

Control

Stepping motor

and

Displacement sensor

and

Actuators

Dan Chen

2013/12/17 Cryo-payload meeting

Test of actuator for initial alignment in cryogenic temperature

| | | | | | | | |
|----|---------|---------------------------------|-------|---------------------------|-------|-----|---|
| 82 | 1.5.1 | Stepping motor (ICRR) | 134日 | 13/11/18 (月) 14/03/31 (月) | 8% | 8% | Chen Dan |
| 83 | 1.5.1.1 | Candidate list | 27日 | 13/12/05 (木) 13/12/31 (火) | 50% | 50% | Sekiguchi Takanori, Takahashi R, Chen Dan |
| 84 | 1.5.1.2 | Procurement of candidates | 78日 | 13/11/29 (金) 14/02/14 (金) | 0% | 0% | Takahashi R, Yamamoto Kazuhiro |
| 85 | 1.5.1.3 | Preparation for candidates test | 26日 | 13/11/18 (月) 13/12/13 (金) | 0% | 0% | Chen Dan, Student from AEI Hannover |
| 86 | 1.5.1.4 | Test at cryo temp | 1.43月 | 14/02/17 (月) 14/03/31 (月) | 84,85 | 0% | To be determined (ICRR), Small cryostat |

Candidate and Status

| Name | Number we have in ICRR | comment |
|----------------|------------------------|---|
| Stepping motor | 0 | The delivery time is 2.5 month. The company said this works at 4K. We have ordered. |
| Pico motor | 1 | We had a cooling test using a PT cooler. But it did not work below 200K. |
| Autex | 0 | Salesmen from Autex show us a motor (PZT). But they said they don't have experience at 10K. They will give us a sample for cooling test. And they will search a stage for cryo. |

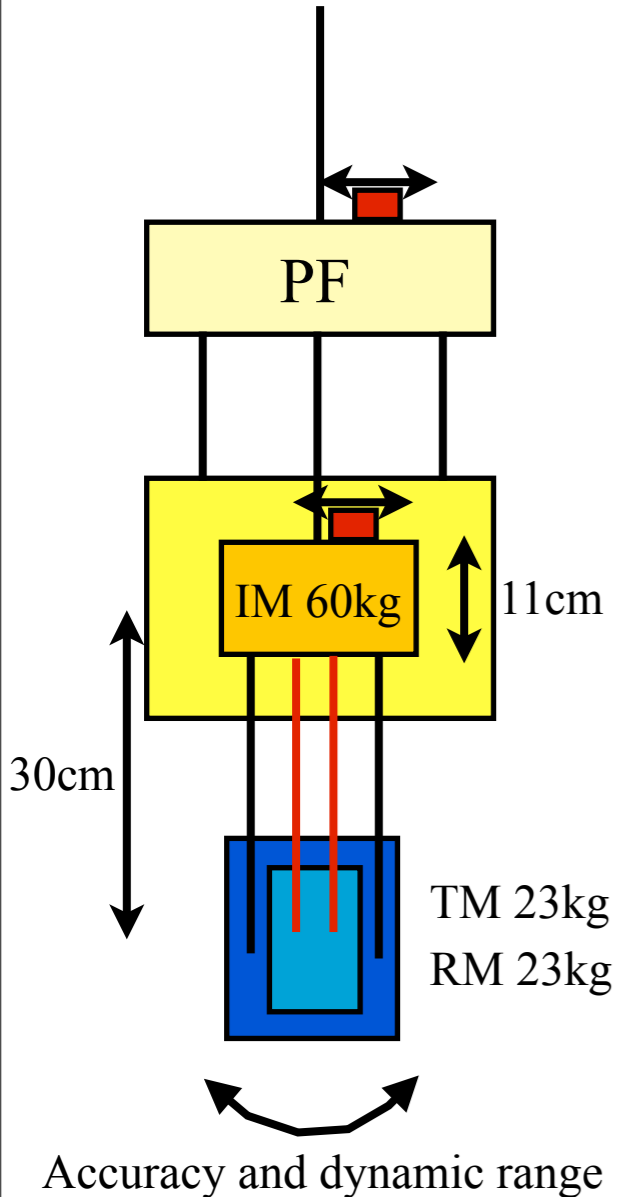
Calculation of the requirement for the mass shifter

Dynamic range we need:

1mrad ← Beginning adjustment limit by hand

Accuracy we need:

