

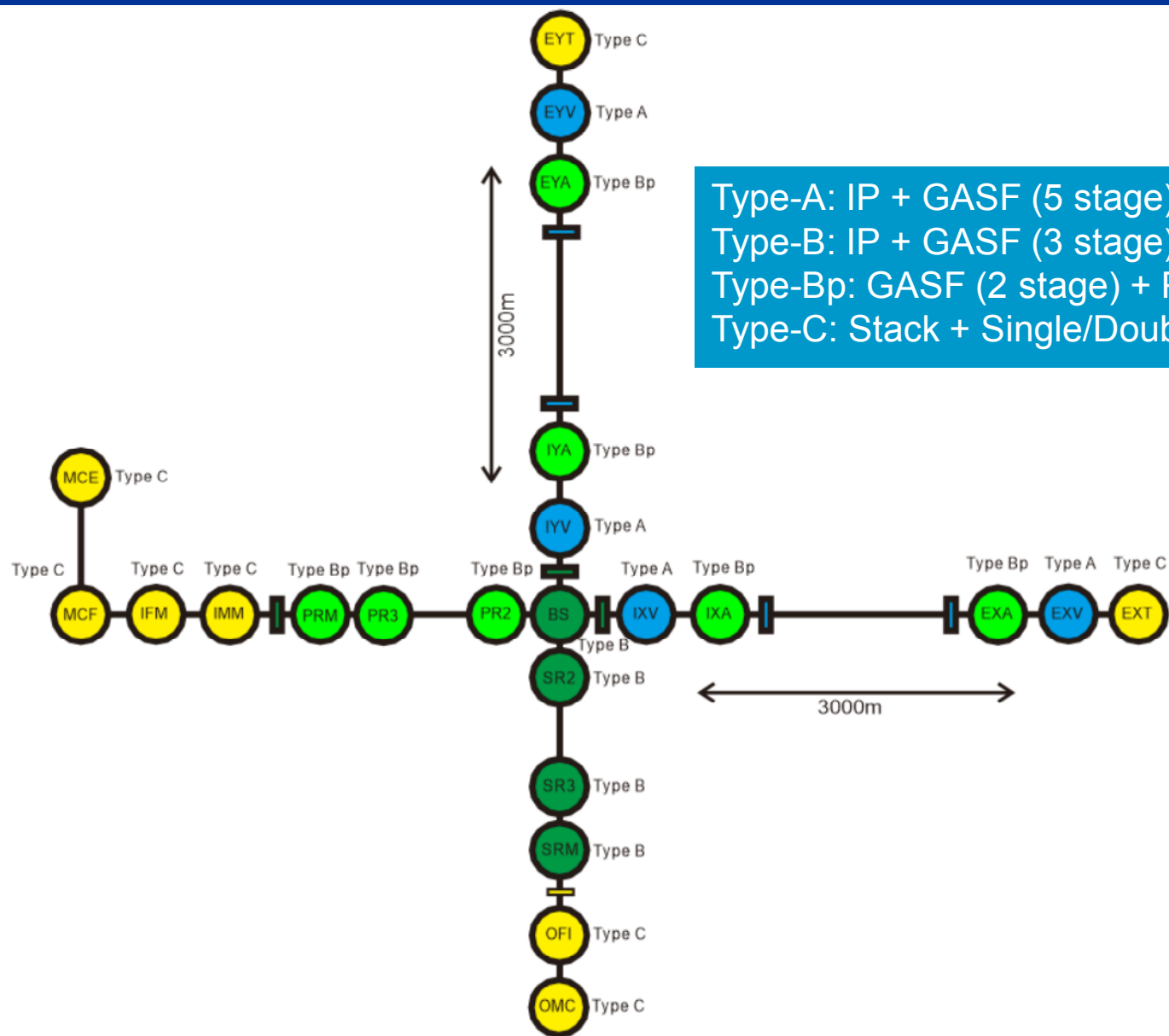
KAGRA用防振装置の開発

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1. 防振システムの構成
2. 開発・準備状況
3. TAMA300を用いた試験
4. まとめ

