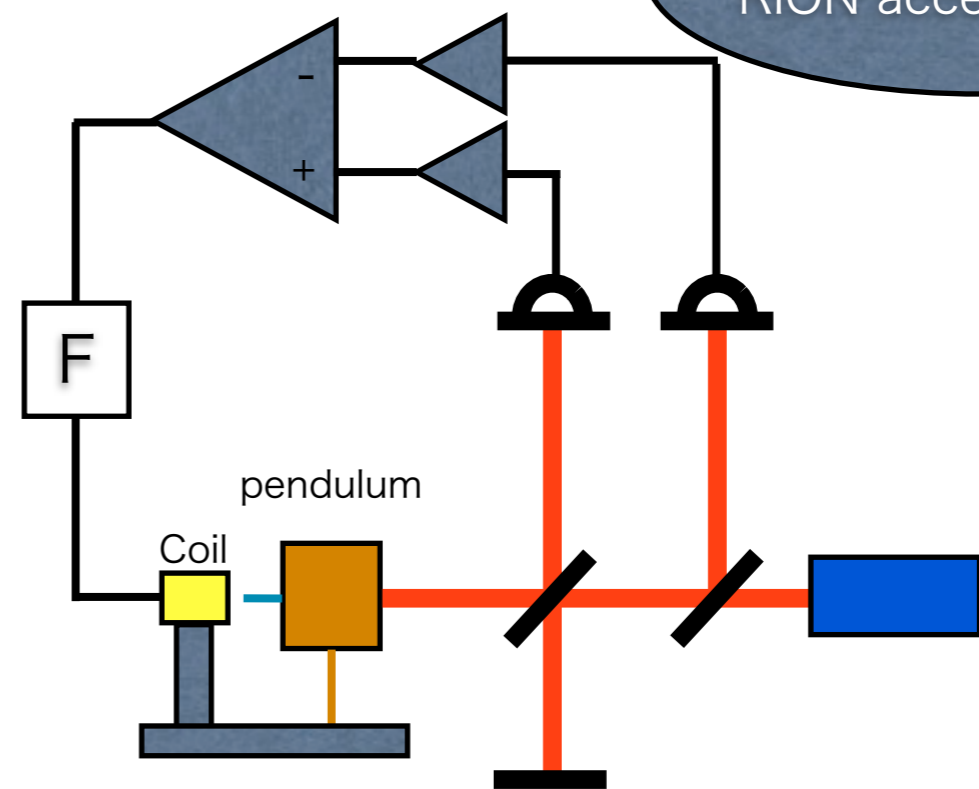
We used a 635nm laser to setup the MI and measured the seismic vibration under air and room temperature.



