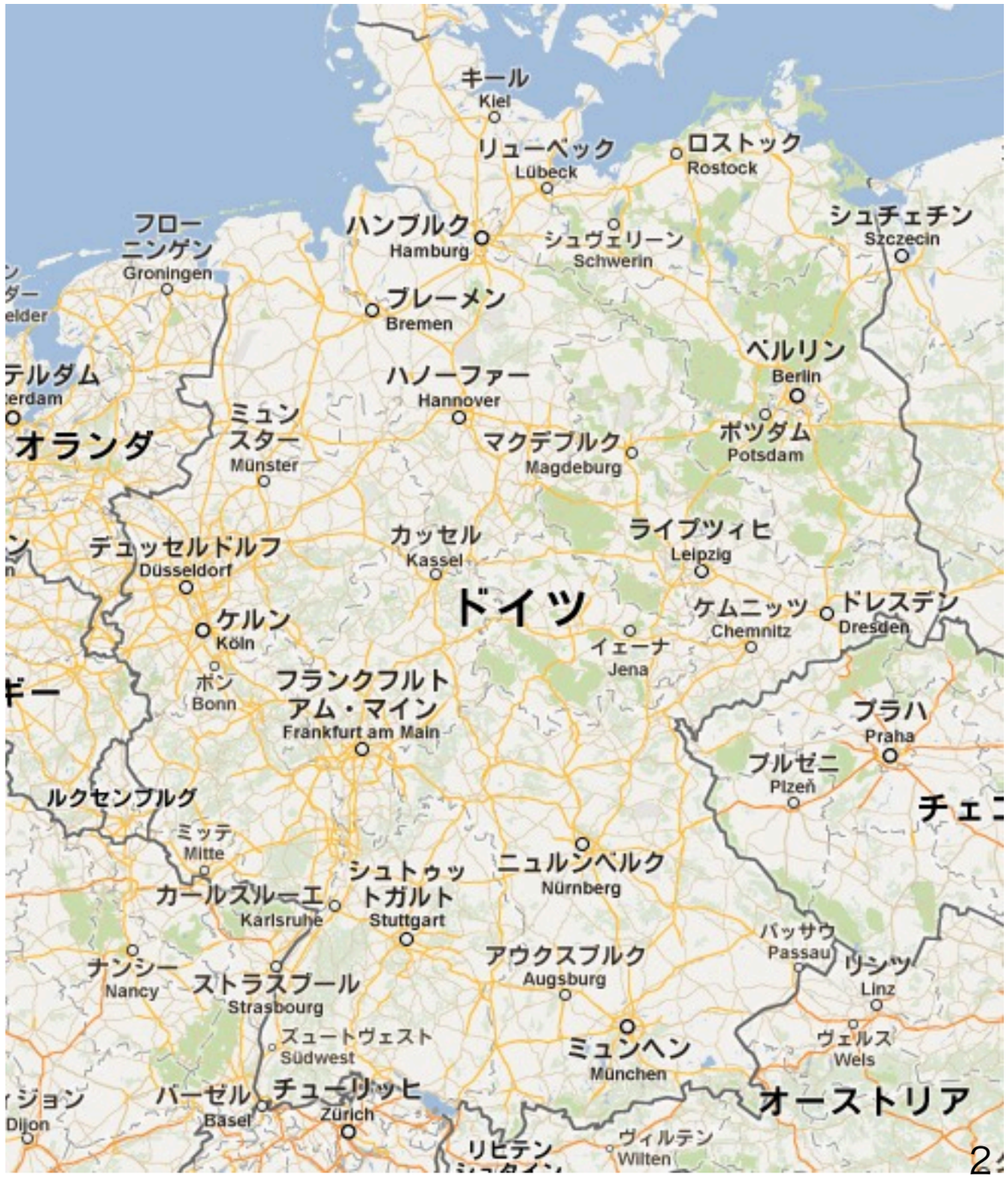
ELiTES work shop
@Germany
-Optical experiment-

29th/Aug/2012

Dan Chen

Schedule



Hannover (14th-15th)

↓

Jena (15th-21st)

- Jena (21st-24th)
  - Experiment
    - Sakakibara
    - Ushiba
    - Chen
  - PI
    - Shibata
- Hannover (21st-24th)
  - Somiya
  - Matsumoto
  - Michimura
  - Sekiguchi

Time table

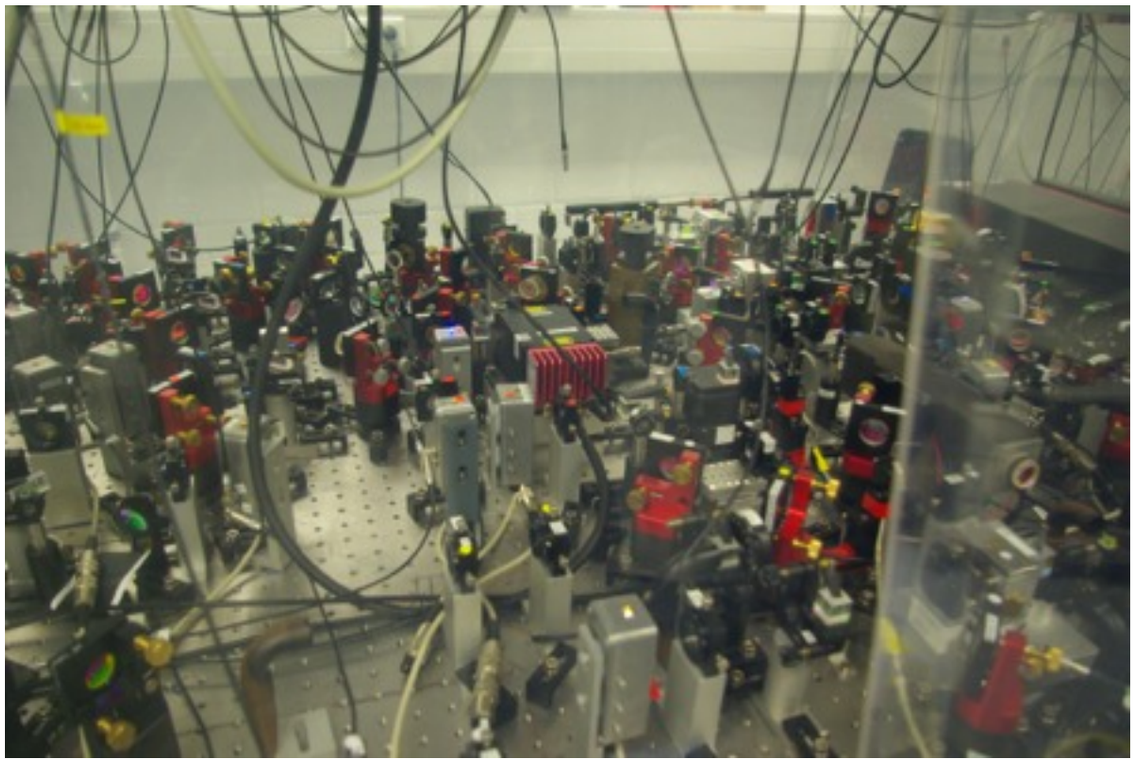
	2012/8/14	2012/8/15	2012/8/16	2012/8/17	2012/8/20	2012/8/21	2012/8/22-24
9:00-10:30		move from Hannover to Jena	thermal noise lecture (D.Heinert) 10AM	TN lecture continues	bulk loss lecture (G.Hofmann) 10AM	absorption (Komma, Steinlechner)	
10:45-12:15				cooling time reduction (Sakakibara)		suspension (Sekiguchi)	
12:15-14:00	lab tour at Hannover	arrival & lunch	lunch				lab work
14:00-15:30		lab tour & informal meeting	parametric instability (Shibata)	silicon cavity (Ushiba)	coating loss (Nawrodt)	free discussion	
15:45-17:15			thermal lensing (Michimura)	120K Silicon (Somiya)	future topic (Matsumoto)		

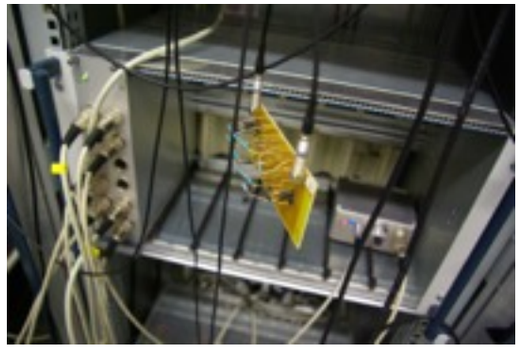
Lab tour at Hannover

10m

- seismic isolation system
- laser source

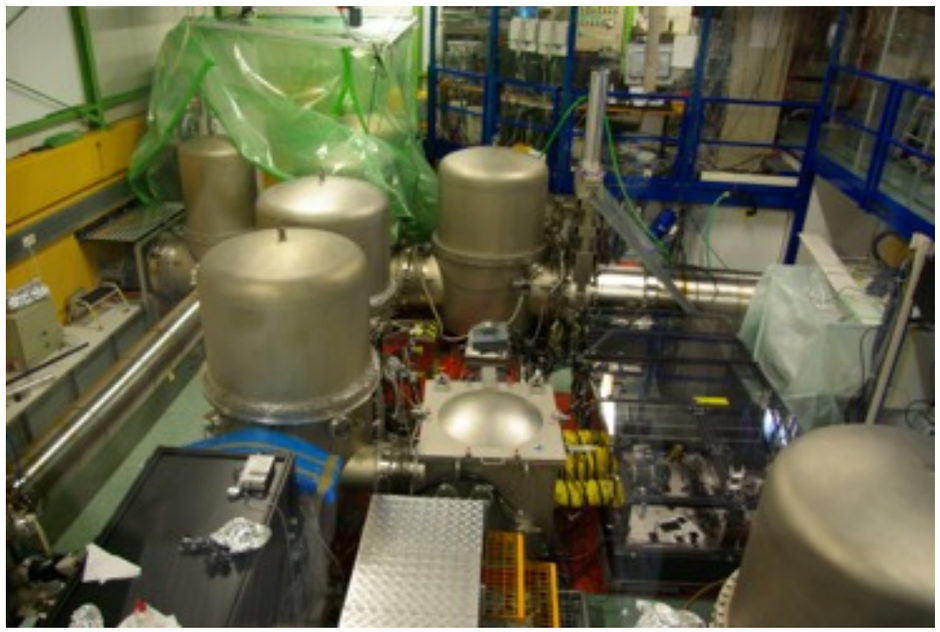
squeezer

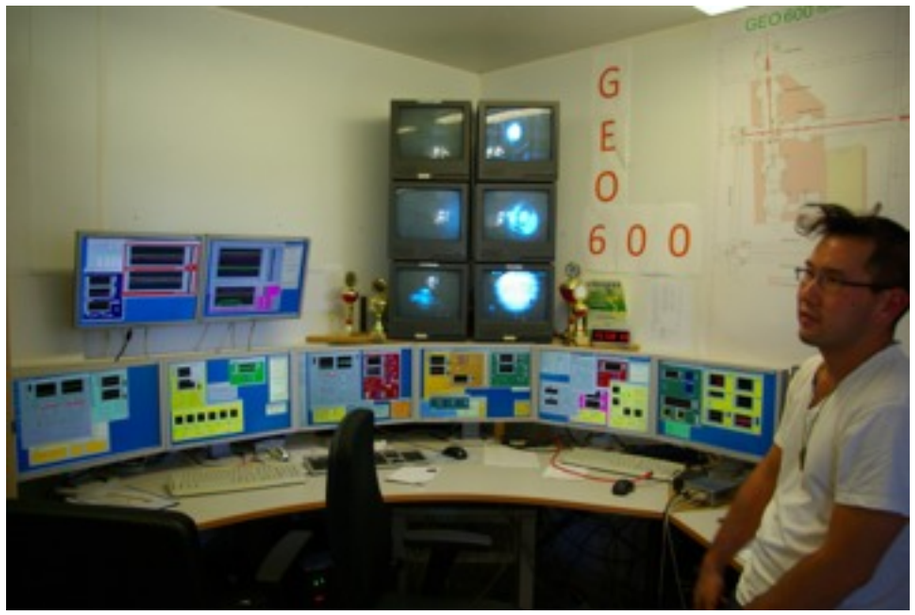




GEO600

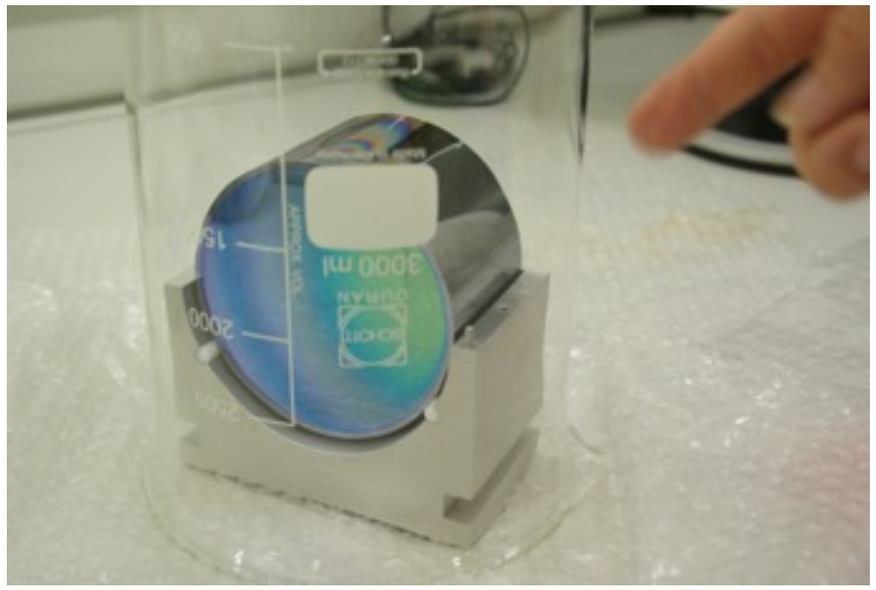
- Observing
- Suspension system
- control room





