

Final project report

| | |
|-------------------------------|---------------------------|
| <i>Project ID</i> | 2005/7.01 |
| <i>Title</i> | OASI/COCHISE |
| <i>Principal investigator</i> | Giorgio Dall'Oglio |
| <i>Institution</i> | Università Roma Tre |
| <i>Email</i> | dalloglio@fis.uniroma3.it |
| <i>Duration</i> | 3 years |
| <i>Assigned funding</i> | 250.000,00 Euro |

Activities and results

The installation of COCHISE was extended up to the XXV Expedition due to the delay in the delivery of the telescope. Moreover, the reduction of funding required substantial changes both in the focal plane and in the cryogenerator. However, the optical alignment and first light have been carried out by using the millimetric photometer already tested and successfully used at OASI in the past.

Besides, the manufacturing of a new generation of detectors has started. Few SHAB prototypes are already available (*SHAB: Superconducting Hot-spot Air-bridge Bolometers*). Preliminary SHAB calibrations have been performed both in laboratory and at the OASI telescope during the XXVI Expedition. The results obtained from this work are interesting and useful for the optimization of the detectors, that is still in progress. A Lamellar-Grating interferometer has been made with minor modifications with respect to the original project. First laboratory calibration have been already performed using a SHAB.

Despite all the problems exposed, COCHISE is now fully working. The mechanics has been exposed to the Antarctic conditions for 3 years without suffering any problem; the mechanical specifications fulfil the requirements on pointing accuracy. The tracking system has been realized and used; to avoid the breaking of the cables due to the low temperatures, the pointing and tracking system has been upgraded by means of wireless technology. Also the acquisition system has been installed and tested.

In order to evaluate the detectors responsivity, Venus and Jupiter have been used as calibrators. We find for the responsivities 15.7 and 0.25 $\mu\text{V/K}$ at 1.25 and 2.0 mm respectively, 6 times better than that usually observed at OASI. These values show that the efficiency at 2.0 mm is lower than expected: this is probably due to a malfunction of the bolometer. Its substitution has been prevented by the lack of enough liquid helium at Dome C. This result does not affect the data analysis. Figure 1 shows the Jupiter transit. The signal-to-noise ratio observed on planets is exceptionally good. These measurements confirm the previous results obtained by the Group with preliminary experiments on site testing.

Site characterization has been continued by monitoring the columnar water vapour content. Our measurements, performed with a spectral hygrometer, will be compared to atmospheric models and radiosounding data in order to provide millimetric transparency. The first COCHISE observations are extremely promising. These results encourage the OASI Group to start the astrophysical and cosmological observations, main goal of the Project. This success derives from years of efforts by the OASI group and its partners, but it would not have been possible without the support and the assistance of PNRA and IPEV people. For this reason the Group devotes them particular thanks.

Programma Nazionale di Ricerche in Antartide (PNRA)

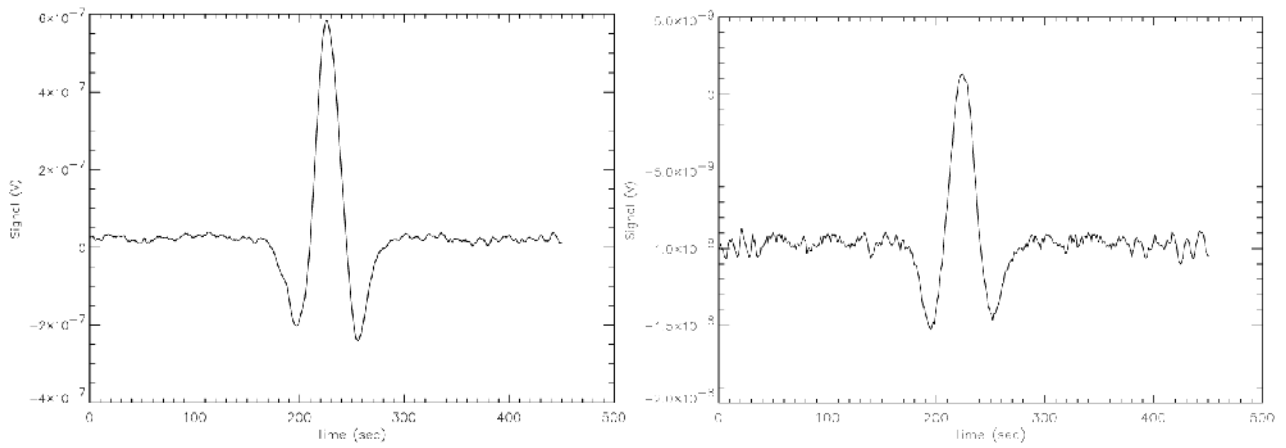


Figure 1: Jupiter transit at 1.25 mm and 2.0mm.



