A DUAL-LOAD CALIBRATION SYSTEM FOR MILLIMETER-WAVE ASTRONOMY

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Accurate radiometric calibration in millimeter-wave radio astronomy has been an elusive goal. Present instruments generally use a single-load system (the *chopper wheel method*), often in the optical path near the feed. Such a system allows convenient measurements by making the simple assumption that the load temperature is similar to the physical temperature of the absorbing sky. However, the resulting accuracies are at best a few percent. The next generation of millimeter and sub-millimeter interferometers (ALMA, CARMA, etc.) will require higher accuracy to improve the comparison of data with models, comparisons between data observed at various epochs and with various telescopes, and to give the best dynamic range and image fidelity.

A dual-load system with temperature-controlled and thermally isolated loads at the subreflector can provide calibration at the 1% level once an independent measurement of the opacity is available. Additional advantages include:

- the calibration signal can be small (a few Kelvin), allowing continuous calibration, and avoiding the difficulties of receiver saturation
- the system can be made to be wavelength and receiver independent
- the loads may be alternately presented sufficiently rapidly that receiver instabilities can be tracked in the presence of sky fluctuations
- the entire signal path may be calibrated.

In poor weather the system can function as an improved (continuous) chopper wheel method. We have constructed a prototype of such a system on one antenna of the Berkeley-Illinois-Maryland Association Array at Hat Creek, northern California.

In this paper, I will describe the prototype system, evaluate its performance, and outline the next steps that will allow it to be used in regular astronomical observations.

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