Control

Stepping motor
and
Displacement sensor
and
Actuators

Dan Chen
2013/12/10 Cryo-payload meeting

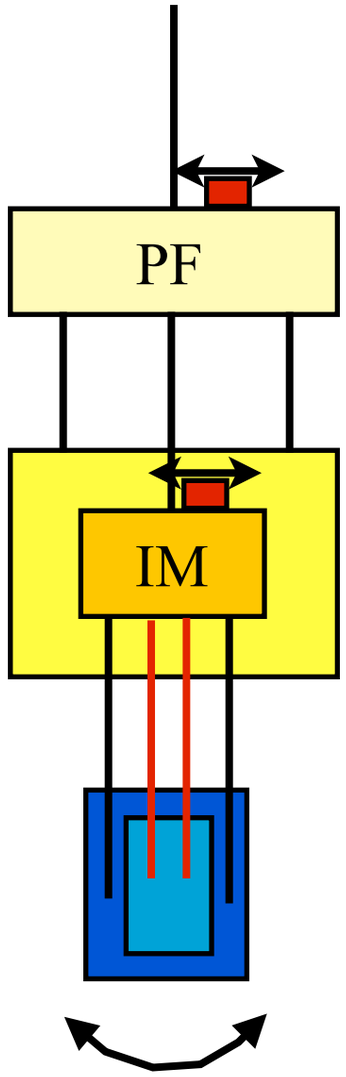
Test of actuator for initial alignment in cryogenic temperature

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%	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



Accuracy and dynamic range

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
(Maraging steel: 0.399m, 1.6mm)

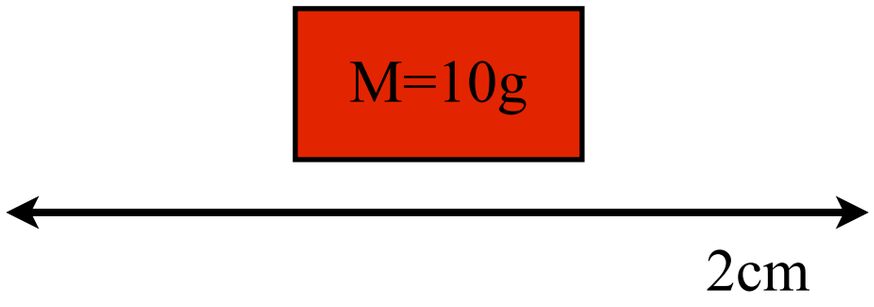
Mass: 10g
Drive range: ±1cm → ±6mrad
Drive accuracy: 5um → 3urad

For PF
(Maraging steel: 3.05m, 3.8mm)

Mass: 10g
Drive range: ±1cm → ±1.6mrad
Drive accuracy: 19um → 3urad

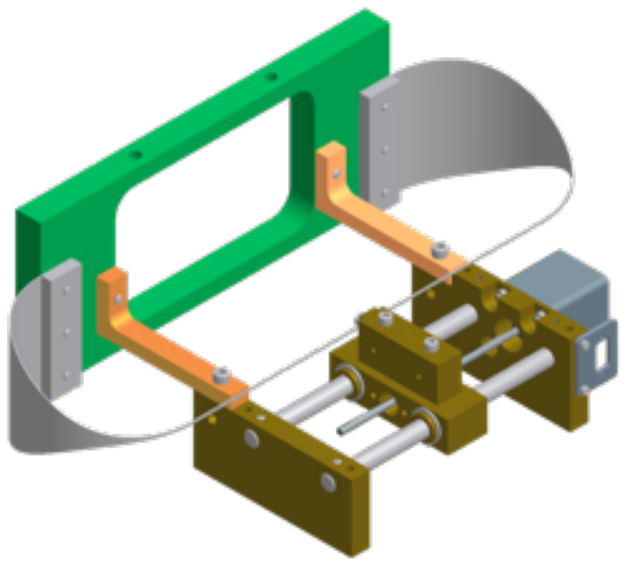
*We assumed the cryo-payload is rigid. So the real dimanic range should be smaller.
*The drive accuracy of the mass shifter we will make can be smaller. So the accuracy angle can be finer.
*Do we need more dymamic range? We can not use water level?

→ 1 step < 5um, 19um



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

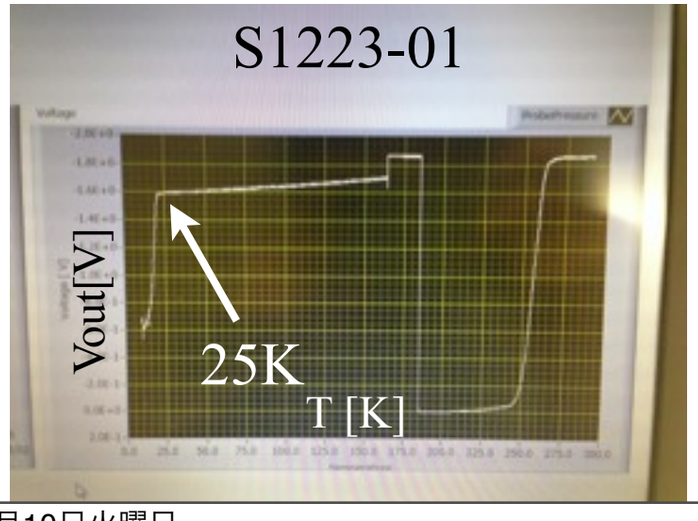
87	**1.5.2**	**Displacement sensor and actuators (between Intermediate Mass and Intermediate Recoil Mass) (ICRR)**	**117日**	**13/11/04 (月) 14/02/28 (金)**		**0%**	**0%**	**Chen Dan**
88	1.5.2.1	Candidate list of light sources and photo diodes	12日	13/11/04 (月) 13/11/15 (金)		0%	0%	Suzuki T,Takahashi R,Yamamoto 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

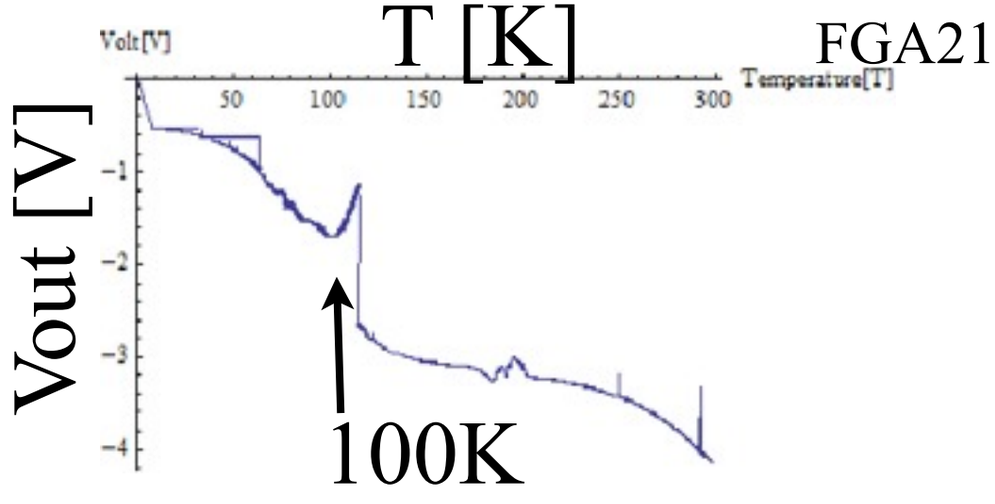
Status

PD: We tasted 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 is 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	GaAIAs	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?