

**MASSACHUSETTS INSTITUTE OF TECHNOLOGY
HAYSTACK OBSERVATORY
WESTFORD, MASSACHUSETTS 01886**

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Telephone: 617-715-5533

To: EDGES group

From: Alan E.E. Rogers

Subject: Comparison of EDGES-2 and EDGES-3 beam chromaticity at different sites

The EDGES systems have been designed to minimize the fine angular and spectral structure in the antenna beam to optimize the extraction of the global 21-cm spectrum from the sky. The beam structure depends on the physical design of the antenna and well as the ground plane, soil uniformity, dielectric and conductivity. Memos 184 186 188 189 248 263 265 297 336 338 340 348 353 374 375 386 413 and 422 cover the many aspects which effect the beam chromaticity including scattering effects. Memos 341 342 348 and 360 shows the effect of scattering on the beam.

Plots of the EDGES-3 simulated residuals along with 2-D plots of the beam change from 76 to 80 MHz for EDGES-3 on 30x30 m and 48x48 m ground planes along raised by 1cm and 1m are shown in memo 436.

The comparison of EDGES-3 on a 48x48m ground plane with EDGES-2 on the 30x30 m ground plane (configuration H2 in the 2018 paper) is shown in Figure 1. This comparison also shows the residuals in the same way as shown in memo 436. Figure 1 also shows the beam “derivative” or change in beam from 76 to 80 MHz in the same way as in memo 436.

Figure 2 shows the beam change for the EDGES-3 deployments at ADAK, Devon, and the WA as well as EDGES-2 at the WA. In this case the residual plots vs GHA are not shown as they depend on the sky map and antenna orientation.

The beams used were:

EDGES-2 WA: newniv.txt

EDGES-3 WA: azelq_box_perf_48_2e-2.txt

EDGES-3 ADAK: azelq_adak_cable_box29.txt

EDGES-3 Devon:

