Vibration Isolation Subsystem

R. Takahashi (ICRR), K. Yamamoto (ICRR),
T. Uchiyama (ICRR), T. Sekiguchi (ICRR),
H. Ishizaki (NAOJ), A. Takamori (ERI),
R. DeSalvo (Univ. of Sannio), E. Majorana (INFN),
J. van den Brand (NIKHEF), E. Hennes (NIKHEF),
A. Bertolini (NIKHEF), + N. Lockerbie (Univ. Strathclyde)

KAGRA
face to face meeting
(31 July, 2012)

Contents

1. Overview
    1. Configuration
    2. Schedule and Status

2. R&D
    1. Pre-isolator
    2. Payload
    3. Outer frame

1. Configuration

Configuration

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

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

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

Chamber	iKAGRA	bKAGRA
IXV, IYV, EXV, EYV		Type-A
IXA, IYA, EXA, EYA	Type-B Payload on rigid table (for ITM/ETM)	
BS, PR2, PR3	Type-B (Only payload is free, other parts are not used)	Type-B
PRM, SRM, SR2, SR3		Type-B
MCF, MCE, IFM, IMM	Type-C	Type-C
OFI, OMC, EXT, EYT		Type-C

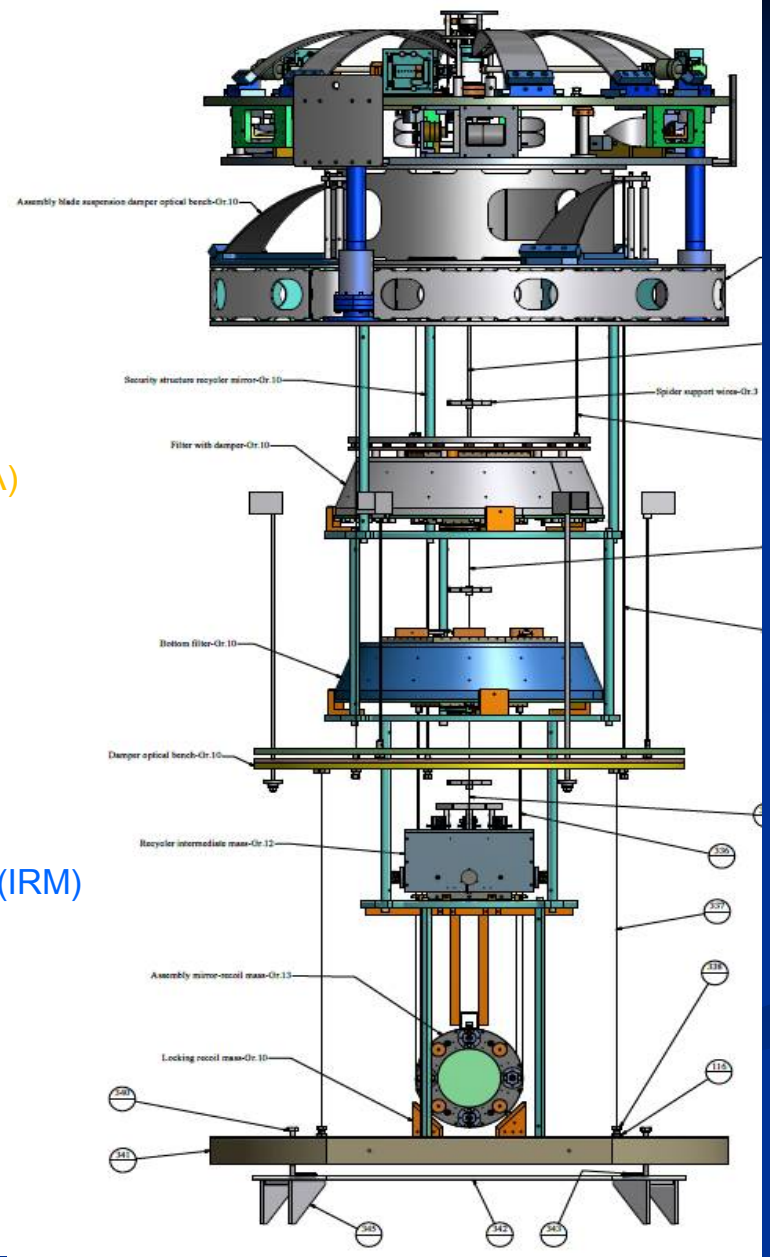
Type-A/B

Pre-isolator
- Top filter [Filter0]
- Inverted Pendulum (IP)

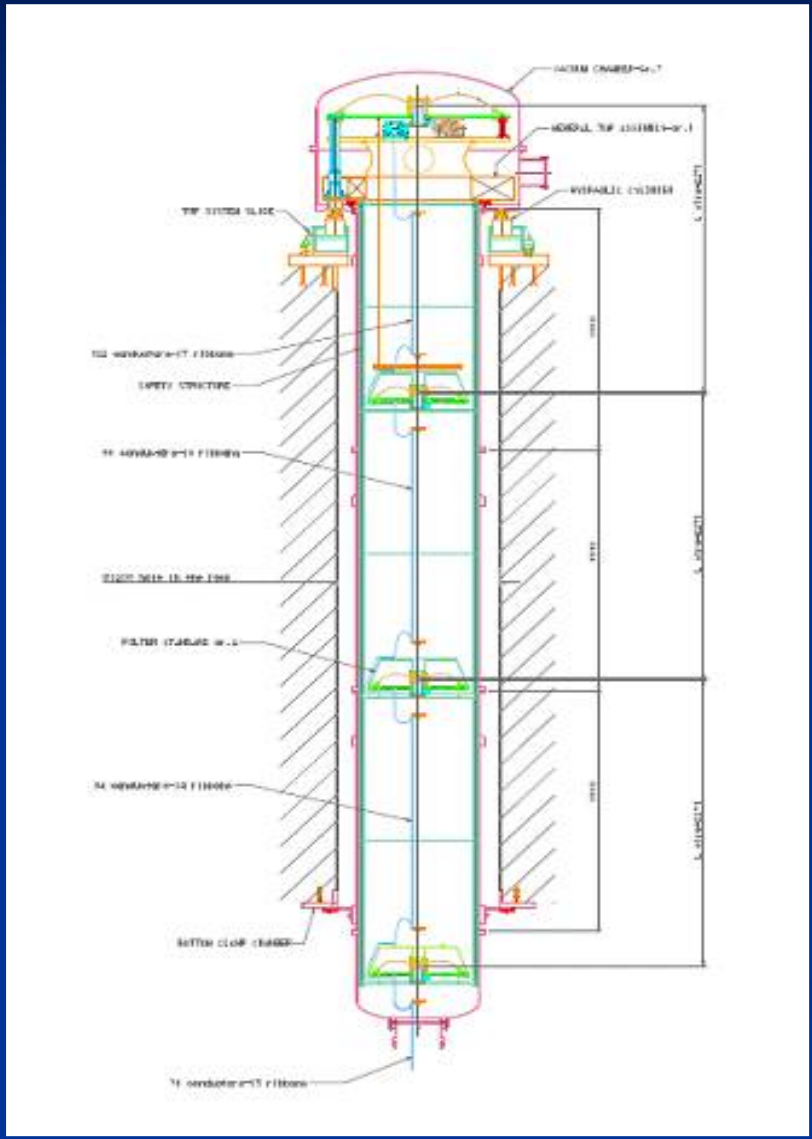
Filter chain
- Filter1 (Filter1~3 in Type-A)

