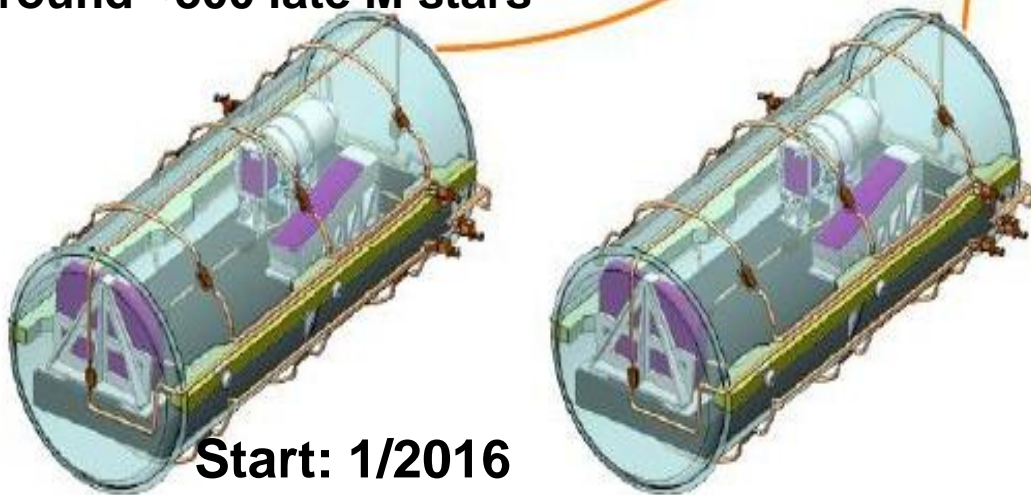




Summary

Two fiber-fed high-resolution echelle spectrographs at the Calar Alto 3.5 m telescope (R=82000) to find ~ 50-100 low-mass planets around ~300 late M stars



Start: 1/2016



Talk overview

Part 1: Overview over the whole
CARMENES project

Part 2: NIR detector cryostat, the main MPIA
hardware contribution to the project

In addition the MPIA has contributed to the
science preparation

CARMENES, the consortium



MPIA (Heidelberg) • **IAA** (Granada) • **LSW** (Heidelberg) •
ICE (Barcelona) • **IAG** (Göttingen) • **IAC** (Tenerife) • **TLS**
(Tautenburg) • **UCM** (Madrid) • **HS** (Hamburg) • **CAB**
(Madrid) • **CAHA** (50% MPG + 50% CSIC)

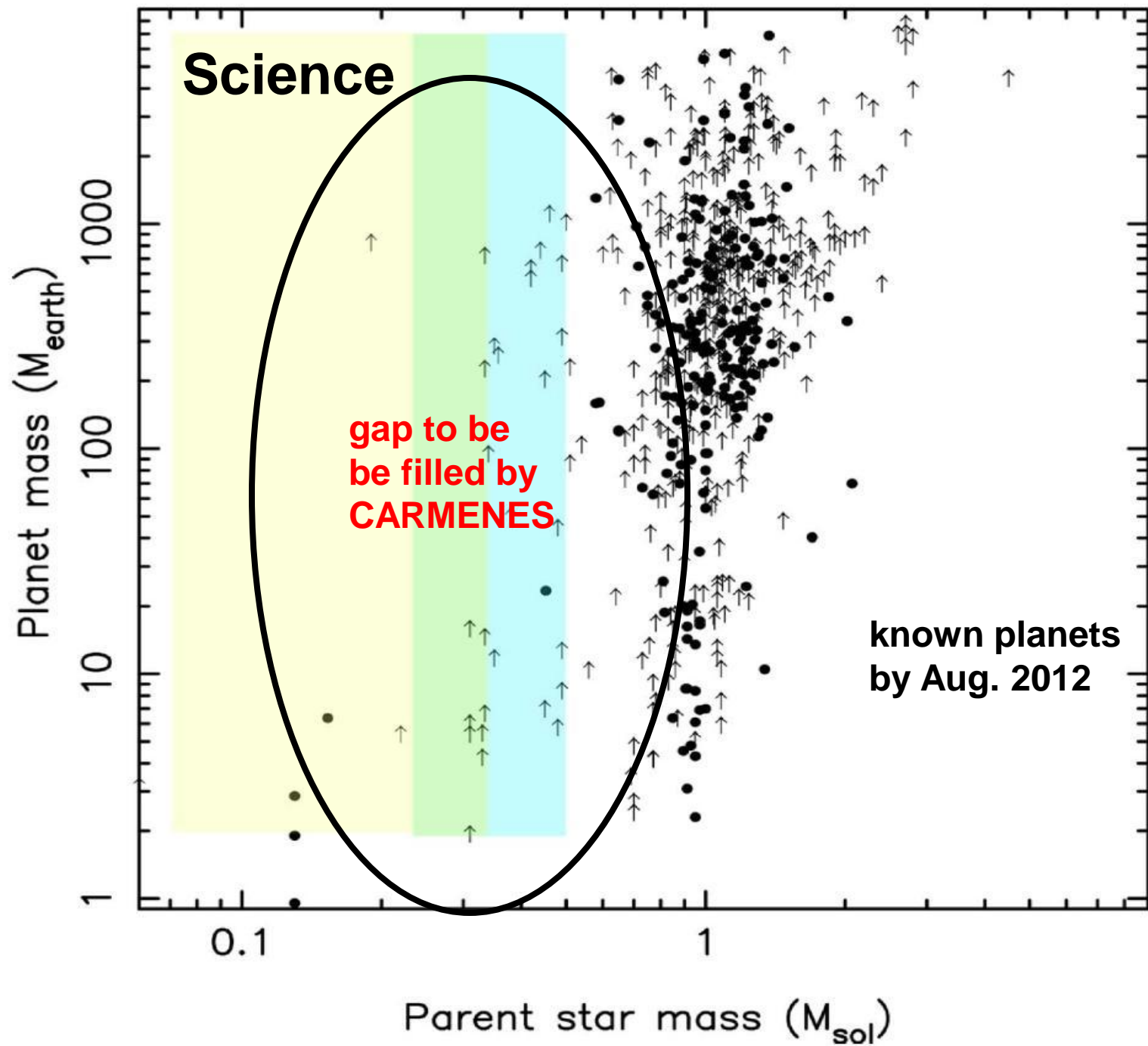
Germany + Spain \geq 5.0 MEUR (hardware)