MI



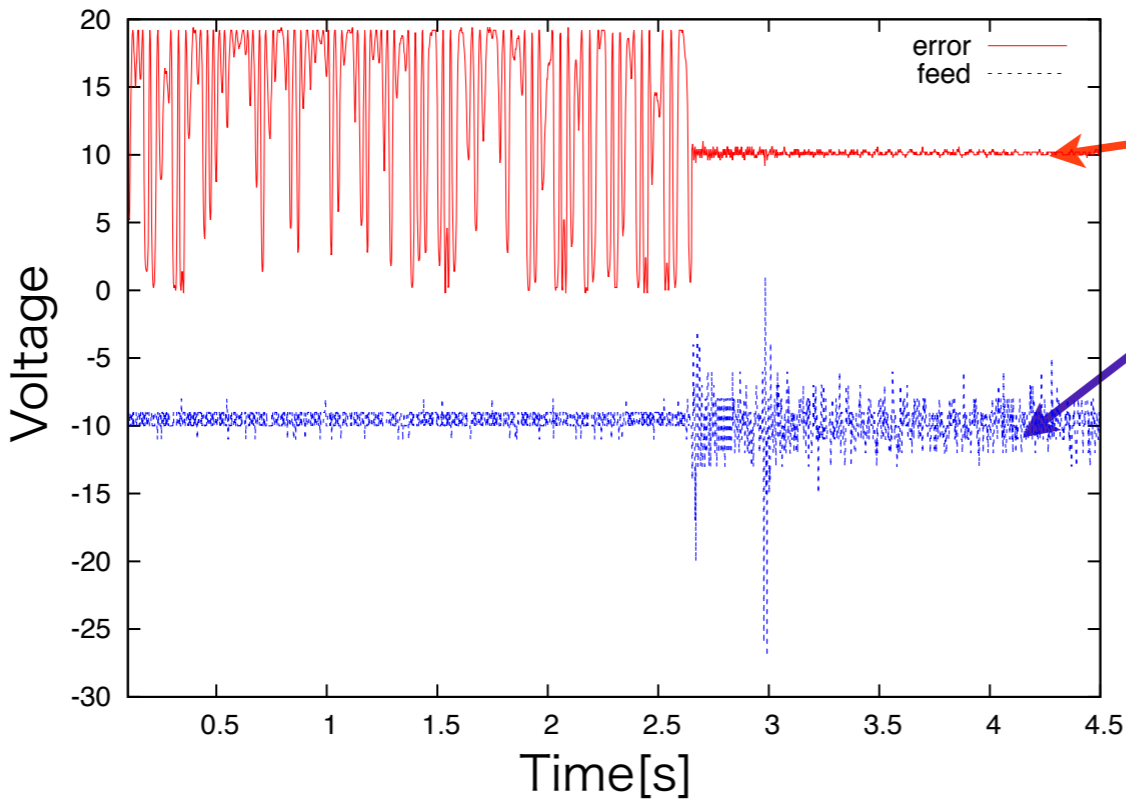
pendulum



The conceptual figure

Consistent with
RION accelerometer.

