

PANIC – REACTIONS AFTER CRYOSTAT LEAK

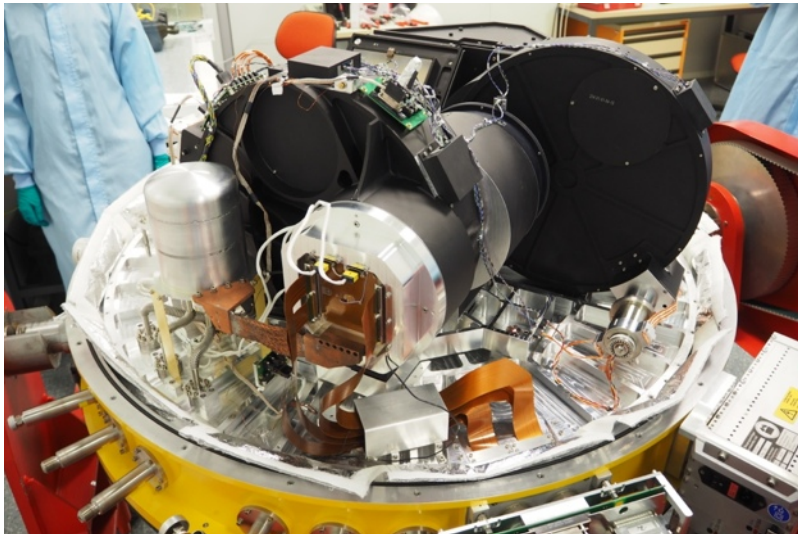


Bernhard Dorner, 27 March 2015
MPIA AstroTechTalk

What's PANIC again?

- **P**Anoramic **N**ear-**I**nfrared camera for **C**alar Alto
- Pls: (Fried,) Meisenheimer, /me (MPIA), Fernandez (IAA)
- Alternative acronym interpretations:
 - ▶ **P**ainful **A**lignment, **N**ever **I**ntegrated **C**ompletely
 - ▶ **P**ainful **A**lignment, **NOW** **I**ntegrated **C**ompletely
 - ▶ **P**artially **A**ging **N**ear-**I**nfrared **C**hips
 - ▶ **P**robleme **A**uch **N**ach **I**nbetriebnahme am **C**alar Alto

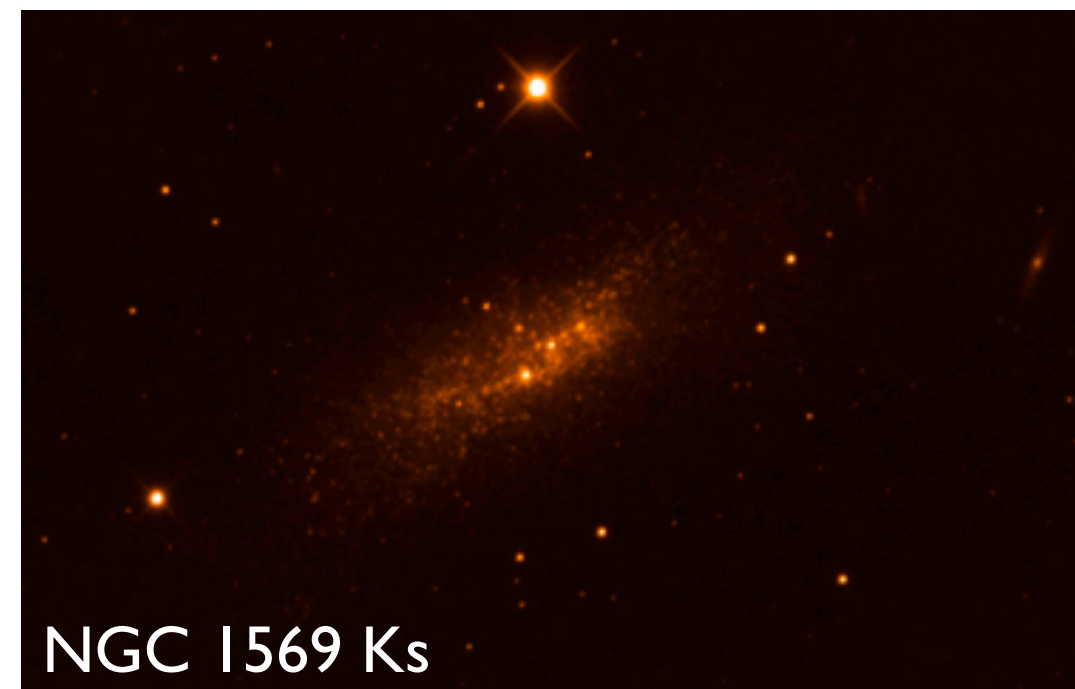
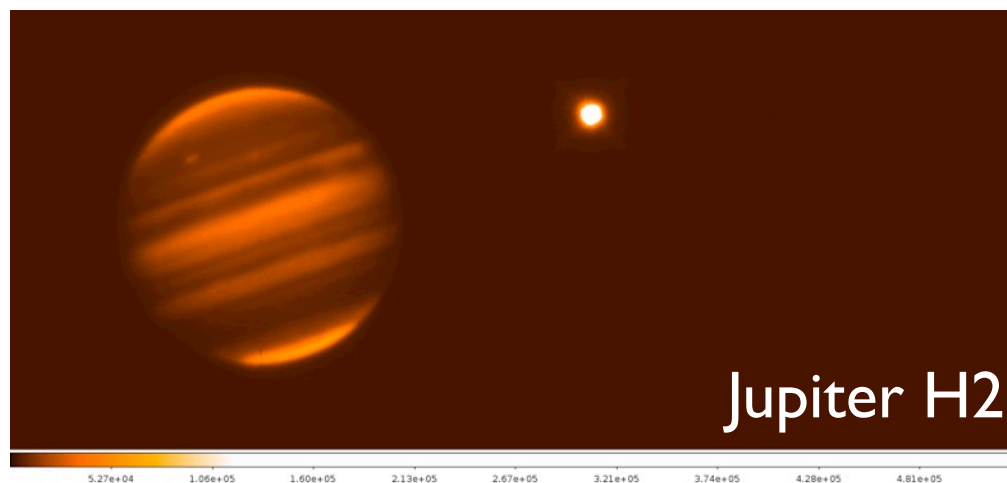
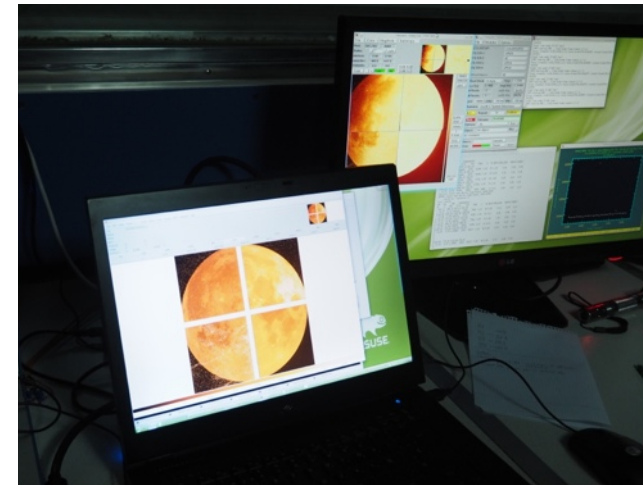
PANIC Overview



Telescope	2.2m	3.5m
FOV	30'×30'	15'×15'
Pixel scale	0.45''	0.225''
Detectors	2×2 mosaic of H2RG 2k×2k	
Filters	Z,Y,J,H,Ks; H2 (expandable)	

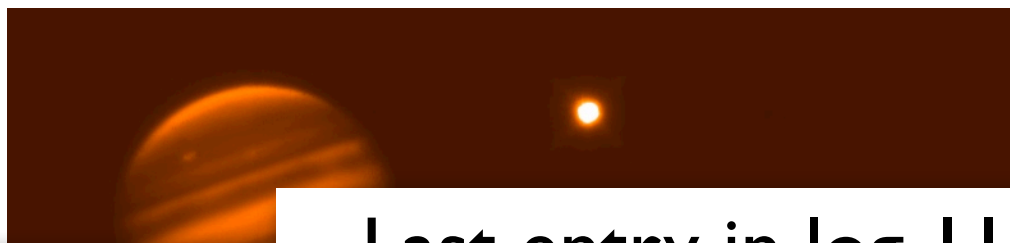
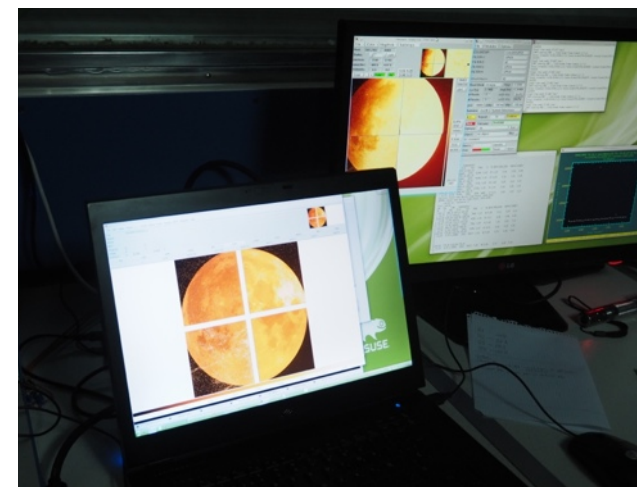
The story at CAHA before