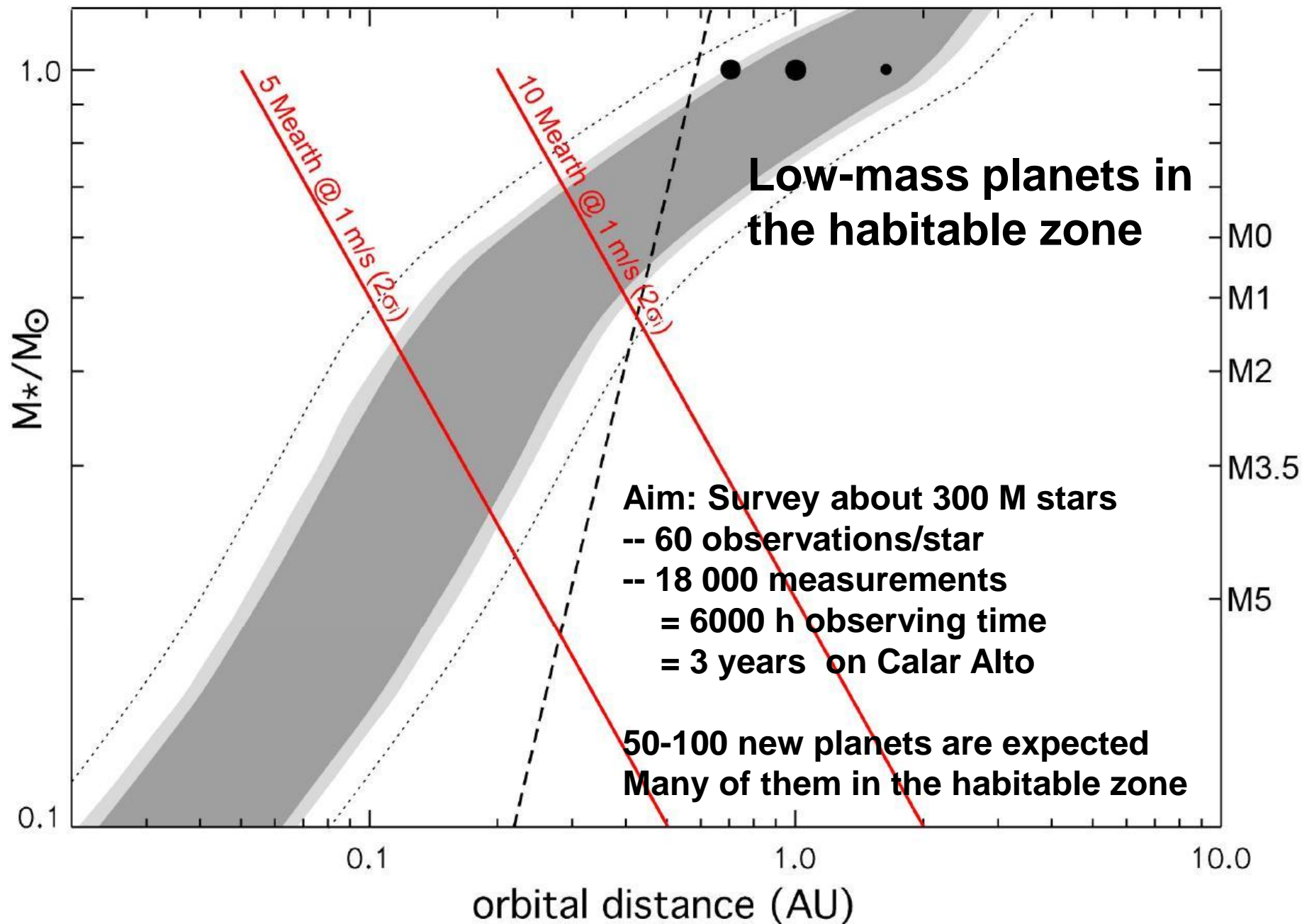


CARMENES, the instrument

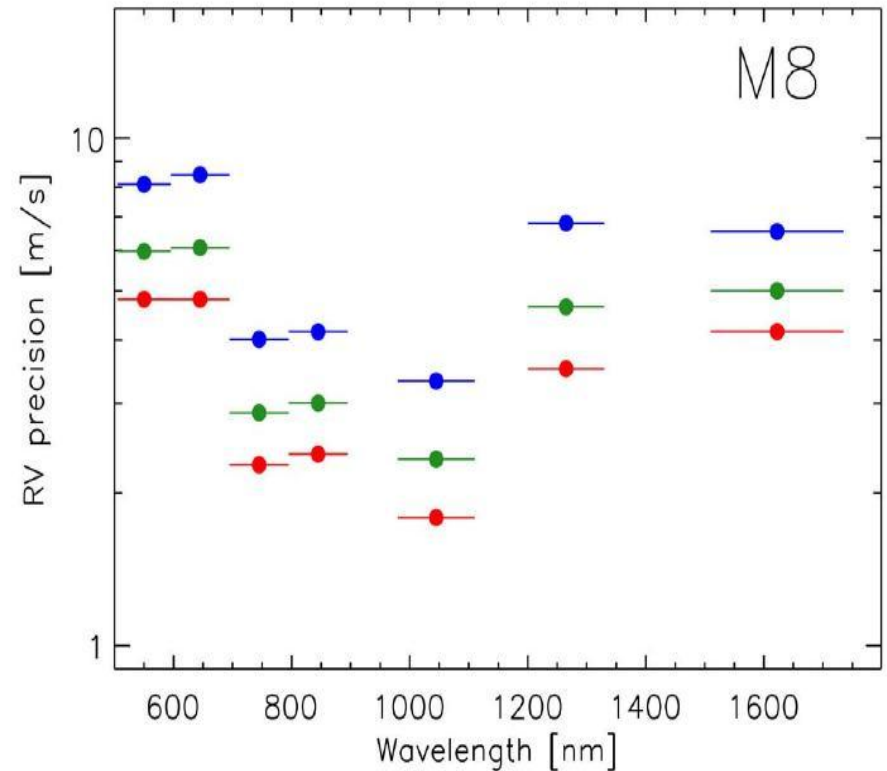
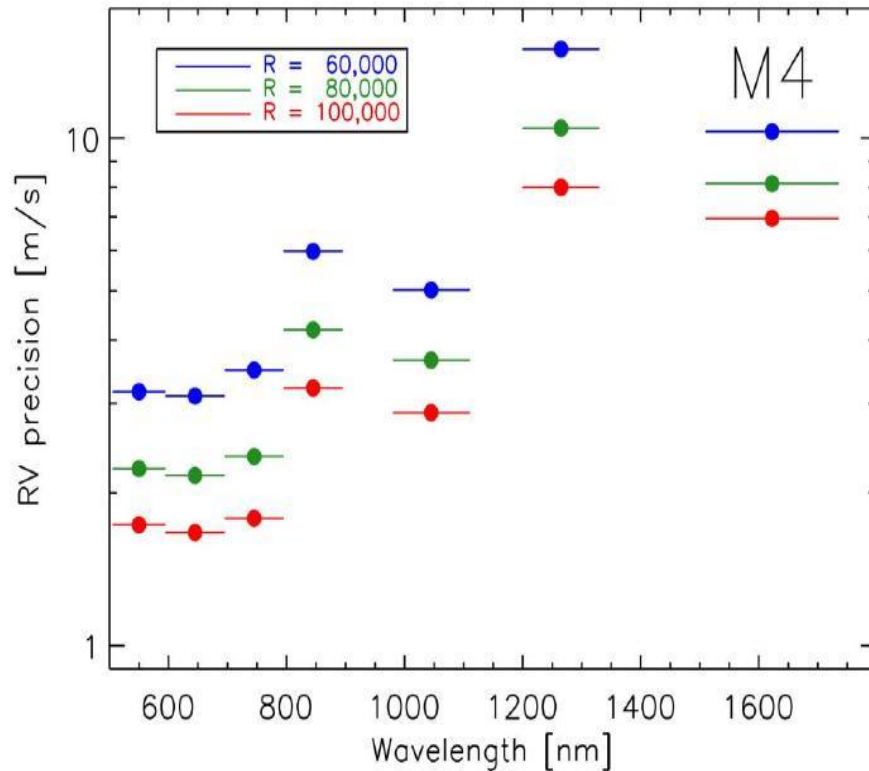


<i>Basic engineering parameters</i>	NIR channel	VIS channel
$\Delta\lambda$ [μm]	0-95-1.70 (29 orders)	0.55-1.05 (53 orders)
Cross disperser	Grism, infrasil	Grism, LF5 glass
Working T [K]	~140	~295
Detector(s)	2 x 2kx2k Hawaii 2-RG (2.5 μm)	1 x 4kx4k e2v CCD231-84
Calibration λ	U-Ne [F-P etalon]	Th-Ar-Ne [F-P etalon]
Optical parameters	Fixed R=82,000*, 2.8-pix sampling (>2.3 pix), 7-pix inter-fibre spacing	

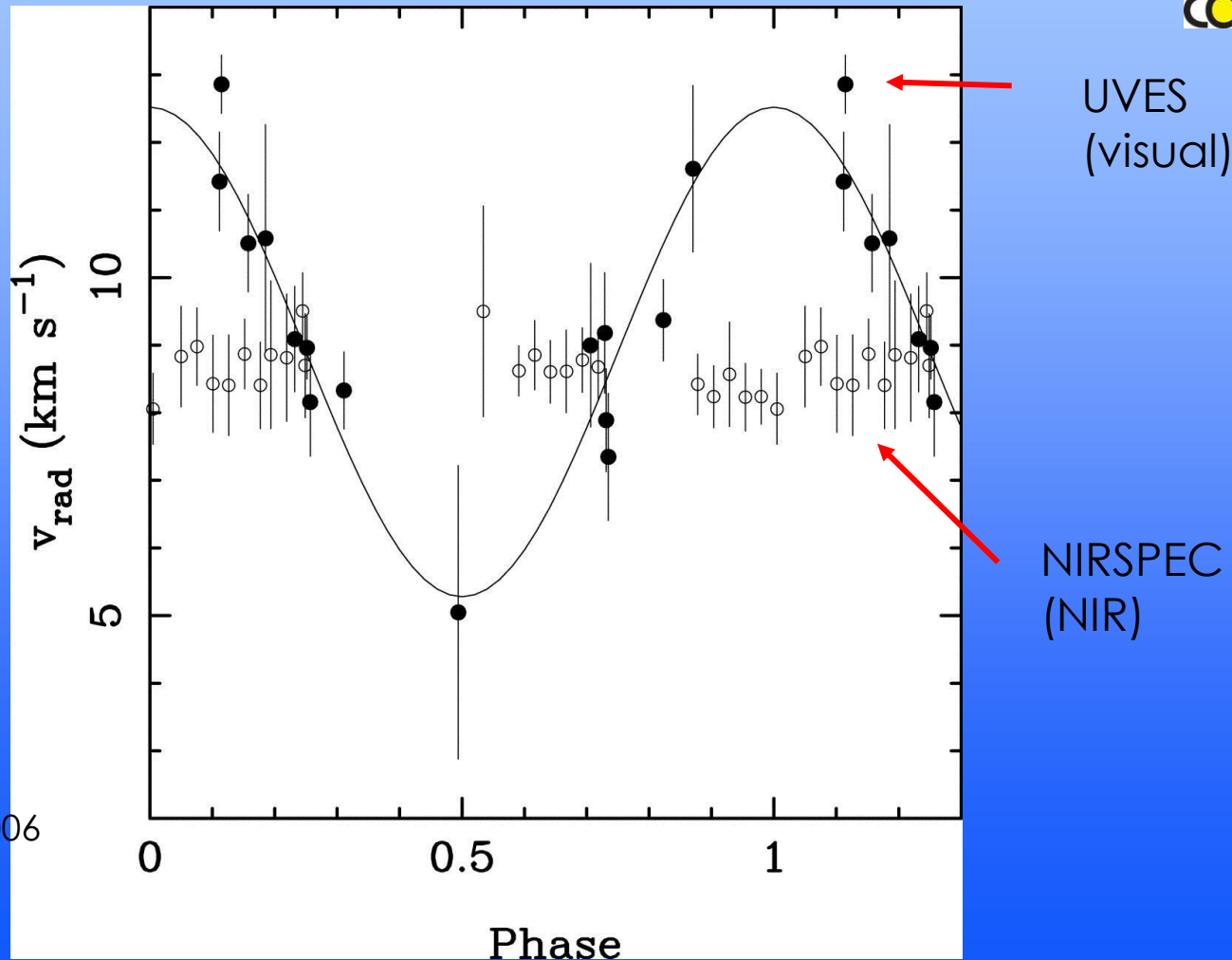




Which wavelength region provides the highest RV precision?