1. 防振システムの構成

KAGRAにおける防振システムの配置

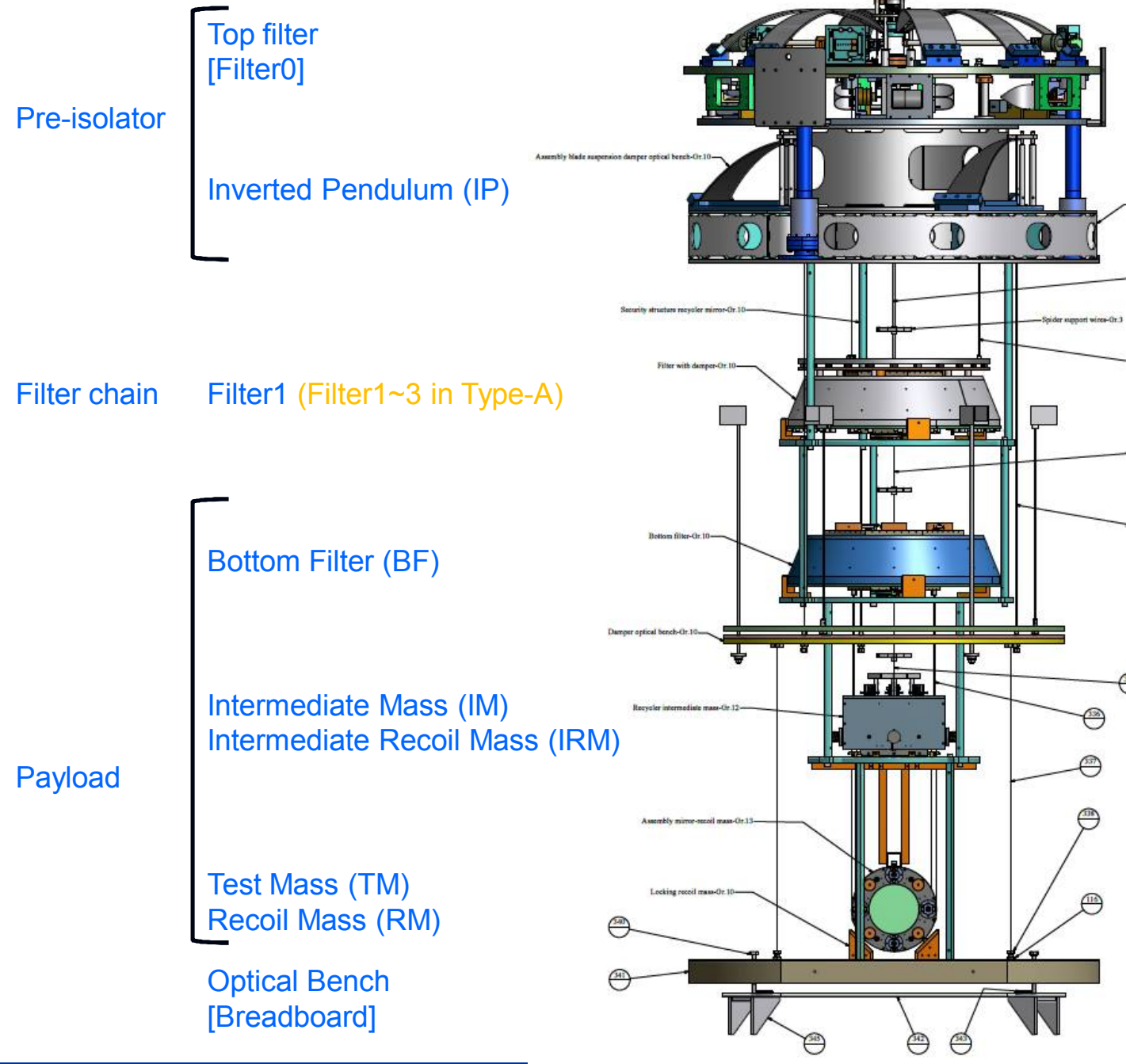


Type-A: IP + GASF (5 stage) + Payload (23kg)
Type-B: IP + GASF (3 stage) + Payload (10kg/20kg)
Type-Bp: GASF (2 stage) + Payload (10kg)
Type-C: Stack + Single/Double-pendulum (~1kg)

