

Vibration Isolation Subsystem

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KAGRA
face to face meeting
(1 August, 2013)

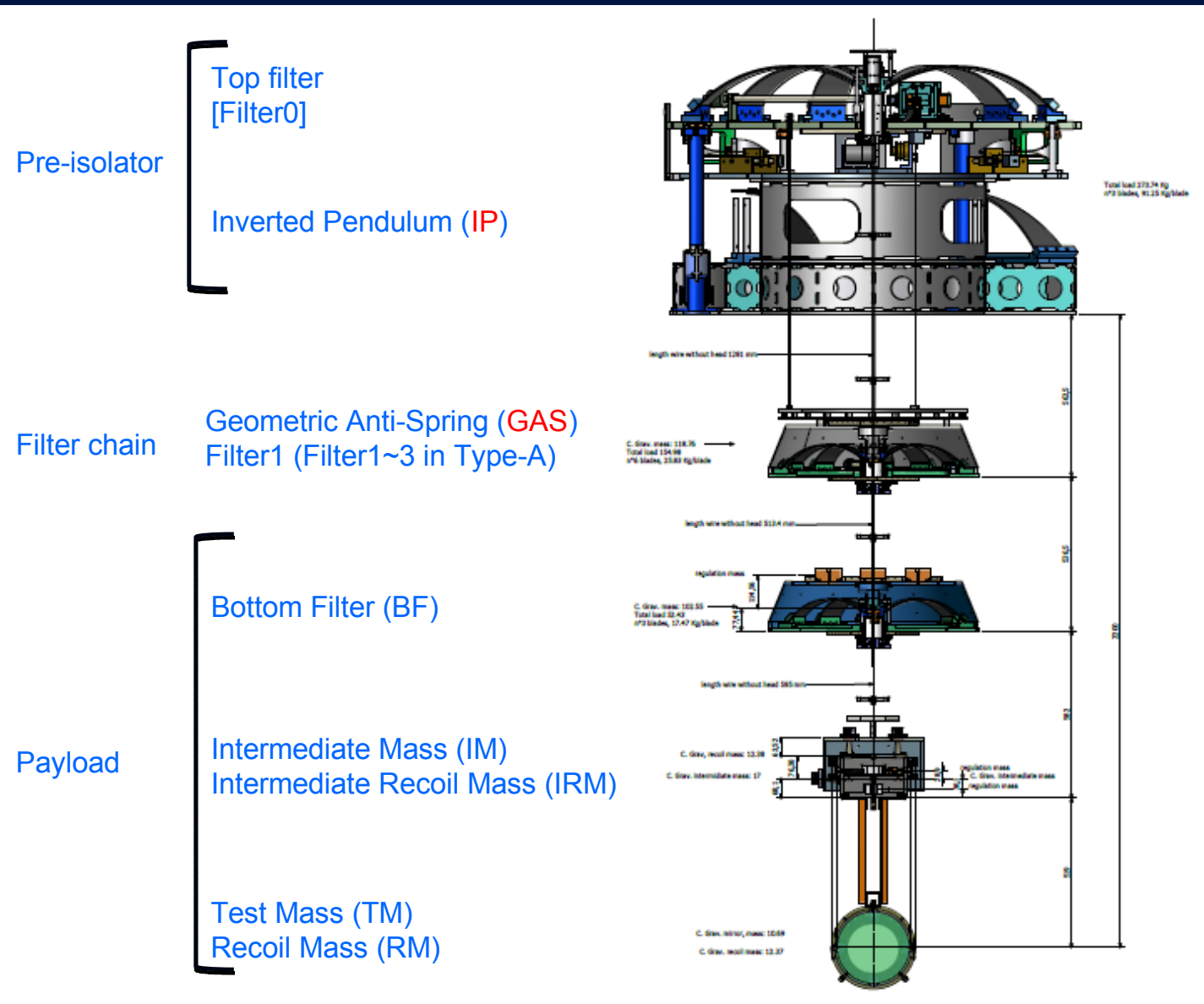
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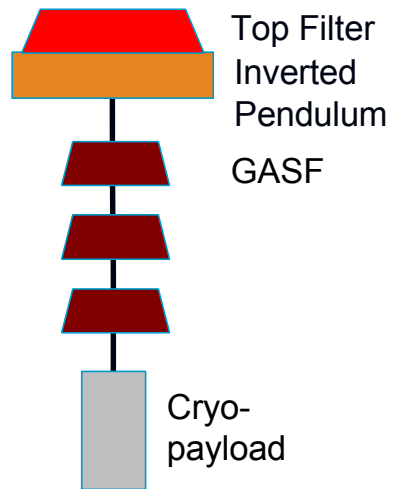
1. Configuration