Lab tour at Jena

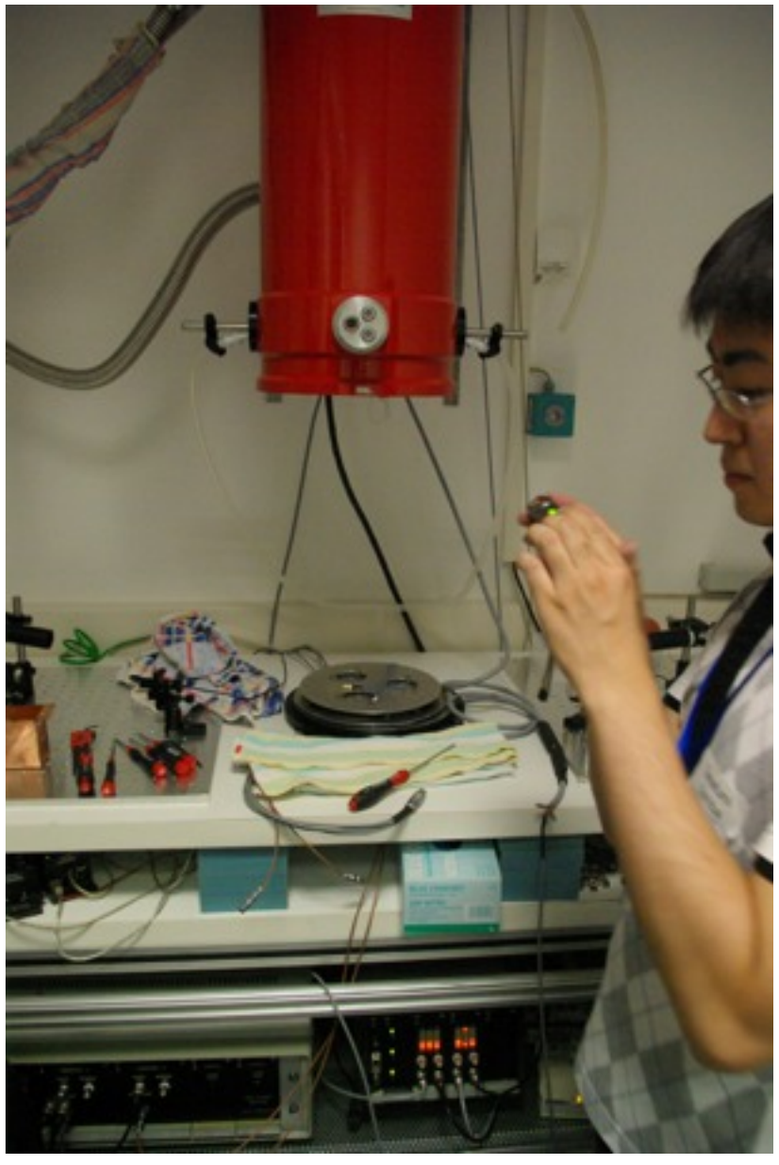
Main Lab
Measurement of the absorption of Si
Using LN_2, LHe to cool cryostat till 5K



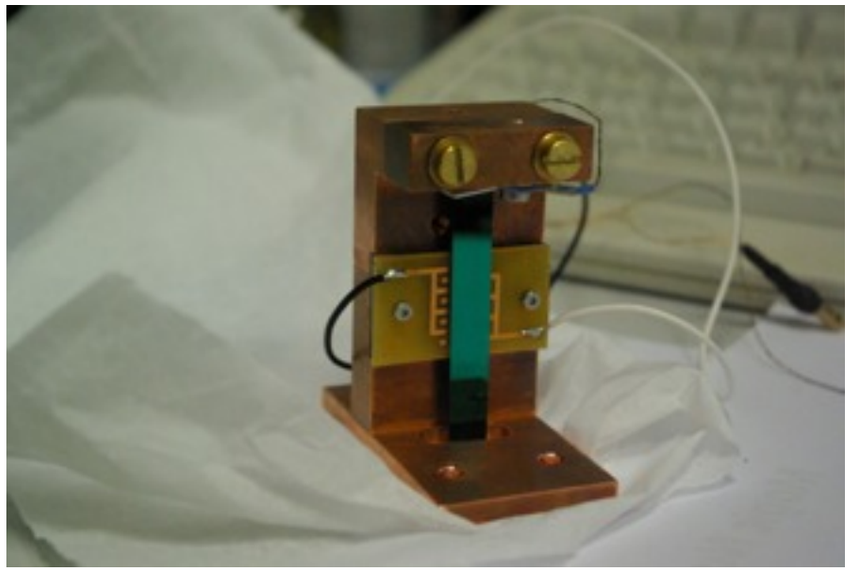
Si bulk with coating on the both of the face to construct a cavity.

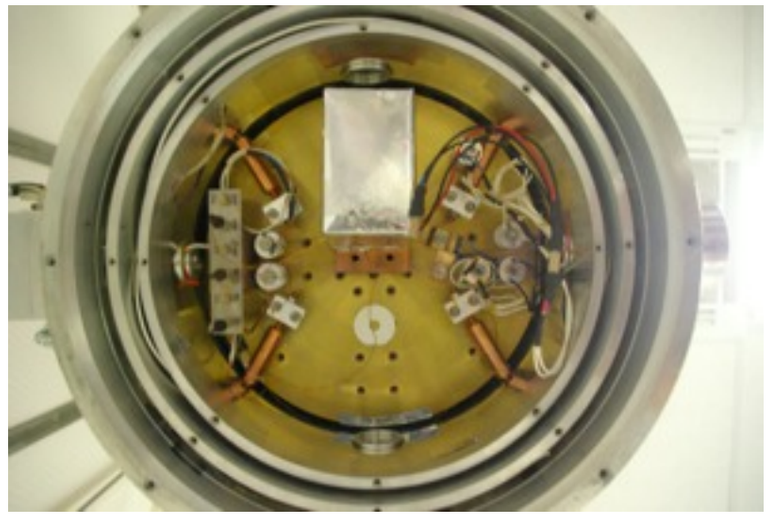
Insert laser to measure the absorption of the bulk

Lab tour at Jena

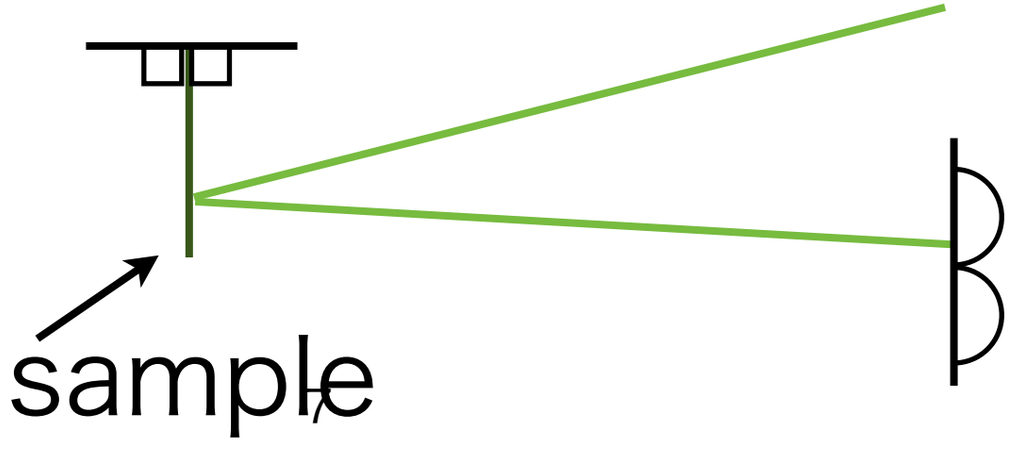


Small lab 1



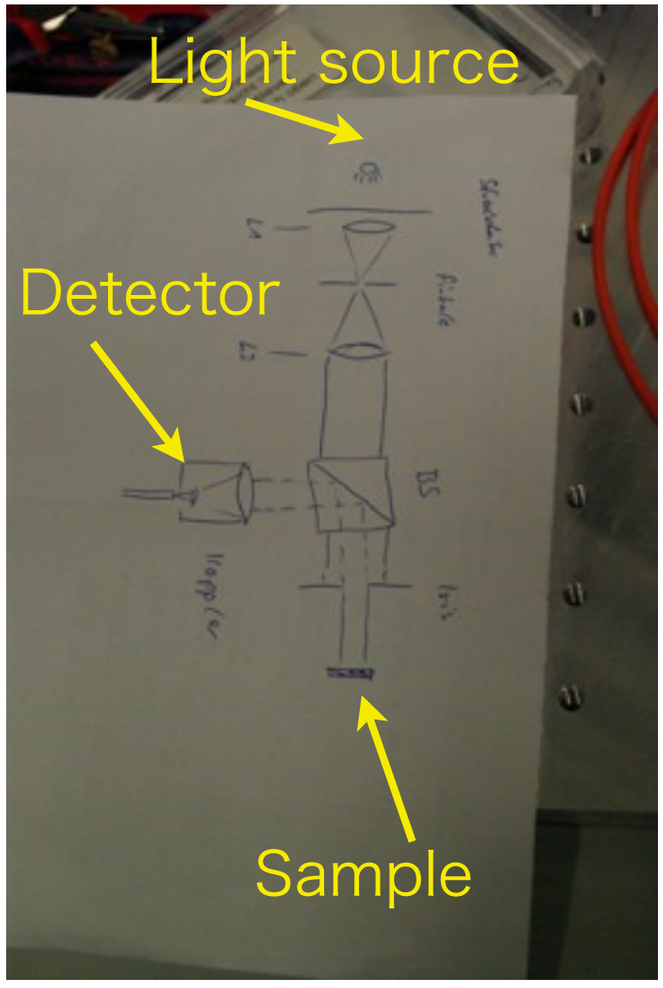


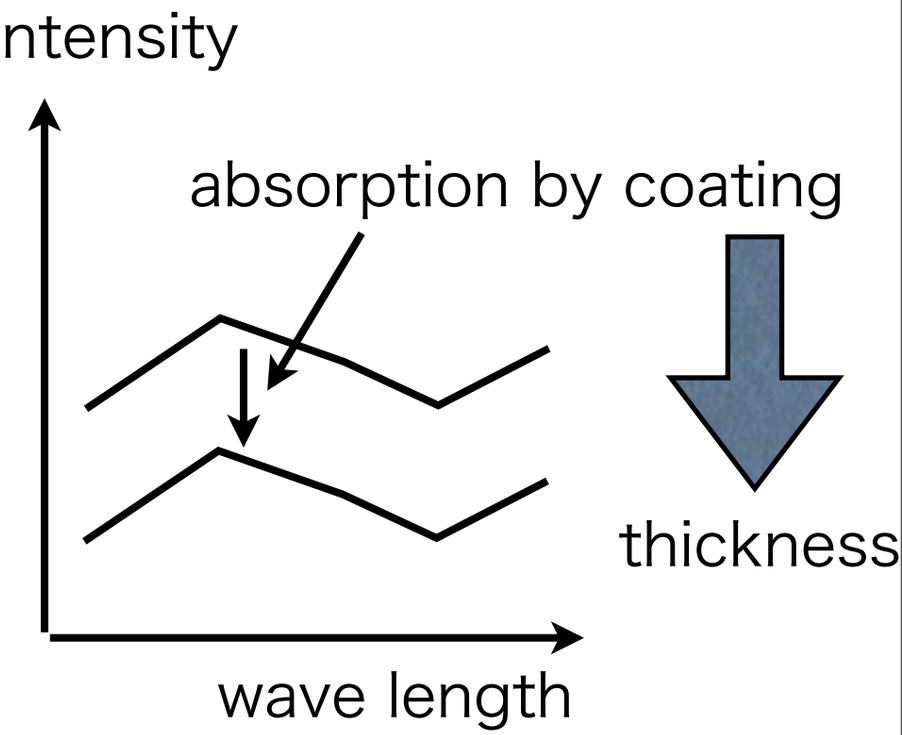
Measurement of the mechanical Q factor of the cantilever



