SuperCam: A 64 pixel heterodyne array receiver

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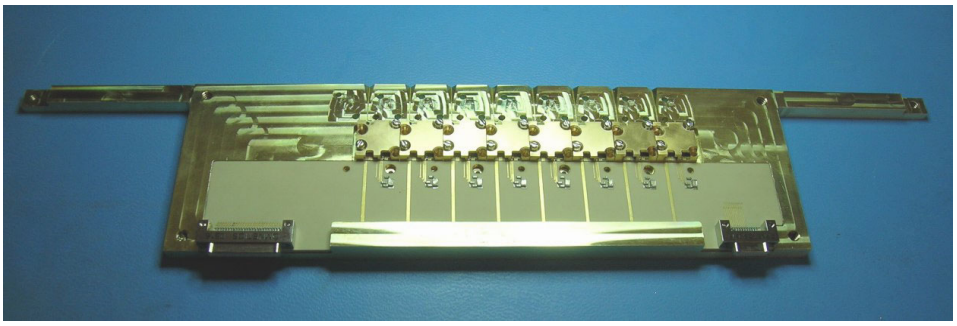
We report on the development of SuperCam, a 64 pixel imaging spectrometer designed for operation in the astrophysically important 870 micron atmospheric window. SuperCam will be used to answer fundamental questions about the physics and chemistry of molecular clouds in the Galaxy and their direct relation to star and planet formation. The Supercam key project is a fully sampled Galactic plane survey covering over 500 square degrees of the Galaxy in 12CO(3-2) and 13CO(3-2) with 0.3 km/s velocity resolution

SuperCam will have several times more pixels than any existing spectroscopic imaging array at submillimeter wavelengths. The exceptional mapping speed that will result, combined with the efficiency and angular resolution provided by the HHT will make SuperCam a powerful instrument for probing the history of star formation in our Galaxy and nearby galaxies. SuperCam will be used to answer fundamental questions about the physics and chemistry of molecular clouds in the Galaxy and their direct relation to star and planet formation. Through Galactic surveys, particularly in CO and its isotopomers, the impact of Galactic environment on these phenomena will be realized. These studies will serve as “finder charts” for future focused research (e.g. with ALMA) and markedly improve the interpretation, and enhance the value of numerous contemporary surveys.

In the past, all heterodyne focal plane arrays have been constructed using discrete mixers, arrayed in the focal plane. SuperCam reduces cryogenic and mechanical complexity by integrating multiple mixers and amplifiers into a single array module with a single set of DC and IF connectors. These modules are housed in a closed-cycle cryostat with a 1.5W capacity 4K cooler. IF signals are downconverted to baseband with a custom surface-mount board with 8 channels of IF processing. An Omnisys AB real time FFT spectrometer processes these IF signals to produce 64x250 MHz spectra with 0.25 km/s velocity resolution. The Supercam system is largely complete, and is now undergoing final fabrication and assembly, and should be deployed on the HHT this observing season.



The Supercam 1x8 mixer module, with integrated Low Noise Amplifiers (LNAs). This module was machined entirely at the SORAL lab.