Planck-LFI update

Aniello Mennella

Università degli Studi di Milano – Dipartimento di Fisica
INAf-IASF – Milano

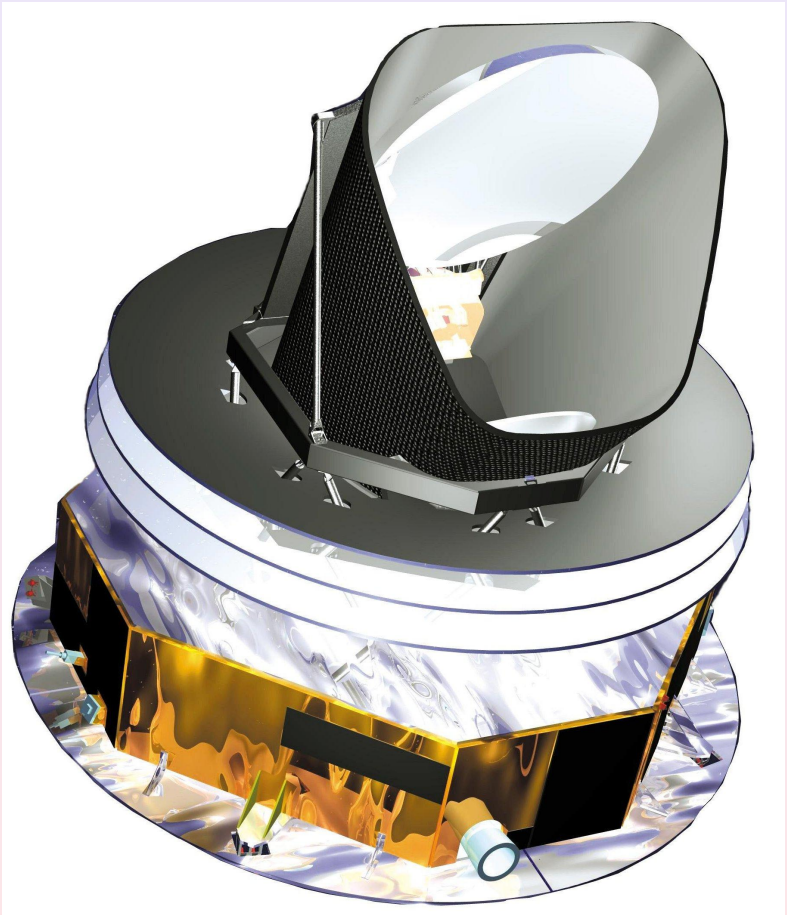
Astro-siesta
8 Febbraio 2006

Outline

Outline

Outline

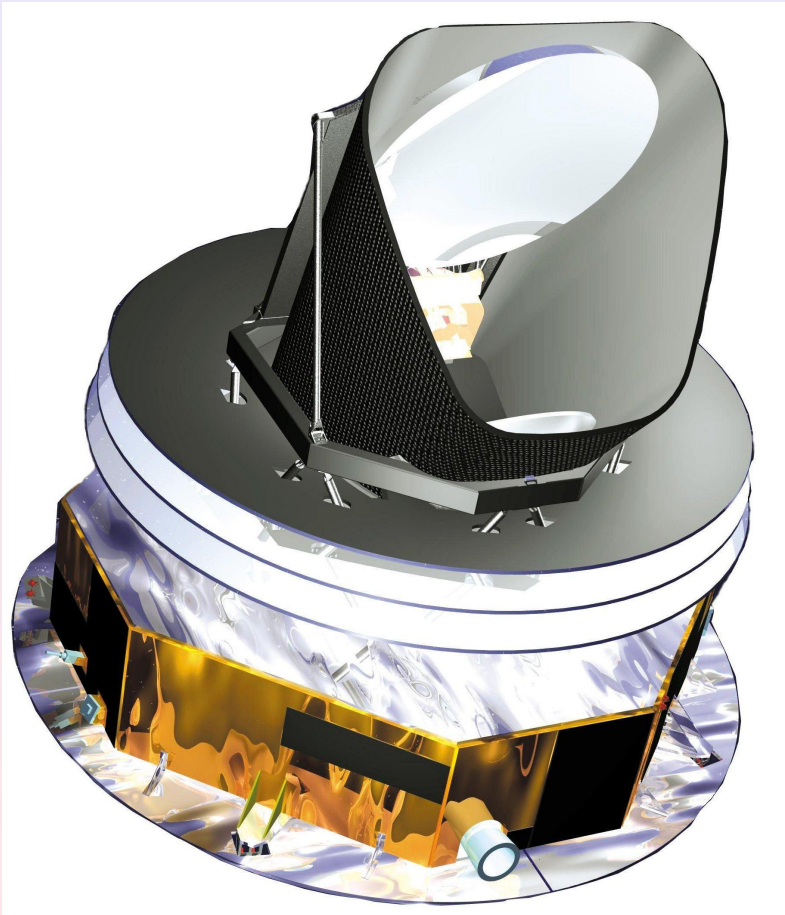
Planck (ESA)



Design goals

- Angular resolution $< 10'$
- Sens./pixel $< 10\mu$K
- Frequency range: 27-900 GHz
- Sky coverage: 100%
- Systematic errors: $< 3\mu$K

Planck (ESA)



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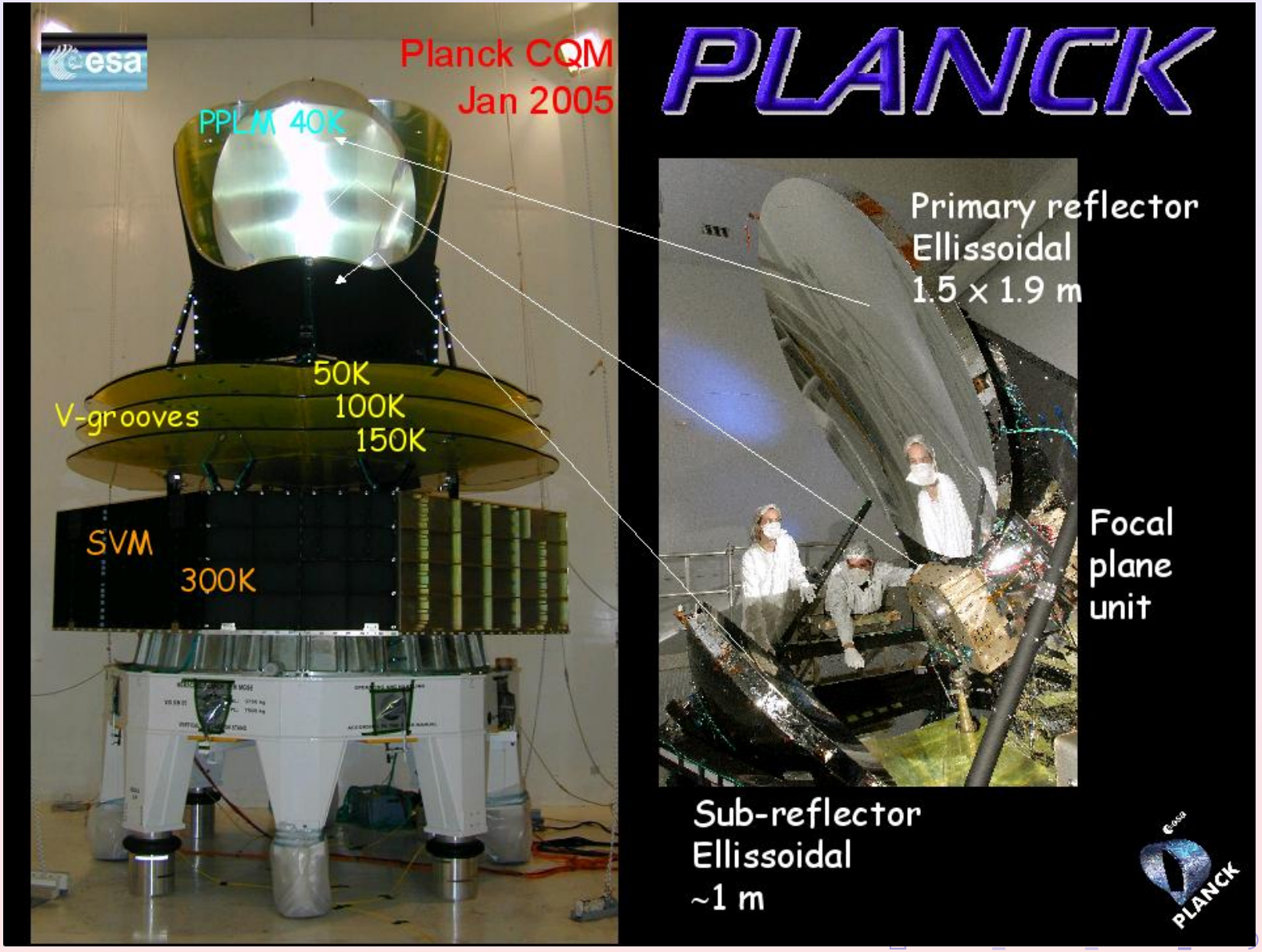
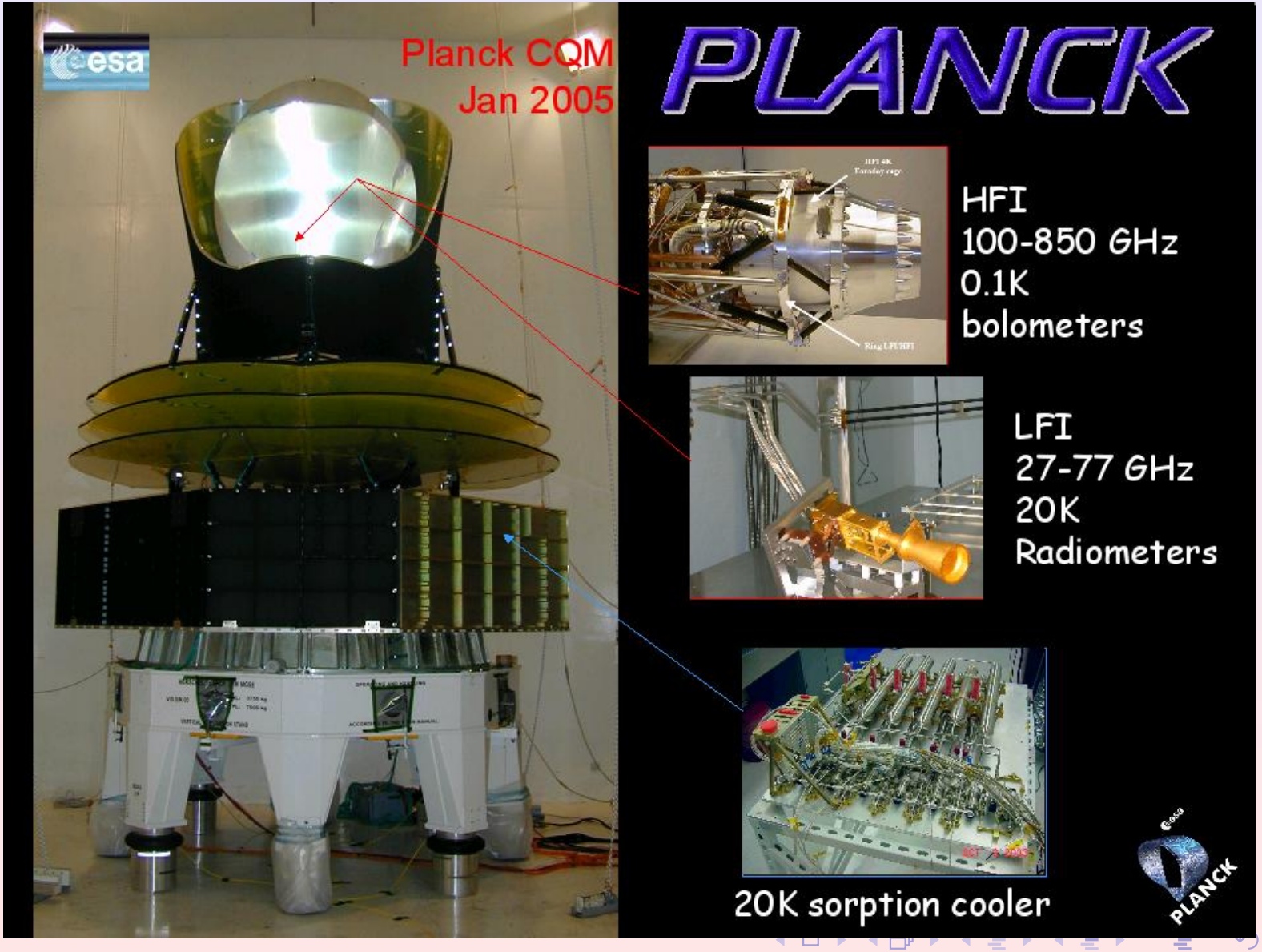
Implementation

- Telescope: 1.5m aplanatic, off-axis
- Cooling: passive+active
- Detectors: 20K radiometers (LFI) + 0.1 K bolometers (HFI)
- Orbit: L2
- Launch: 2008

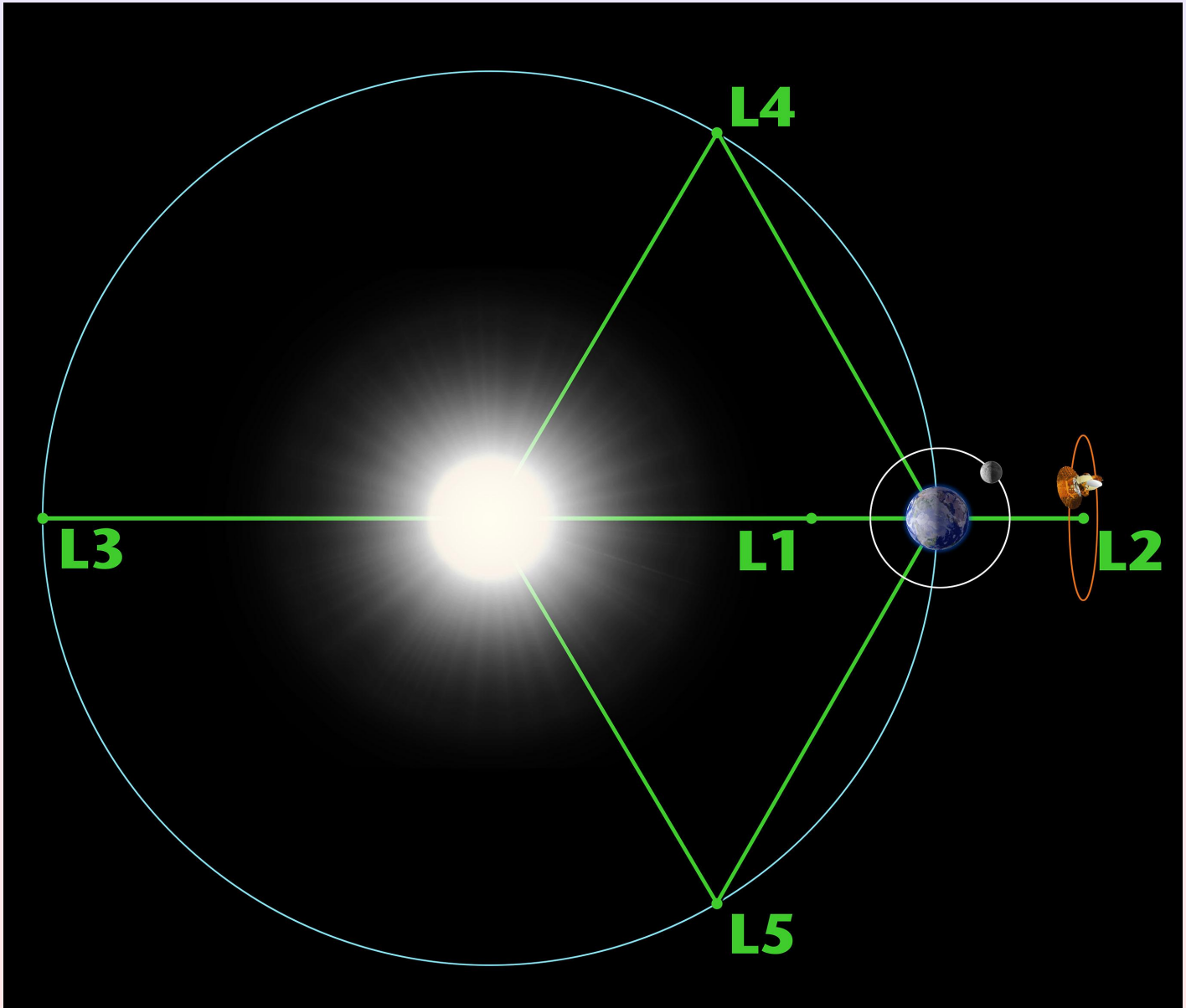
Planck - il satellite



Planck - il satellite



Planck - l'orbita



People

Laben

- P. Battaglia, C. Franceschet
- F. Colombo, L. Pagan, M. Lapolla
- P. Leutenegger, M. Miccolis, R. Silvestri
- M. Balasini, F. Ferrari

