EDGES MEMO #234

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To: EDGES Group

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Subject: Suggested improved orientation for second low band ground plane.

The effects of the ground plane on the beam chromaticity are dominant when more than 3 terms polynomial are removed. Figure 1 show the simulated beam corrections for an infinite ground plane. Each Galactic Hour Angle (GHA) is repeated. The first is for an antenna orientation of NS and the second is for an EW orientation. Four polynomial terms have been removed. Figure 2 shows the simulated beam correction residuals for the current extended and perforated low band ground plane.

Figure 3 shows the residuals for the oriented NS and at 45 degrees azimuth. Figure 4 shows the residuals for NS and EW as in Figure 2 but with the ground plane dimensions increased by a factor of 1.5. Figure 5 is for the same antenna, ground plane and orientations for a location at Owens Valley instead of the MRO. Figure 6 shows the result of an antenna dipole direction which runs along the diagonal direction of the ground plane. This results in a significant reduction of beam chromaticity. This orientation makes the ground plane dimension larger in the direction of maximum beam at low elevations and further rotates the phase of waves reflected from the edges of the ground plane. For the finite ground planes the FEKO simulations of the soil below the ground plane has a dielectric constant of 3.5 and a conductivity of 2e-2 S/m.

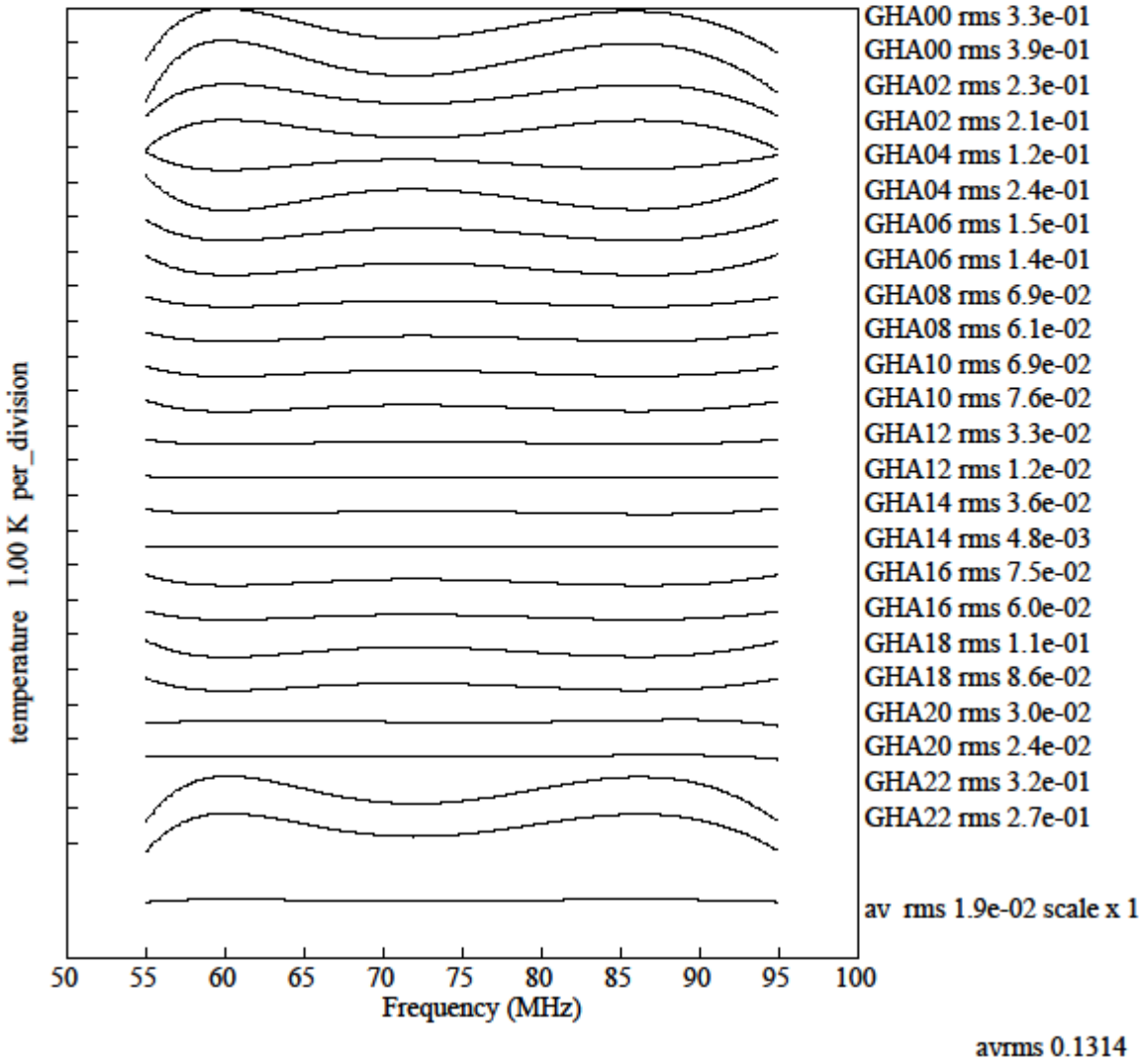

Figure 1. Simulated residuals to beam corrections using 4 polynomial fit for an infinite ground plane at the MRO.