Lab tour at Jena

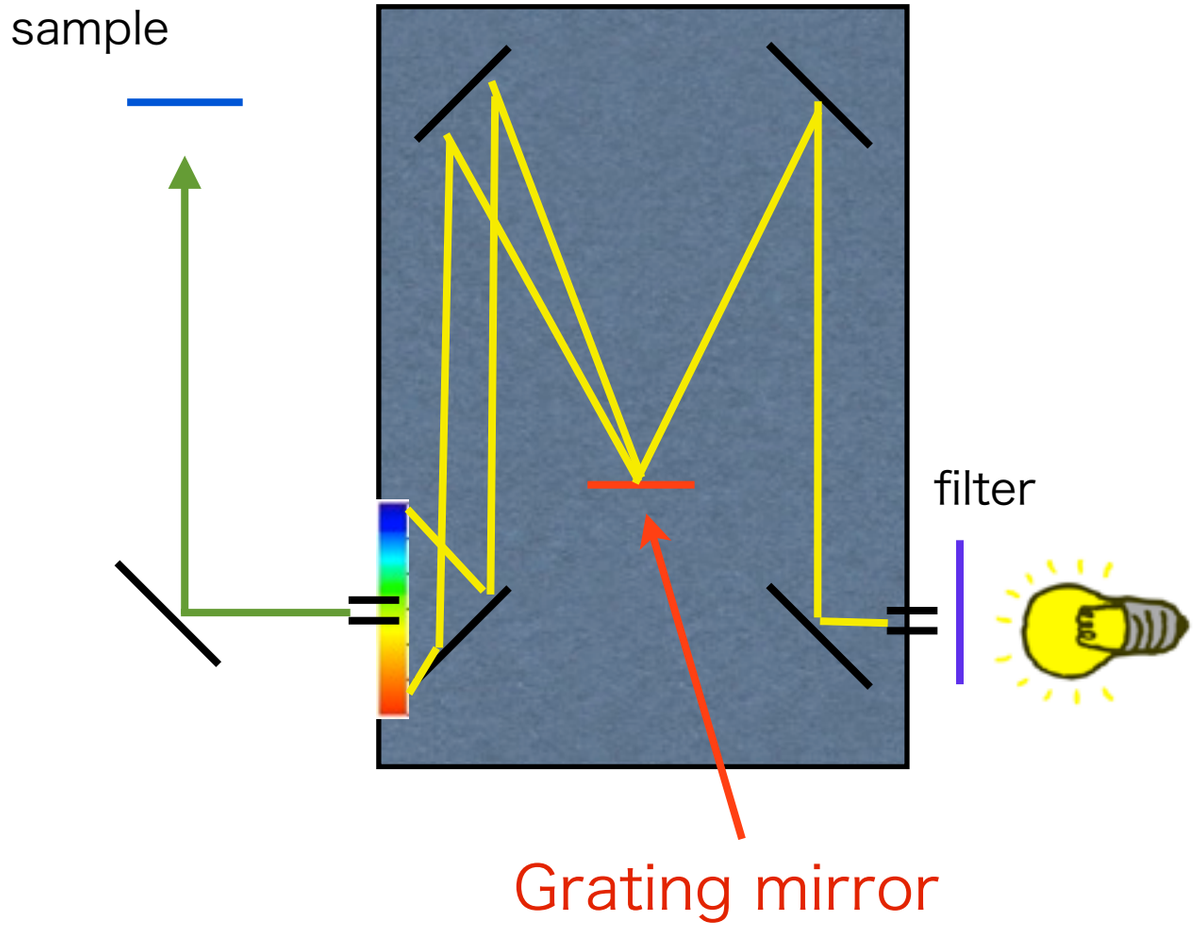
Small lab 1





Measurement of the thickness of the coating using reflecting

Lab tour at Jena



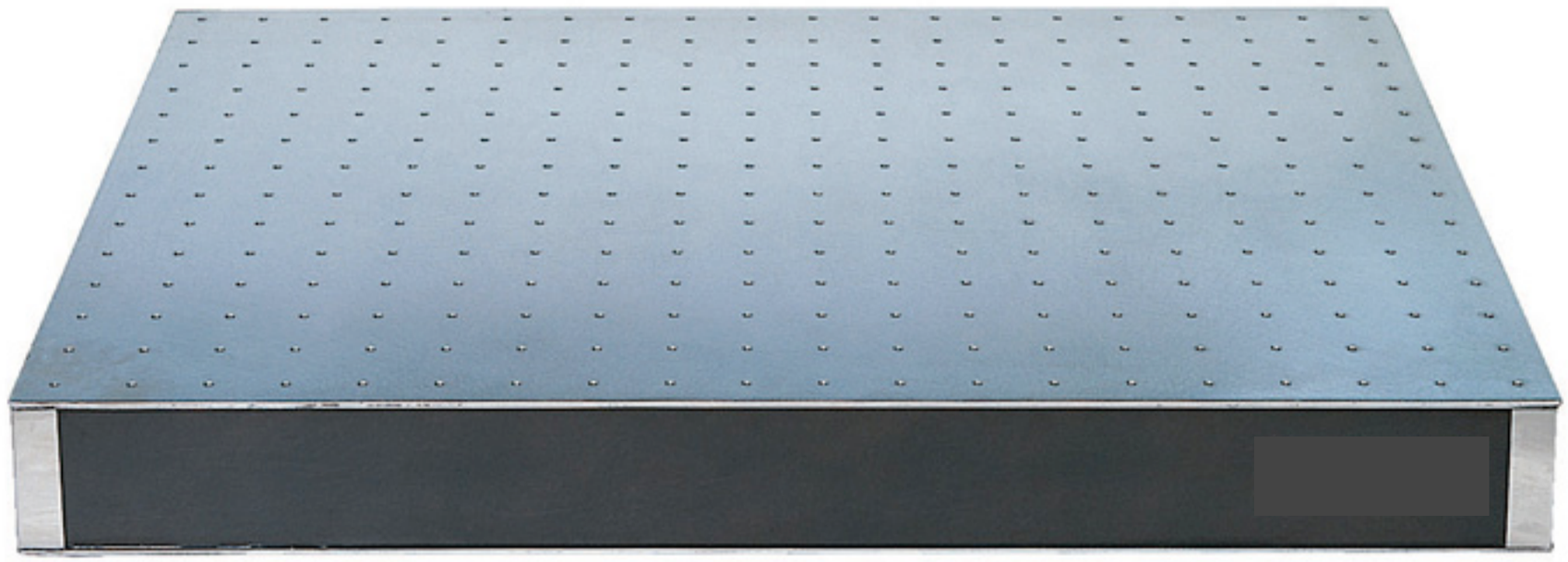
Small lab 2

Spectroscope: Creating continuance light source to measure the absorption of the bulk.

They can use this to measure the absorption by many wave length without many light source.

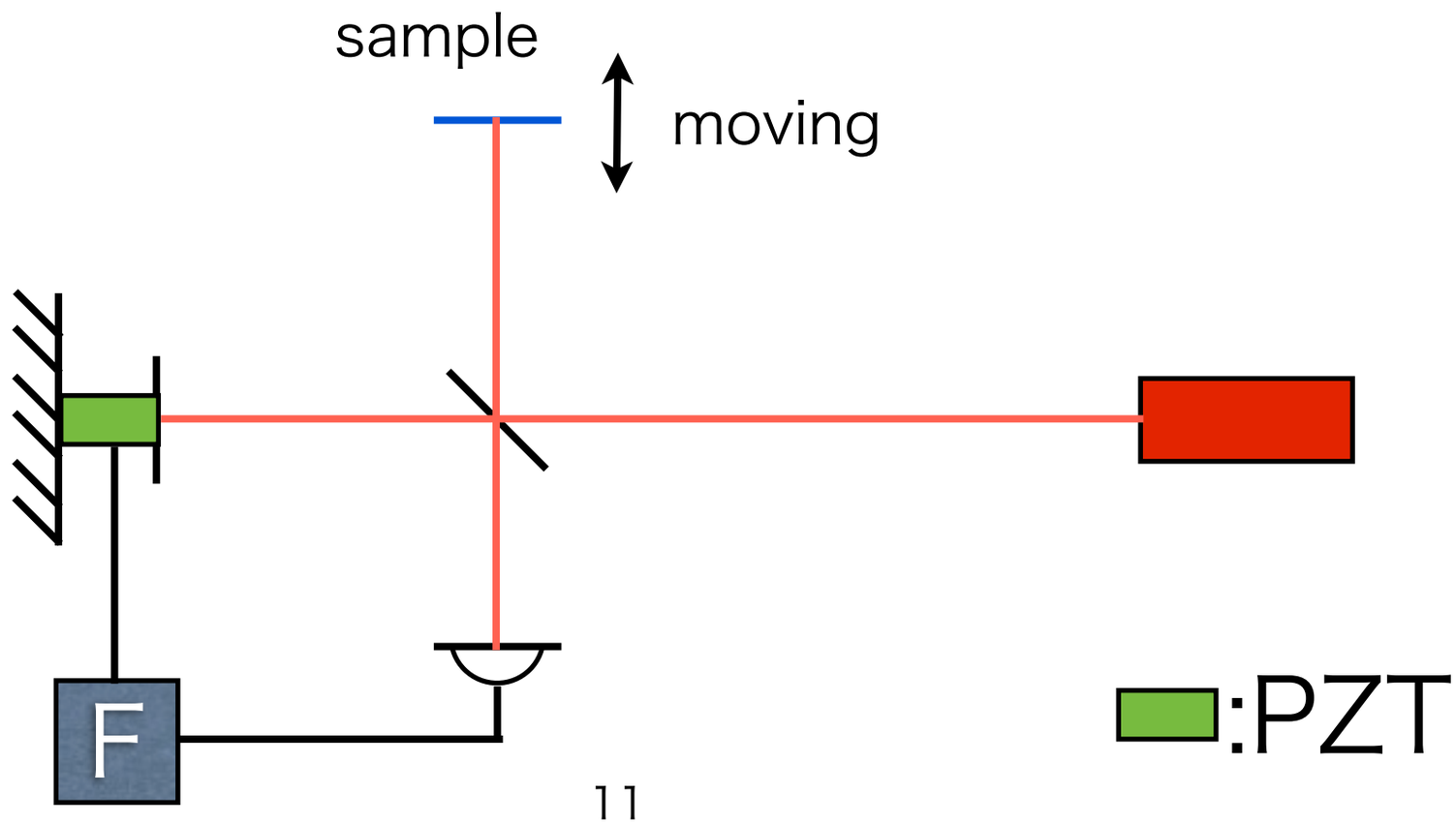
Lab work

Task: lock a Michelson interferometer by 3 days



Purpose

They want to measure the mechanical Q factor of the cantilever using a Michelson interferometer.