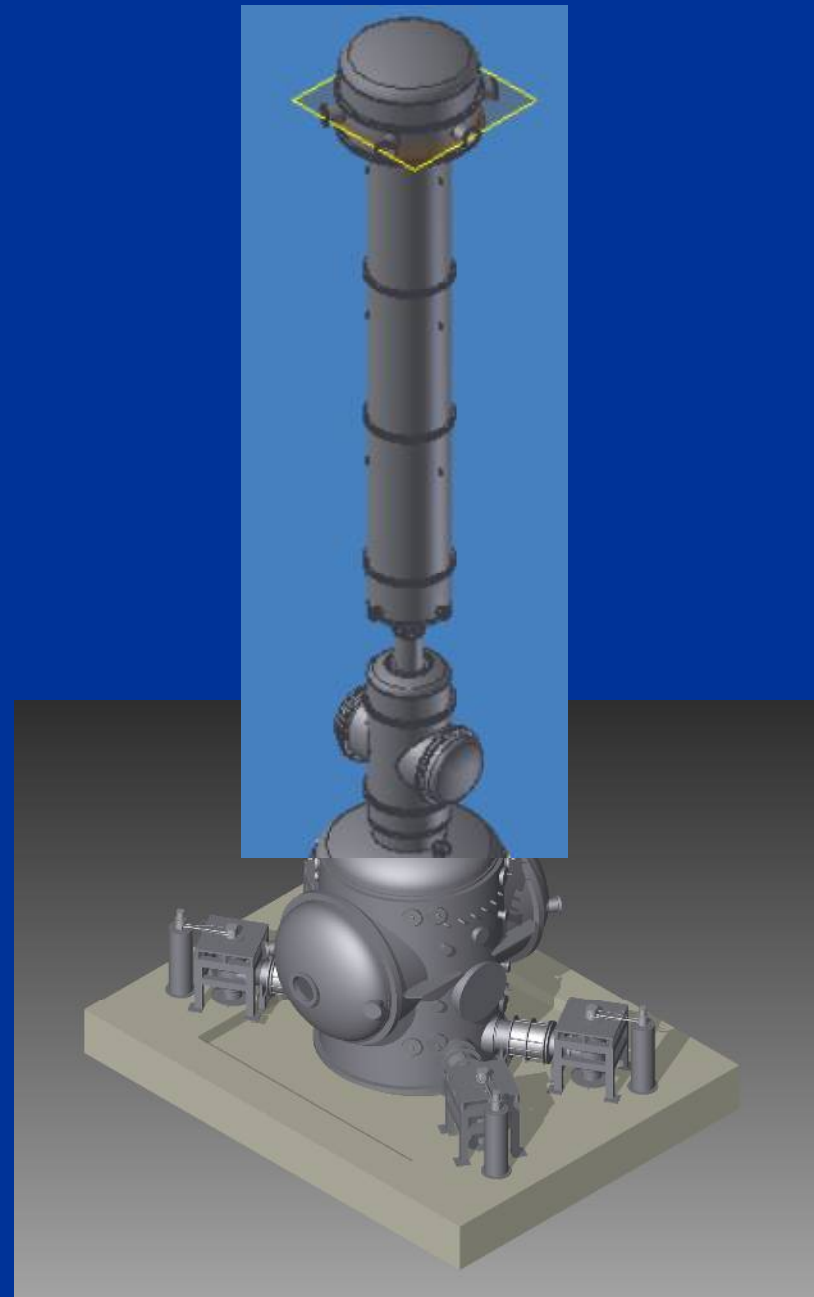
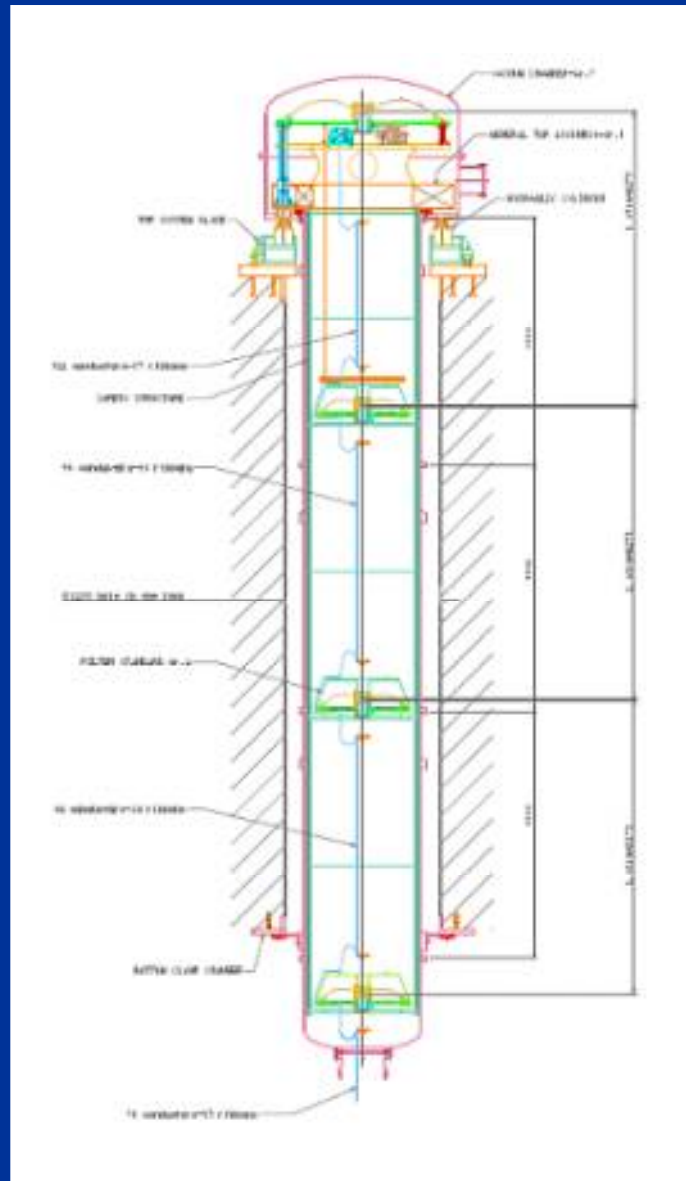
Configuration

