Ground Pickup From a Seven Degree Horizon

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A study was done to determine the effect of an elevated ground set to 300K upon the antenna temperature. To implement this, a sky-ground temperature map was made that set the sky temperatures to zero and the ground temperature to 300 K. The elevation of the sky-ground interface was varied between zero degrees and 7 degrees of elevation. This sky map was then mapped onto the EDGES beam map of directivity between the frequencies of 100 MHz and 190 MHz in steps of 1 MHz. The beams were obtain using CST and a full model of the EDGES antenna using the Roberts balun.

Figures 1-4 show the integrated response of the antenna for various elevation angles. The effect of the ground is very smooth with frequency, but the temperature does rise with frequency. This is due to the beam's side lobes becoming more pronounced.. Figures 4-6 demonstrate this effect.

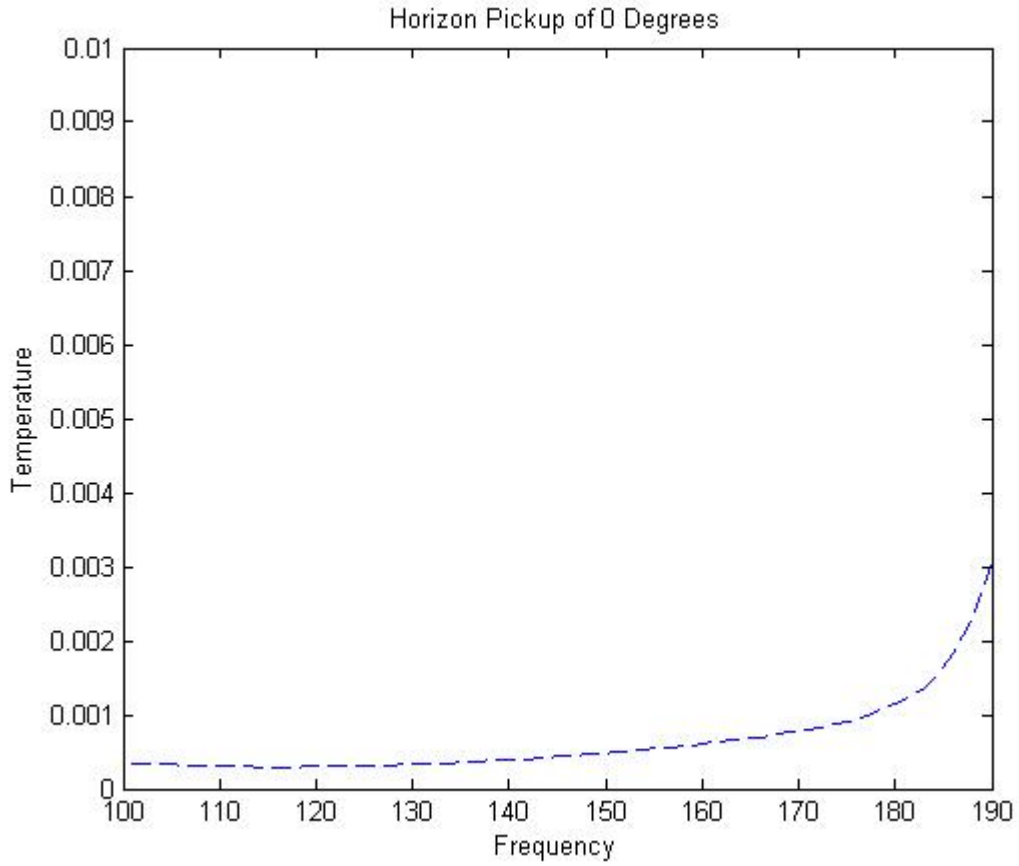

Figure 1. Antenna response with the ground sky interface is defined to be 0 degrees elevation. The ground is set to 300 K and the sky is set to 0 K. The rise at higher frequencies is due to the side lobes becoming more significant. Note the zoomed y axis as compared to the following graphs.

