EDGES MEMO #177

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To: EDGES Group

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Subject: High and low band comparisons

Since the high and low band blade antennas are approximately 1:2 scaled version of each other comparisons between the bands may give insight into the effects of the foreground and antenna beam on a finer scale. For example Figures 1 and 2 show the spectra from 3 parameter fits in each band for 8 hours at GHA=10 hours with beam correction.

The results are as follows:

Band (MHz)	Spectral index	Gamma	Tcenter (K)
50-100	-2.573	-0.033	1638.5
100-200	-2.543	0.096	279.0

The spectral index from the ratio of the temperature at the center of each band is -2.554. The period for each band is 2015 days 292 and 293.

On a finer scale Figure 3 and 4 show spectra from 50 to 100 and 100 to 200 MHz respectively. In each set of spectra tests 1 and 2 are for 3 term fits, tests 3 and 4 for 4 term fits and test 5 and 6 for 5 term fits. Even numbered tests have beam correction. The plot for 50 to 100 MHz have a scale 6 times that of 100 to 200 MHz to approximately compensate for the increased temperature in the low band.

Figure 5 and 6 compare the low and high band with 3 terms removed for Galactic center hour angles during the night. Each spectrum is for 2 hours of data each day at the indicated GHA and averaged for days 286-299. At the high band about half the days are excluded owing to RFI from TV channel 7.

Comments on the comparisons

1] Combining the high and low band has the potential for improving the accuracy of the foreground spectra index and “gamma”.

2] All spectra from both low and high band deviate downwards at the bottom of each band. Some of this downwardslope might be explained by

a) Error in S11 magnitude which becomes more critical at the low end of the band.
b) An under estimate of the antenna and balun (including the connector) loss which becomes more critical at the low end of band where the antenna has a larger S11. More study of this is in progress.