- Delivery to CAHA and reintegration in Oct 2014
- First light at 2.2m 6th Nov 2014
- First useful observations at 2.2m Dec 2014
- Second first light at 3.5m March 2015
- No handover yet

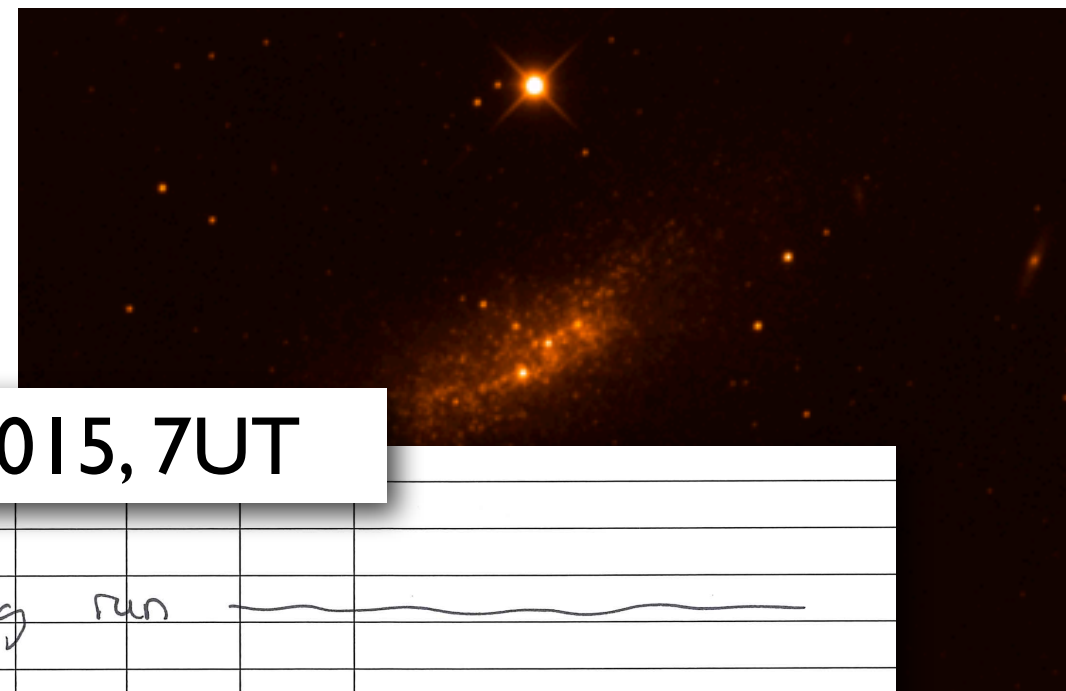
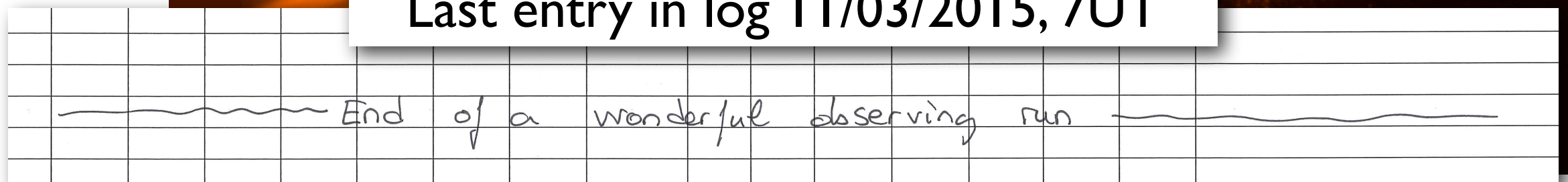


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Last entry in log 11/03/2015, 7UT



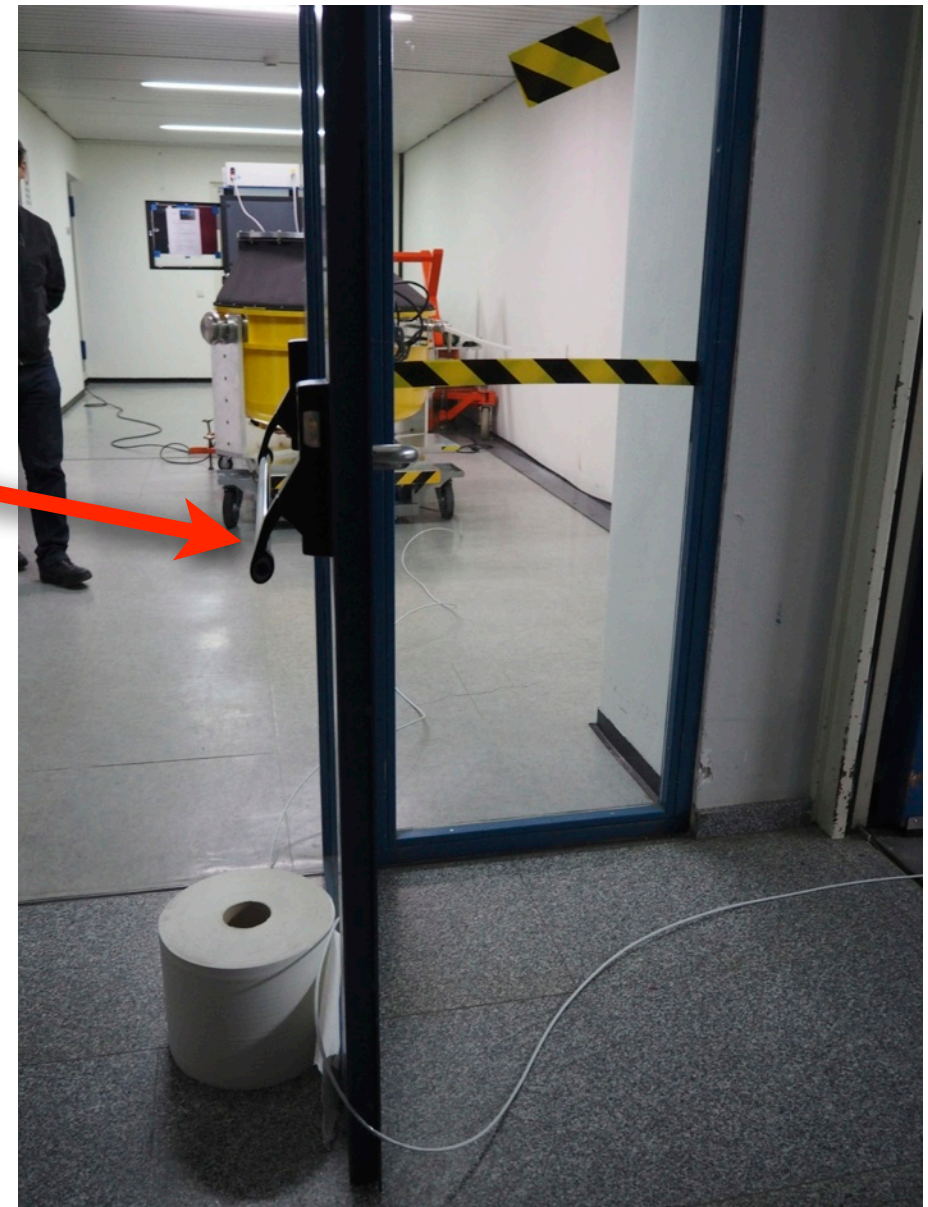
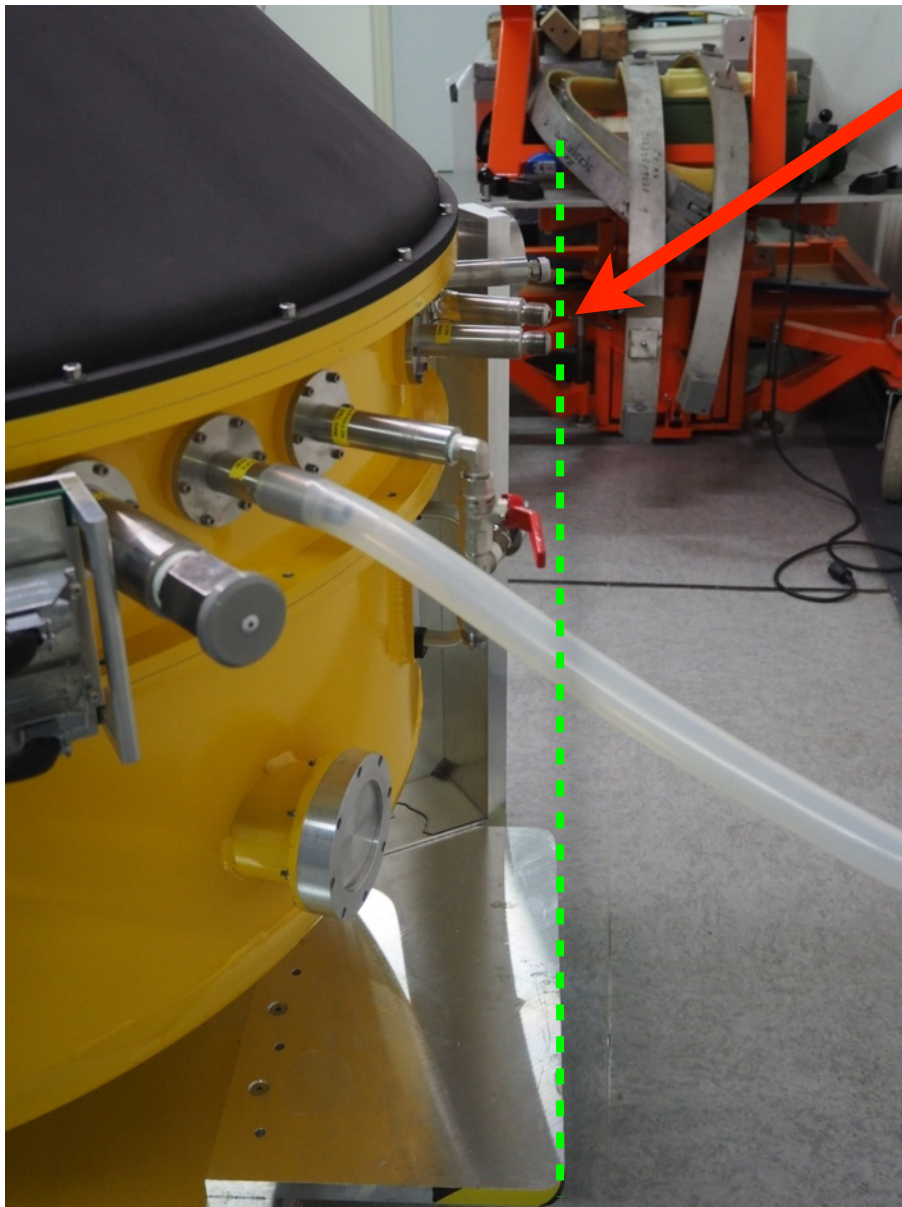
The accident: what