Let's Talk About jitter



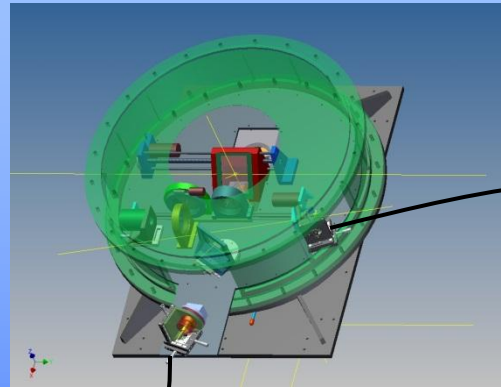
Martin et al. 2006

RV curve of the active M9 dwarf LP-944 20

Instrument Overview



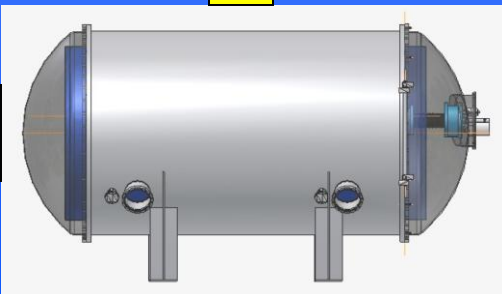
Front-End



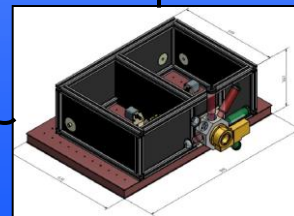
Cooling System
Vac.pumps
Sensors
MCE

ICS + ICE
GUI
Scheduler
Pipeline

Scrambler



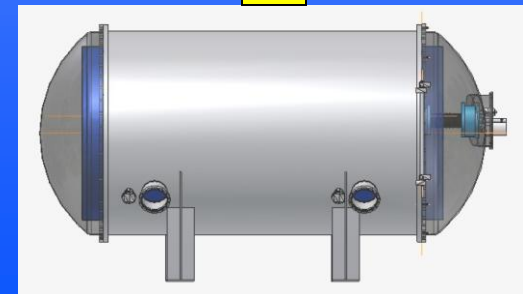
XPM



CalUnit



Scrambler

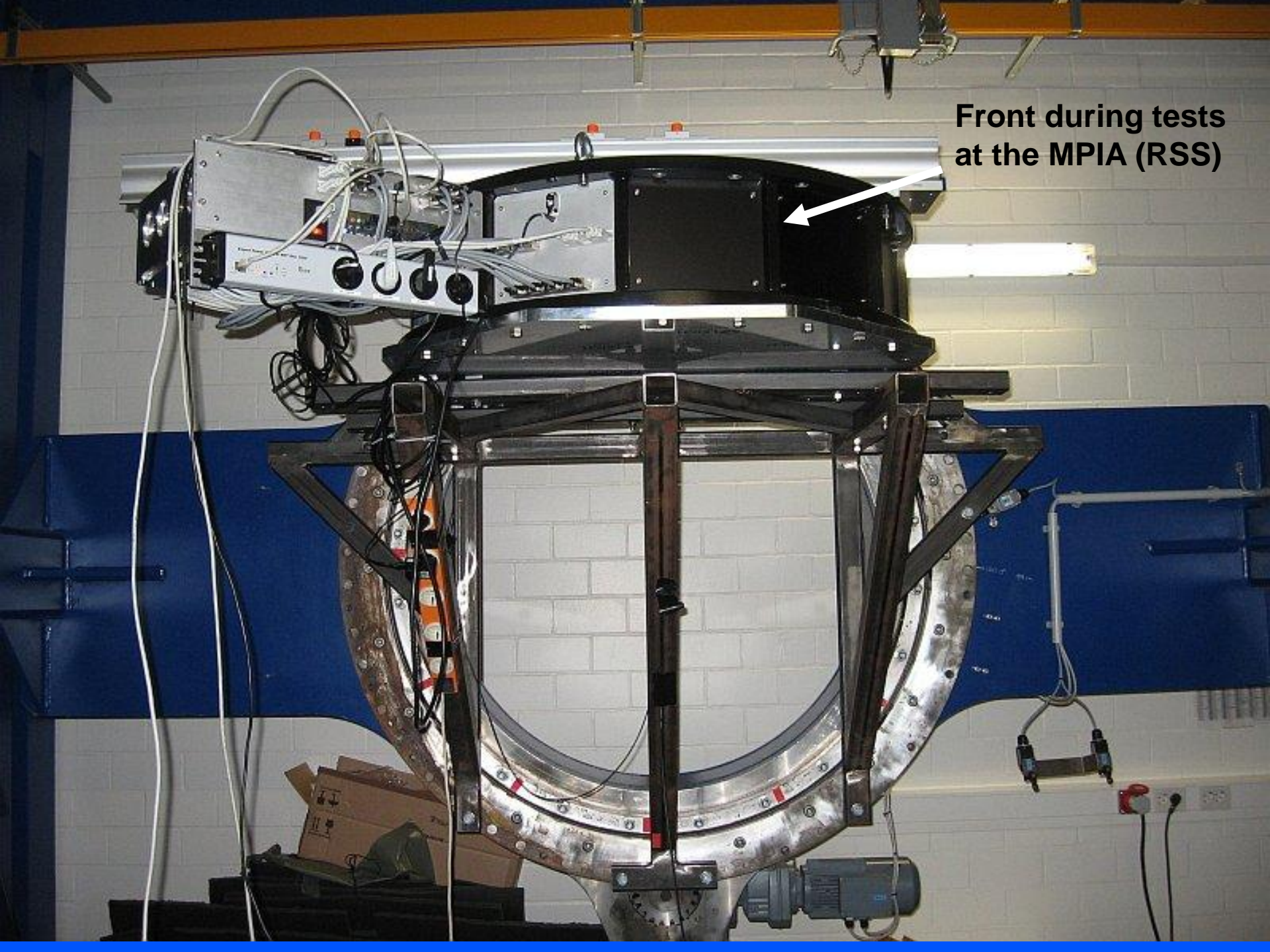


XPM

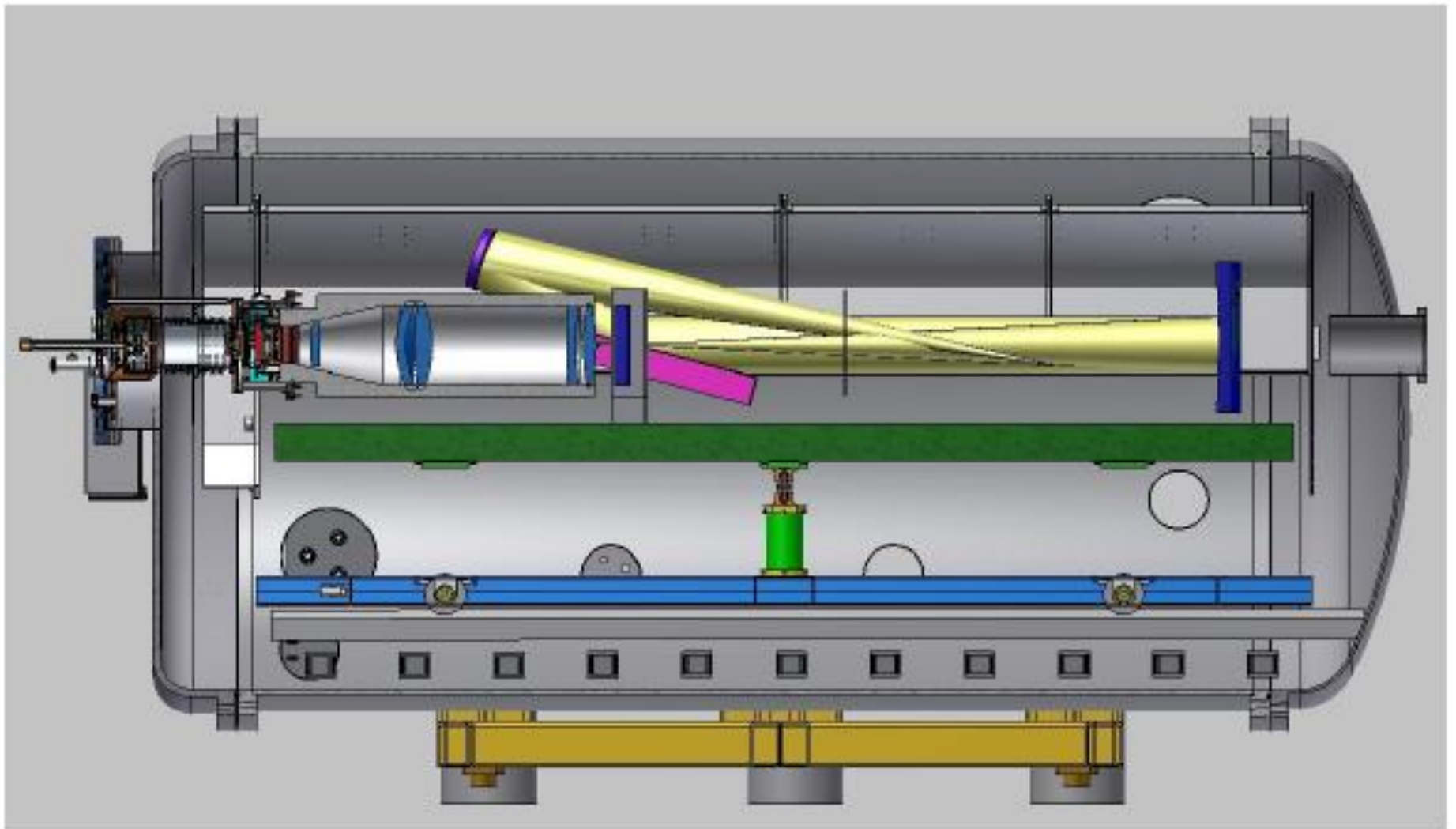
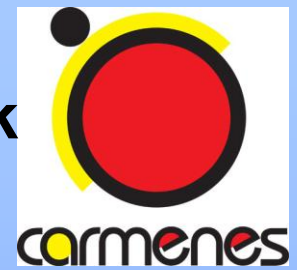
NIR Spectrograph 140 K

VIS Spectrograph 285 K

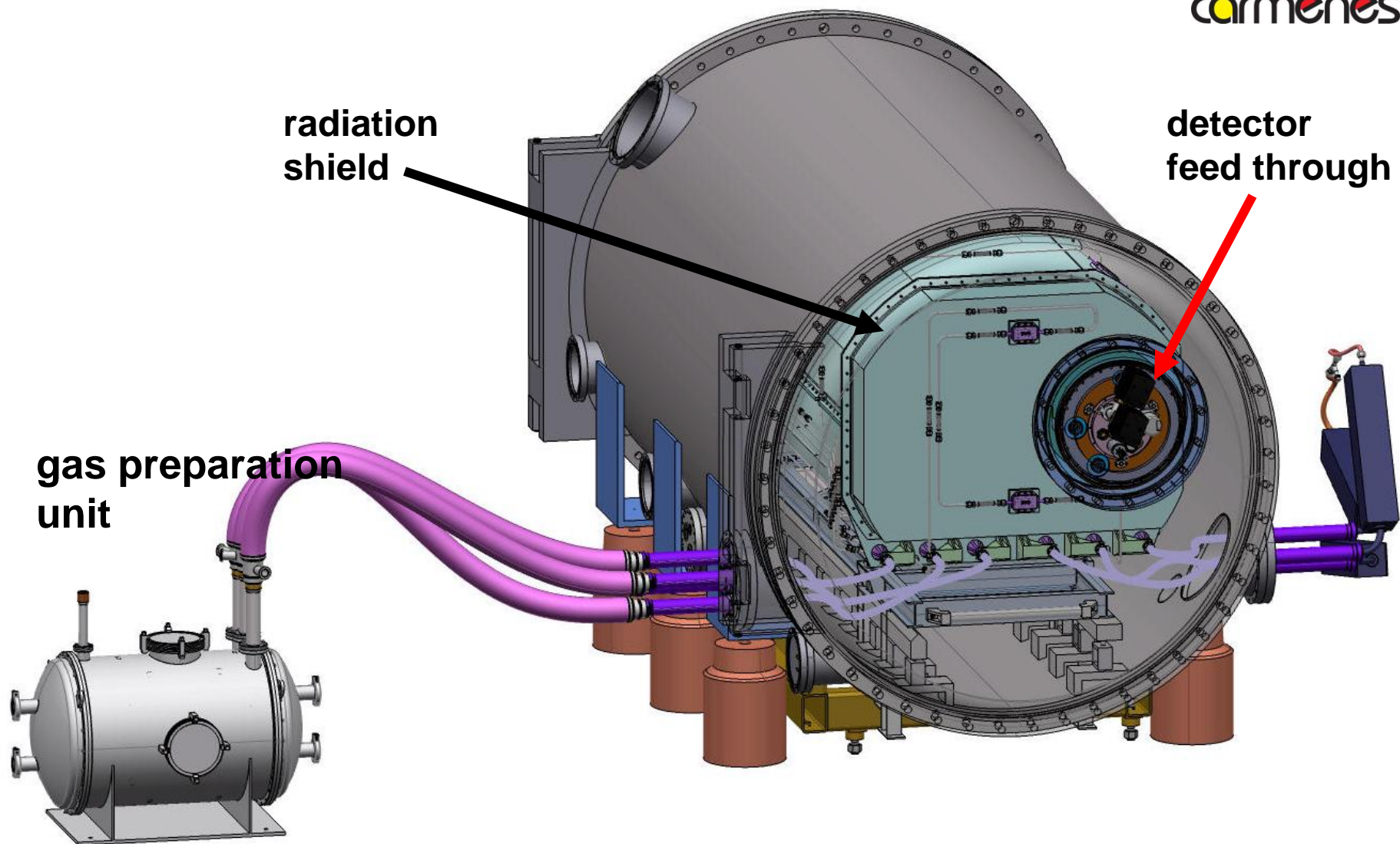
Front during tests
at the MPIA (RSS)



