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To: EDGES group

From: Alan E.E. Rogers

Subject:: Analysis of the EDGES-3 at Adak vs GHA

The results from EDGES-3 at Adak are summarized in memo 478 and 479 using the full range available data. In this memo an analysis of three separate ranges of Galactic hour angle (GHA) is made as follows:

The first range covers GHA bins (00 01 02 03 04 05 19 20 21 22 23) for “Galaxy up” data the second range covers GHA bins (07 08 09 10 11 12 13 14 15 16 17) for “Galaxy down” data and third range covers all GHA in data for which the sun is more than 20 degrees below the horizon.

Each “bin” or “block” is nominally one hour long but many 3-position switch cycles may be flagged by RFI so the actual integration time in the average could be significantly less than 60 minutes.

center MHz	SNR	amp K	width MHz	rms1 mK	rms2 mK	lim K	GHA	GHA blocks and GHA range	Tsky at 75 MHz K
81.3	7.7	0.55	20.9	47	41	0.3	Gal. up	19,20,21	1707
80.1	13.4	0.62	17.0	51	27	0.2	Gal. down	8,9,11,12,13,14,15,16,17	1572
79.3	20.9	0.66	17.4	45	18	0.25		All except 23,0,1,2,3,4,5	1628
80.9	5.0	0.47	20.9	58	56	0.1	00	12 hour block centered at 00	1649
80.1	14.3	0.67	17.0	48	28	0.1	12	12 hour block centered at 12	1667
79.3	14.2	0.54	17.9	46	23	0.1	all	24 hour block	1649

Table 1. Results of 21-cm spectrum using 6 loglog polynomial terms  $\tau = 4$  60 to 98 MHz

The last 3 entries in table 1 are using a single 12 or 24 hour block for each day. The spectra for the first two entries are shown in Figure 1.

This test shows that the 21-cm results are reasonably consistent for a different range of GHA as the Galaxy up and down have no GHA range in common however there is not a large difference in the sky temperature in this data because GHA from 22 to 07 hours is not covered in the range of days with the sun more than 20 degrees below the horizon. In addition Adak is in the northern hemisphere so the Galactic center is low in the sky and consequently lower antenna gain. The results of the last three entries which use 12 and 24 hour blocks are similar have lower SNR especially for the 12 hour block centered at GHA = 0 hr.

Figure 2 shows a plot using one hour blocks over all GHA with the sun more than 30 degrees below the horizon, a limit on each block of 0.25 K and  $\tau = 5$ .

In summary these tests of the consistency with different ranges of GHA along with a test without beam correction and a subtraction test in memo 477 limit the probability that 21-cm spectrum is significantly effected by sources of systematic error.