- Nitrogen exhaust pipe torn from flange: leak in cryostat
- Vacuum loss within few minutes
- Air in instrument, warming up, outside later frozen



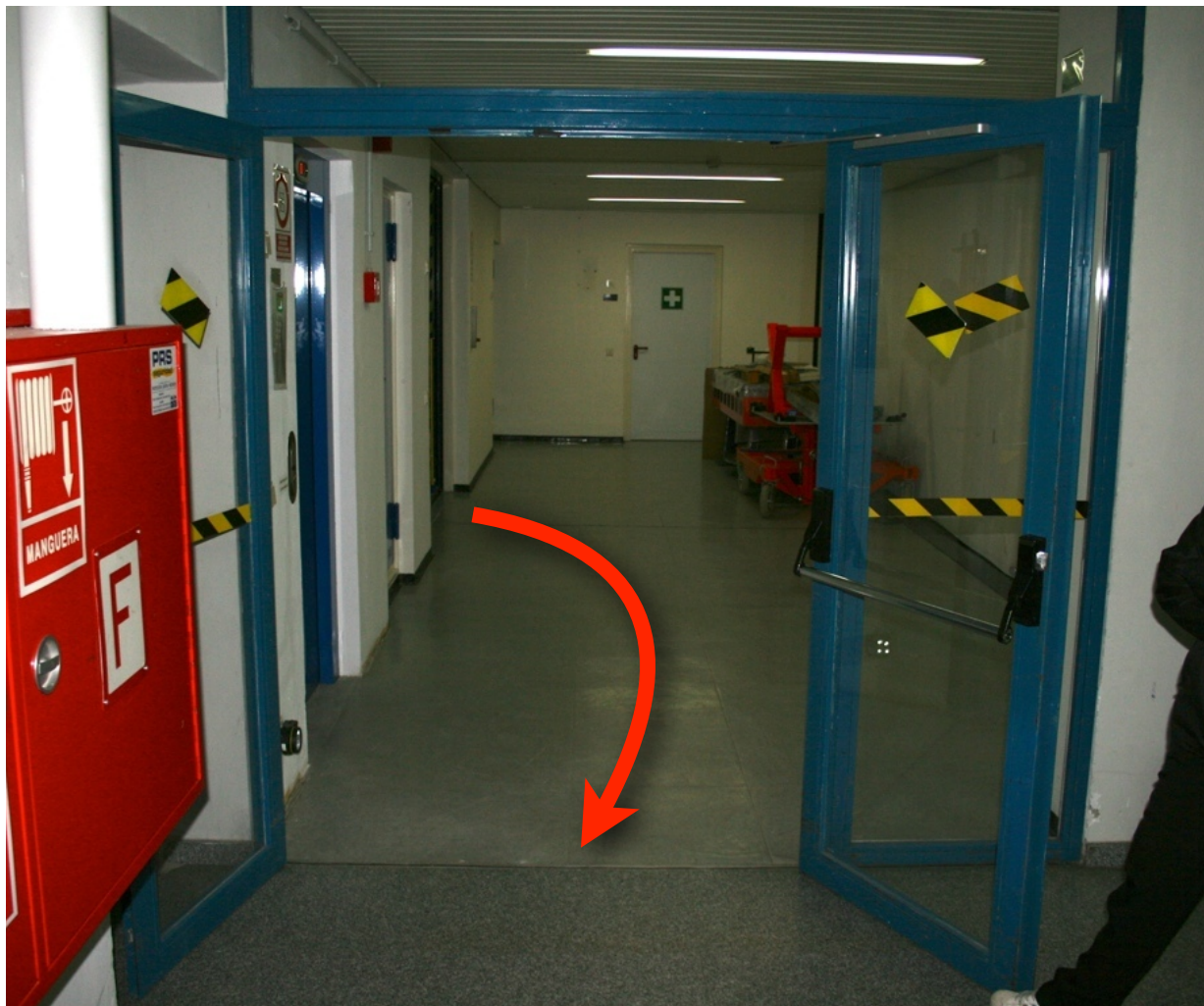
The accident: how

- Collision of pipe with panic bar (oh the irony)
- Protective bumper plate not helping