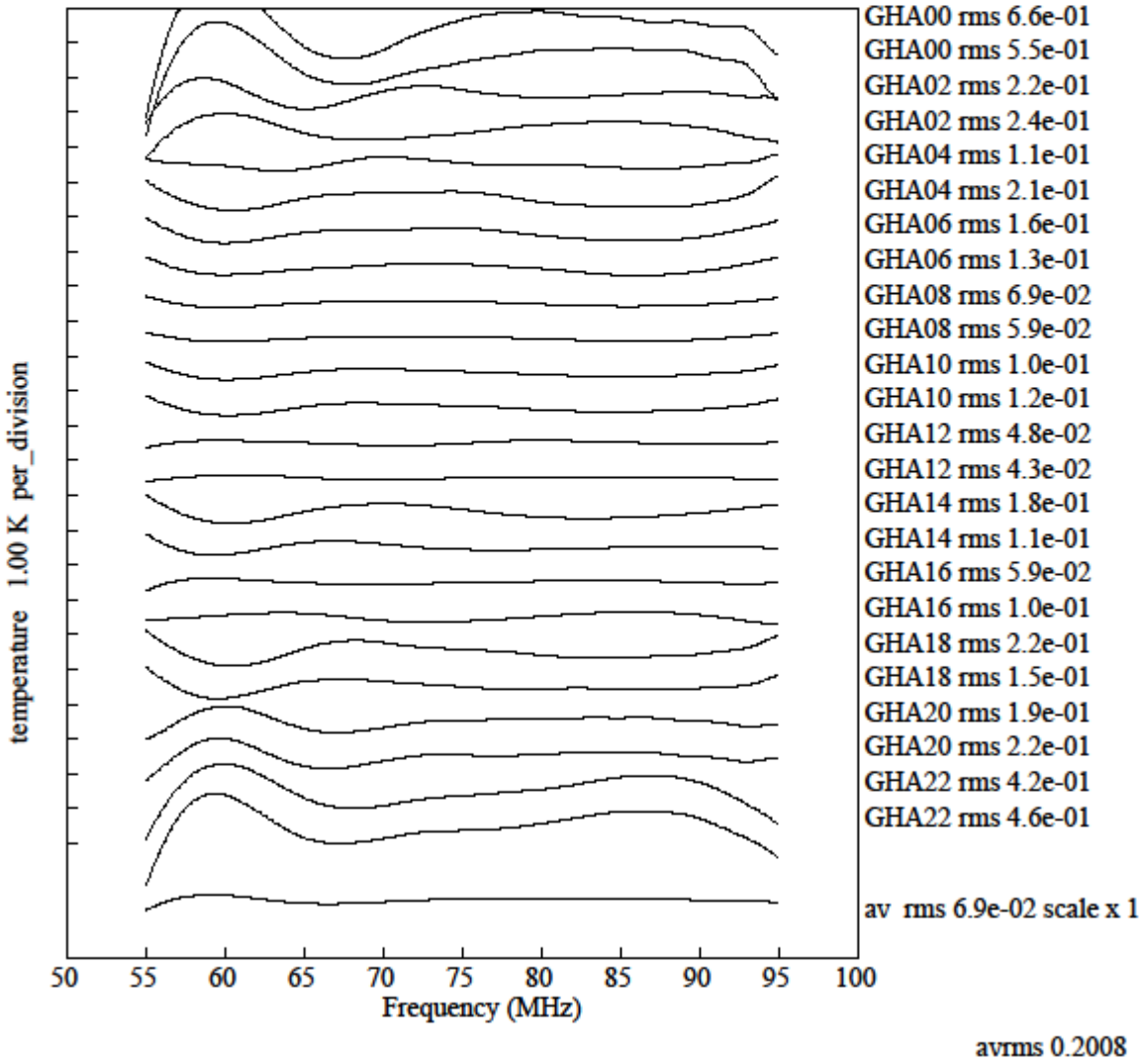

Figure 2. Beam correction results for current perforated ground plane for antenna oriented NS and EW.

