Status of PLL system of ALS

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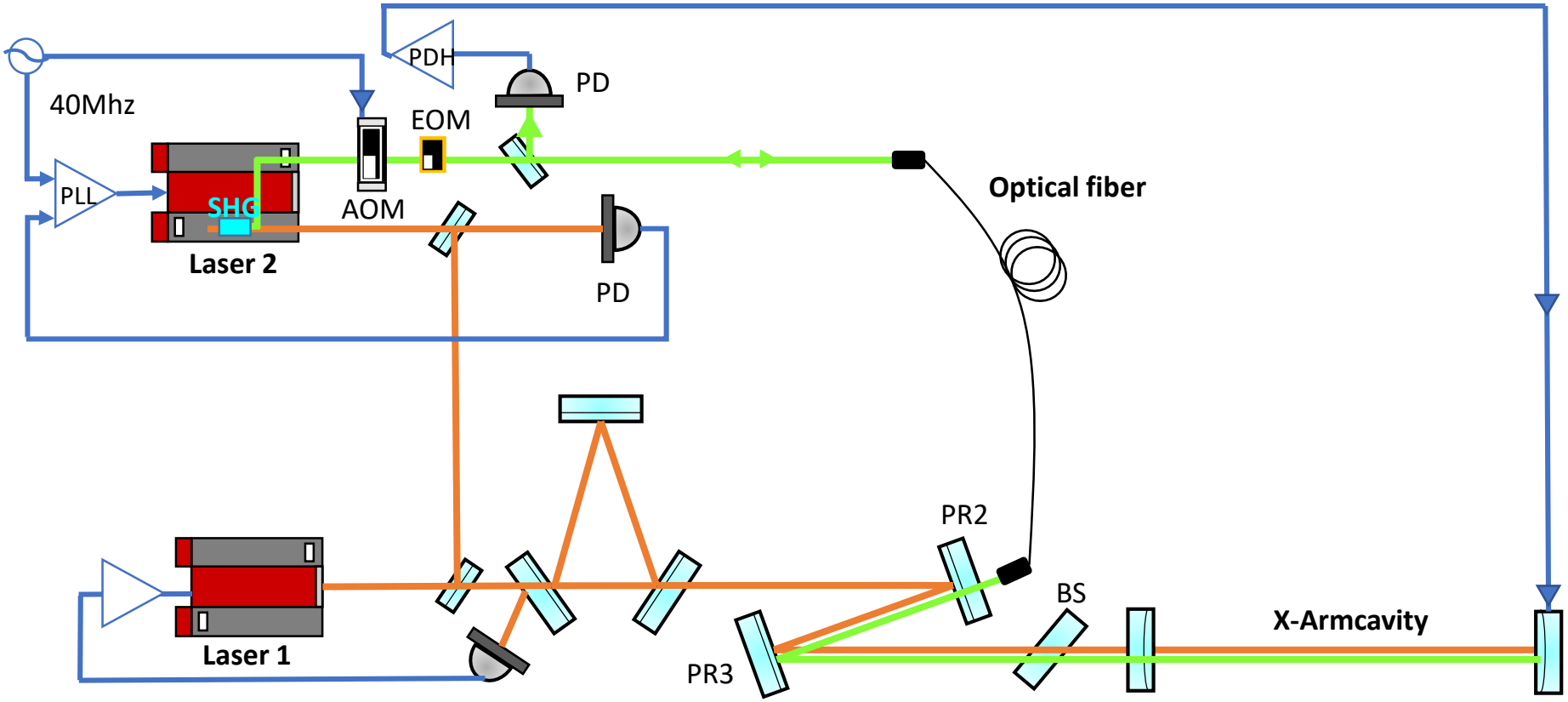
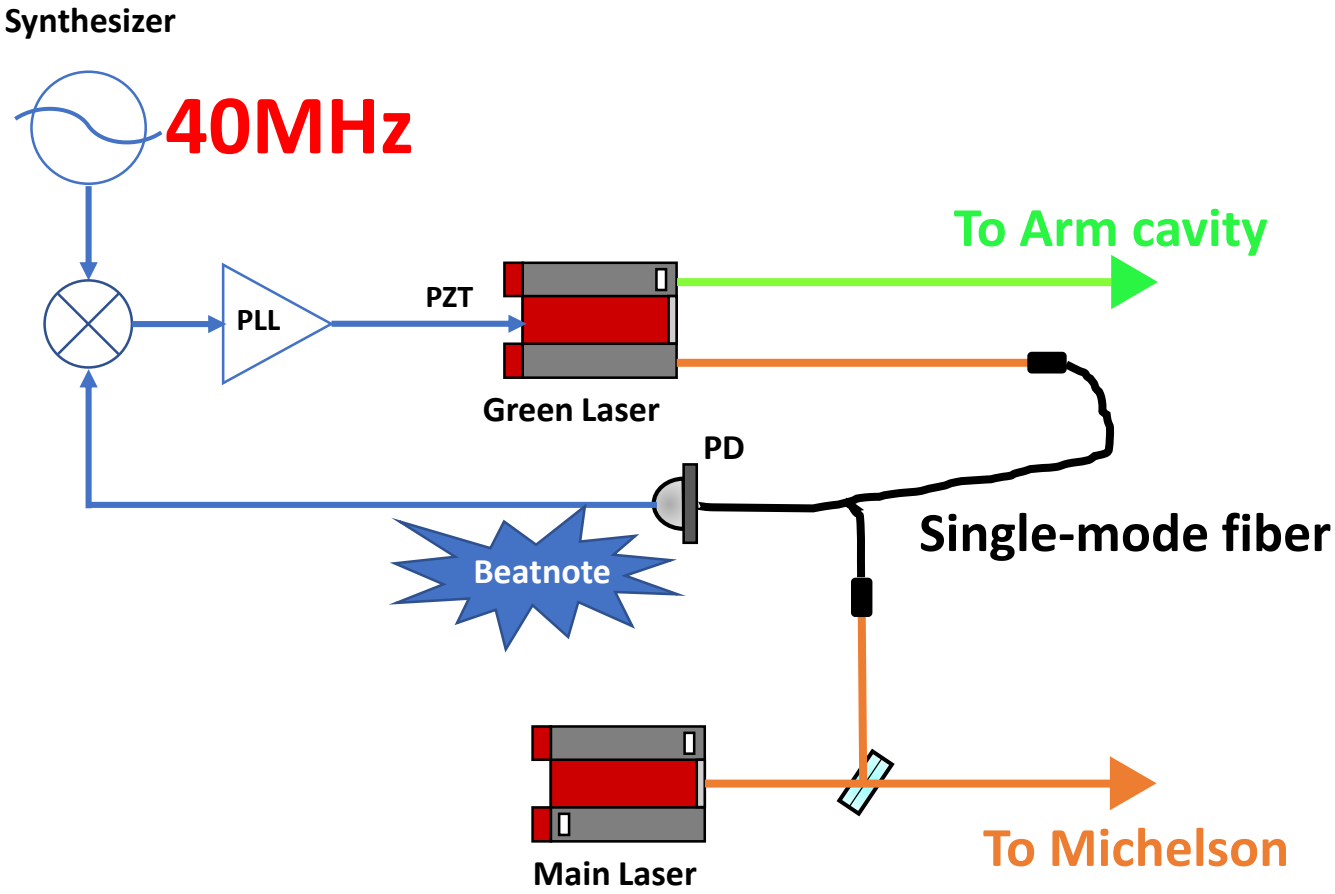