Seismic Attenuation System SAS (Type-A/B)

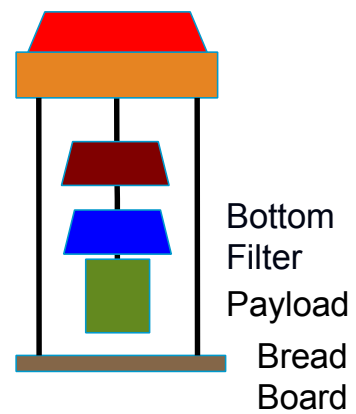


Components of VIS

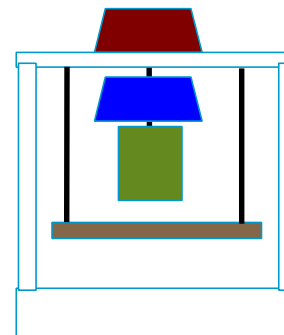
Type-A



Type-B



Type-Bp



Base
Plate

Type-C



Configuration

Type-A: IP + GASF (5 stage) + Payload (23kg, cryogenic)

Type-B: IP + GASF (3 stage) + Payload (10kg/20kg)

Type-Bp: GASF (2 stage) + Payload (10kg)

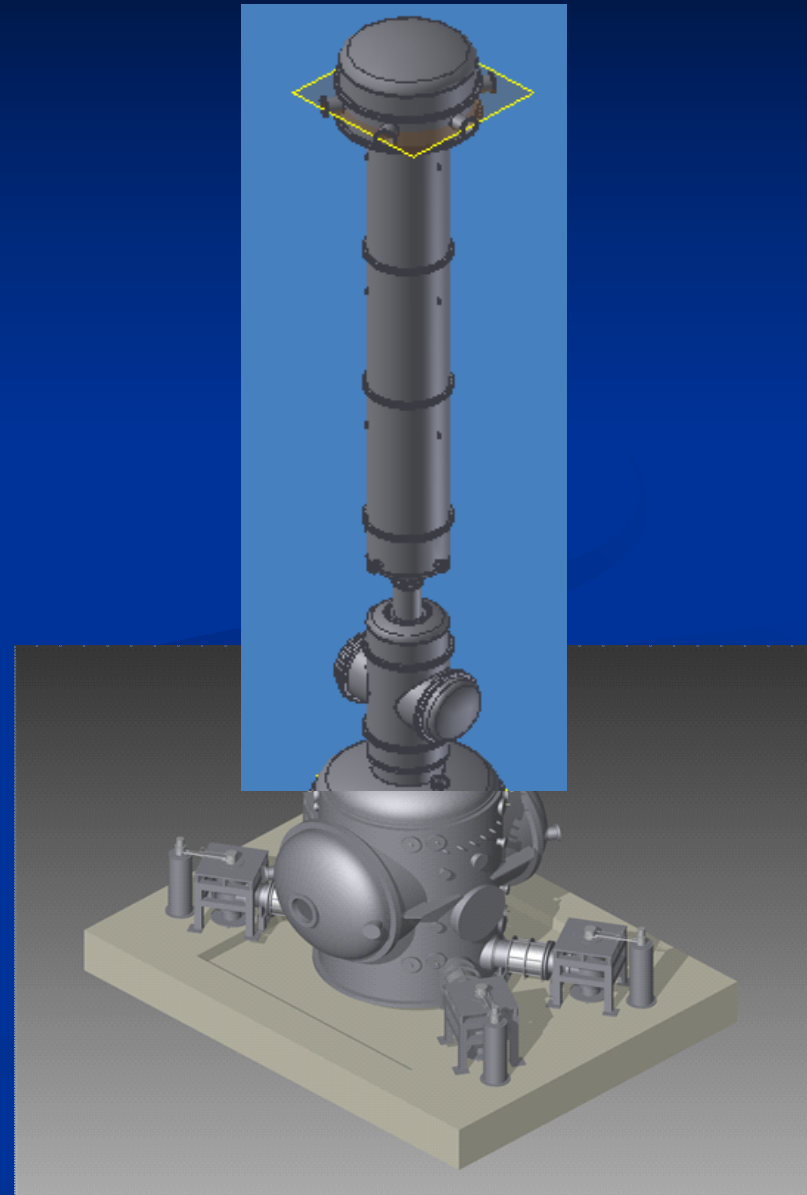
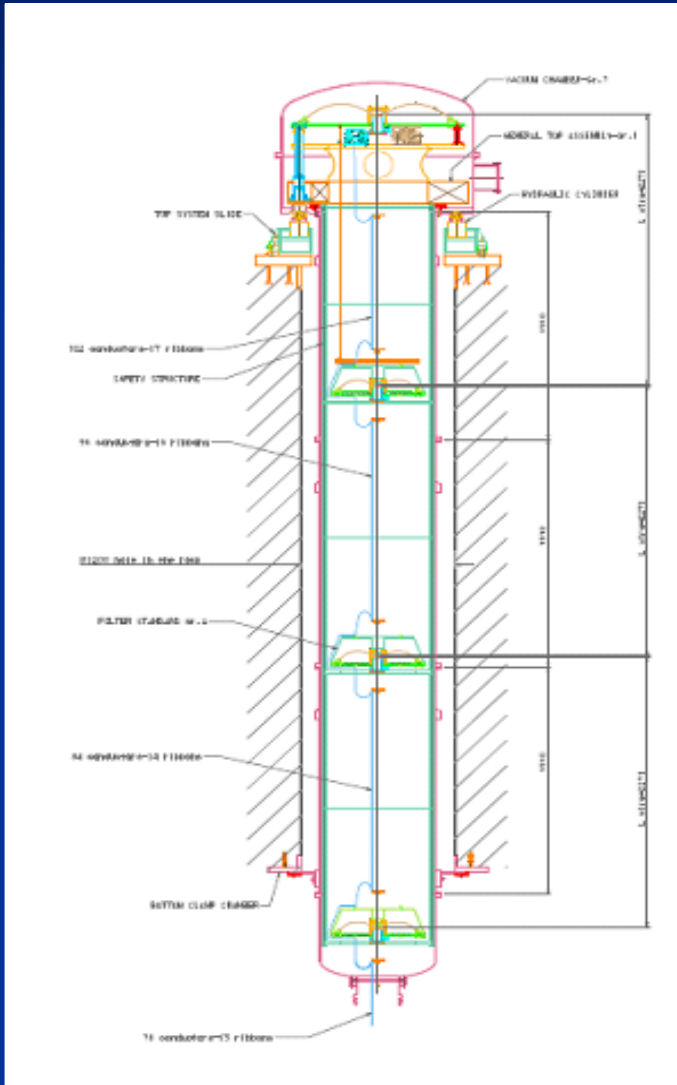
Type-C: Stack + Single/Double-pendulum (~1kg)

Chamber	iKAGRA	bKAGRA
IXV, IYV, EXV, EYV		Type-A
IXA, IYA, EXA, EYA	Type-Bp (for ITM/ETM)	
BS	Type-B	Type-B
PRM		Type-Bp
PR2, PR3	Type-Bp	Type-Bp
SRM, SR2, SRM		Type-B
MCF, MCE, IFM, IMM	Type-C	Type-C
OFI, OMC, EXT, EYT		Type-C

