

KAGRA低温系の現状

KEK 鈴木敏一

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KAGRA Cryogenics Subgroup

1. Fabrication of Cryostat, Duct-Shield, Cryocooler

Kimura, Tomaru, Suzuki

2. Installation, Leak test, Measurement of inclination

Kimura, Tomaru, Miyamoto, Tanaka, Kasuya, Kume, Suzuki

3. Preparation Status of Cryogenic Pendulum

Tomaru, Miyamoto, Hagiwara, Suzuki

4. Preparation Status of Sapphire Suspension

Yamamoto, Tanaka, Kumar, Craig

5. Sapphire Prototype Suspension & Assembly

Jigs, Measurement of Fundamental Parameters

Craig, Kumar

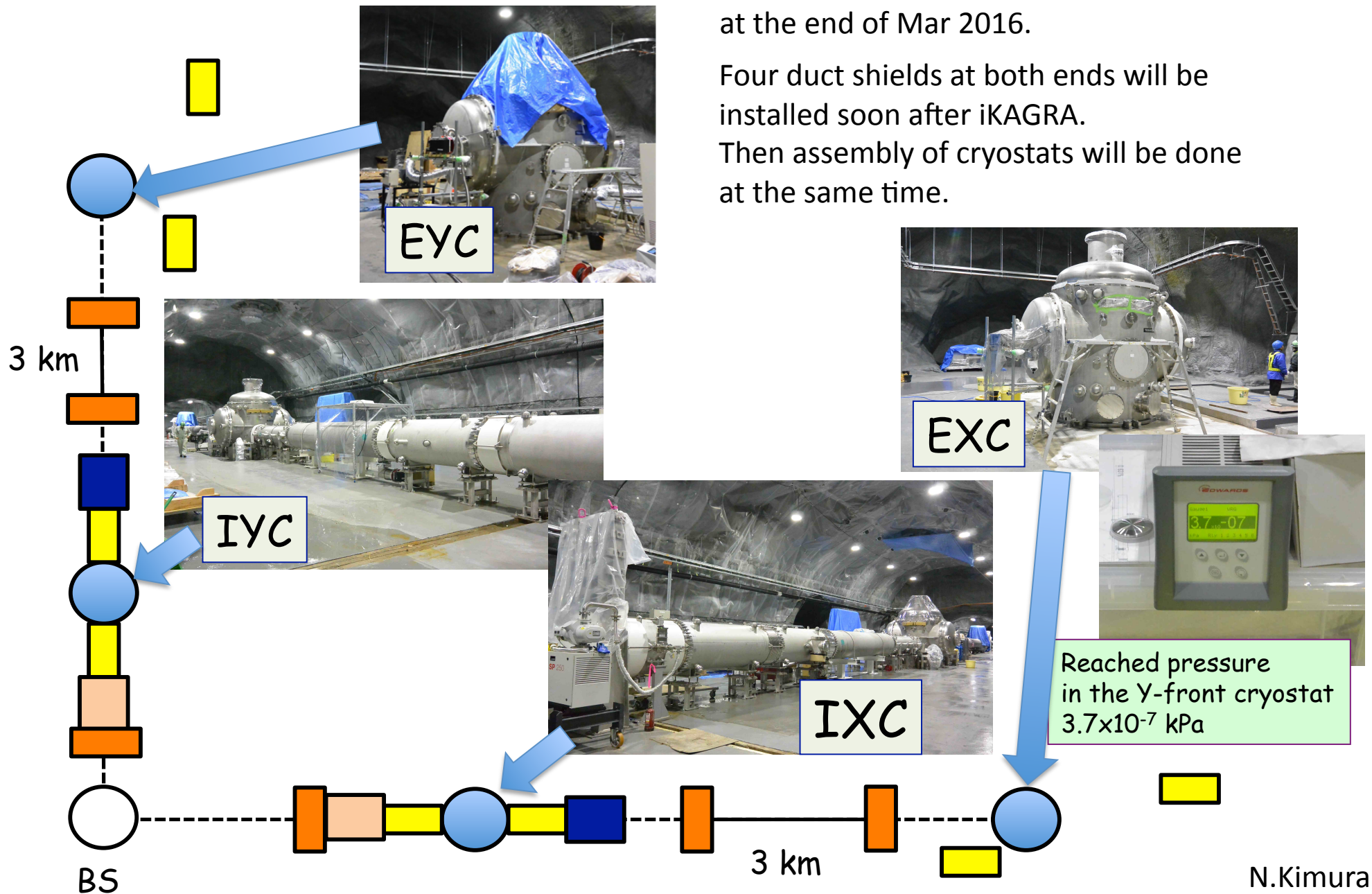
6. Summary

1. 2. Cryostat, Duct-Shield, Cryocooler

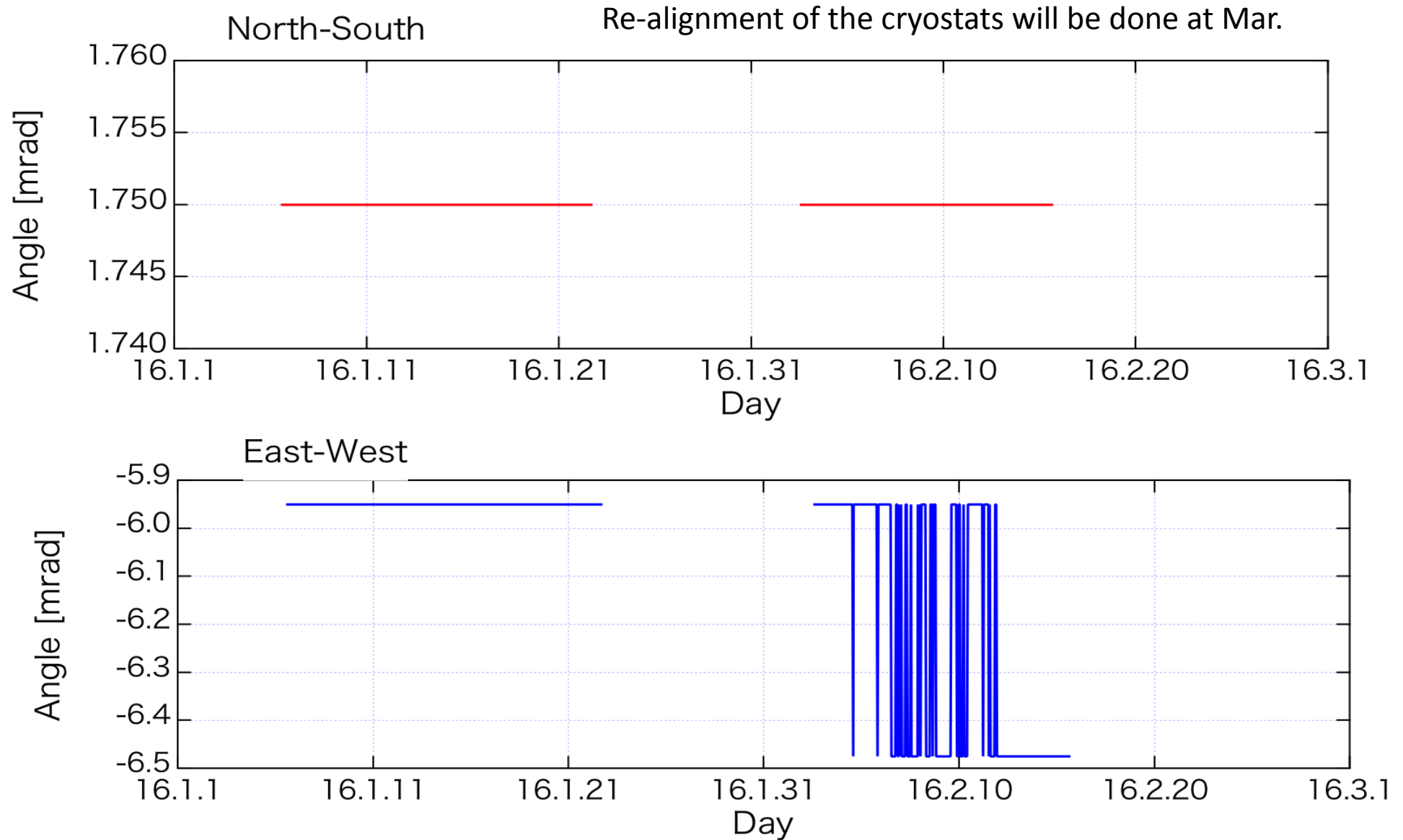
Last two duct shields will be delivered at the end of Mar 2016.

Four duct shields at both ends will be installed soon after iKAGRA.

Then assembly of cryostats will be done at the same time.