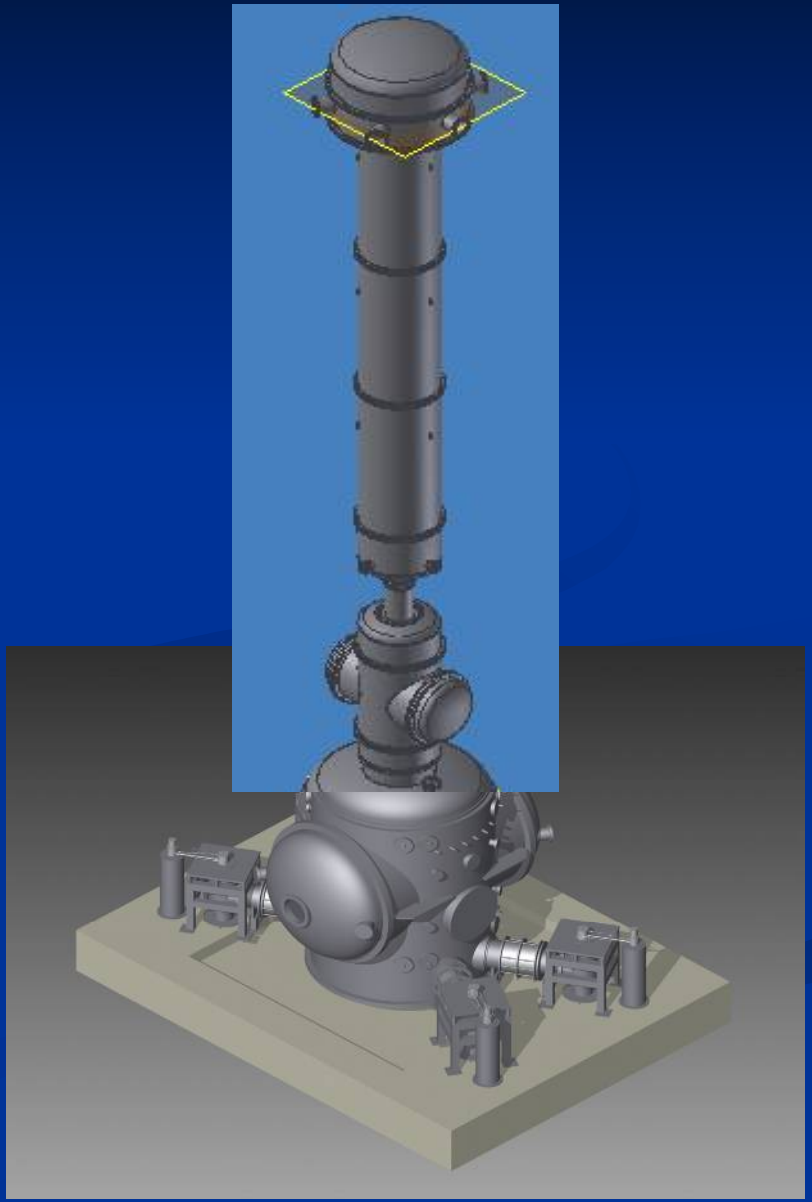
Payload
- Bottom Filter (BF)
- Intermediate Mass (IM)
- Intermediate Recoil Mass (IRM)
- Test Mass (TM)
- Recoil Mass (RM)

Optical Bench [Breadboard]