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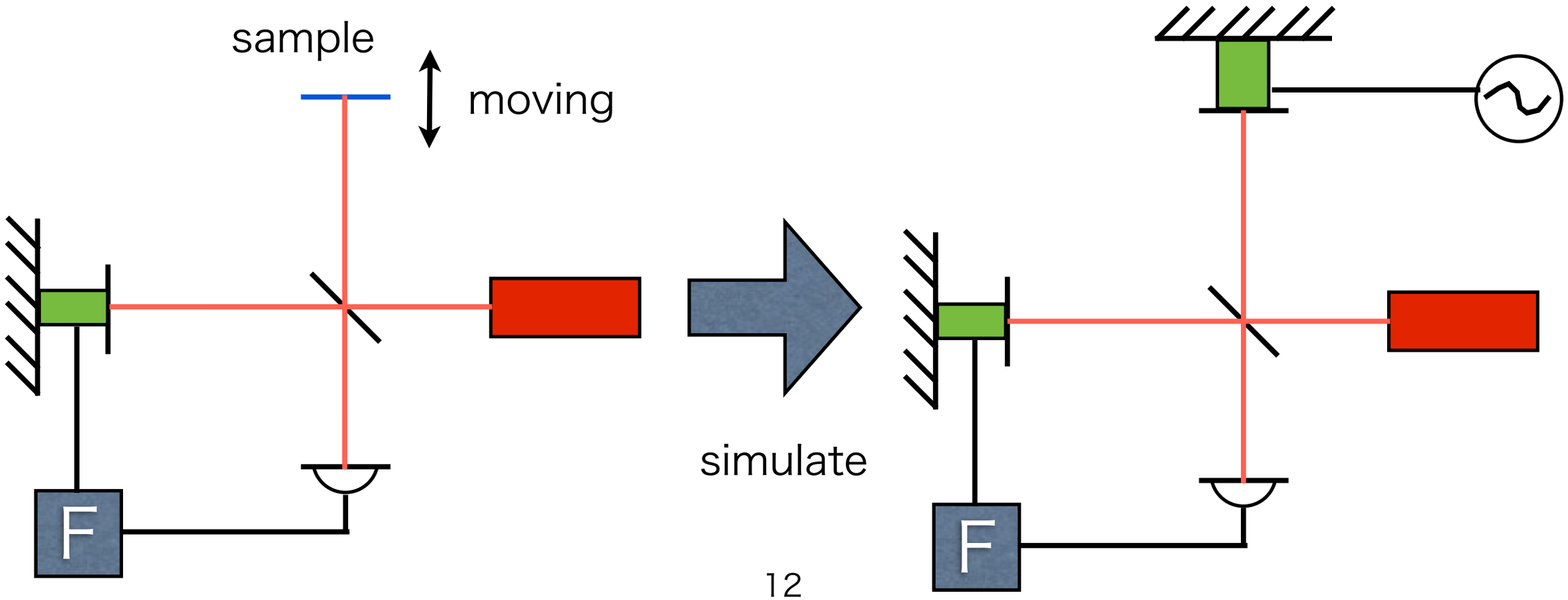
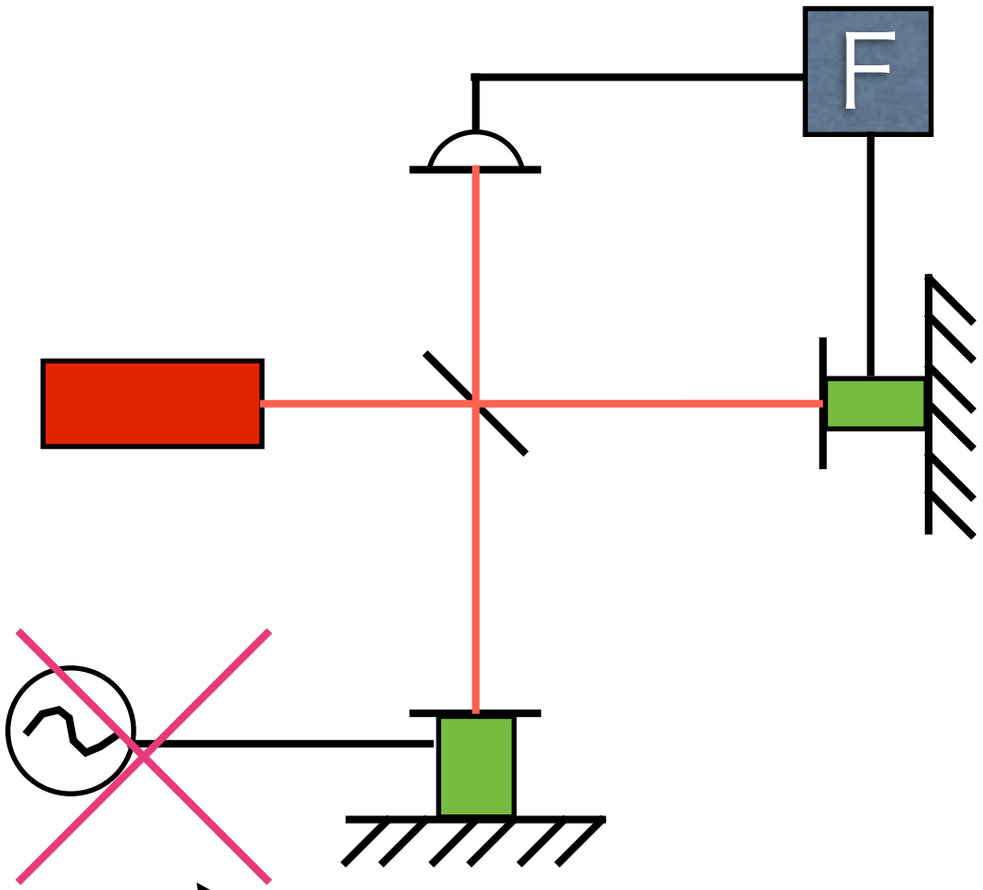
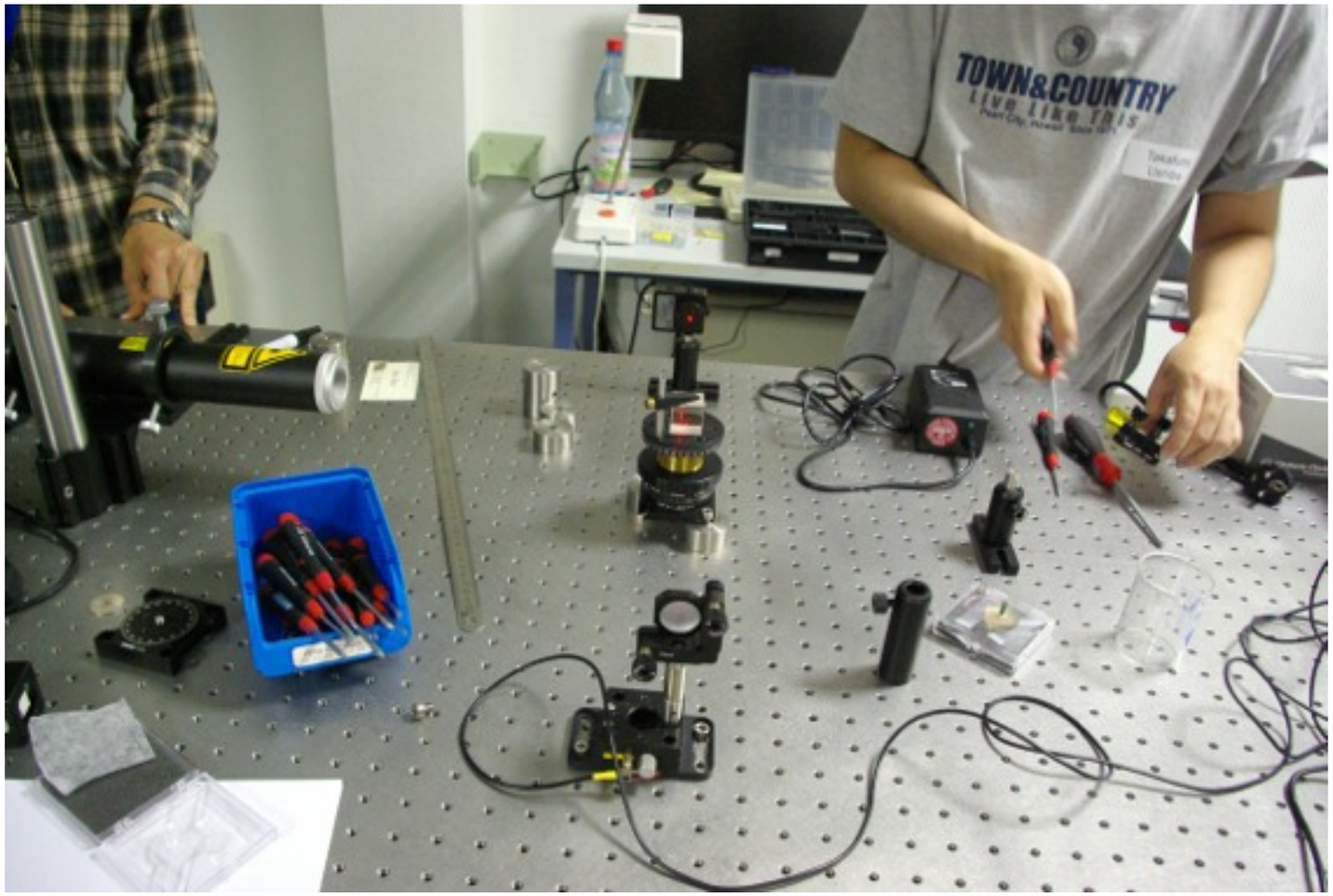


1st day

We constructed a MI which we wanted to lock at last.



We tried to control with out shaking this mirror



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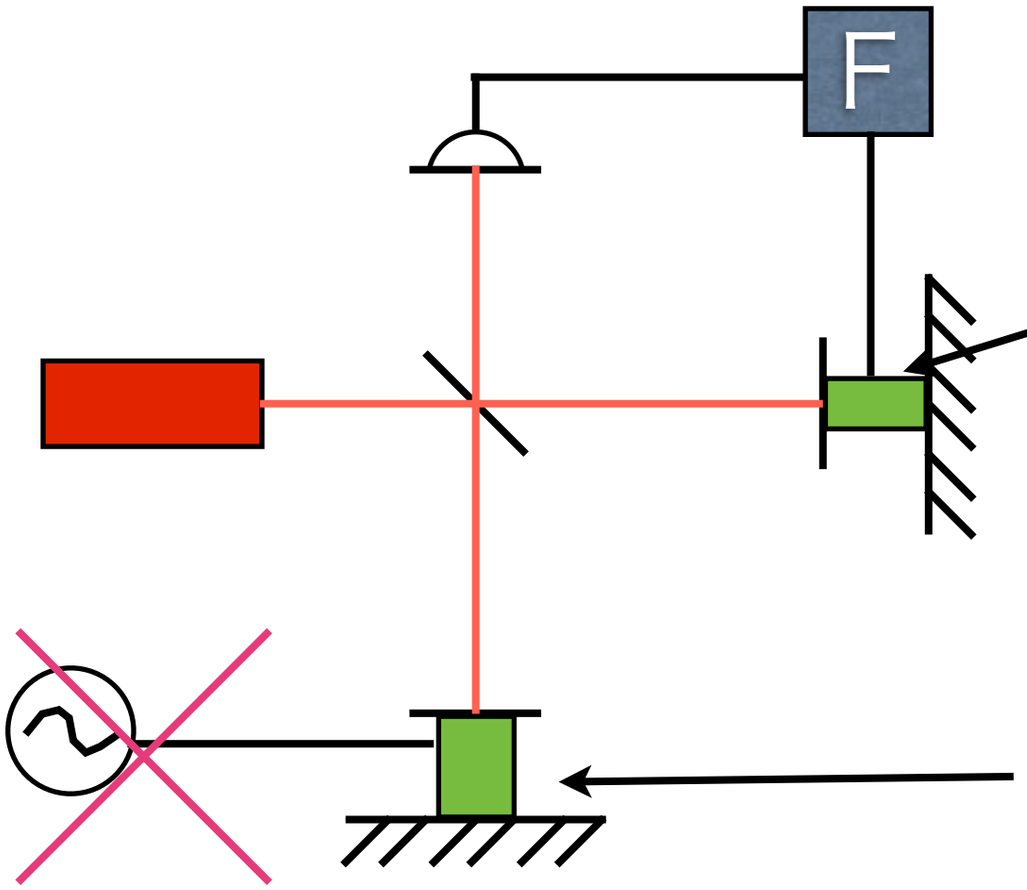
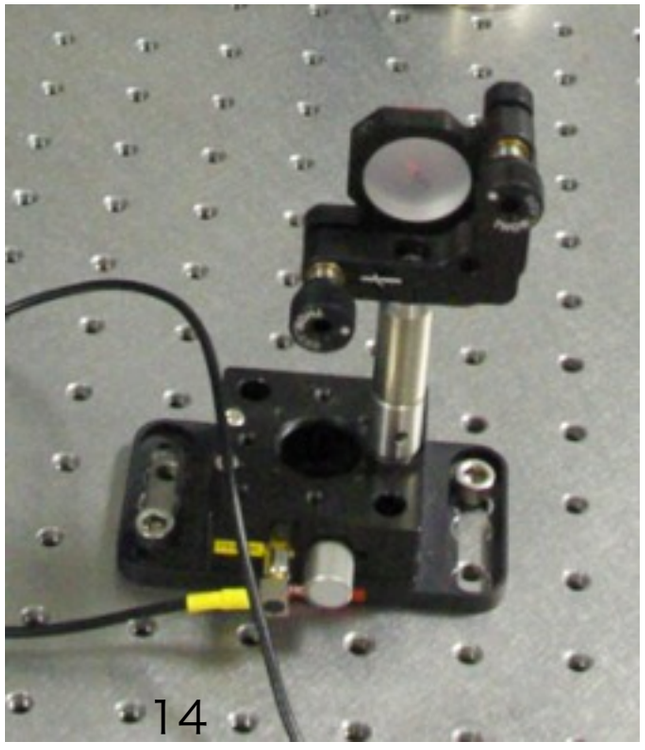
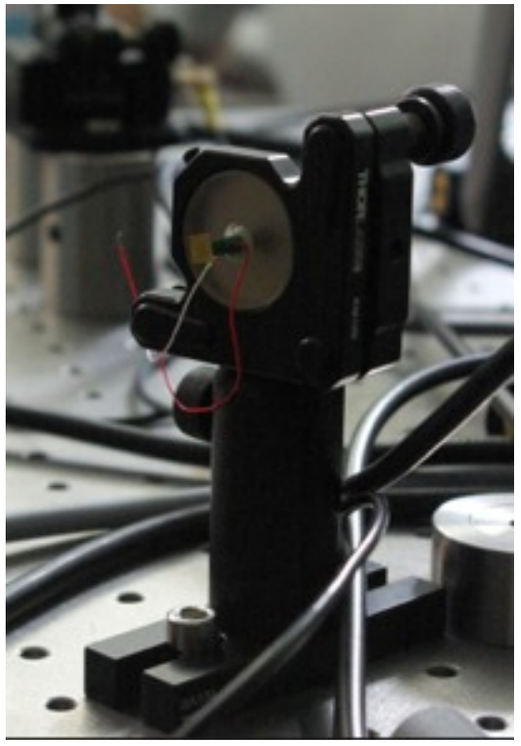