Optical bench, detector cryostat and vacuum tank



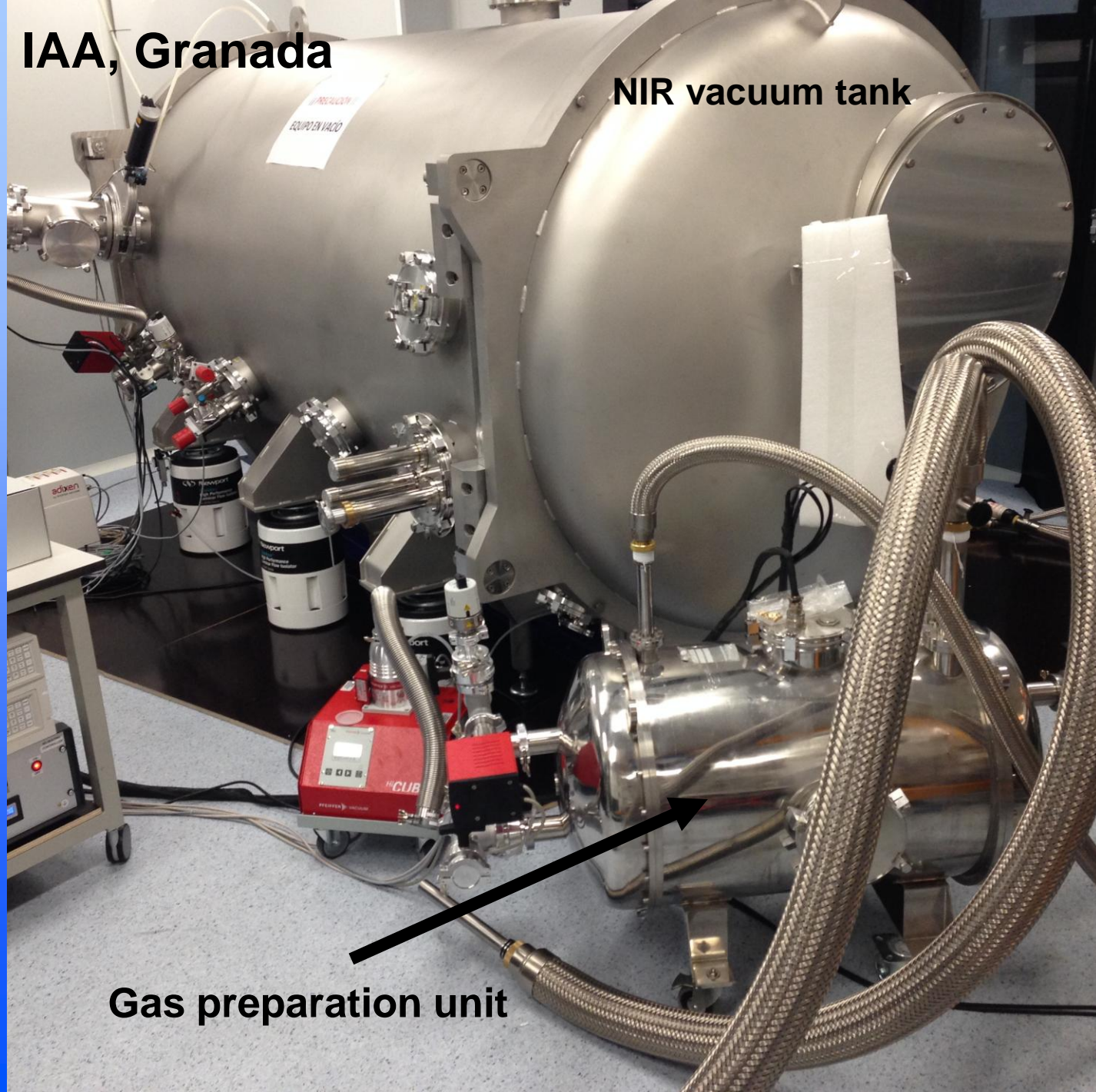
NIR spectrograph 140 K

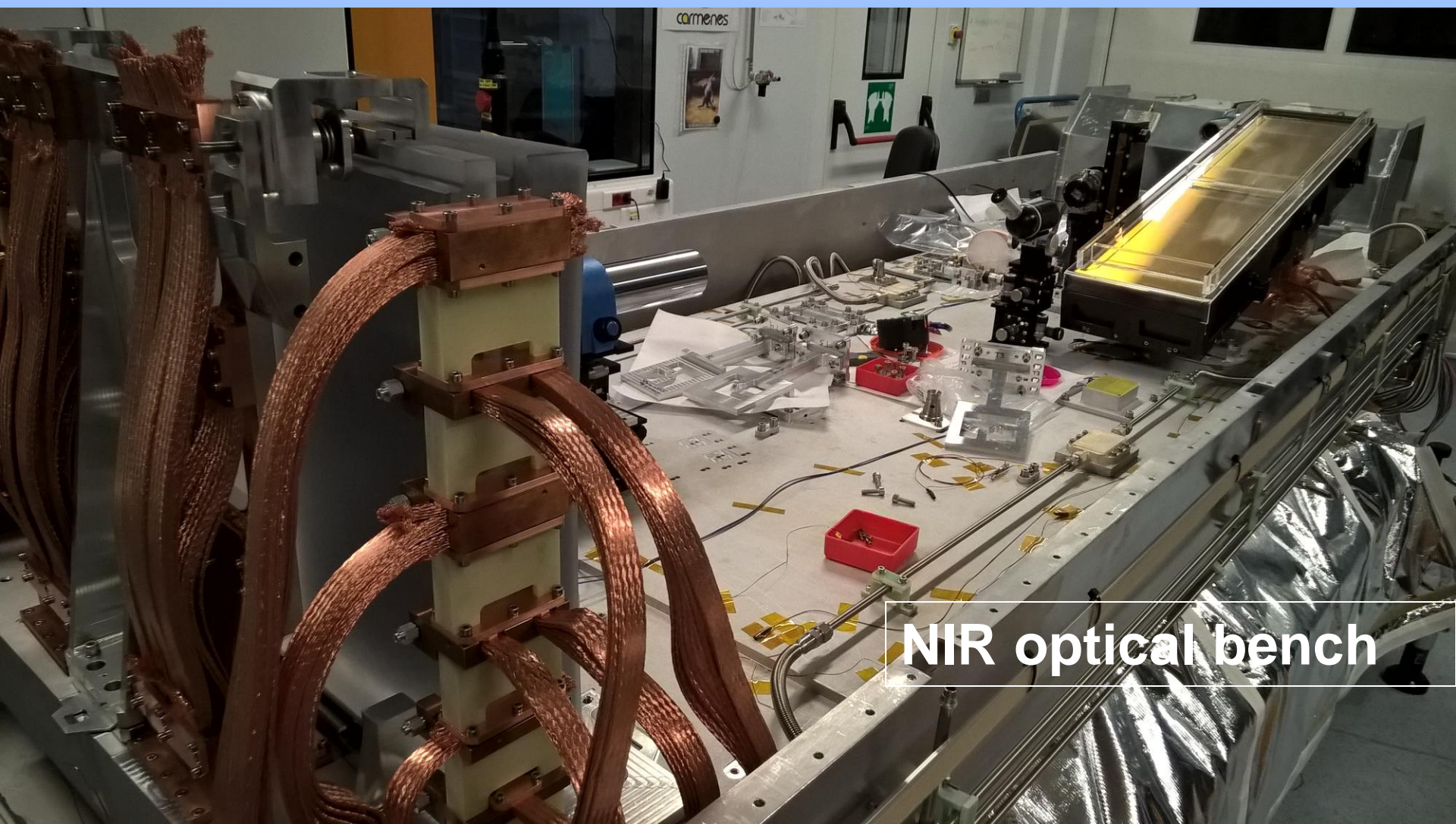


IAA, Granada

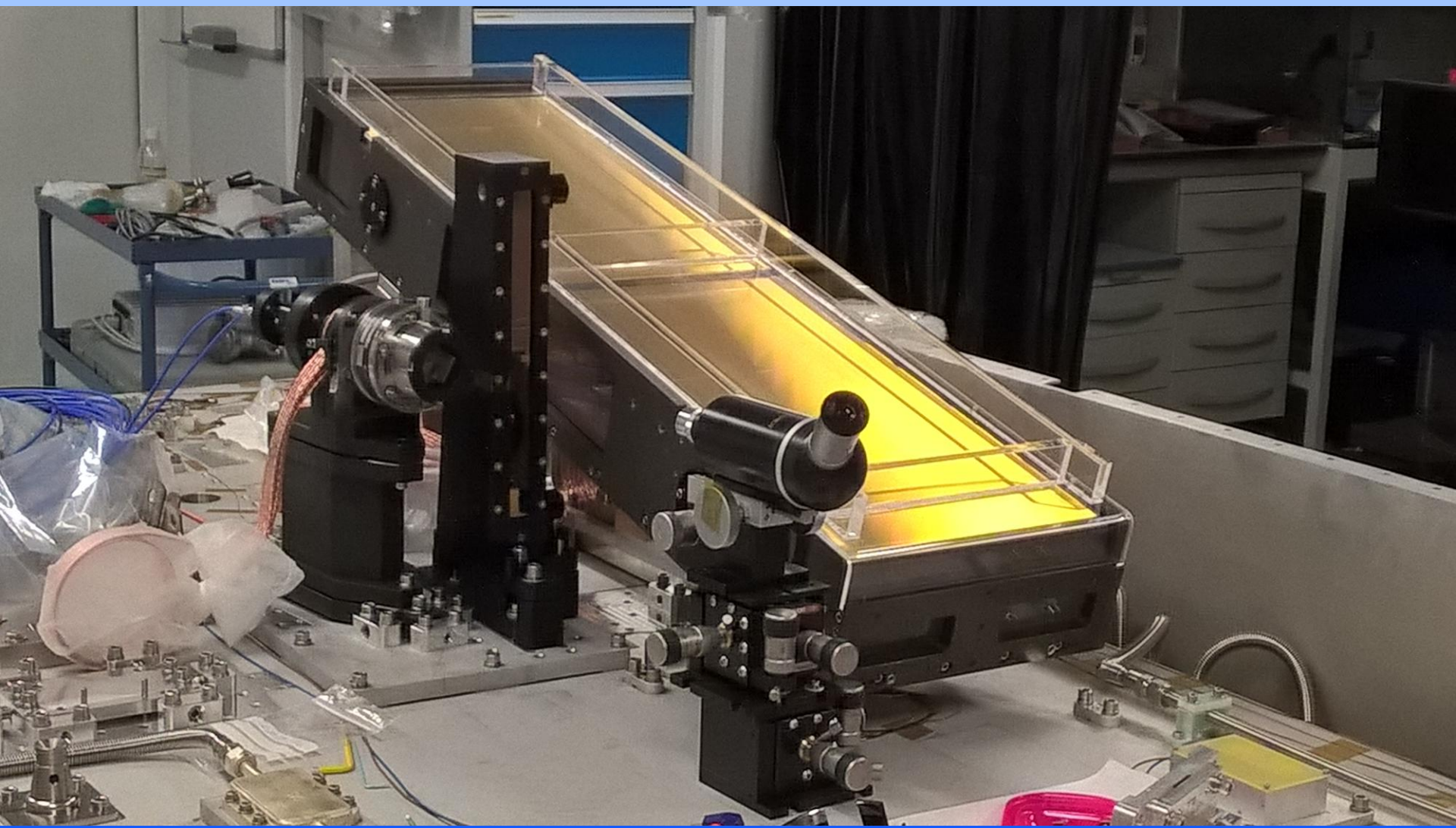
NIR vacuum tank

Gas preparation unit



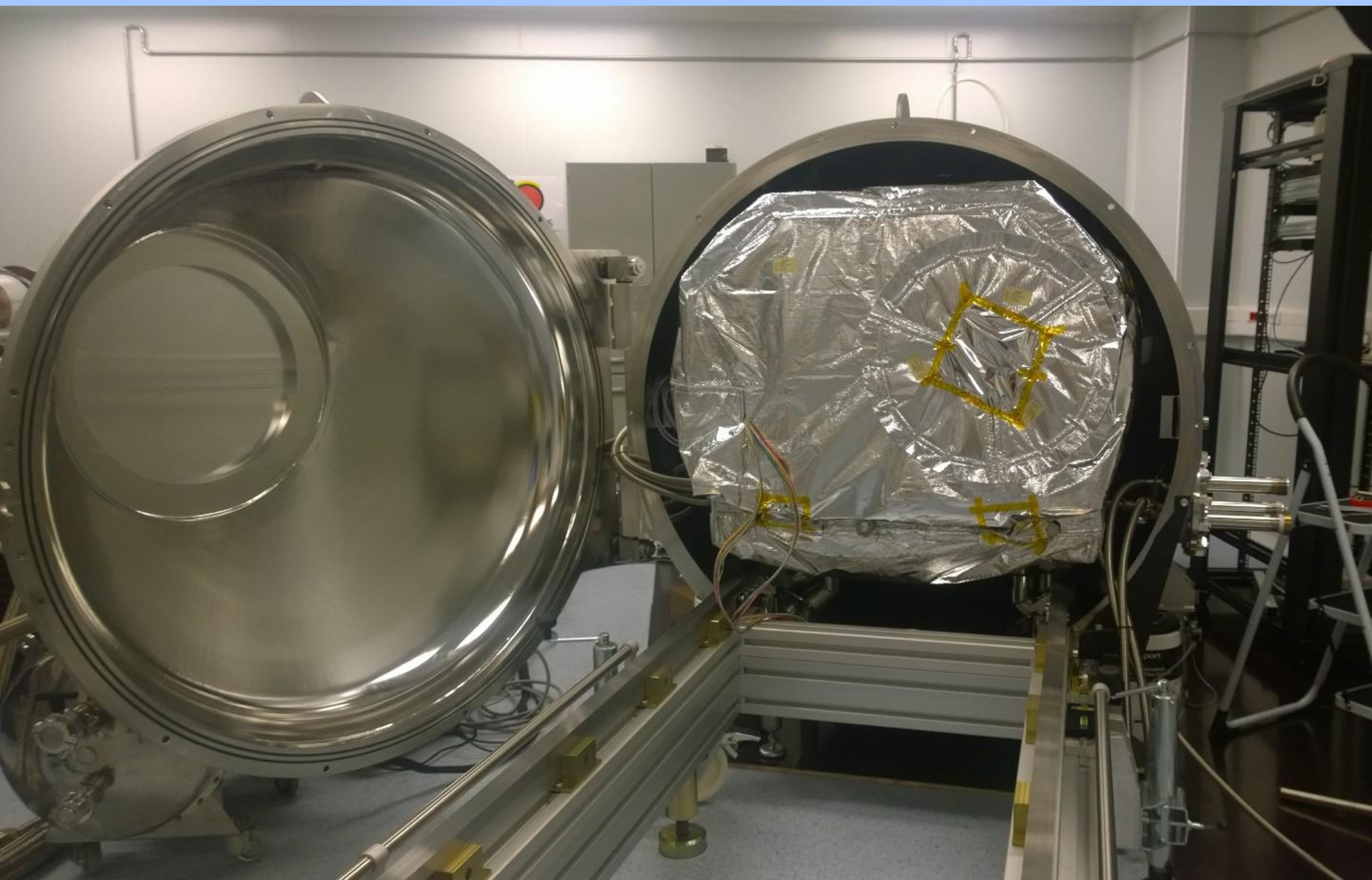


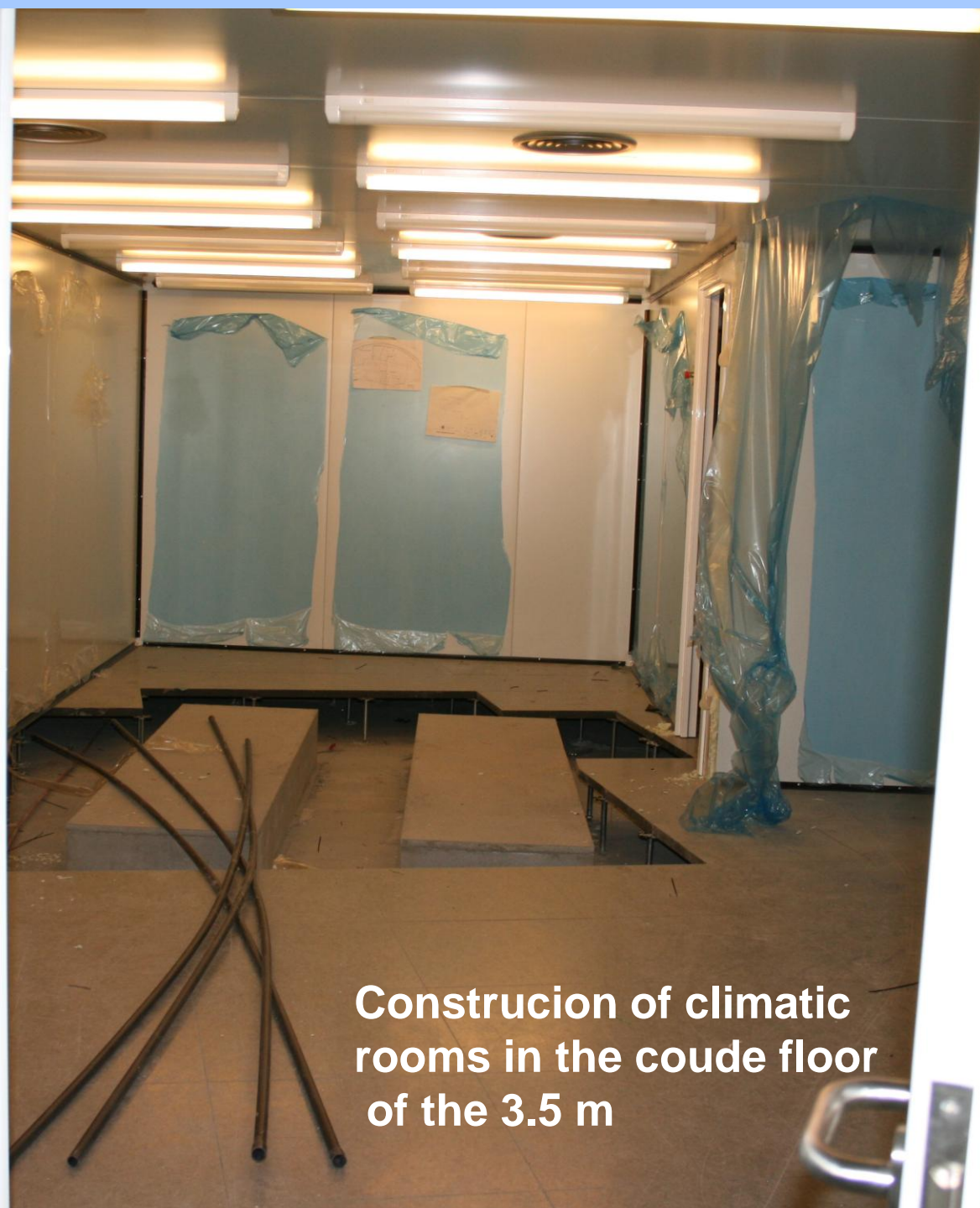
NIR optical bench



Radiation shield test







Construcion of climatic
rooms in the coude floor
of the 3.5 m

93 72
Jueves 23/
Miércoles 24/10
Wolker



Climatic rooms neary finished, stabilized to 15 ± 0.2 degrees

• Main milestones

- 28 Dec. 2015 CARMENES in operation
- 06 Nov. – 17 Dec 2015 VIS+NIR Com.No. 2
- Oct. 2015 NIR channel shipping to CAHA
- 02-15 Okt. VIS Com.No. 1
- Aug. 2015 VIS optical bench shipping to CAHA
- July 2015 VIS vacuum tank shipping to CAHA
- 24-28 June 2015 Front-end ComNo. 2

Part 2: Hawaii 2RG detector mosaic and detector flow cryostat

Main MPIA hardware tasks/aims:

- building of a detector flow cryostat
 - building of detector read out electronic (ROE)
 - providing the software (GEIRS)
 - characterization of the detector mosaic
- (-- science preparation between 2010-2014)