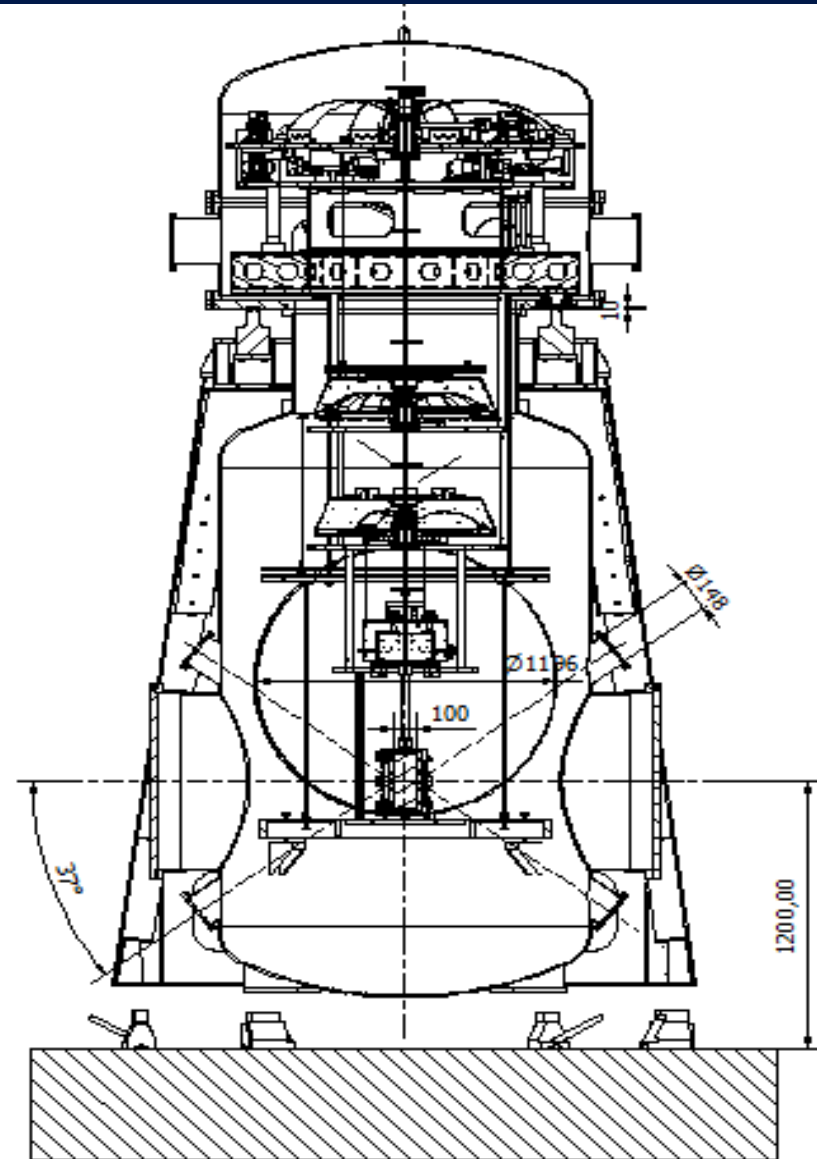
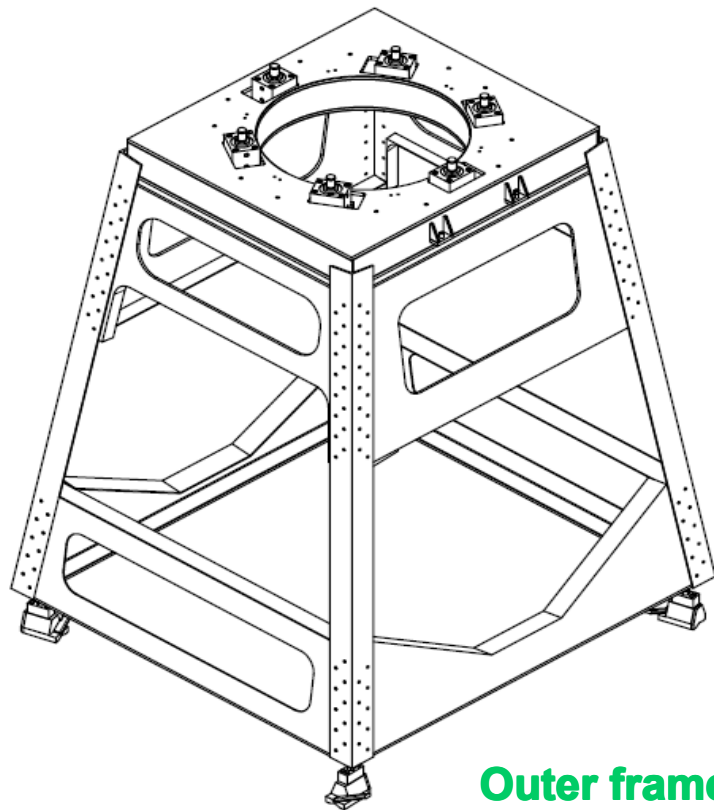
Configuration in iKAGRA

