

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
HAYSTACK OBSERVATORY
WESTFORD, MASSACHUSETTS 01886
March 28, 2017

Telephone: 781-981-5414
Fax: 781-981-0590

To: EDGES Group
From: Alan E.E. Rogers
Subject: Simulations of resonances in balun shield

FEKO simulations of the balun shield under the low band antenna show that while it reduces the unwanted radiation from the balun it has the potential to produce resonances from capacitively loaded slots which could form in regions of poor contact. For example, a region of lost ohmic contact between the screws which hold the two halves together could form vertical slots which result in omnidirectional horizontally polarized radiation.

Figure 1 shows the simulation of the beam effects of a gap from the top screw on the side of the shield to the top of the shield loaded at the top with 100 pf which forms a resonance at 75 MHz. The resonance also results in dip on about 0.5 dB in the antenna S11. However, the plot is made on the assumption that the S11 is measured with the resonant structure in place and the resonance is not smoothed out in the processing.

Figure 2 shows the effect of a capacitively loaded slot produced by lack of contact between the base and the ground plane over a region whose length is equal to one side of the shield. In this case the S11 dip is about 2 dB and Figure 3 shows the effect of including the S11 on the assumption that it is not present in the S11 measurement or is smoothed out in the measurement.

For a resonance under the antenna the effects on the spectrum by a change in S11 and that from beam chromaticity are about equal while the effects due to a change in S11 drop more rapidly than those from beam chromaticity as the resonant structure is moved away from the antenna. This dependence is discussed in more detail in memo 168.

