

## Report of SEO

### SEO

= System Engineering Office, chaired by PM (project manager)

### Task of SEO

- = to manage the project schedule, budget and commissioning sequence, according to the guideline decided by Executive Office (EO).
- = to prepare the issues to be discussed in Chief Meeting
- = to request tasks to each sub-group
- = to decide the issues given by each sub-group and by Chief Meeting
- = to moderate the boundary issues between sub-groups
- = to distribute necessary information to all sub-groups

## Task of SEO members

	Scheduling	Budget	Installation*	Commissioning** (incl. two hours lock)	Other task
Y. Saito, chair (PM)			on-site scheduling		warehouse for storage
M. Ohashi (Deputy PM)		overall budget (incl. tunnel)	overall manage		
S. Kawamura (Deputy PM)	input/output optics	Input/output optic	input/output optics	overall manage	
M. Ando	overall roadmap (incl. operation)			co-organizer, categorizing processes	risk management, bKAGRA design
S. Miyoki		tunnel facilities	on-site scheduling		public relations
K. Somiya		overall budget	man-power count		sensitivity evaluation
T. Suzuki	cryo-payload	cryo-payload	cryo-payload	cryo-payload	
Y. Aso					management of NAOJ task

\* All components to be installed inside vacuum are set, and the system is pump-downed to the required pressure. The components to be installed outside vacuum are fixed where they are to be located.

\*\* After installation, the beam is switched on, and then all the components are being tuned for interferometer performance.

## Meetings, SEO member attending

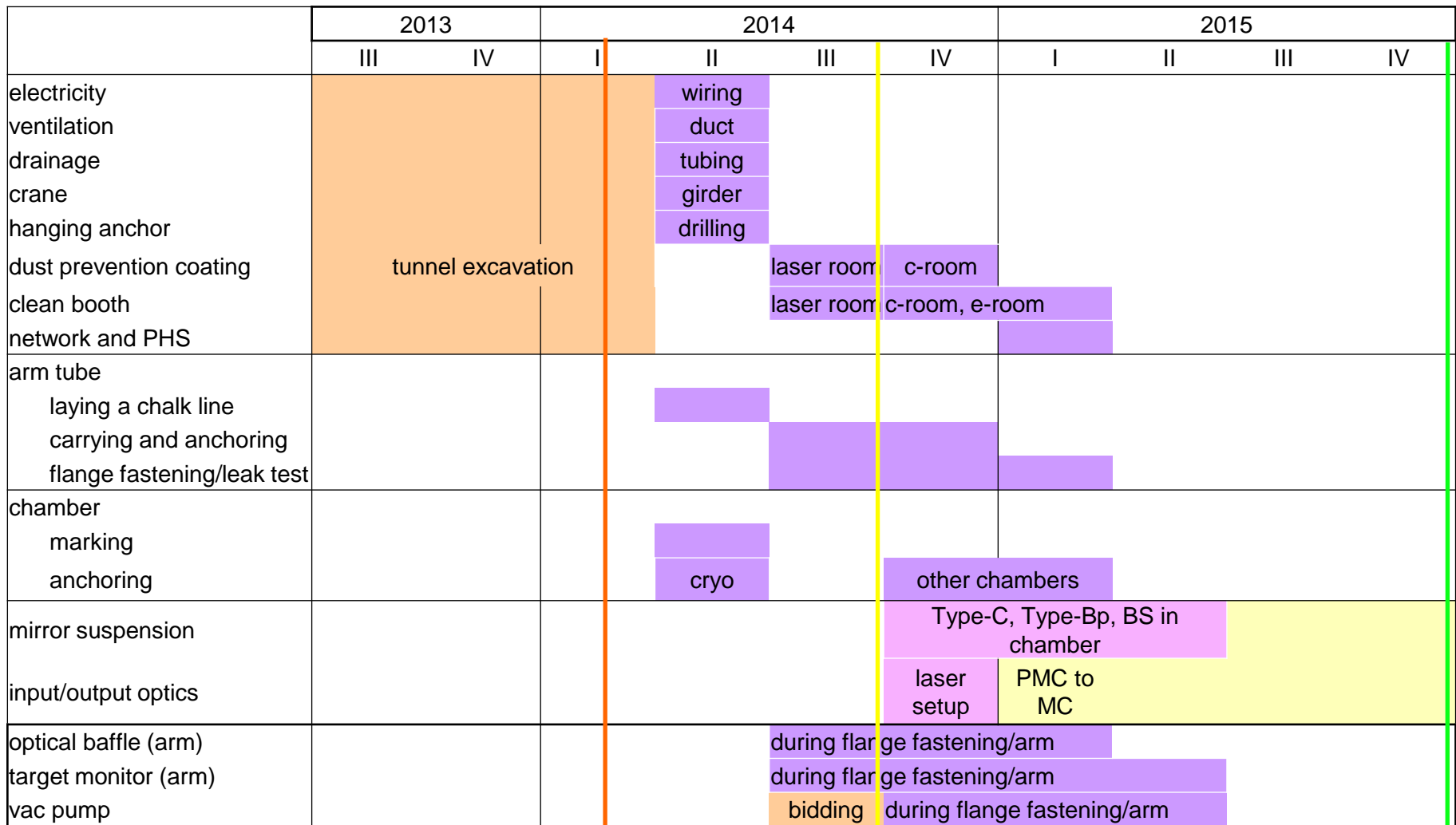
meeting		contents	frequency	Attending member form SEO
	EO meeting	Overall schedule and budget, administration	weekly	Y. Saito, M. Ohashi, S. Kawamura, M. Ando
	SEO meeting	Breakdown of EO items Decision of chief meeting items	biweekly	All members of SEO
	Chief meeting	Reports by sub-groups Discussion of pending items	biweekly	All members of SEO
sub-group meeting		contents	frequency	Attending member form SEO
	Tunnel excavation	Progress report Requirements from/to KAGRA	weekly	M. Ohashi, S. Miyoki, Y. Saito,
	Tunnel facilities	Construction of electricity, ventilation	monthly	M. Ohashi, S. Miyoki, Y. Saito,
	Cryo-payload	Overall design of cryogenic payload	weekly	T. Suzuki, K. Somiya, M. Ohashi
	Input/output optics	Installation and commissioning schedule	optional	S. Kawamura, K. Somiya
	Main interferometer	Beam optics design	optional	M. Ando, K. Somiya, Y. Saito
	Mirror	Fabrication and evaluation	weekly	optional
other meeting		contents	frequency	Attending member form SEO
	PAB	Program advisory board	twice/year	All members of SEO
	Collaborator meeting	Internal/International collaborator meeting	twice/year	All members of SEO
	Face to face meeting	International collaborator meeting	twice/year	All members of SEO

## Man-power\* in each sub-group (still re-arranging now)

\*management, theory, simulation, ..are not included.

		head count		full-time equivalent		requested after 2015	
		2012 Aug	2013 Oct	2012 Aug	2013 Dec	until 2015 Dec	Dec
TUN	Tunnel	5	5	0.8	1.8	5	0
FCL	Facility		5		2.5	4	2
VAC	Vacuum	5	1	2.0	0.8	5	2
CRY	Cryogenics	14	9	2.8	5.4	11	12
VIS	Vibration Isolation	7	11	2.4	2.8	6	6
MIR	Mirror	2	2	1.0	1.0	5	3
LAS	Laser	2	2	0.2	0.2	3	4
MIF	Main-Interferometer	12	5 (MIF) 14 (DetChar)	0.9	0.8 (MIF) 0.9 (DetChar)	8 (MIF) 5 (DetChar)	17 (MIF) 4 (DetChar)
IOO	Input/Output Optics	14	19	0.5	4.5	3	3
AOS	Auxiliary Optics	13	10	0.9	3.6	6	6
AEL	Analog Electronics		2		1.0	5	5
DGS	Digital System	6	3	2.1	1.2	10	10
DMG	Data Management	8	12	3.4	2.1	5	5
DAS	Data Analysis		22		9.0	15	25
GIF	Geophysics Interferometer	3	3	0.4	0.4	1	1
		91	120	17.4	33.9	97	105

# Onsite installation of iKAGRA: 2014-2015



Feb 2014

Oct 2014

Dec 2015

Start input-optics installation

iKAGRA obs.