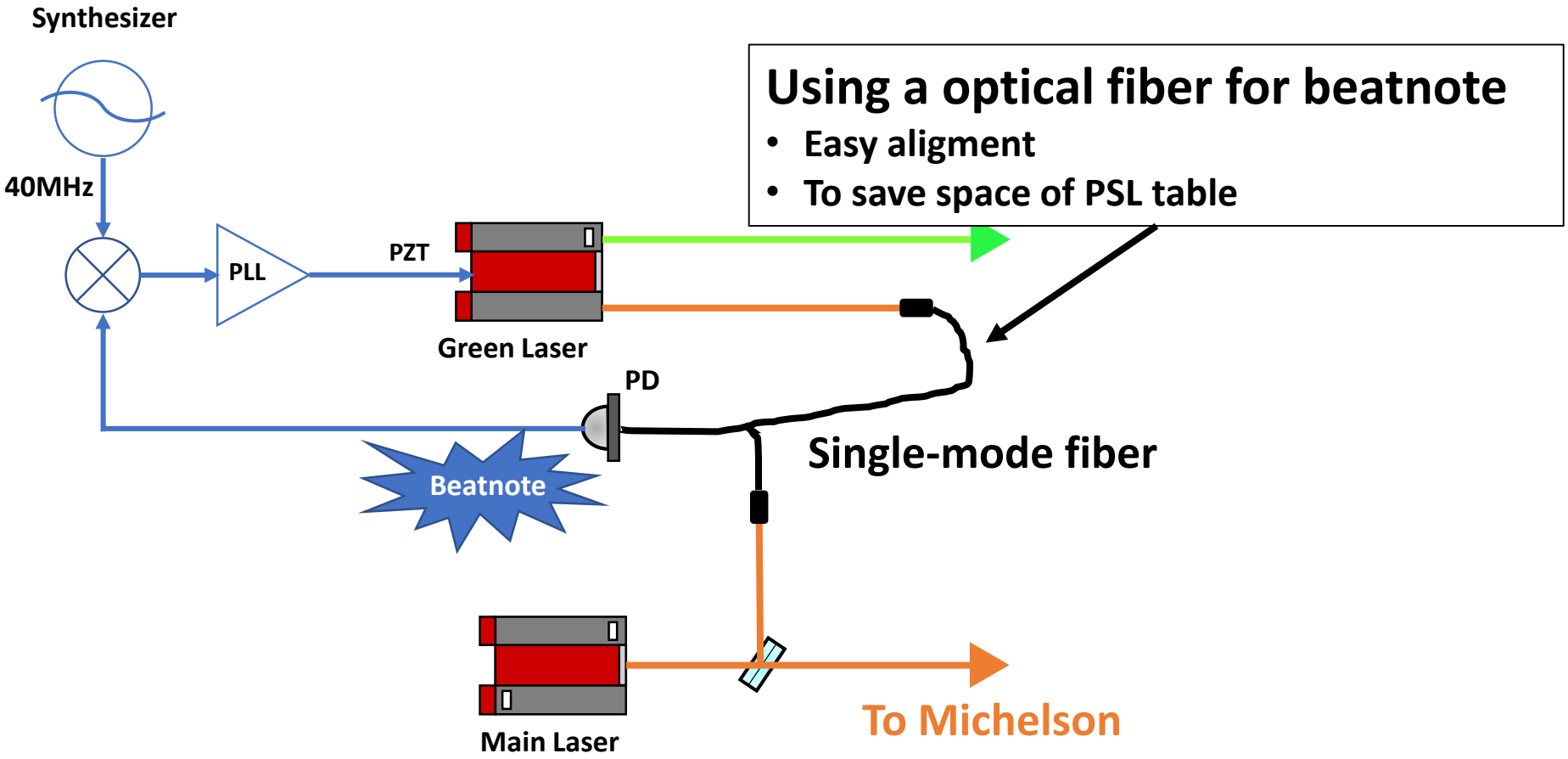
Arm Length Stabilization (ALS)