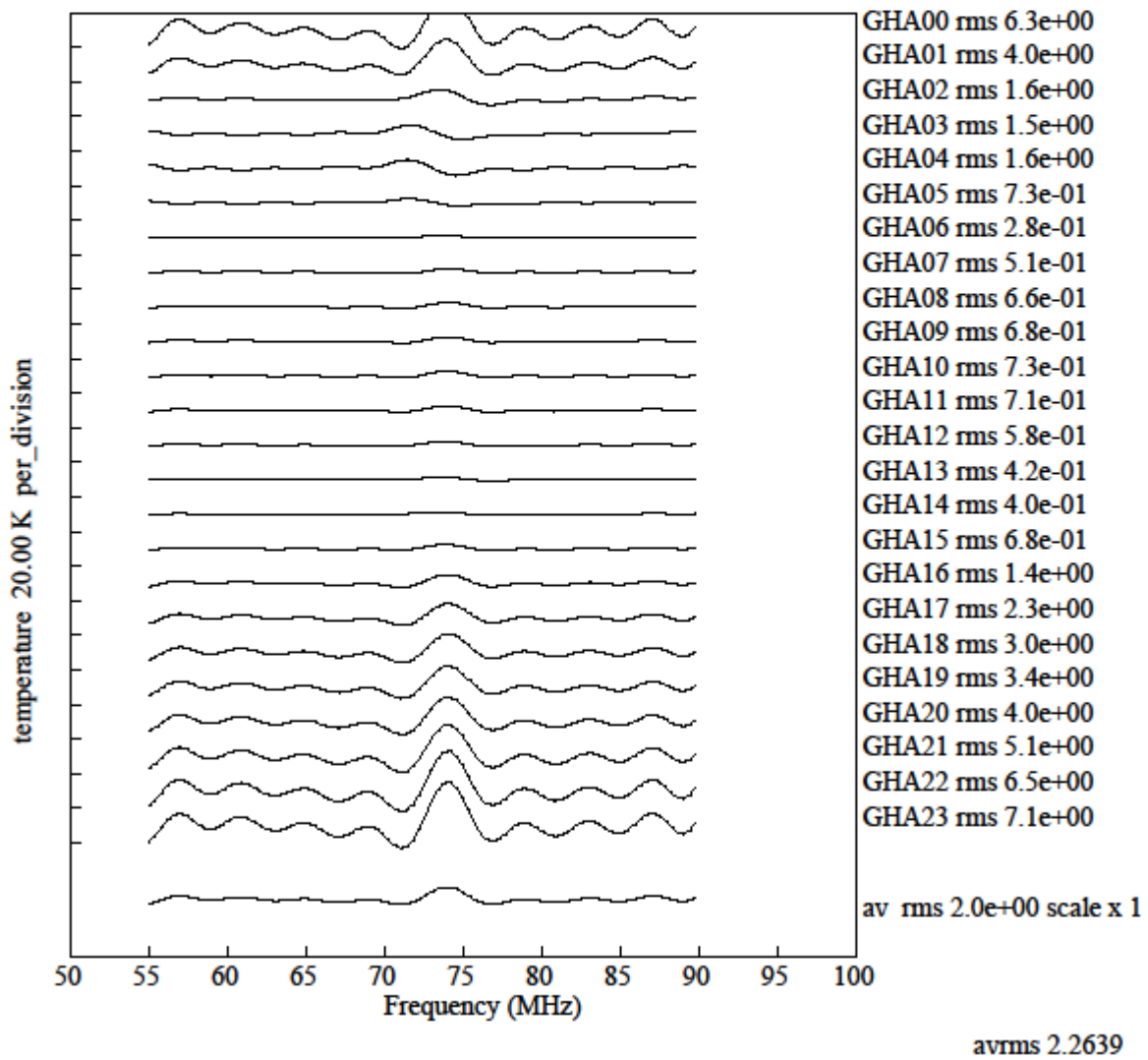


Figure 1. Beam effects of resonant slot in contact between 2 halves of the shield. 4 poly terms removed.

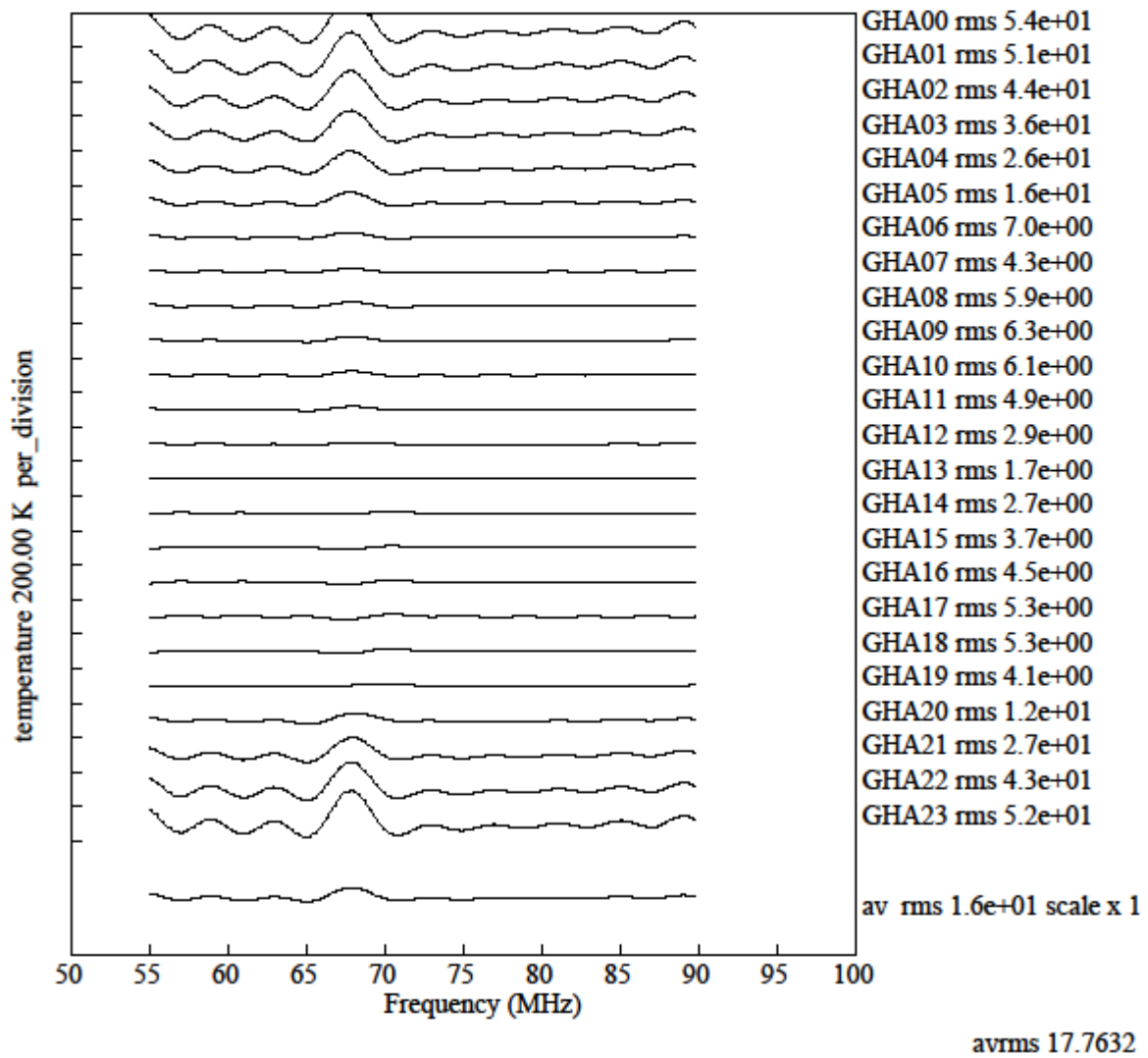


Figure 2. Resonant slot in the loss of contact between the bottom of the shield and the ground plane.