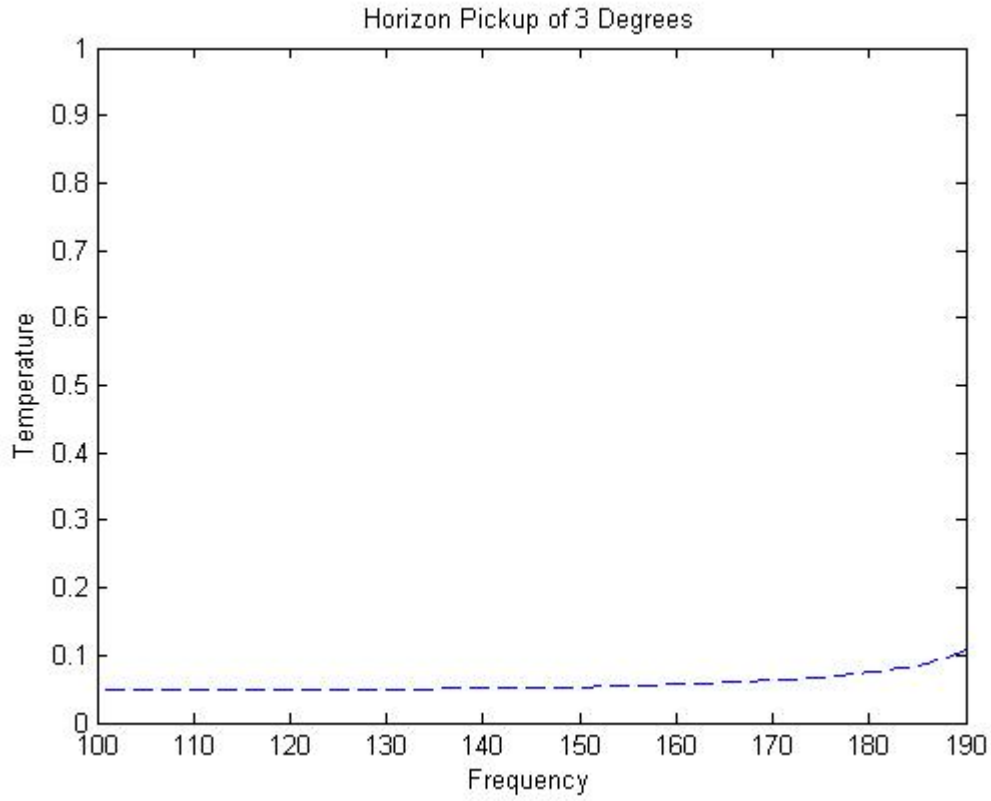

Figure 2. Antenna response with the ground sky interface is defined to be 3 degrees elevation.