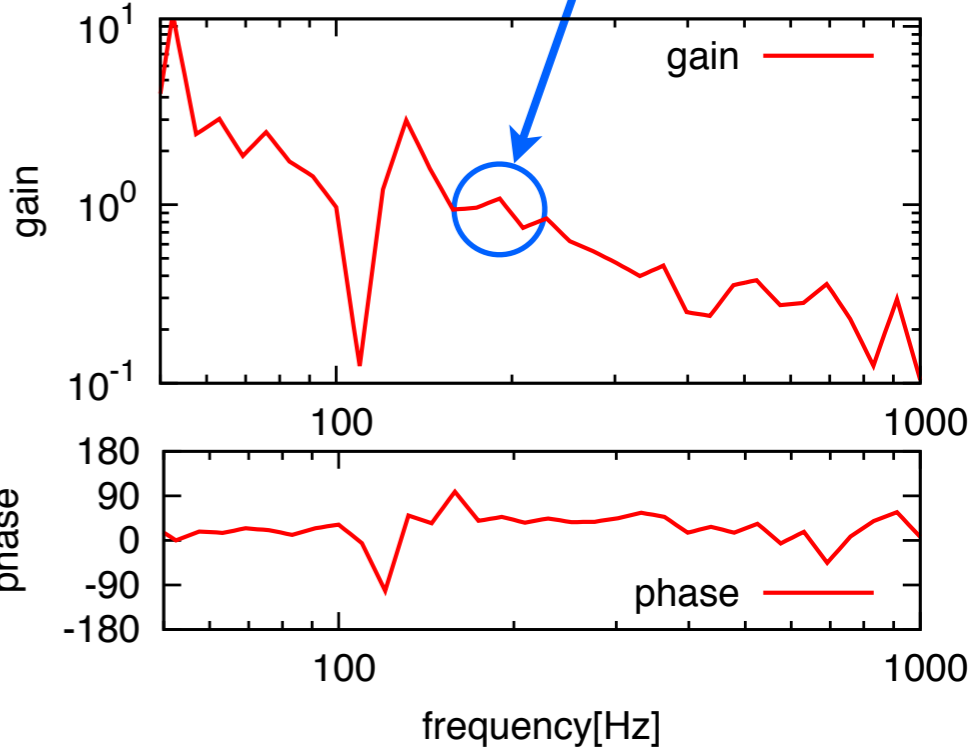
Interferometer control test



Error signal

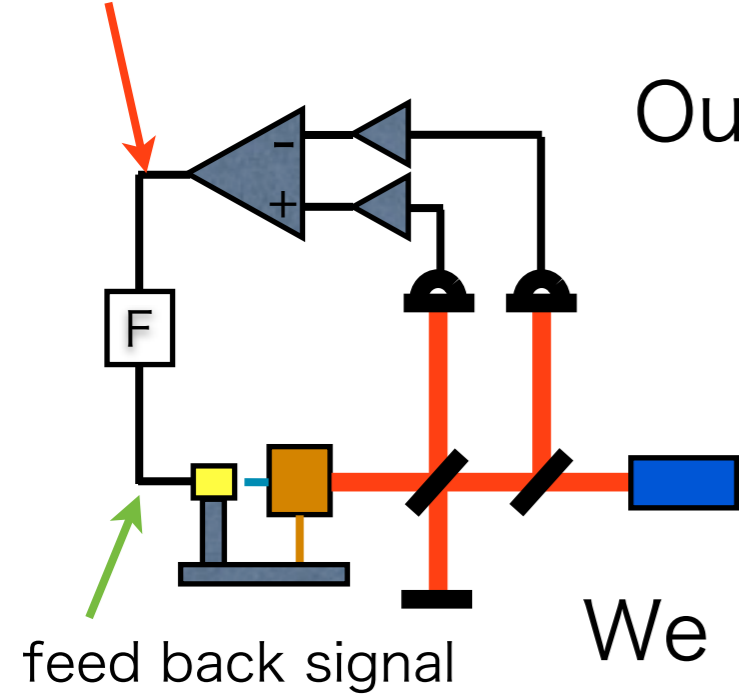
Feed back signal

UGF~170Hz



error signal

Output of the MI and control signal



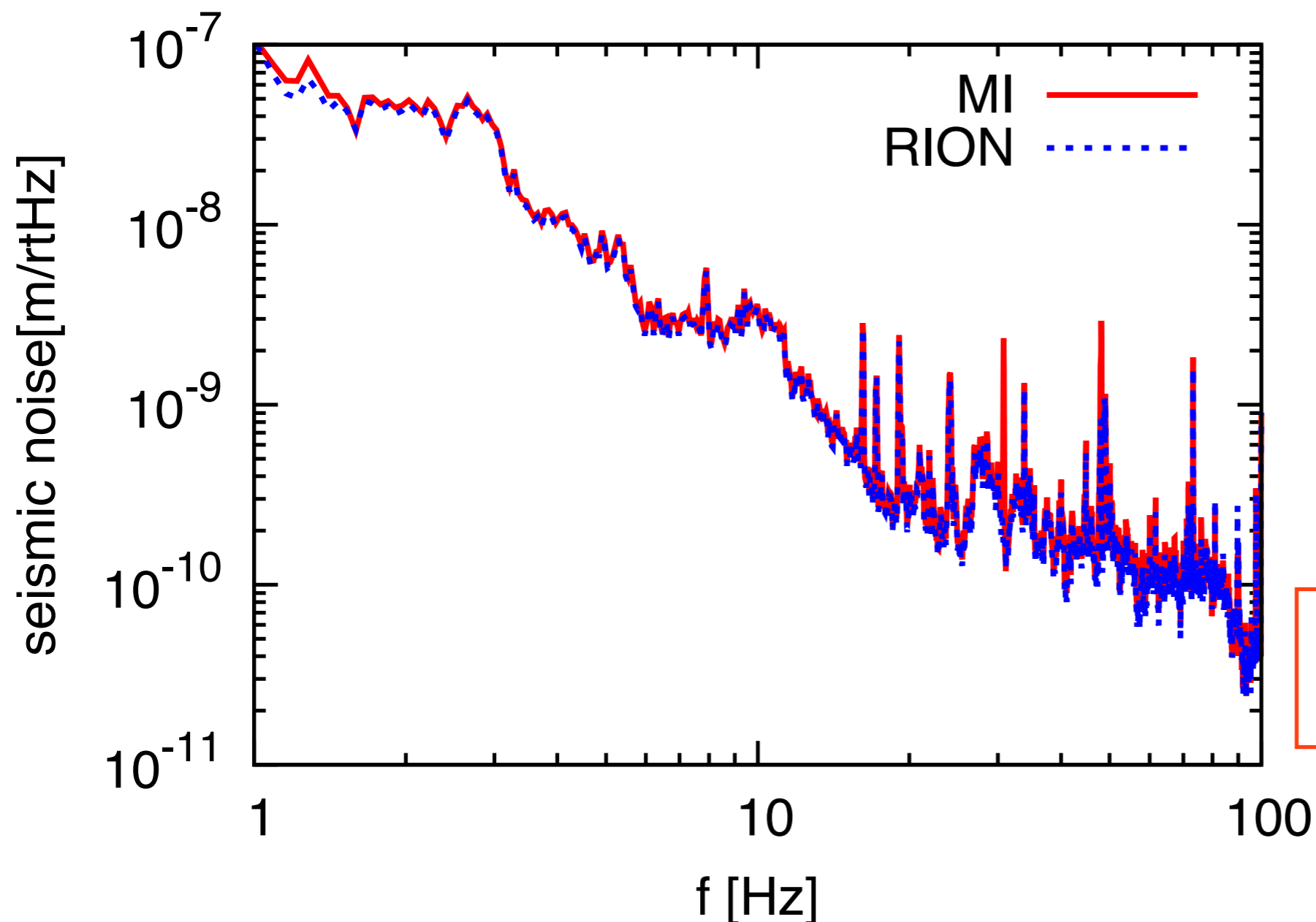
feed back signal

We can measure the vibration under 100Hz

Open loop TF

Interferometer control test

Seismic measurement@Kashiwa



Consistent with RION
accelerometer.

Laser (1550nm)