PLL system


Synthesizer
40MHz
PLL
PZT
Green Laser
To Arm cavity
PD
Beatnote
Single-mode fiber
Main Laser
To Michelson

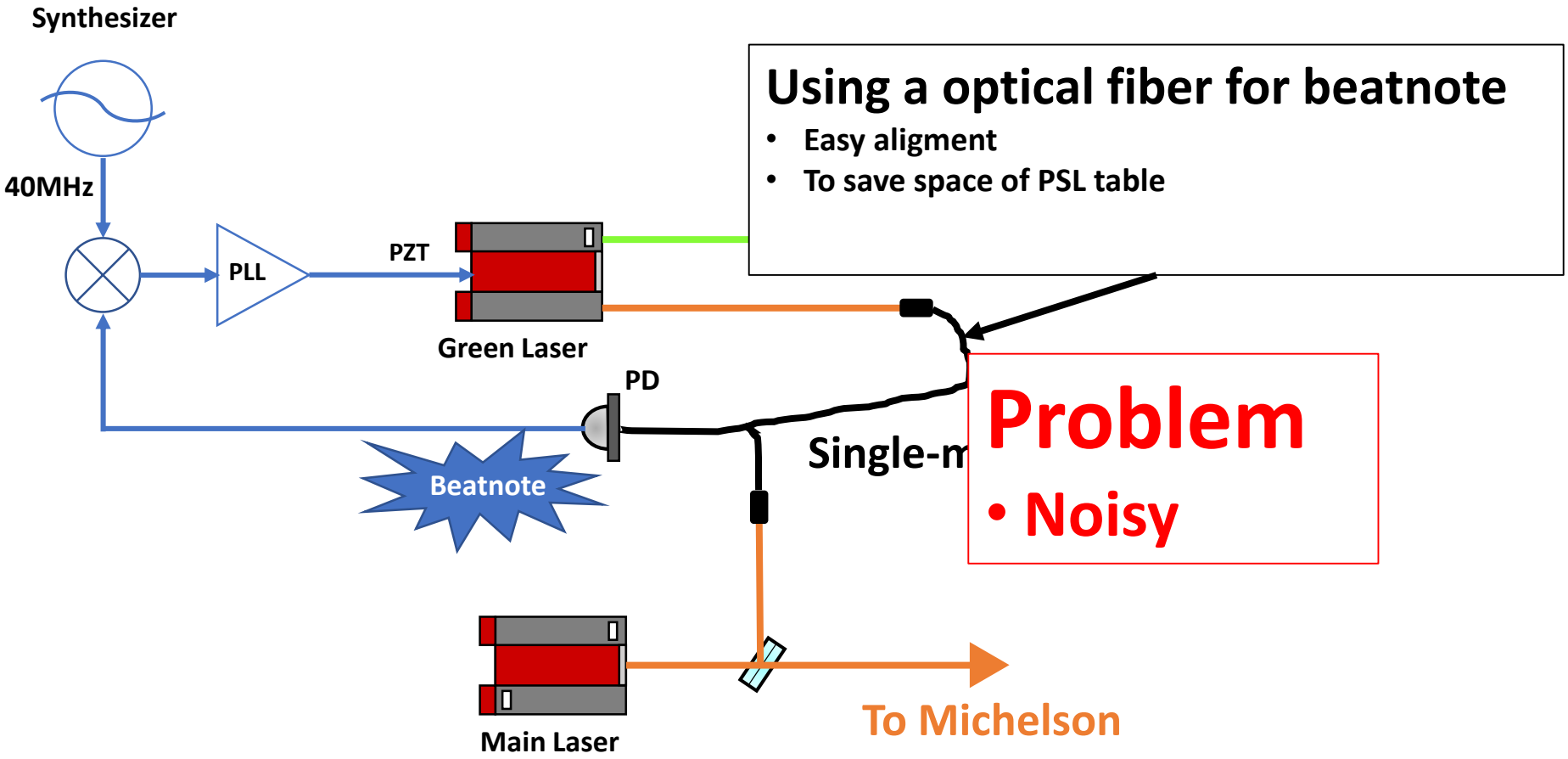
PLL system



Using a optical fiber for beatnote

- Easy aligment
- To save space of PSL table

PLL system