Milano

- M. Tomasi, S. Galeotta, A. Zonca
- O. D'Arcangelo, B. Cappellini
- M. Bersanelli, A. Mennella

People

Bologna

- L. Stringhetti, F. Villa, L. Terenzi, G. Morgante
- E. Franceschi, F. Cuttaia, M. Sandri
- C. Butler

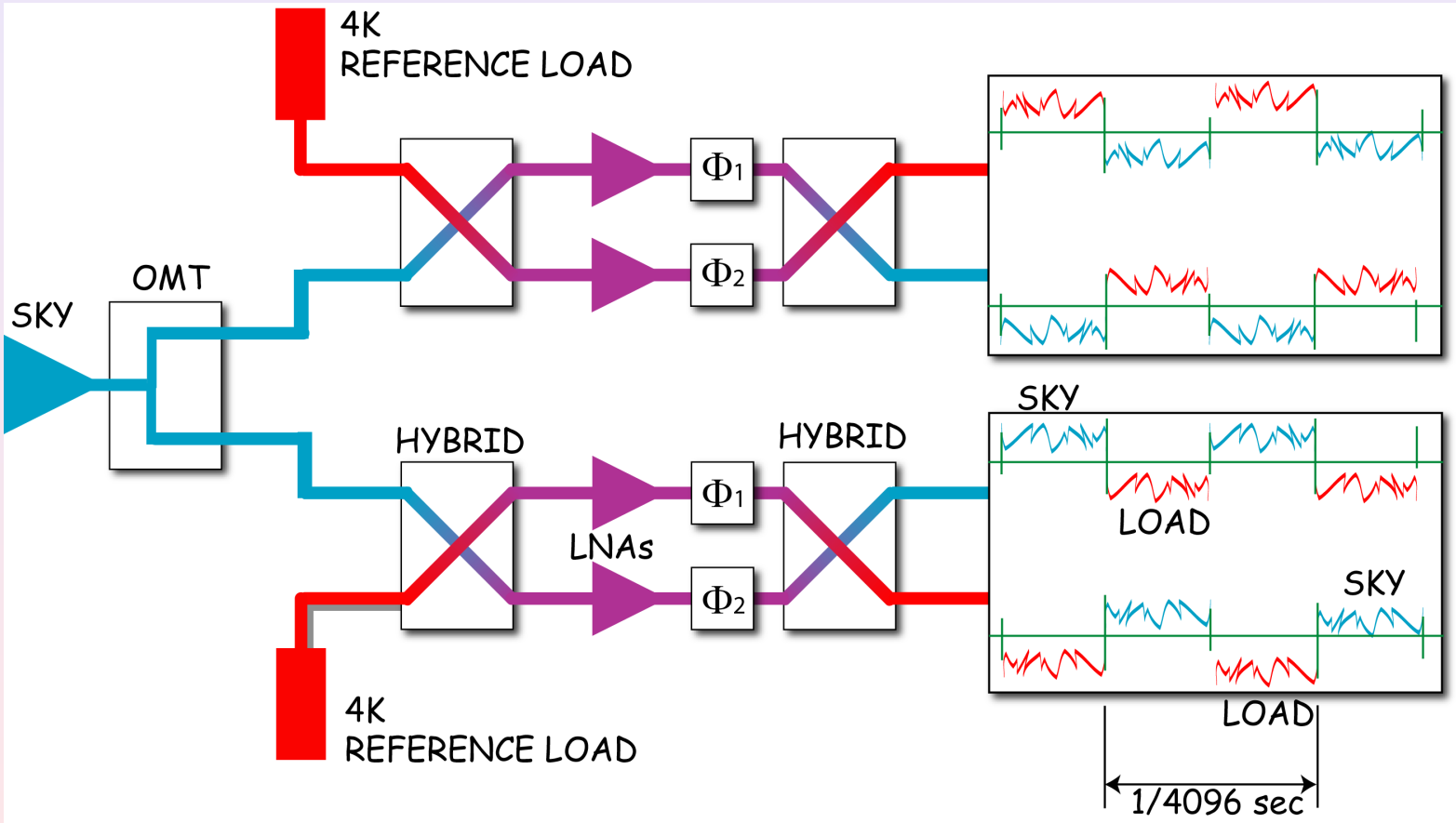
Trieste

- A. Zacchei, M. Frailis,
- M. Maris, A. Gregorio

Altri

- L. Mendes, L. Perez (ESA)
- R. Leonardi, P. Meinhold (UCSB)
- S. Lowe, R. Davis, A. Wilkinson (JBO)
- N. Hughes, M. Laaninen (Elektrobit)
- K. Ball (Univ S. Carolina)

The Planck-LFI pseudo-correlation receivers



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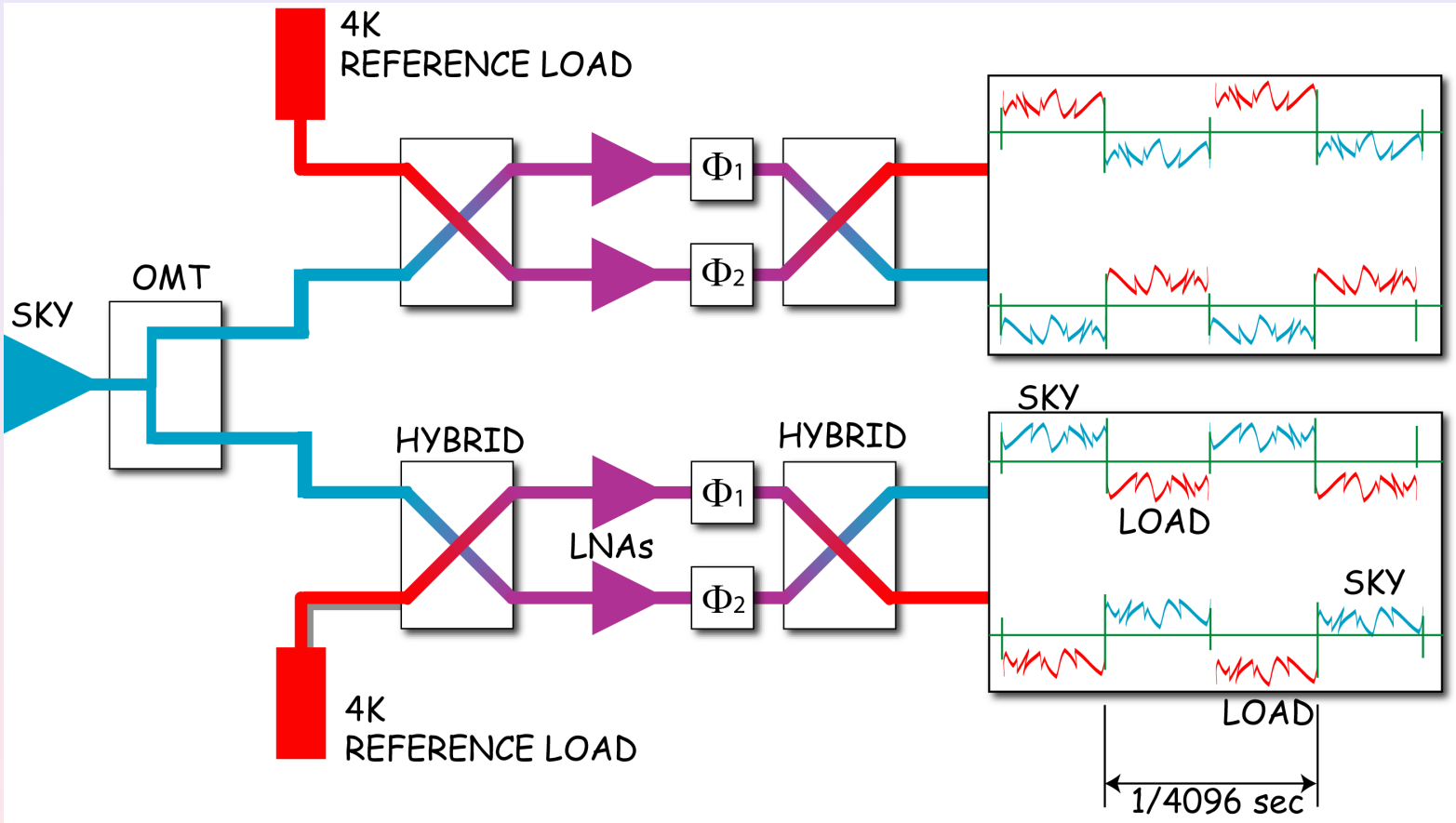
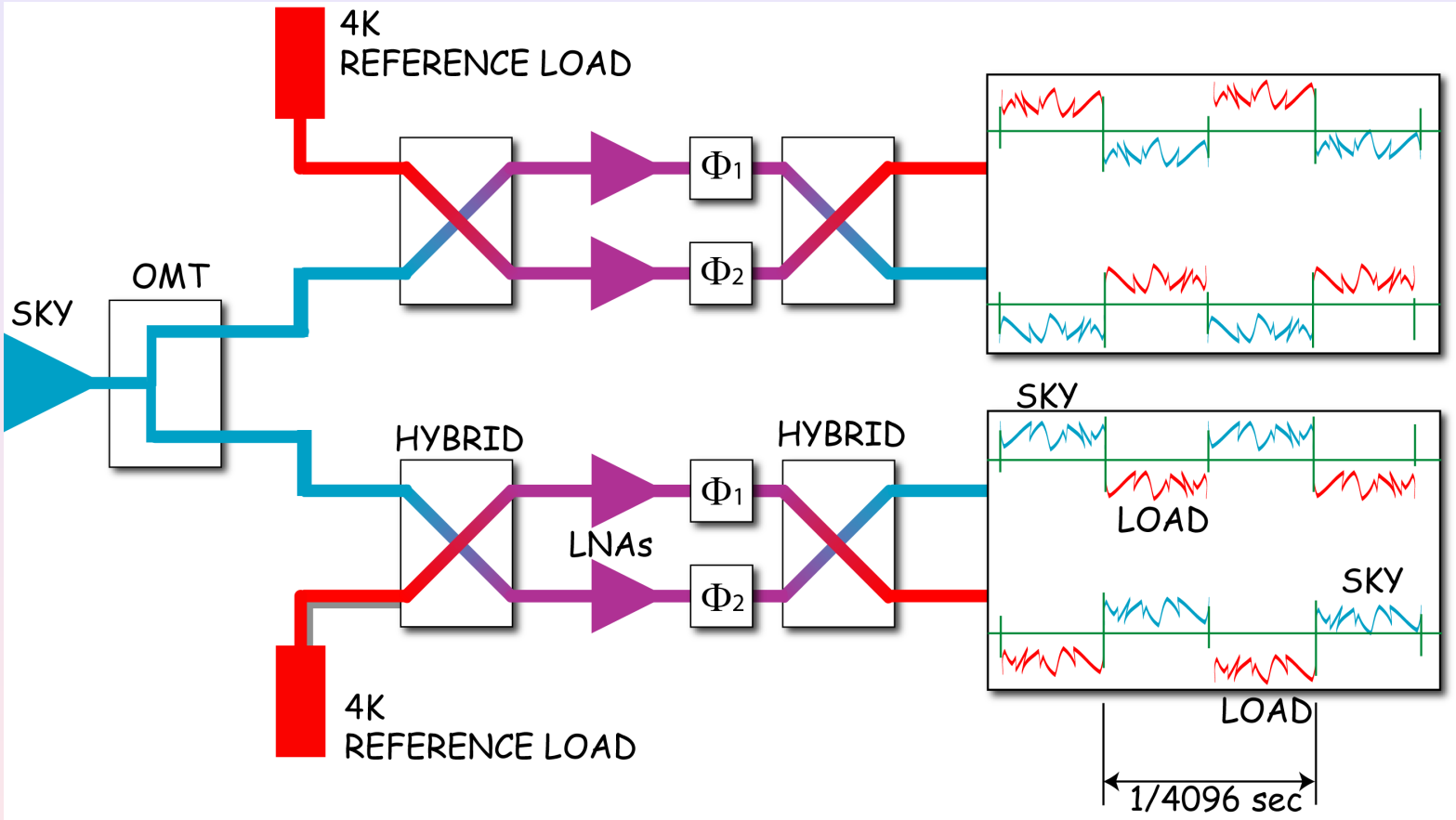


Four outputs: R0D0, R0D1, R1D0, R1D1

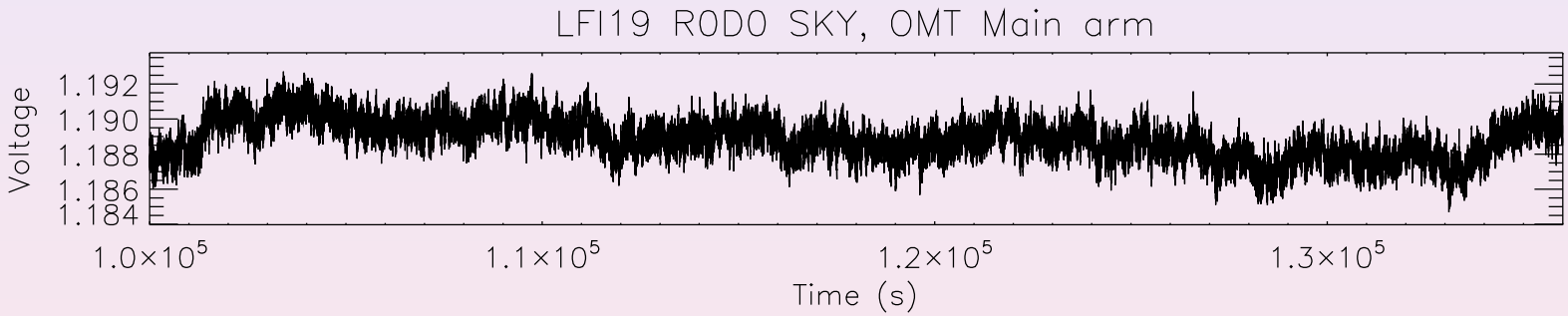
The Planck-LFI pseudo-correlation receivers



