

SMART: The KOSMA Sub-Millimeter Array Receiver for Two Frequencies

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We present the first results obtained with our new dual frequency SIS array receiver SMART (Sub-Millimeter Array Receiver for Two Frequencies). The instrument is operational since September 2001 at the KOSMA 3m telescope on Gornergrat near Zermatt/Switzerland. The receiver consists of two 2×4 pixel subarrays. One subarray operates at a frequency of 490 GHz, the other one at 810 GHz. Both subarrays are pointed at the same positions on the sky. We can thus observe eight spatial positions in two frequencies simultaneously. For the first year of operation we installed only one half of each subarray, i.e. one row of 4 mixers at each frequency.

The receiver follows a very compact design to fit our small observatory. To achieve this, we placed most of the optics at ambient temperature, accepting the very small sensitivity loss caused by thermal emission from the optical surfaces. The optics setup contains a K-mirror type image rotator, two Martin-Puplett diplexers and two solid state local oscillators, which are multiplexed using collimating Fourier gratings. To reduce the need for optical alignment, we machined large optical subassemblies monolithically, using CNC milling techniques. We use the standard KOSMA fixed tuned waveguide SIS mixers with Nb junctions at 490 GHz, and similar Nb mixers with Al tuning circuits at 810 GHz.

We give a short description of the front end design and present focal plane beam maps, receiver sensitivity measurements, and the first astronomical data obtained with the new instrument.

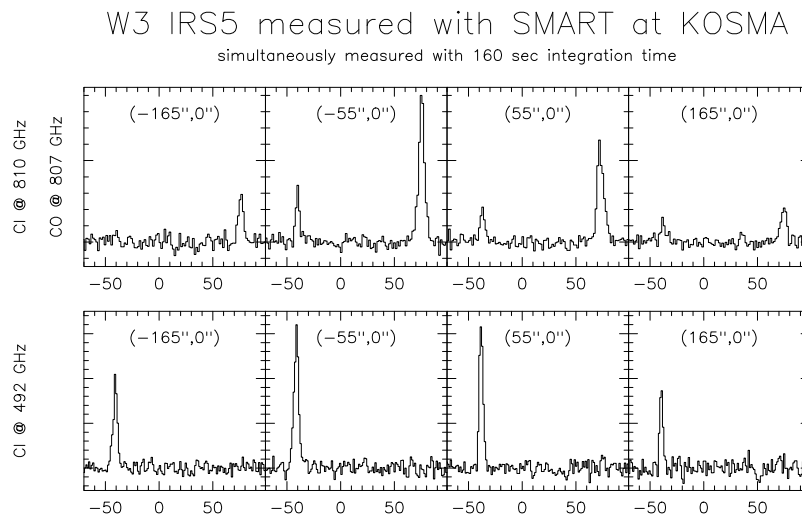


Figure 1: Sample spectra obtained simultaneously toward W3 IRS5 during a single 160 sec integration with SMART at the KOSMA telescope. The lower row of panels shows the 492 GHz fine structure transition of neutral atomic carbon (CI), the upper row shows the 810 GHz fine structure line of CI and the 807 GHz $J=7 \rightarrow 6$ transition of CO. Pixel offsets are indicated in each panel.

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