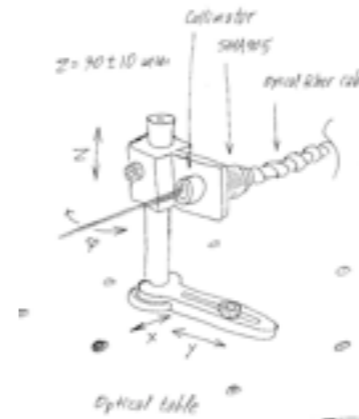


Fiber-Pigtailed Laser Diode



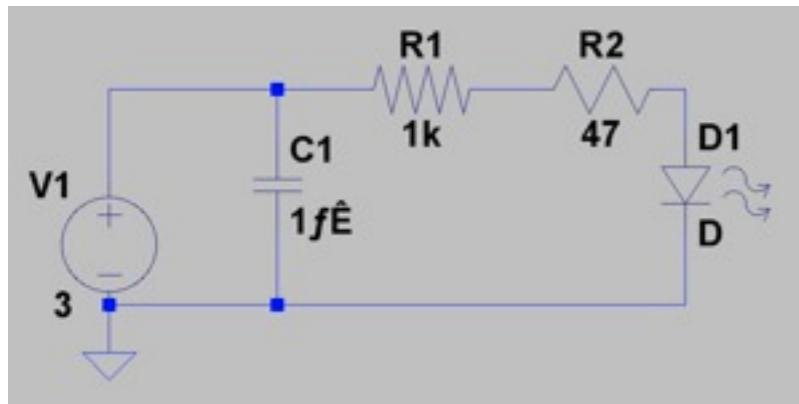
Optical fiber in vacuum

Somehow, I could not drive a LD with very simple circuit.



Output mount

Michelson Interferometer



LD was broken?

Action Items

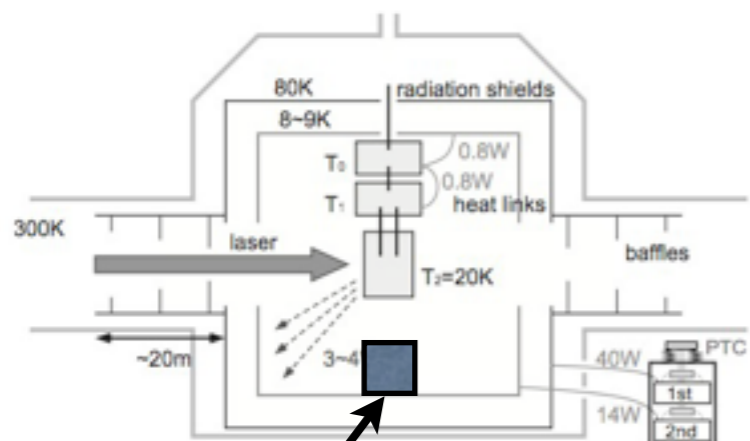
- Laser source
- Order O-ring for the chamber
- Order optical components.
- Clean room to clean the accelerometers.