FY2014

# Onsite installation of iKAGRA: 2014-2015

**You (and your lab's staff/student) are kindly invited to contribute to onsite-installation in the tunnel.**

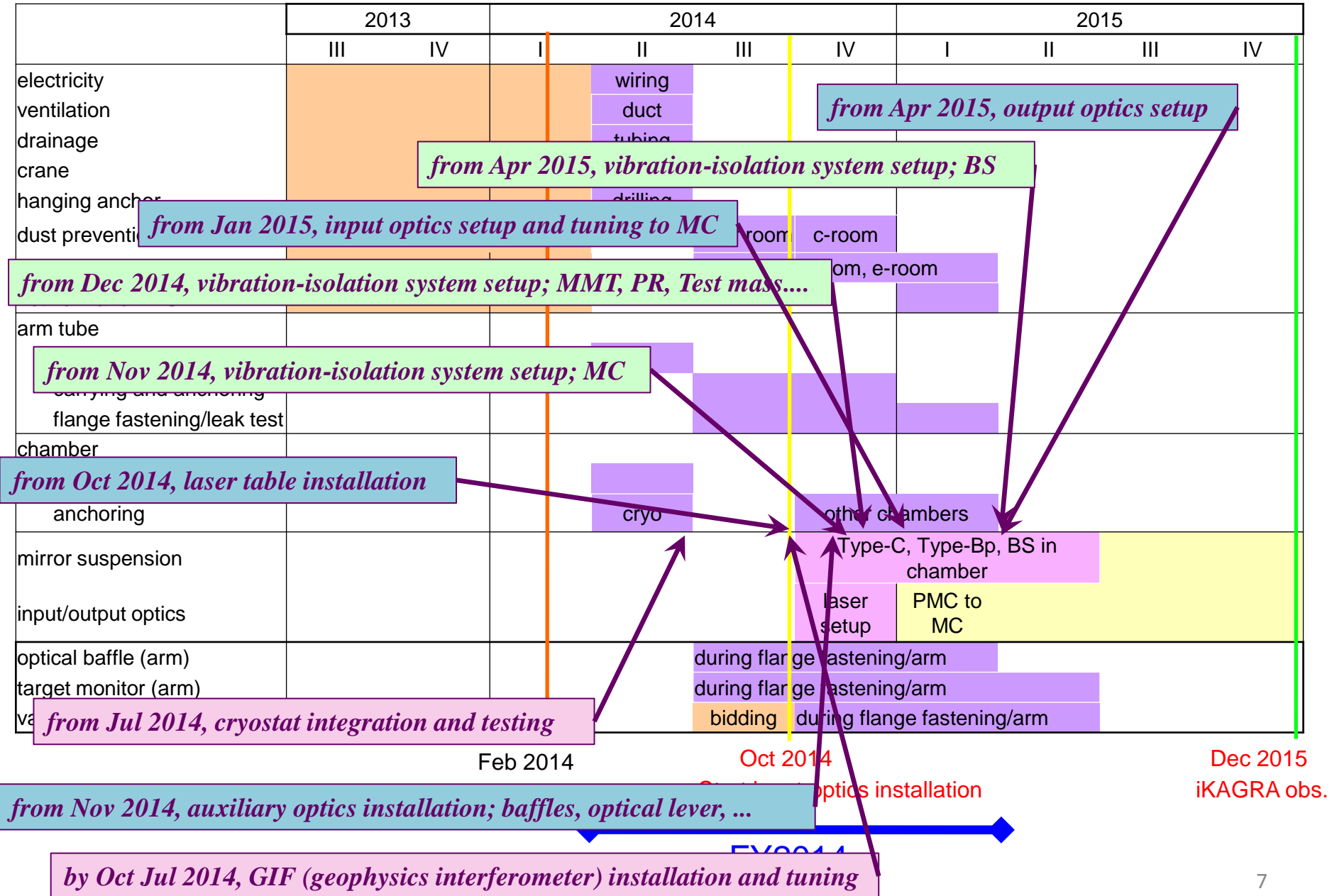
	2013		2014			IV
	III	IV	I	II	III	
electricity						
ventilation						
drainage						
crane						
hanging and						
dust prevent						
clean booth						
network and PHS						
arm tube						
laying a chalk line						
carrying and anchoring						
flange fastening/leak test						
chamber						
marking						
anchoring						
mirror suspension						
input/output optics						
optical baffle (arm)						
target monitor (arm)						
vac pump						



S in	
rm	

Dec 2015  
iKAGRA obs.

# Onsite installation of iKAGRA: 2014-2015







issues so far discussed (iKAGRA)

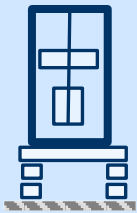
**Appendix; for your  
reference**

# issues so far discussed (iKAGRA)

iKAGRA obs. Run in Dec. 2015 ~1 month

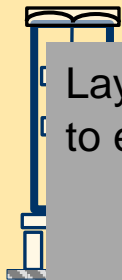
## iKAGRA configuration

- Room-temp. test masses suspended by Type-Bp payload
- FPMI with 2.94 km arm cavities
- Low laser power (power TBD).
- On-site test of VIS and Cryo system



