

H2020-MSCA-RISE-2016 – Grant Agreement N° 734303



POLITECNICO  
MILANO 1863

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UNIVERSITÀ DEGLI STUDI  
DI GENOVA



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# Gravitational waves detectors

Helios Vocca and Enrico Calloni



WP-3 Co-Leaders



# WP3: Gravitational wave detectors (Research, Training, Transfer of Knowledge)

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Lead: UNIPG

Participant: INFN, UNIPI, UNINA, UNIPG, Impex, EGO, CNRS, CALTECH, NAOJ

## Objectives

**O3.1:** Test the frequency dependent squeezing on a fullscale prototype, before using this technique in the Advanced detectors.

**O3.2:** Develop a subtraction scheme for non stationary gravity gradient noise.

**O3.3:** Study of silicon and sapphire materials for third generation monolithic suspensions.

**O3.4:** Study of payload and seismic suspension systems for cryogenic facilities

**O3.5:** Implementation of advanced control techniques for second and third generation gravitational wave detectors

# WP Status

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All the items have started more or less on time (even if the number of secondments done is below the expected).

This is mainly due to the extreme intense work done during this year on the three detectors (LIGO, Virgo and Kagra) for their upgrades in view of the third observation run (O3).

# Planned secondments (as the original GA)

Staff member ID	Staff member profile	Sending Organization	Seconded to Organization	Starting month	Duration (month)
47	ER	UNIPG	NINS-NAOJ	9	1
47	ER	UNIPG	ICRR	21	1
47	ER	UNIPG	ICRR	33	1
49	ER	UNIPG	ICRR	5	1
49	ER	UNIPG	ICRR	17	1
49	ER	UNIPG	ICRR	29	1
49	ER	UNIPG	ICRR	35	1
49	ER	UNIPG	IMPEX	38	1
50	Technical Staff	UNIPG	ICRR	7	1
50	Technical Staff	UNIPG	ICRR	19	1
50	Technical Staff	UNIPG	CALTECH	31	1
50	Technical Staff	UNIPG	CALTECH	43	1
51	Technical Staff	UNIPG	NINS-NAOJ	4	1
51	Technical Staff	UNIPG	ICRR	22	1
51	Technical Staff	UNIPG	CALTECH	40	1
82	ER	INFN	NINS-NAOJ	21	1
82	ER	INFN	NINS-NAOJ	33	1
82	ER	INFN	NINS-NAOJ	45	1
85	ER	UNINA	NINS-NAOJ	4	1
85	ER	UNINA	NINS-NAOJ	28	1
86	ER	EGO	ICRR	5	1
87	ER	EGO	CALTECH	18	1
88	ER	EGO	CALTECH	32	1
89	ER	EGO	CALTECH	40	1
91	ER	INFN	CALTECH	42	1
92	ER	INFN	CALTECH	32	1
94	ER	UNIRO	NINS-NAOJ	25	1
95	ER	UNIRO	NINS-NAOJ	13	1
100	ESR	CNRS	NINS-NAOJ	28	1
100	ESR	CNRS	NINS-NAOJ	40	1
102	ER	CNRS	CALTECH	10	1
104	ER	UNIFI	CALTECH	14	1
105	ER	INFN	CALTECH	10	1
106	ER	INFN	CALTECH	14	1
107	ER	INFN	CALTECH	18	1
108	ER	INFN	ICRR	22	1
109	ESR	INFN	ICRR	14	1
110	ER	INFN	CALTECH	9	1
111	ER	INFN	CALTECH	12	1
113	ER	IMPEX	INFN	20	1
151	ER	INFN	ICRR	12	1
151	ER	INFN	ICRR	18	1
151	ER	INFN	ICRR	30	1



# Secondments status

Staff member	Staff member profile	Sending Organization	Seconded to Organization	Starting date	Duration (month)
Helios Vocca	ER	UNIPG	NINS-NAOJ	07/07/17	2.17
Helios Vocca	ER	UNIPG	ICRR	27/06/18	0.6
Helios Vocca	ER	UNIPG	ICRR	24/08/18	1.67
Antonfranco Piluso	Technical Staff	UNIPG	NINS-NAOJ	11/08/17	1.03
Flavio Travasso	ER	UNIPG	ICRR	27/06/18	0.6
Flavio Travasso	ER	UNIPG	ICRR	15/09/18	0.53
Fabio Garufi	ER	UNINA	CALTECH	18/03/18	0.23
Michele Punturo	ER	INFN	CALTECH	17/03/18	0.2
Annalisa Allocca	ER	INFN	CALTECH	16/03/18	0.3
Annalisa Allocca	ER	INFN	CALTECH	29/06/18	0.73
Ettore Majorana	ER	INFN	ICRR	27/06/18	0.63
Massimiliano Razzano	ER	UNIFI	CALTECH	10/07/18	0.3
Franco Carbognani	ER	EGO	CALTECH	17/06/18	0.3
Marc Eisenmann	ESR	CNRS	NINS-NAOJ	20/04/18	1
Marc Eisenmann	ESR	CNRS	ICRR	24/07/18	0.87
Pierre Prat	ER	CNRS	NINS-NAOJ	06/04/18	0.43