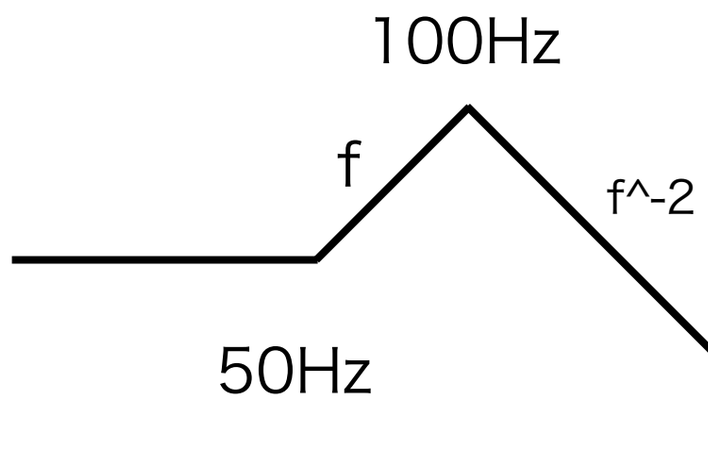
1st day

Laser source

Coherent length: 100km -> several cm

Filter

We made a control filter by SR560 and SR650



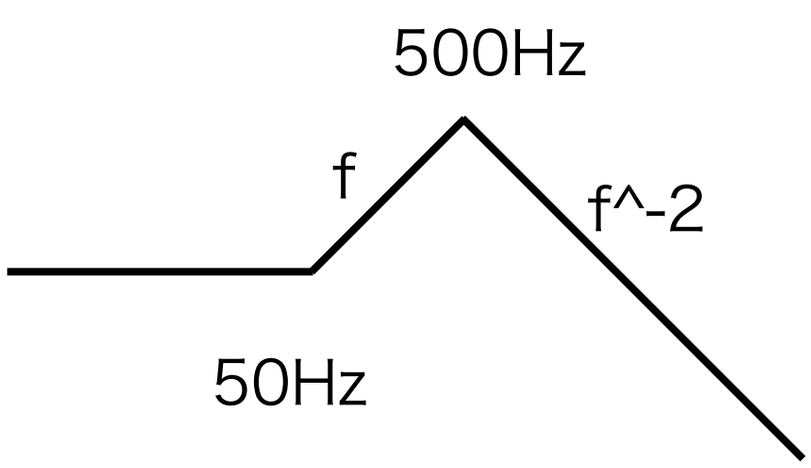
The TF of the filter we expected.

We could not control the MI.

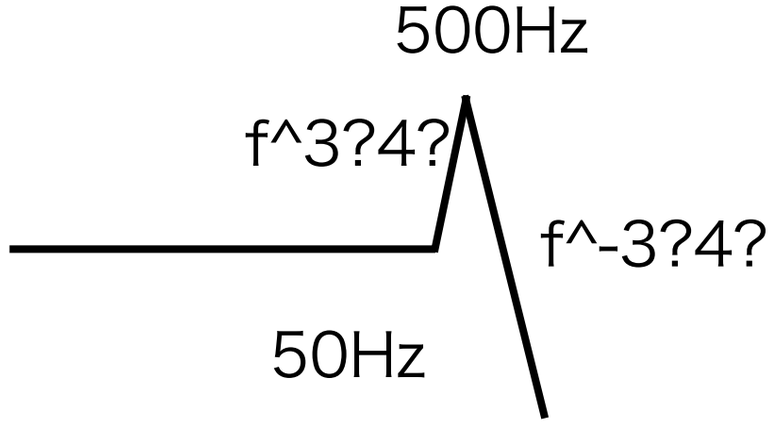
Why?

2nd day

Because the filter was not such shape. (And ...)



The TF of the filter we expected.

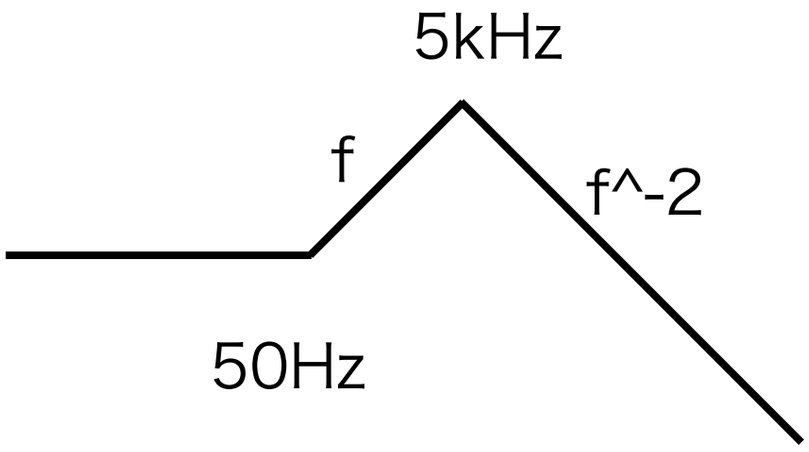


The TF of filter we measured

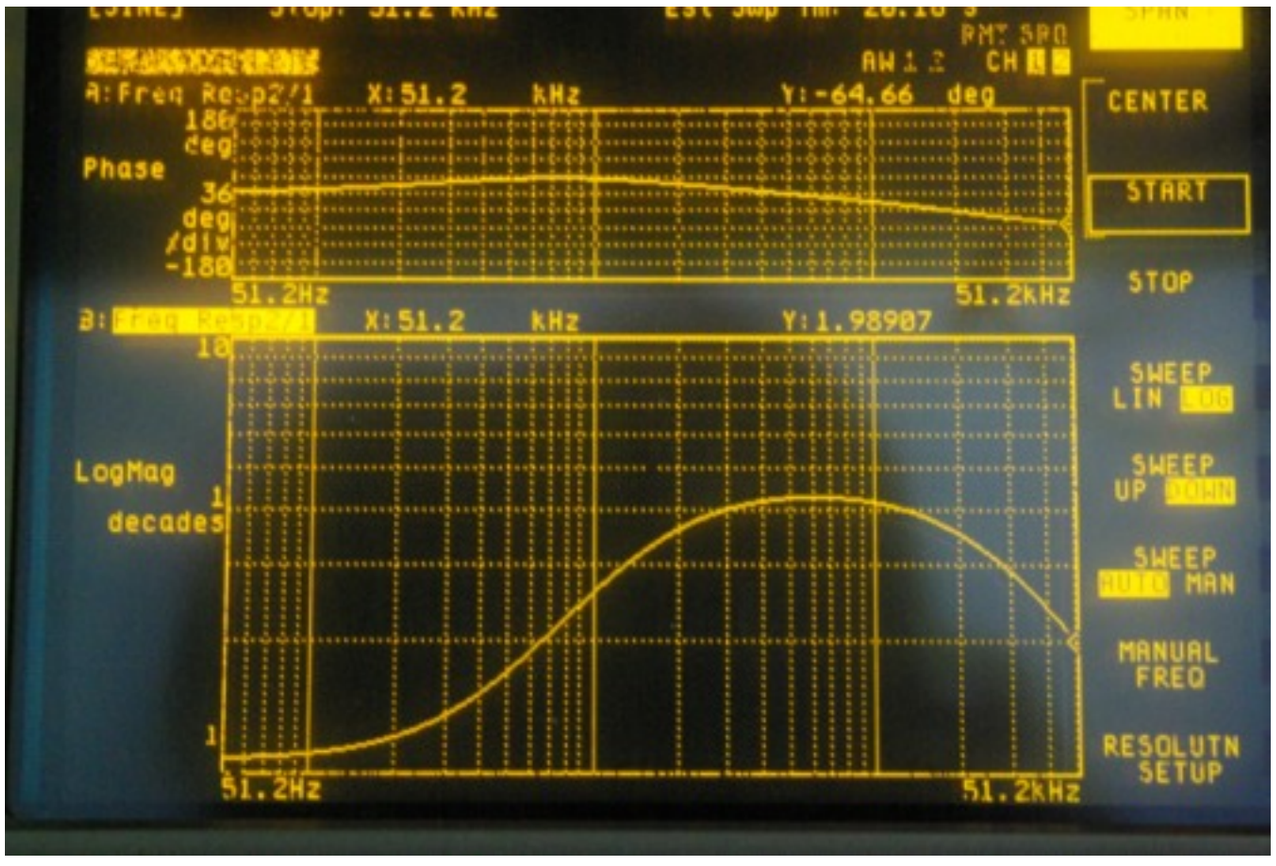
The slope was too steep.

2nd day

We made a filter with OP amp.



The TF of the filter we expected.

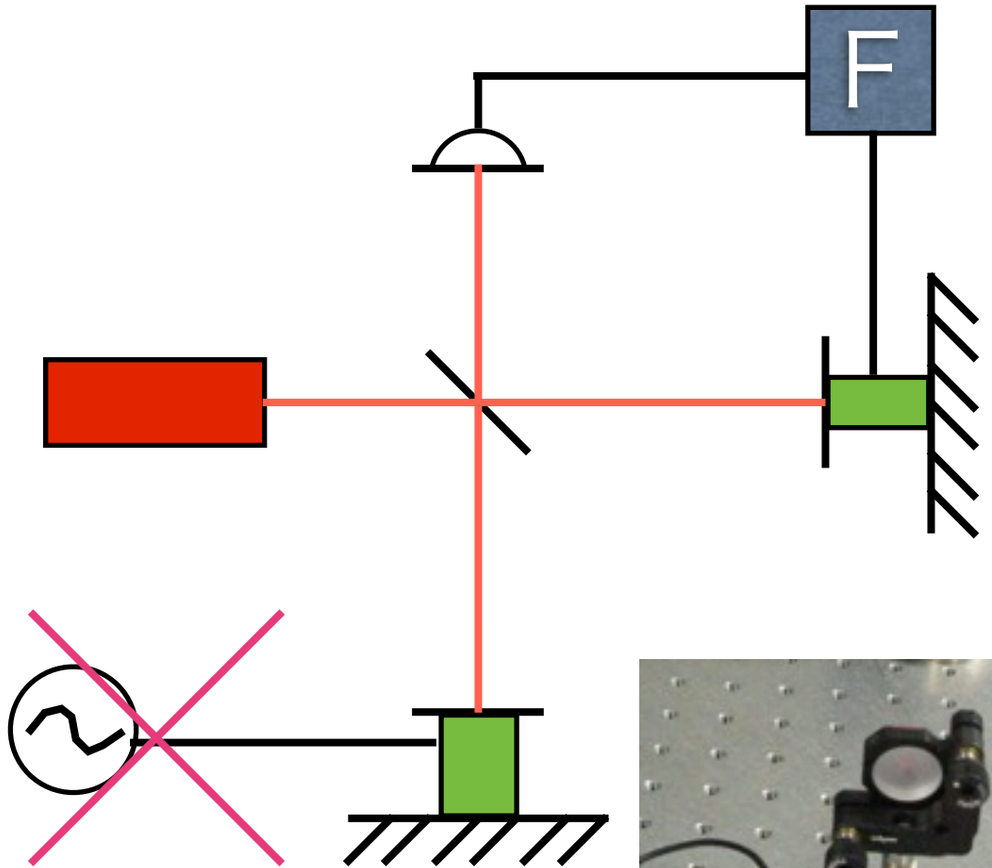


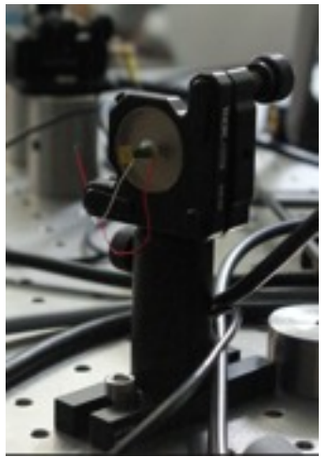
Why?