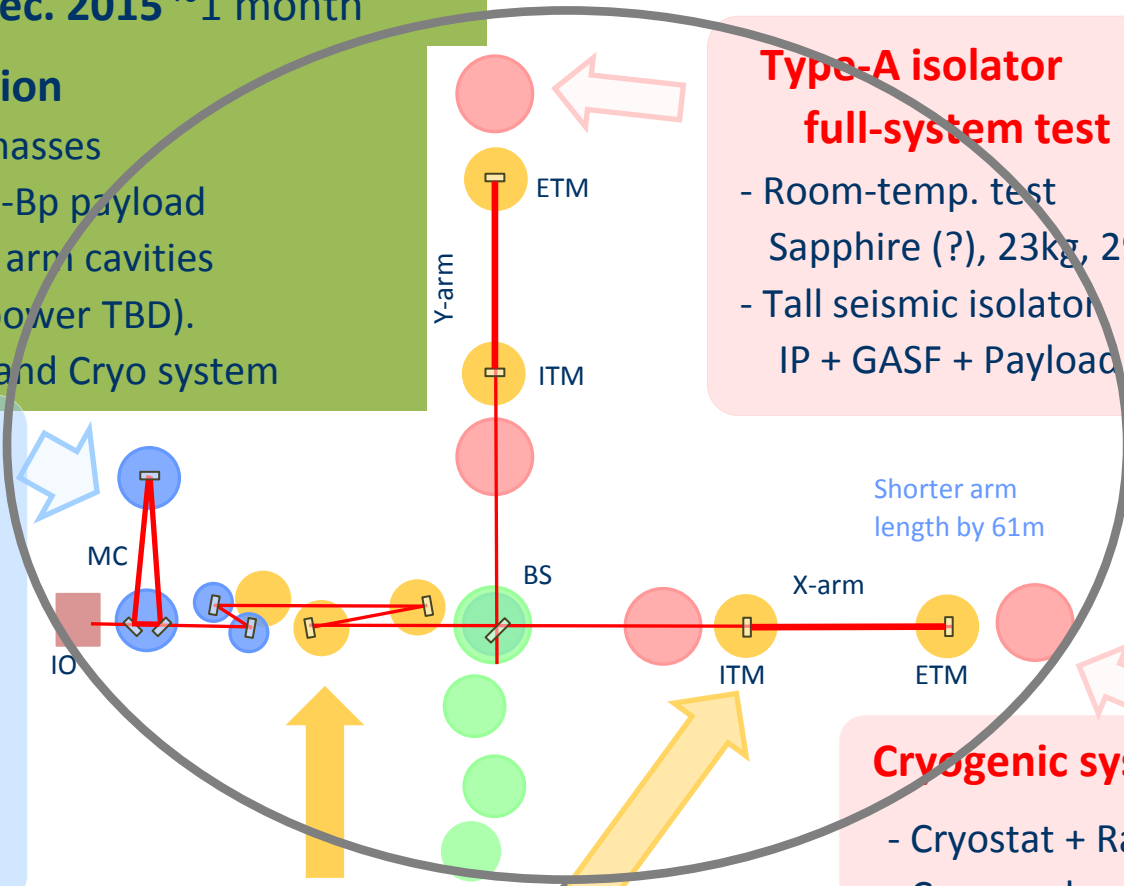
## Type-C system

- Mode cleaner  
Silica, 0.5kg, 290K
- Stack + Payload



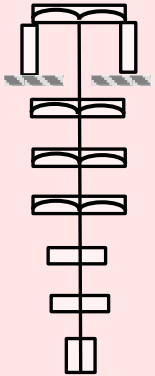
## Type-Bp payload

Layout: (VAC)  
to establish coordinate conversion matrixes between,  
Geodetic coordinates: *Latitude, Longitude, Height*  
Japan rectangular plane coordinate: *survey map*  
3D terrestrial coordinate: *X, Y, Z*.



## Type-A isolator full-system test

- Room-temp. test  
Sapphire (?), 23kg, 290K
- Tall seismic isolator  
IP + GASF + Payload



## Cryogenic system test

- Cryostat + Rad. shield duct
- Cryo-cooler
- Cryogenic payload

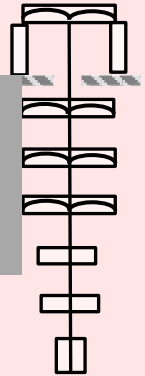
# issues so far discussed (iKAGRA)

iKAGRA obs. Run in **Dec. 2015** ~1 month

## iKAGRA configuration

- Room-temp IO (input/injection optics):  
suspended to fix the schedule of test/onsite set-up followed by commissioning
- FPMI with 2 >>>Kawamura (SEO) will manage IOO group.
- Low laser power (power TBD).
- On-site test of VIS and Cryo system

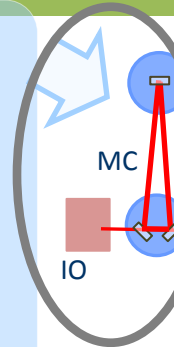
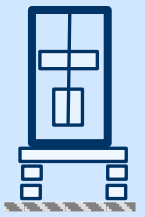
## Type-A isolator



- Tall seismic isolator
- IP + GASF + Payload

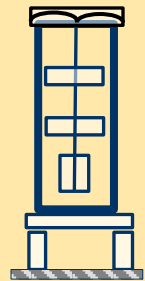
## Type-C system

- Mode cleaner
- Silica, 0.5kg, 290K
- Stack + Payload



## Type-Bp payload

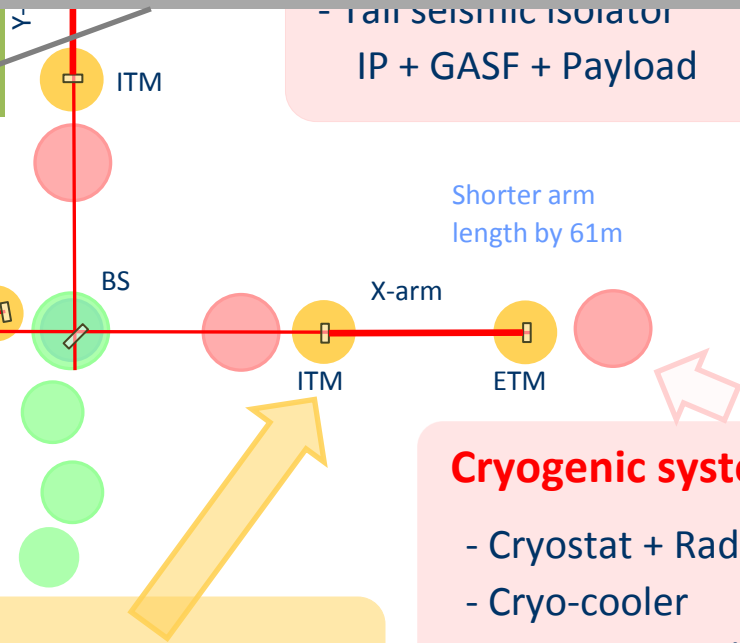
- Test mass and Core optics (BS, FM,..)
- Silica, 10kg, 290K
- Seismic isolator
- Table + GASF + Type-B Payload



Shorter arm length by 61m

## Cryogenic system test

- Cryostat + Rad. shield duct
- Cryo-cooler
- Cryogenic payload
- Fixed Type-A SAS



# issues so far discussed (iKAGRA)

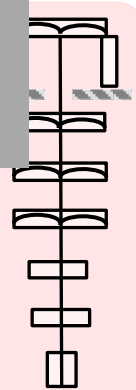
iKAGRA obs. Run in Dec 2015 ~1 month

## iKAGRA configuration

- Room-temp. test suspended by Type-Bp payload
- FPMI with 2.94 km arm cavities
- Low laser power (power TBD).
- On-site test of VIS and Cryo system

OO (output optics):  
design of signal extraction layout and preparation of components  
>>>cost evaluation and budget schedule

- Room-temp. test Sapphire (?), 23kg, 290K
- Tall seismic isolator IP + GASF + Payload