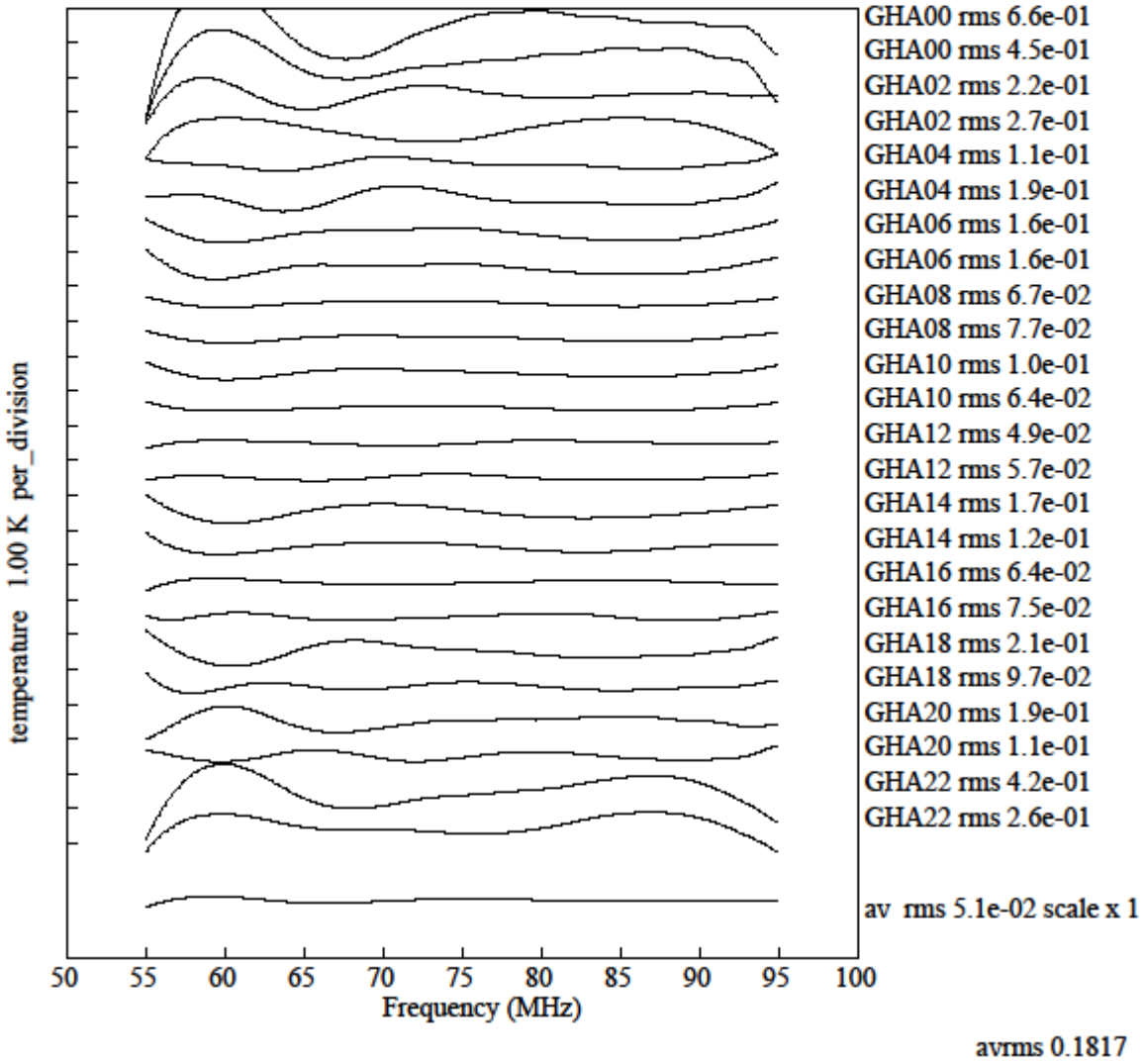

Figure 3. Results for antenna orientations at azimuth 0 and 45 degrees.