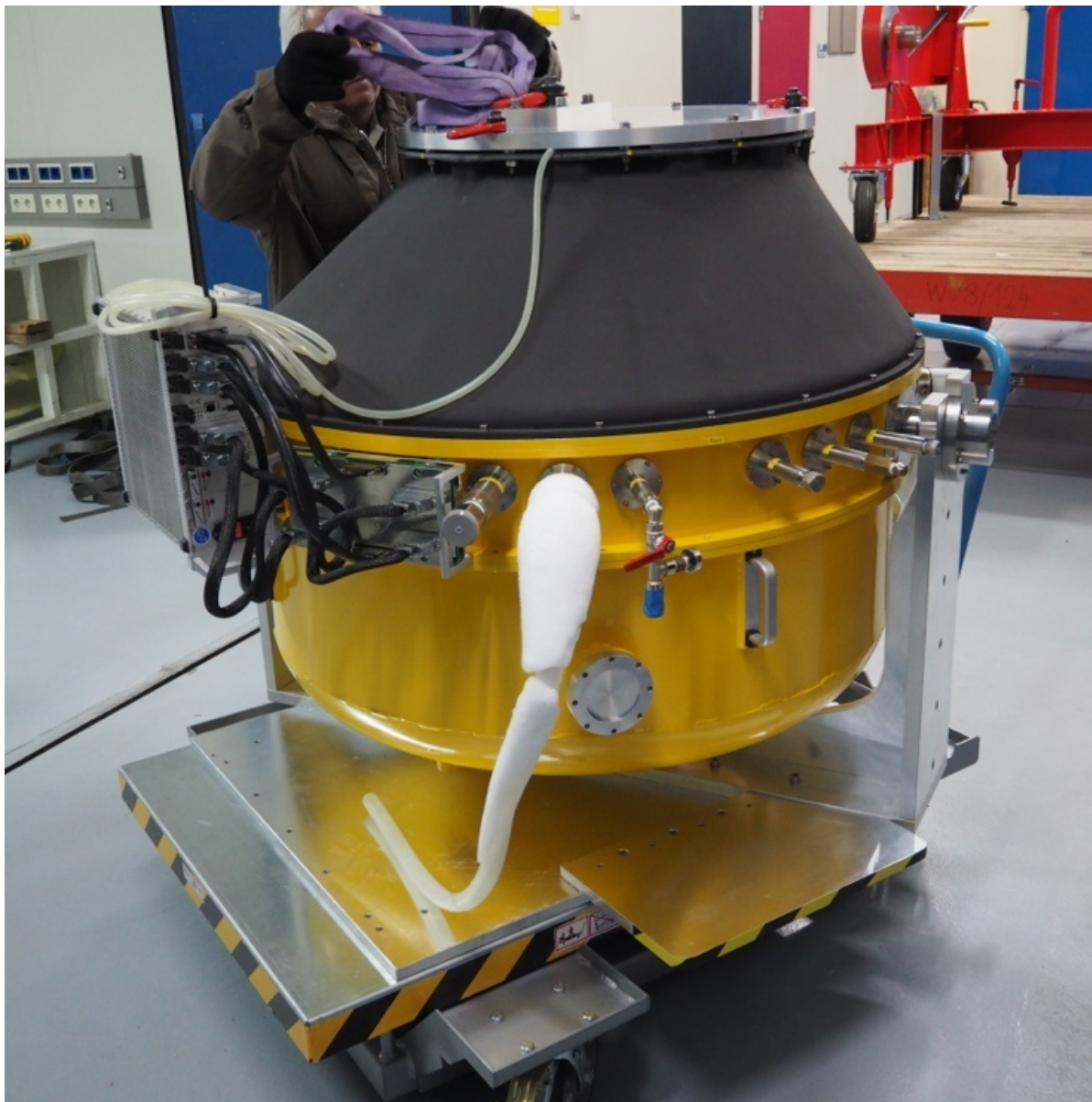
The accident: where

- After observation end: transport inside 3.5m building
- Navigation through narrow passage close to elevator



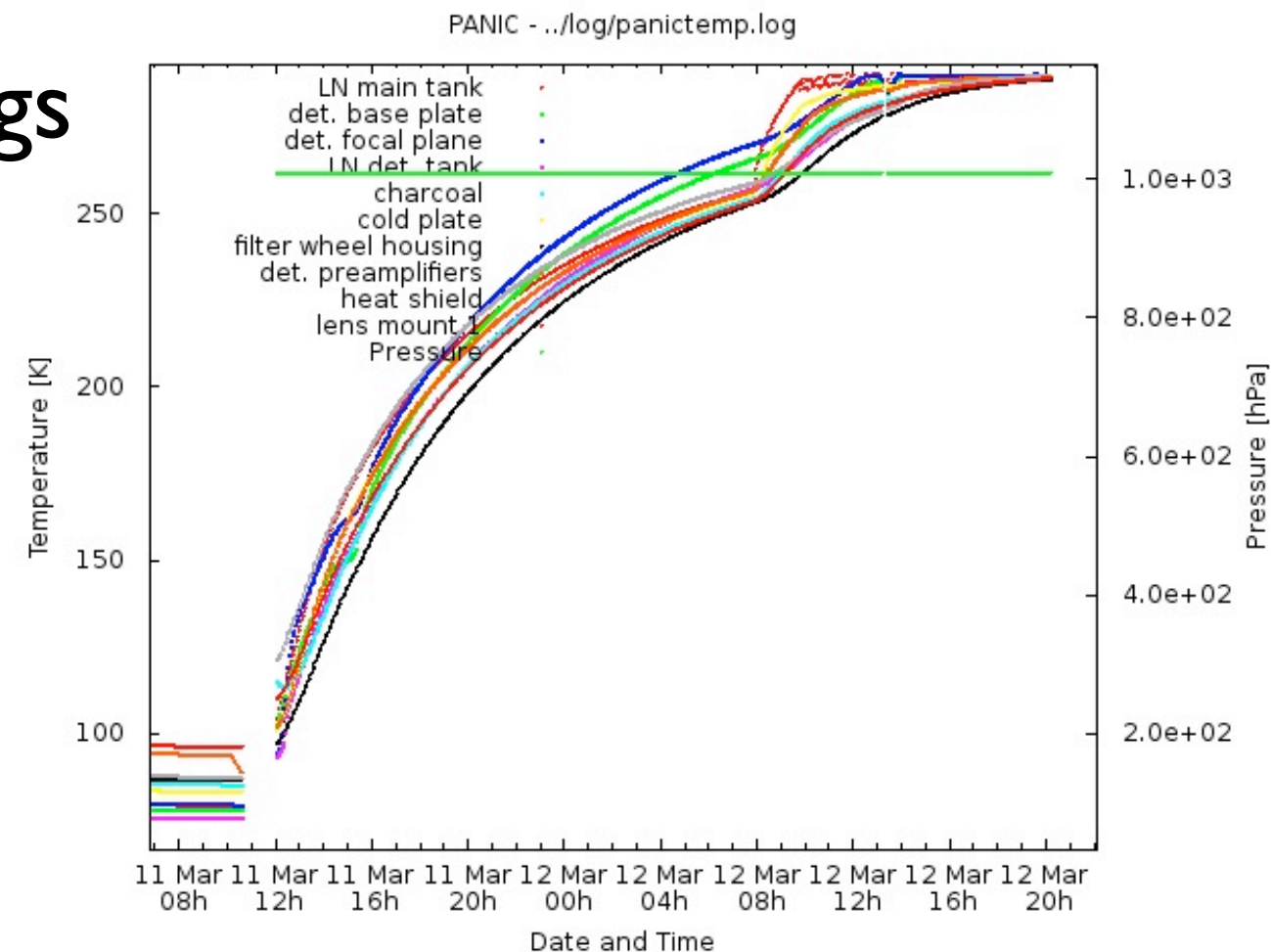
The accident: why

- Instrument always kept cold
- Telescope caddy made small to fit into 2.2m elevator



