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To: EDGES group

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Subject: Dependence of EDGES-3 results from Adak on the sun elevation limit

The results from Adak are summarized in memos 477 and 478. The effect of limiting the data for all the available days from 2024 day 345 to 2025 day 116 in 5 degree steps for a frequency range of 60-98 MHz and tau = 4 are listed in Table 1 below:

center	SNR	amp	width	rms1	rms2	sun limit	comments	
MHZ		Κ	MHz	mК	mК	deg		
77.4	15	0.75	23.0	75	31	-10		
79.3	17	0.57	17.6	46	20	-15		
79.3	17	0.58	17.6	45	26	-20	all available days	
79.3	19	0.69	17.5	47	21	-25		
78.9	20	0.77	17.9	54	23	-30	data up to day 98	
78.5	17	0.83	19.1	67	30	-35		
77.7	15	0.93	20.2	72	38	-40	data up to day 48	
Table 1. Results of a grid search for 21-cm using 6 loglog terms								

The parameters of the results in Table 1 were as follows: calibration s11 from 2025_029_07 calibration amb,hot,open,short spectra from 2024_344 and antenna 2024_345 calibration fit parameters: -cfit 7 -wfit 9 -nfit3 7

beam azelq adak cable box29.txt azelq.txt with Guzman map

acceptance threshold for each one hour data block rms residual: -lim 0.25 K

The main effect of lowering the sun limit is to limit the available data beyond day 98. Getting more data by increasing the sun limit results in contributions from the solar emissions at the low end of the band. Residuals rms1 and rms2 are for 6-terms removed before and after the grid search respectively.

center	SNR	amp	width	rms1	rms2	sun limit comments	
MHZ		K	MHz	mК	mК	deg	
79.3	17	0.58	17.5	45	20	-20	reference
79.3	18	0.61	17.9	49	20	-20	no beam correction
79.3	17	0.58	17.5	44	20	-20	Haslam map
79.3	18	0.62	17.8	48	20	-20	azelq_box_fulsiz_pec.txt
79.3	17	0.59	17.6	46	20	-20	specal_test3.txt
79.3	16	0.56	17.2	50	21	-20	antenna s11 from day 72
79.3	18	0.60	17.8	47	20	-20	acceptance threshold 0.3K
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Table 2. Results of a grid search for 21-cm using 6 loglog terms 60 to 98 MHz

The effects of no beam correction, using a different sky map for the beam correction as well as changing the beam from the FEKO simulation for Adak and a PEC ground plane are listed in Table 2 below. Also listed in Table 2 are the results of changing the VNA to LNA cable offset from 4.26 to 4.45 inches in the EDGES-3 calibration and changing the antenna s11 used from day 345 to day 72. It is noted that many of the days for which antenna s11 measurements were made and plotted in figure 1 of memo 477 had large errors owing to the poor conductivity of the antenna connections whose details are shown in memo 476. The last entry in Table 2 the effect of a change in the acceptance threshold.

In summary with 6 loglog terms the results from Adak are relatively insensitive to the sky map, changes in the choice of which calibration is used at least in the frequency range of 60 to 98 MHz as long as the sun limit is between -15 and -30 degrees. It is noted that there is a change in the results with the acceptance threshold which is needed to exclude 1 hour blocks which have high residuals which result from severe weather and high solar activity.