end

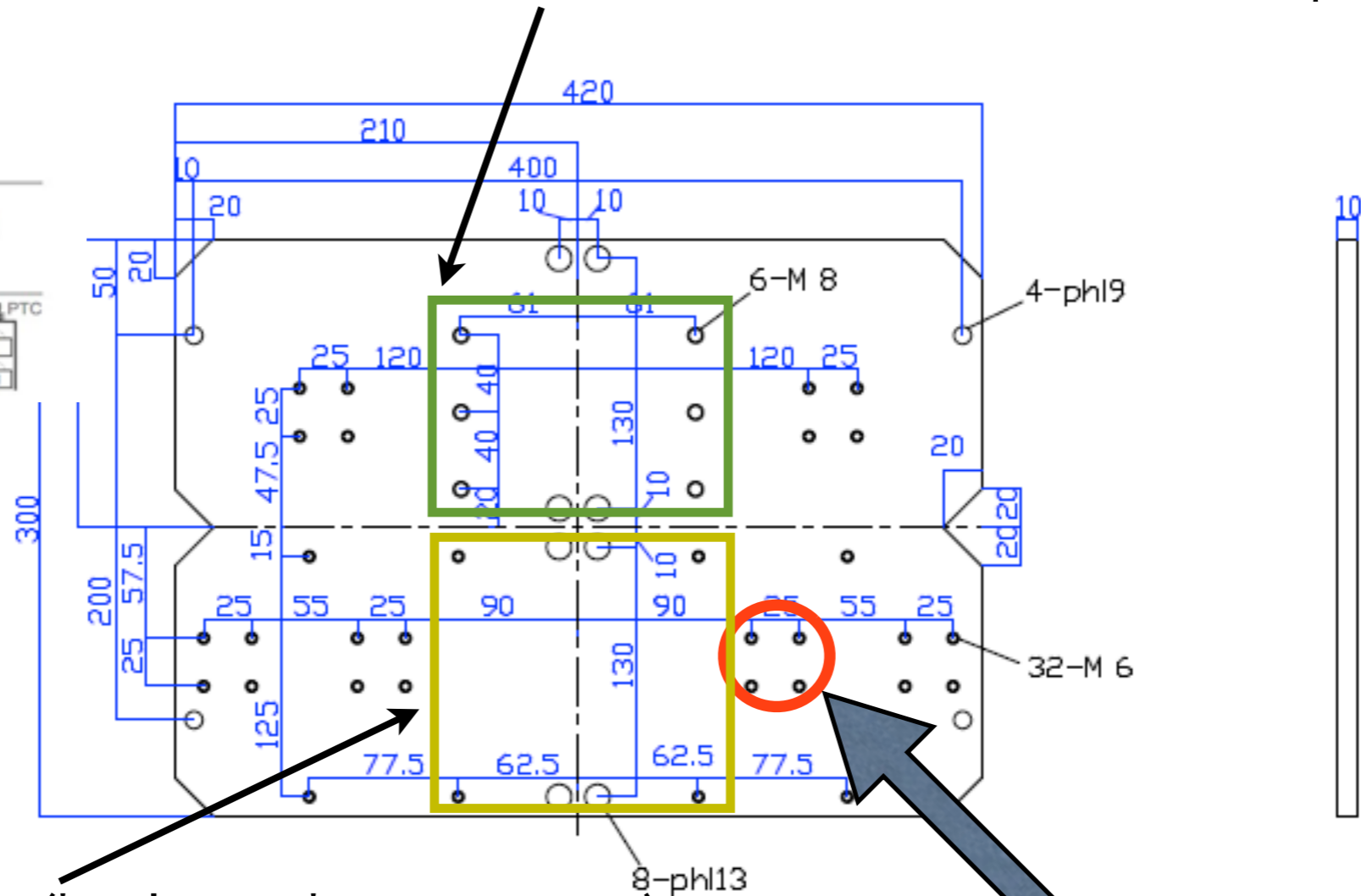
Fix with radiation shield

(The design of the baseplate.)