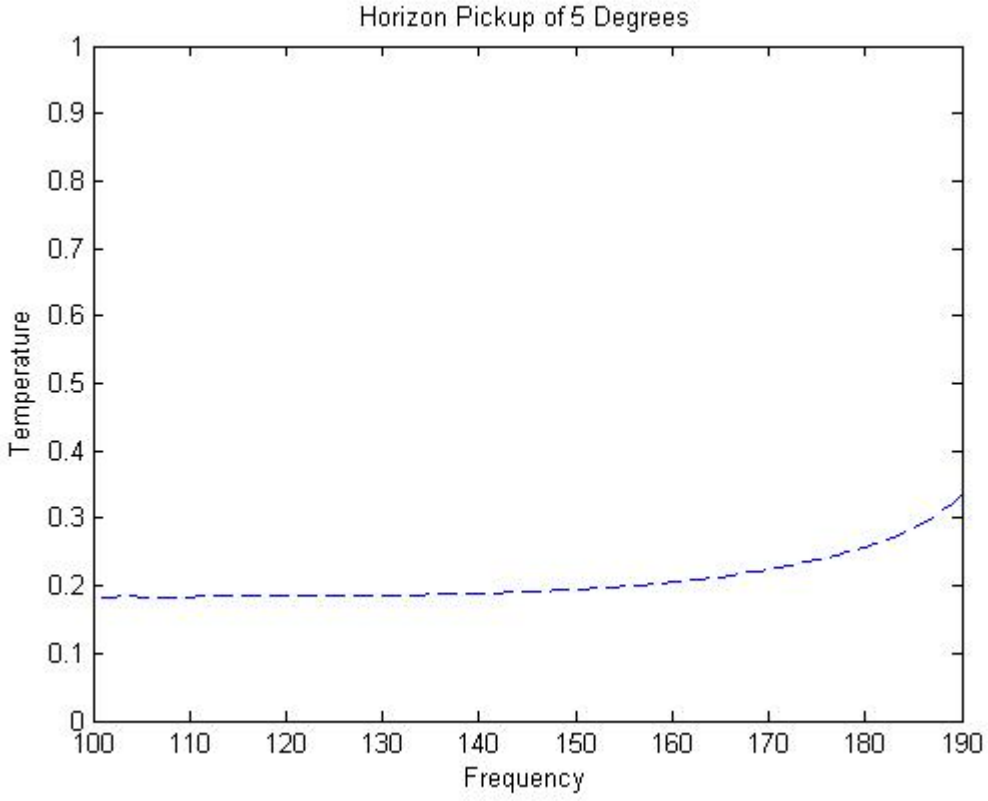

Figure 3. Antenna response with the ground sky interface is defined to be 5 degrees elevation.

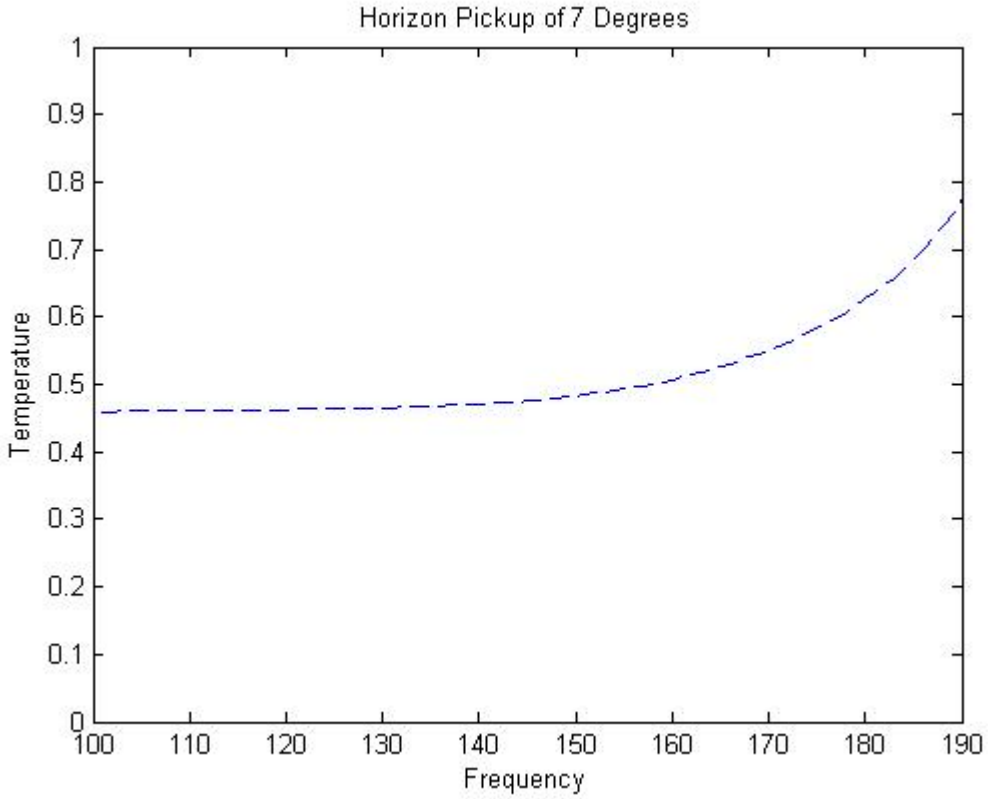

Figure 4. Antenna response with the ground sky interface is defined to be 7 degrees elevation.