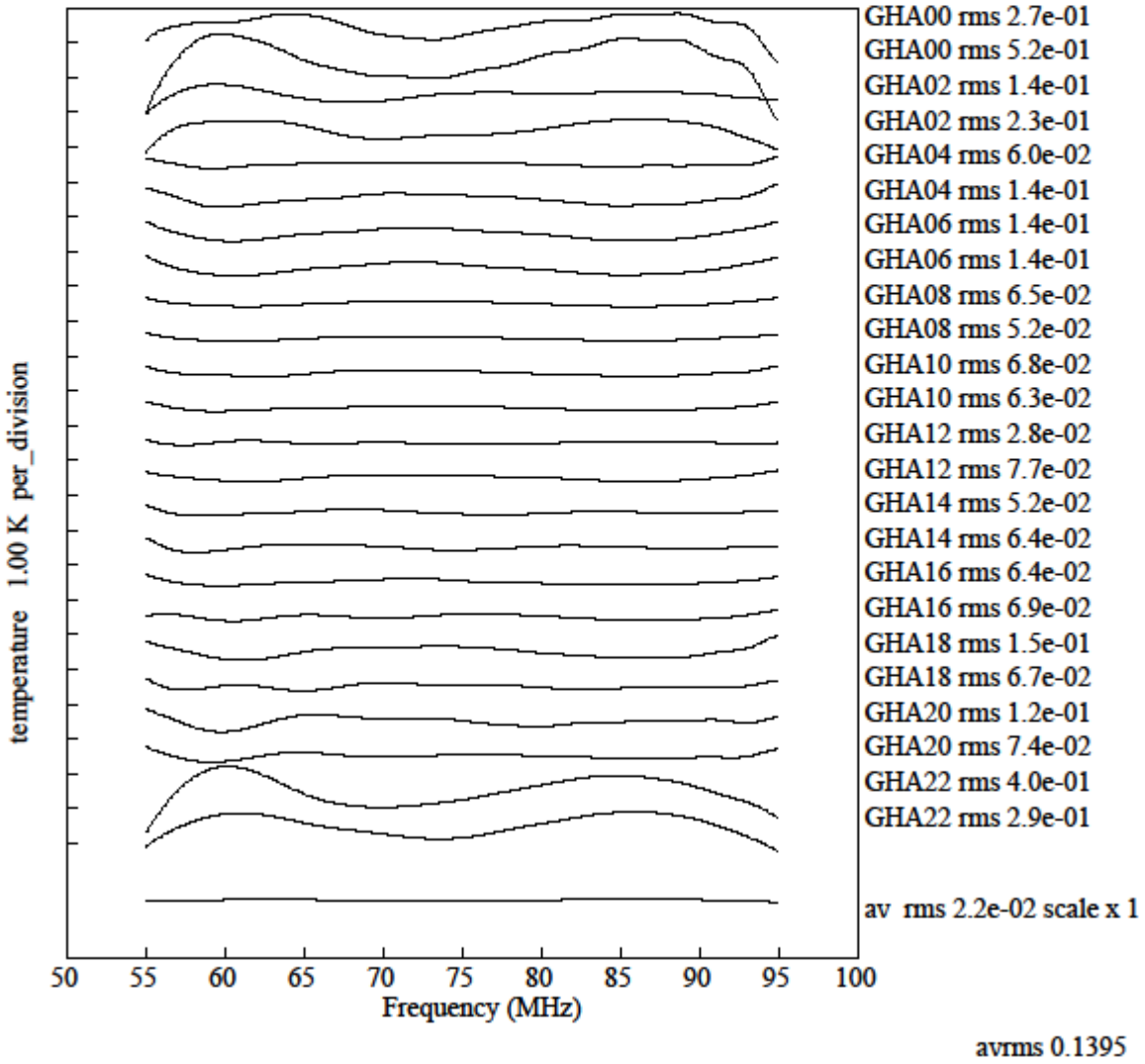

Figure 4. Results for a ground whose dimensions are scaled up by 1.5.