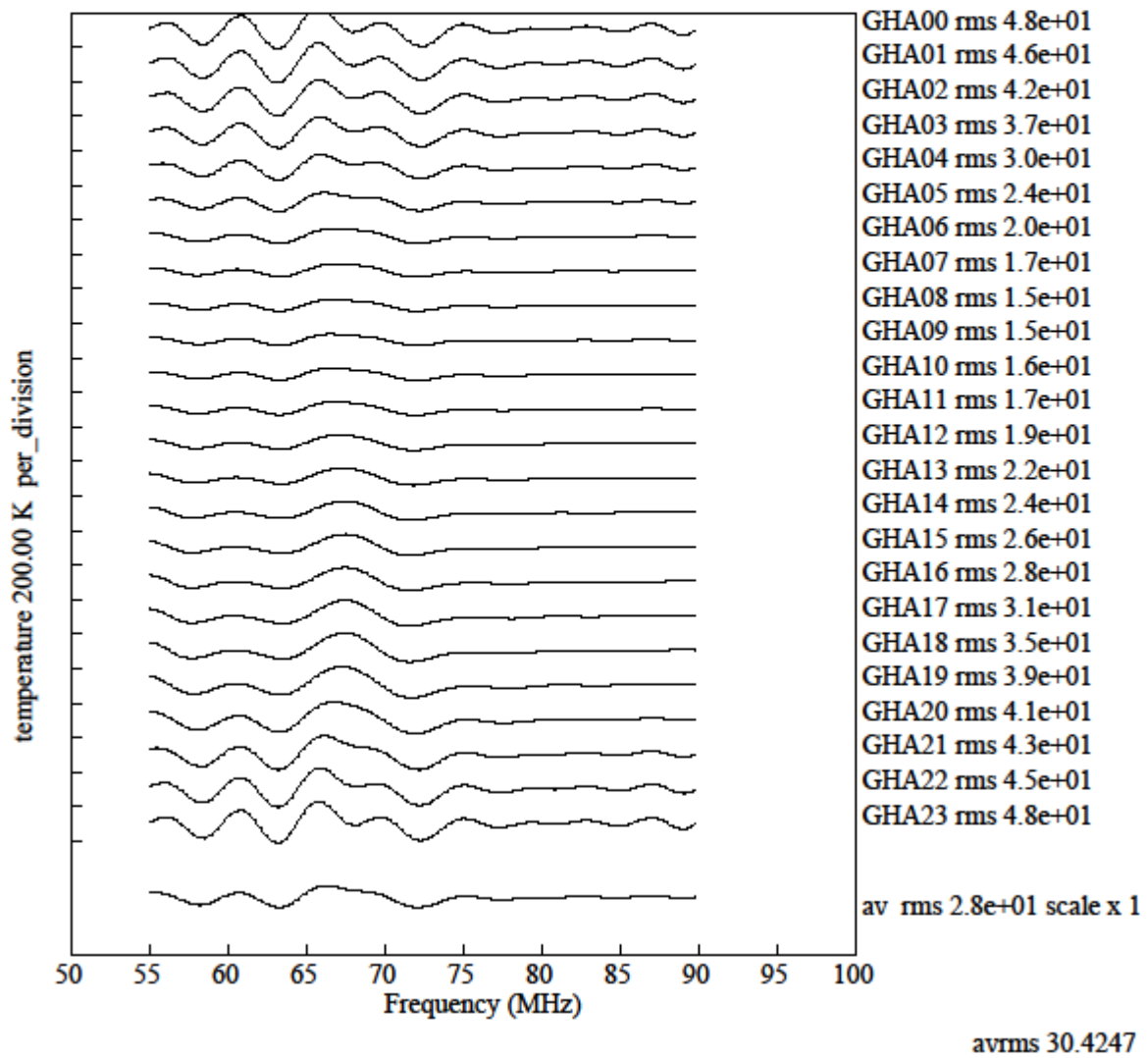


Figure 3. Same as figure 2 but includes the effects of the change in S11 due to the resonance.