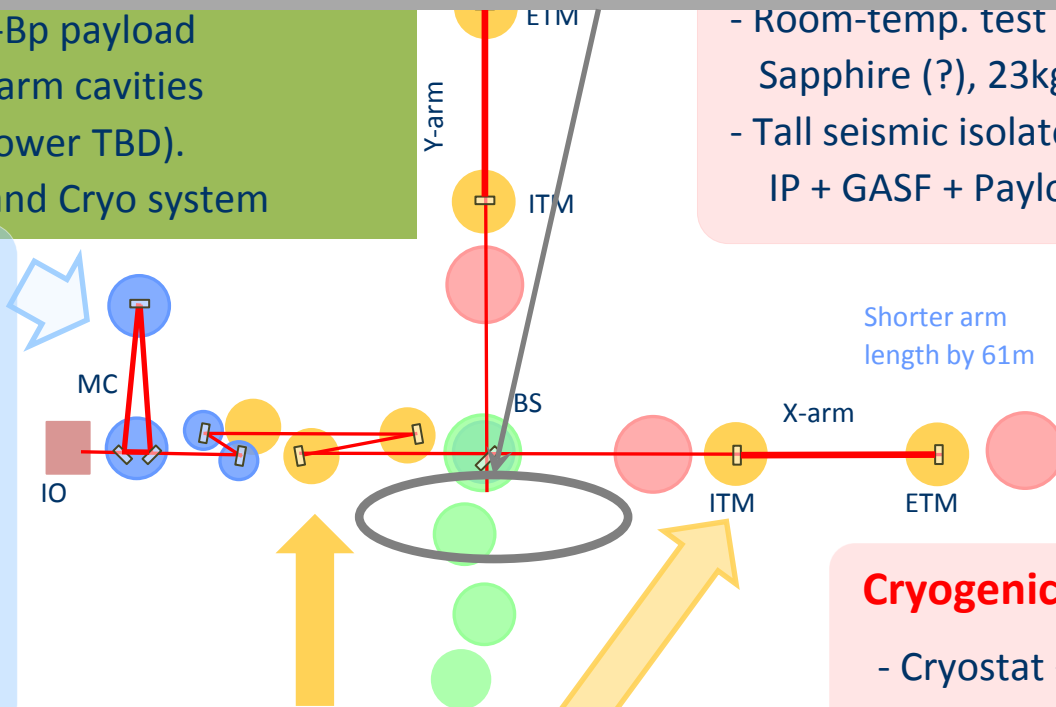


**Type-C system**

- Mode cleaner  
Silica, 0.5kg, 290K
- Stack + Payload

**Type-Bp payload**

- Test mass and Core optics (BS, FM,..)  
Silica, 10kg, 290K
- Seismic isolator  
Table + GASF + Type-B Payload



**Cryogenic system test**

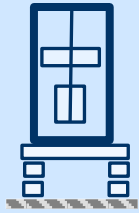
- Cryostat + Rad. shield duct
- Cryo-cooler
- Cryogenic payload
- Fixed Type-A SAS

# issues so far discussed (iKAGRA)

iKAGRA obs. Run in **Dec. 2015** ~1 month

## iKAGRA configuration

- Room-temp. test masses suspended by Type-Bp payload
- FPMI with 2.94 km arm cavities
- Low laser power (power TBD).
- On-site test of VIS and Cryo system



## Type-C system

- Mode cleaner

AOS (auxiliary optics system):

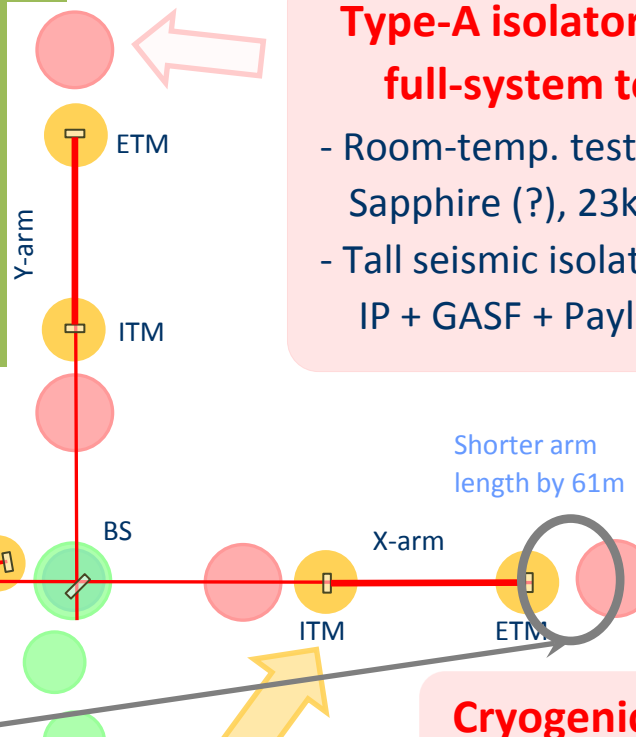
design and preparation of beam reducing telescope for transmitted beam

>>>cost evaluation and budget schedule



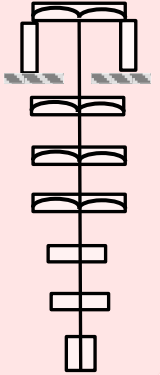
## Type-Bp payload

- Test mass and Core optics (BS, FM,..)  
Silica, 10kg, 290K
- Seismic isolator  
Table + GASF + Type-B Payload



## Type-A isolator full-system test

- Room-temp. test  
Sapphire (?), 23kg, 290K
- Tall seismic isolator  
IP + GASF + Payload



## Cryogenic system test

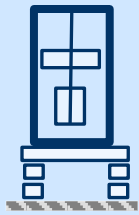
- Cryogenic payload
- Fixed Type-A SAS
- Rad. shield duct
- Cooler

# issues so far discussed (iKAGRA)

iKAGRA obs. Run in **Dec. 2015** ~1 month

## iKAGRA configuration

- Room-temp. test masses suspended by Type-Bp payload
- FPMI with 2.94 km arm cavities
- Low laser power (power TBD).
- On-site test of VIS and Cryo system



## Type-C system

- Mode cleaner

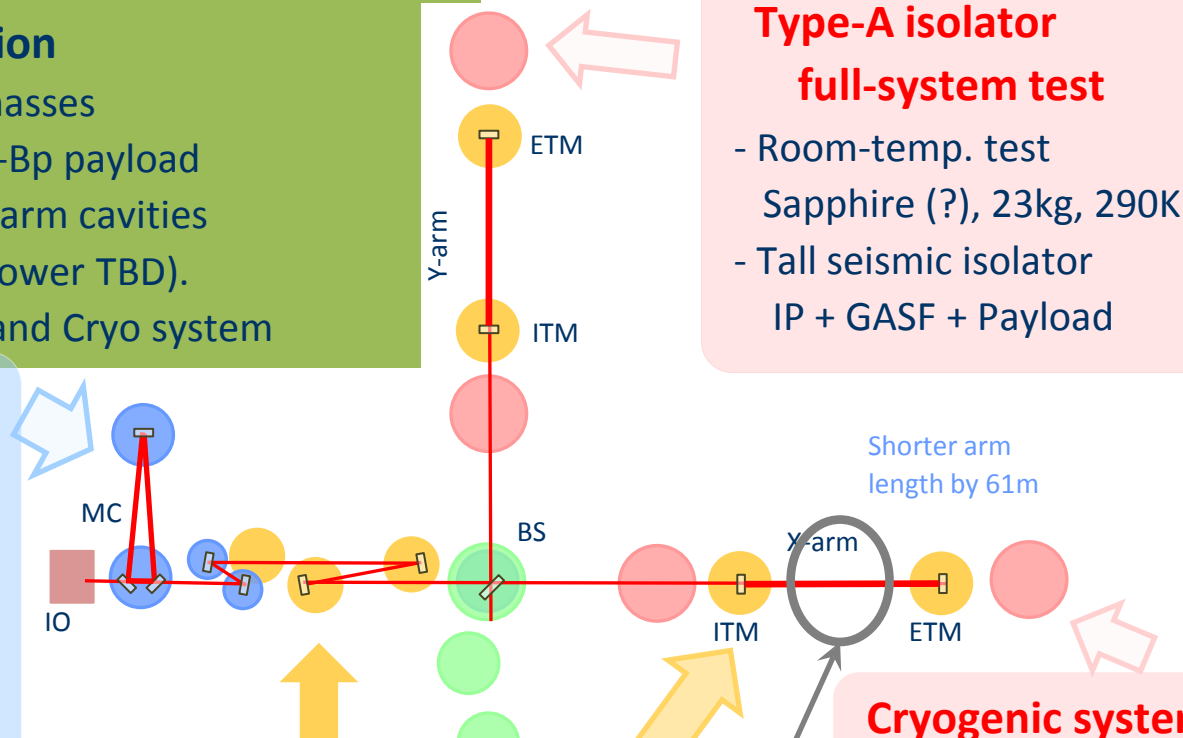
## AOS/VAC:

to optimize the number of optical baffle, to choose better coating material for optical absorption.

- >>>125 of baffles in the arm
- >>>”Solblack” coating was chosen.