Luca's accelerometer (vertical component)



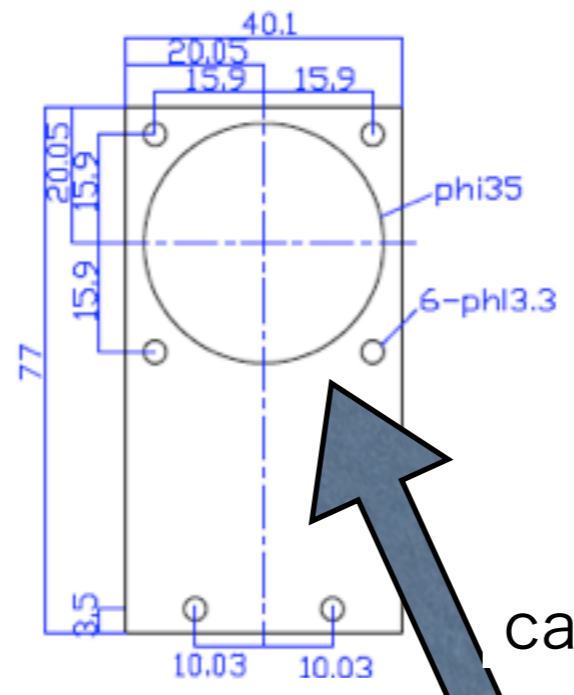
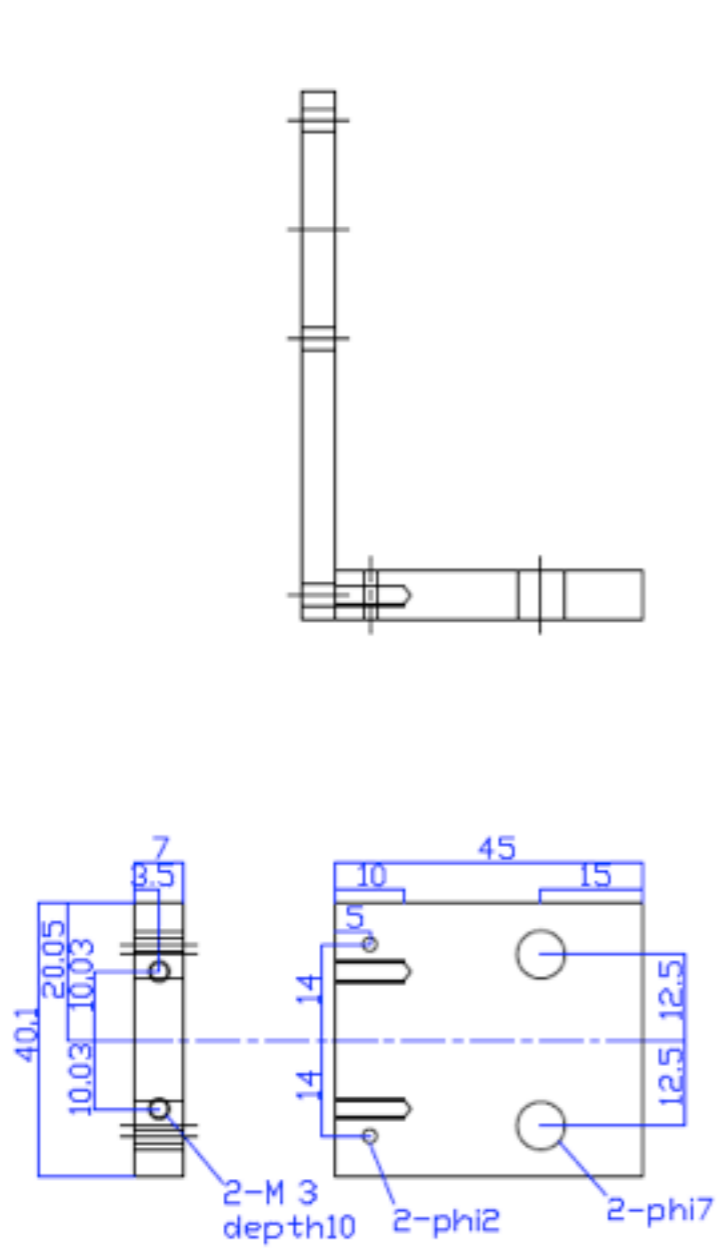
accelerometers



My accelerometer (horizontal component)

Holes to fix burndy holder

fix with radiation shield



The connector of the cable will be inserted here.