azelq_bladebox_50x25m_mspac4_gravel_1m_6.5_5e3_18a_permap_1cm_batdev120.txt

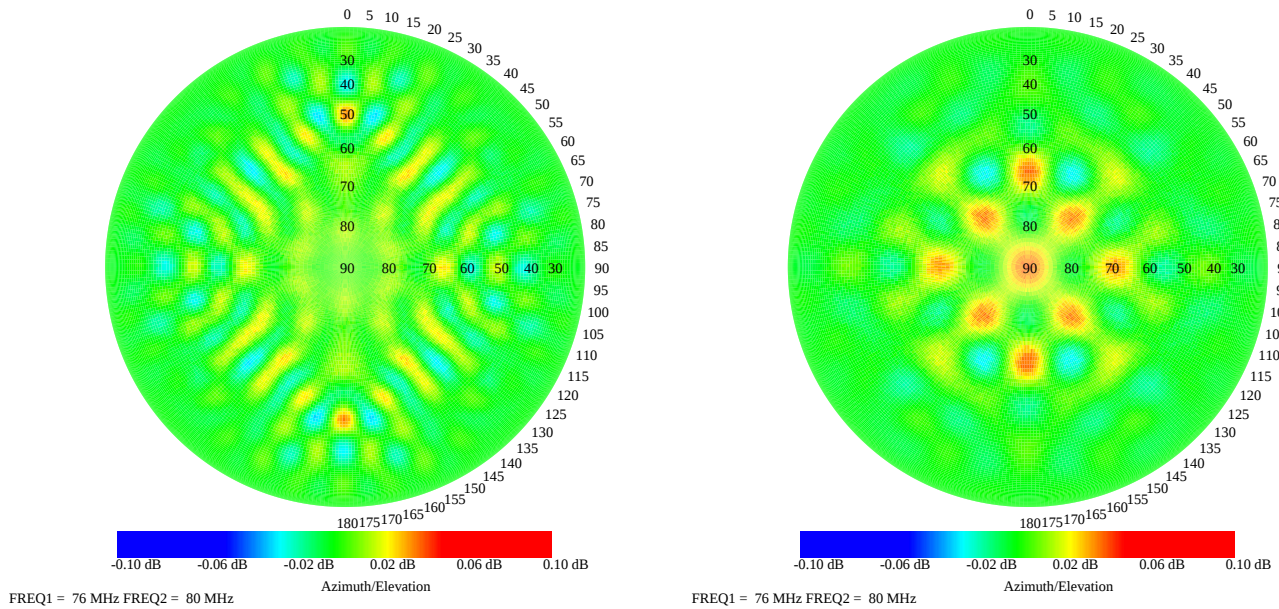
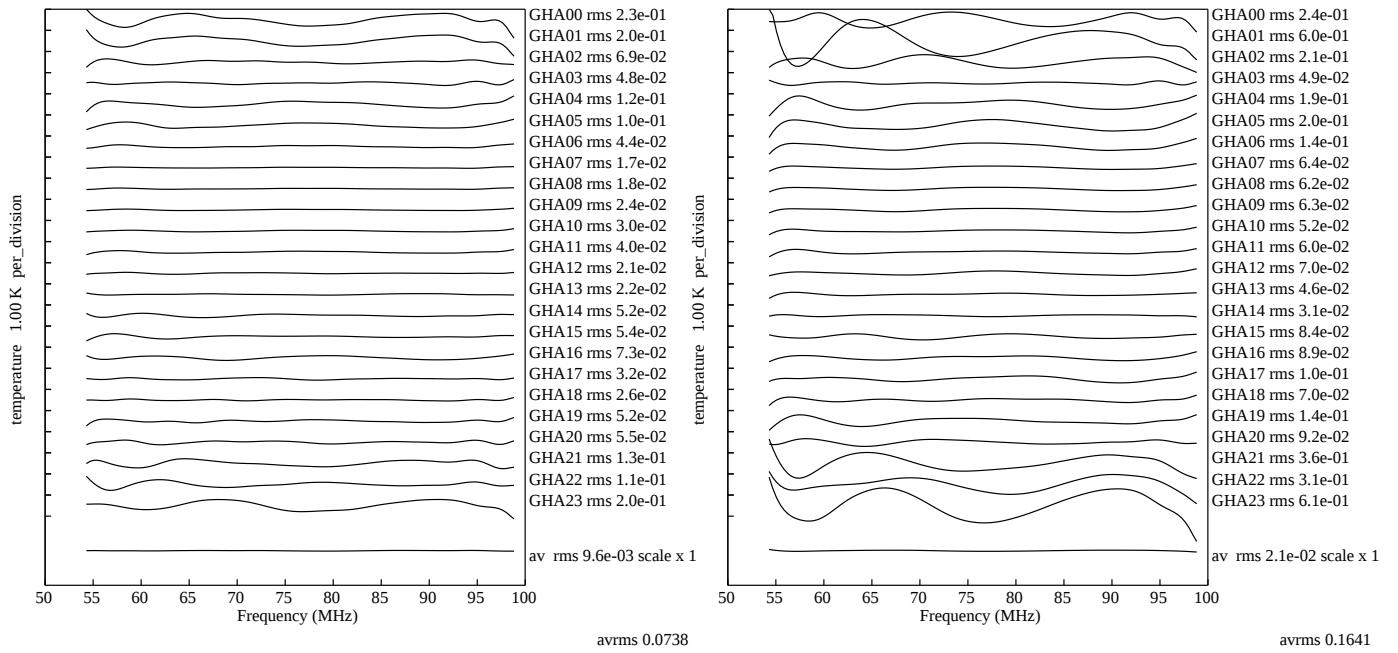


Figure 1. EDGES-3 residuals with 5-terms and 48x48 on the left and EDGES-2 30x30 on the right.