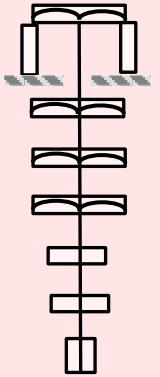


- Seismic isolator  
Table + GASF + Type-B Payload



## Type-A isolator full-system test

- Room-temp. test  
Sapphire (?), 23kg, 290K
- Tall seismic isolator  
IP + GASF + Payload



## Cryogenic system test

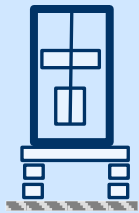
- Cryostat + Rad. shield duct
- Cryo-cooler
- Cryogenic payload
- Fixed Type-A SAS

# issues so far discussed (iKAGRA)

iKAGRA obs. Run in **Dec. 2015** ~1 month

## iKAGRA configuration

- Room-temp. test masses suspended by Type-Bp payload
- FPMI with 2.94 km arm cavities
- Low laser power (power TBD).
- On-site test of VIS and Cryo system



## Type-C system

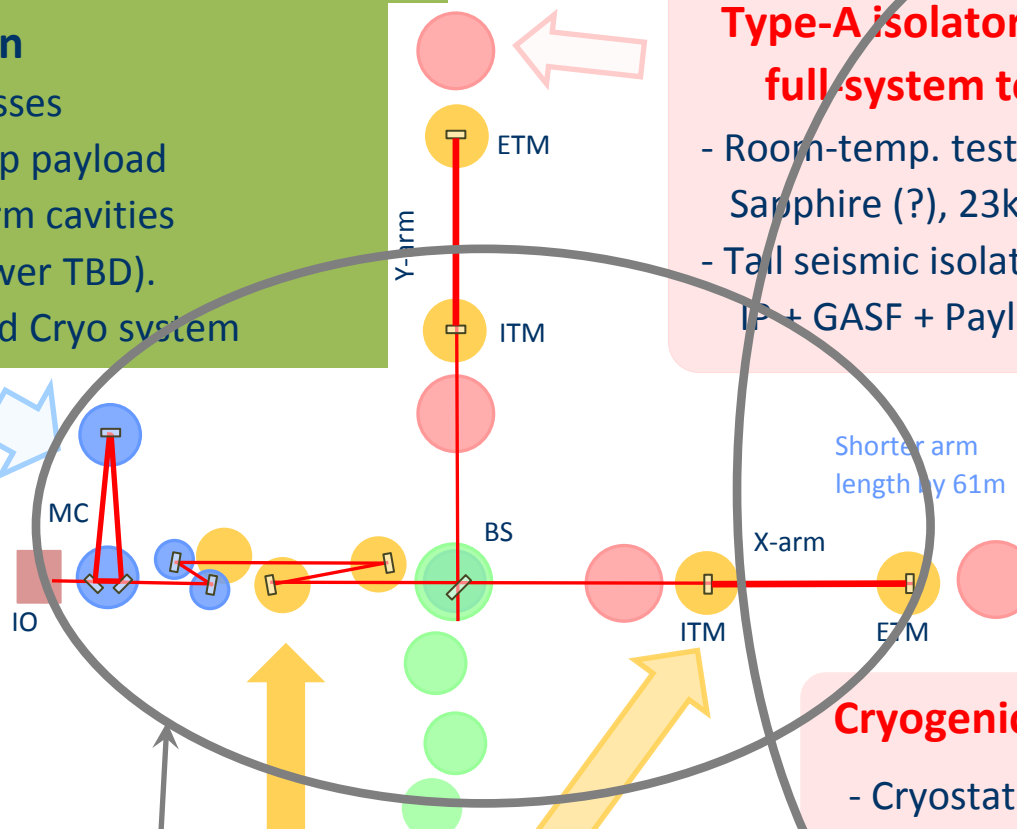
- Mode cleaner  
Silica, 0.5kg, 290K
- Stack + Payload



## Type-Bp payload

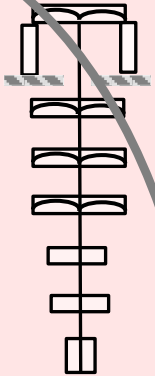
DGS/AEL and CRYO:  
Warehouses for storing electronic circuit modules and cryo-chambers is necessary.  
>>>Hida city offers places.

Table + GASF + Type-B Payload



## Type-A isolator full-system test

- Room-temp. test Sapphire (?), 23kg, 290K
- Tail seismic isolator IP + GASF + Payload



## Cryogenic system test

- Cryostat + Rad. shield duct
- Cryo-cooler
- Cryogenic payload
- Fixed Type-A SAS

# issues so far discussed (iKAGRA)

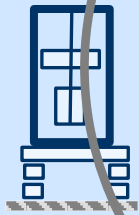
iKAGRA obs. Run in **Dec. 2015** ~1 month

## iKAGRA configuration

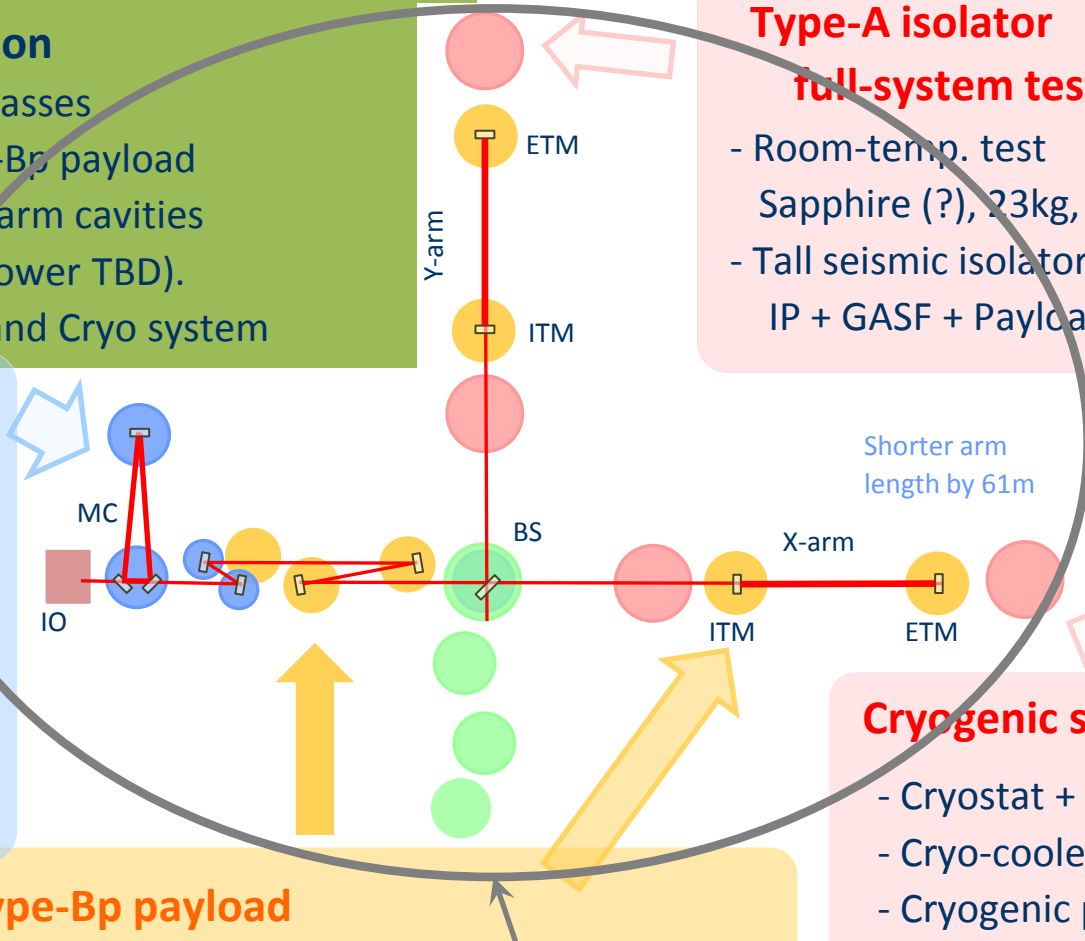
- Room-temp. test masses suspended by Type-Bp payload
- FPMI with 2.94 km arm cavities
- Low laser power (power TBD).
- On-site test of VIS and Cryo system