Figure 2: The COCHISE telescope.



Figure 3: View of the primary mirror.

Programma Nazionale di Ricerche in Antartide (PNRA)

Products

A – papers in scientific magazines

1. Sabbatini, L., Cavaliere, F., Dall'Oglio, G., Miriametro, A., Pizzo, L., Mancini, D. COCHISE : the Italian millimetric telescope at Concordia (Dome C, Antarctica). Submitted to Experimental Astronomy.
2. Cibella, S., Carelli, P., Castellano, M.G., Foglietti, V., Leoni, R., Ortolani, M., Torrioli, G. A Superconducting Bolometer Antenna-Coupled to Terahertz Waves. JLTP 154, 142-149 (2009)
3. Sabbatini, L., Cavaliere, F., Dall'Oglio, G., Davies, R.D., Martinis, L., Miriametro, A., Paladini, R., Pizzo, L., Russo, P.A., Valenziano, L. Millimetric observations of southern H II regions. A&A 439, 595-600 (2005)
4. Pizzo, L., Dall'Oglio, G., Martinis, L., Sabbatini, L. A multipurpose ^3He refrigerator. Cryogenics, Volume 46, Issue 10, 762-764 (2006).

B – book chapters

--

C - proceedings of international conferences

1. Dall'Oglio, G. Millimetric results and perspective. EAS Publications Series 14, 69-73 (2005)
2. Sabbatini, L., Dall'Oglio, G., Pizzo, L., Miriametro, A., Cavaliere, F. COCHISE: a 2.6 meter millimetric telescope at Concordia. EAS Publications Series 40, 319-325 (2010)
3. Valenziano, L. Astronomical site quality in the sub-millimetric and millimetric bands at Dome C, Antarctica. EAS Publications Series 14, 25-30 (2005)

D – proceedings of national meetings and conferences

1. Sabbatini, L., Dall'Oglio, G., Pizzo, L., Cavaliere, F., Miriametro, A. COCHISE: cosmological observations from Concordia, Antarctica. 1st Roman Young Researchers Meeting Proceedings, arXiv:0912.2558, 5-10 (2009)

E – thematic maps

--

F – patents, prototypes and data bases

--

G – exhibits, organization of conferences, editing and similar

--

H - formation (PhD thesis, research fellowships, etc.)

1. Sabbatini, L. Millimetric observations of Southern compact HII regions with OASI telescope and preparation of COCHISE telescope for cosmological observations. PhD Thesis (2009)
2. Cibella, S. Studio di bolometri per il lontano infrarosso. PhD Thesis (2009)

Research units

Unit 1

Giorgio Dall'Oglio – Prof. Ass. – Università di Roma Tre
Gabriella Pizzo – Ricercatore – Università di Roma Tre
Lorenzo Martinis – Contrattista - Università di Roma Tre
Lucia Sabbatini - Dottoranda – Università di Roma Tre
Sara Cibella – Dottoranda - Università di Roma Tre
Antonio Miriametro – Funz. Tecn. – Università di Roma “La Sapienza”
Francesco Cavaliere – Coll. Tecn. – Università di Milano

Unit 2

Luca Valenziano – Ricercatore - CNR/IASF-BO

Programma Nazionale di Ricerche in Antartide (PNRA)

Unit 3

Marco De Petris – Ricercatore - Università di Roma "La Sapienza"

Luca Lamagna – Assegnista di Ricerca – Università di Roma "La Sapienza"

Simone De Gregori – Dottorando – Università di Roma "La Sapienza"

Gemma Luzzi – Assegnista - Università di Roma "La Sapienza"

Date: 22/02/2011

Notes