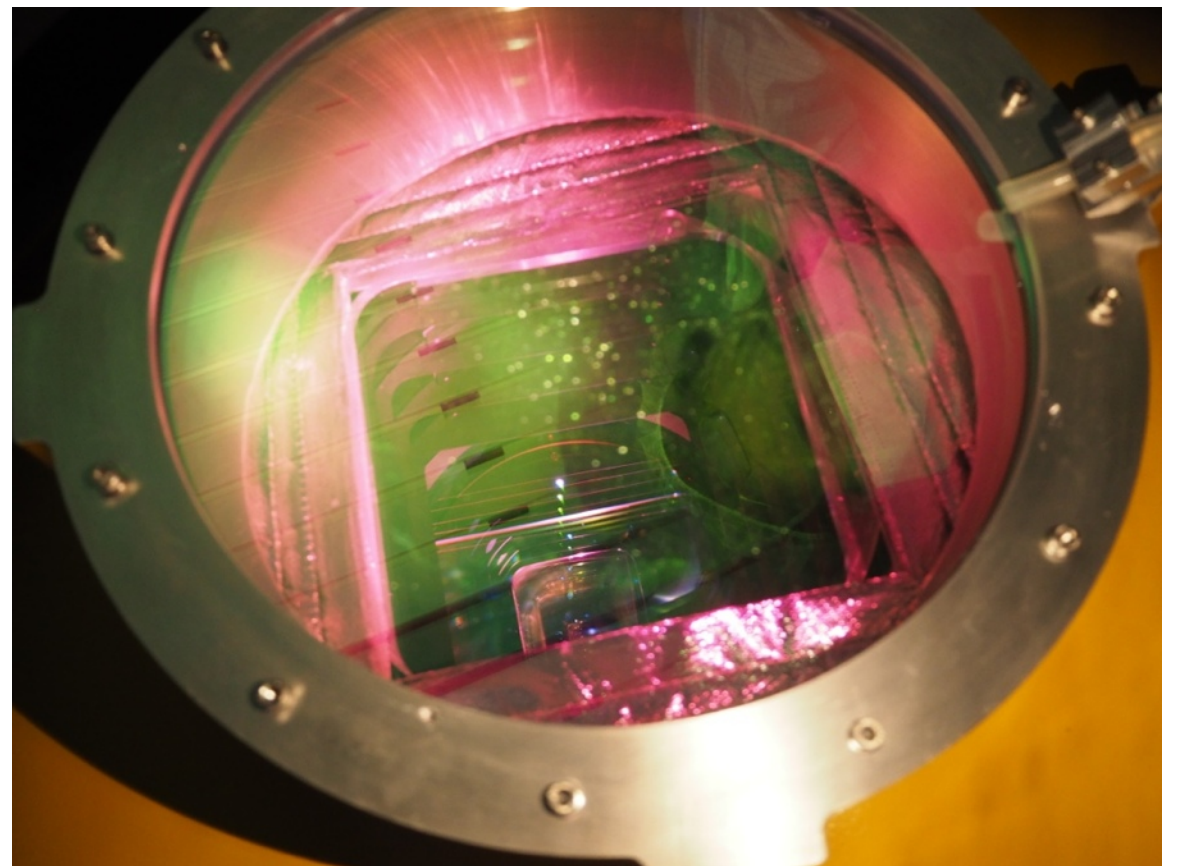
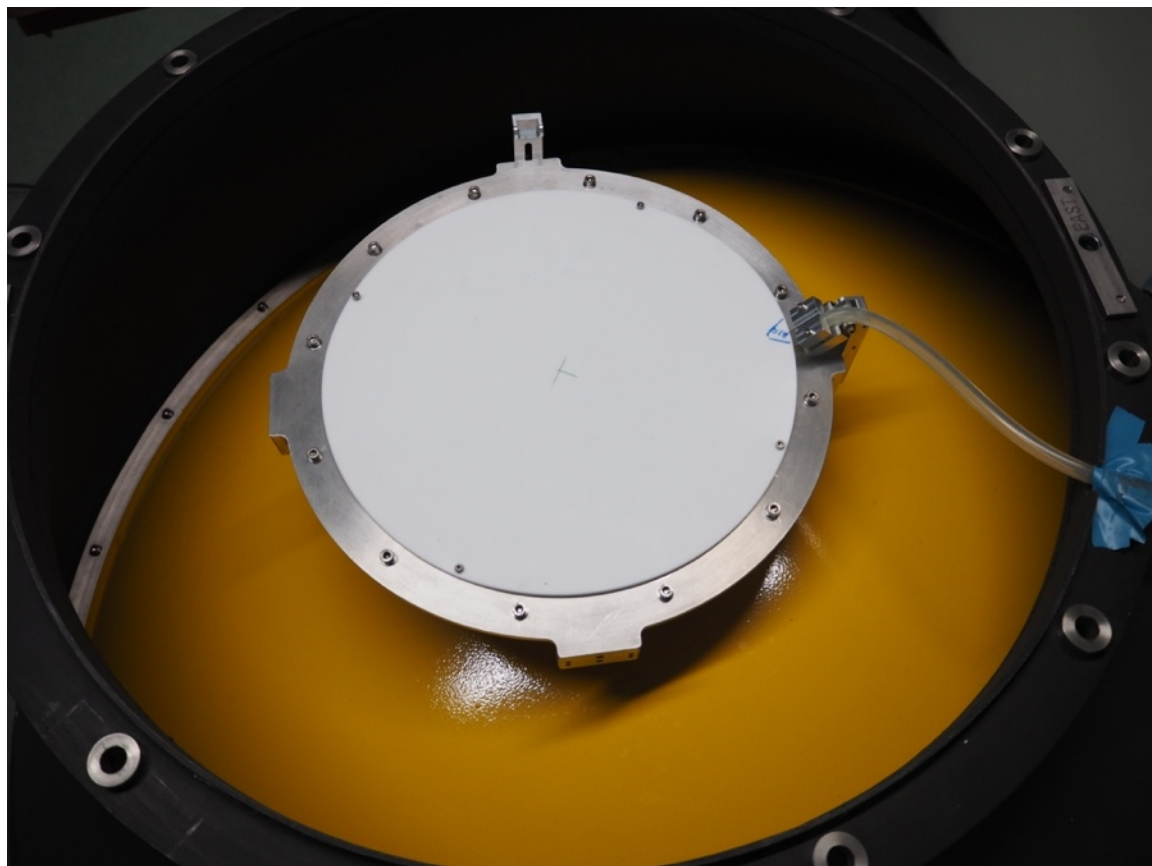
The accident: first aid

- Warming up detector with max. allowed rate: keep it warmest point in instrument
- Trying to fix leak, but lack of proper equipment: no success
- Opening would make things worse
- Wait until warmed up
- Assemble tiger team



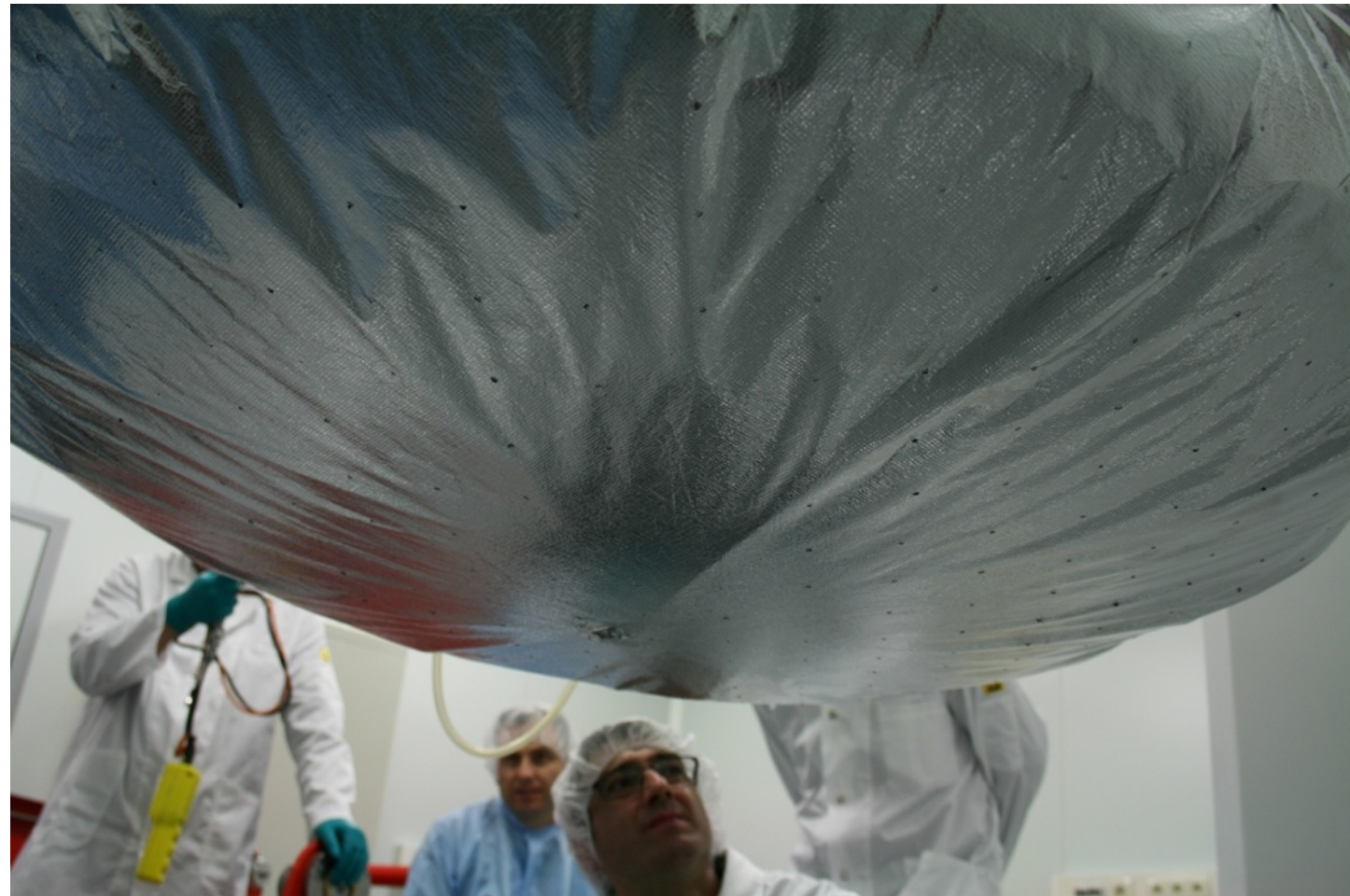
Inspection: first look

- View from telescope side: entrance window, baffles, first lens
- Passage for air to reach closed optical bench area
- No ice or condensation inside ($T \approx 265\text{K}$)