<i>Chamber</i>	<i>iKAGRA</i>	<i>bKAGRA</i>
<i>IXV, IYV, EXV, EYV</i>		<i>Type-A</i>
<i>IXA, IYA, EXA, EYA</i>	<i>Type-Bp (for ITM/ETM)</i>	
<i>BS</i>	<i>Type-B (Only payload is free)</i>	<i>Type-B</i>
<i>PRM</i>		<i>Type-Bp</i>
<i>PR2, PR3</i>	<i>Type-Bp</i>	<i>Type-Bp</i>
<i>SRM, SR2, SR3</i>		<i>Type-B</i>
<i>MCF, MCE, IFM, IMM</i>	<i>Type-C</i>	<i>Type-C</i>
<i>OFI, OMC, EXT, EYT</i>		<i>Type-C</i>

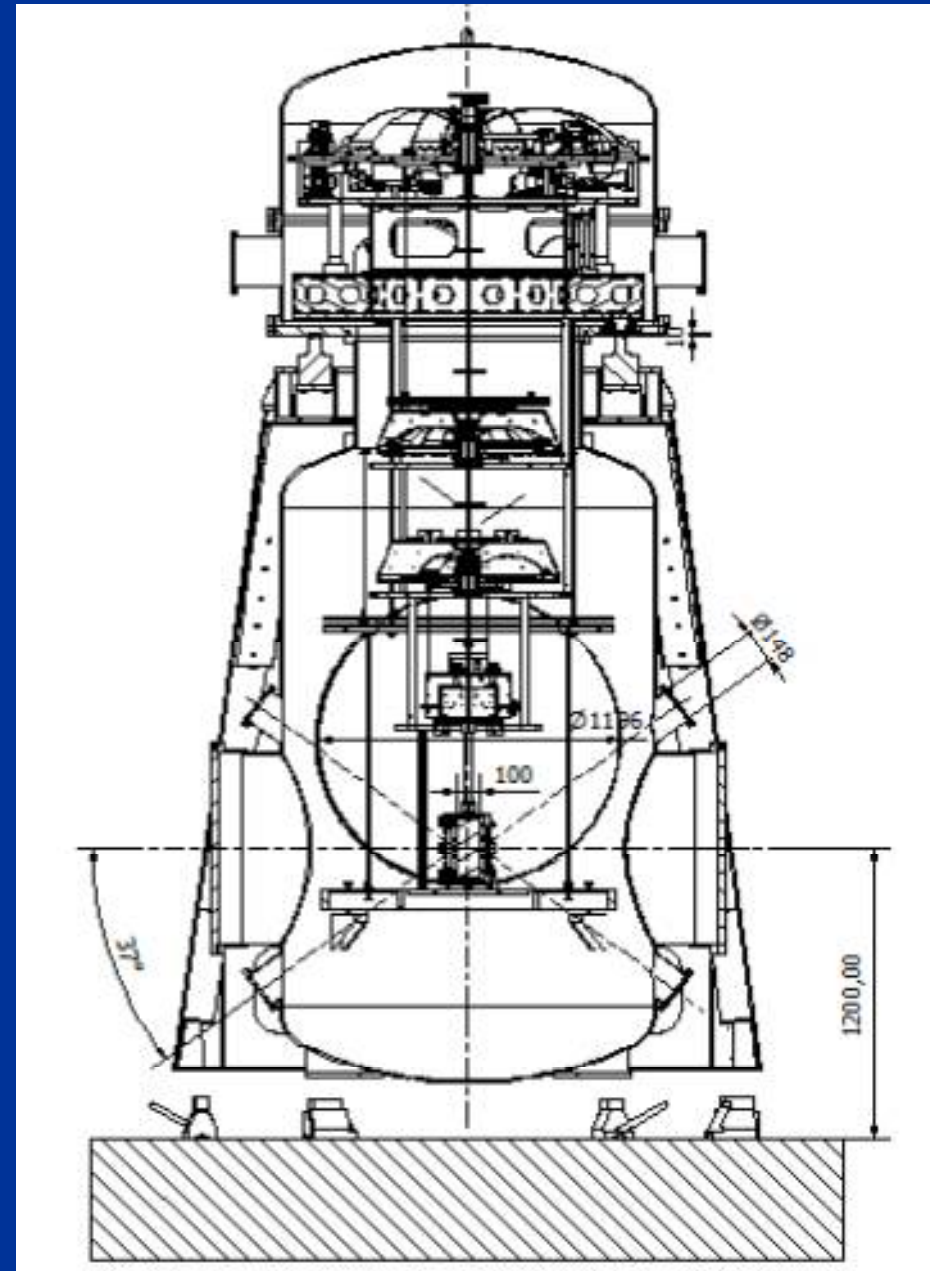
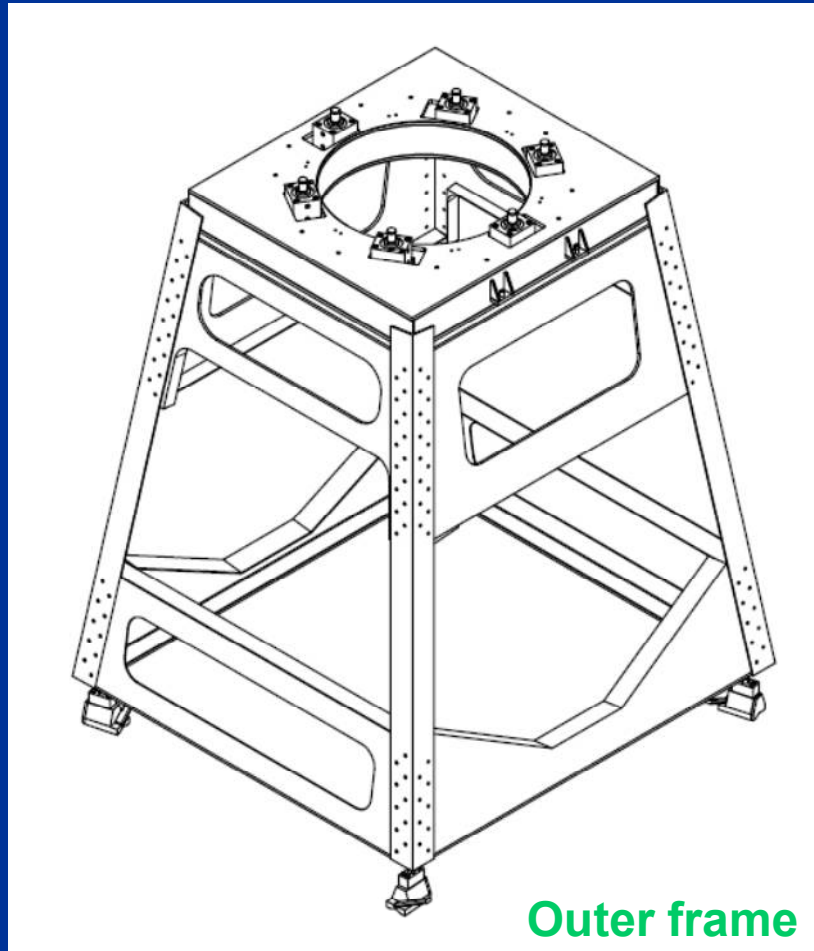
Type-A/B system