## Type-C system

- Mode cleaner  
Silica, 0.5kg, 290K
- Stack + Payload

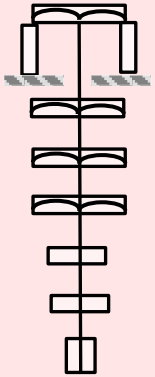


## Type-Bp payload



## Type-A isolator full-system test

- Room-temp. test  
Sapphire (?), 23kg, 290K
- Tall seismic isolator  
IP + GASF + Payload



## Cryogenic system test

- Cryostat + Rad. shield duct
- Cryo-cooler
- Cryogenic payload

## Installing Schedule:

Tunnel excavation will be finished by Mar 2014.

But, *floor/wall finish, construction of electric power supply system and ventilation system* takes some time after Mar. 2014.

>>> installation schedule is to be matched with civil engineering one.



# issues discussed so far (bKAGRA)

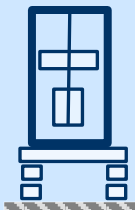
first science run in **FY2017**

## b) MIR (mirror):

to confirm polishing and coating process of sapphire mirrors

>>> surface roughness and coating evaluation will be done by the test bulk.

>>> manufacturing schedule is to be fixed.



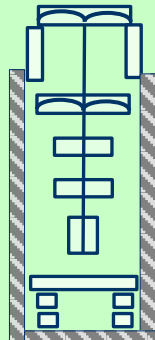
**Type-C system**

- Mode cleaner
- Silica, 0.5kg, 290K
- Stack + Payload



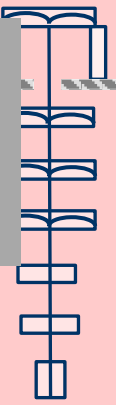
**Type-Bp payload**

- Test mass and Core optics (BS, FM,...)
- Silica, 10kg, 290K
- Seismic isolator
- Table + GASF + Type-B Payload

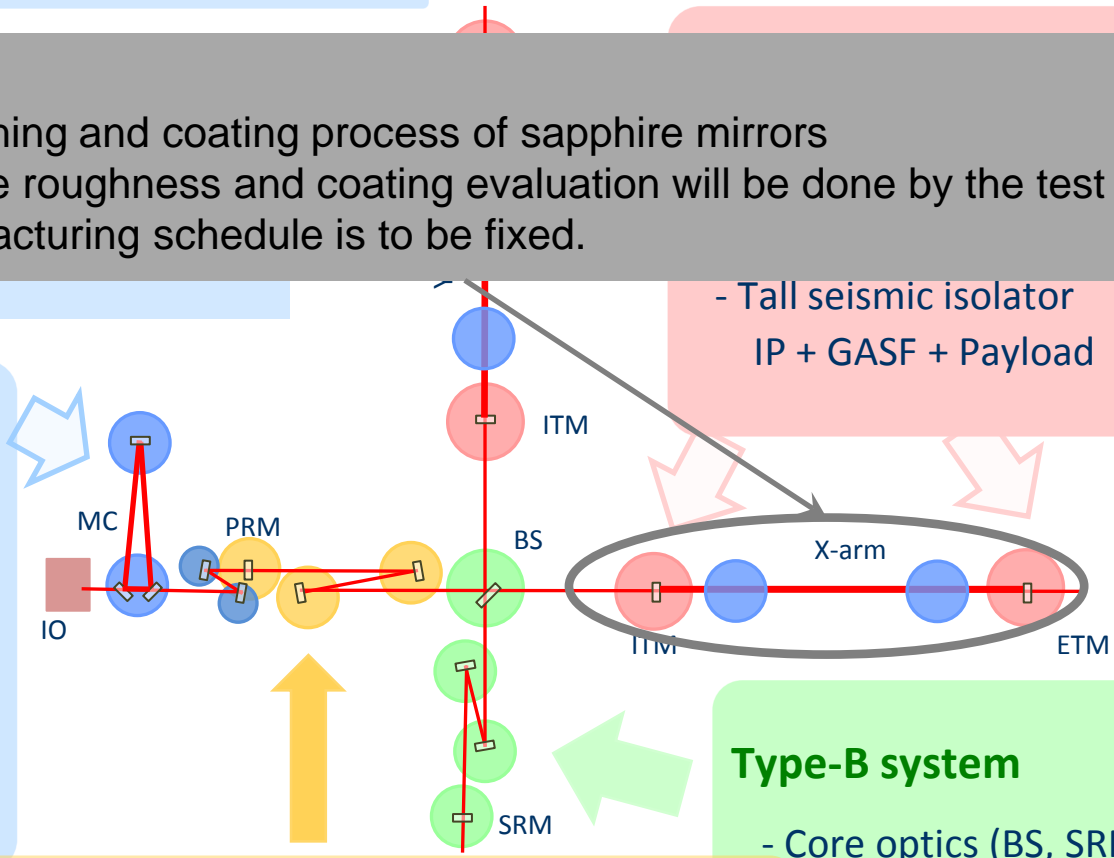


**Type-B system**

- Core optics (BS, SRM,...)
- Silica, 10kg, 290K
- IP + GASF + Payload
- Stack for aux. optics