3urad ← 1 step of the mass shifter = 1 cm shift of main beam on the other TM



For IM calculation by Dan and Ono

Mass: 0.5kg

Drive range: $\pm 4\text{cm}$ → **$\pm 1\text{mrad}$** Drive accuracy: $120\mu\text{m}$ → **3urad**

Mass: 1.0kg

Drive range: $\pm 2\text{cm}$ → **$\pm 1\text{mrad}$** Drive accuracy: $60\mu\text{m}$ → **3urad**

Mass: 2.0kg

Drive range: $\pm 1\text{cm}$ → **$\pm 1\text{mrad}$** Drive accuracy: $30\mu\text{m}$ → **3urad**

→ 1 step < $120\mu\text{m}$, $60\mu\text{m}$, $30\mu\text{m}$

M=0.5kg, 1kg, 2kg

←—————→
8cm, 4cm, 2cm

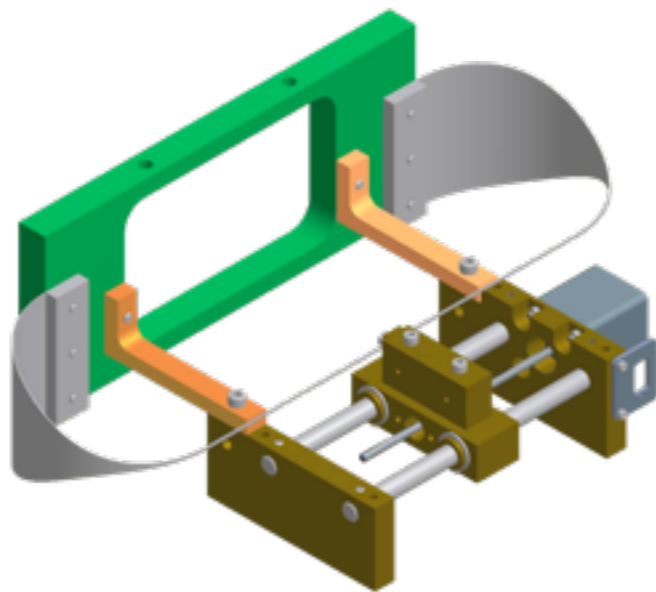
*We assumed the cryo-payload is rigid. So the real dynamic range should be smaller.

*The drive accuracy of the mass shifter we will make can be smaller. So the accuracy angle can be finer.

*Do we need more dynamic range? We can not use water level?

Test of actuator for initial alignment in cryogenic temperature A/I

- We will make a test stage for Stepping motor.
 - ▶ We have to consider the connection point between the motor we ordered and this stage. The stage which VI group have is not fit with the stepping motor we ordered. We have to design it again. (Just reduction)
- We have to consider the rotate component is.
 - ▶ We have to calculate the requirement.



Test of Displacement sensor and actuators (OSEM) in cryogenic temperature

| | | | | | | | | |
|----|---------|---|------|---------------------------|-------|----|----|--|
| 87 | 1.5.2 | Displacement sensor and actuators (between Intermediate Mass and Intermediate Recoil Mass) (ICRR) | 117日 | 13/11/04 (月) 14/02/28 (金) | | 0% | 0% | Chen Dan |
| 88 | 1.5.2.1 | Candidate list of light sources and photo diodes | 12日 | 13/11/04 (月) 13/11/15 (金) | | 0% | 0% | Suzuki T, Takahashi R, Yamamoto Kazuhiro, Chen Dan |
| 89 | 1.5.2.2 | Procurement of candidates of light sources and photo diode | 26日 | 13/11/16 (土) 13/12/11 (水) | 88 | 0% | 0% | Chen Dan |
| 90 | 1.5.2.3 | Preparation of test for the candidates of light sources and photo diode | 12日 | 13/11/29 (金) 13/12/10 (火) | | 0% | 0% | Chen Dan, Student from AEI Hannover |
| 91 | 1.5.2.4 | Test for the candidates of light sources and photo diode | 20日 | 13/12/12 (木) 13/12/31 (火) | 90,89 | 0% | 0% | Chen Dan, Small cryostat |
| 92 | 1.5.2.5 | Preparation for test of sensor | 27日 | 13/11/17 (日) 13/12/13 (金) | | 0% | 0% | Student from AEI Hannover |
| 93 | 1.5.2.6 | Test of sensor at cryogenic temperature | 54日 | 14/01/06 (月) 14/02/28 (金) | 92 | 0% | 0% | To be determined (ICRR), Small cryostat |