Type-A

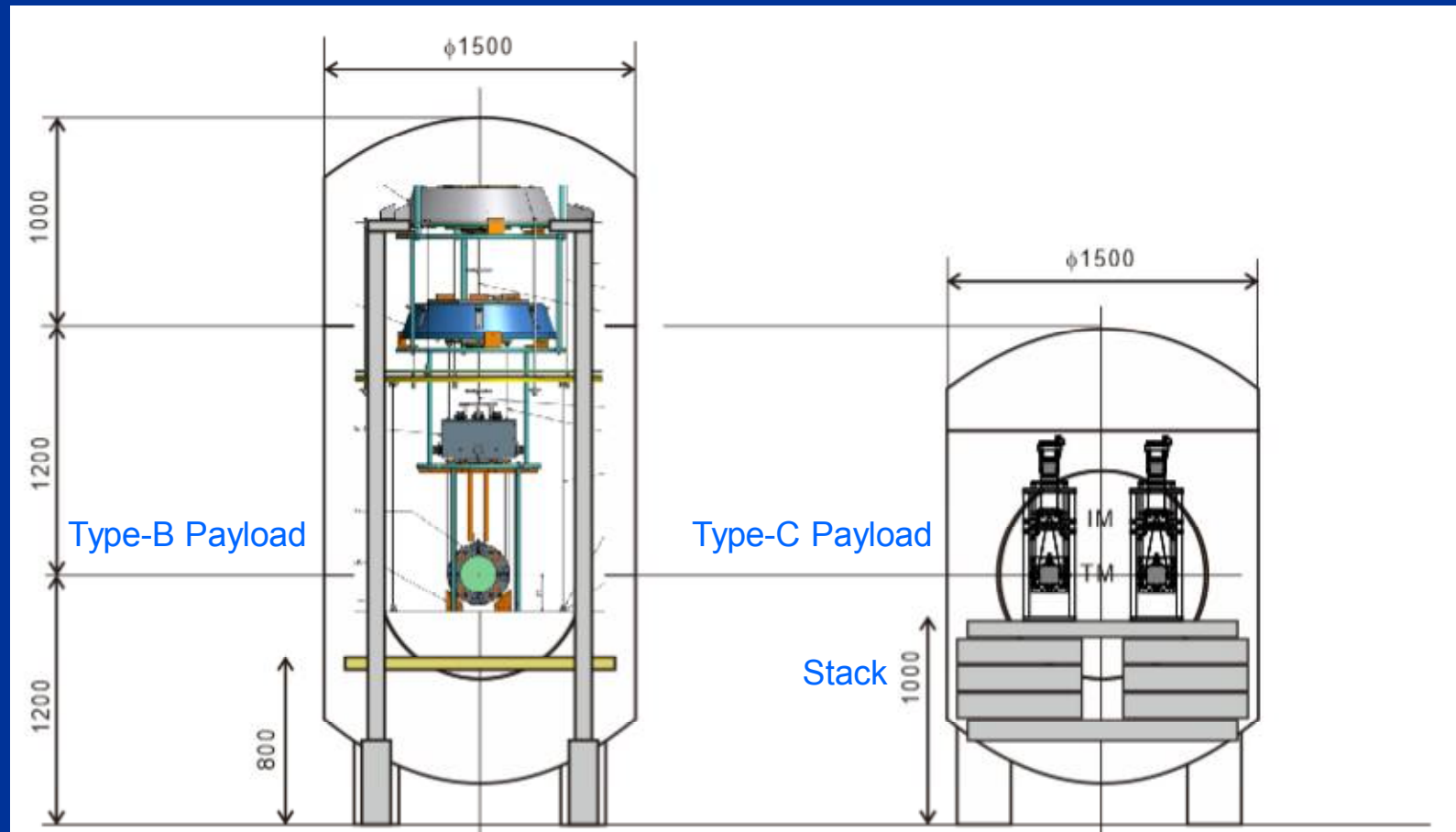


Type-B



Type-Bp

Type-C



2. 開発・準備状況

Suchedule

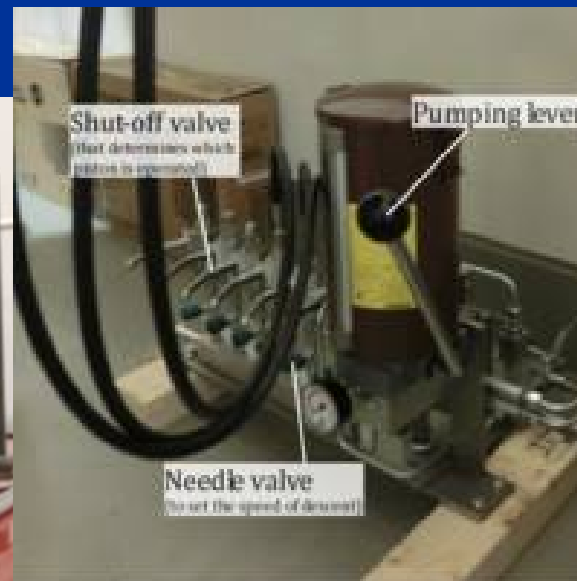
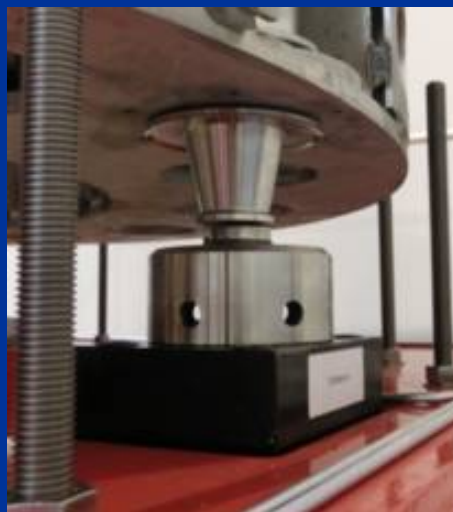
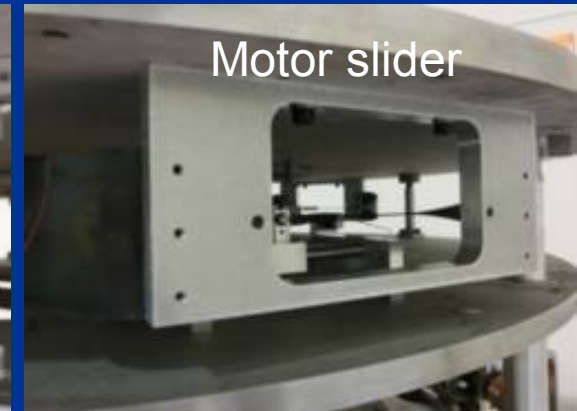
		2011	2012	2013	2014	2015	2016	
Standard GASF	Prototype test Procure Assembling							in Nikhef /Kashiwa
Pre-isolator	Prototype test Procure Assembling		6 SET	6 SET	5 SET	5 SET		in Akeno in Kashiwa
Type-B payload	Prototype test Procure Assembling Installation				ETM ITM			in Akeno in Mitaka in Kamioka
Type-A SAS	Prototype test Installation					ETM ITM		in Kamioka
Type-B SAS	Prototype test Installation				PRM/BS	SRM	PRM/BS	in TAMA
Type-C System	Assembling Installation							in TAMA