Chamber	Dia. [m]	Support	OB [m]	Optics	Pendulum	Suspension	Incident [deg]
MCE	1.5	Stack	1.3	eMC	double	TAMA-RM	0
MCF	1.5	Stack	1.3	iMC, oMC	double	TAMA-MC	45
IFI	1.2	Stack	1.0	iMMT2	double	TAMA-NM1	0
IMM	1.2	Stack	1.0	iMMT1	double	TAMA-NM2	0
BS	1.5	Pre-isolator	1.4	BS	triple	Type-B	45
PR2	1.5	Rigid	1.4	PR2	triple	Type-Bp	0
PR3	1.5	Rigid	1.4	PR3	triple	Type-Bp	0
IXA	1.5	Rigid		ITMX	triple	Type-Bp	0
EXA	1.5	Rigid		ETMX	triple	Type-Bp	0
IYA	1.5	Rigid		ITMY	triple	Type-Bp	0
EYA	1.5	Rigid		ETMY	triple	Type-Bp	0

Type-A (IXC, IYC, EXC, EYC)

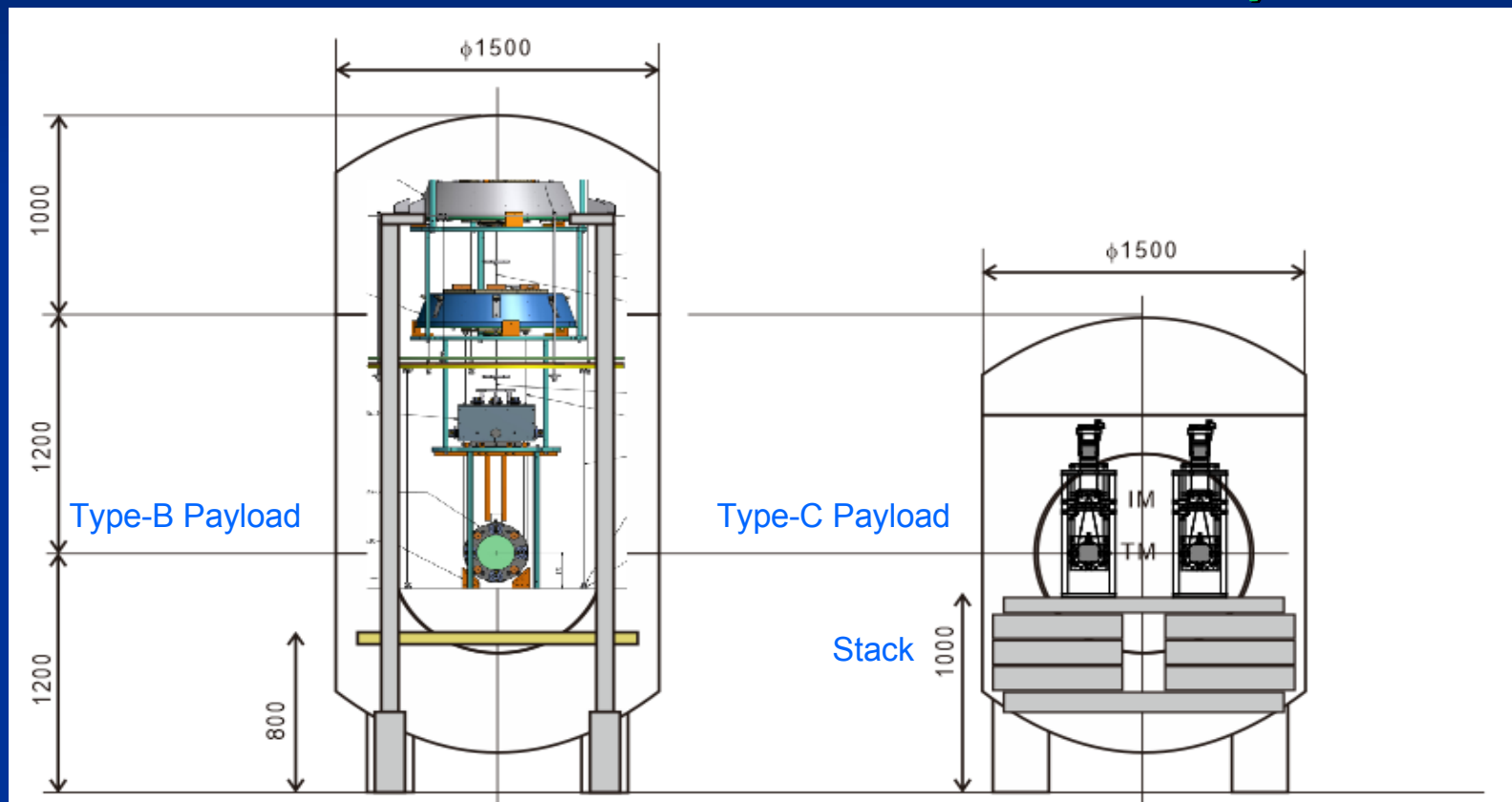


Type-B (BS, SRM, SR2, SR3)



**Type-Bp
(PR, PR2, PR3,
IXA, IYA, EXA, EYA)**

**Type-C
(MCF, MCE,
IFM, IMM)**



2. Control

Hierarchical control

Displacement

horizontal

Actuation	Sensing	Control Band
Moter Slider on IP	Offset of VC	1/day
Voice Coil on IP	LVDT	<0.1Hz
	Geophone	0.1-1Hz
	Global	<0.1Hz
Intermediate Mass	OSEM	<1Hz
	Global	0.1-1Hz
Test Mass	Global	1-1kHz

vertical

Actuation	Sensing	Control Band
Moter Slider on Filter0	Offset of VC	1/day
Voice Coil on Filter0	LVDT	<1Hz