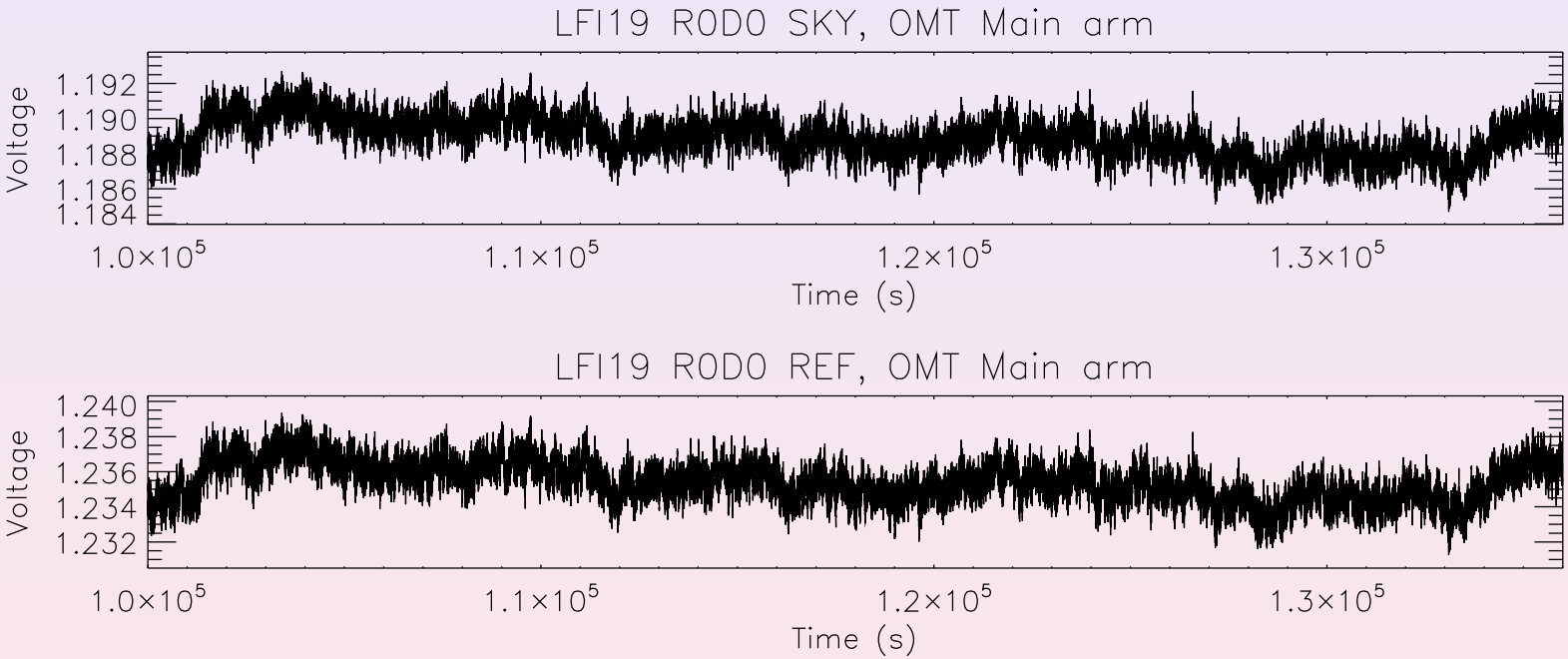
$$\Delta V(t) = V_{sky}(t) - r \times V_{load}(t)$$

$$r \sim \langle V_{sky} \rangle / \langle V_{load} \rangle$$

The Planck-LFI pseudo-correlation receivers



The Planck-LFI pseudo-correlation receivers



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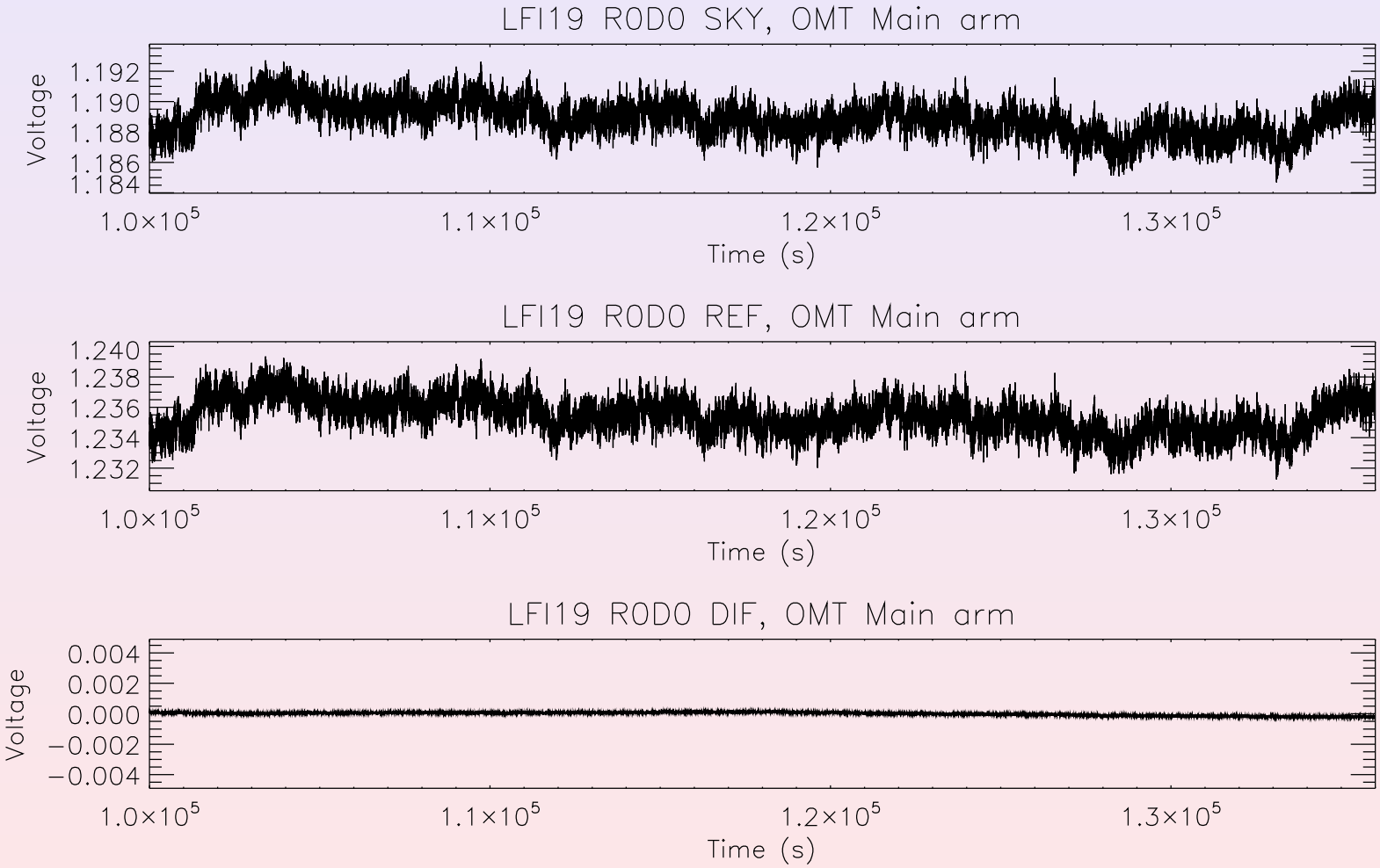
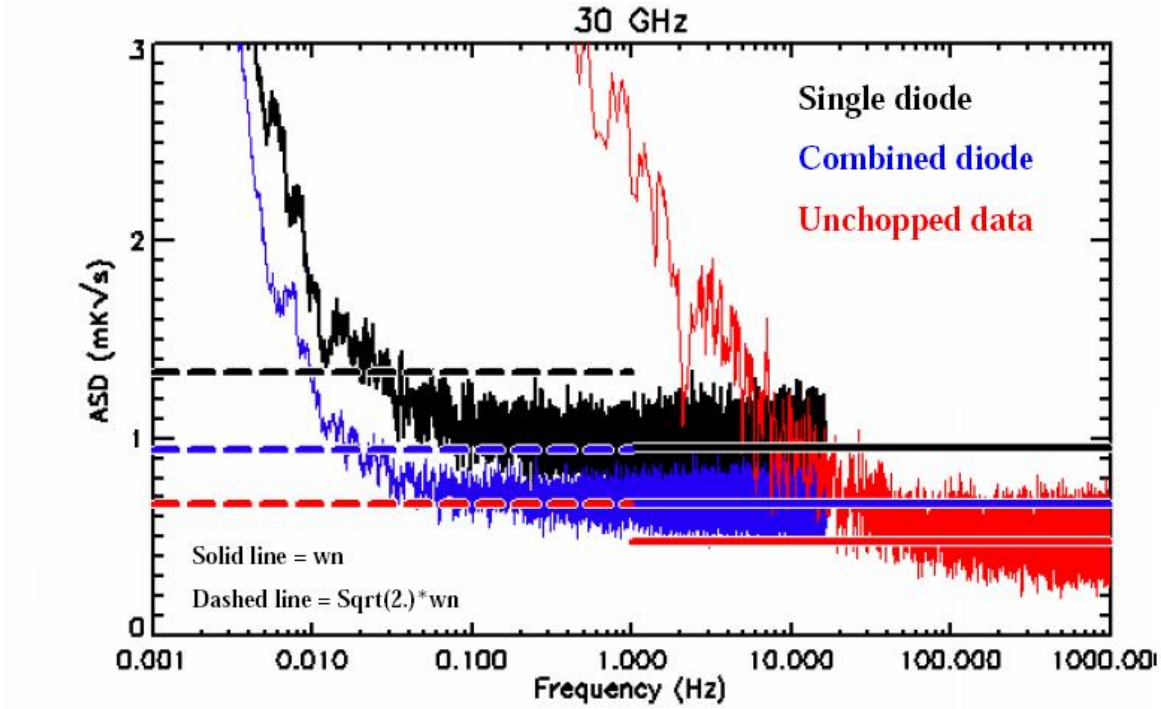


The Planck-LFI pseudo-correlation receivers

Basic model:
Radiometer Equation $\sigma_T = K \left(\frac{T_{\rm sys} + T_{\rm sky}}{\sqrt{\beta \cdot \tau}} \right)$

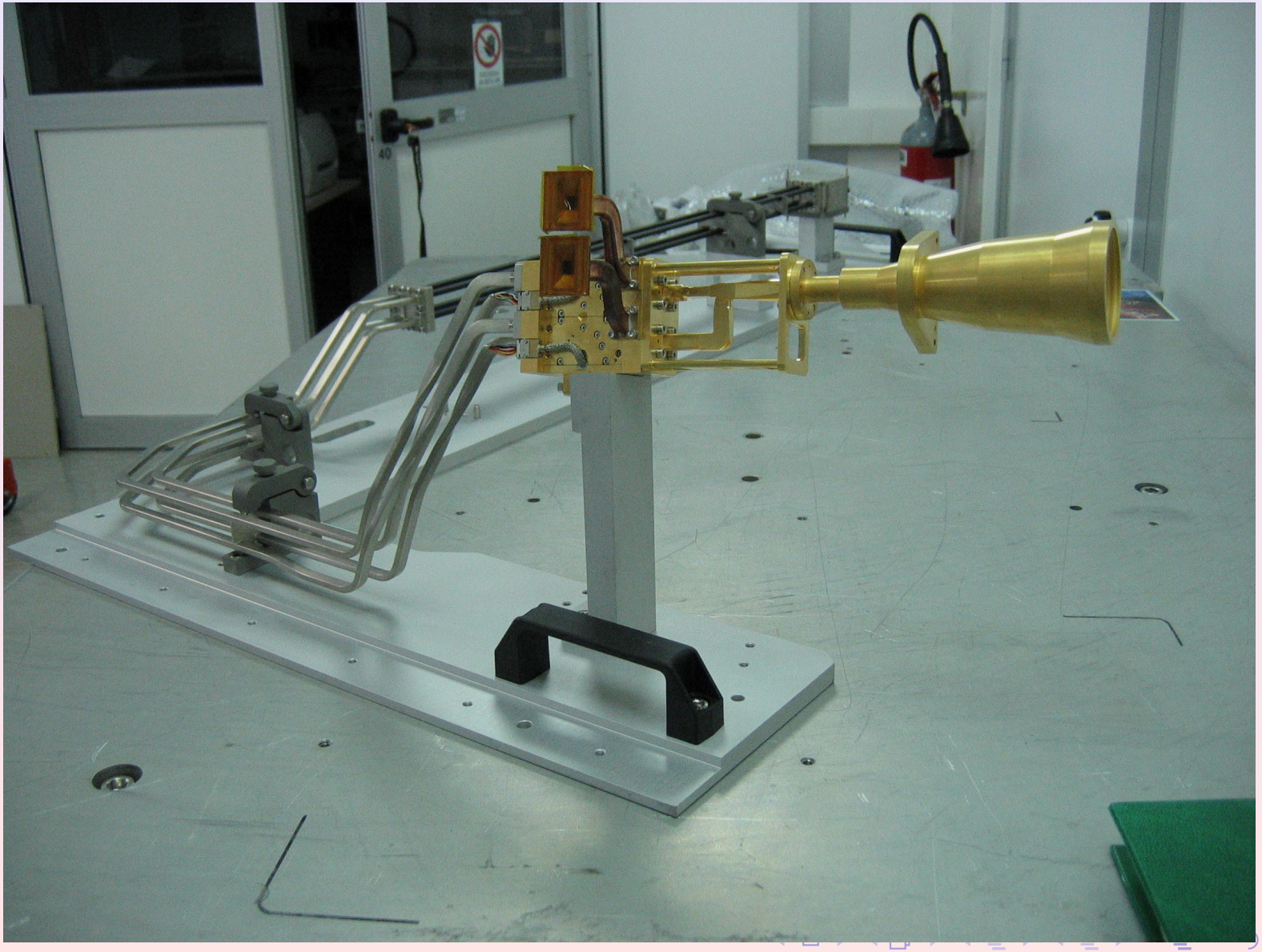


$K = 2$

$K = \sqrt{2}$

$K = 1$

L'hardware - LFI



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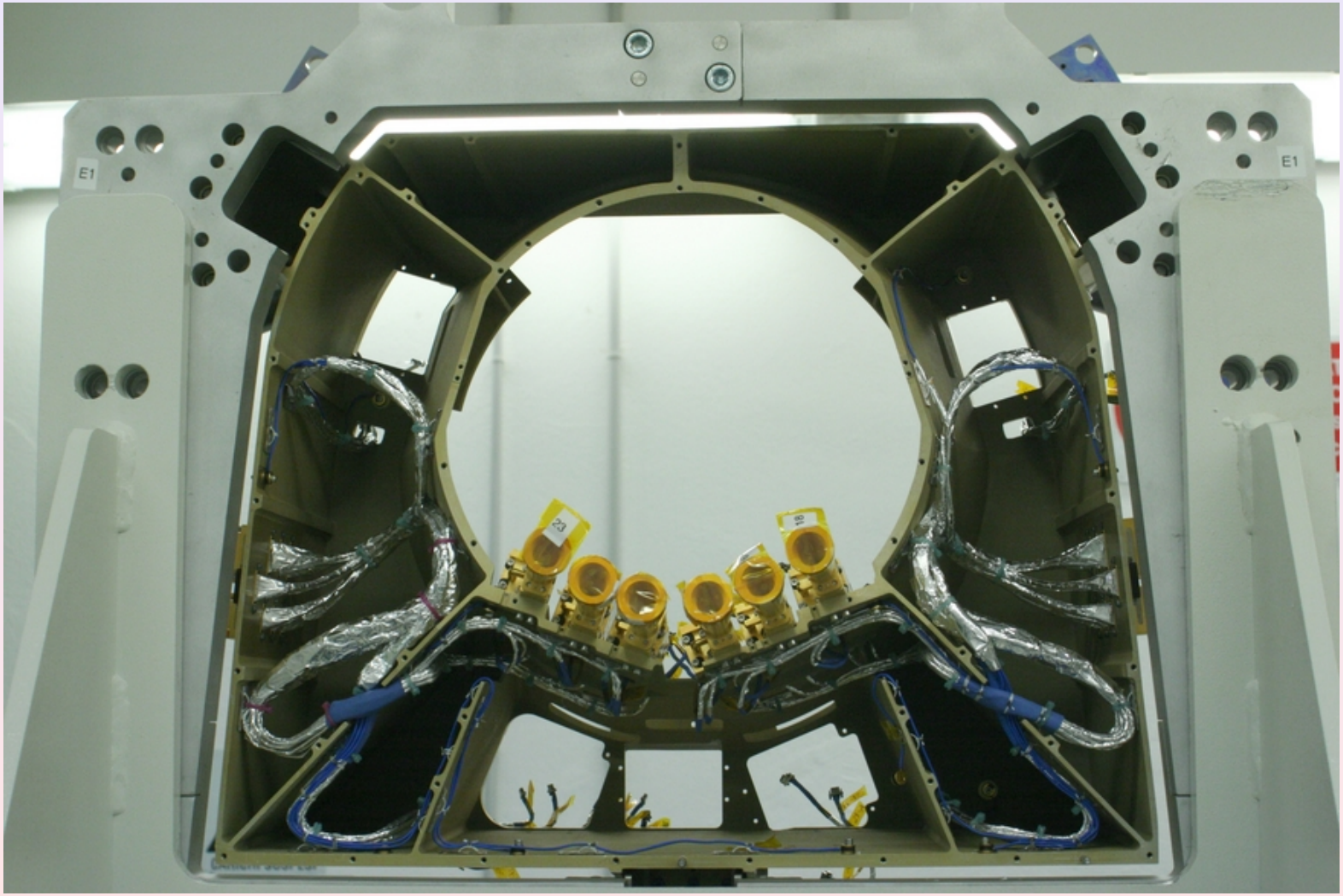