Current status

- The pre-isolator prototype is working with digital control system (Kashiwa).
- Final assembly of the GAS filters is going (Akeno).
- The payload prototype is ready for assembly (Mitaka).
- Production of 6 pre-isolators has been finished.

Test of the pre-Isolator prototype

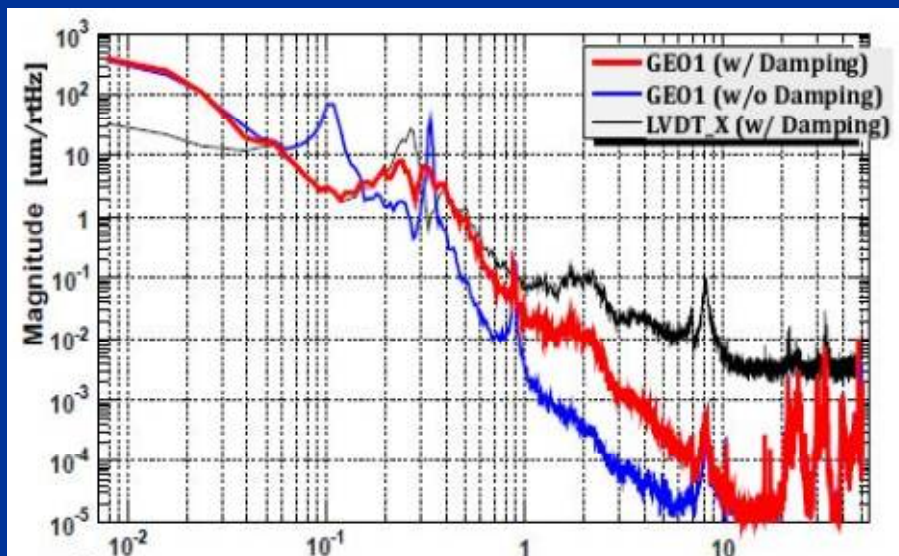
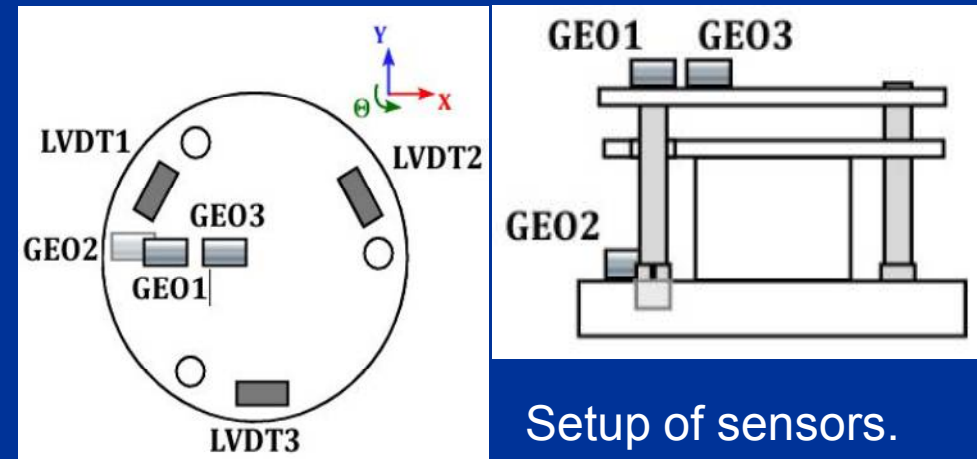


The level of the IP base was tuned using the hydraulic piston.