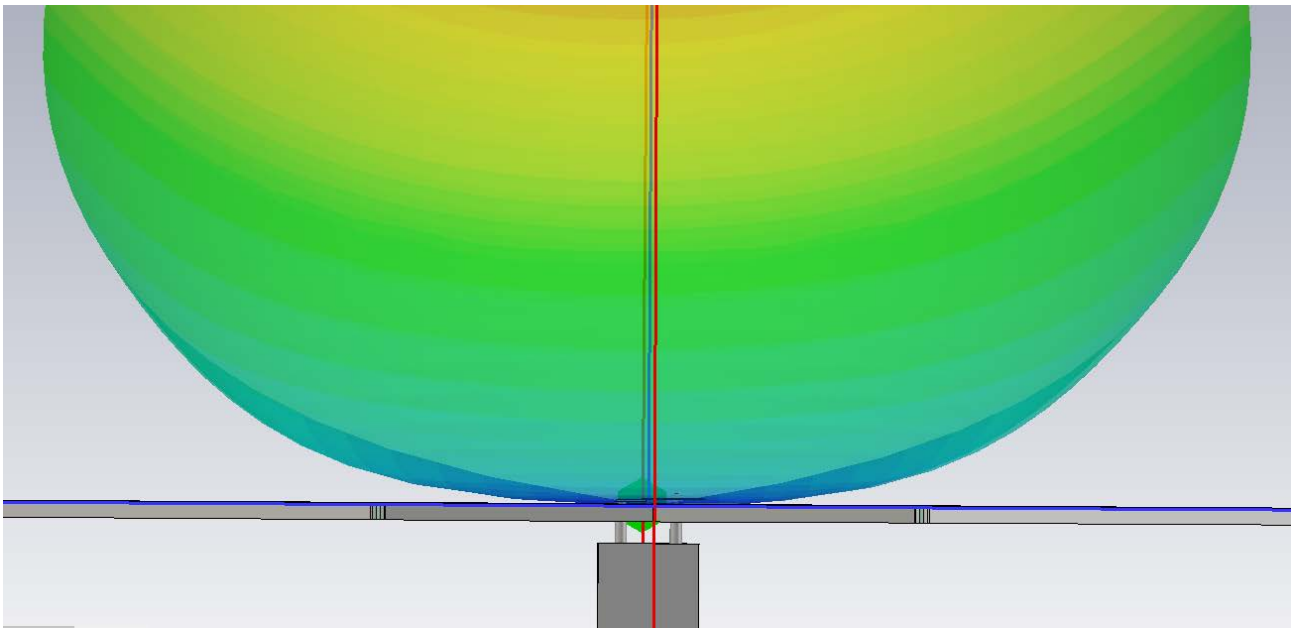

Figure 5. Beam pattern zoomed into the low elevation response at 150 MHz. Notice the lack of sidelobes.