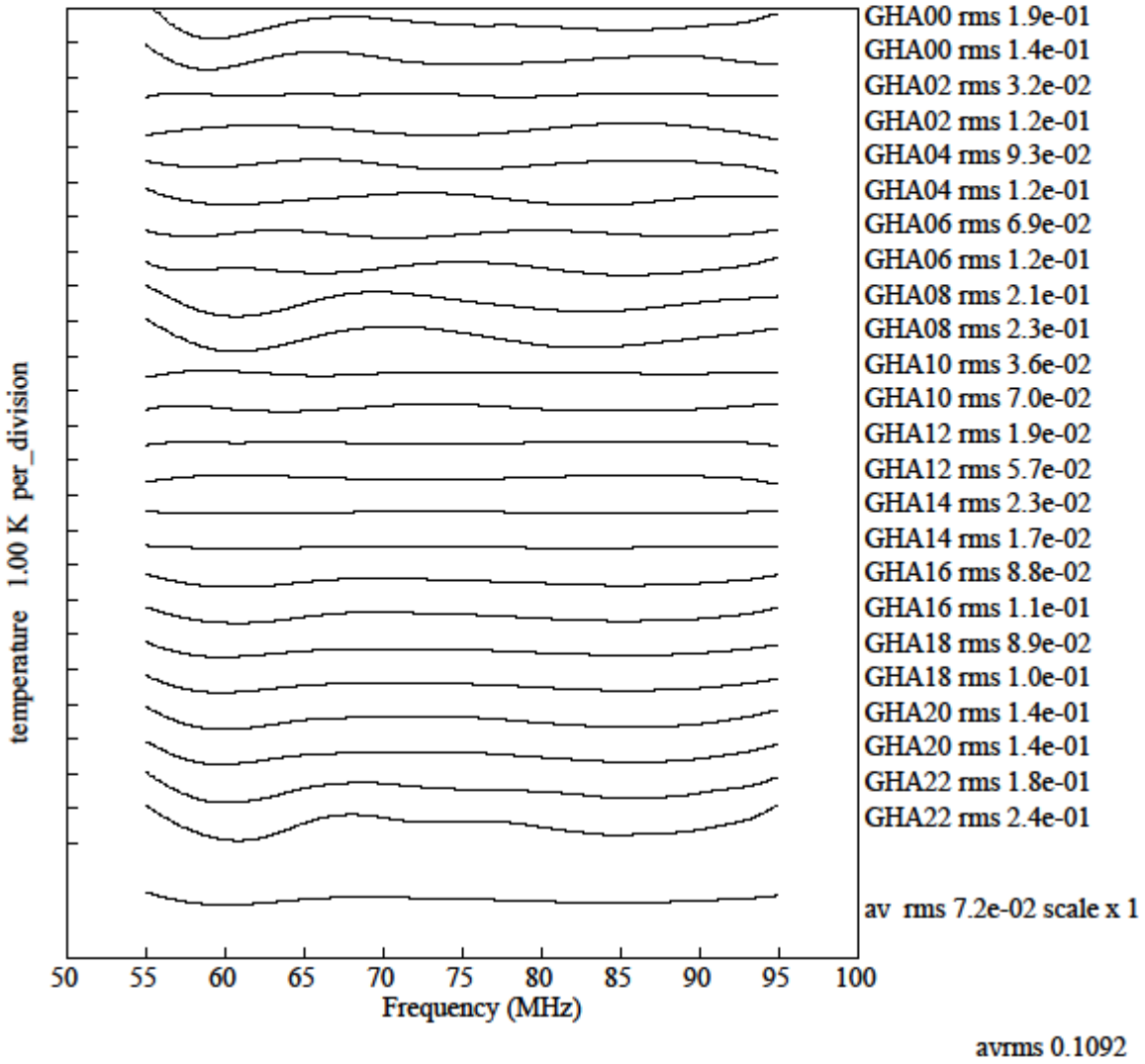

Figure 5. Same as figure 2 for a location with latitude of 37˚ N.