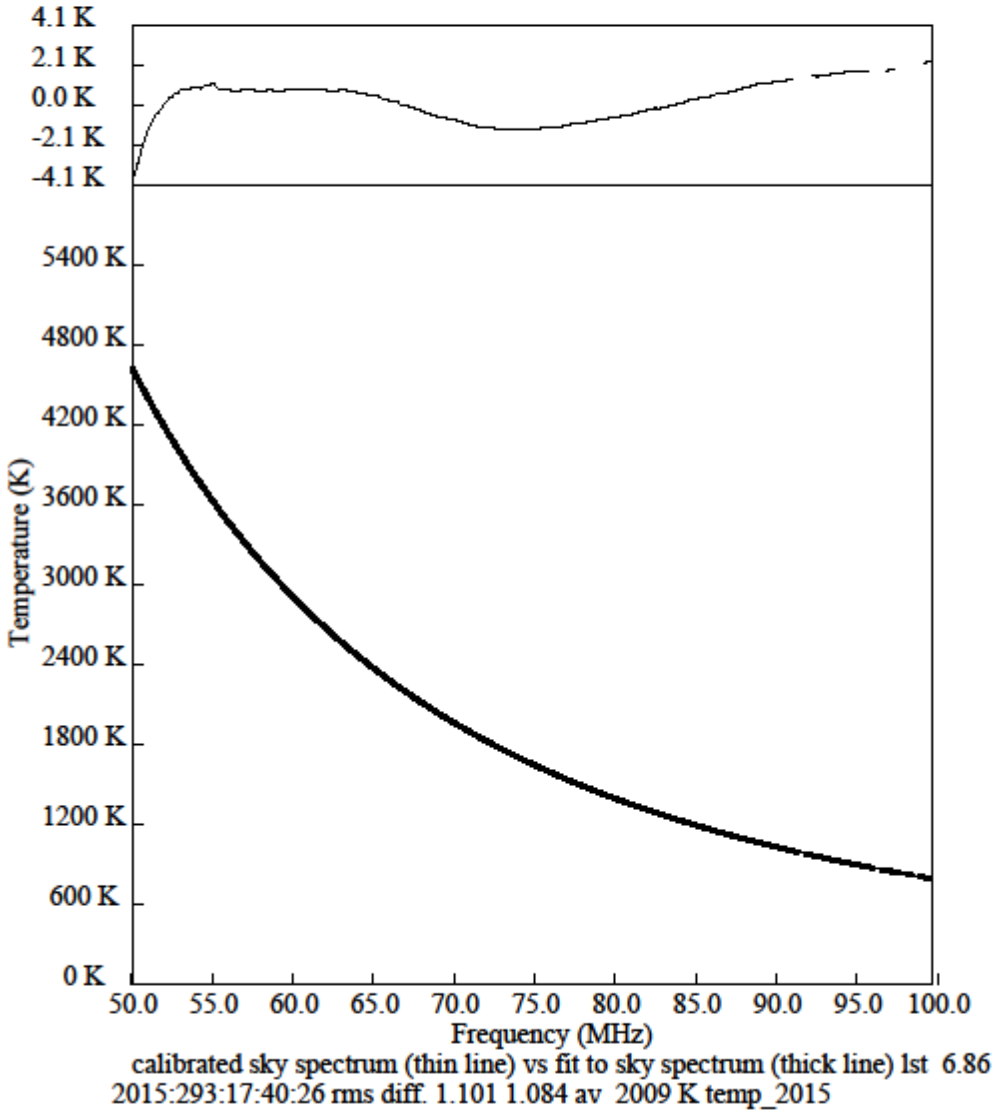

Figure 1 3-term fit to obtain the spectral index and gamma at GHA=10 hours

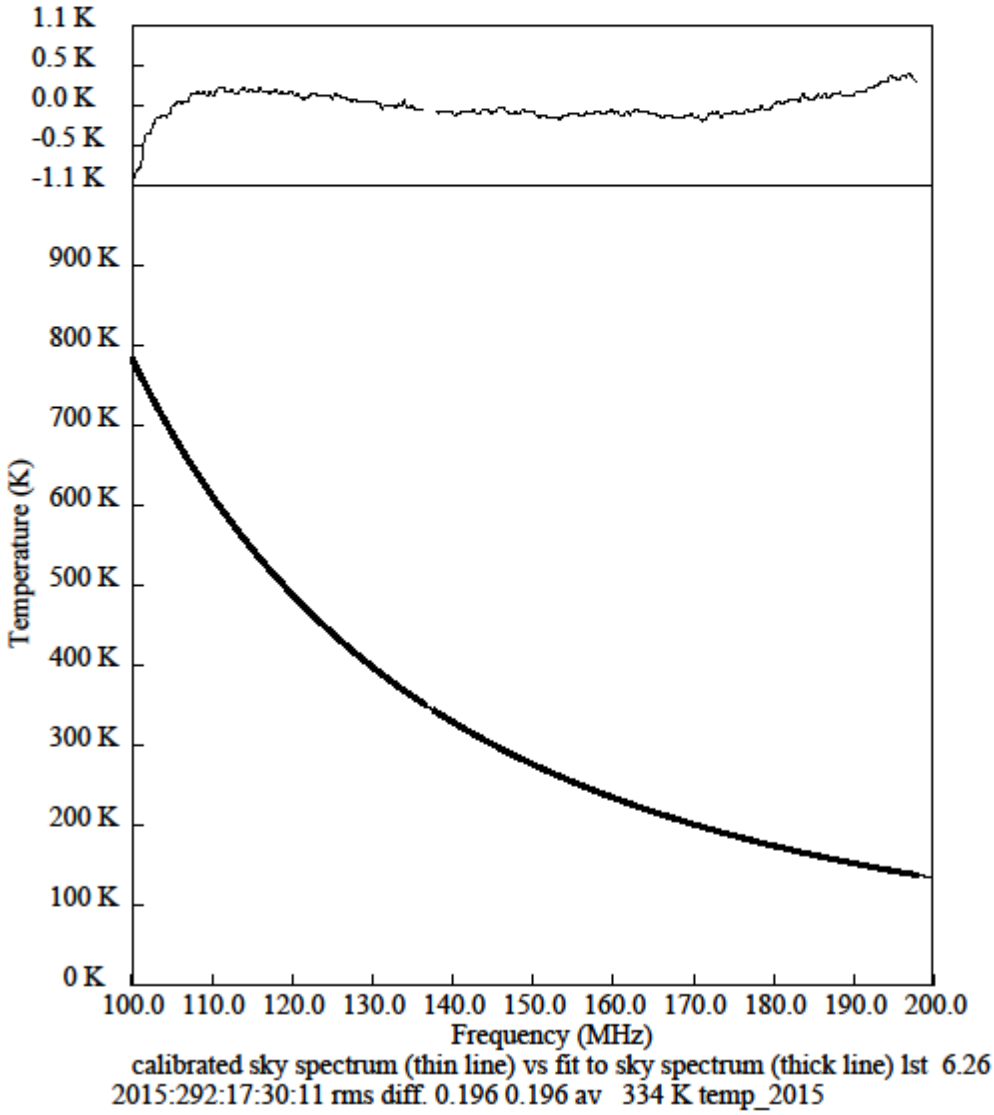
1.1 K
0.5 K
0.0 K
-0.5 K
-1.1 K
900 K
800 K
700 K
600 K
500 K
400 K
300 K
200 K
100 K
0 K
Temperature (K)
100.0 110.0 120.0 130.0 140.0 150.0 160.0 170.0 180.0 190.0 200.0
Frequency (MHz)
calibrated sky spectrum (thin line) vs fit to sky spectrum (thick line) lst 6.26
2015:292:17:30:11 rms diff. 0.196 0.196 av 334 K temp_2015