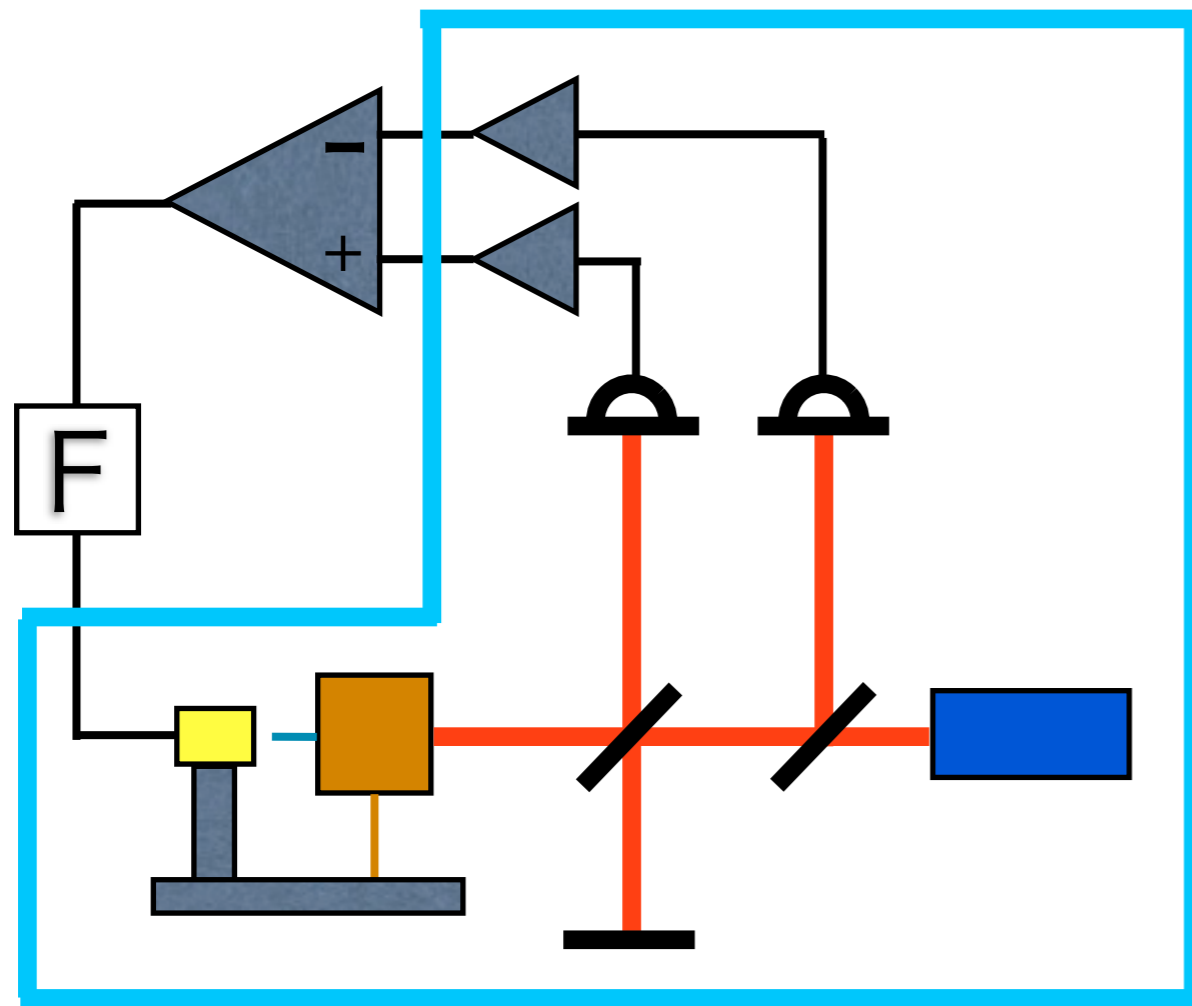


Burndy holder v.2	2012/7/25
Scale = 1/1	Dan Chen

Future work

- Order the chamber
- Order the baseplate and burndy holder
- Order optical fibers