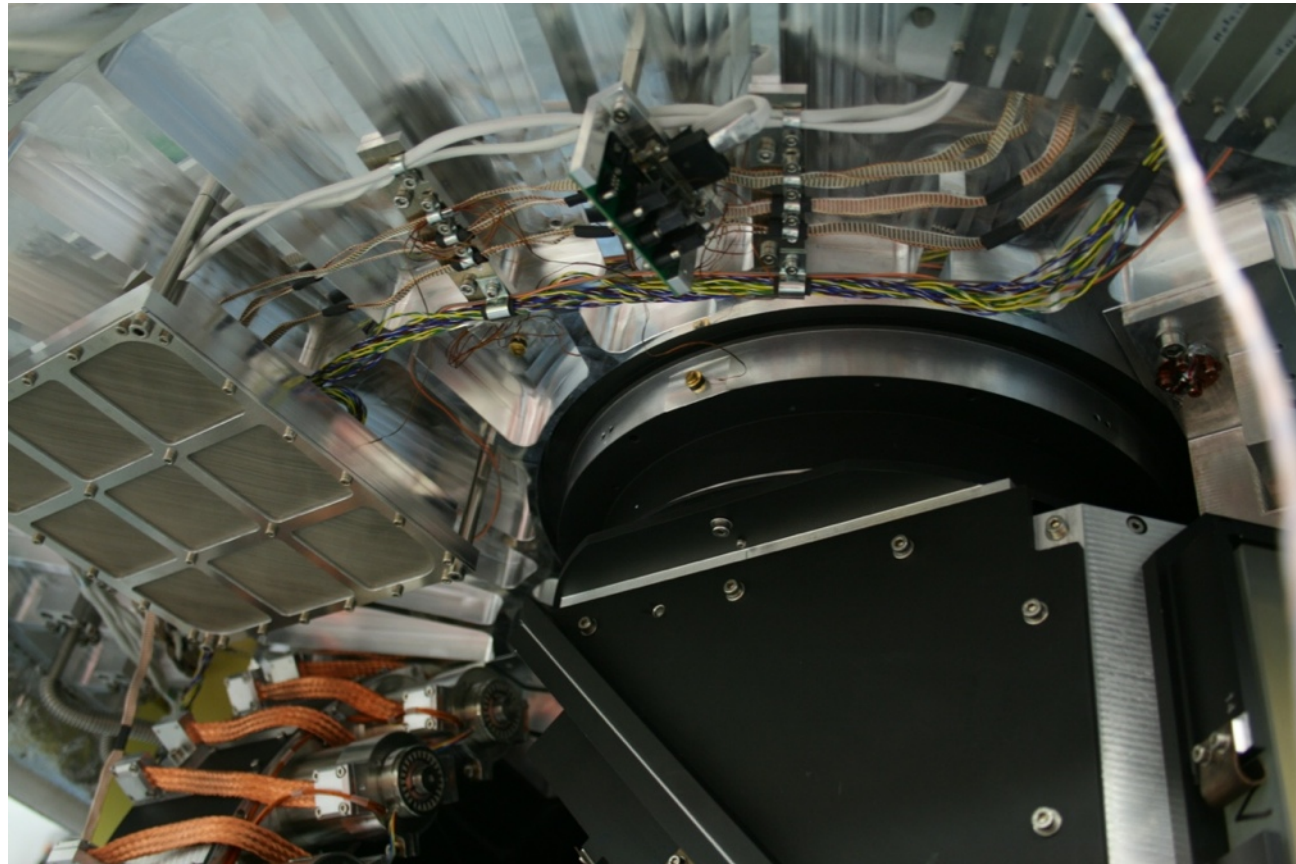
Inspection: opening

- Transport to cleanroom in 3.5m building
- Opening while hanging at crane (preserve orientation)
- No water inside cryostat hull or on radiation shield



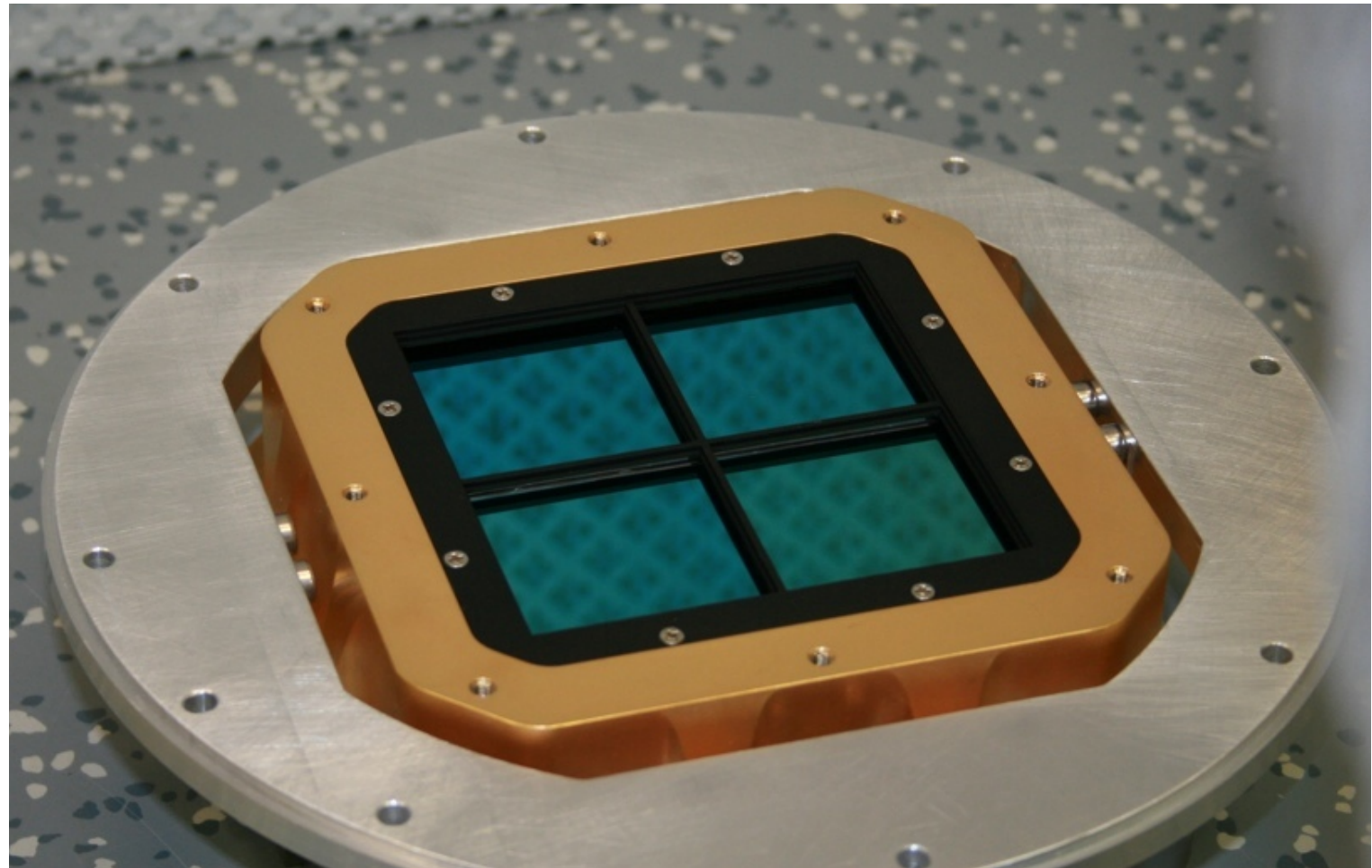
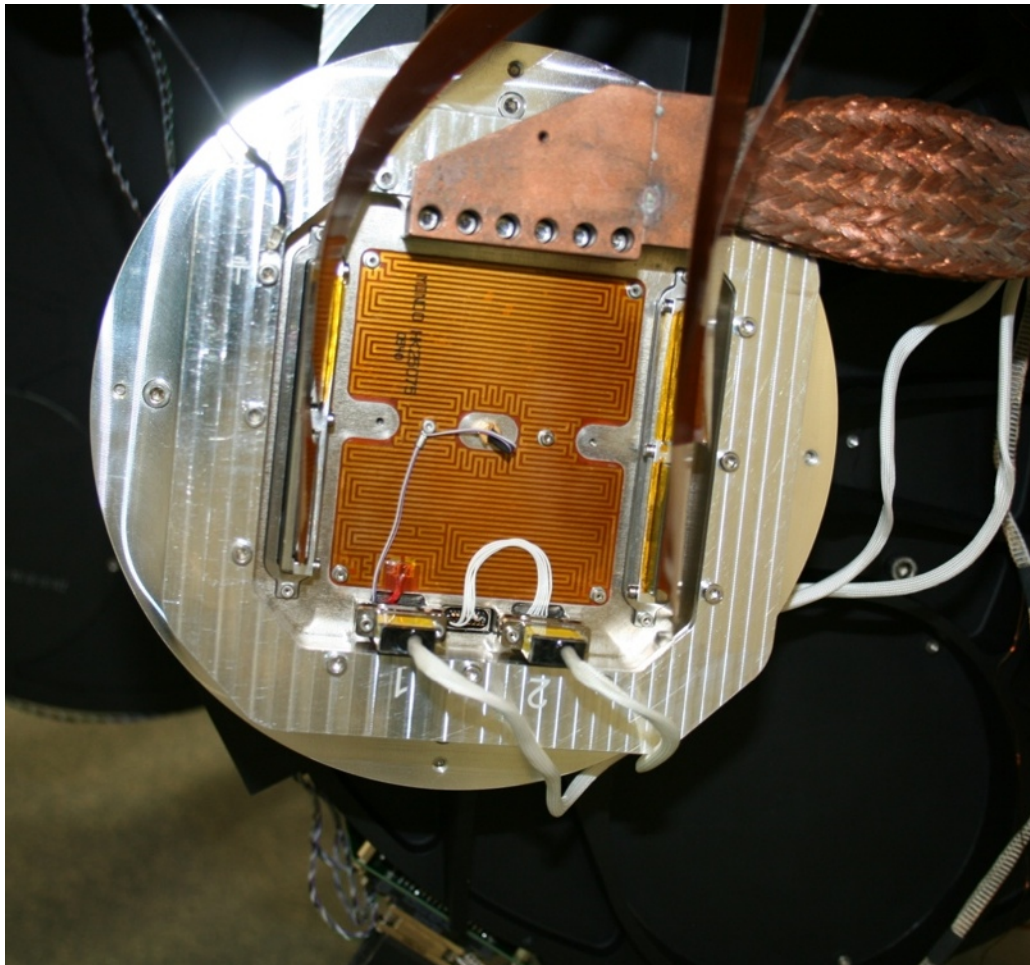
Inspection: optical bench