MPIA Team

Böhm (+mech. workshop), U. Grözing, D. Hermann,
A. Huber, R. Klein, W. Laun, U. Mall, R. Mathar,
L. Mohr(+ electr. workshop), R. Mundt, V. Naranjo,
J. Panduro

MPIA contribution

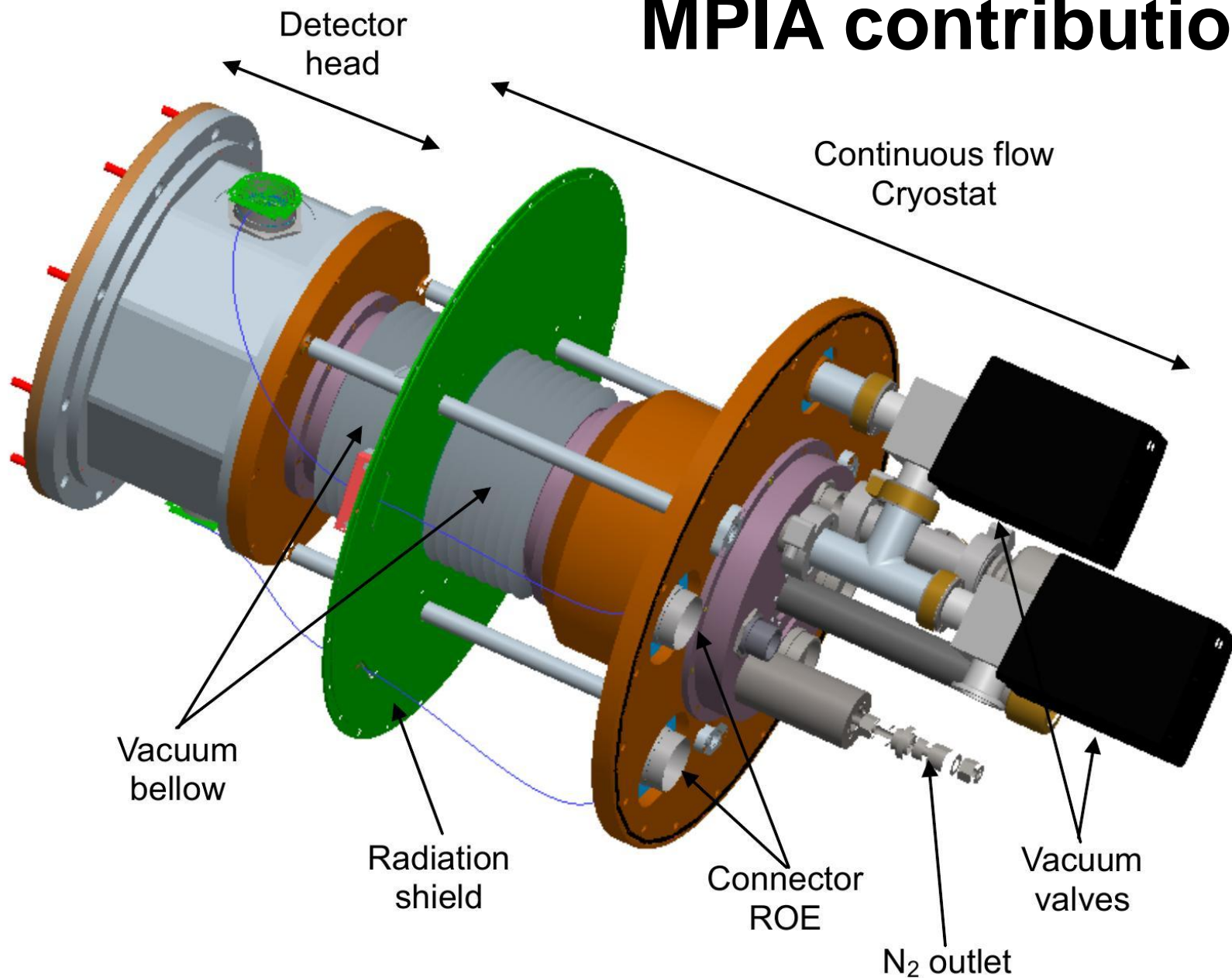


Figure 2: Flow cryostat for the NIR detector array

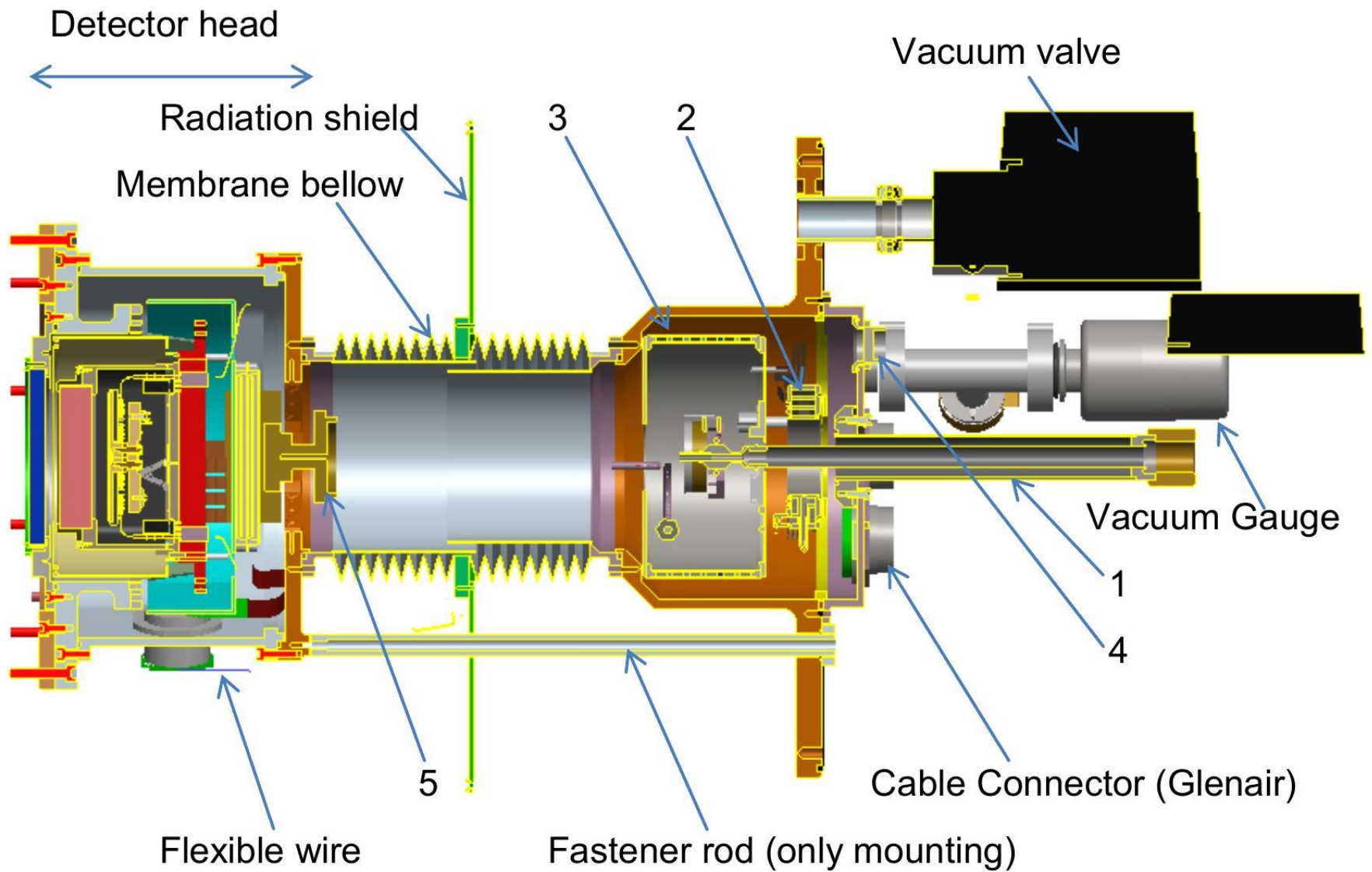


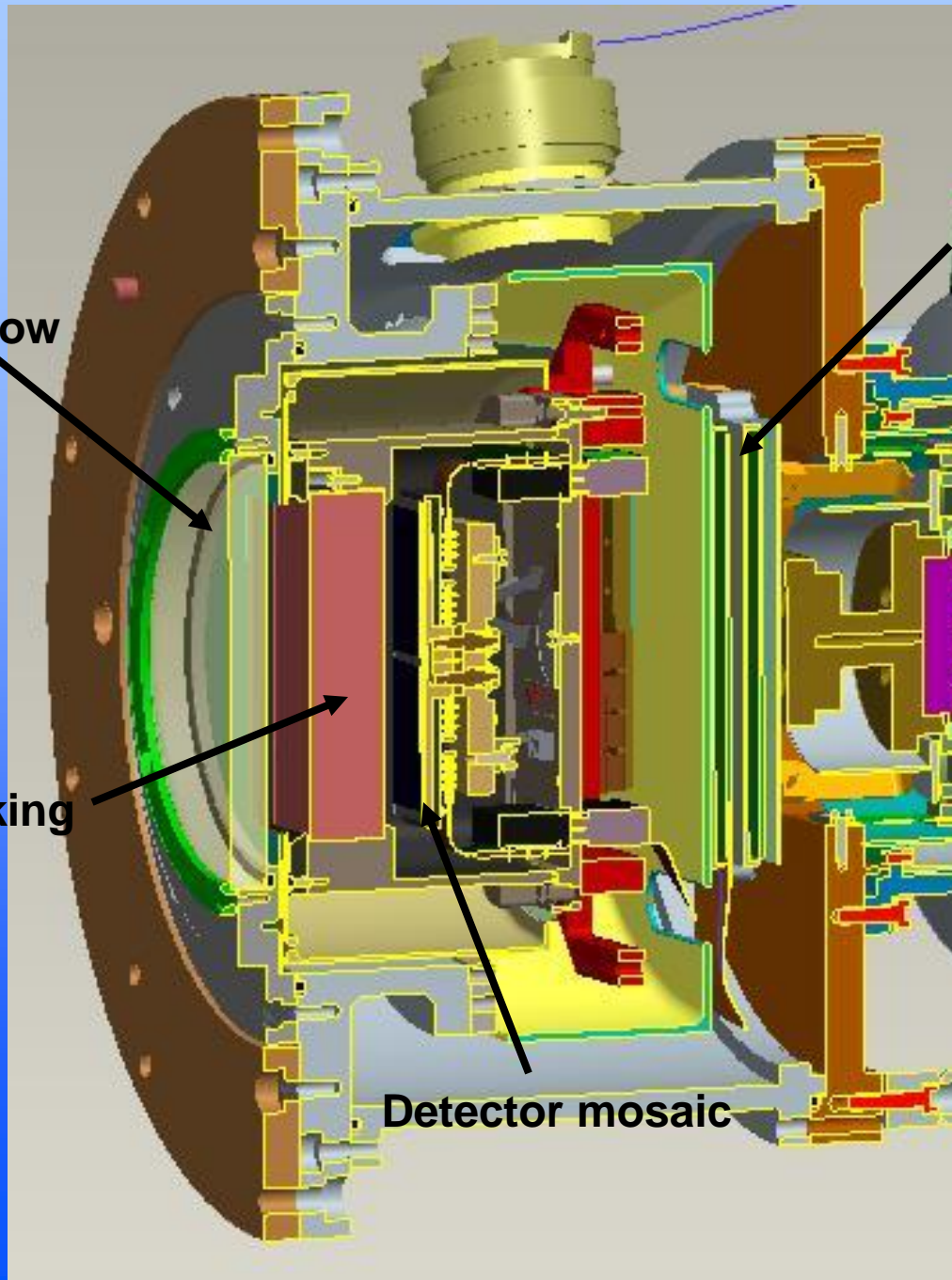
Figure 3: Cryostat (cut)