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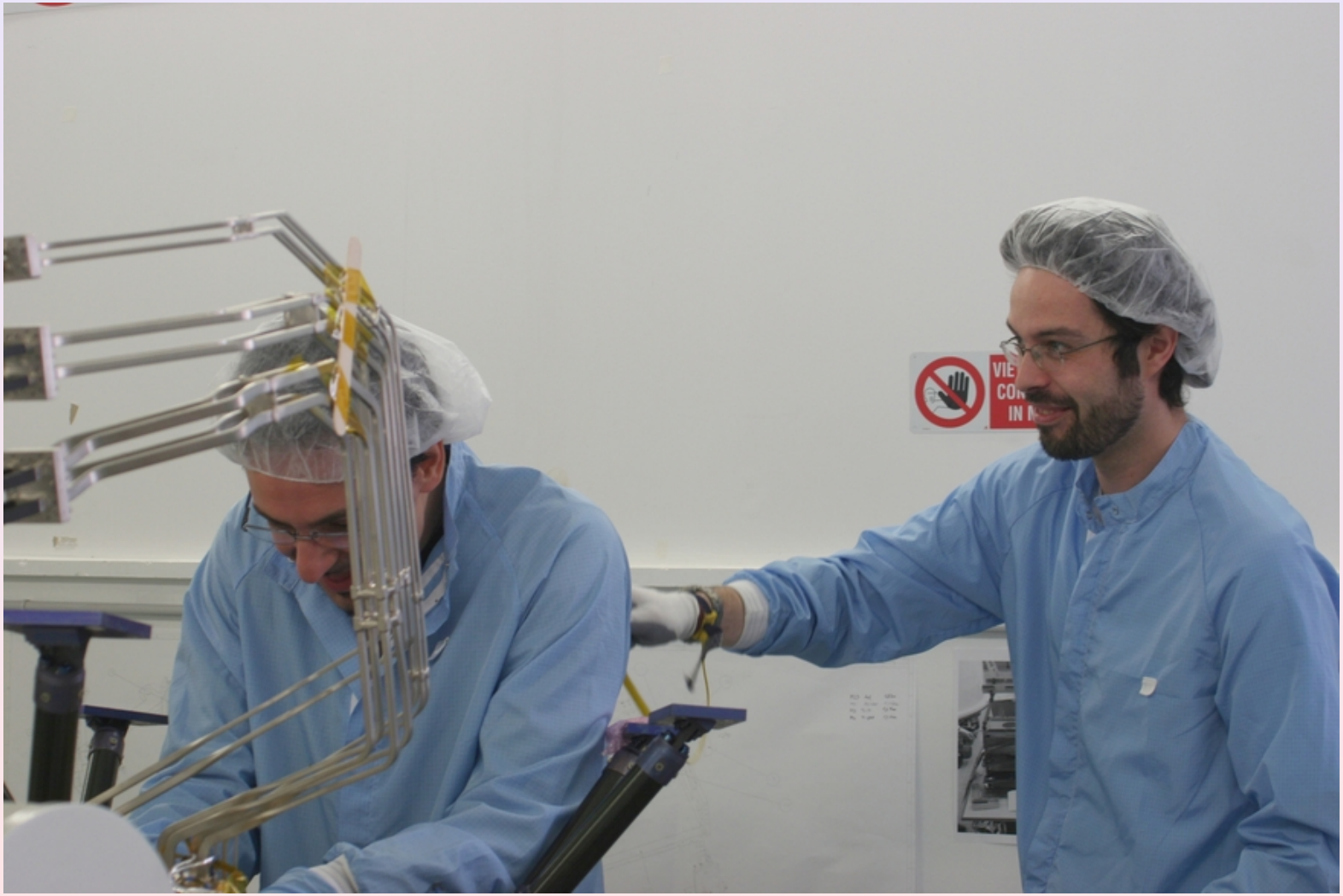

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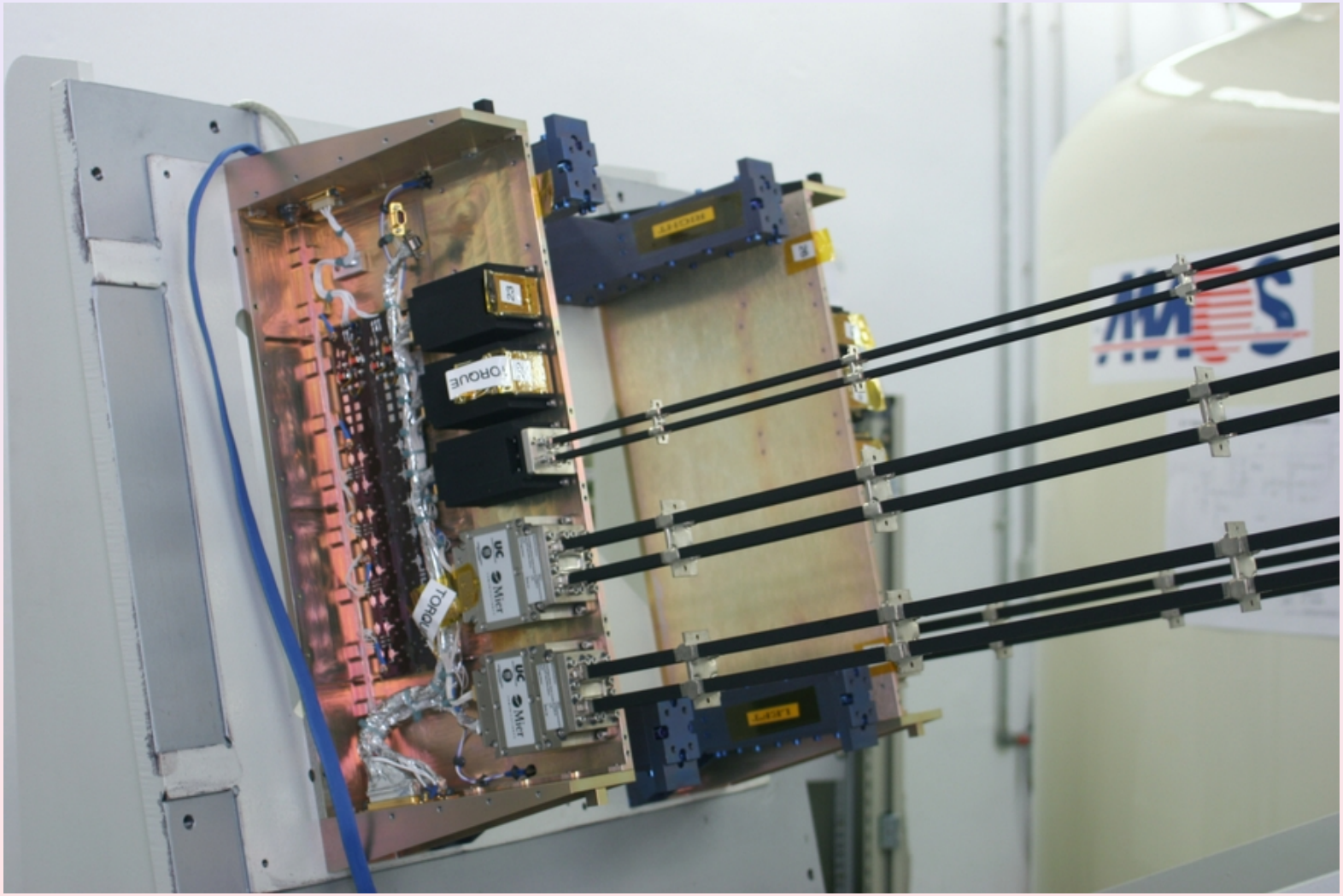

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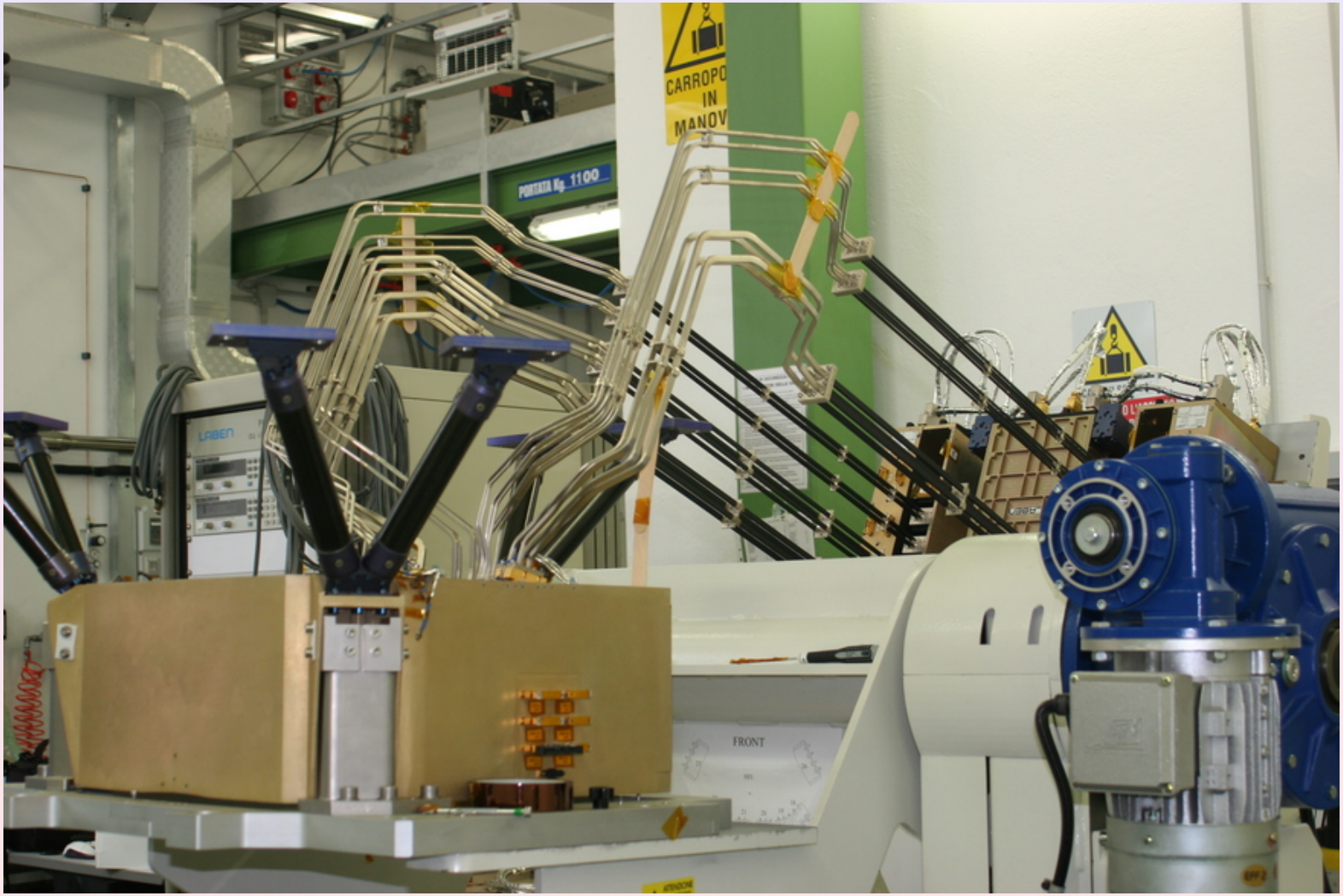

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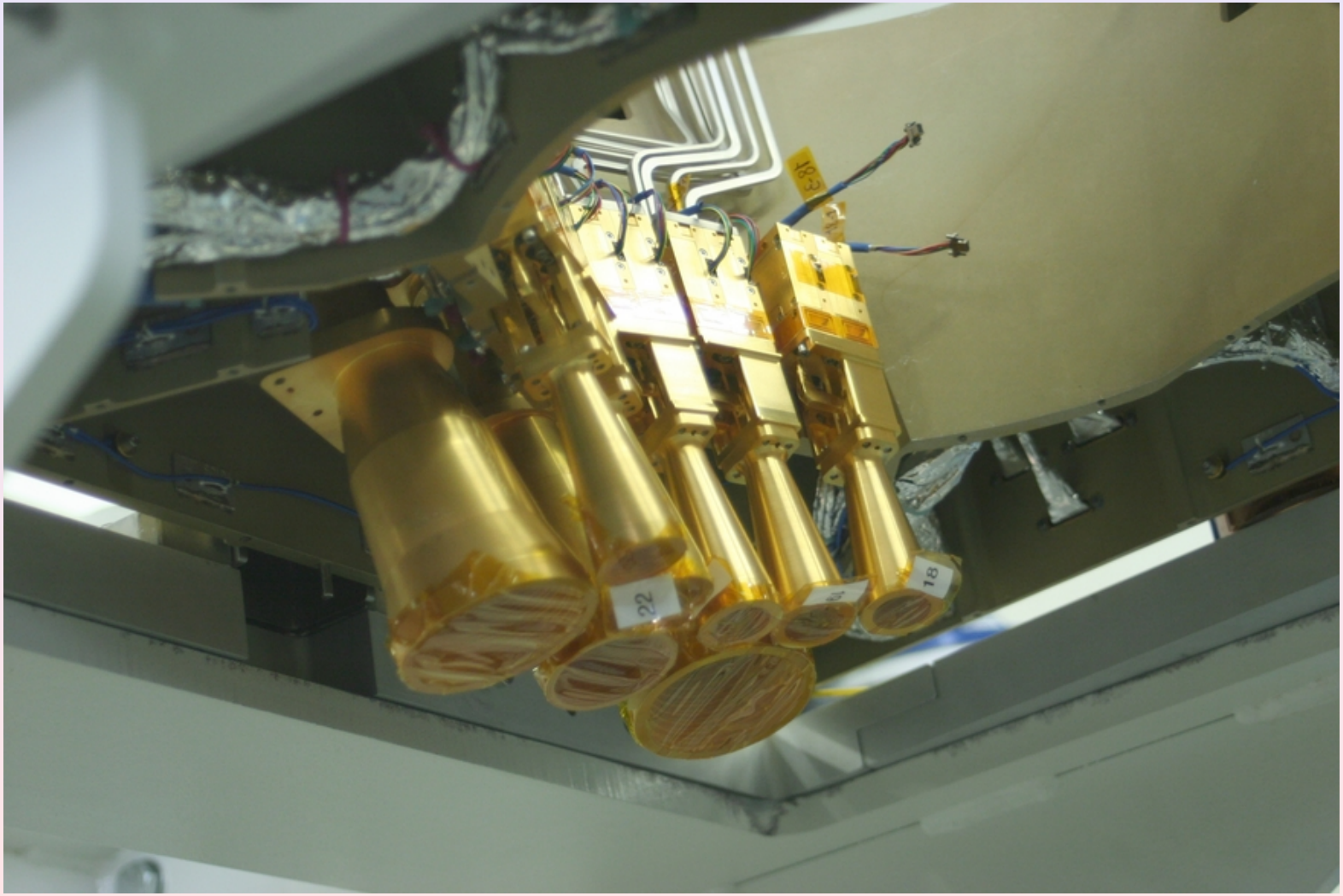