Figure 2.

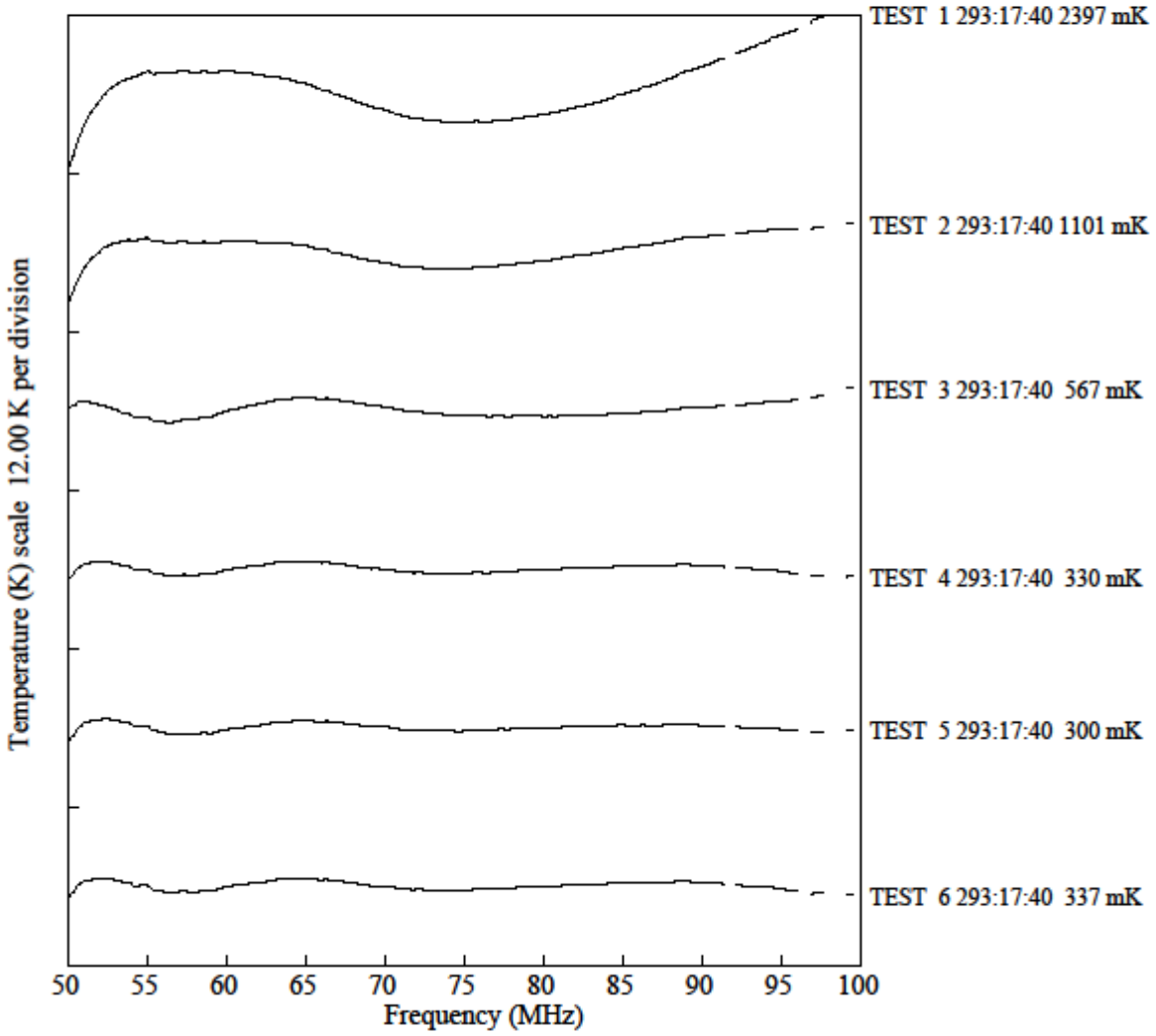

Figure 3. 3, 4 and 5 term fits with and without beam correction at GHA=10 hours.