2. Tilt Measurement of Y-front Cryostat

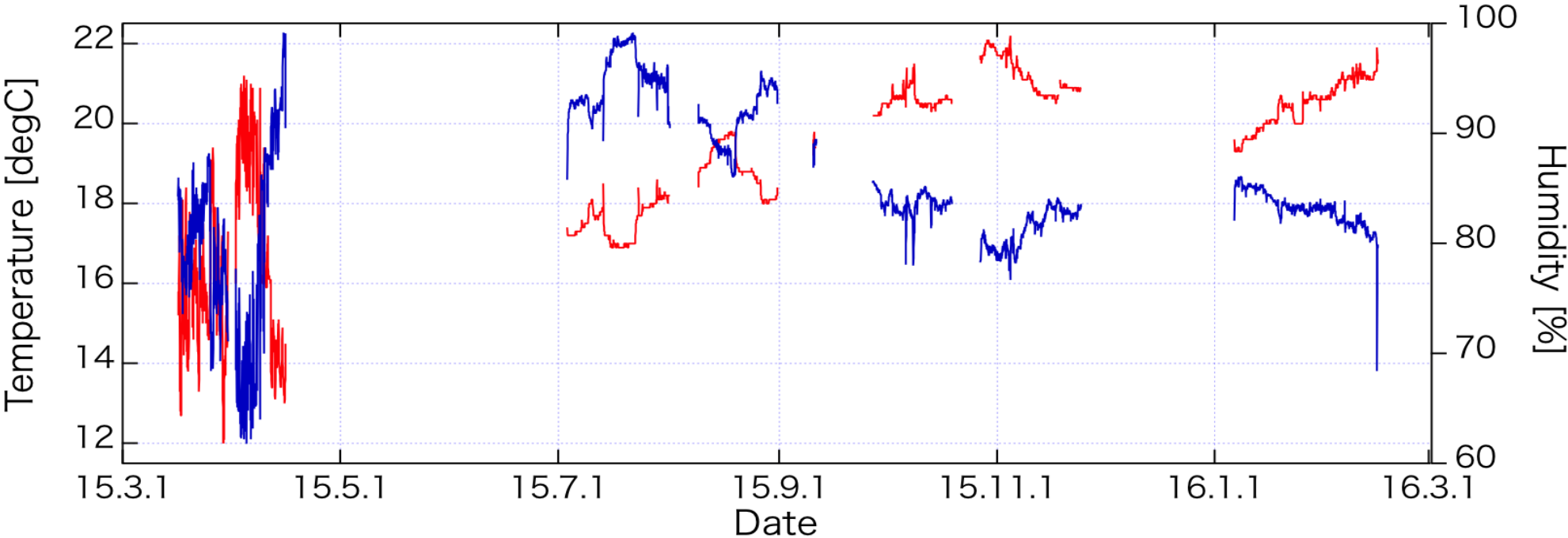


We lost data between Nov. and Dec. since PC trouble, but it didn't change from above.

T.Tomaru

Temperature & Humidity at X-front

From Mar. 17, 2015 to Feb. 15, 2016



— Temperature
— Humidity

3. Preparation Status of Cryogenic Pendulum

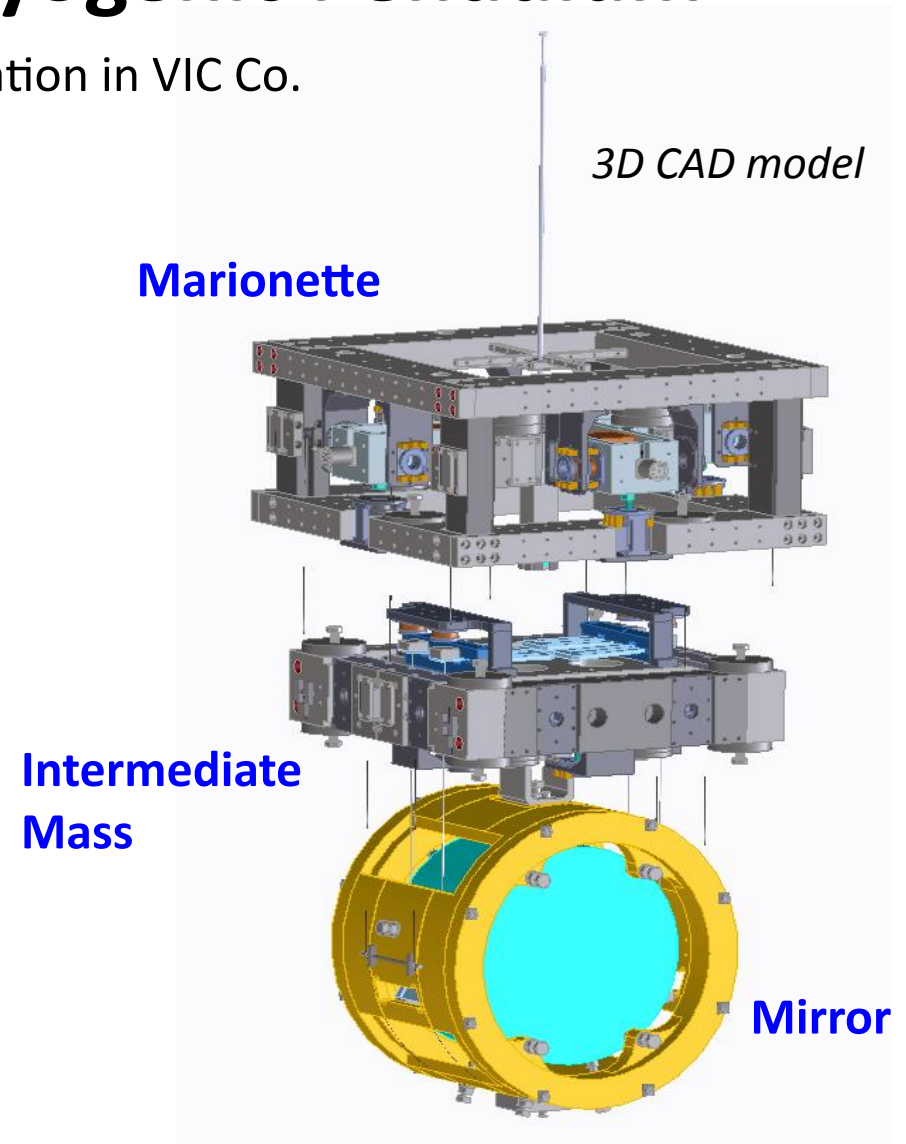
1st Practical Cryogenic Payload is under fabrication in VIC Co.