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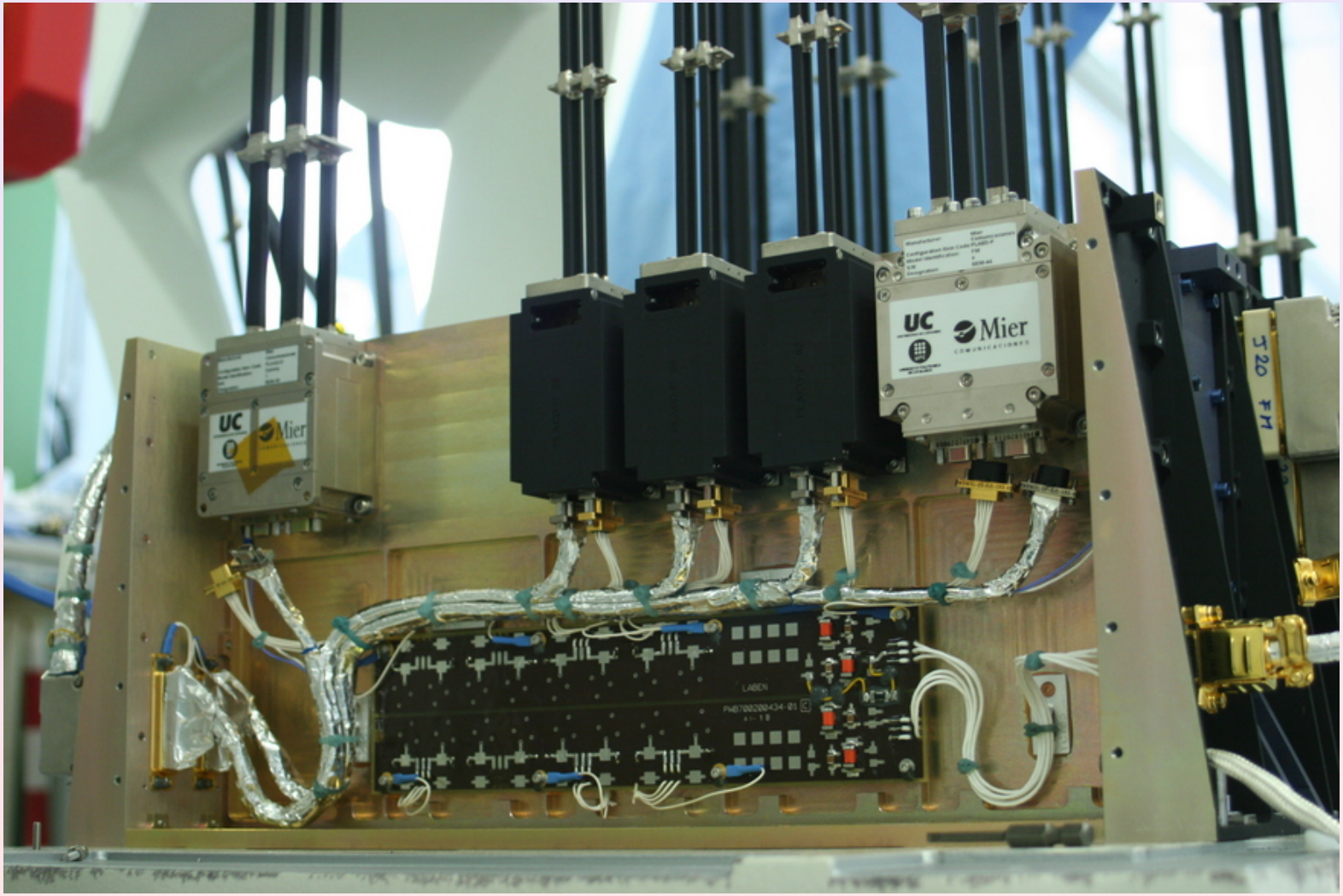

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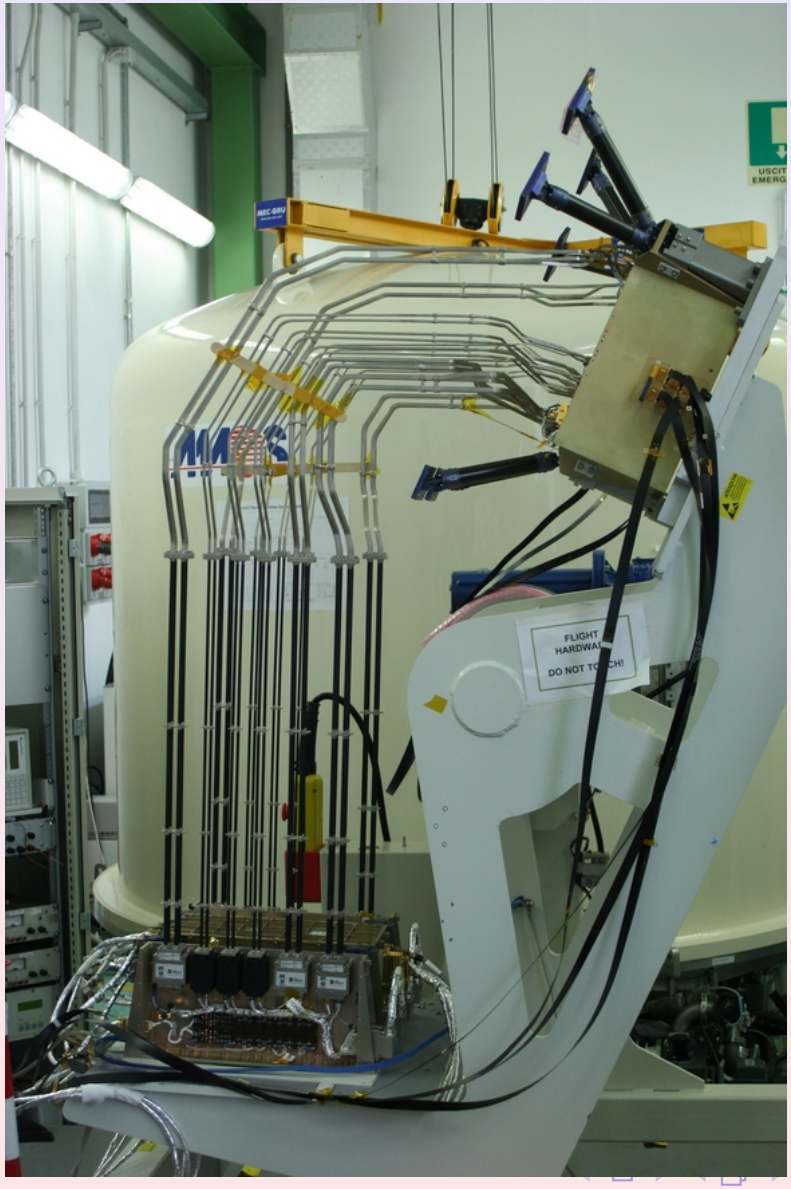

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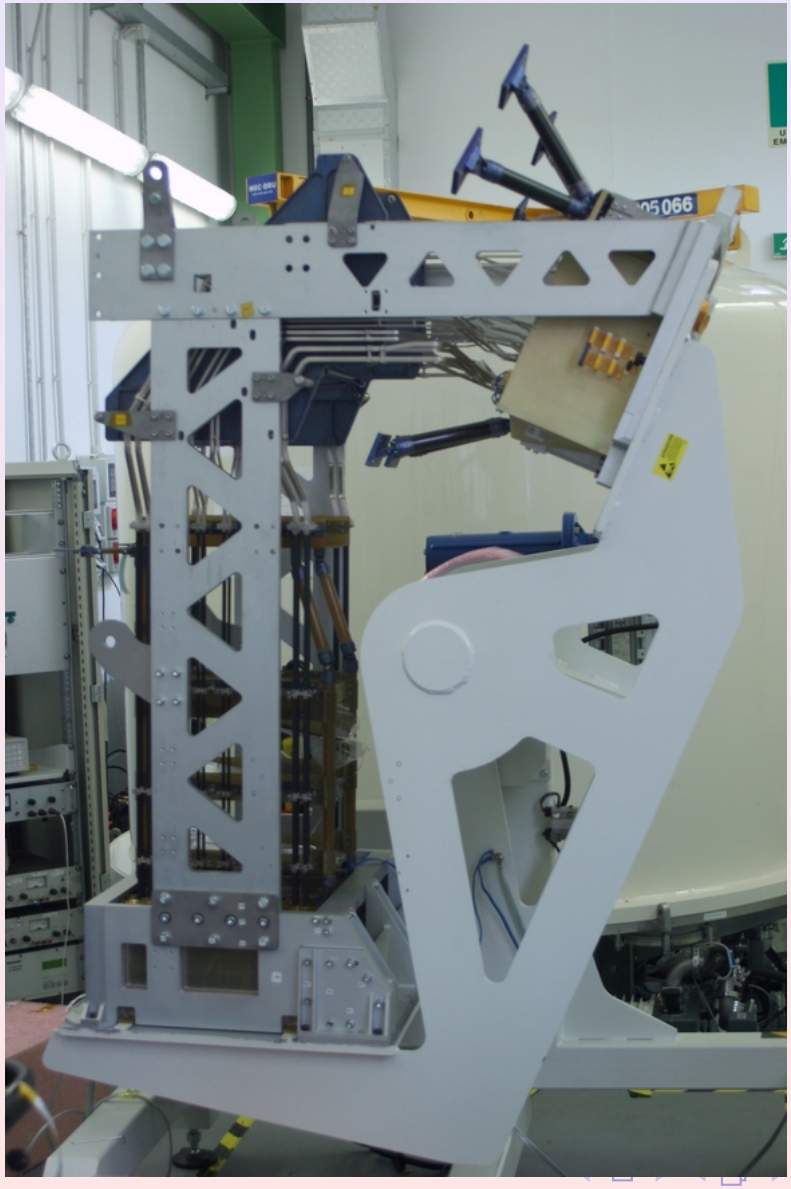

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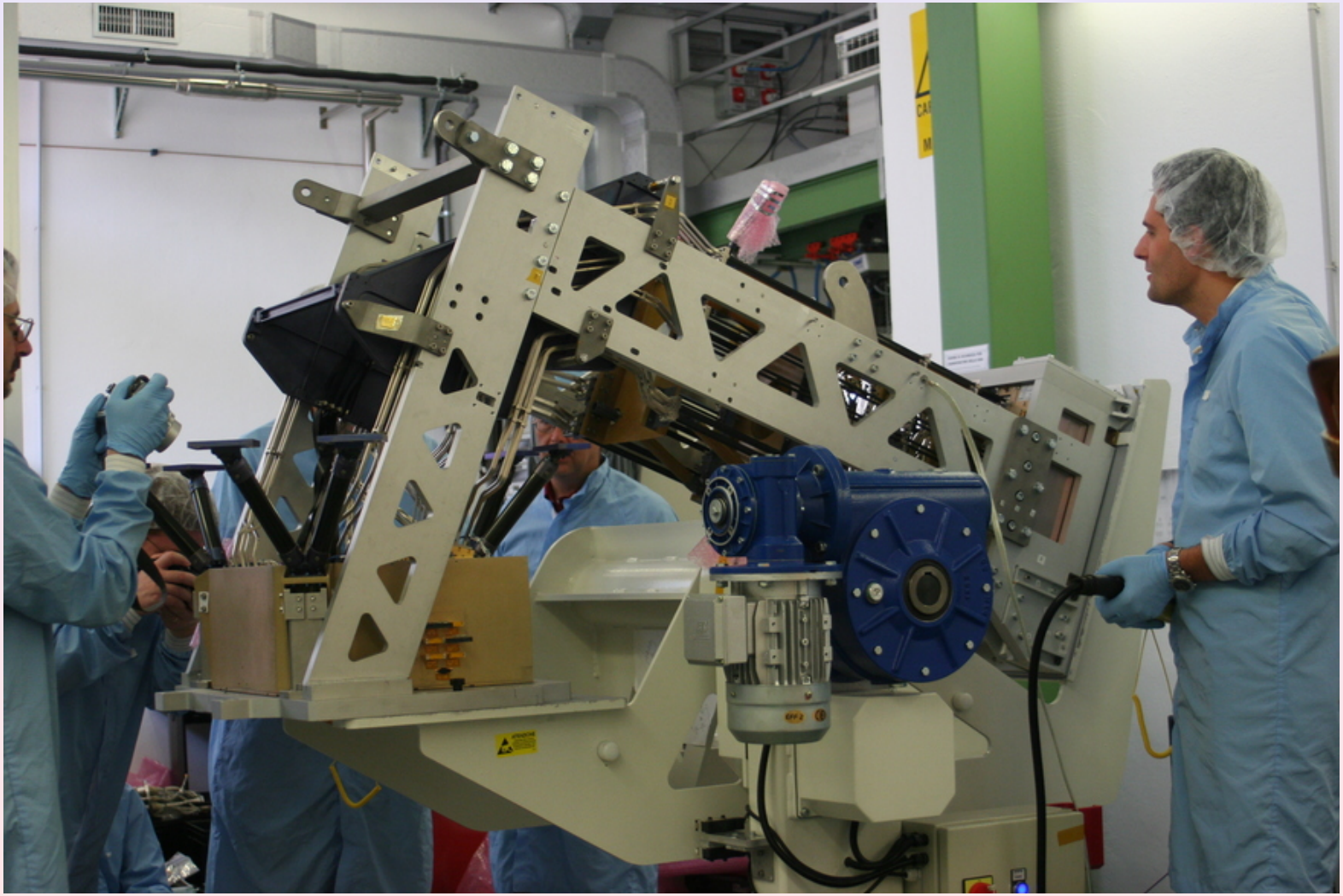