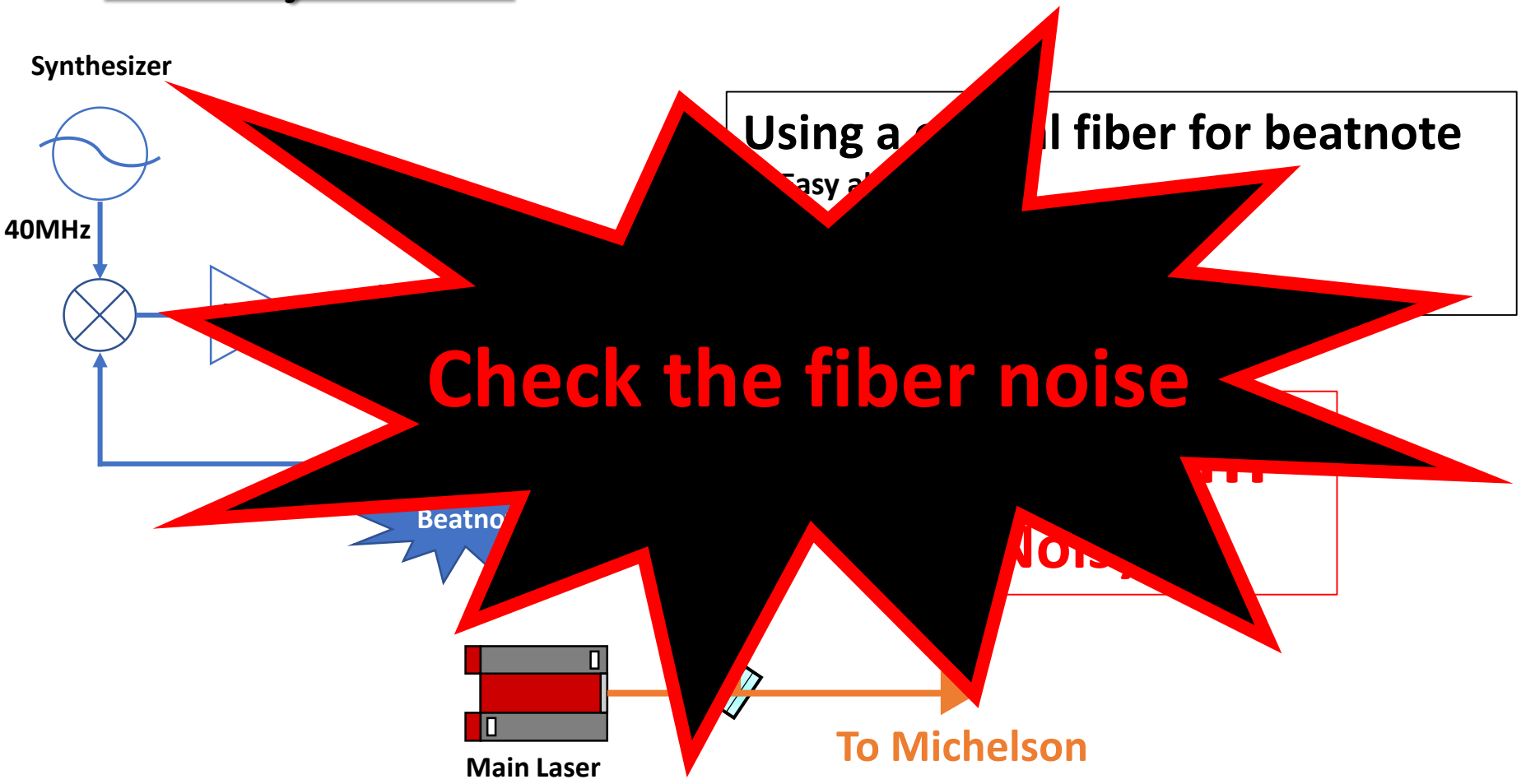
Using a optical fiber for beatnote

- Easy aligment
- To save space of PSL table

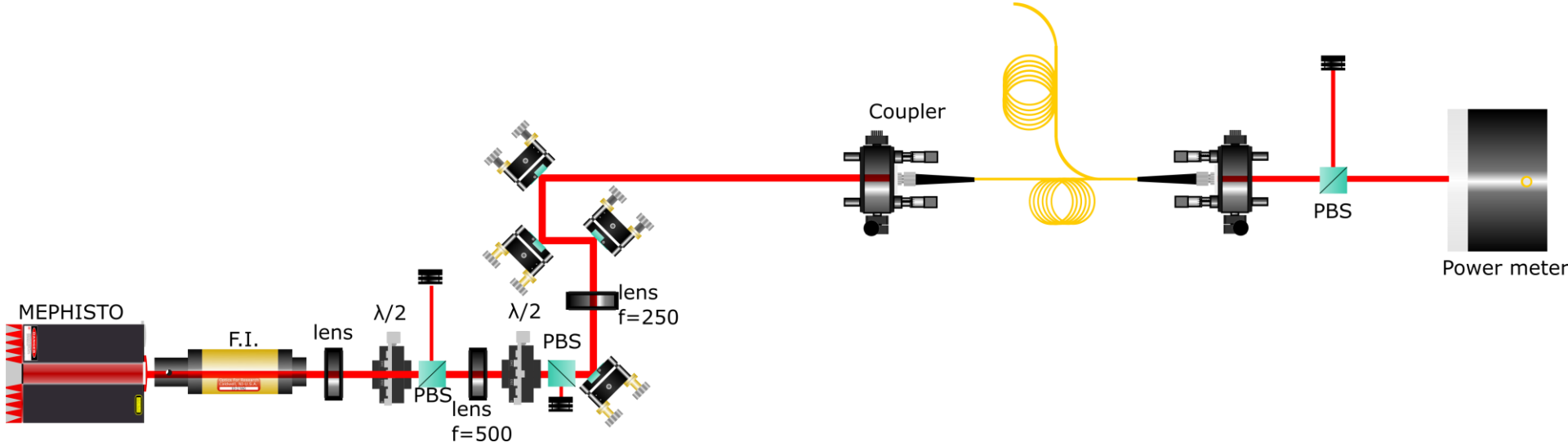
Problem

- **Noisy**

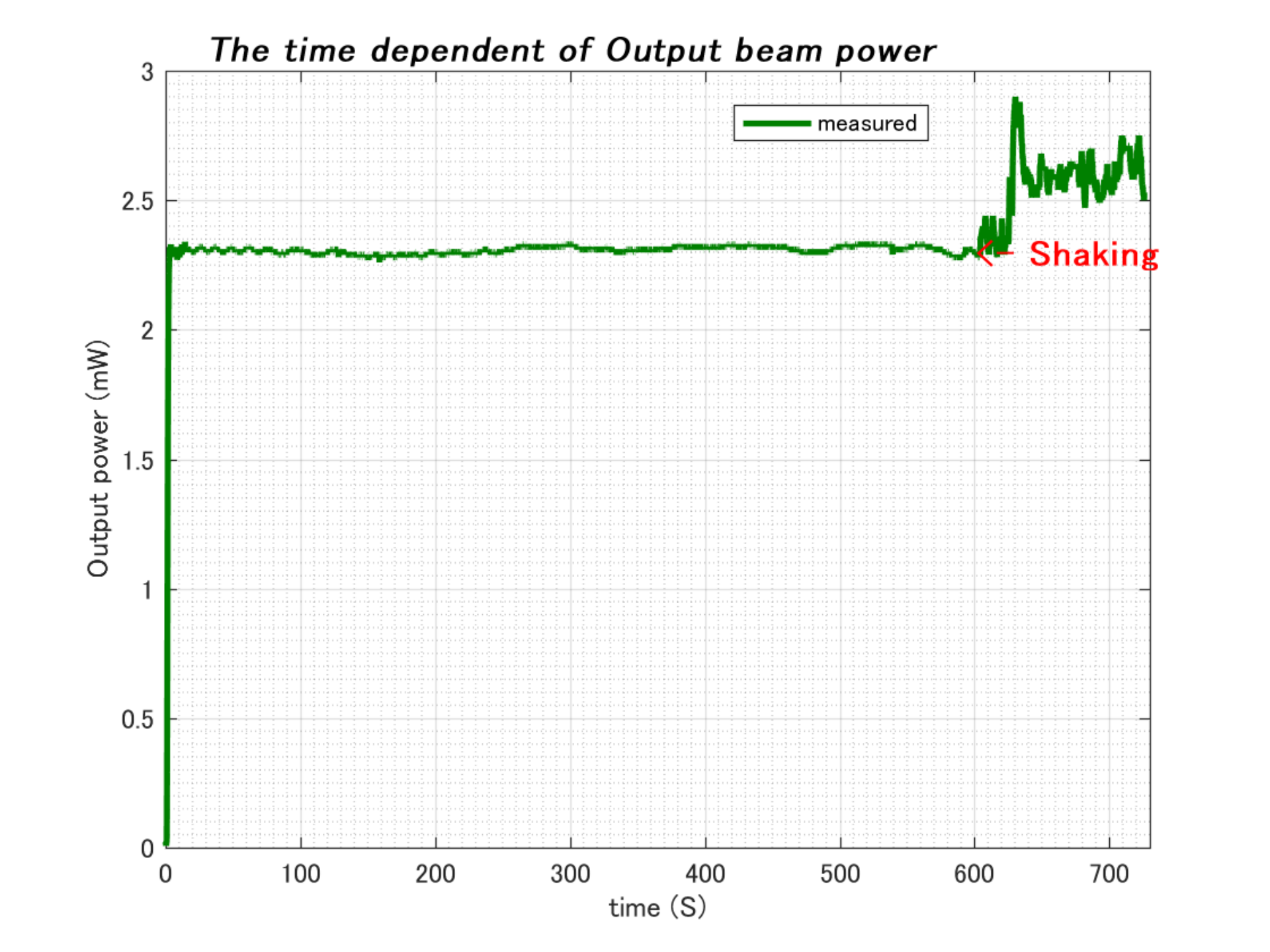
PLL system


Synthesizer
40MHz
Using a
l fiber for beatnote
Check the fiber noise
Beatno
Main Laser
To Michelson

Measurement of fiber noise



I measured power of beam for 10 minutes


The time dependent of Output beam power
measured
Shaking
Output power (mW)
time (S)
0
0.5
1
1.5
2
2.5
3
0
100
200
300
400
500
600
700