- Removing radiation shield
- No water anywhere to be seen
- Filters clean



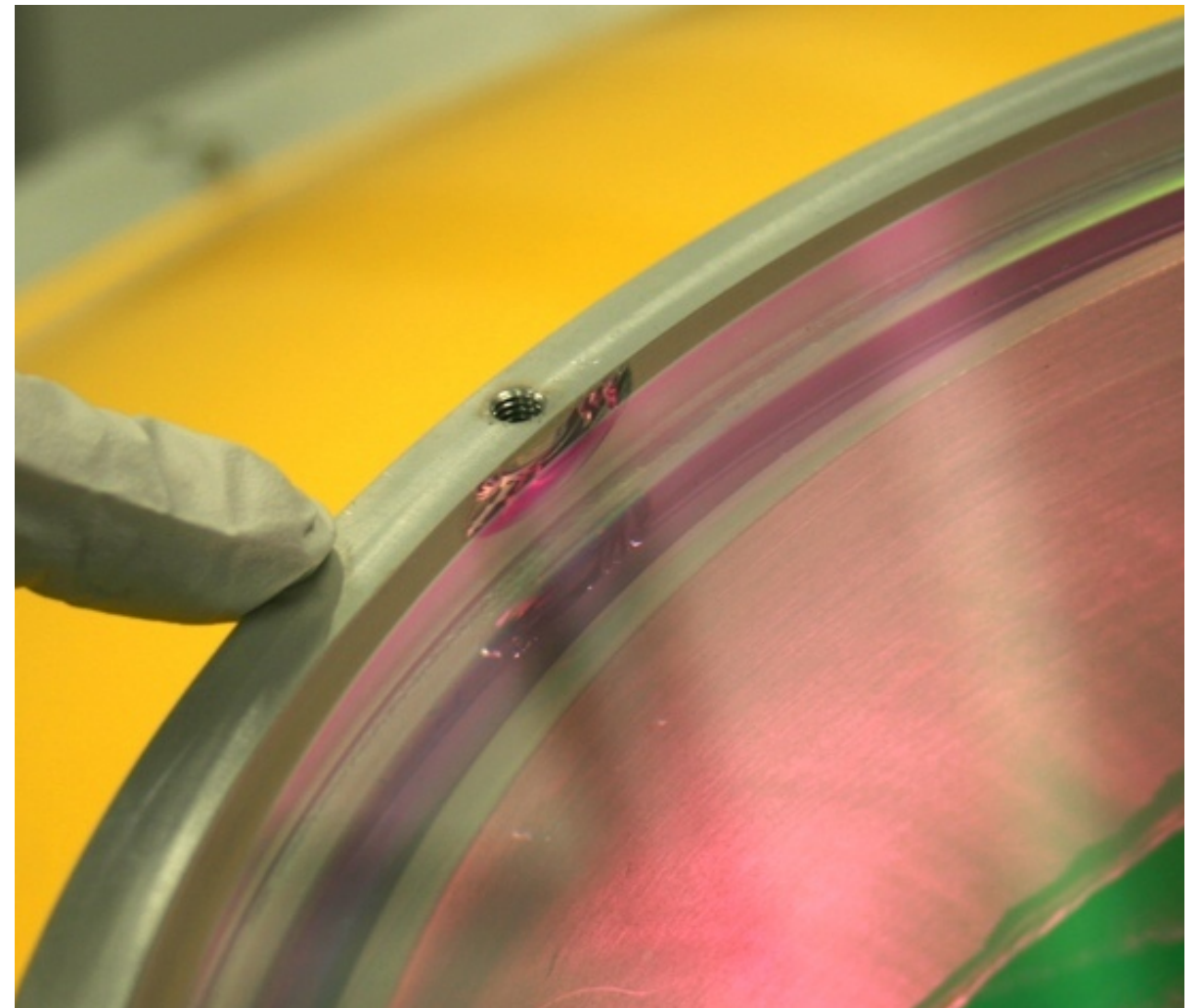
Inspection: Schrödinger's detector

- No contamination outside or on surface
- Electronics, connectors, and cables clean



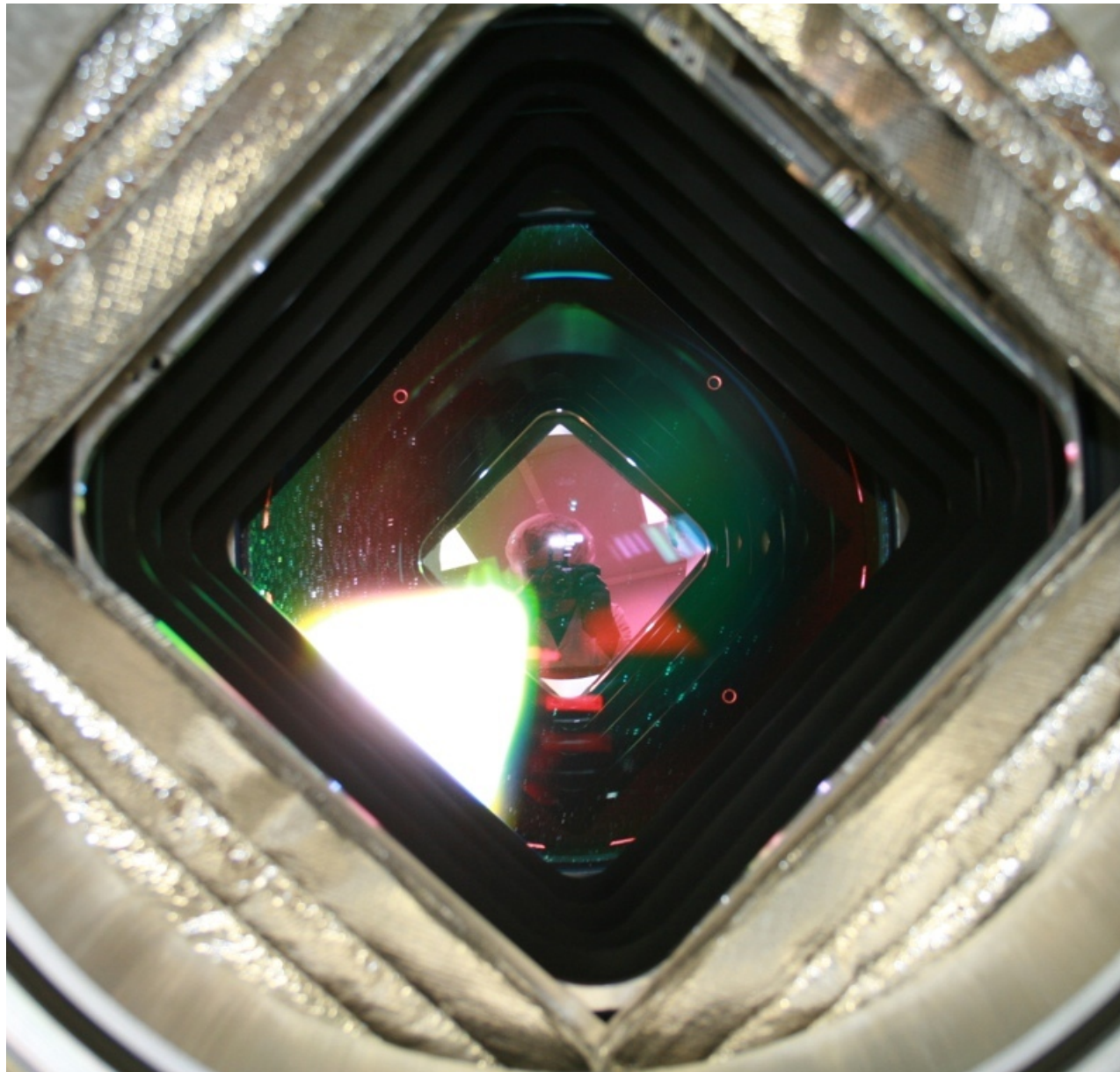
Inspection: Entrance window

- Routine disassembly for cleaning
- Volume crack found near edge outside of vacuum seal
- Connection with accident unlikely



