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To: EDGES Group
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Subject: Preliminary estimate of the effect of foreground polarization

Two tests of the effect of polarization on the EDGES spectrum indicate that the effect is about 5 mK rms with the Galactic center below the horizon and up to 50 mK rms with the Galactic center above the horizon. The rms is for 5 polynomial terms removed over a frequency range from 50 to 100 MHz. The rms estimates are reduced by a factor of about 6 in the range 100 to 200 MHz.

In the first test the Haslam sky map was filled with polarization squares of 1 percent linear polarization and rotation measure 1 rad/m^2 .

	Rms_5 –terms_51-97MHz (mK)	
square_size (deg)	Galaxy up	Galaxy down
whole_sky	13000	3700
90×50	7200	4400
45×45	6200	840
22×22	3400	330
11×11	2300	200
6×6	1700	68
3×3	620	65
1.4×1.4	350	39
0.7×0.7	83	7
0.35×0.35	46	6

Table 1.

Each square was assigned a random position angle at 139 MHz. Table 1 shows that when averaged over the large beam of the EDGES “blade” dipole the effect on the rms deviation of the spectrum decreases with the square root of the number of squares in the beam so that for a scale of 1 degree the rms is about 10 mK.

In the second test the polarization fraction and rotation measure from the MWA at 139 MHz (courtesy of Emil Lenc of the University of Sydney) of a 30×30 patch of sky centered at $RA=0$, $DEC = -27^\circ$ was used to fill Haslam map by using 72 copies of same map spaced over the full range of right ascension and declination. In addition each copy is assigned a random polarization offset. The residual spectra with 5 terms removed are shown in Figure 1.

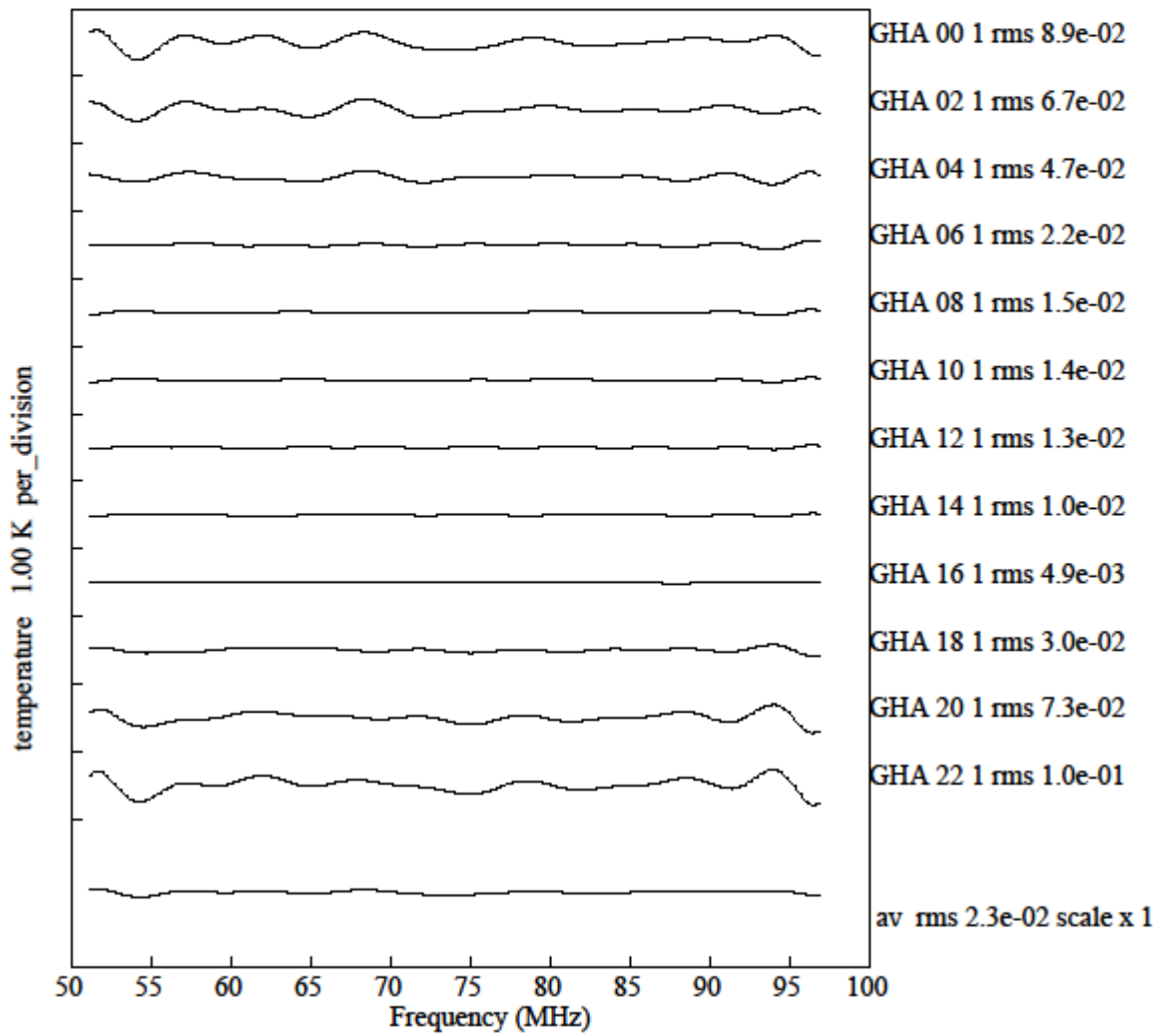


Figure 1. Estimated Effect of polarized foreground on spectral residuals with 5 polynomial terms removed.