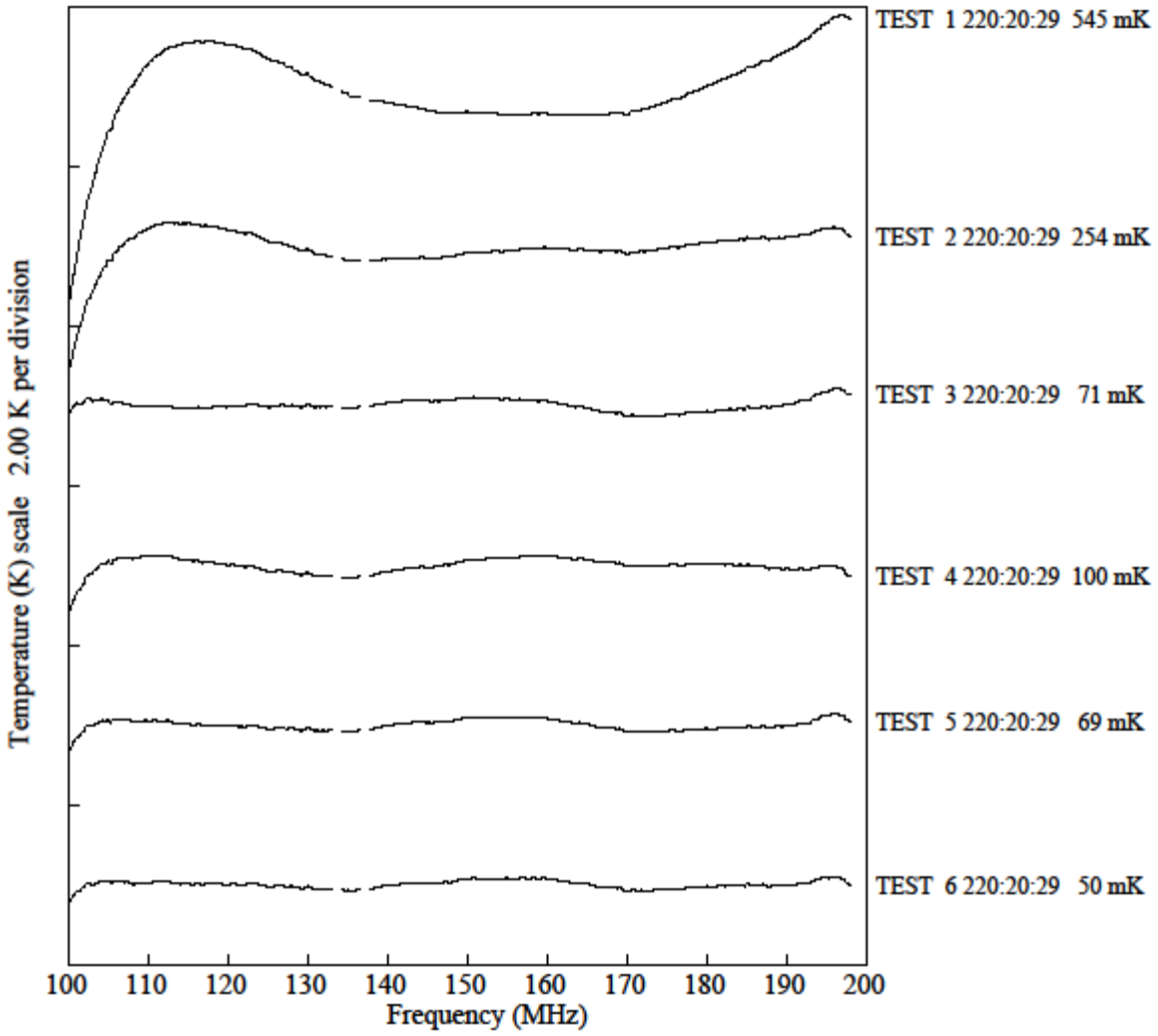
TEST 1 220:20:29 545 mK
TEST 2 220:20:29 254 mK
TEST 3 220:20:29 71 mK
TEST 4 220:20:29 100 mK
TEST 5 220:20:29 69 mK
TEST 6 220:20:29 50 mK
Temperature (K) scale 2.00 K per division
100 110 120 130 140 150 160 170 180 190 200
Frequency (MHz)

Figure 4.