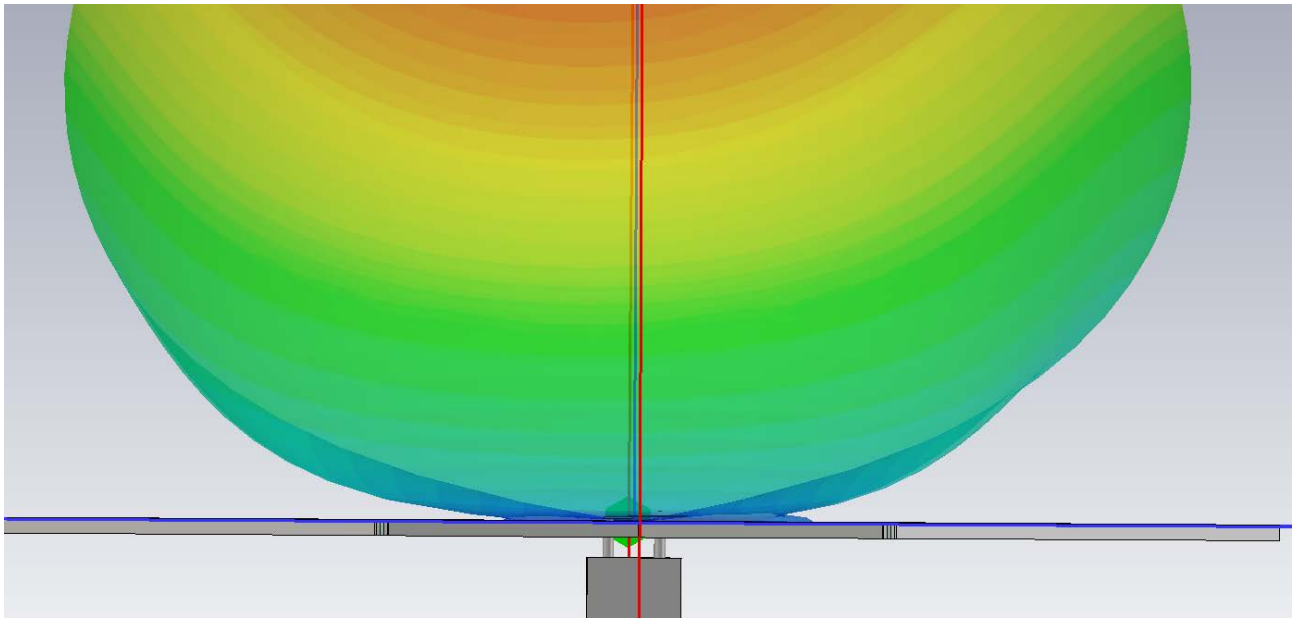

Figure 6. Beam pattern zoomed into the low elevation response at 180 MHz. The sidelobes are beginning to become visibly noticeable.

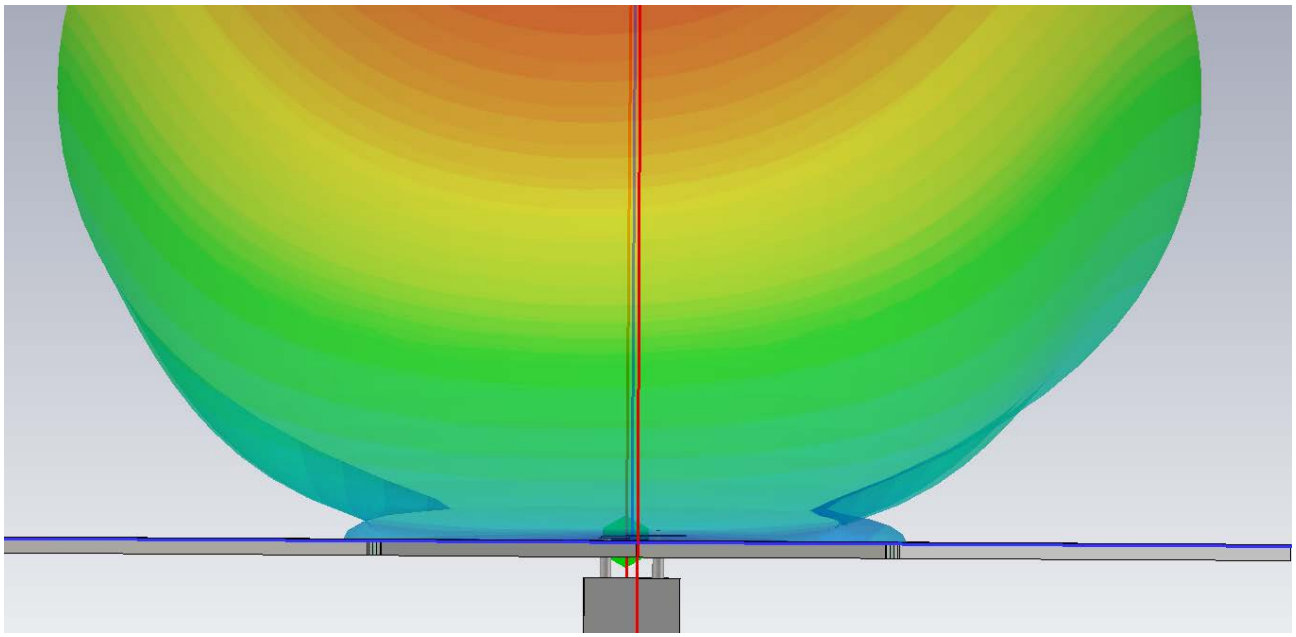

Figure 7. Beam pattern zoomed into the low elevation response at 190 MHz. The sidelobes are now prominent.