Entrance window

**Blocking
filter**

Detector mosaic

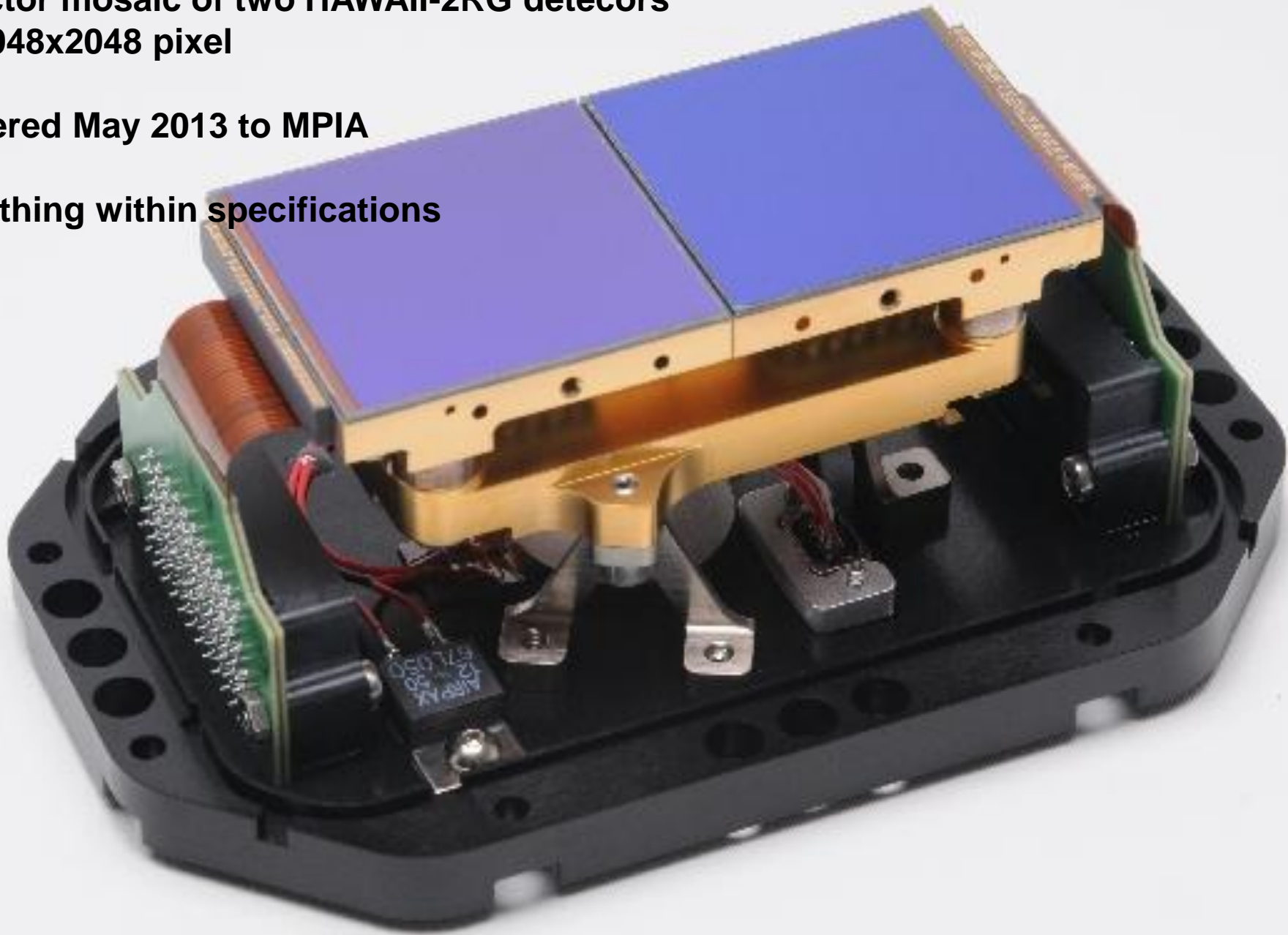
Pre amplifiers

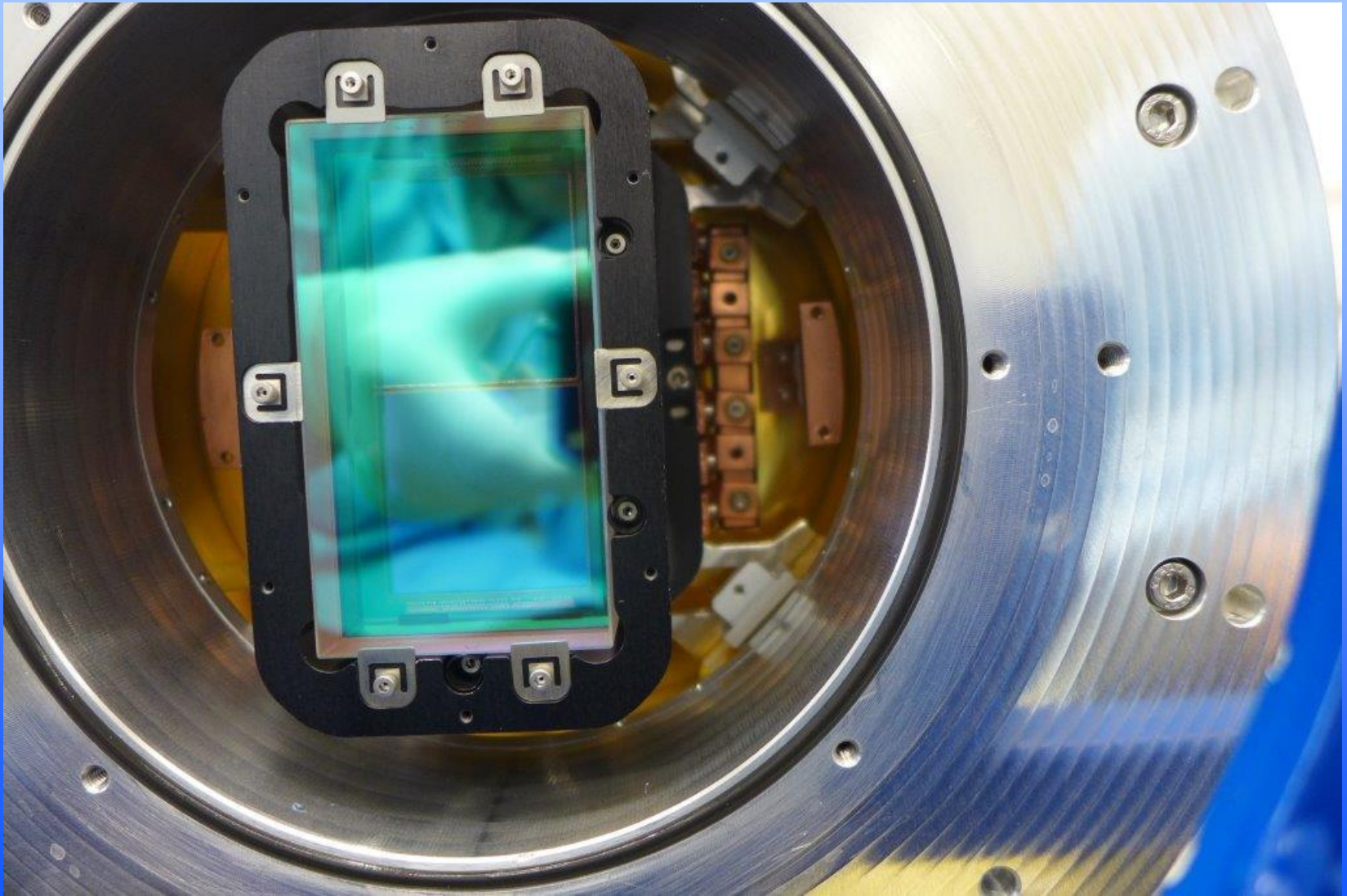


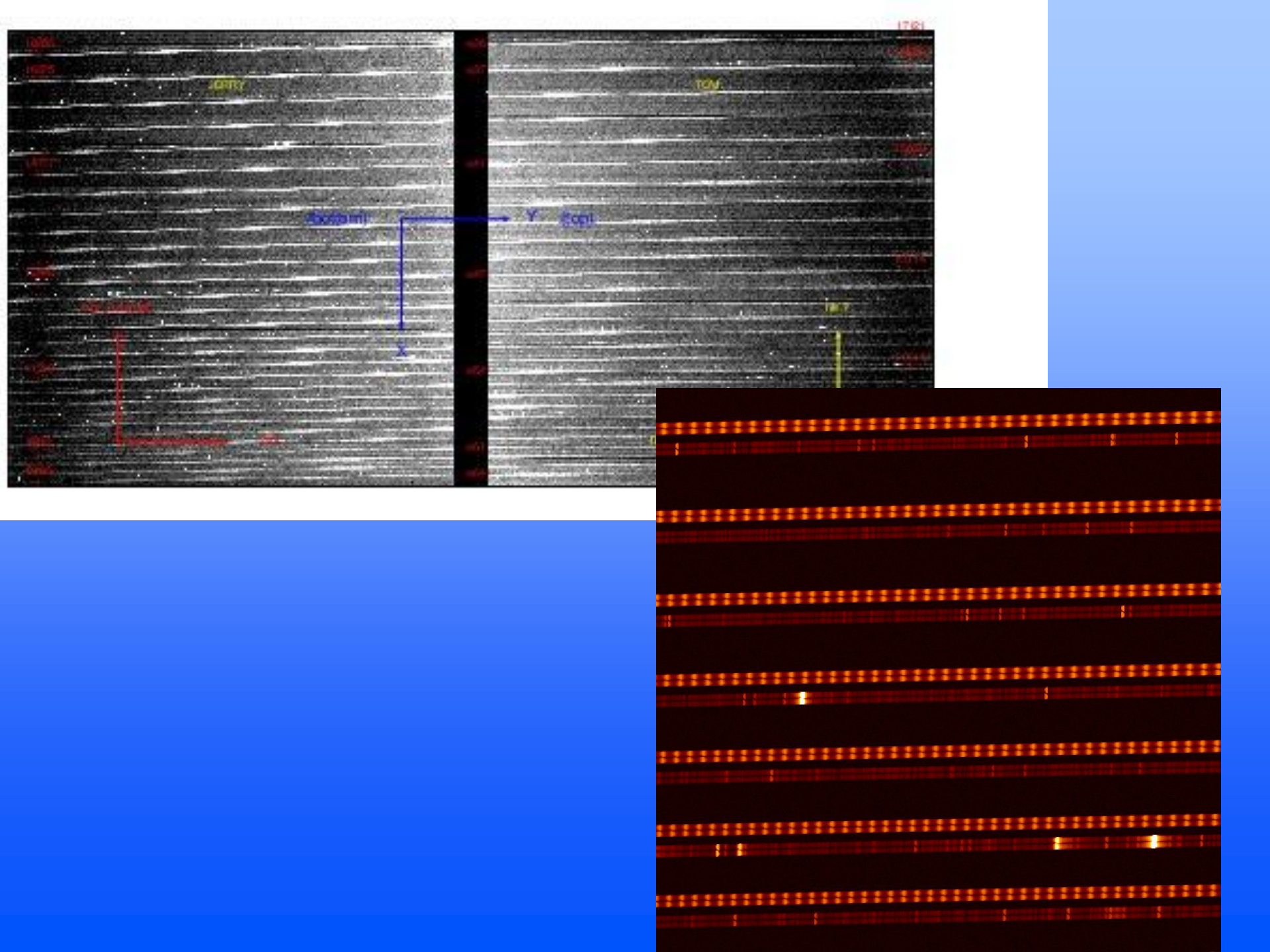
**Detector mosaic of two HAWAII-2RG detectors
2 x 2048x2048 pixel**

delivered May 2013 to MPIA

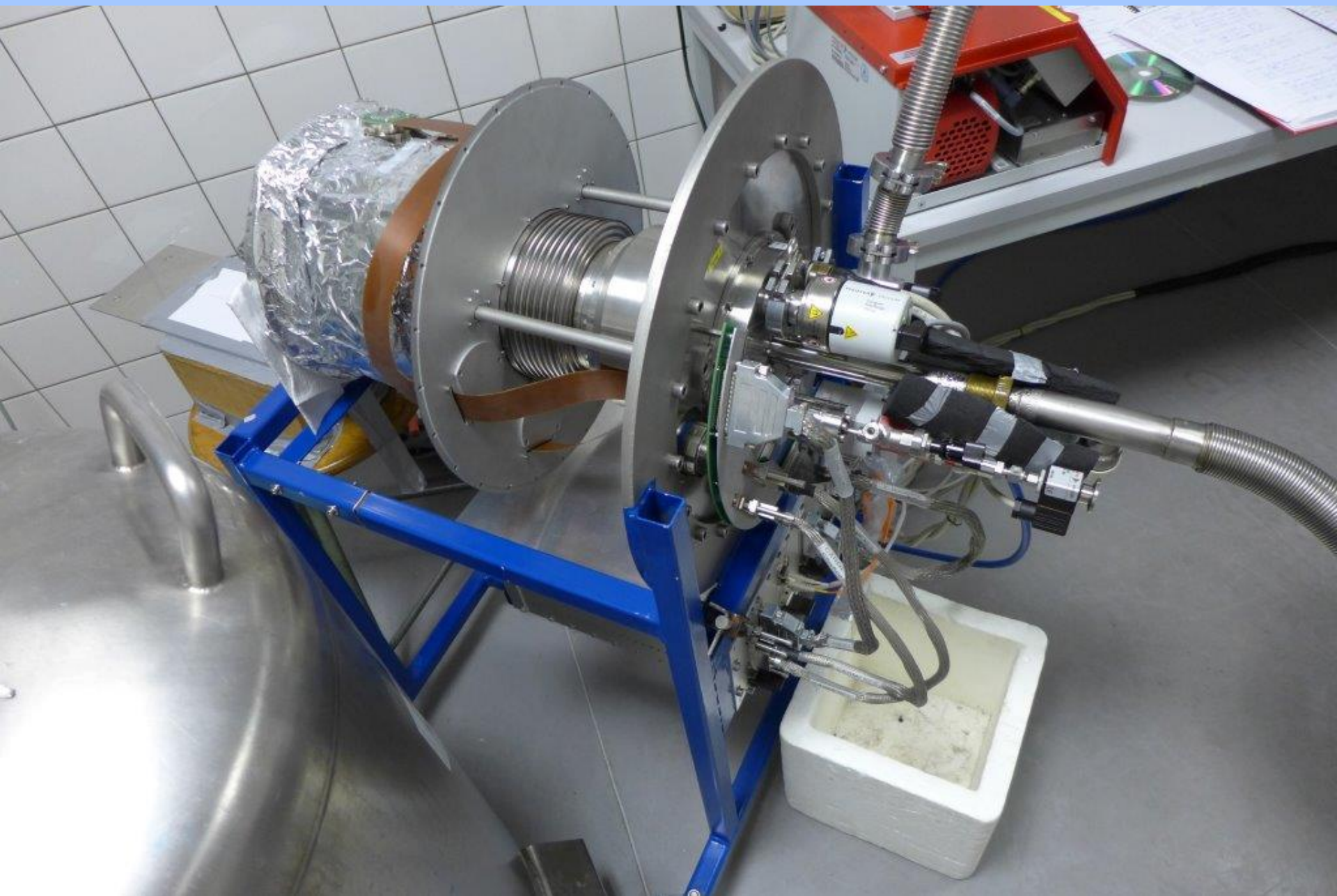
everything within specifications





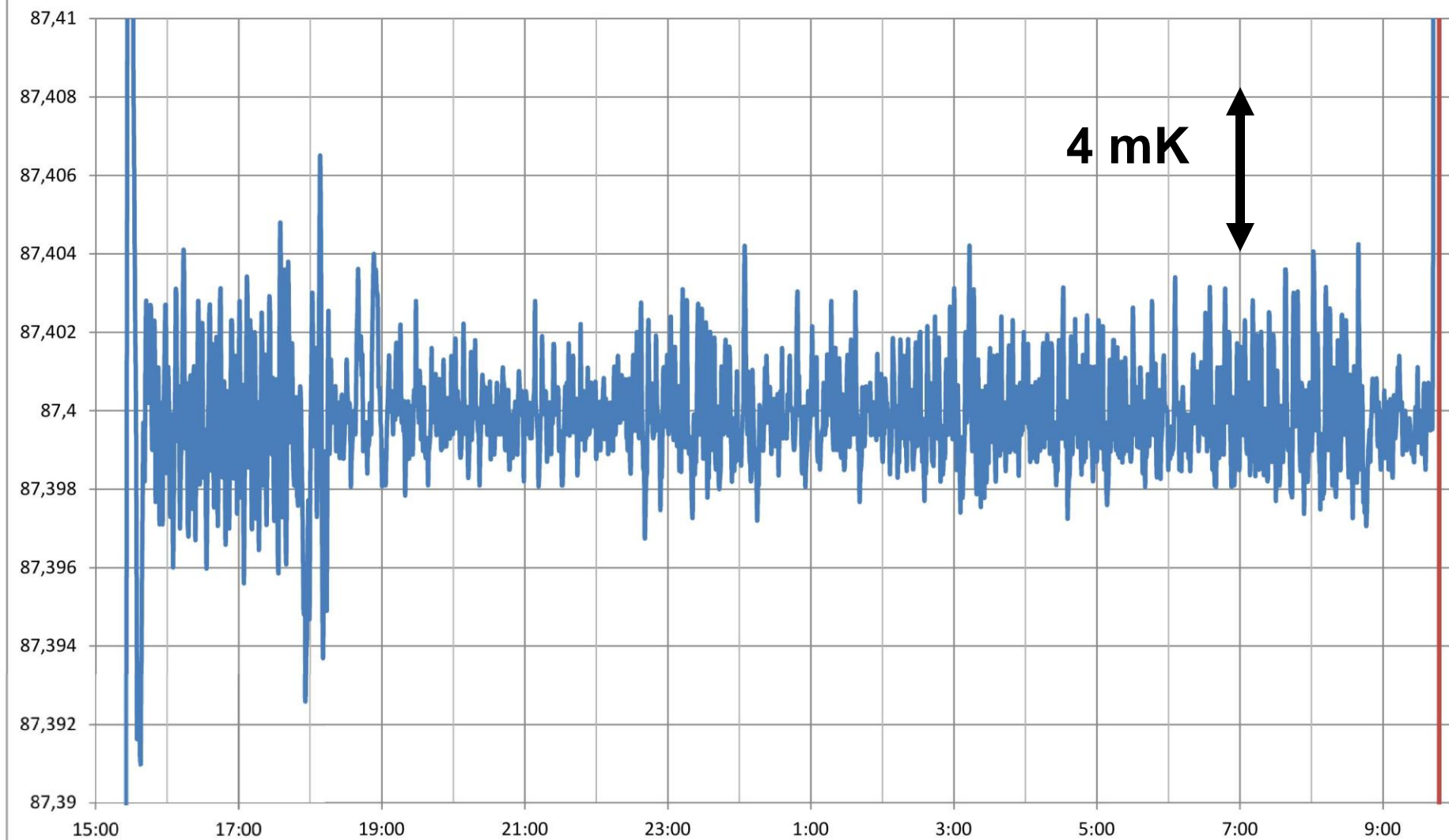








Temperature stability detector 22 April - 23 April 2015



Detector properties, Hawaii 2RG 2048x4096 px

Mean QE at	SCA 1	SCA 2
	Measured (e-/ph)	Measured (e-/ph)
800 nm	0.86 ± 0.02	0.83 ± 0.02
1000 nm	0.85 ± 0.03	0.76 ± 0.05
1230 nm	0.87 ± 0.04	0.80 ± 0.06
2000 nm	0.88 ± 0.05	0.83 ± 0.05

Readout mode	Dark Current SCA 1	Dark current SCA 2
CDS @ 77K	0.002 e-/s	9.11E-4 e-/s

Readout mode	SCA 1 RON (e-)	SCA 2 RON (e-)
lir	11,2	9,8
srr-5	13,2	12,3
srr-11	9,2	8,9

Linearity measurements