Method

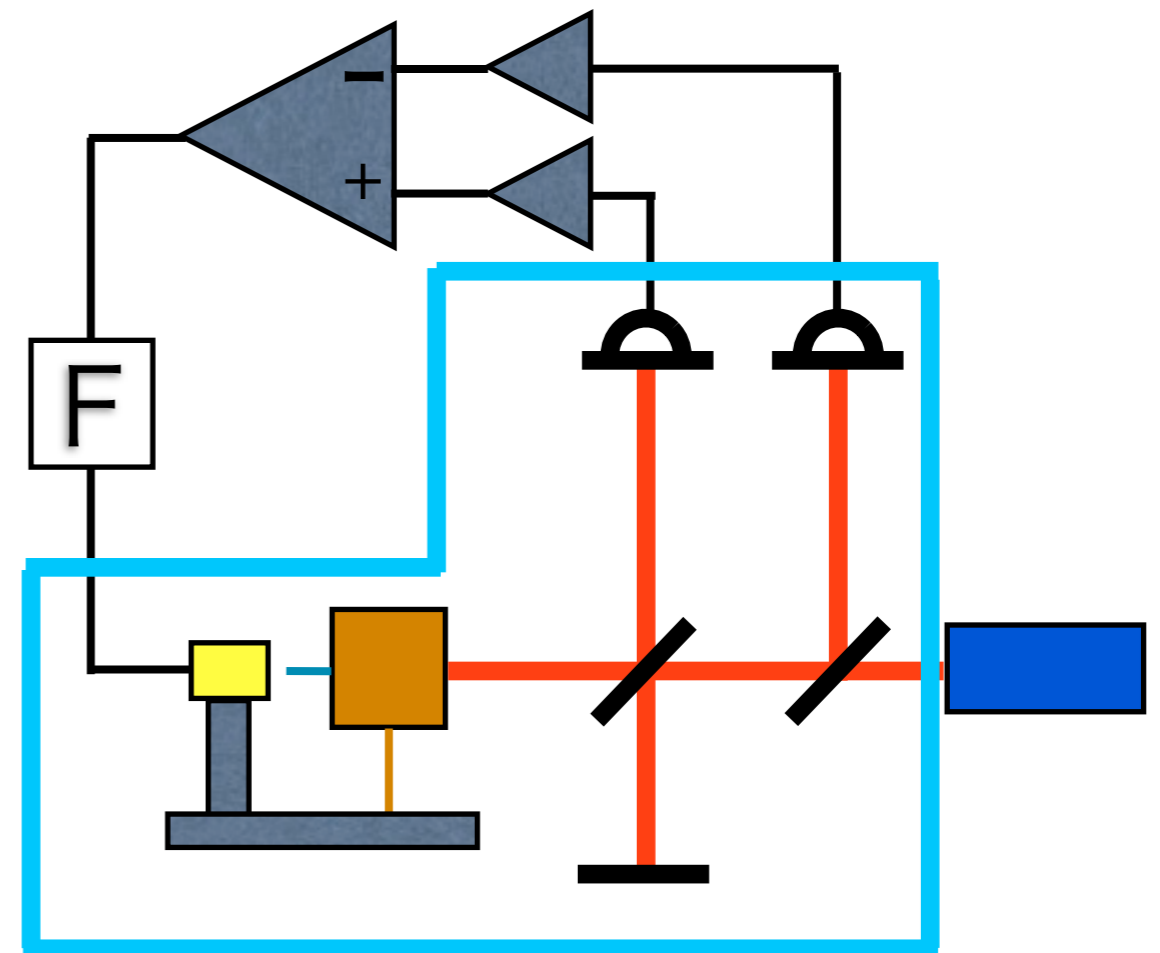


Cryogenic

Challenging

We will prepare both of the configurations.

(The priority of right one is higher)



Cryogenic

The easiest