We could not control the MI.

2nd day

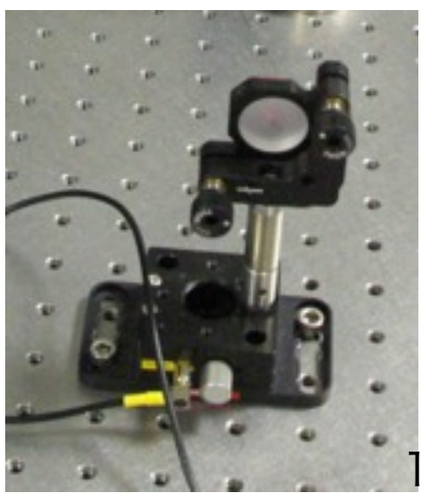
We measured the efficiency of the PZT.





~0.1um/V

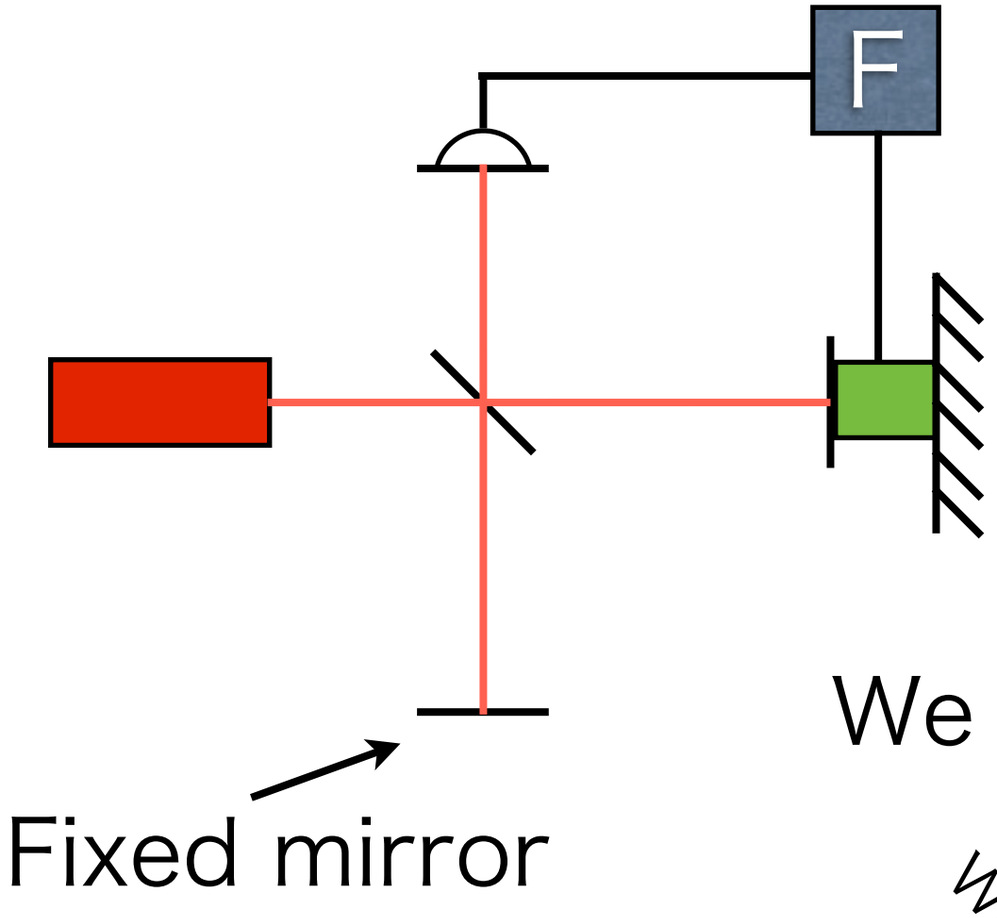
We used only 10V to drive this PZT.
We needed more actuator range.

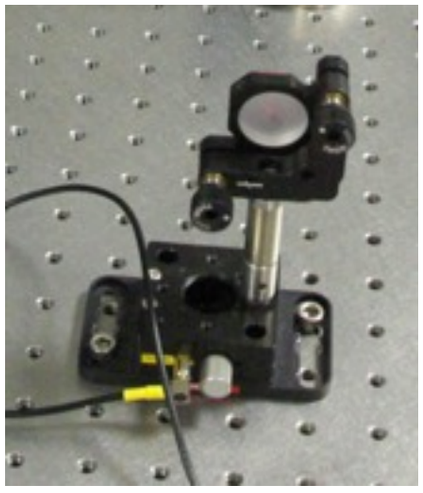


~5um/V

2nd day

We tried to use the PZT with stage to control.





~5um/V

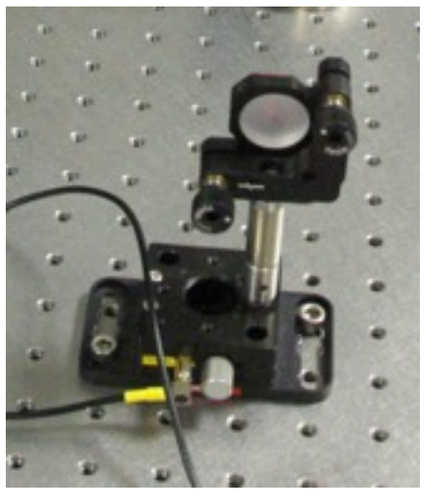
We used a LPF as the servo filter

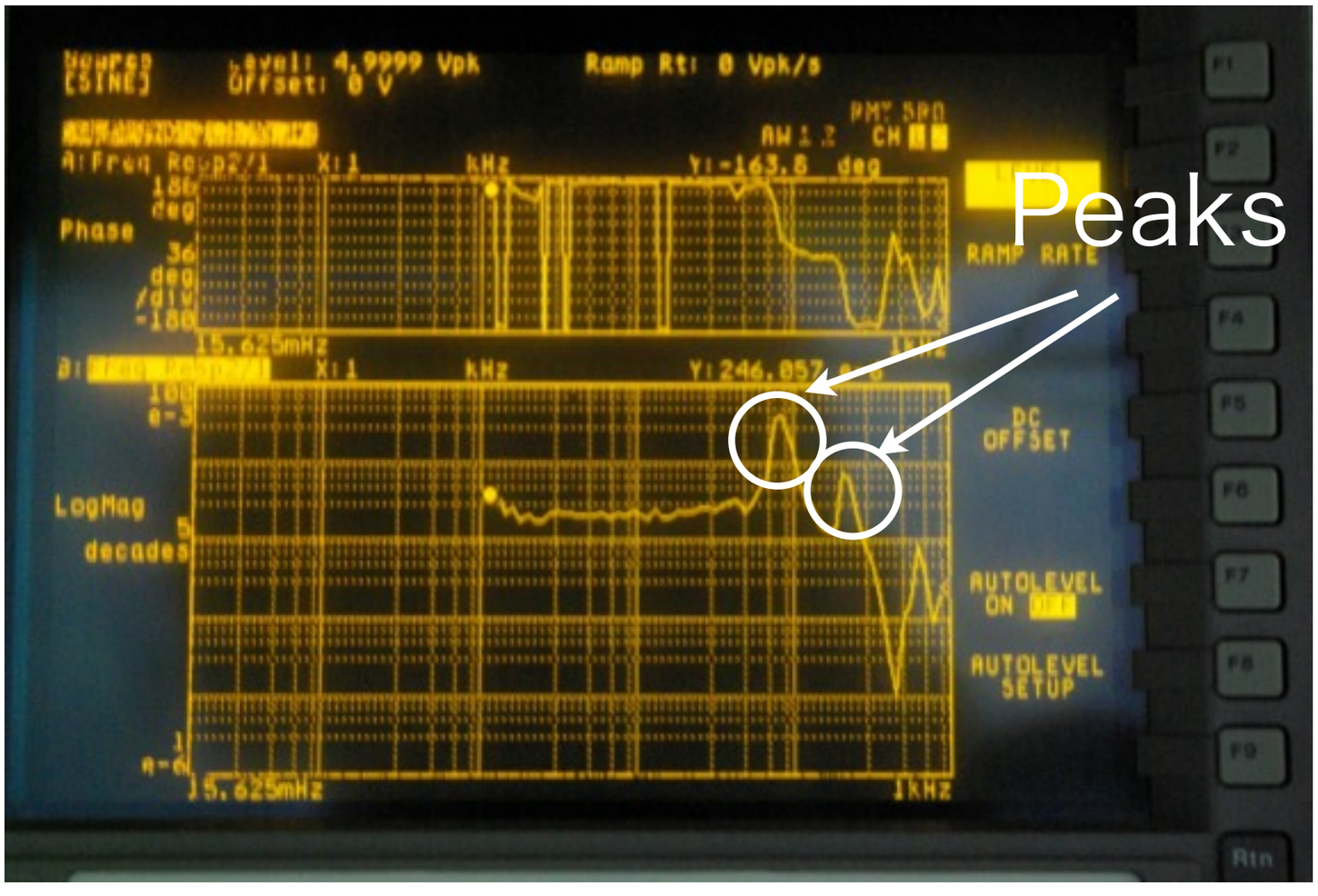
No. Why?

We measured the TF of PZT.

2nd day

We measured the TF of PEZ.



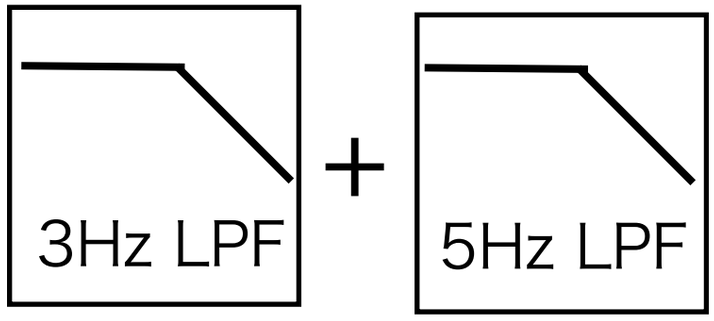


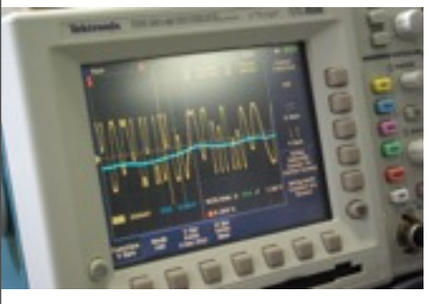
This peaks may disturb the control.

