Name of research institute or organization:

I. Physikalisches Institut, Universität zu Köln, Radioastronomisches Institut, Universität Bonn

Title of project:

KOSMA - Kölner Observatorium für Submm-Astronomie

Project leader and team:

Prof. Dr. Jürgen Stutzki, observatory director
Dr. M. Miller, station manager
Universität zu Köln: Dr. H. Jakob, Dr. U. Graf, Dr. C. Kramer, Dr. R. Simon, Dr. V. Ossenkopf, Dr. M. Röllig.
Universität Bonn: Prof. Dr. F. Bertoldi, Prof. Dr. U. Klein, P. Müller, J. Pineda.

Project description:

The large scale distribution, physical and chemical conditions of the interstellar matter

End of last year we upgraded the array receiver SMART, a dual-frequency, 2x8 pixel array receiver operating at two frequency bands near 492 and 810 GHz with 8 pixels each on the sky. SMART now allows observations of both [CI]-lines and CO 7-6 simultaneously. It also allows for CO(4-3), 13CO(8-7) observations. The receiver consists of four major units:

* The image rotator. As the source is followed on its path through the sky during a long observation, its image in the focal plane of the telescope rotates. This effect, which is caused by the way our telescope is mounted (alt-az), is compensated by the image rotator.
* The main optics unit. This part contains most of the optics of the instrument, in particular the diplexer assembly, consisting of two identical Martin-Puplett-interferometers, and the local oscillator (LO) assembly, consisting of two solid state LO-chains and two collimating Fourier gratings as beam multiplexers.
* The cryostat. Inside the cryostat, the detectors (SIS-mixers) and the first low-noise amplifiers are cooled to approximately 4 K using a closed cycle refrigerator.
* The electronics racks for the 490GHz and 810GHz channel. The racks contain most of the control hardware required to operate the receiver together with a computer that monitors and controls the hardware.

Between January and April 2008 we tested the new hardware (810 GHz components), and the software of the receiver system under realistic conditions at Gornergrat observatory. Several steps of debugging were necessary for the complex electronics. The operation at Gornergrat also proved to be very helpful for determining the most efficient way to properly align the beam rotator and array pixel optical components. Due to the poor weather in the spring 2008 season, no astronomical observations at the high frequencies were possible, except for sun-pointings for the optical alignment measurements. Also, the digital Fourier-transform spectrometer from ETH-Zürich and its associated intermediate-frequency hardware were upgraded and tested for the SMART operation with 16 high spectral resolution channels.

In the beginning of May we prepared SMART for transport to Chile. Shipping was on May 9. SMART has been successfully installed and tested at NANTEN2. Hardware failures of one of the LO components requires repair in the 2008/09 Chilean summer and full operation will resume in Chile in the 2009 season.

The KOSMA Dual-SIS-Receiver for 230/345 GHz is still in use. In cooperation with Prof. Yuefang Wu from the Astronomy Department of Peking University/China we observed 12CO 3-2, 12CO 2-1 lines in multiple component sources in spring 2008. We resumed operation in late fall 2008 in preparation for the spring 2009 observing season with the 230/345 GHz dual channel receiver.

Key words:

Interstellar matter, ISM, PDR, millimeter, submillimeter wave telescope, SIS receiver, array receiver, Nasmyth rotation, beam rotator, pointing model

Internet data base

http://www.ph1.uni-koeln.de/kosma
http://www.astro.uni-bonn.de/

Collaborating partners/networks:

MPI für Radioastronomie Bonn, Institut für angewandte Physik, Universität Bern, ETH Zürich, Astrophysics Division of CEA Grenoble, France, Observatoire de Bordeaux, France, Astronomy Department Peking University, China, National Astronomical Observatory Chinese Academy of Science (NAOC), Peking, China, NANTEN2 Observatory, Pampa la Bola, Atacama, Chile (Nagoya and Osaka University)

Scientific publications and public outreach 2008:

Refereed journal articles

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