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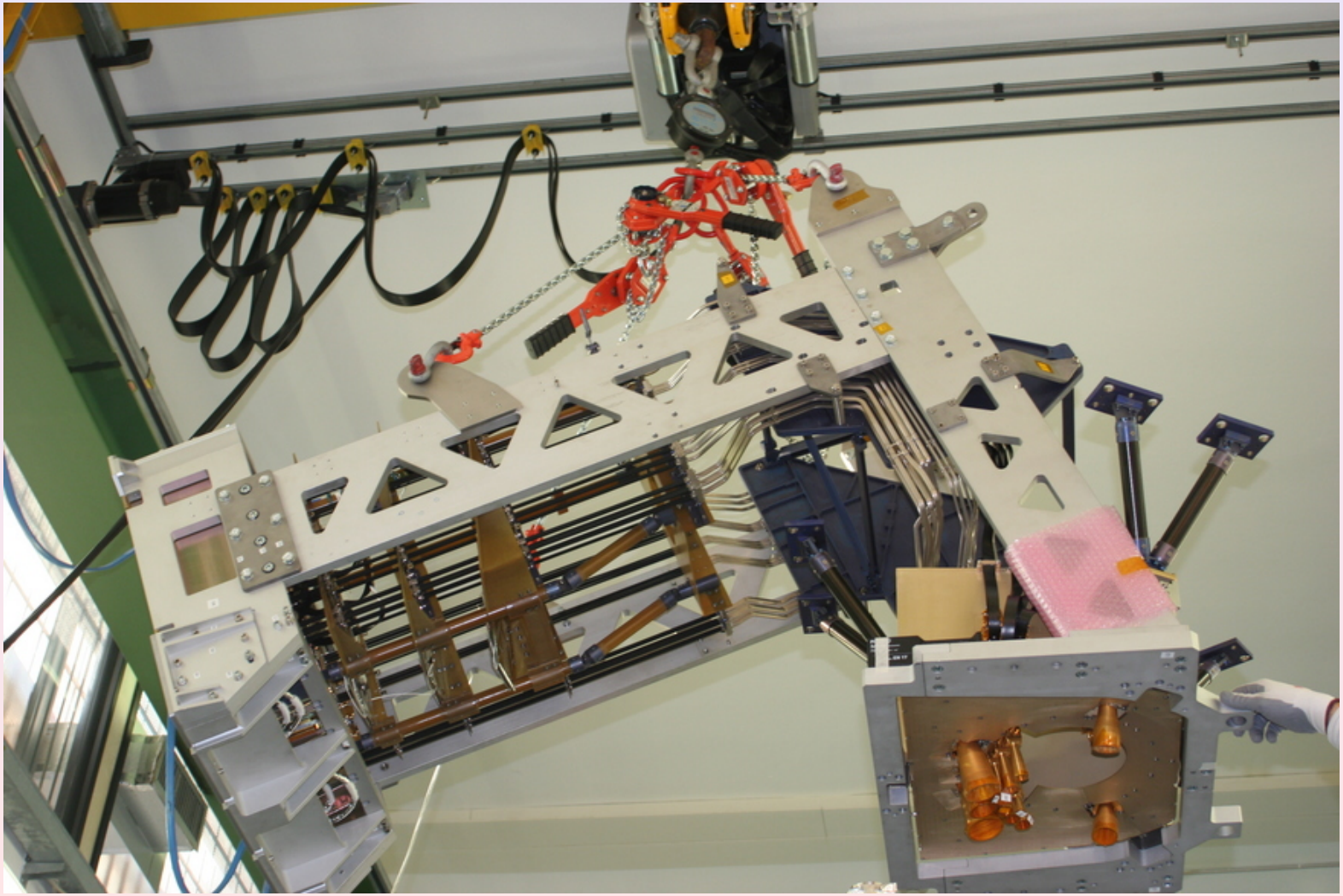

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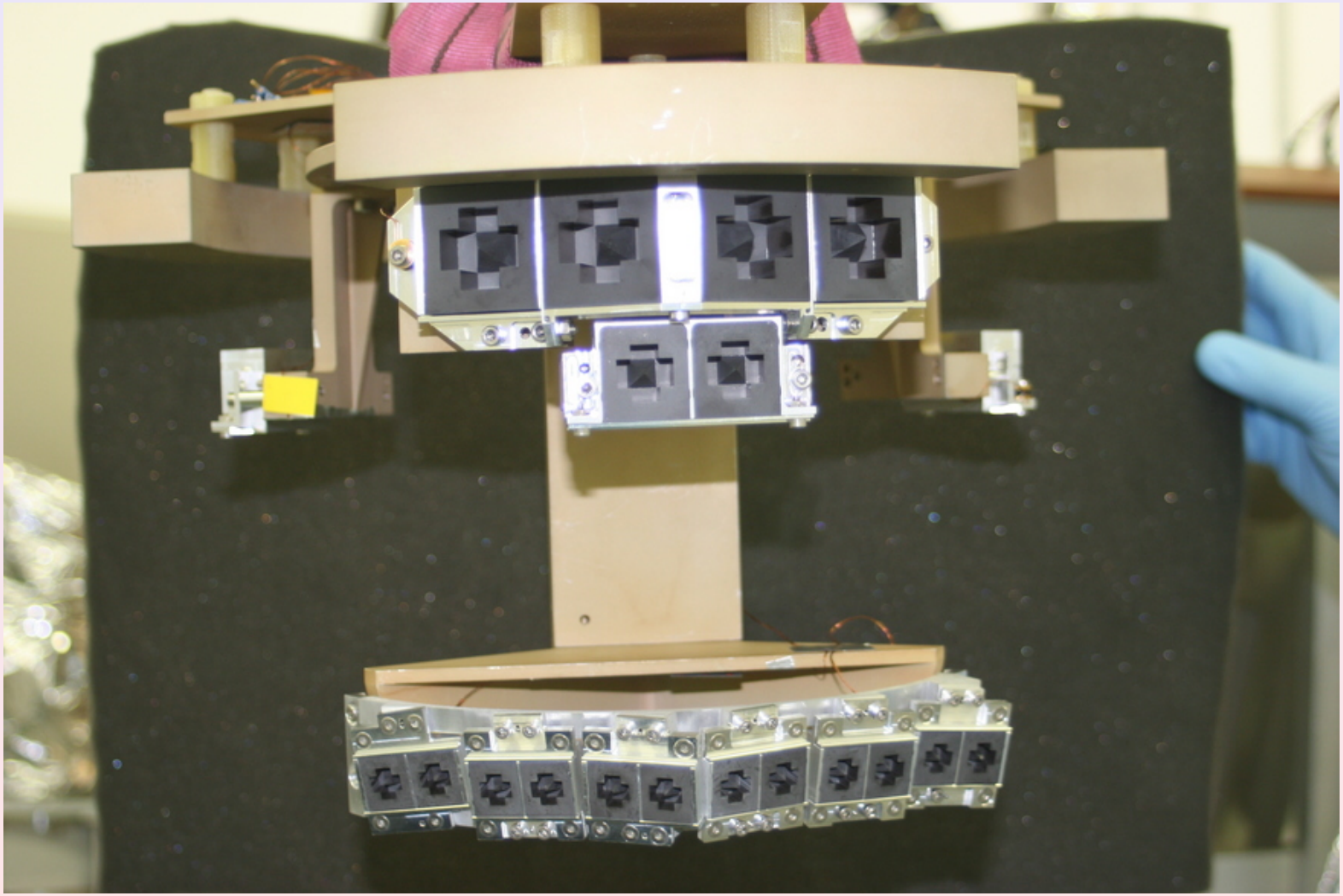

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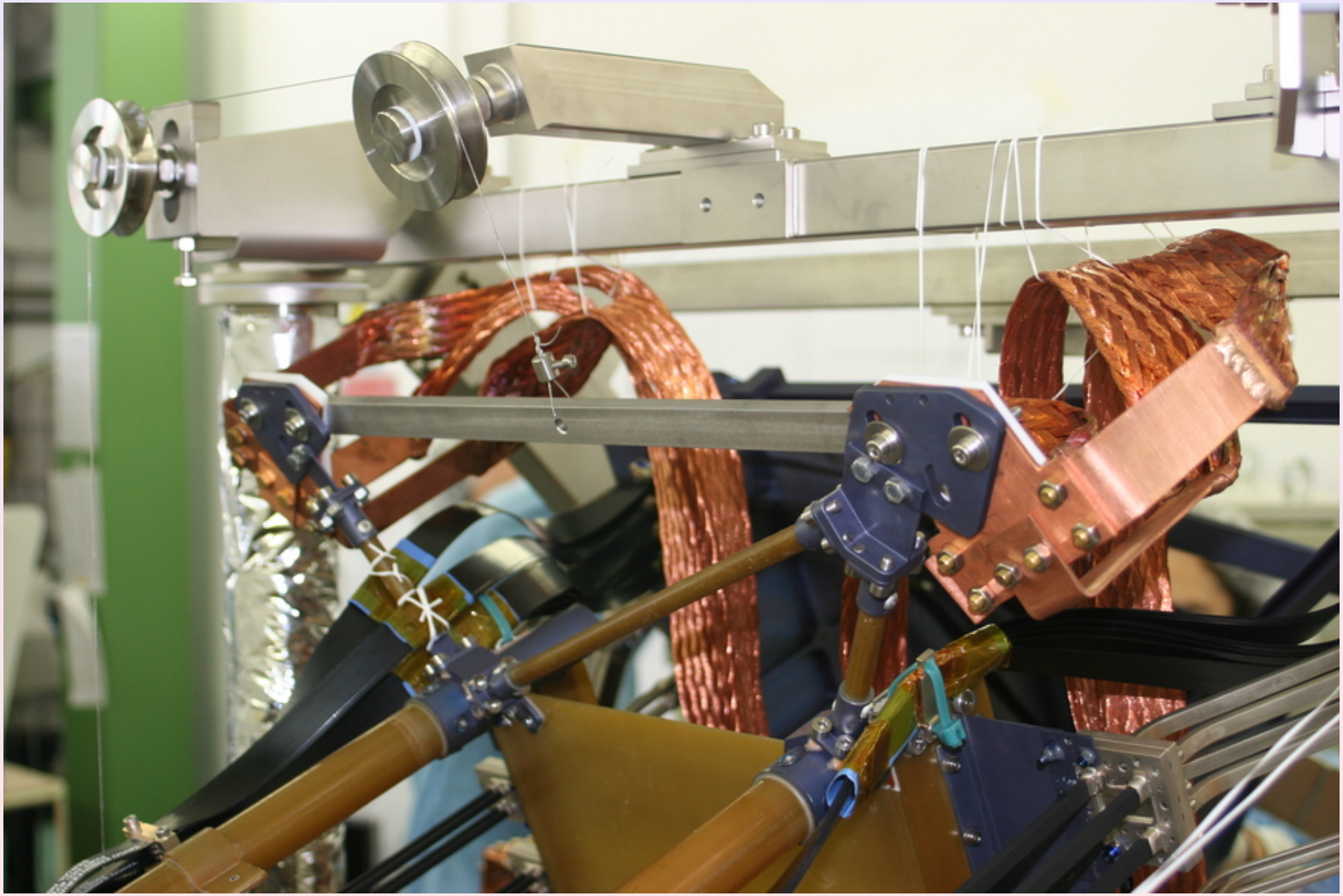

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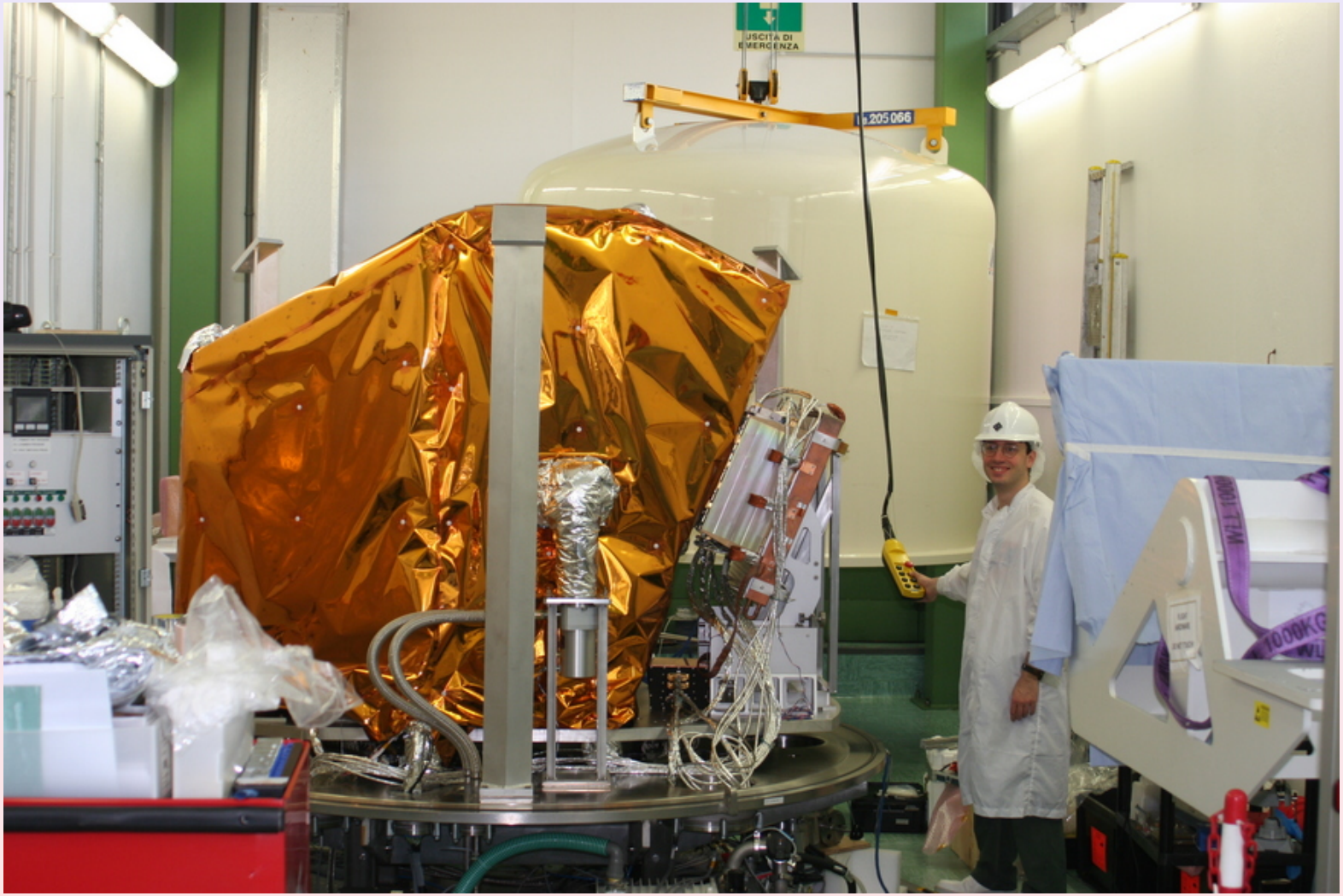