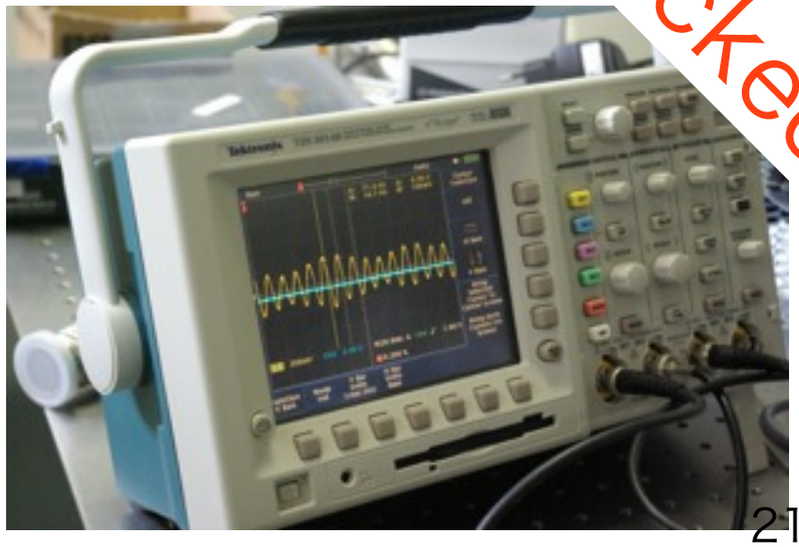
3rd day (last day)

We used two LPFs to control the MI.

Experiment



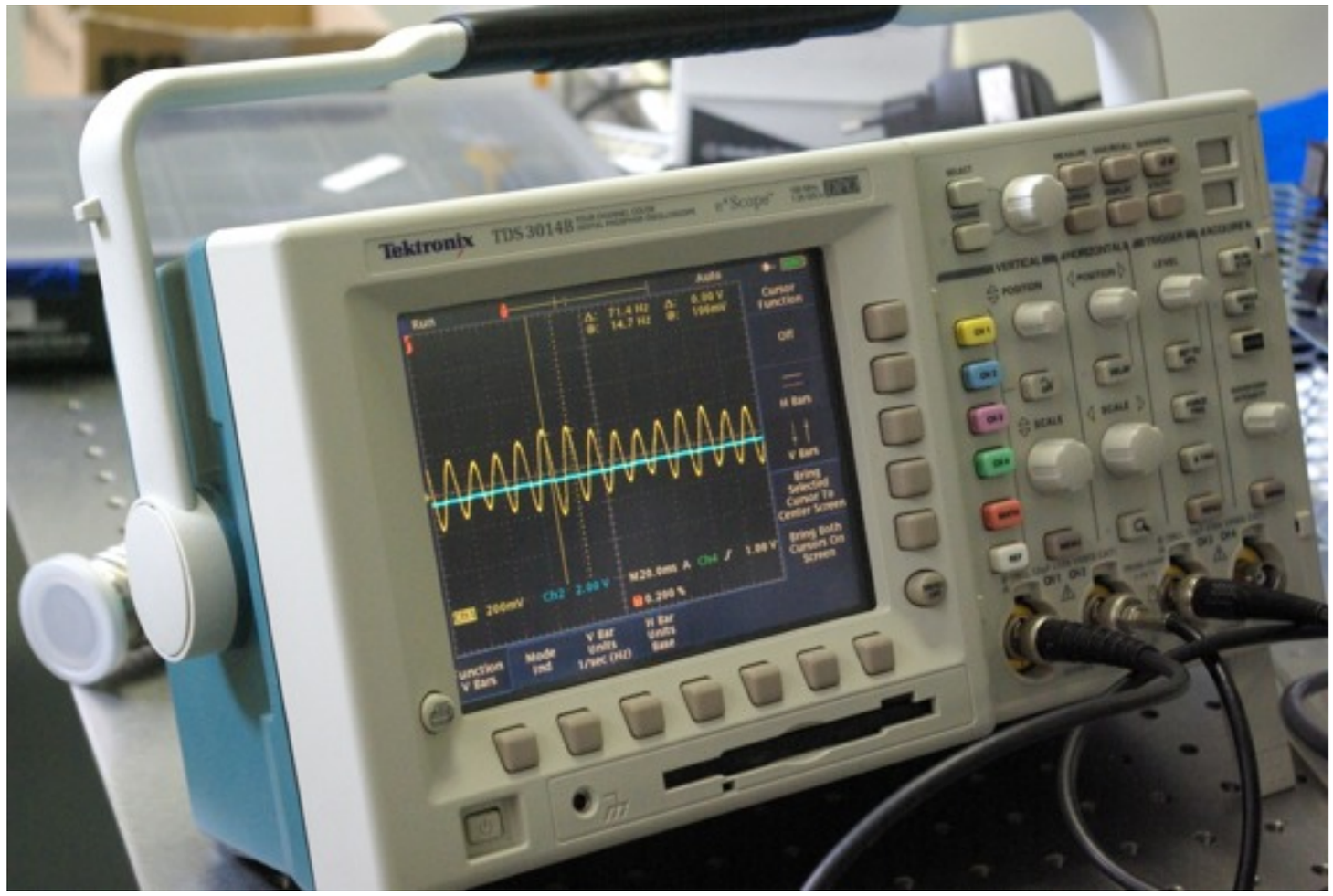




Calculation

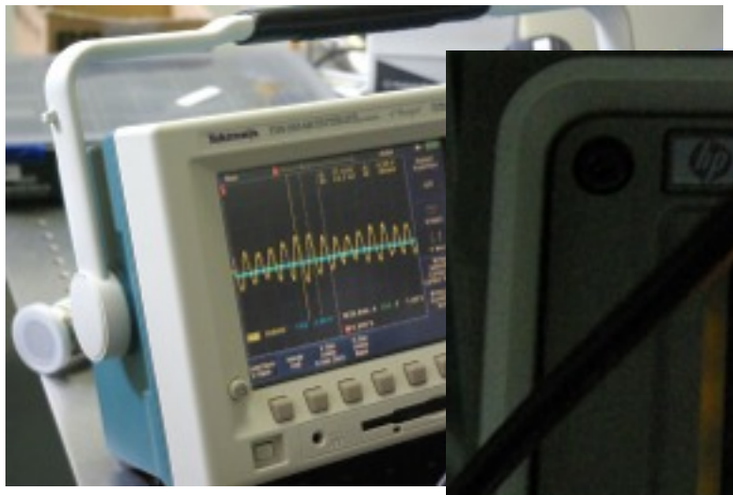
We could not suppress the peak with one LPF

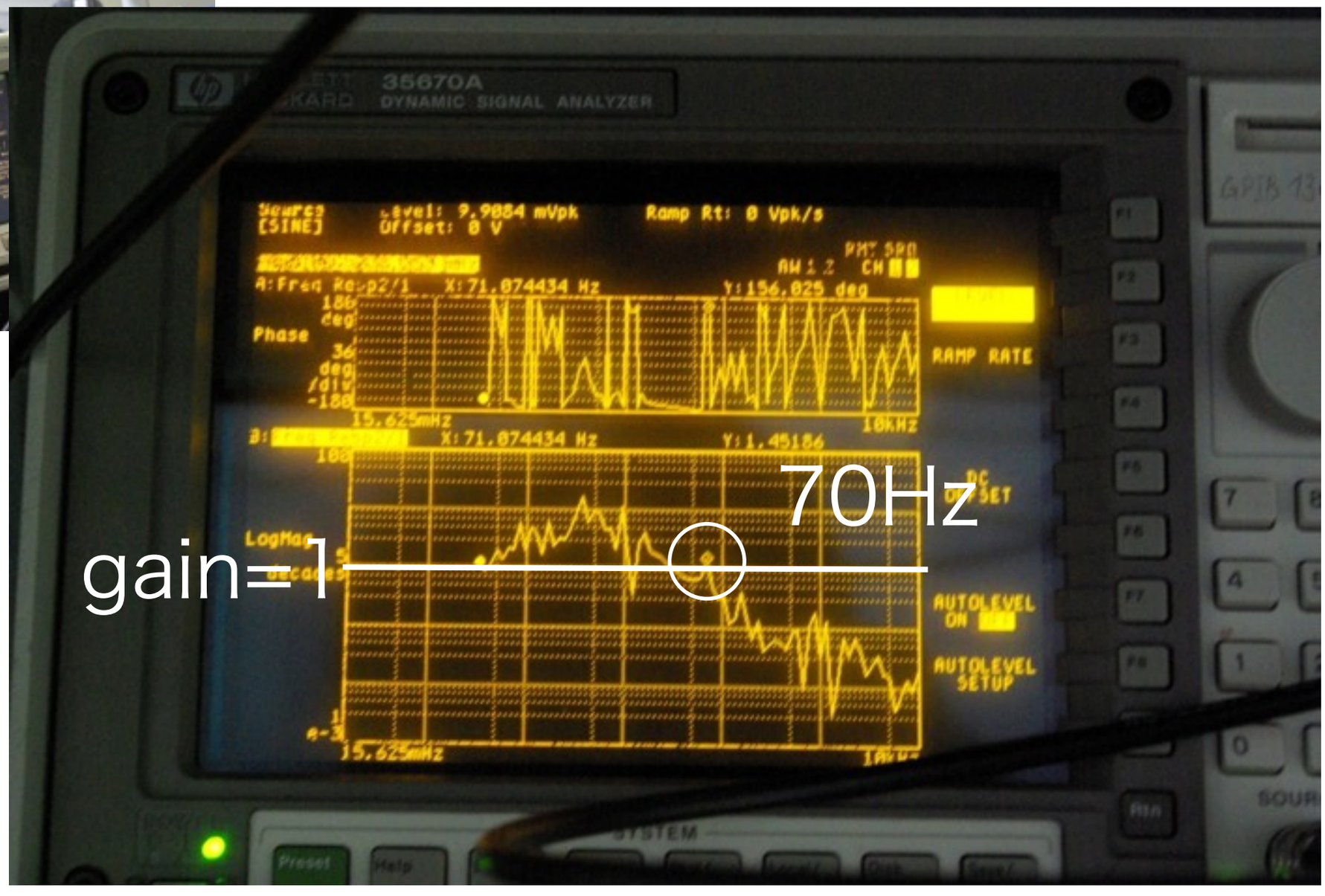
3rd day (last day)



There is a peak at 70Hz.

3rd day (last day)