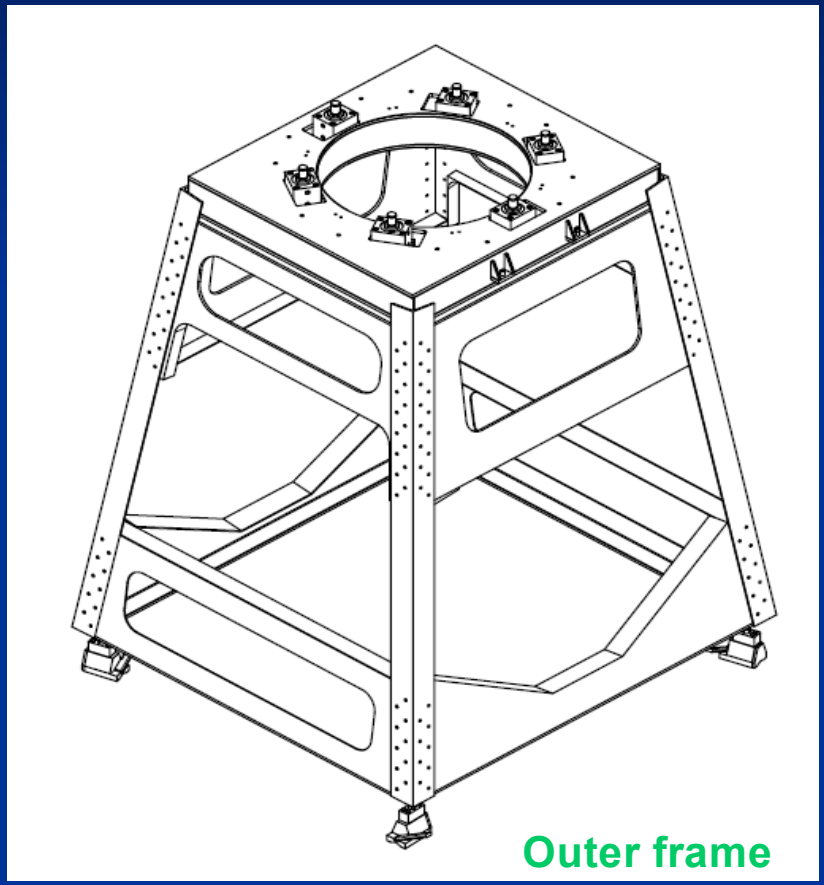


Type-A

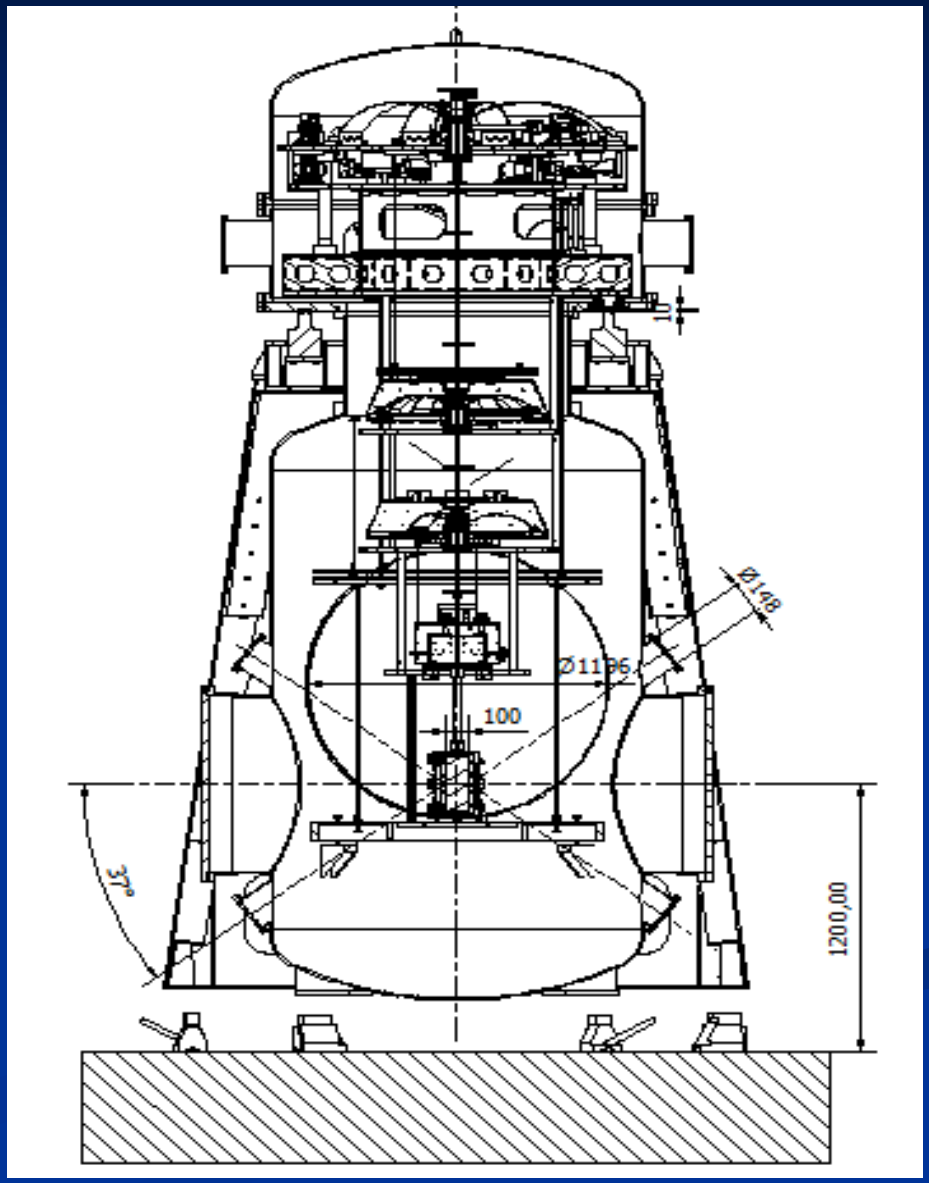




Type-B

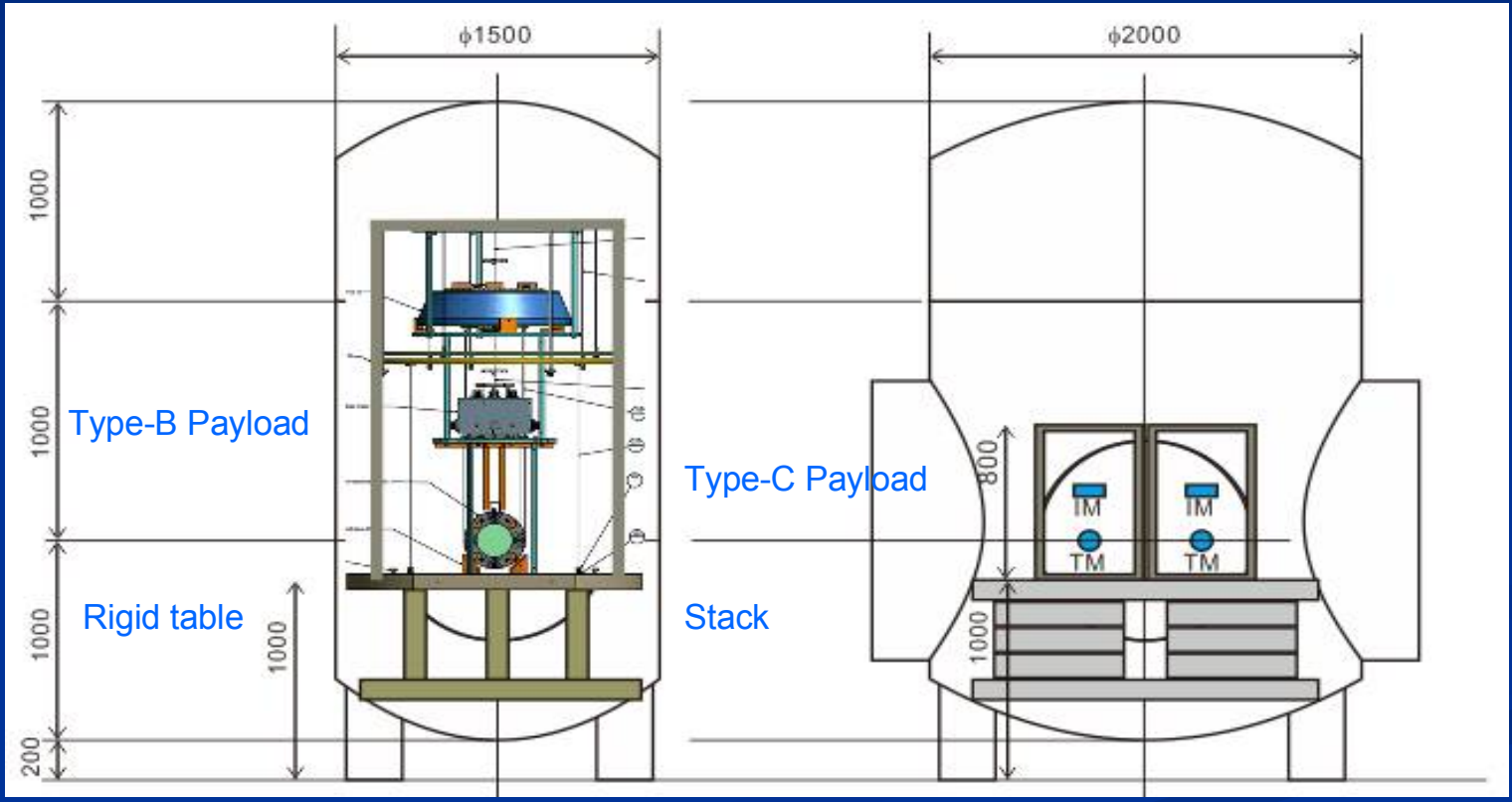


Outer frame

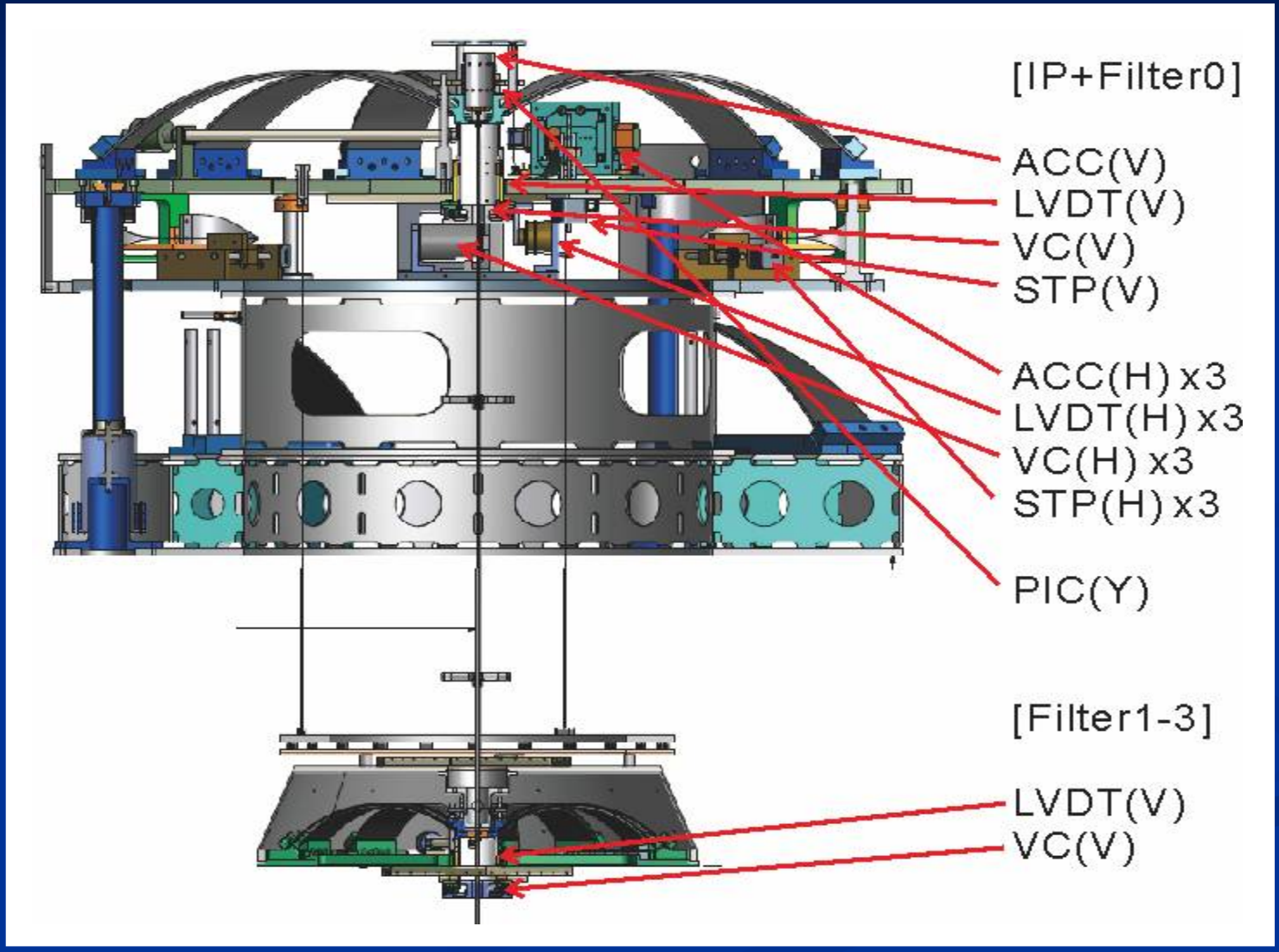