Voice Coil on Filter1-3	LVDT	0.1-1Hz
Intermediate Mass	OSEM	<1Hz

Hierarchical control

Angle

pitch

yaw

Actuation	Sensing	Control Band
Hydraulic leveler on IP	Offset of VC	1/day
Motor Slider on IM	Offset of TM	1/day
Intermediate Mass	OSEM	<1Hz
Test Mass	Optical Lever	<1Hz
	Global	<0.1Hz

Actuation	Sensing	Control Band
Motor Slider on Filter0	Offset of TM	1/day
Voice Coil on IP	LVDT	<0.1Hz
	Geophone	0.1-1Hz
Motor Slider on BF	Offset of TM	1/day
Intermediate Mass	OSEM	<1Hz
Test Mass	Optical Lever	<1Hz
	Global	<0.1Hz

3. Schedule and Status

Suchedule

		2011	2012	2013	2014	2015	2016	
Standard GASF	Prototype test							in Nikhef /Kashiwa
	Procure							in Akeno
	Assembling							in Kashiwa
Pre-isolator	Prototype test							
	Procure			6 SET	2 SET			
	Assembling			6 SET		2		in Akeno
Type-B payload	Prototype test							in Mitaka
	Procure							
	Assembling							
	Installation					ETM ITM		in Kamioka
Type-A SAS	Prototype test							in Kamioka
	Installation					ETM ITM		
Type-B SAS	Prototype test							in TAMA
	Installation					BS SRM		
Type-C System	Assembling							in TAMA
	Installation							