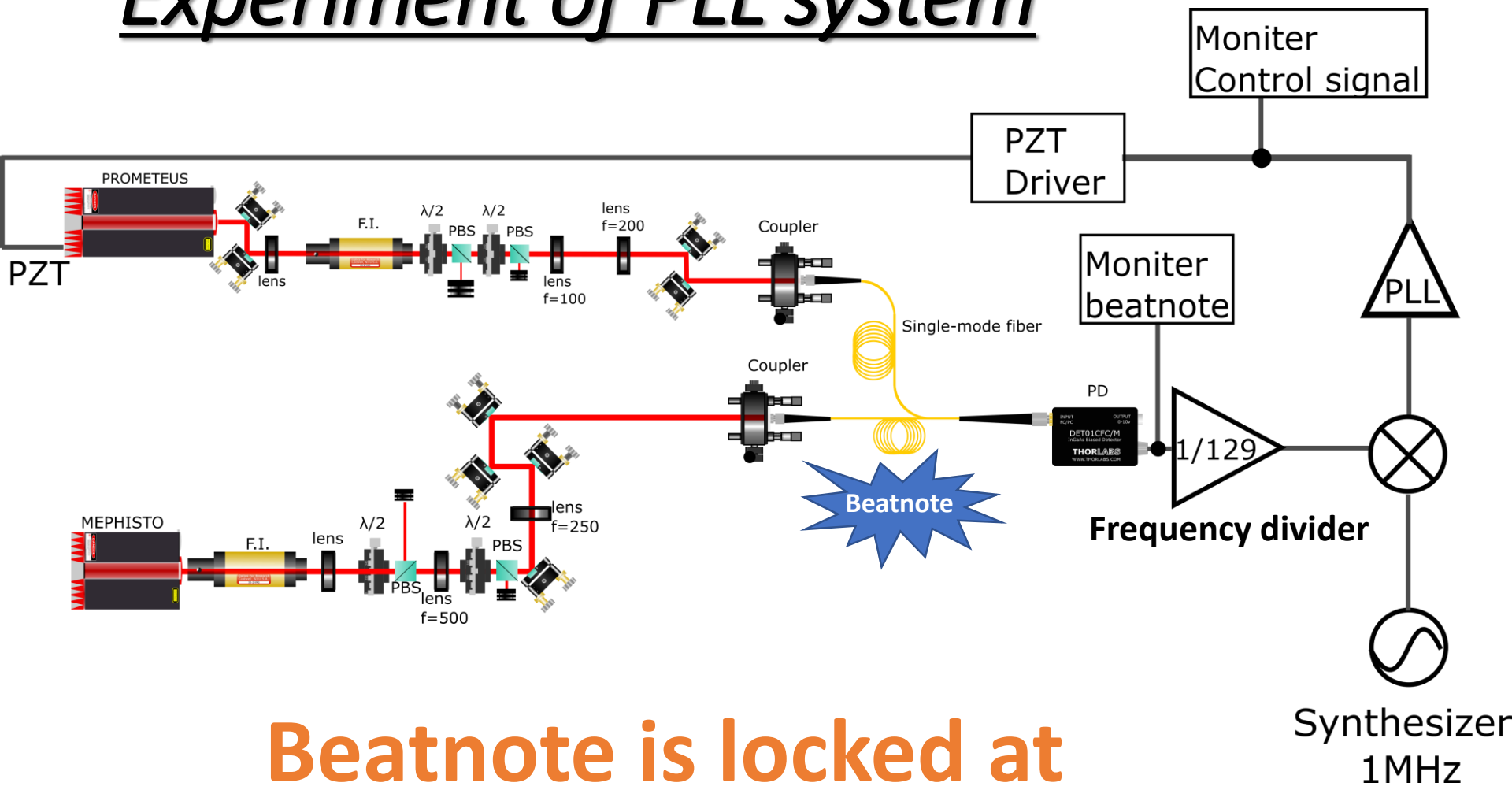
Summary

- **When optical fiber is shaked, the poralization of beam is rotating**

Future work

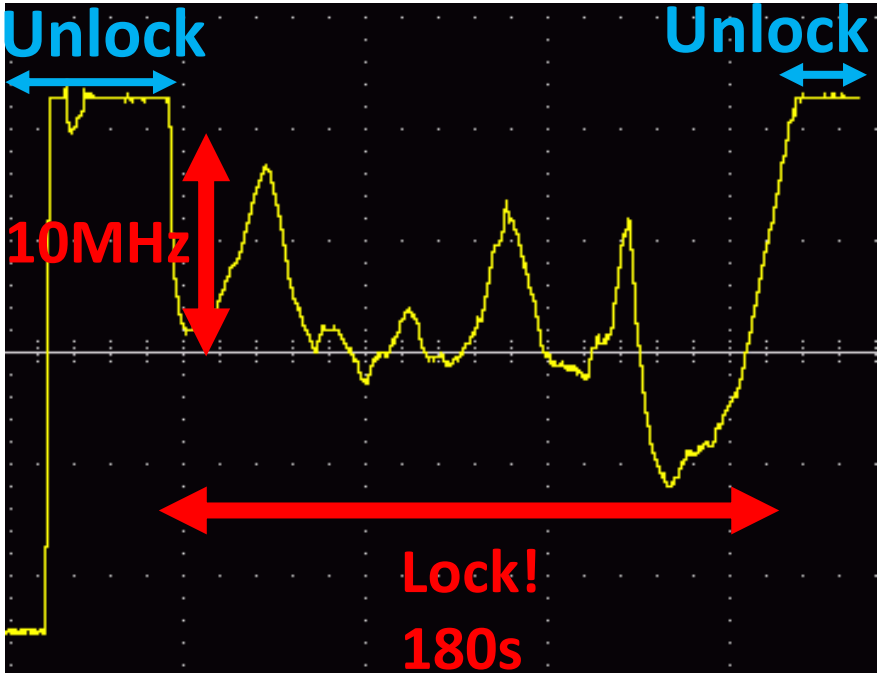
- **I will use POLARIZED WAVE HOLDING OPTICAL FIBER which is more stable.**

Experiment of PLL system

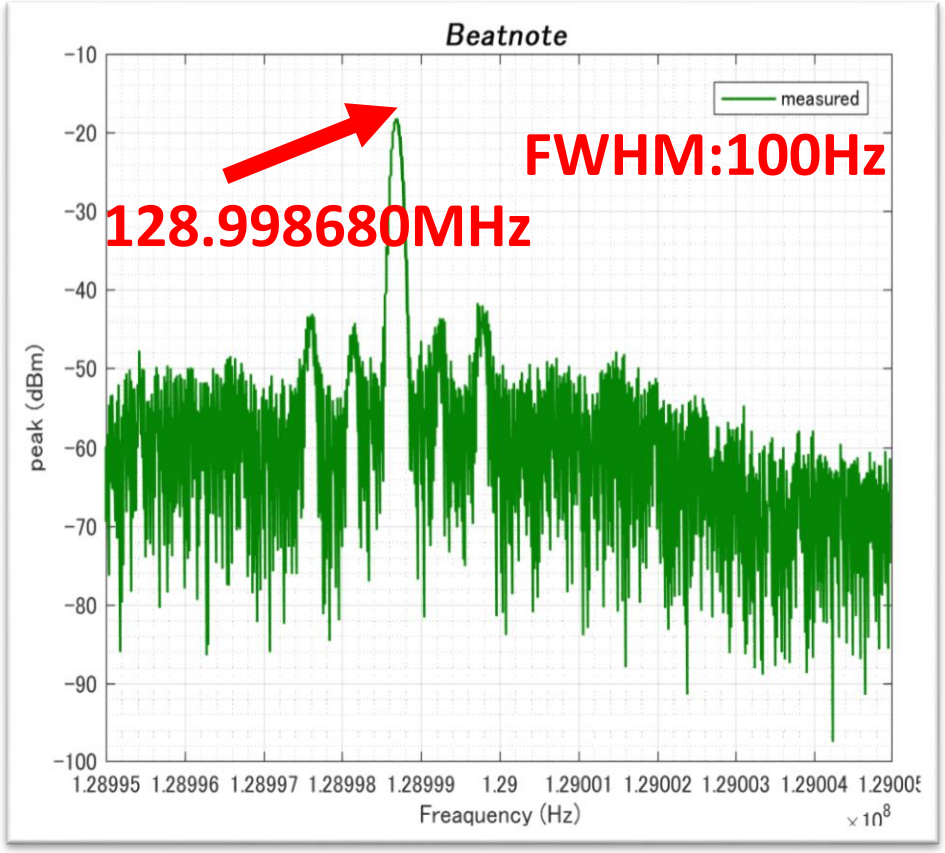


Beatnote is locked at 129MHz

Result



Feedback signal to PZT (1MHz/V)



Beatnote

Summary

- **We maintain frequency locking for 3 minutes.**
- **Line width is about 100Hz.**
- **The position of peak is shifted 1.3kHz from 129Mhz**
- **What are these sideband ?**

Future work

- **I will upgrade the filter circuit of PLL for long time locking.**
- **I will calculate the requirement of PLL system**