A 350 GHz Multi-beam Receiver for the GreenLand Telescope

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***Abstract*—SAO and ASIAA are undertaking a project to place the ALMA North America prototype antenna at Summit Station, a NSF research station located close to the highest point (3210m above MSL) on the Greenland ice sheet. The primary science goal of this telescope – now renamed the GreenLand Telescope (GLT) – is to carry out mm-wave VLBI observations of the central black-hole in M87. VLBI observations will occupy only a small amount of the available observing time at this excellent sub-mm and THz site, and so additional instruments are required to maximize the scientific return from this project.**

We are developing a multi-beam SIS receiver for the 325-375 GHz and 385-425 GHz atmospheric windows. Possible science projects for the receiver include a follow-up survey of CO(3-2) in galaxies found by the ALFALFA HI survey and mapping of H_2D^+ in cold molecular clouds regions, as well as surveys for high redshift C(II) and other molecular species. This project will also lead to the development of higher frequency multibeam receivers for this telescope, operating in the 450 and 350 micron windows.

The receiver will use a close-packed hexagonal array of 48 smooth-walled feed-horns, to be designed and manufactured by Oxford Astrophysics. The single-piece horn array will form the mechanical support for a set of mixer modules. Each module will contain an 8-way LO corporate power divider network and 8 SIS mixers in blocks incorporating waveguide LO couplers, and arranged in a 4x2 configuration. Initially a single module will be built to prototype the array, before final production of additional modules to fully populate the array.

The receiver will use either SiGe LNAs developed at SAO, or InP or SiGe MMIC amplifiers. Power dissipation at cryogenic temperatures will be the determining criteria for amplifier selection, and hence the IF bandwidth of the receiver. The receiver backend spectrometer system will be based on CASPER based systems under development at SAO.