- Tall seismic isolator  
IP + GASF + Payload

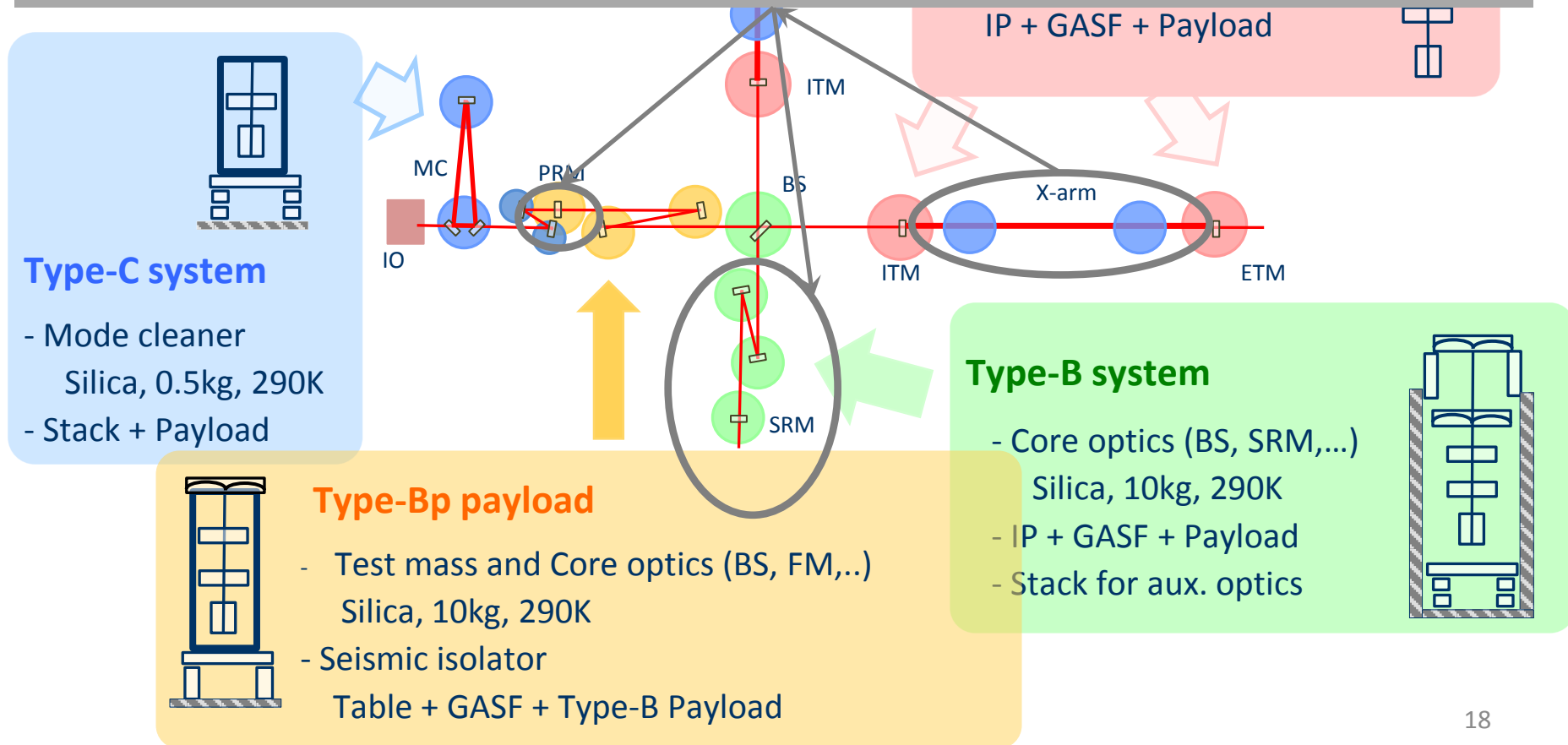


# issues discussed so far (bKAGRA)

first science run in **FY2017**

VIS (vibration isolation system):

- 1) installation of Type-Bp system in PRM (moved from iKAGRA).
- 2) set-up and test of Type-B system in SR2, SR3, SRM (re-assembling Type-Bp of iKAGRA)
  - >>> schedule after iKAGRA operation is to be fixed.
  - >>> cost reduction of Type-B system is being discussed.



# issues discussed so far (bKAGRA)

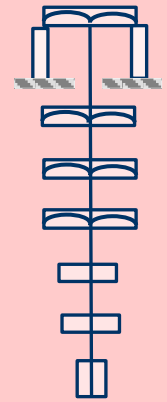
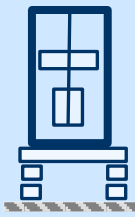
first science run in **FY2017**

AOS , CRYO, MIF:

- 1) preparation of beam reducing telescope for transmitted beam.
  - >>>vacuum chamber design
  - >>>cost evaluation and budget schedule
- 2) narrow- and wide-angle optical baffles for cryo use
  - >>>geometric structure and suspension system is being designed.

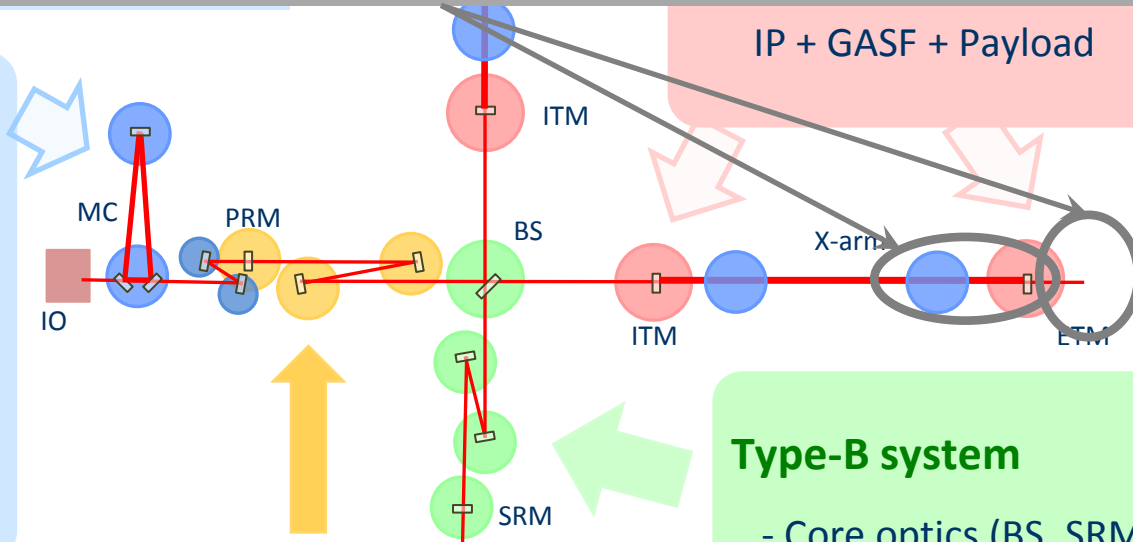
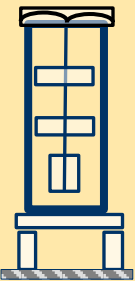
bKAGRA

- Cryo
- 3 k
- RSE

**Type-C system**

- Mode cleaner
- Silica, 0.5kg, 290K
- Stack + Payload

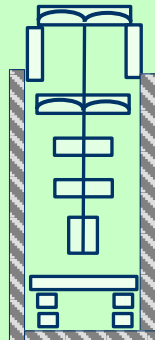



**Type-Bp payload**

- Test mass and Core optics (BS, FM,...)
- Silica, 10kg, 290K
- Seismic isolator
- Table + GASF + Type-B Payload

**Type-B system**

- Core optics (BS, SRM,...)
- Silica, 10kg, 290K
- IP + GASF + Payload
- Stack for aux. optics



