Programma Nazionale di Ricerche in Antartide (PNRA)

Final project report

Project ID  2005/7.01
Title  OASI/COCHISE
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Duration  3 years
Assigned funding  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 μV/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.
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Figure 1: Jupiter transit at 1.25 mm and 2.0mm.

Figure 2: The COHISE telescope.

Figure 3: View of the primary mirror.
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Products

A – papers in scientific magazines


B – book chapters

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C - proceedings of international conferences


D – proceedings of national meetings and conferences


E – thematic maps

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F – patents, prototypes and data bases

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G – exhibits, organization of conferences, editing and similar

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


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