Type-B payload on rigid table

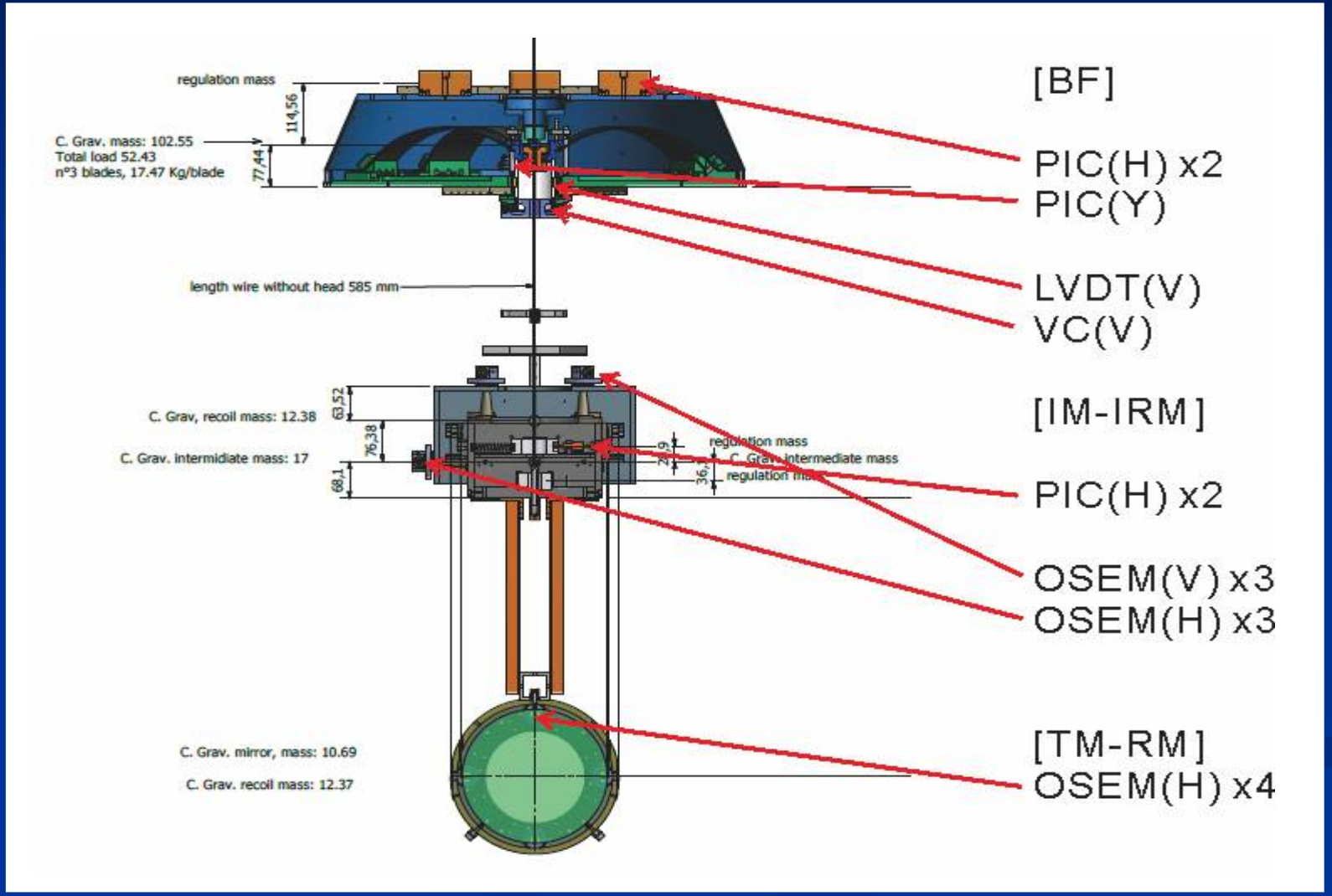
Type-C



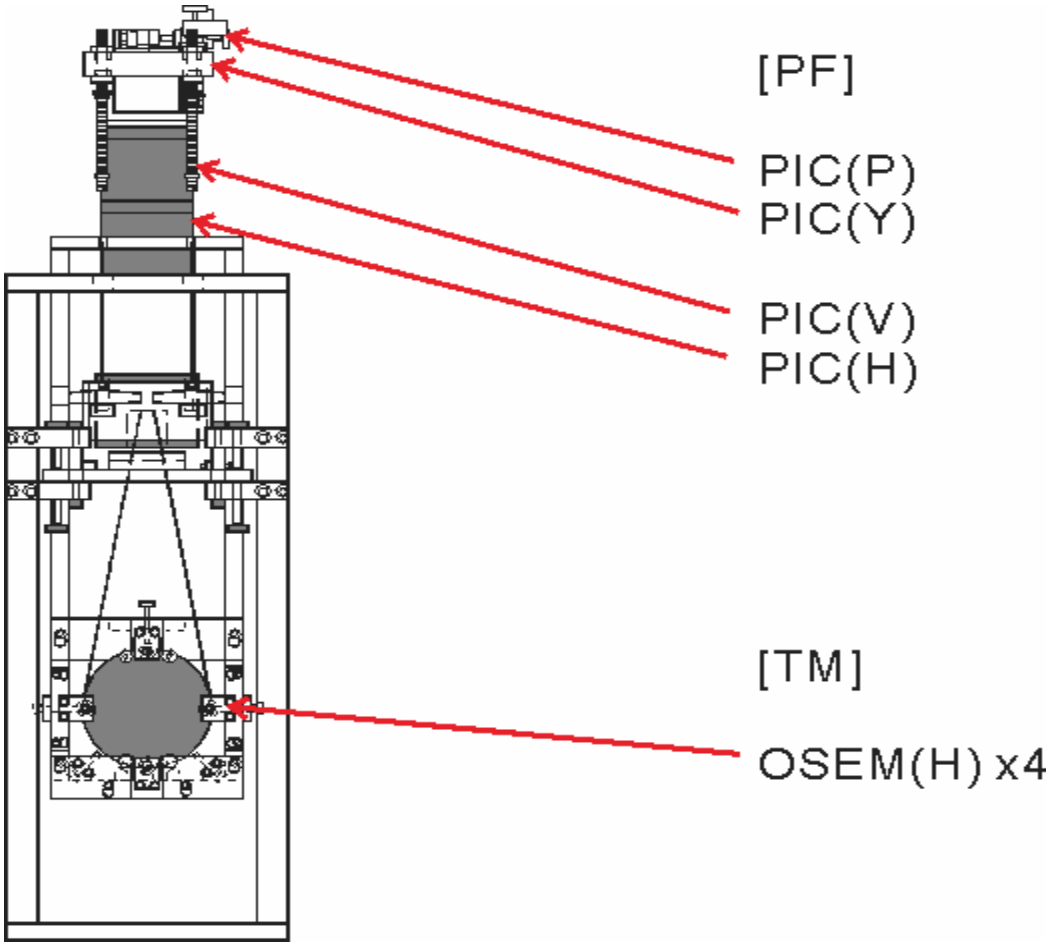
Sensors & Actuators (Pre-isolator)