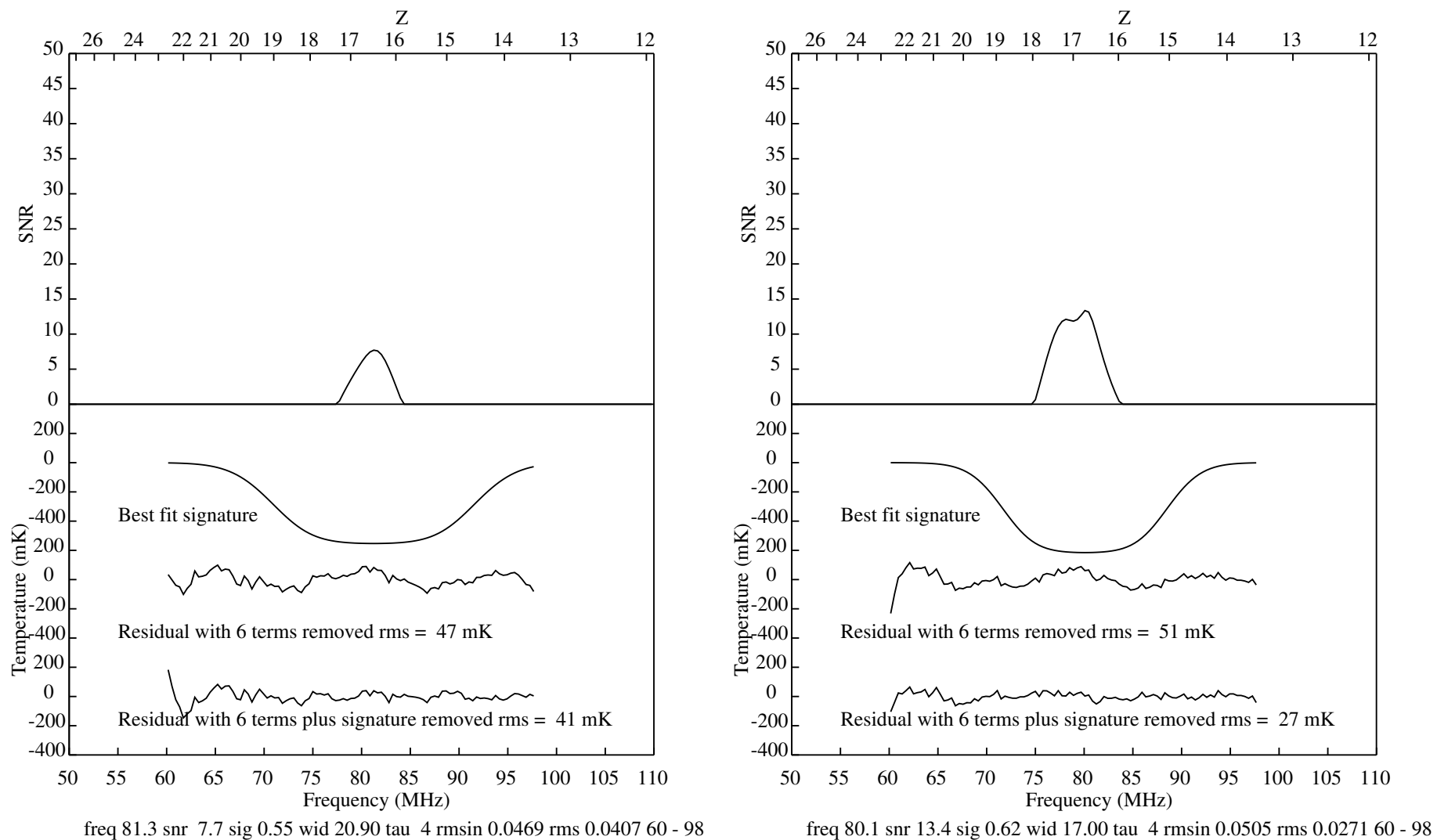


Figure 1. Grid search for 21-cm spectrum for Galaxy "UP" on the left and Galaxy "DOWN" on the right

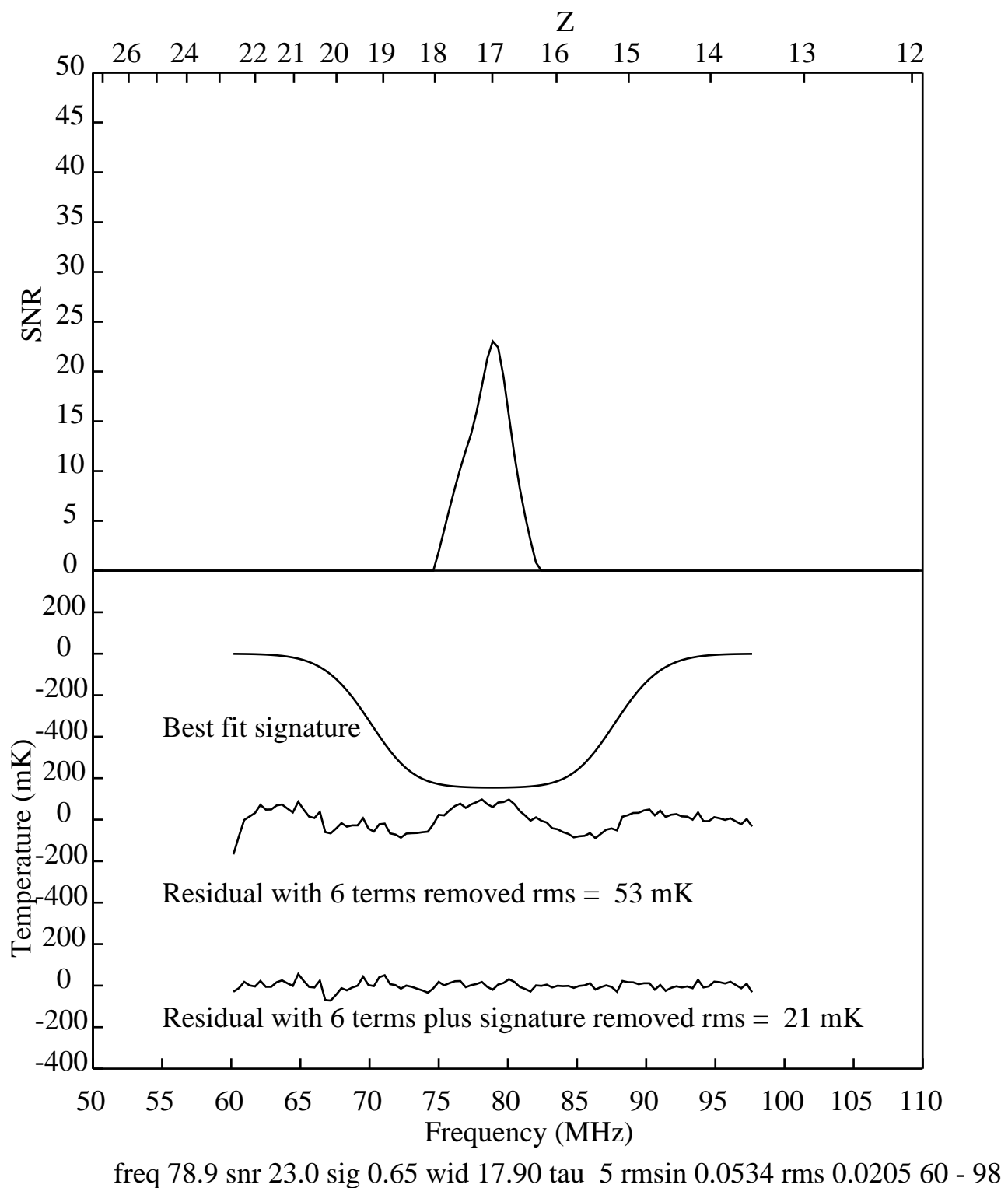


Figure 2. Grid search for 21-cm spectrum using one hour blocks and tau = 5.