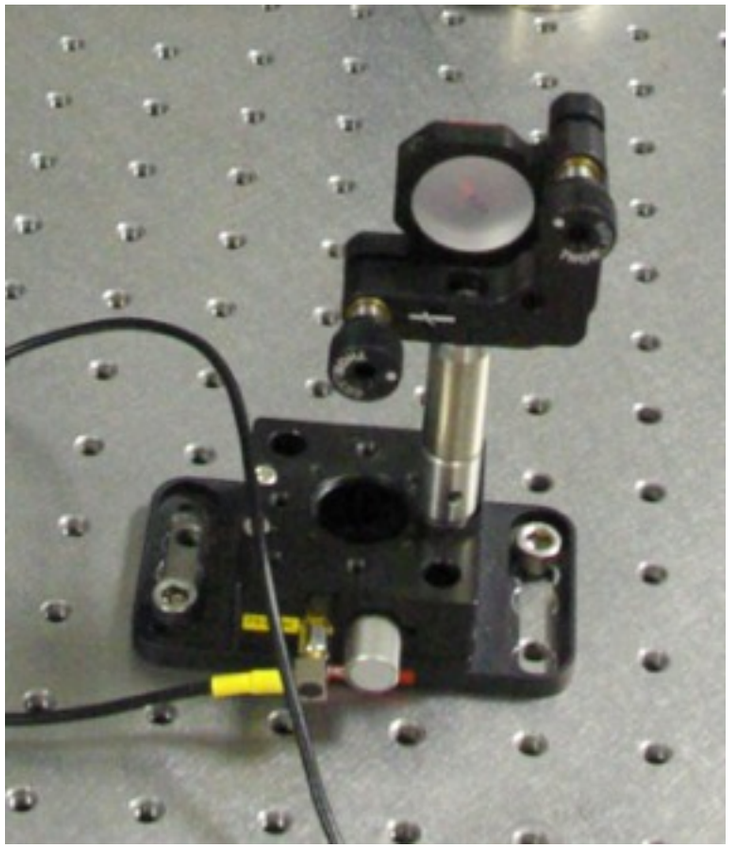


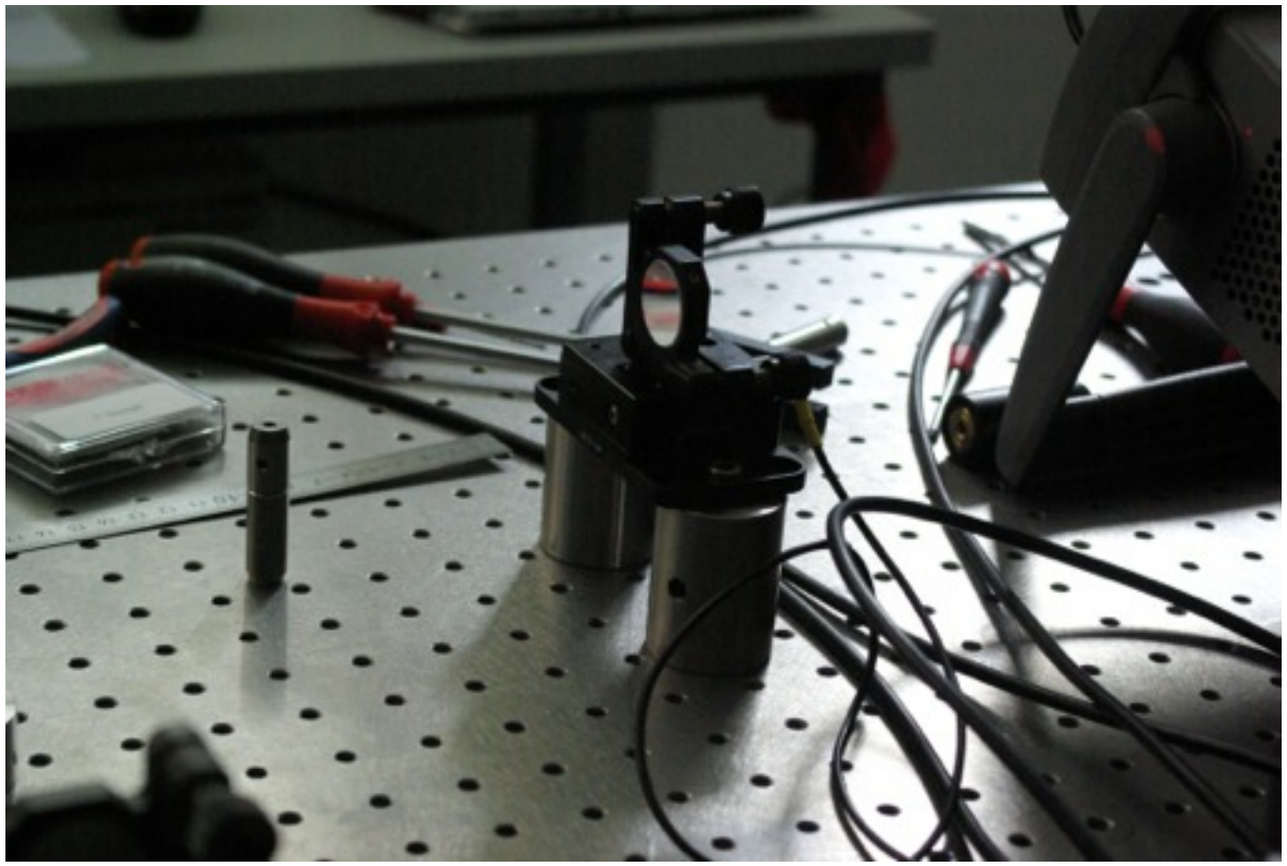


The open loop TF of the control system

3rd day (last day)

We refined the PZT.

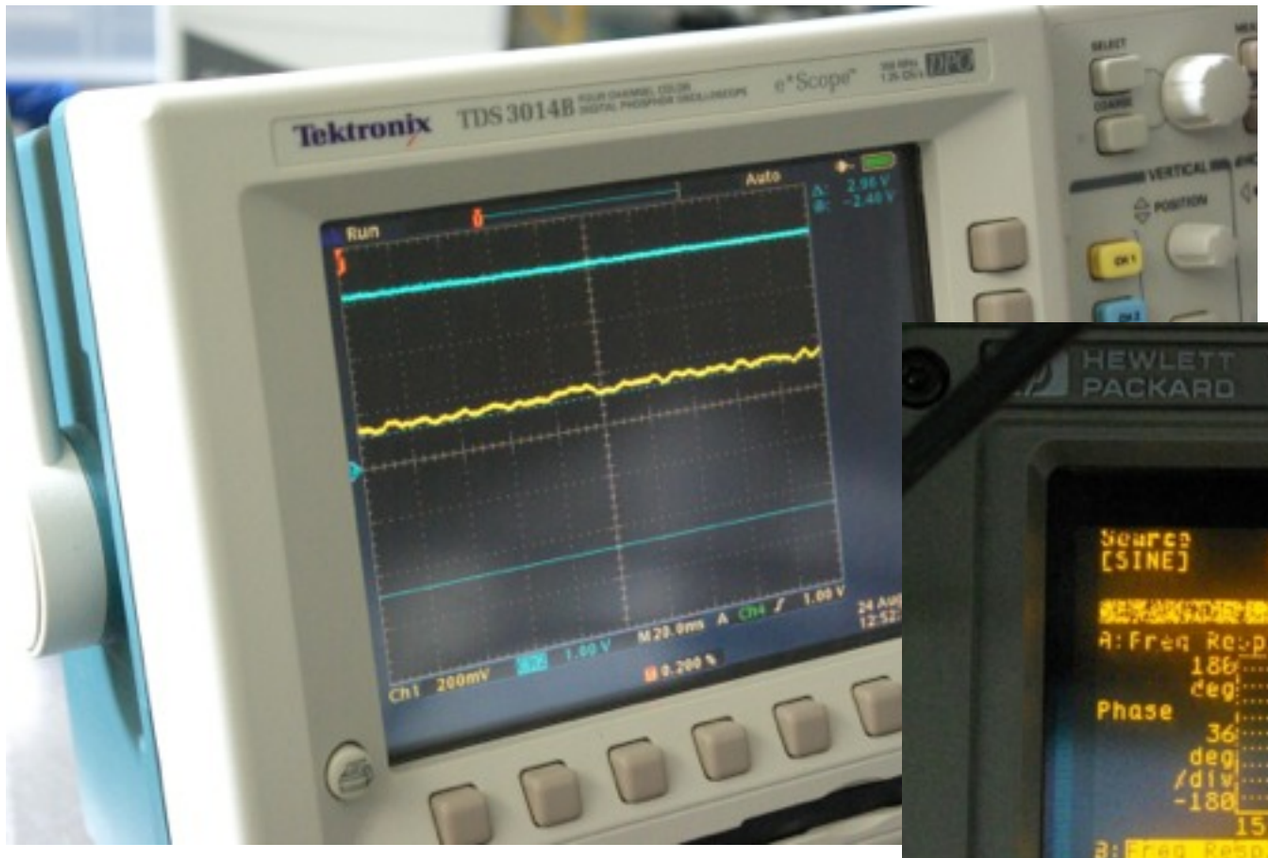




This change let the peak rise.

We could raise the UGF.

3rd day (last day)



UFG=20Hz

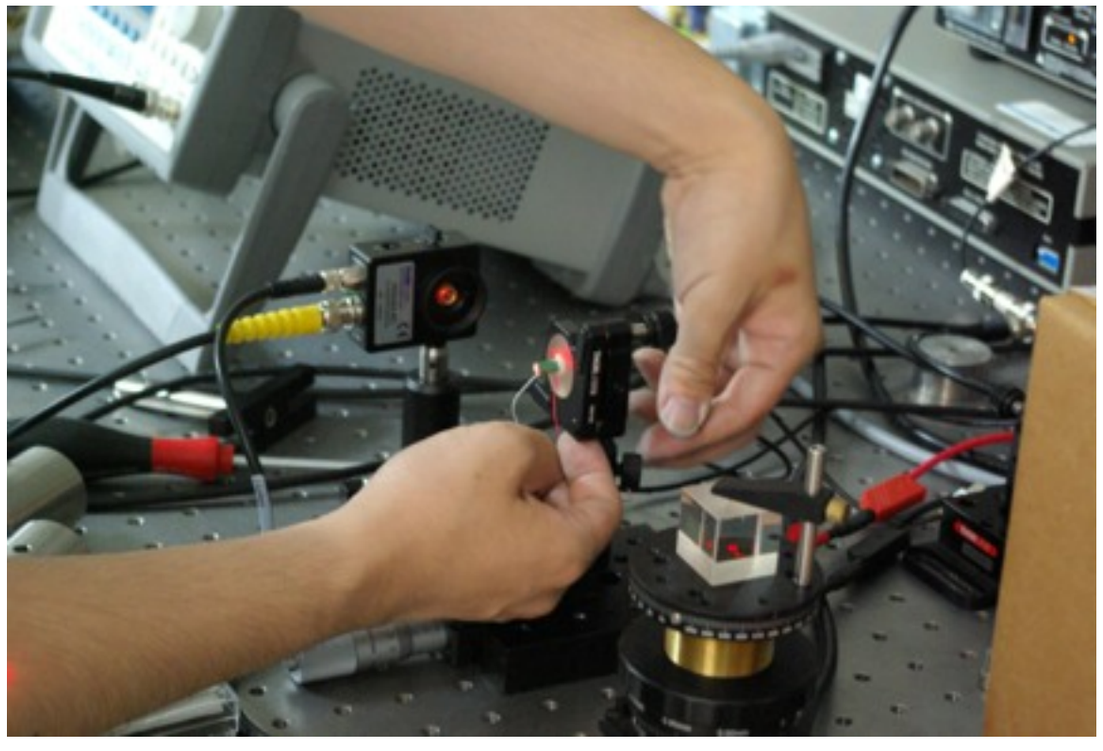
3rd day (last day)

+α

Ronny gave us high voltage amp.

We measured the TF of the small PZT.

And we found there is no peak under 10kHz

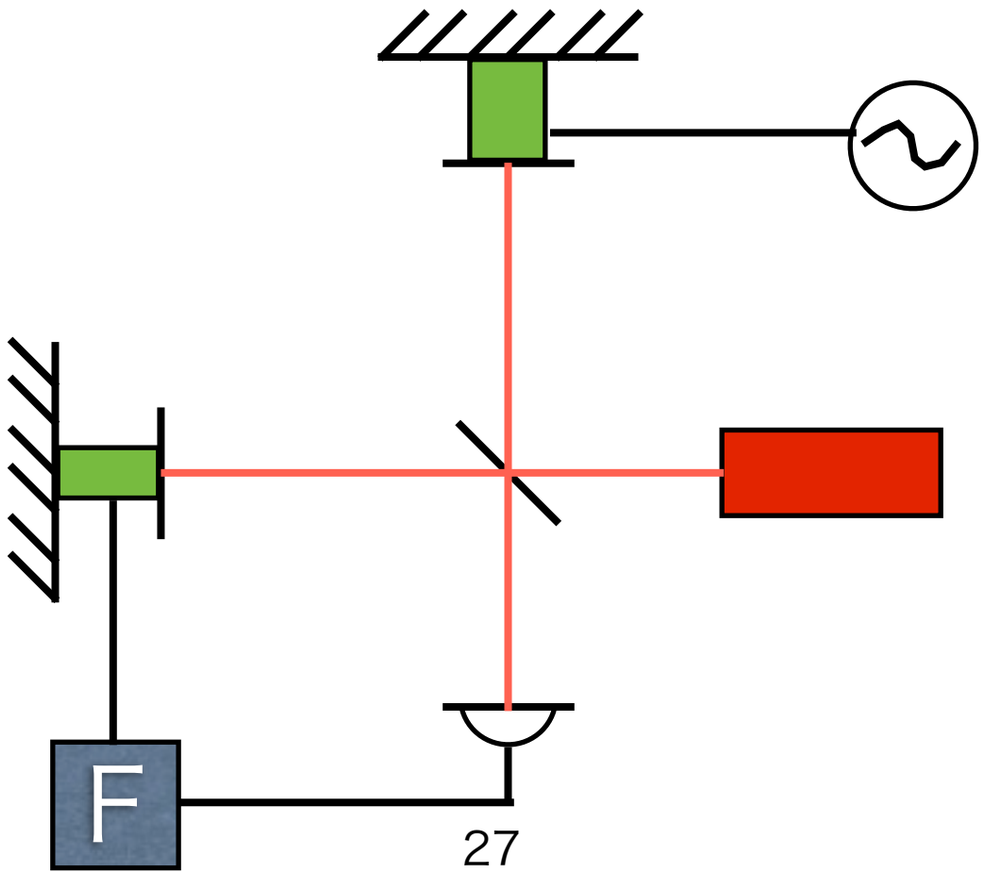


We should be able to control the MI with a high voltage amp.

(The high voltage amp Ronny gave could not be drive in low frequency.)

Future

1. Use a high voltage amp to lock the MI.
2. Change the laser source to 1550nm.
3. Measure the vibration of the sample.



Summery

We locked a MI.

Problems:

1. The coherence length of the laser.
2. We should not use SR650 to make a filter.
3. The PZT stage had peaks to disturb control.
4. The small PZT need more high voltage.

Firework and festival at Hannover.