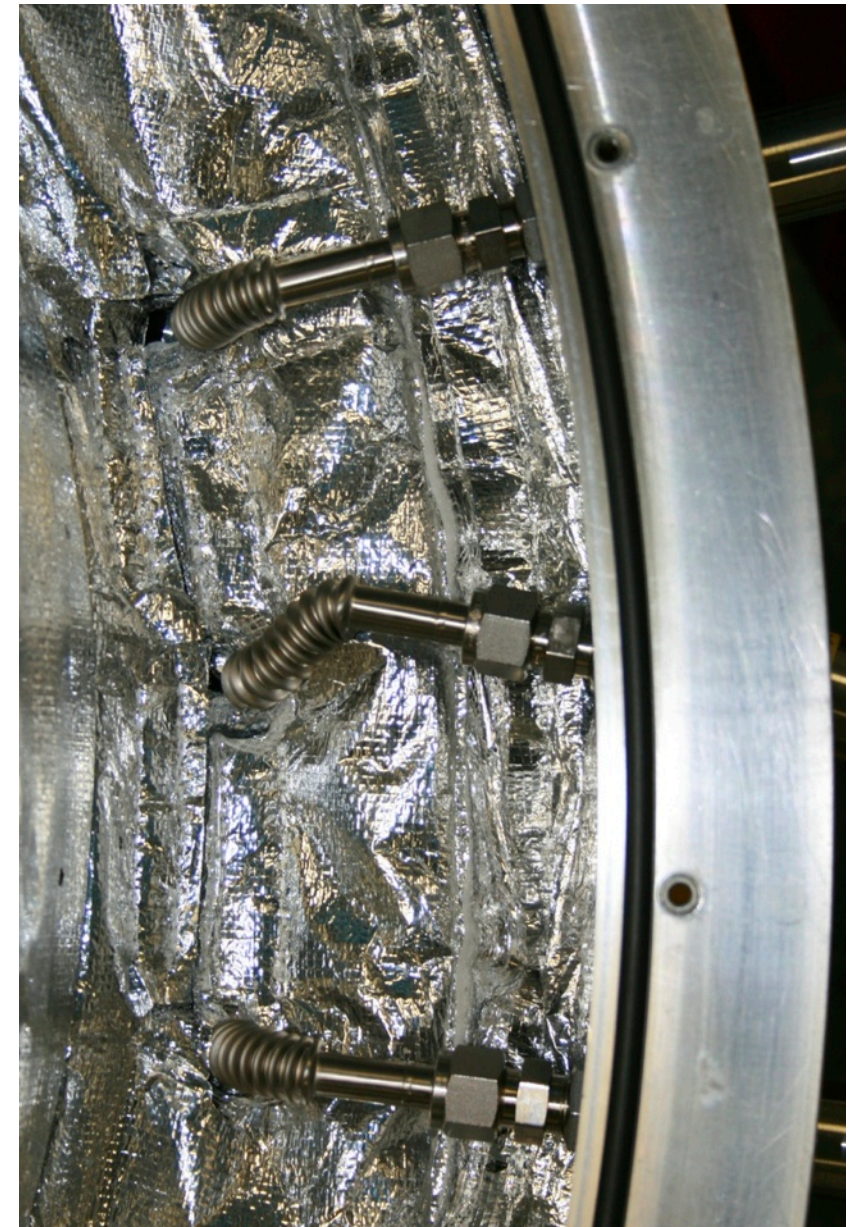
Inspection: First lens

- Some contamination on outer surface
- Origin unknown, cleaning successful



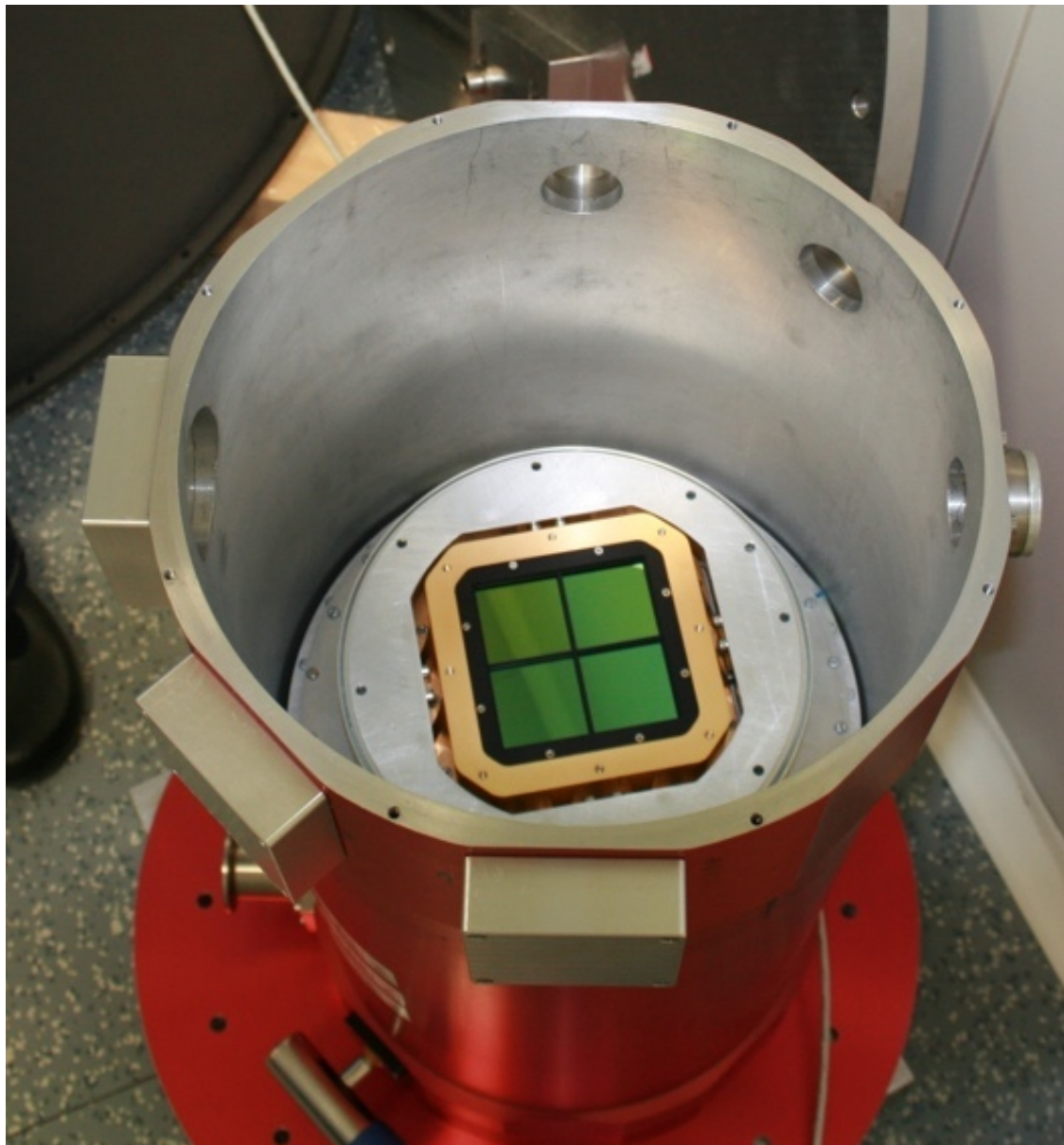
Inspection: Pipes

- Opening cryostat from telescope side
- Exhaust pipe bent, parts until bench need replacement



Detector recovery

- Pump over night to remove water or contaminants
- Re-Install and warm functional test: successful!



Closeout

- Detector put in vacuum, stored in freezer (-26°C)
- Entrance window replaced with metal dummy
- Cryostat closed and left in cleanroom



Pipe replacement

- Parts on backorder, delivery mid April



Entrance window refurbishment

- Just kicked off work
- Try to re-polish edge?
- Examine mechanical arrangement of seal and holding ring, improve mounting



Verification

- Optical
 - ▶ Star simulator at warm by eye: nothing strange
 - ▶ Real test at cold with detector
- Detector
 - ▶ Routine lab tests for noise and hot pixels
 - ▶ At telescope: throughput and flatfield response



Risk mitigation

- Future transport
 - ▶ To/from 3.5m dome: through floors with big crane?
 - ▶ In 2.2m building: clear paths, little risk
- Put additional protection on caddy?
 - ▶ Fixed: Creates risk when placing/removing cryostat
 - ▶ Removable: TBD how to attach

Resurrection in sight?

- Expected impact on operations:
 - ▶ Optical performance: None
 - ▶ Detector performance: none to little (possible small hot pixel increase due to warm phase)
- Back in service:
 - ▶ Not before May (TBC)
 - ▶ Best case: 1 month lost

Credits:

Conchi Cardenas
Irene Ferro Rodriguez
Jens Helmling
David Maroto
Johana Panduro
Julio Marin
Antonio Garcia
Werner Laun
Armin Huber
Santiago Reinhart