# Secondments status per sending organization

Sending Organization	Seconded to Organization	Duration (month)
UNIPG	NINS-NAOJ	3.2
UNIPG	ICRR	3.4
UNINA	CALTECH	0.23
INFN	CALTECH	1.86
UNIFI	CALTECH	0.3
EGO	CALTECH	0.3
CNRS	NINS-NAOJ	1.43
CNRS	ICRR	0.87

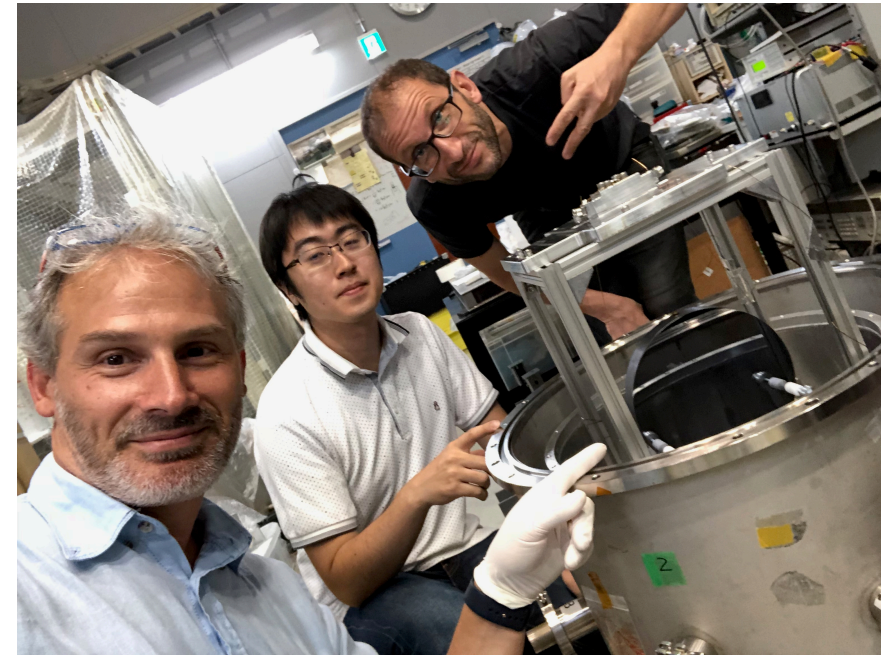
# Last secondments topic (UNIPG to ICRR)

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UNIPG was seconded to **ICRR** (Japan) to work on a first prototype of a silicon cryogenic suspension for the 3<sup>rd</sup> generation detectors.