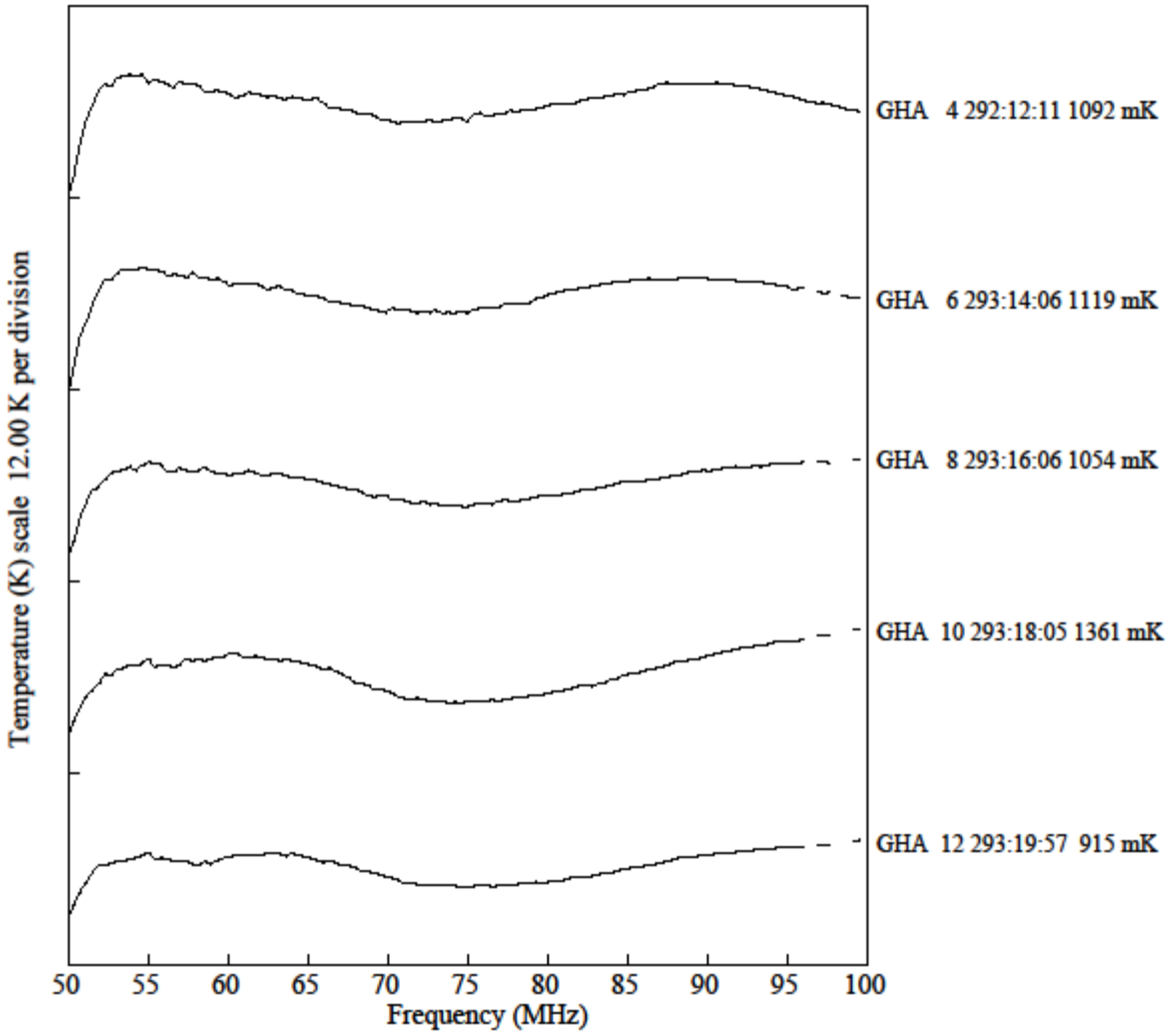

Figure 5. 3-term fits with beam correction for GHA=4, 6, 8, 10, 12 hours.