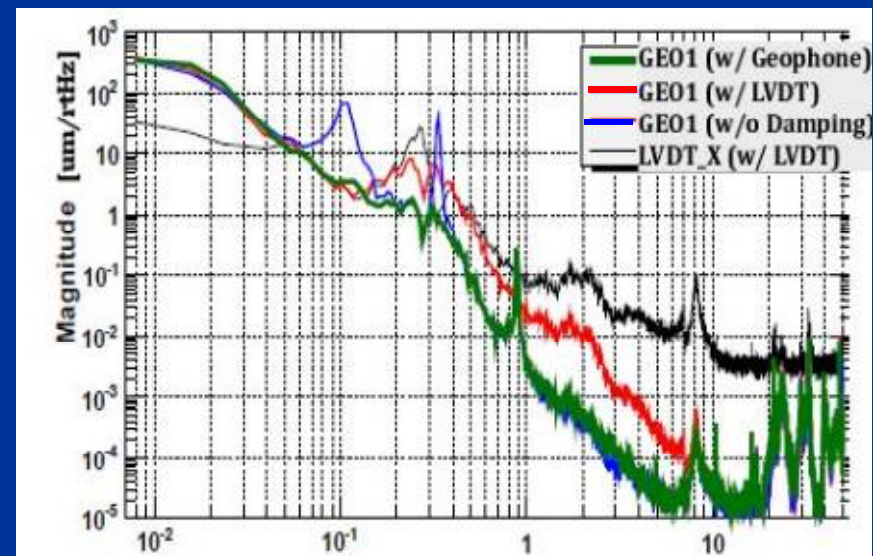
Geophones, LVDT-actuator modules and motor sliders were assembled onto the IP with cabling.

Damping control of the inverted pendulum

by T. Sekiguchi



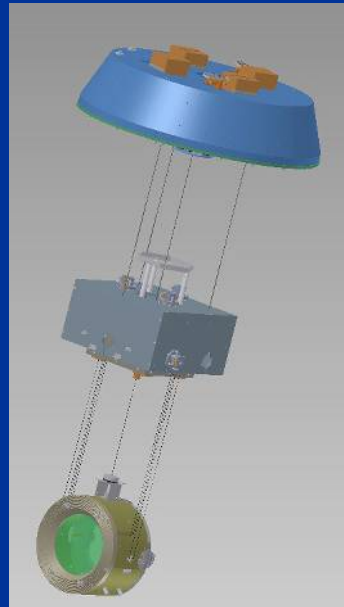
Active damping using the LVDT signals with simple viscous damping filters. The LVDTs introduce additional seismic noise. The top stage motion follows the output of the LVDT at around 0.1 - 0.5 Hz.



Active damping using the geophone signal. Only X-DoF was controlled by the geophone (GEO3). The other DoFs were controlled by the LVDTs. The motion of the top stage follows the non-control level.

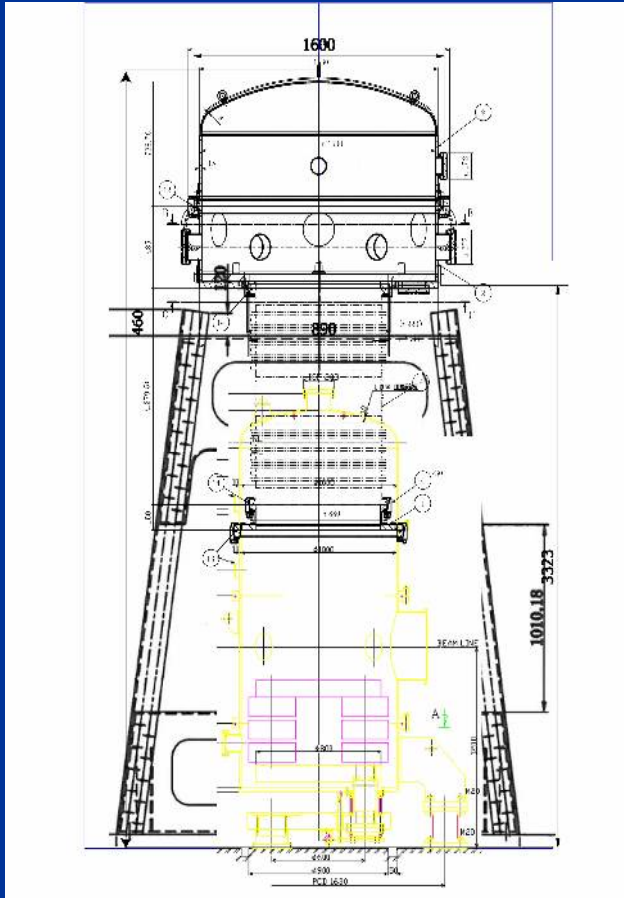
Manufacturing of payload prototype

Production of the payload prototype and the assembly jig has been finished. Assembling and tests will be started soon.



3. TAMA300を用いた試験

Full Type-B Prototype in TAMA



Structure of the test chamber

The experiments will start in summer, 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.

4. まとめ

- KAGRAでは要求される性能に応じた4つのタイプの防振システムが使用される。
- GAF filterの実機19台とpre-isolatorの実機6台の製作が完了。
- 変位センサ(LVDT)や慣性センサ(Geophone)を用いた倒立振り子(IP)のデジタル制御に成功。
- TAMA300を用いた試験の準備が進行中。