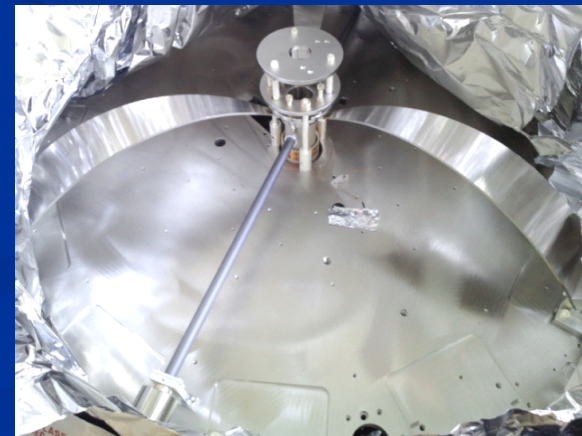


Current status

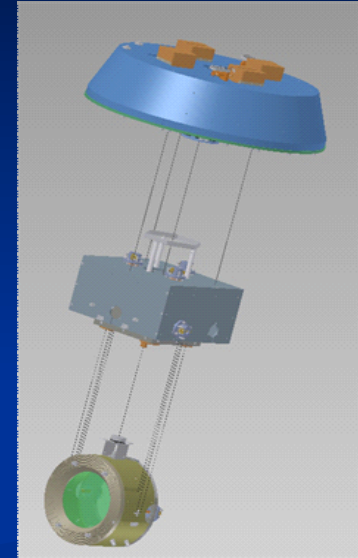
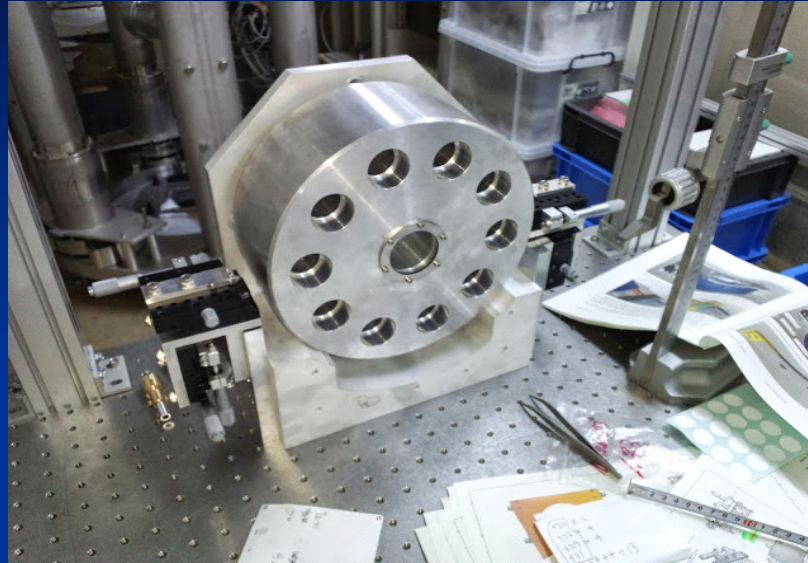
- The pre-isolator prototype is working with digital control system in Kashiwa (ICRR).
- Final assembly of the GAS filters is going in Akeno (ICRR).
- Assembly of the payload prototype was started in Mitaka (NAOJ).
- Production of 6 top filters has been finished.

Storage & Assembly in Akeno

- 19 standard GAS filters (March, 2012)
- 4 breadboards for type-C system (September, 2012)
- 6 top filters (March, 2013)



Assembly of the payload prototype



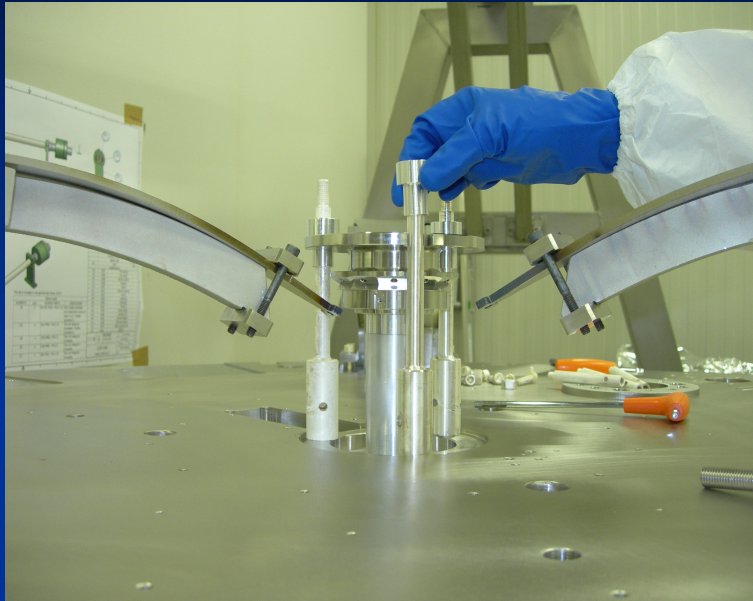
Production of the payload prototype and the assembly jig has been finished. Assembly of the payload prototype was started.