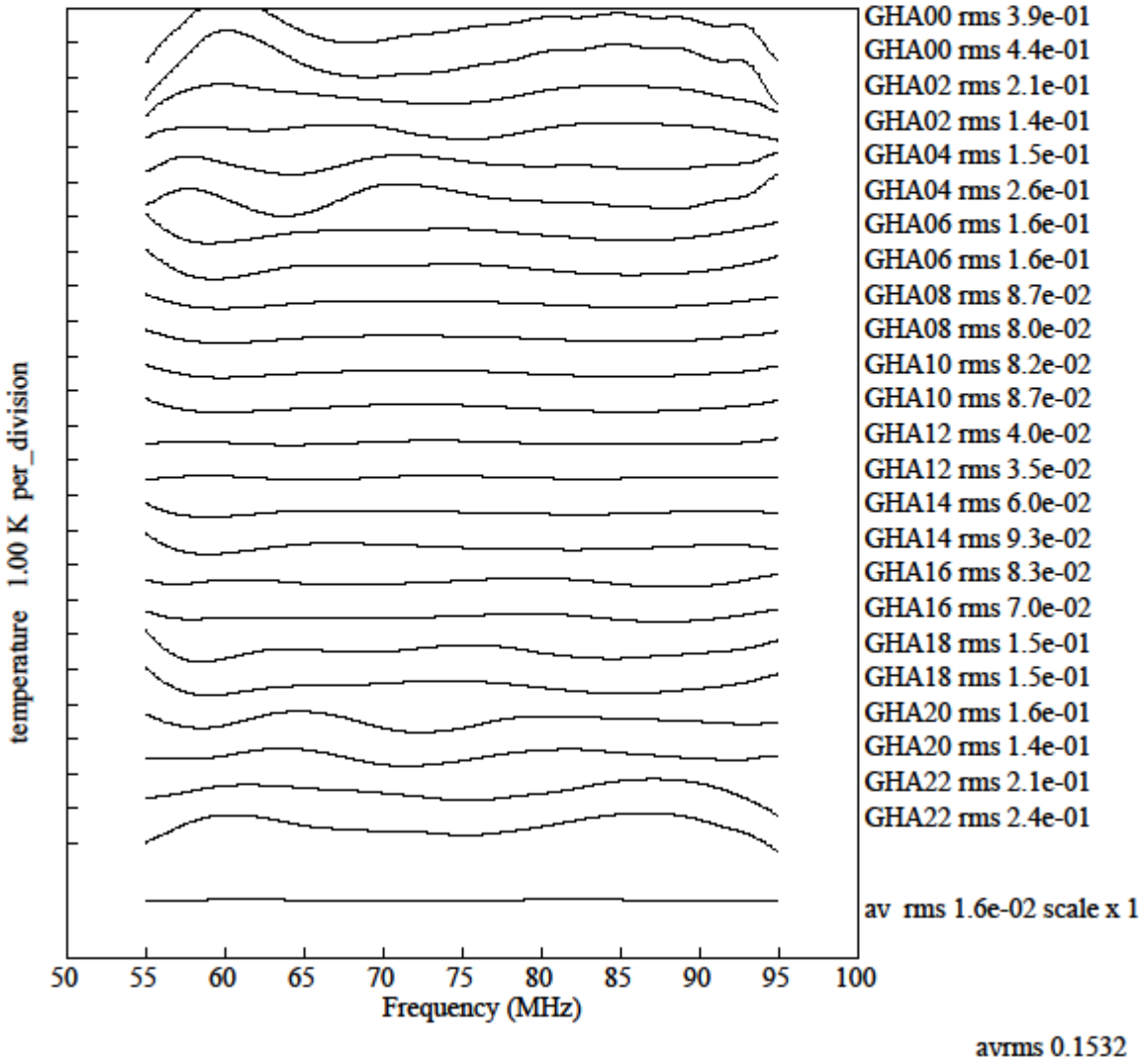

Figure 6. Results for antenna dipole aligned with the diagonal instead of the edges of the ground plane. The beam effects are significantly lower than those of the current ground plane orientation shown in Figure 2.