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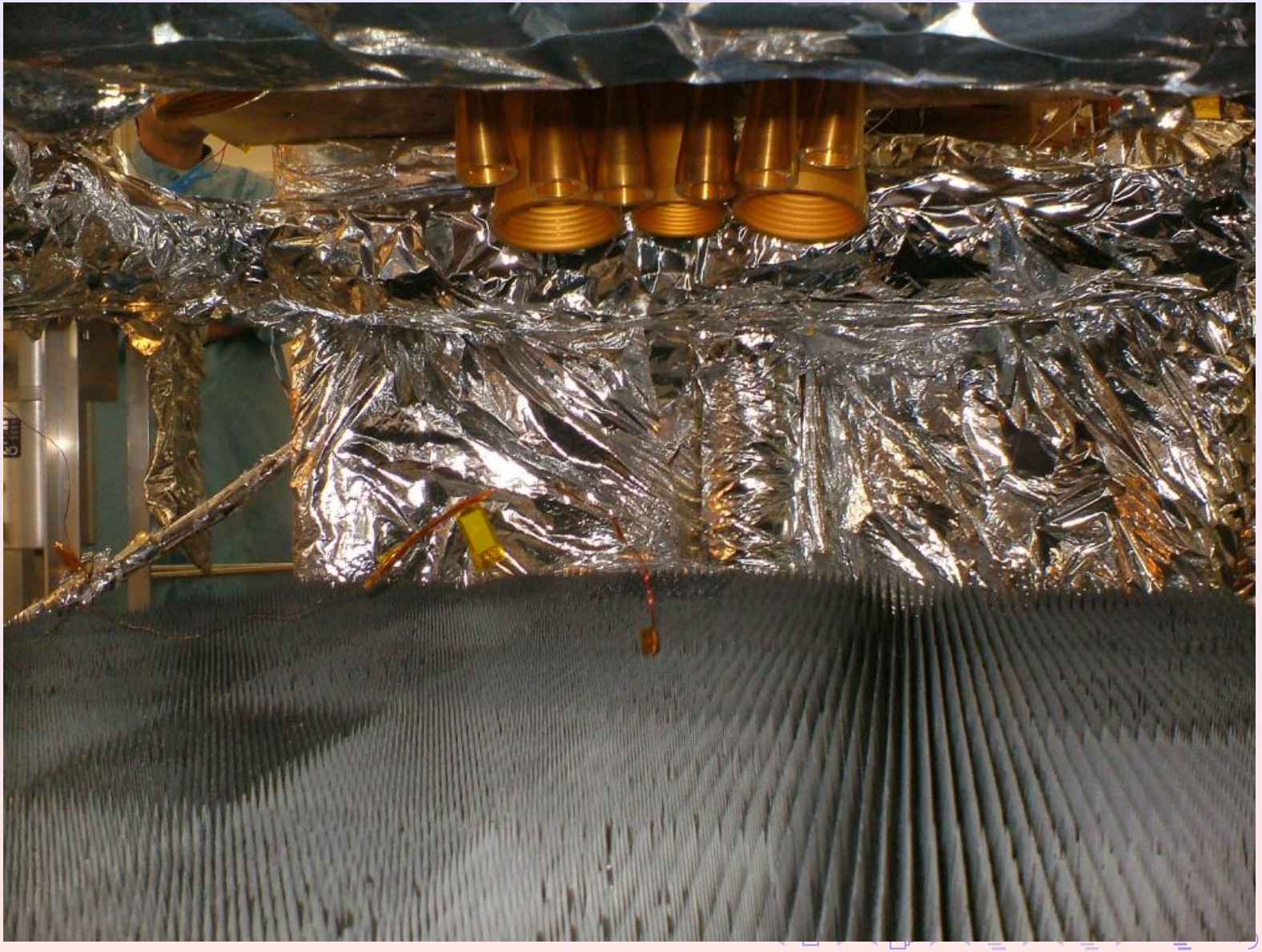
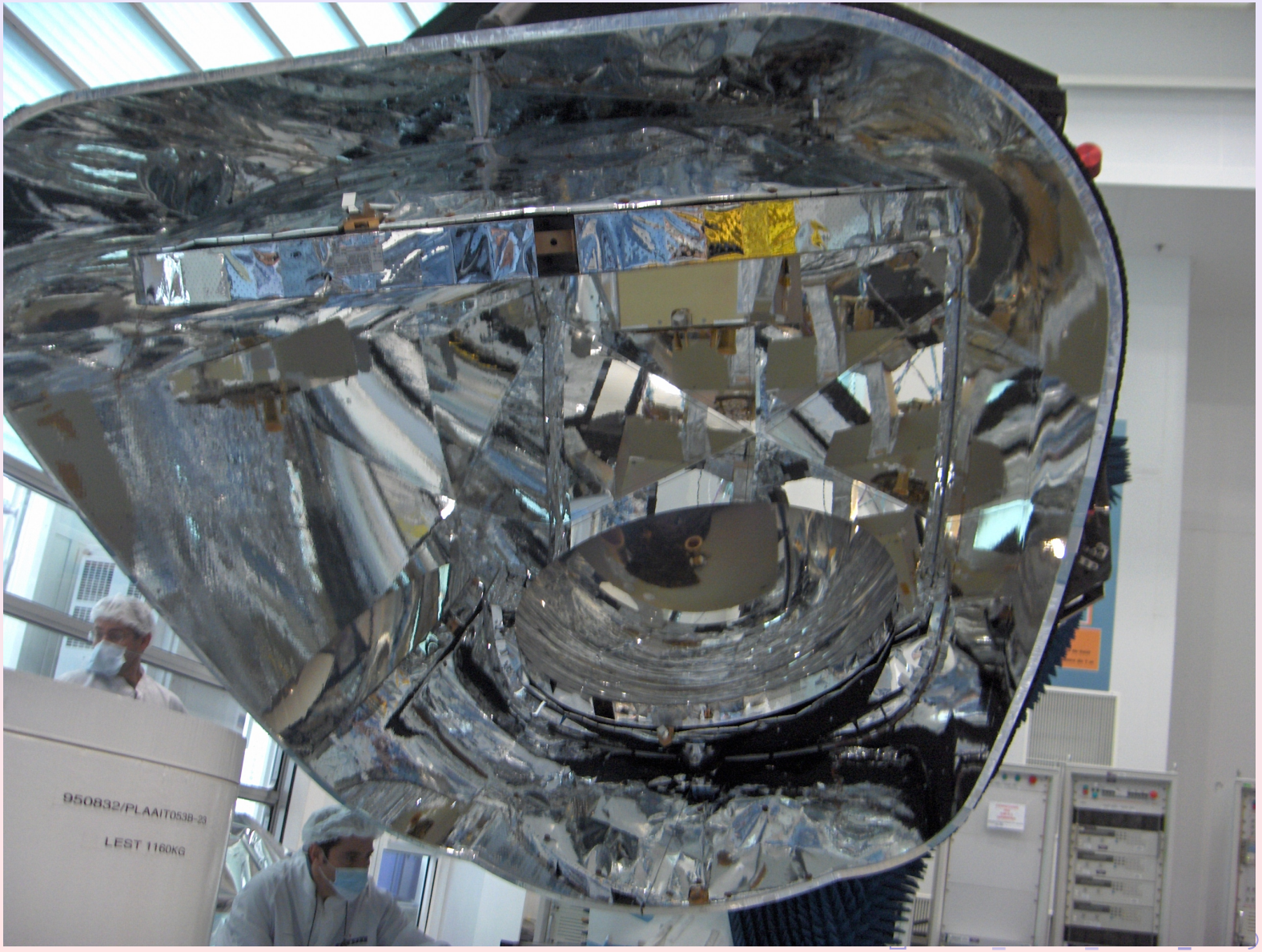


L'hardware - Planck-FM



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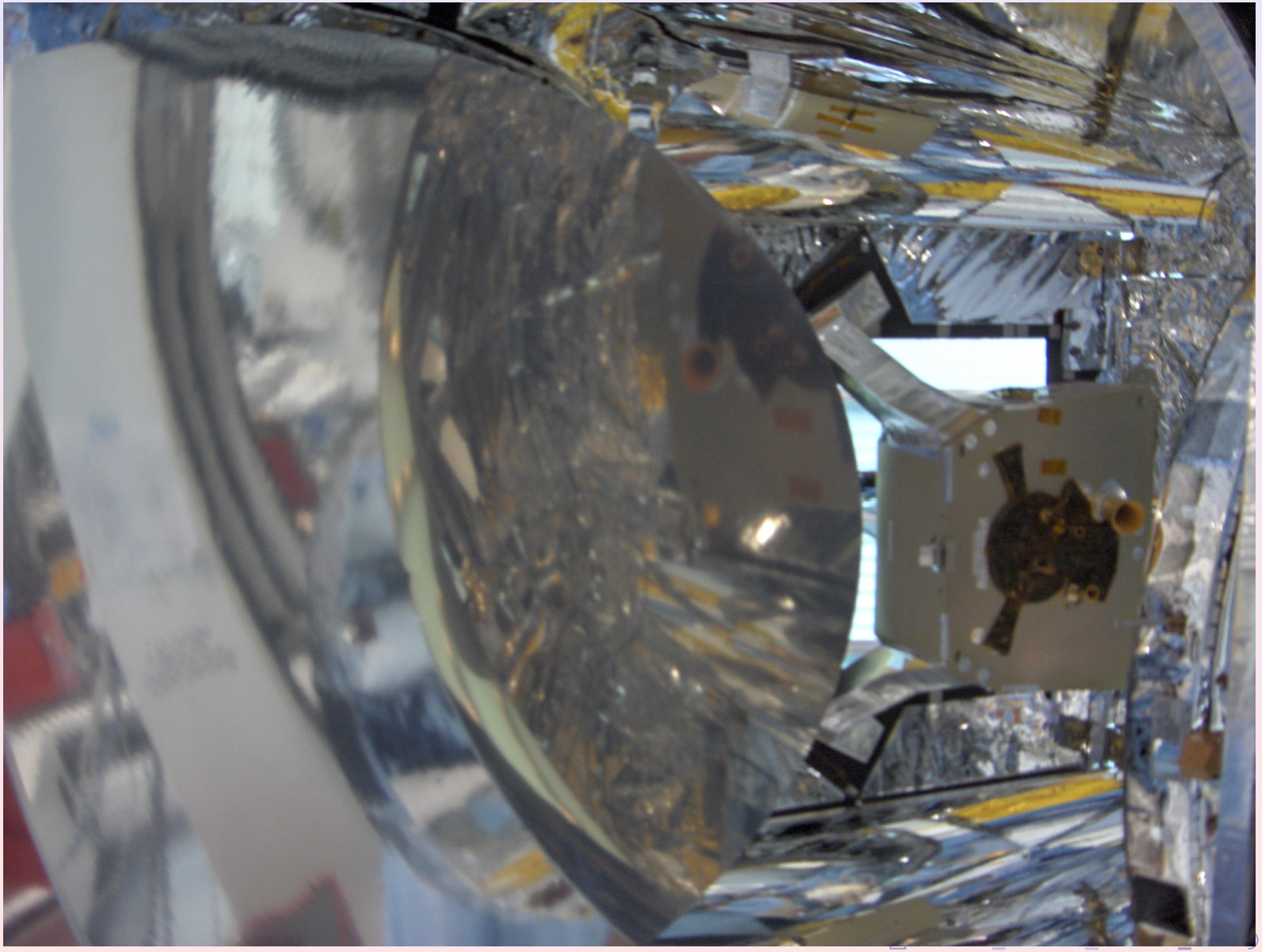

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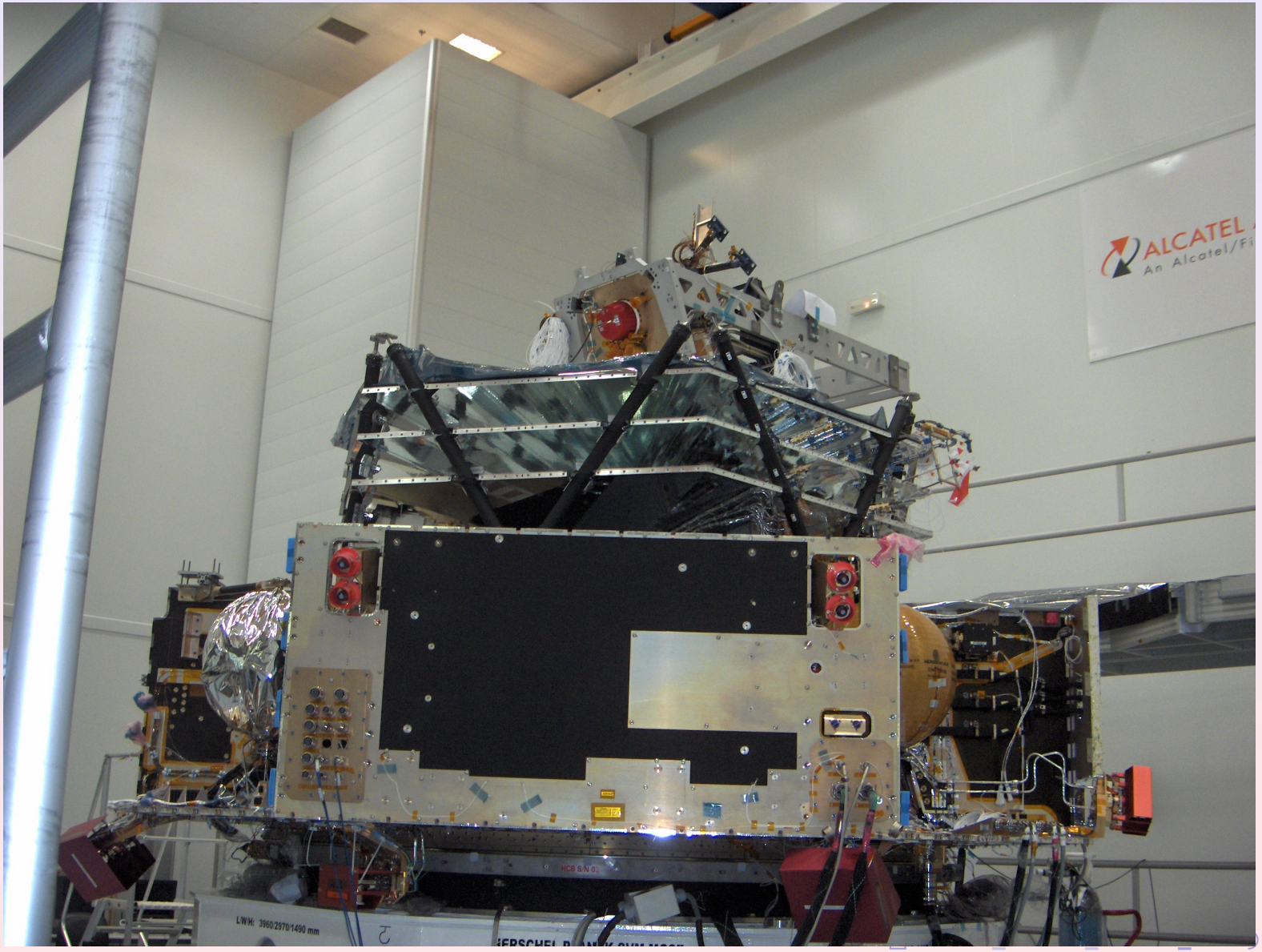