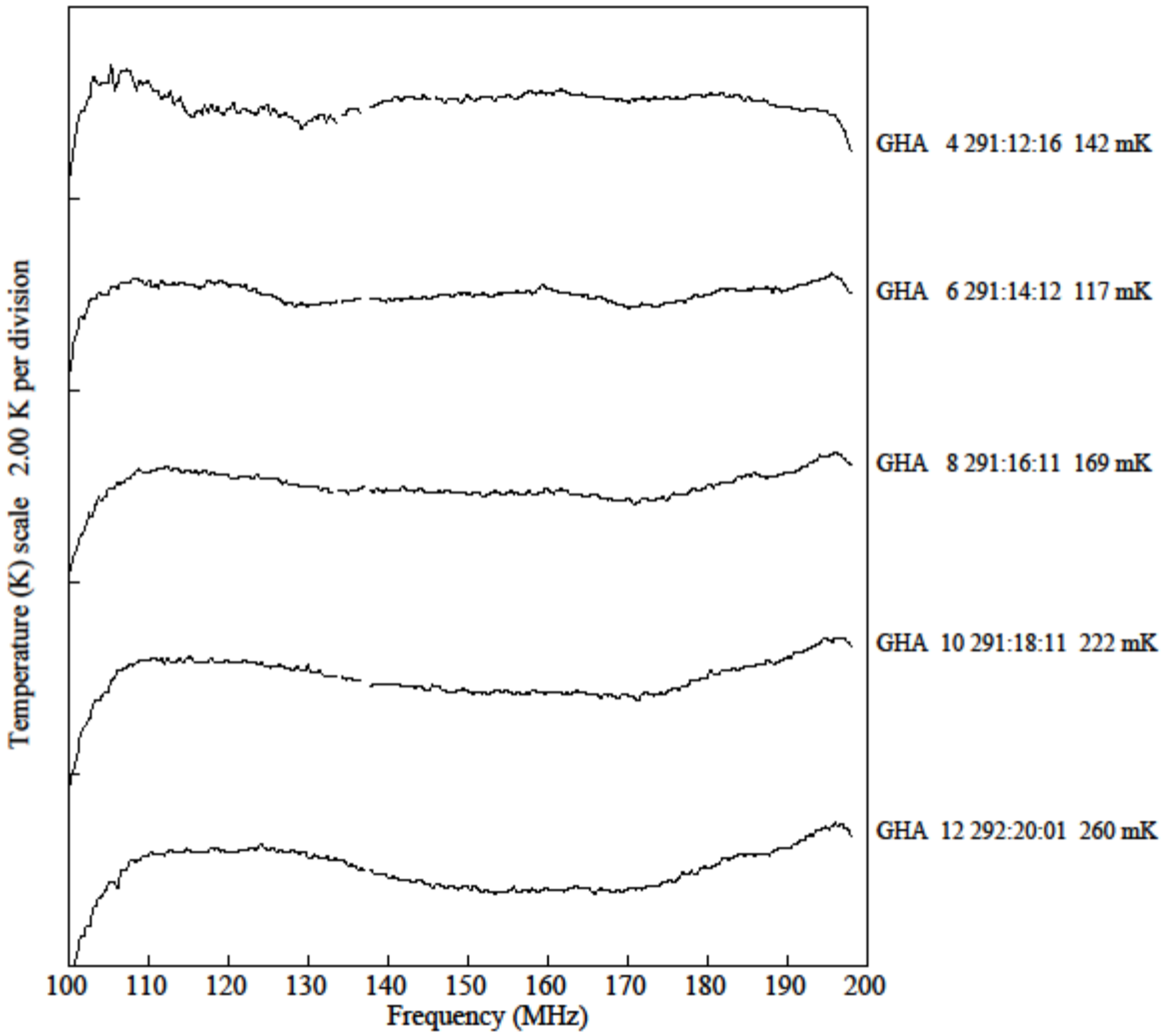
Temperature (K) scale 2.00 K per division
GHA 4 291:12:16 142 mK
GHA 6 291:14:12 117 mK
GHA 8 291:16:11 169 mK
GHA 10 291:18:11 222 mK
GHA 12 292:20:01 260 mK
100 110 120 130 140 150 160 170 180 190 200
Frequency (MHz)

Figure 6.