Production of the pre-isolators

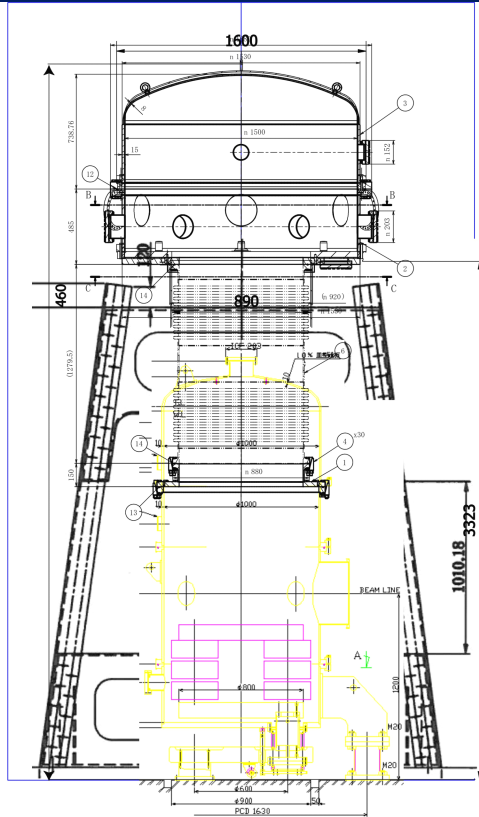
Production of the 6 top filters has been finished.

The resonant frequency of the filters was tuned to around 0.2Hz.



filter	Tune frequency [Hz]	Working point [mm]	Load at working point [kg]	Compression [mm]
B1-1	0.176	23.6	274	15.8
B1-2	0.186	24.6	276	15.4
B1-3	0.117	25.8	276	14.9
B2	0.138	18.4	301	15.5
A1	0.211	18.2	210	16.7
A2	0.168	25.1	209	15.7

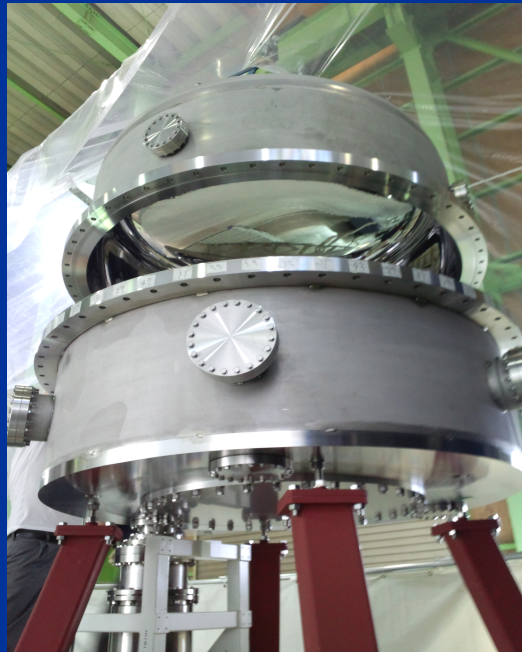
Full Type-B test in TAMA



Structure of the test chamber

The experiments will start in autumn, 2013.

- Top-chamber for KAGRA
- Bellows connection for KAGRA
- TAMA EM1 chamber
- Outer frame prototype
- Pre-isolator prototype
- GAS filter prototype
- Type-B payload prototype



Seal test of the top-chamber



Outer frame installed in February, 2013.