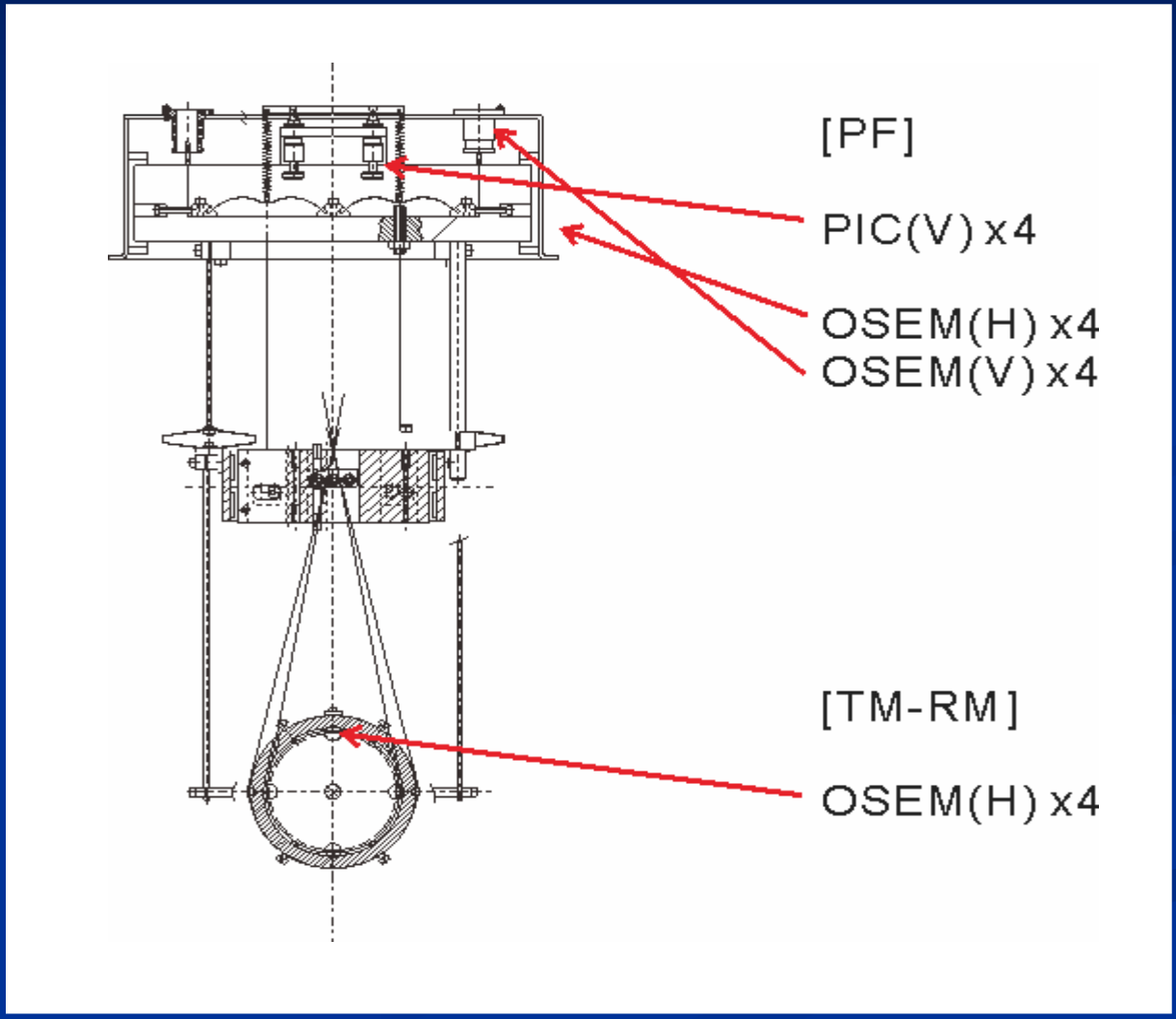
Sensors & Actuators (Type-B Payload)



Sensors & Actuators (Type-C1 for MC)



Sensors & Actuators (Type-C2 for MMT)

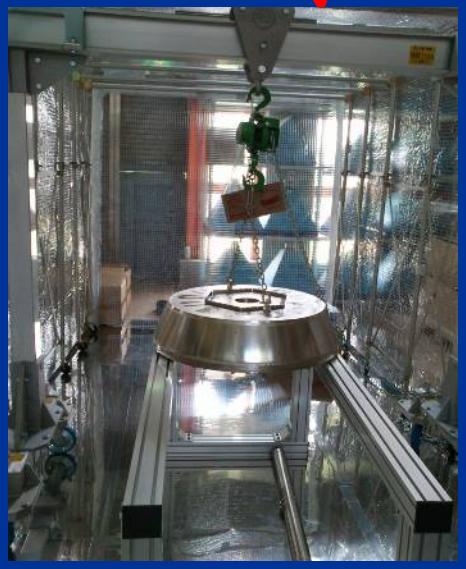


1. Overview

2. Schedule and Status

Schedule

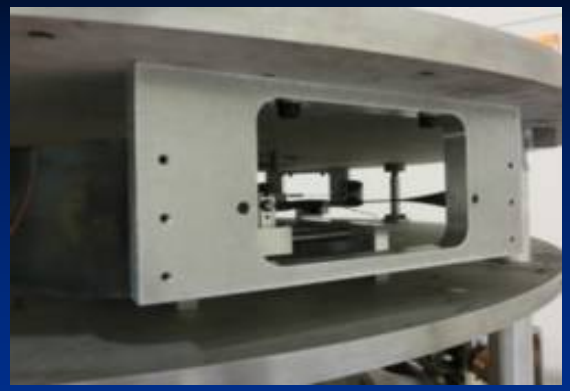
		2011	2012	2013	2014	2015	2016	
Standard GASF	Prototype test							in NIKHEF/ICRR
	Procure							
	Assembling							in Akeno
Pre-isolator	Prototype test							in ICRR
	Procure							
	Assembling							in Akeno
Type-B payload	Prototype test							in NAOJ
	Procure							
	Assembling							in Kamioka
	Installation							
Type-A SAS	Prototype test							in the site
	Installation					ETM	ITM	
Type-B SAS	Prototype test							in TAMA
	Installation					SRM	PRM	
Stack	Procure							
	Installation							



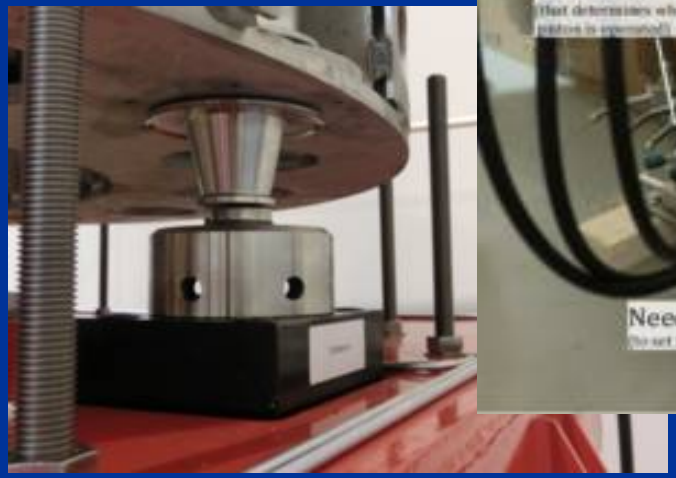
Current task
- Prototype test of the pre-isolaor in Kashiwa
- Assembling of the GAS filters in Akeno

Order in 2012FY
- Payload prototype: June
- 6 Pre-isolators: October

Preparation for control test of the pre-Isolator prototype



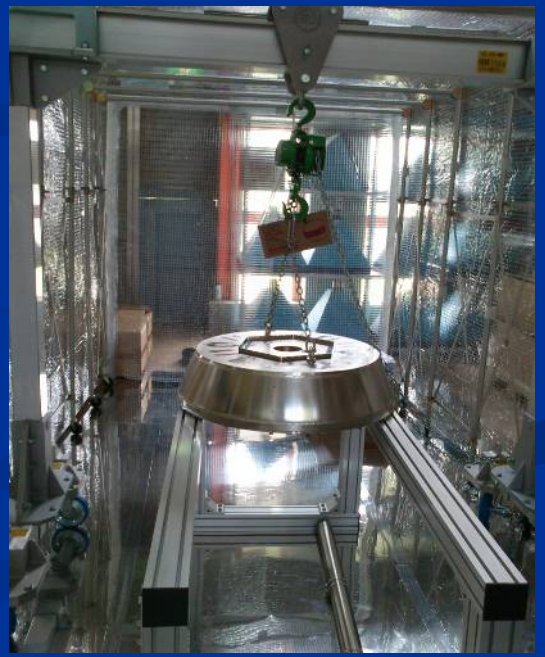
Motor sliders and LVDT-actuator modules were assembled onto the IP with cabling.



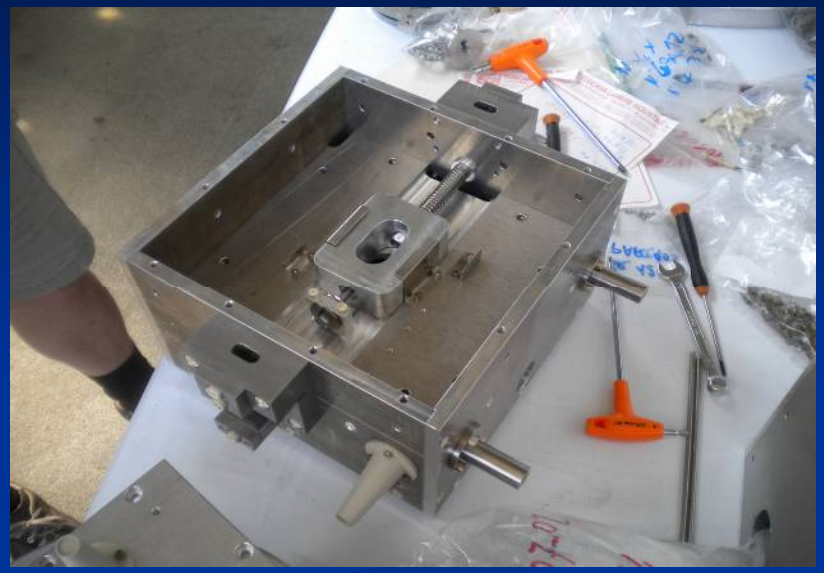
The level of the IP base was tuned using the hydraulic piston.