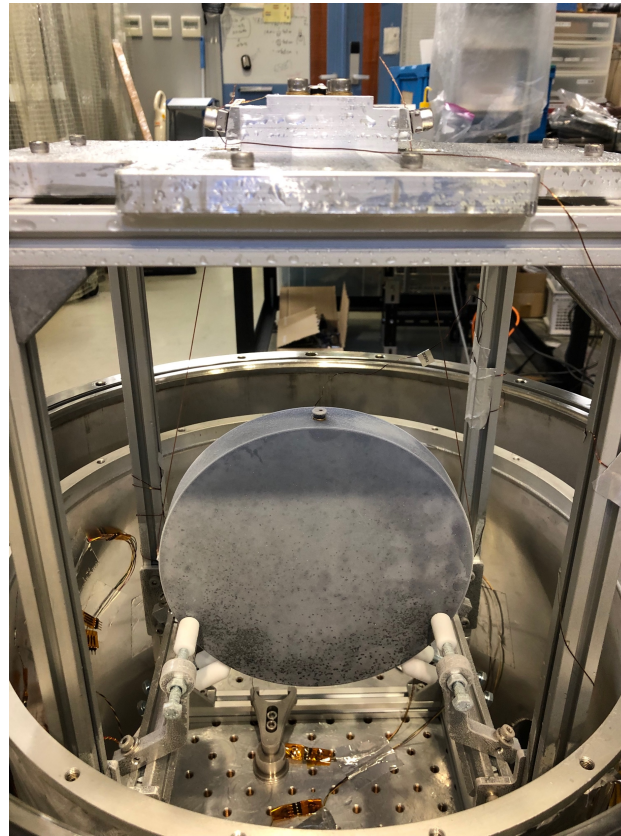
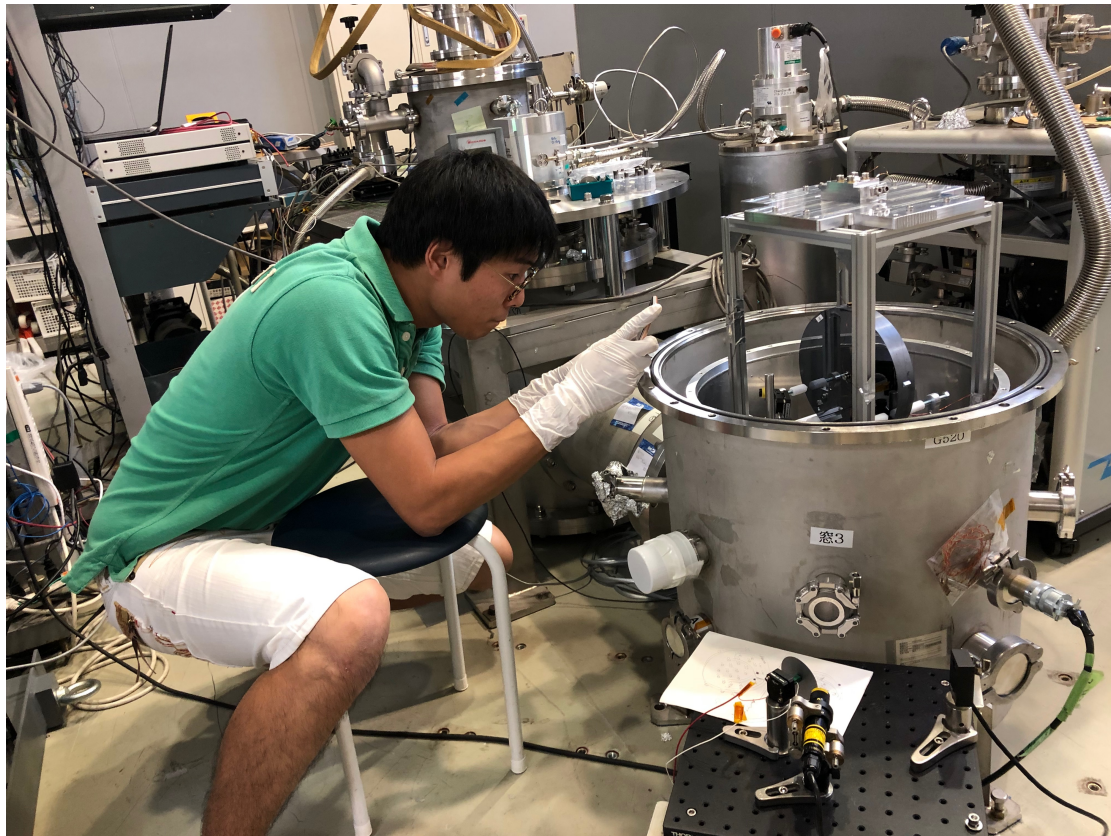
A Silicon mirror has been transferred to ICRR and suspended with a Cu-Be wire in a cryostat.

The thermal conductivity and the mechanical quality factors have been measured at 40K.





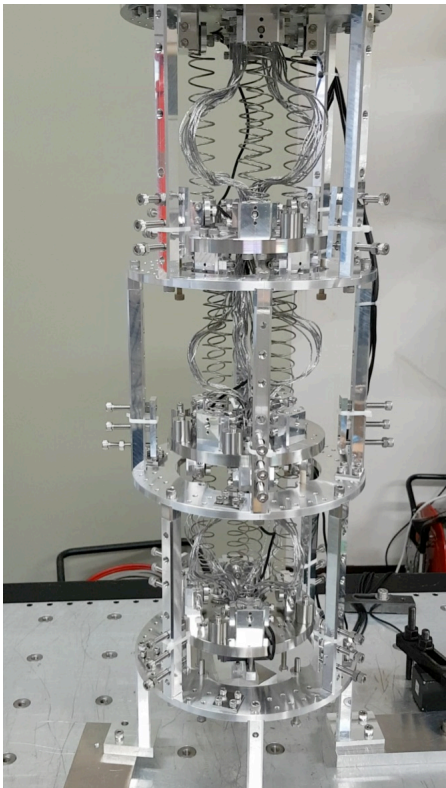
# Last secondments topic (UNIPG to ICRR)





# Last secondments topic (INFN-RM1 - Majorana - to ICRR)

Preliminary test/characterization  
Of a three-stage ancillary passive  
suspension for heat links connecting  
the cryocoolers to test mass  
payload



Assembly of the final attenuator at  
the KAGRA site



Heat link attenuator integration into  
the cryostat