

Name of research institute or organization:

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

Title of project:

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KOSMA – Kölner Observatorium für Submm-Astronomie

Project leader and team:

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Prof. Dr. Jürgen Stutzki, observatory director

Dr. M. Miller, station manager

Universität zu Köln: H. Jakob, Dr. U. Graf, PD Dr. C. Kramer, Dr. R. Simon, PD Dr. V. Ossenkopf, Dr. M. Röllig.

Universität Bonn: Prof. Dr. F. Bertoldi, Prof. Dr. U. Klein, P. Müller, J. Pineda.

Project description:

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

In 2007, the observatory was in operation for 3 months. In January and early February the group of Philippe Andre (CEA Paris) used the KOSMA telescope for 3 weeks to test a new version of the 450  $\mu\text{m}$  Bolometer camera ARTEMIS. The camera was developed at the Astrophysics Division of the CEA/DAPNIA and the LETI/LIR of CEA in Grenoble (France). The detector is a 16x16 pixel array which is cooled to 300 mK. It is similar to the CEA detector PACS which is one of the three instruments used in the Herschel satellite. A series of tests were done on the Gornergrat KOSMA telescope. The recycling time of the  $^3\text{He}$  cooler could be extended to more than 24 hours.

Three months later, the first wide-field maps were obtained with this prototype camera on APEX telescope on the Chajnantor plateau in Chile.

In preparation for future observations on the NANTEN2 telescope on Pampa la Bola, Atacama desert, Chile, we updated the spectrometer control software (kosma\_control). A new server for continuum observations was included. The multi backend server software was tested once more using the Acousto Optical Spectrometers (AOS) and the Digital Fourier Transform Spectrometer (DFT) of ETH Zürich in parallel mode. Under laboratory conditions we found that the linearity of the AOS is better than that of the DFT. But in astronomical observations with higher noise a difference in the amplitude of the lines cannot be seen clearly.

Within a one week observing period in beginning of November we tried to detect HNC(4-2), HCN(3-2), CO(3-2), and CO(2-1) in comet Holmes, which had a extremely strong outbreak two weeks before. The weather conditions were good for several days. The pointing was controlled by images done with the optical pointing telescope. But we could not detect any of the lines in the comets core. Observations of the Plateau de Bure Interferometer done at the same time showed an active region of the comet of 10''-20'' only (dust and HCN emission). The beam filling factor for the KOSMA telescope was too small to detect a significant signal.

In December 2007 we installed the upgraded array receiver SMART, a dual-frequency, 2x8 pixel array receiver operating at two frequency bands near 492 and 810 GHz, and KOSMA array Acousto Optical Spectrometers (AOS) as backends.

SMART allows observations of both [CI]-lines and CO 7-6 simultaneously. It also allows for CO(4-3), <sup>13</sup>CO(8-7) observations. The LO system of SMART is very different to the former one. We now use an amplifier chain of Virginia Diodes. A phase-lock loop and backshorts are no longer needed and thus allow for a much easier and faster tuning of the receiver. All parameters can be set remotely. This is very important for remote observations with SMART on the NANTEN2 telescope in Chile. We will use the winter season 2007/2008 to test the hardware and software of SMART and improve it if necessary. The transport to Chile is planned before beginning of the southern winter which is the best observing season.

Key words:

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Interstellar matter, ISM, PDR, millimeter, submillimeter wave telescope, SIS receiver, array receiver, bolometer, comet Holmes

Internet data bases:

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<http://www.ph1.uni-koeln.de/gg>

<http://www.astro.uni-bonn.de/~webrai/index.php>

Collaborating partners/networks:

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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, NANTEN2 Observatory, Pampa la Bola, Atacama, Chile (Nagoya and Osaka University)

Scientific publications and public outreach 2007:

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**Refereed journal articles**

T.Kamiński, M. Miller, M. R. Tylenda, Observations of V838 Monocerotis in the CO rotational transitions, *A&A* **475**, 569-574, 2007.

T. Kamiński, M. Miller, R. Szczerba, R. Tylenda, Observations of V838 Mon and the Nearby Region in the CO J = 1→0, 2→1 and 3→2 Transitions, *Astronomical Society of the Pacific*, **363**, 103, 2007.

H. Jakob, C. Kramer, R. Simon, N. Schneider, V. Ossenkopf, S. Bontemps, U.U. Graf, J. Stutzki, The cooling of atomic and molecular gas in DR21, *A&A* **461**, 999-1012, 2007.

K. Wang, Y. Wu, L. Ran, W. Yu, M. Miller, A search for massive stellar objects in early evolutionary phase, *MNRAS*, submitted, 2007.

R. Xue, Y. Wu, A multi-wavelength study of the massive star forming region, *ApJ*, submitted, 2007.

**Conference papers**

K. Sun, C. Kramer, B. Mookerjea, V. Ossenkopf, M. Röllig, J. Stutzki, Study of photon dominated regions in IC 348, Triggered Star Formation in a Turbulent ISM, edited by B. G. Elmegreen and J. Palous. Proceedings of the International Astronomical Union 2, IAU Symposium #237, held 14-18 August, 2006 in Prague, Czech Republic. Cambridge University Press, 477-477, 2007.

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