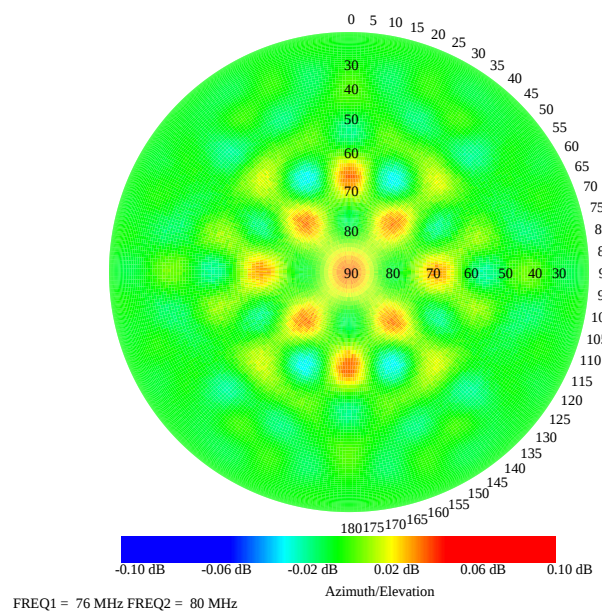
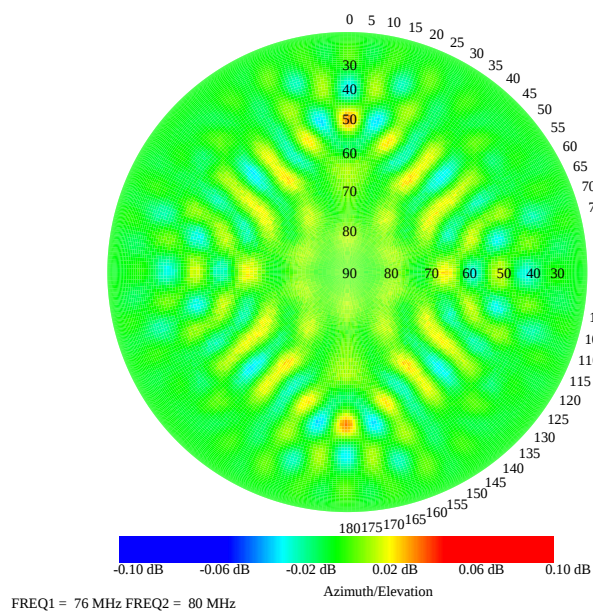
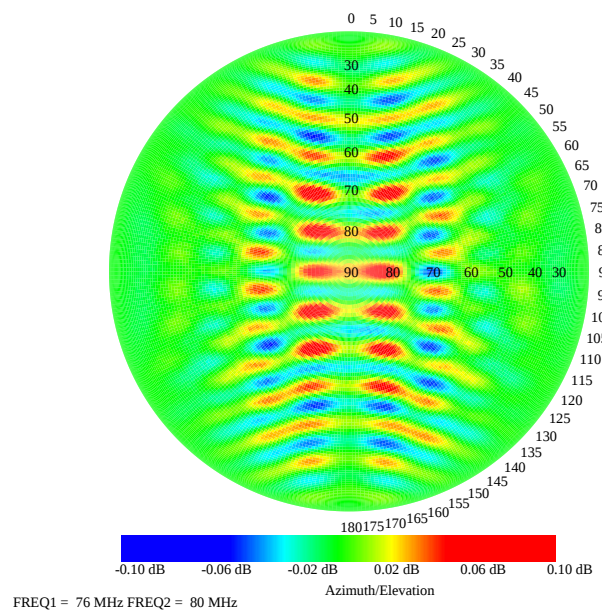
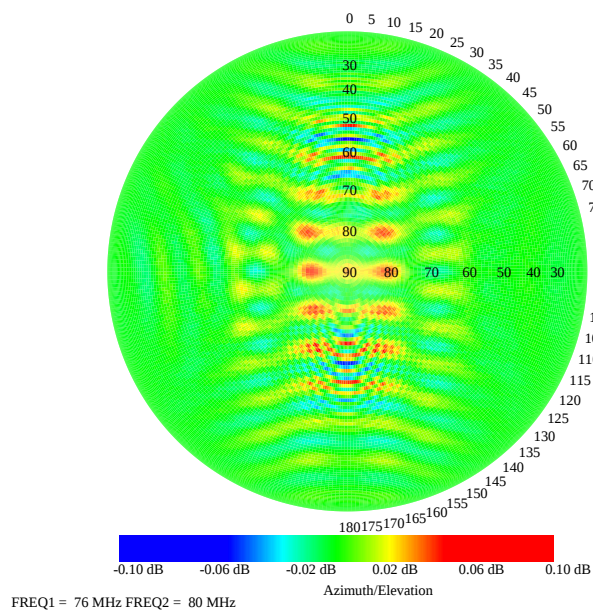


Figure 2. EDGES-3 at ADAK and DEVON on top with WA on the bottom left and EDGES-2 on the right.