- Marionette
 - 2 Moving Mass
 - 6 Actuators & Sensors
- Marionette Recoil Mass
- Intermediate Mass
 - 6 Actuators & Sensors
 - 4 Damping Coil for vertical springs
- Intermediate Recoil Mass
- Dummy Mirror (by KEK)
 - 4 Actuators
- Mirror Recoil Mass
(low magnetism Stainless Steel)

Fabrication will be done at end of this Mar.

CAD sets:

We have already have prototype payload which is not including Marionette recoil mass and Intermediate recoil mass.



Done

- Mechanical design
- Prototype fabrication
- Resonant frequency measurement of prototype
- Test fabrication of 5N purity Al heat link
- Setup of cryostat for payload test in KEK

Still Testing

- Mechanical simulation (~50%)
- Test fabrication of 6N purity Al heat link (~80%)
- Local sensor developments at cryogenic temperature (~50%)
- Ball screw test at cryogenic temperature for moving mass (70%)
- Design of assembly jigs (50%)

Not Yet

- Control Electronics
- black coating w/o magnetism
- Design of installation jigs
- Optical Lever
- Platform design

詳細 宮本 21pCE3

4. Preparation Status of Sapphire Suspension

Procurement of parts of KAGRA sapphire suspension

(except for sapphire mirrors themselves)

Almost half numbers of sapphire parts were ordered in this fiscal year.

Final parts will be delivered by July 2016.

Delivery is on time.

Items	CAD No.	2015	2016	2015 comments
サファイアブレード	KAGRA-Cryo-mec-051-03	8	8	2セット分
サファイアワッシャー	KAGRA-Cryo-mec-051-01	16	48	1セット分
サファイアロッド	KAGRA-Cryo-mec-14-01	24		2セット分+テスト用, 鏡上のマグネットベース
ネールヘッド付ファイバー				

Investigation of delivered products

Geometrical shape of sapphire ears : **OK** (So far) by Kazuhiro Enami (KEK)

Flatness of bonding surface with mirror is **in progress**. by Akitoshi Ueda (NAOJ)

We think **extra sapphire fibers** are necessary (They could be broken).

K.Yamamoto
T.Tomaru

Heat Load Test by one fiber prototype

H.Tanaka and K.Yamamoto

Simpler prototype (easier assembling)

Shorter cooling time

Sapphire fiber $\phi 1.6$
(100mm, monolithic)