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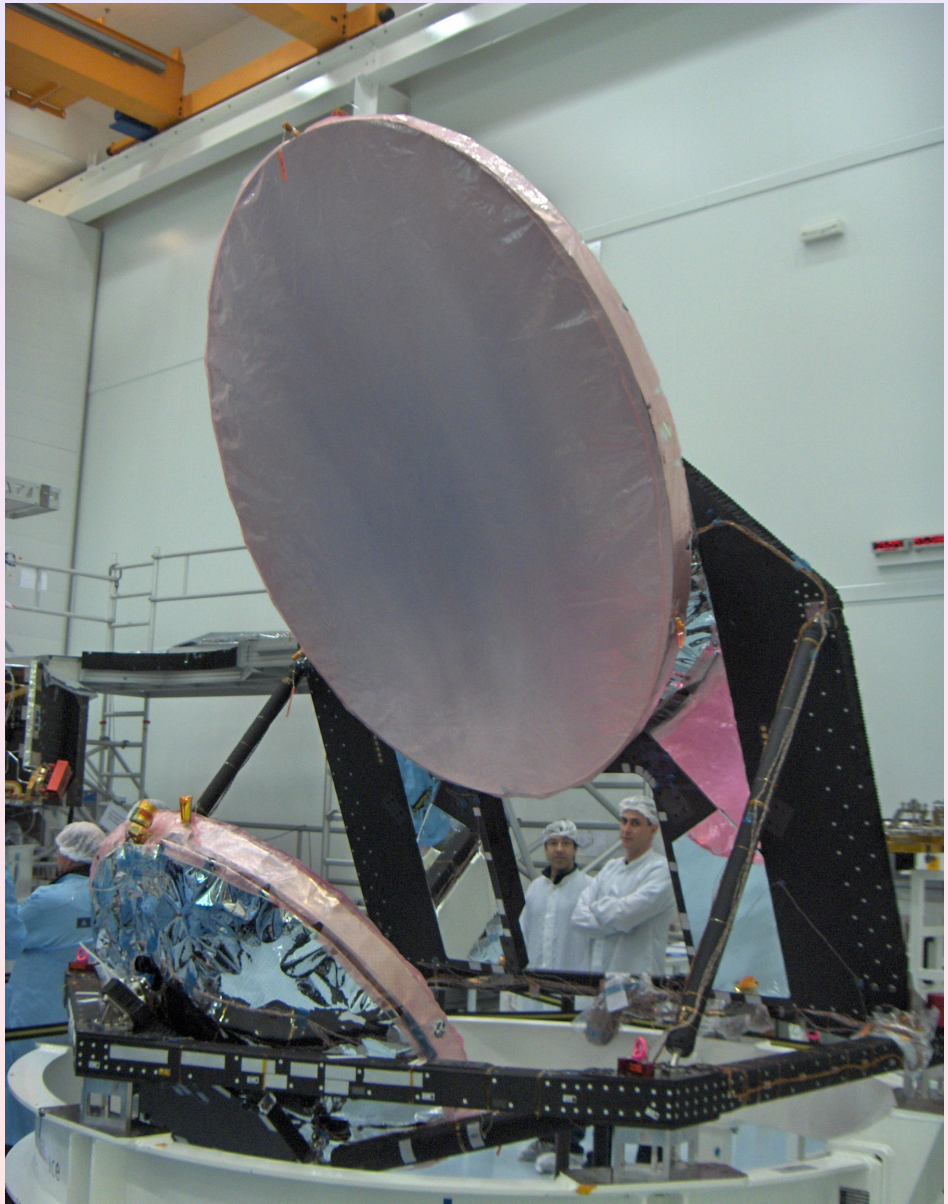

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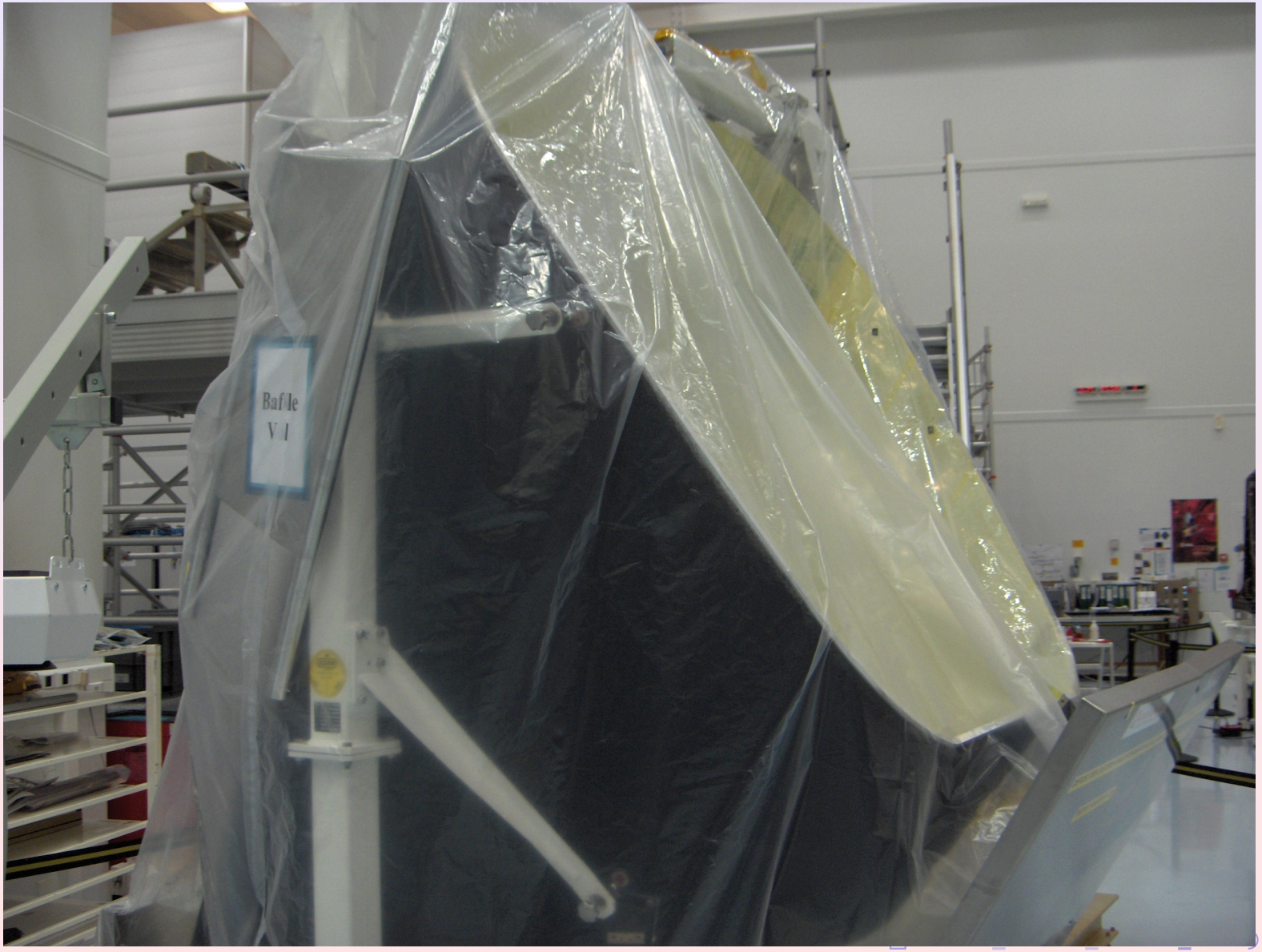

LIFE main features

- Software suite for instrument performance analysis
  - *RaNA (Radiometer aNAlyser) - RCA test data analysis*
  - *LAMA (Lfi Array Measurements Analyser) - RAA ground test data analysis*
- Mixed IDL/C++ (QT graphics libraries) language
  - *Runs on Linux/Windows*
  - *Integration within IDL environment*

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LFI main features

- GUI features
  - *Navigation through multiple datasets and TODs (LAMA only)*
  - *Possibility to zoom into data, select and pan with mouse in zoomed views*
  - *Add/remove/normalise datasets, cross correlation plots*
- IDL command line access to data
  - *Application of user-defined custom analyses*
  - *Implementation of batch scripts with automatic LaTeXreport generation*

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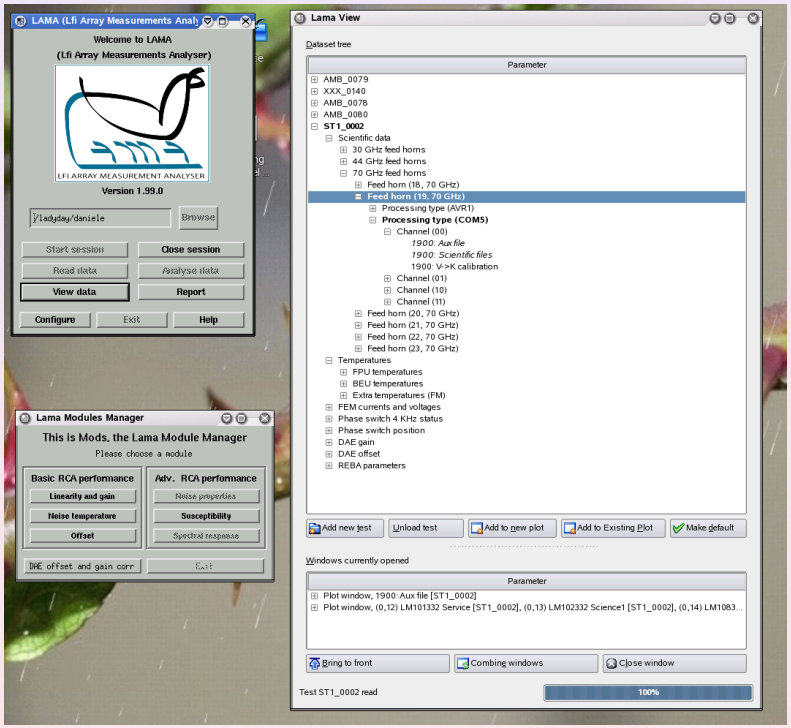
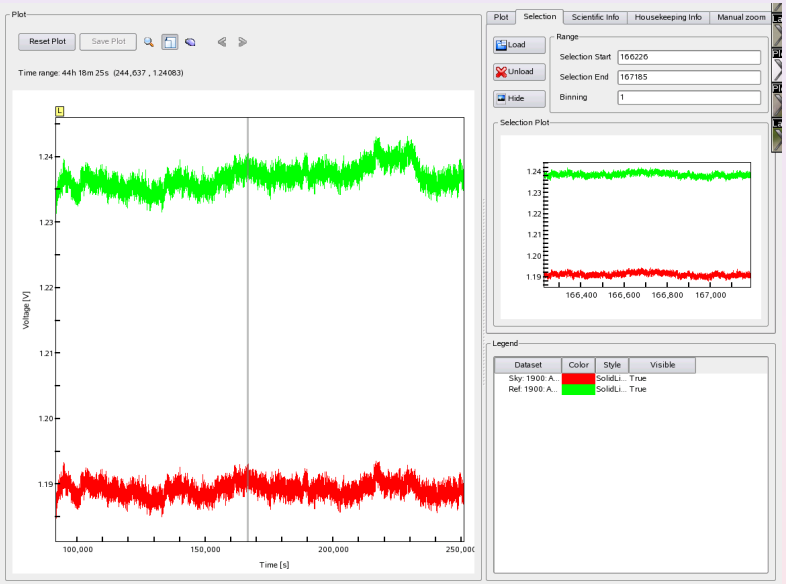
Status of LIFE software - screenshots





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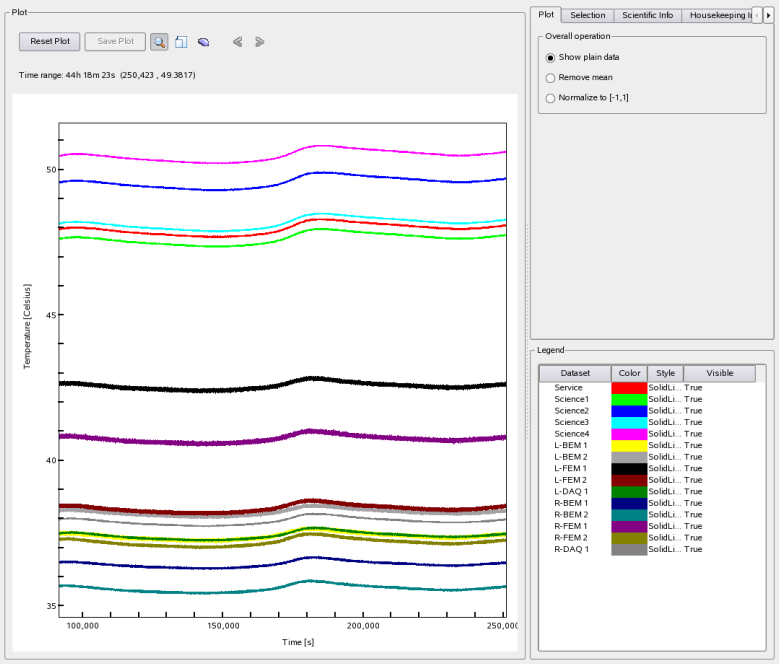

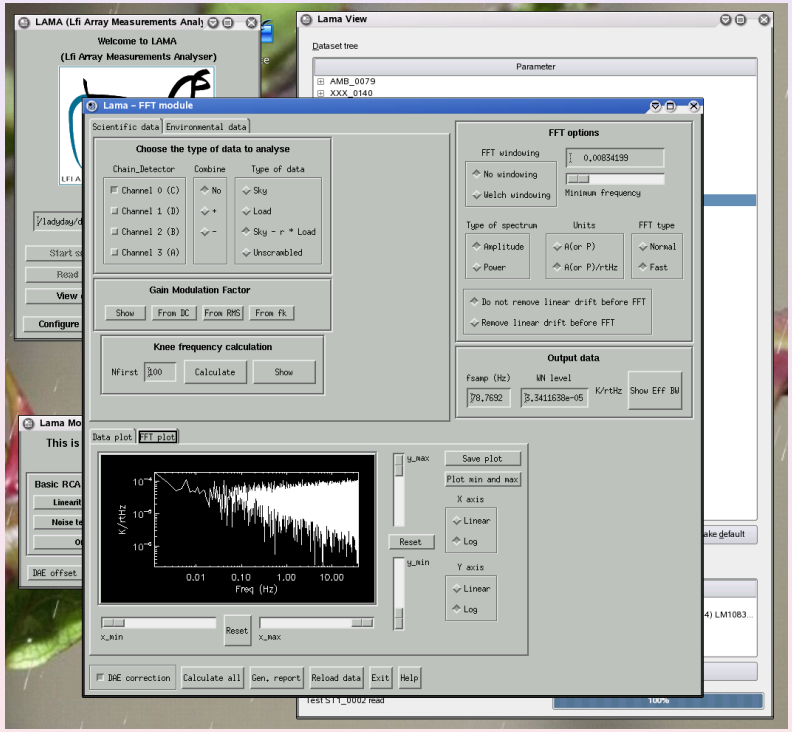

LIFE - Acknowledgments

A. Mennella (UniMi): main coordinator
M. Tomasi (IASF-MI): coordination of LAMA GUI and C++ code

Developers

- S. Galeotta (IASF-MI)
- L. Mendes (ESA)
- S. Lowe (JBO)
- F. Villa (IASF-BO)
- B. Cappellini (UniMi)
- K. Ball (Univ. North Carolina)

Developers (cont...)

- R. Leonardi (UCSB)
- M. Sandri (IASF-BO)
- L. Valenziano (IASF-BO)
- M. Salmon (Univ Cantabria)
- M. Maris (OAT)
- L. Terenzi (IASF-BO)

Data analysis - acknowledments

UniMi/UniTs/ESA/CNR-IFP/JBO/IASF-INAF/UCSB/OAT/SAN
LFI Project System Team

Planck LFI

TITLE: **Data analysis and scientific performances of the LFI FM instrument.**

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Prepared by	Aniello Mennella Marco Bersanelli Benedetta Cappellini Angel Colin Francesco Cuttaia Ocleto D'Arcangelo Samuele Galeotta Anna Gregorio Rodrigo Leonardi Stuart Lowe Michele Maris Luis Mendes Peter Meinhold Maria Salmon Maura Sandri Luca Stringhetti Luca Terenzi Maurizio Tomasi Luca Valenziano Fabrizio Villa	November 15, 2006
Agreed by	M. Bersanelli LFI Instrument Scientist C.R. Butler LFI Program Manager	30 October 2006
Approved by	N. Mandolesi LFI Principal Investigator	30 October 2006