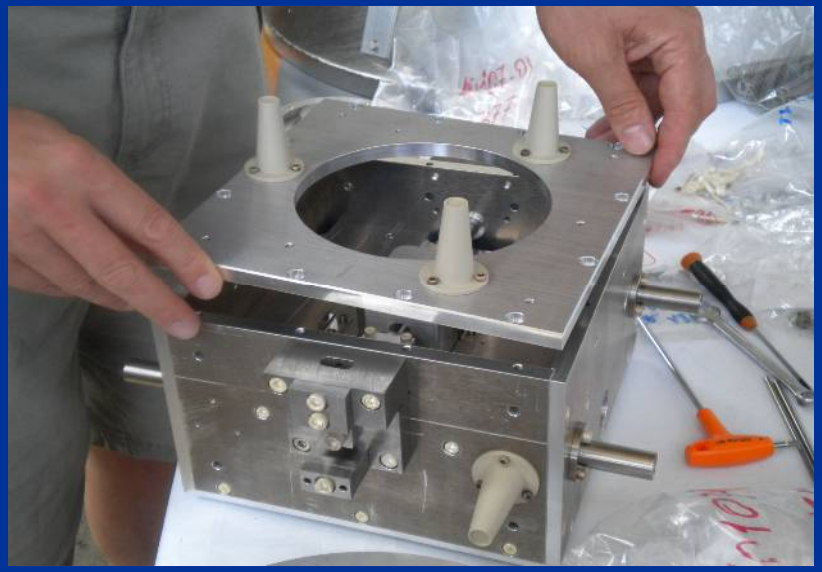
Storage & Assembling in Akeno

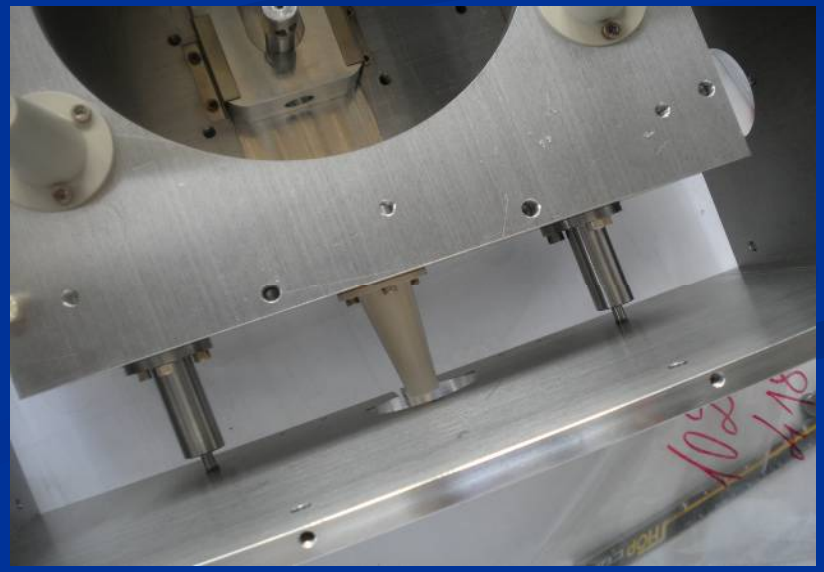
- The 19 GAS filters have been delivered in February, 2012.
- The clean booth is ready for assembling.
- We are preparing for tuning of wagic wands.