Indium Bond

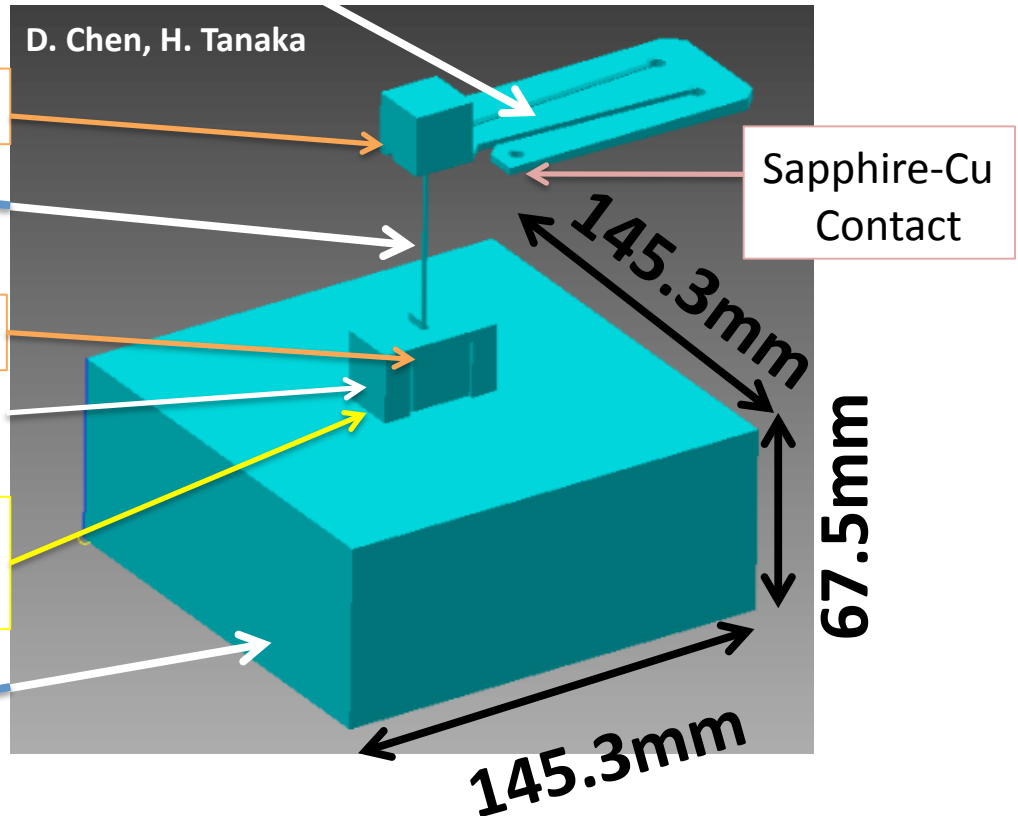
Indium Contact

Sapphire hanger

HCB (Hydroxide-Catalysis Bond or
Silicate Bond)

6kg sapphire mass
(M/4 of KAGRA mirror)

Sapphire blade spring



Heat load test is in progress. A large temperature difference (about 10K) between blade spring and its support (Sapphire-Cu contact) was found.

詳細-> 田中 21pCE6

5. Sapphire prototype suspension

- Assembly frame designed and built
- Earthquake stops assembled
- Intermediate mass, and blade spring clamps assembled
- Next step: HCB bonding ears to test mass
- Assembly of full suspension (including indium bonds in suspensions)

Details

K.Craig 21pCE4

R.Kumar 21pCE5

KAGRA Cryogenics Group

@ Apr. 2016



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KEK, Assoc. Prof.



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Cryostat sub-chief
KEK, Assoc. Prof.



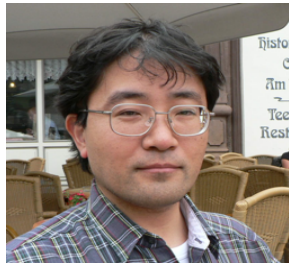
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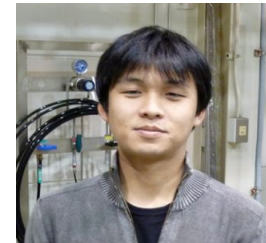
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Toshikazu SUZUKI
KEK, Prof. (Senior)



Hiroki TANAKA
Cryo-Payload, Q
ICRR, Grad. Student



Takahiro MIYAMOTO
Cryo-Payload
ICRR, Grad. Student

T.Kume and I. Murakami left

H.Vocca will join

6. Summary

- Cryogeic Pendulum -cryopayload –
 - 今年度にPF (platform)を除く1台分の部品は製作
 - プロトモデルによる制御実験を進行中
- Sapphire Suspension
 - 部品調達中
 - 組み立て準備中
 - one fibre prototype実験進行中
- Cryostat傾き、地盤の不同沈下
 - 観測を続行中。増水期前までは安定している。
 - 2階と1階の結合 (type-A)に問題ないかは未確認
- Cryostat冷却試験
 - 冷却水調達の都合ではXエンドから始める見通し
 - iKAGRA終了から準備に入る。