# issues discussed so far (bKAGRA)

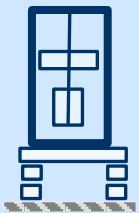
first science run in **FY2014**

**bKAGRA configuration**

- Cryogenic test masses
- 3 km arm cavities
- RSE with power recycling

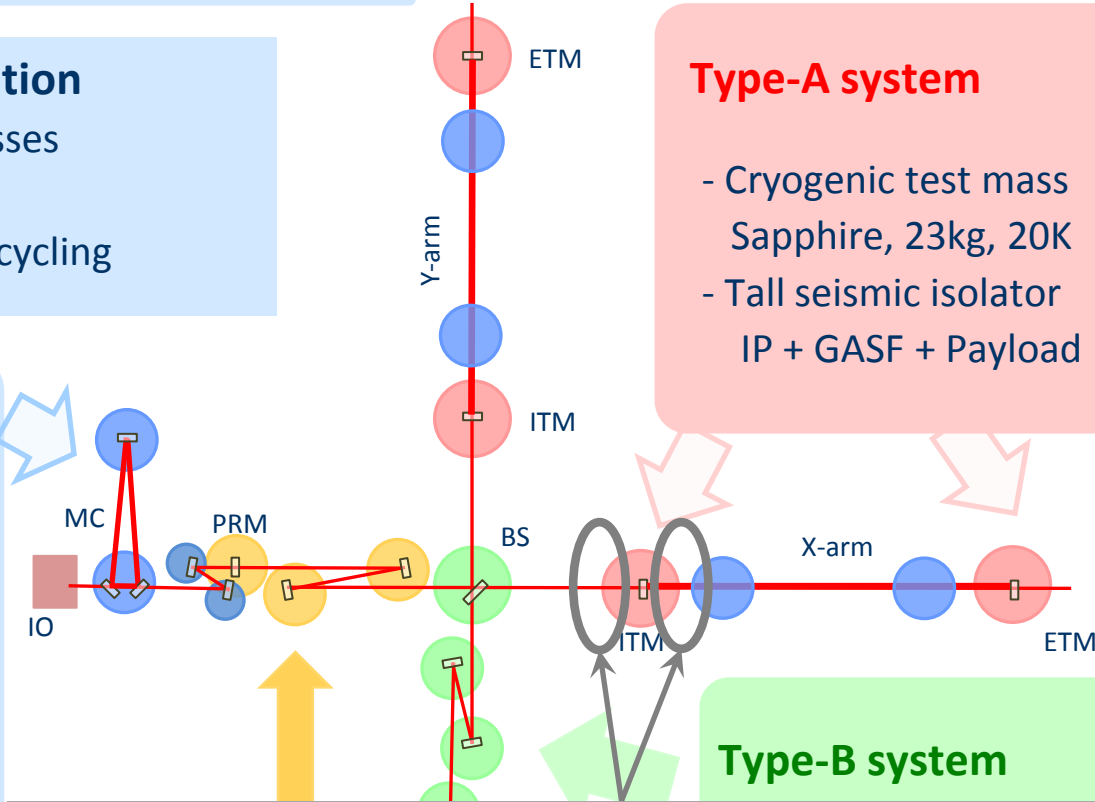
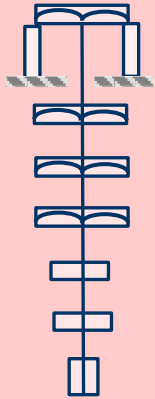
**Type-C system**

- Mode cleaner  
Silica, 0.5kg, 290K
- Stack + Payload

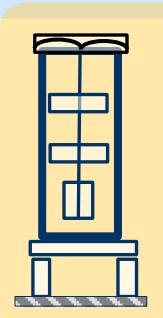
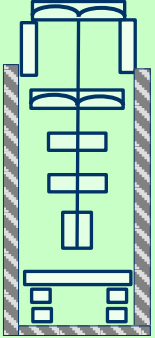


**Type-A system**

- Cryogenic test mass  
Sapphire, 23kg, 20K
- Tall seismic isolator  
IP + GASF + Payload



**Type-B system**



**CRYO :**  
 to optimize the cryo-shield duct structure.  
 >>>thermal insulation performance in *shorter* shield-duct.  
 >>>surface finish of cryo-baffles and shields.

**Type-B system**

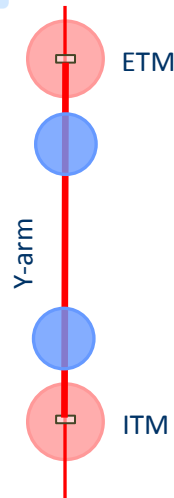
- Test mass  
Silica, 10kg, 290K
- Seismic isolator  
Table + GASF + Type-B Payload

# issues discussed so far (bKAGRA)

first science run in **FY2014**

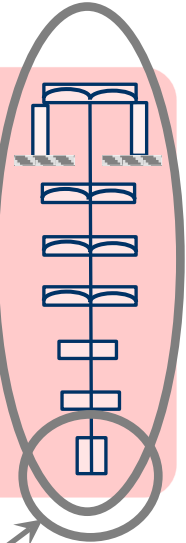
## bKAGRA configuration

- Cryogenic test masses
- 3 km arm cavities
- RSE with power recycling



## Type-A system

- Cryogenic test mass  
Sapphire, 23kg, 20K
- Tall seismic isolator  
IP + GASF + Payload



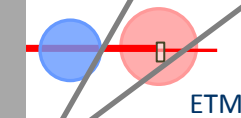
## CRY, VIS, AOS, MIR:

1) structure of payload including vibration-isolation system.

- >>> modeling the system for vibration analysis
- >>> manufacturing schedule

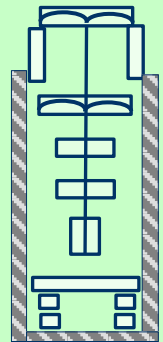
2) sapphire mirror suspension

- >>> grinding and polishing test of sapphire bulk
- >>> thermal conductivity measurement for sapphire fiber
- >>> evaluating bonding performance of sapphire-sapphire



## Type-B system

- Test mass and Core optics (BS, SRM,...)  
Silica, 10kg, 290K
- IP + GASF + Payload
- Stack for aux. optics



- Test mass and Core optics (BS, FM,...)  
Silica, 10kg, 290K
- Seismic isolator  
Table + GASF + Type-B Payload

# issues discussed so far (bKAGRA)

first science run in **FY2017**

VAC, VIS, MIF:

1) layout of SRM (Type-B payload) and PRM (Type-Bp payload)

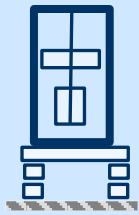
>>>tolerance of vacuum chamber alignment

>>>limit of remote-controlled positioning by using suspension system

2) layout of signal extraction

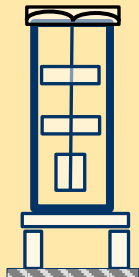
>>>output-mode matching mirror (OMM), output mode cleaner (OMC) being designed.

>>>discuss re-using of TAMA300 vacuum chamber.



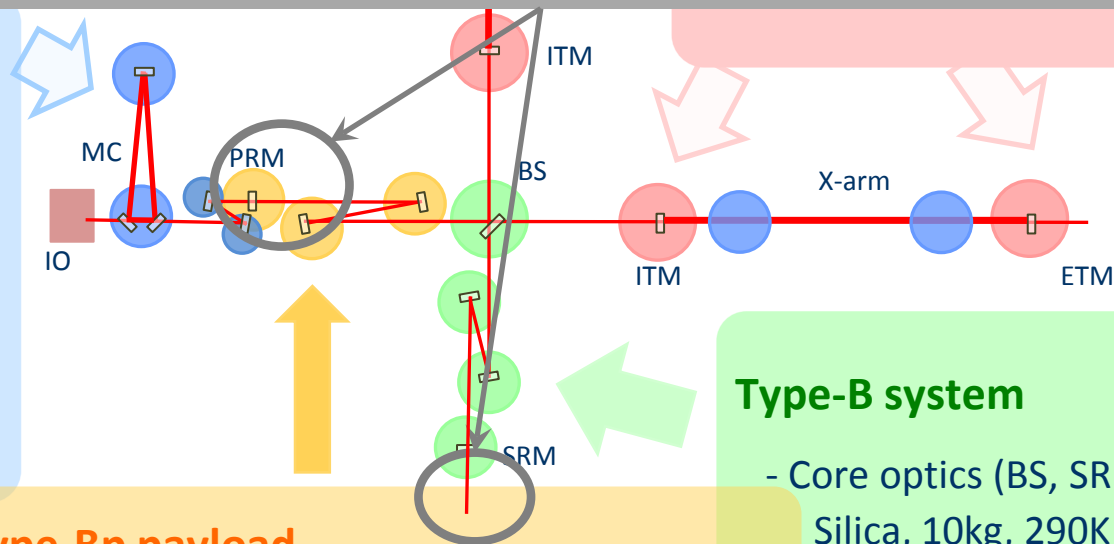
## Type-C system

- Mode cleaner  
Silica, 0.5kg, 290K
- Stack + Payload



## Type-Bp payload

- Test mass and Core optics (BS, FM,...)  
Silica, 10kg, 290K
- Seismic isolator  
Table + GASF + Type-B Payload



## Type-B system

- Core optics (BS, SRM,...)  
Silica, 10kg, 290K
- IP + GASF + Payload
- Stack for aux. optics