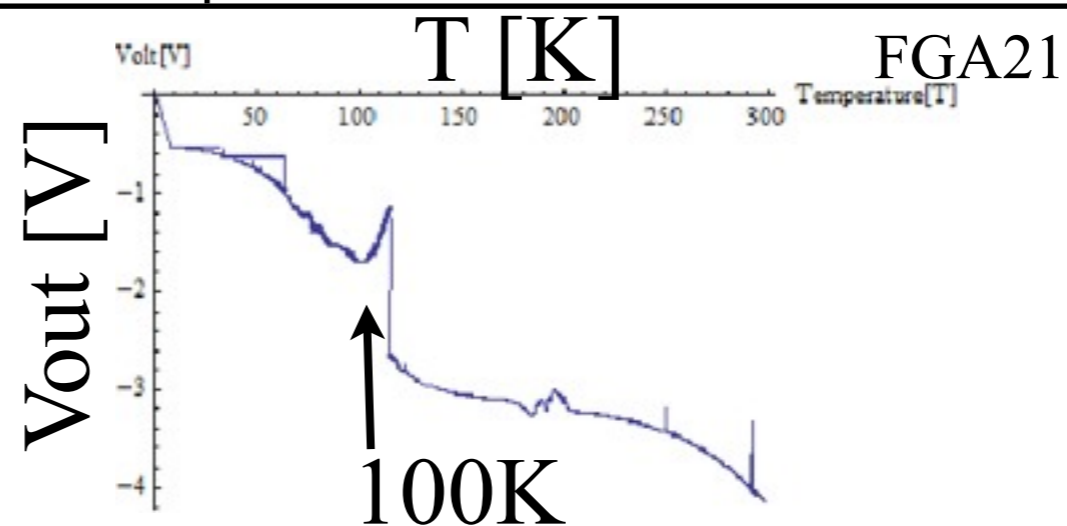
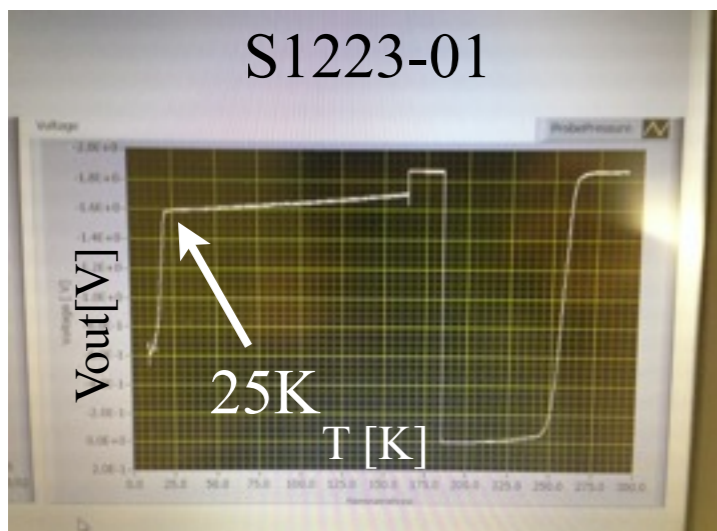
Status

PD: We tested 2 PDs at low temperature.

LED: One of LD works at 77K.

PD

| Name | Type | Peak | Number we have in ICRR | comment |
|----------|---------------|---------|------------------------|---|
| S1223-01 | Si PIN PD | 960 nm | 5 | We had a cooling test. Efficiency decreases at low T (37%) |
| G8370-01 | InGaAs PIN PD | 1550 nm | 0 | Tomaru-san said this works at low T. I asked a quotation but it was out of stock. |
| FGA21 | InGaAs Pin PD | 1600 nm | 2 | The quantum efficiency decreases at low T(15%). |



LED

| Name | Type | Peak | Number we have in ICRR | comment |
|-----------|---------|---------|------------------------|--|
| OP232 | GaAlAs | 890 nm | 5 | This is used in OSEM at room temperature. |
| L2656-03 | GaAlAs | 890 nm | 0 | Tomaru-san said this works at low T. I ordered. Delivery time = 2 weeks |
| ML925B45F | InGaAsP | 1550 nm | 2 | |

Liquid nitrogen test: 77K

| | |
|-----------|---------------|
| OP232 | Does not work |
| ML925B45F | Works! |

Detect by sensor card

Test of Displacement sensor and actuators (OSEM) in cryogenic temperature A/I

- Search other PD and LED. (Manu is in process.)
- Test LEDs we have in 77K and cryostat.
- Calculate the noise from the data we have now.
- Actuator?

必要な周波
数帯は?