Manufacturing of Payload Prototype





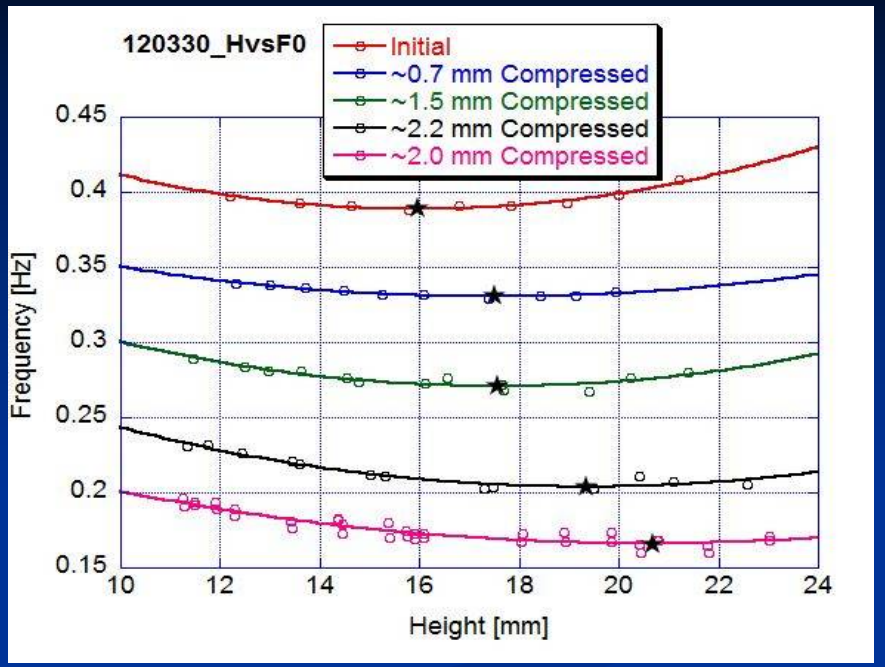


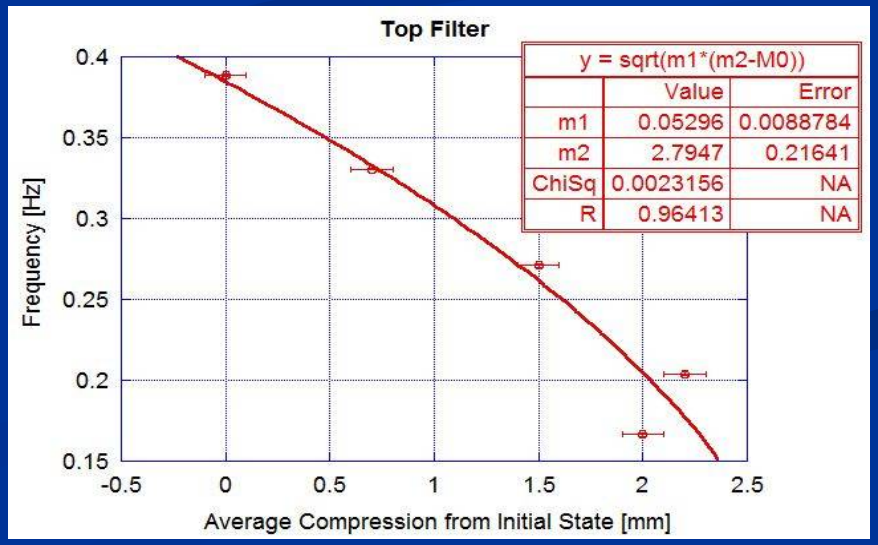
1. Pre-isolator

Measurements of Pre-Isolator prototype

by T. Sekiguchi

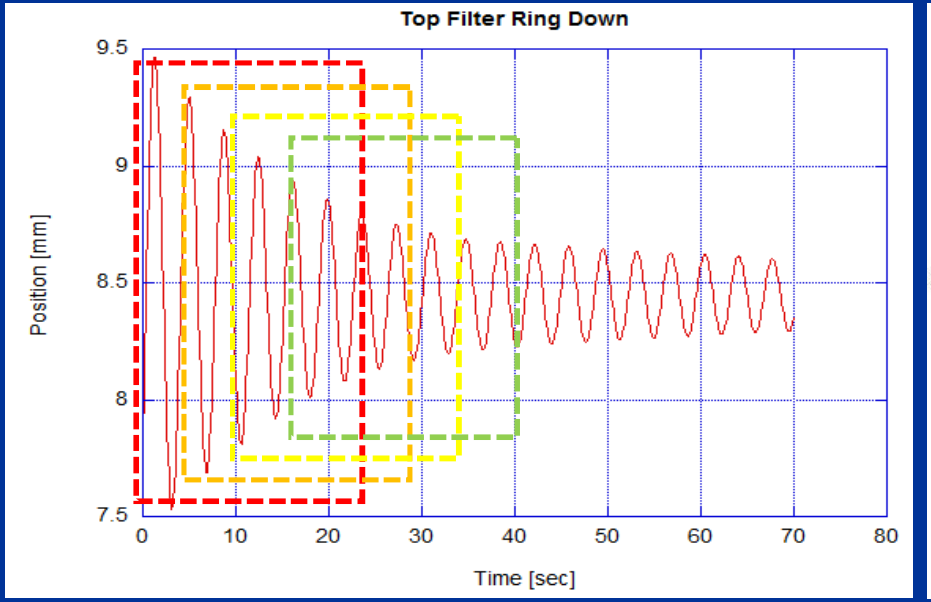
Pre-isolator at ICRR

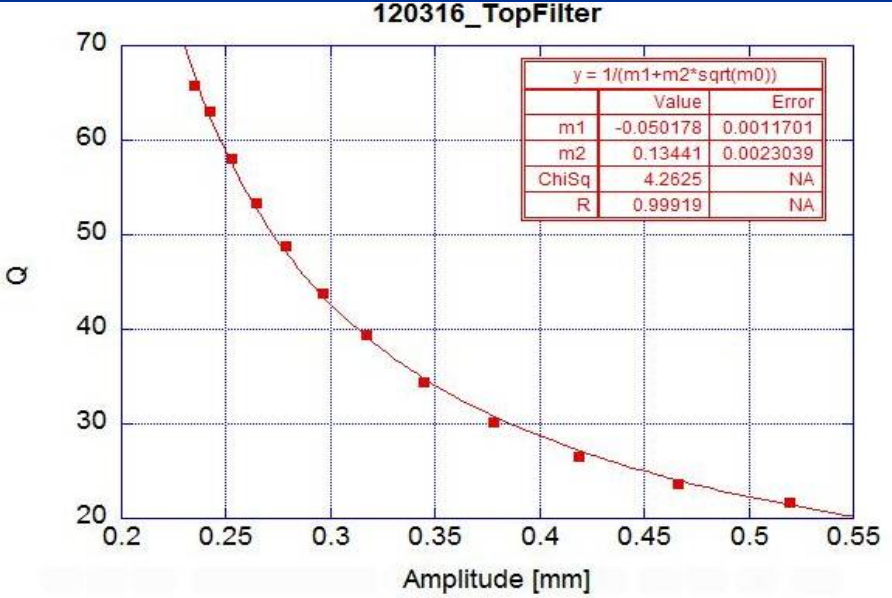




Q of the top filter depends on the amplitude.

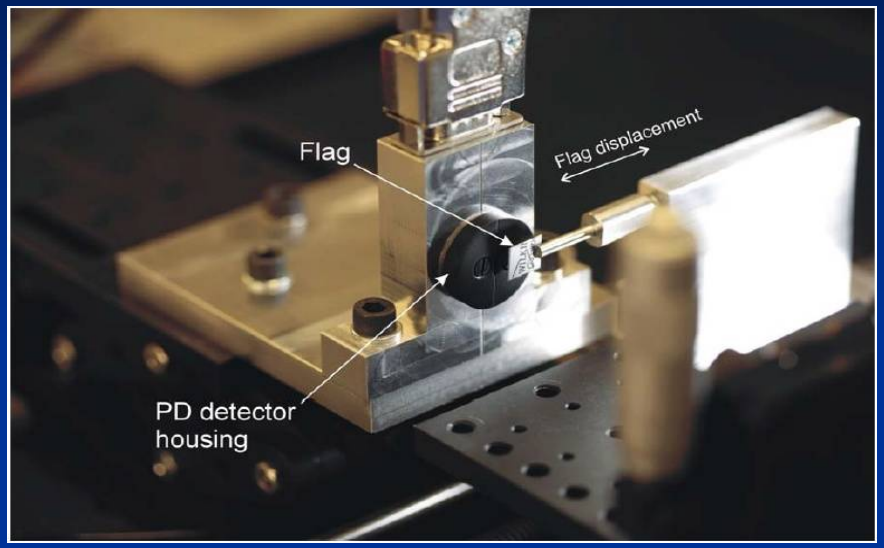
This result is consisted with Self-Organized Criticality Model.

