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# Observations at millimetric and sub millimetric wavelengths from Antarctica: activity report

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**Abstract.** Millimetric and sub millimetric astrophysics in Antarctica is a rapidly growing field. In Italy many projects are going on. We present an activity report of the Milano Radio Group in this field.

**Key words.** radio continuum: general – submillimeter – instrumentation: polarimeters – cosmic microwave background – stars: formation

## 1. Introduction

The Antarctic Plateau is a unique site for astrophysical observations at mm and sub-mm wavelengths. In fact its average elevation is about 2.5 km and the water vapour content of the atmosphere above it is extremely low. Moreover the Plateau is a flat, thick (about 2 km) and large (about 2500 km radius) slab of ice at constant temperature therefore the atmosphere above it is very stable. For all these reasons the atmosphere above the Plateau is extremely transparent to mm and sub-mm wavelengths radiation and the atmospheric noise level produced by turbulence low. Various astrophysical stations and facilities have been already built and are now in operation on the Plateau, e.g. the US Amundsen Scott Base at South Pole and the Russian Vostok station. Dome C is a facility used by the French Italian Antarctic community. Presently used in the (local) summer season, it will become soon operative also in winter. The Italian astrophysical community has projects of facilities to be installed at Dome C (for a review see for instance Candidi et al. (2000), Sironi (1998)).

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## 2. The Milano Radio Group: an activity report

The Milano Radio Group is currently working on:

– a)Polarimetry of the Cosmic Microwave Background: an etherodyne correlation polarimeter operating at 33 GHz has been built in the past and tested in Antarctica in 1994 (BTN) (Sironi et al. 1998) and in 1998 (Dome C) (Sironi et al. 1997, see Fig. 2). It allows to study both circular and linear polarization. With an angular resolution of

**Fig. 1.** The Mk-2 Milano Polarimeter at Dome C.

$7^0$ and $14^0$ it has been used for studying the region of the South Celestial Pole, in the linear polarization mode. An improved model (Mk-3) whch includes phase modulation to improve the noise rejection and to increase the system sensitivity has been recently completed and is now ready for extensive tests and observation from the Italian Alps, at the Testa Grigia Observatory (Sironi et al. 2002). When the Dome C station will be operative also in the local winter we plan to bring our polarimeter there and to carry on observations looking directly at the sky (angular resolution of $7^0$ and $14^0$ and through the 2.6 m telescope which is being prepared by the group of G. Dall'Oglio of Rome III University (Dall'Oglio 2002) (angular resolution 30 arc min).

– b)Low noise Etherodyne receivers at 94, 225 and 345 GHz. In collaboration with IEN Galileo Ferraris of Turin, Electronics Depts of the Polytehcnic Schools in Milan and Turin and CAISMI/CNR of Arcetri in the past we developed the capabilty of preparing SIS (Superconductor - Insulator - Superconductor) junctions we use now to build low noise mixers (Sironi et al. 1996). They are now used to build radiometers operating at 94, 225 and 345 GHz (Battistelli et al. 2002). Coupled to an acousto -optical spectrometer prepared by CAISMI/CNR these receivers will be used to study regions of stellar formation. In future we plan also to use similar systems to study CI lines in galaxies at $Z > 1$ and work out the temperature of the Cosmic Microwave background at $Z > 1$. Also these systems are ready for tests and observations fron the italian Alps. We are ready to bring them at Dome C and carry on observations using the 2.6 m facility as soon as Dome C and the Dalloglio Telescope will be available.

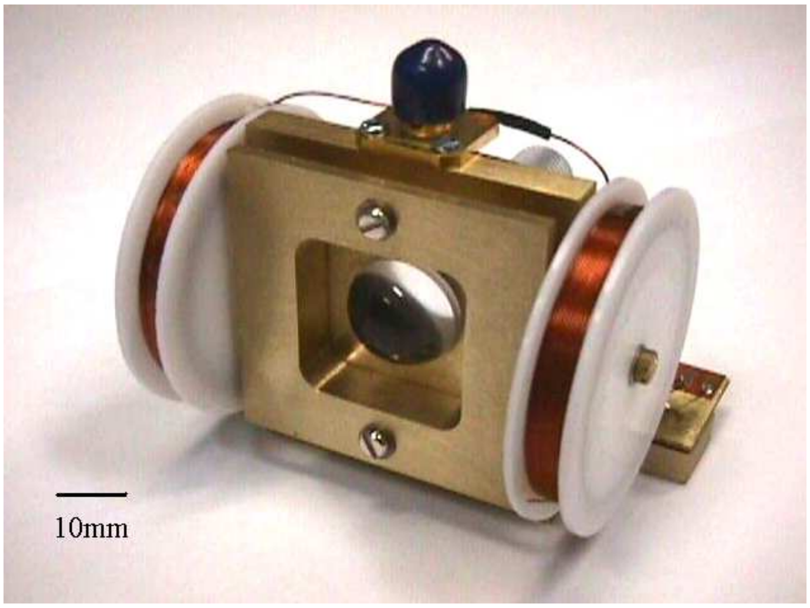


**Fig. 2.** Quasi optical SIS mixer built at IEN Galileo Ferraris (Torino) for the Milano-Arcetri-Torino collaboration.

– c)project for advanced telescopes (Sironi 2000) and observations with existing telescopes, like AST/RO at South Pole (Scappini et al. 2000).

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