Interoffice

NATIONAL RADIO ASTRONOMY OBSERVATORY

TUCSON, ARIZONA

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To: 36-Foot Telescope Spectral Line Observers

From: B. L. Ulich

Subject: Absolute calibration errors

Several additions to the standard spectral line hardware will affect the observed intensity of spectral lines.

I. Quasi-Optics Box

The quasi-optics box mounted on top of the 3 mm receiver blocks the outer edges of the feed radiation pattern. As a result some extra noise power is radiated into the receiver, increasing the system temperature by typically 8 %. The antenna coupling efficiency to the sky is also artifically increased by about 7 %. Thus the net apparent increase in system temperature is about 15 %. However, the signal from a spectral line source is unaffected, and TC should be decreased by about 7 % to maintain proper calibration.

II. Heated Vane

The chopping vane used to produce the calibration signal is heated above ambient temperature (to about 292 K). As a result, the calibration signal is larger than normal, and TC should be increased accordingly to compensate. At an ambient temperature of 273 K, the correction is about 10 %, at 283 K the correction is about 4 %, and near 293 K the correction is negligibly small.

III. Sunscreen

The sunscreen attenuates a spectral line signal by a factor of about 0.82 near 3 mm wavelength. However, the additional noise added is only about 5 K. Thus the source signal is decreased more than the calibration signal, and TC should be increased by typically 19 %.

The "normal" values of TC at 50^{o} elevation angle are listed below:

Frequency (GHz)	80-105	110	115
TC (Without Sideband Filter)	788	811	956
TC (With Sideband Filter)	394	396	404

Depending on which hardware is installed and on the ambient temperature, these TC values can be scaled using the preceding correction factors to produce a more accurate absolute calibration scale.

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