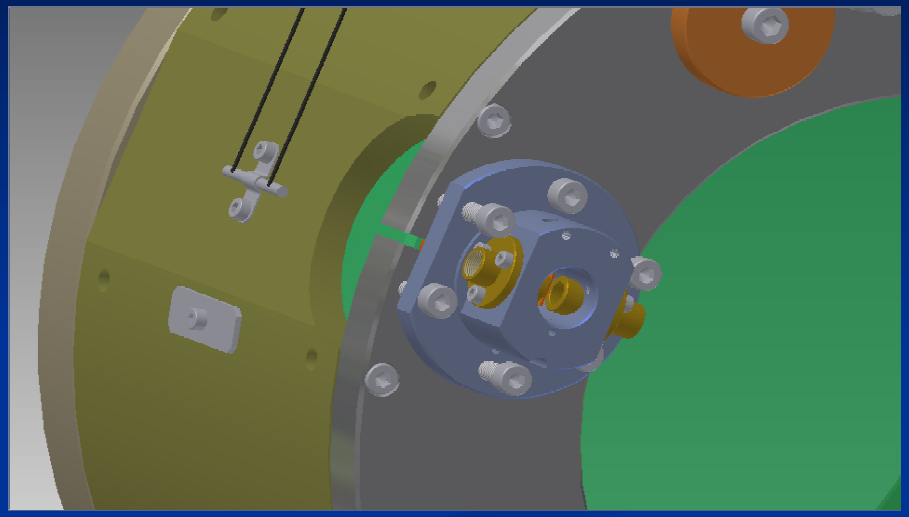


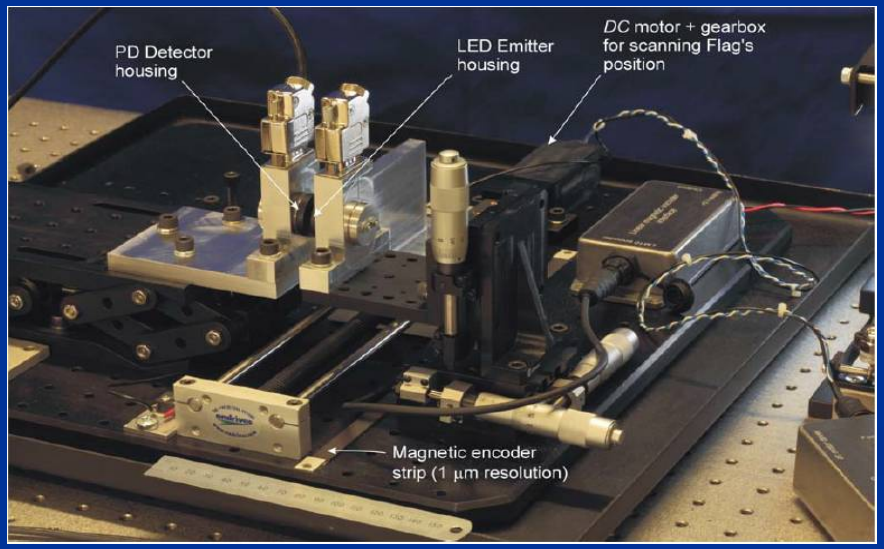


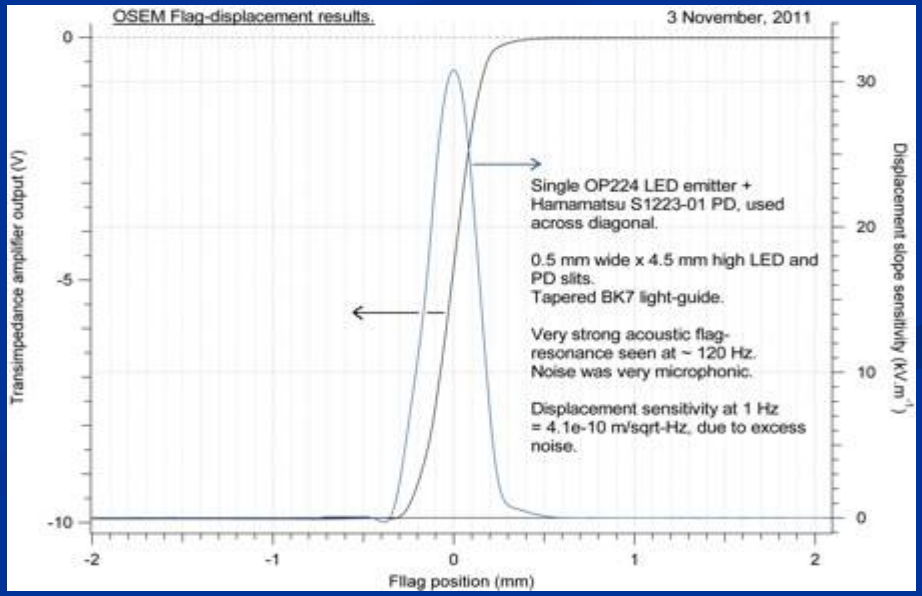
2. Payload

OSEM design and test by N. Lockerbie





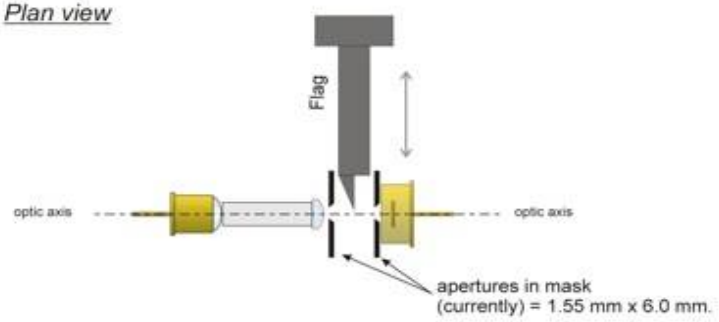




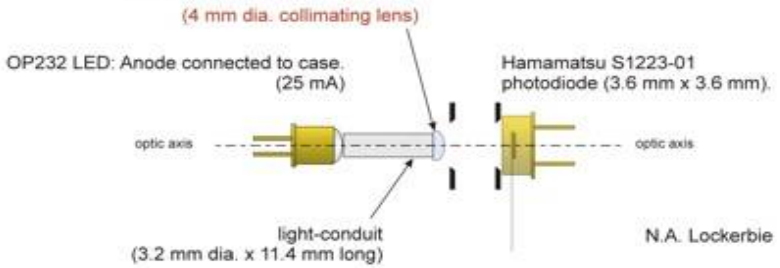
13 April, 2012

Current OSEM Design

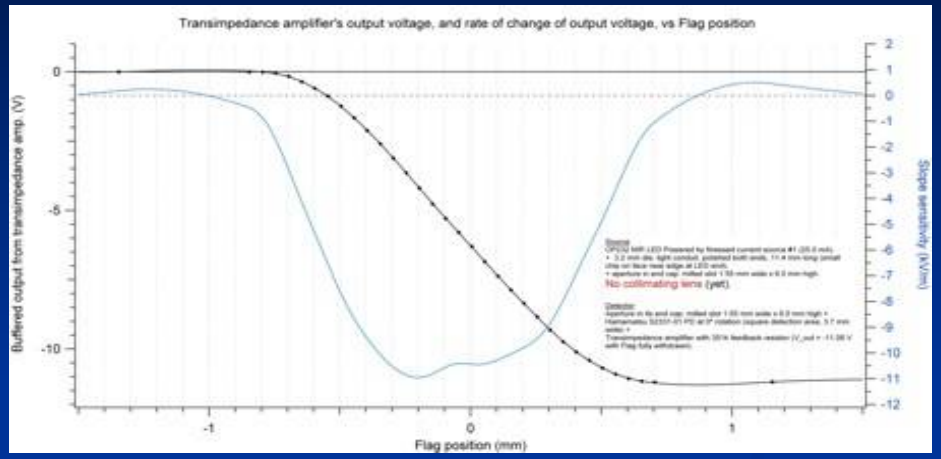
Plan view



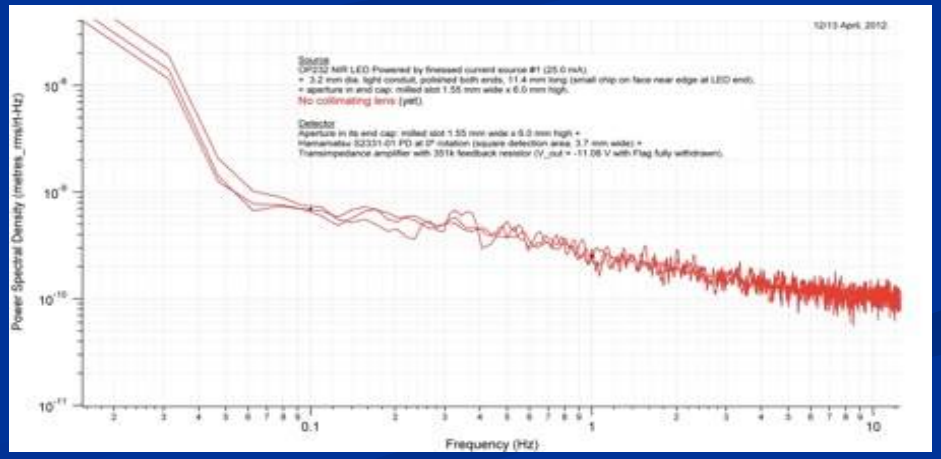
Side elevation



N.A. Lockerbie



The linear range is ~ 1mm.



The sensitivity is ~ 2.5×10^{-10} m/Hz$^{1/2}$ at 1 Hz, and ~7×10^{-10} m/Hz$^{1/2}$ at 0.1 Hz.

3. Outer Frame

Dmping material for Outer frame of Type-B

by H. Ishizaki & R. Takahashi

Props

Squre pipe: 100x100x3.2t 2,000h
Material: SS400
with/without ***Mineracast***

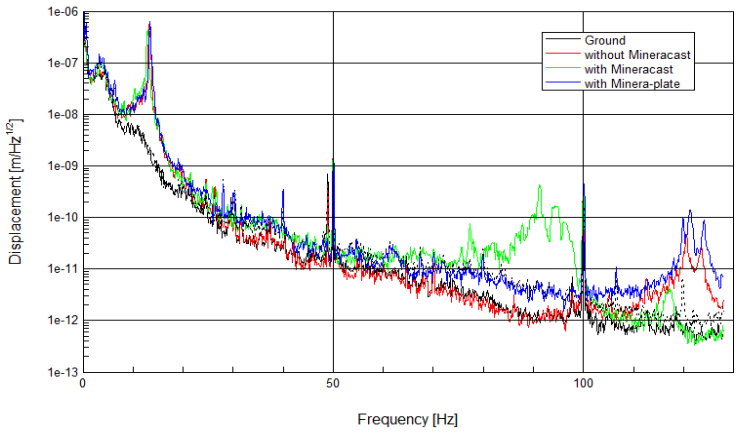
Anker plate

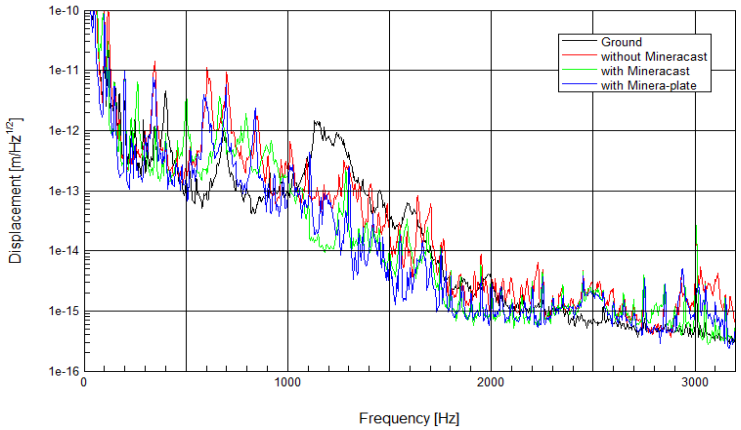
Plate: 220x220x25t
Material: ***Mineracast***

Mineracast is a complex material containing grains of granite that are solidified with resin and is similar in nature to stone.

Preliminary results

Power spectrum density





Transfer function