EDGES MEMO #491

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
HAYSTACK OBSERVATORY
WESTFORD, MASSACHUSETTS 01886

August 18, 2025

Telephone: 617-715-5533

To: EDGES group

From: Alan E.E. Rogers

Subject: Summary of the removal of the 75 MHz resonant slots in the EDGES-3 deployment at the WA

Resonances have been a concern for EDGES. A resonance was observed in figure 1 of memo 138 from a bad connection and the math of slot resonances along with FEKO simulations were made in memo 168. Further study of slot resonances due to overlapping section of ground planes are made in memo 209.

The resonant bump at 75 MHz is studied in memo 407 and thought to be due to slots between the bolts which connect the EDGES-3 antenna's baseplate to the ground plane. The figures in memo 407 show the "bump" at 75 MHz before adding bolts to reduce the length of the gaps in 23 February 2023.

Figure 1 compares the residuals for 5-terms removed for GHA 12.5 to 15.5 hrs in steps of 0.5 hrs using data from 2022 day 319 to 2023 day 6 for which the sun was below 20 degrees on the left and for the same days from 2023 into 2024 on the right. This compares the spectra for the same "time of year" blocks before and after the bolts were added to move the slot resonance out of the EDGES band. In addition to adding the bolts, FEKO modeling, and a search of the EDGES ground plane resonances using a loop antenna were made. See memos 429 431 435 and 442 for details.

Memo 437 provides a summary of the data and 21-cm absorption results from EDGES-3 at the WA after adding the extra bolts to the antenna baseplate to fix the resonance at 75 MHz.

The data from 2023/2024 has a higher noise level than the data from 2022/2023 in figure 1. This is due to a combination higher solar activity and an increase in reflections of FM radio signals which contribute to more data being excised as discussed in memo 448.

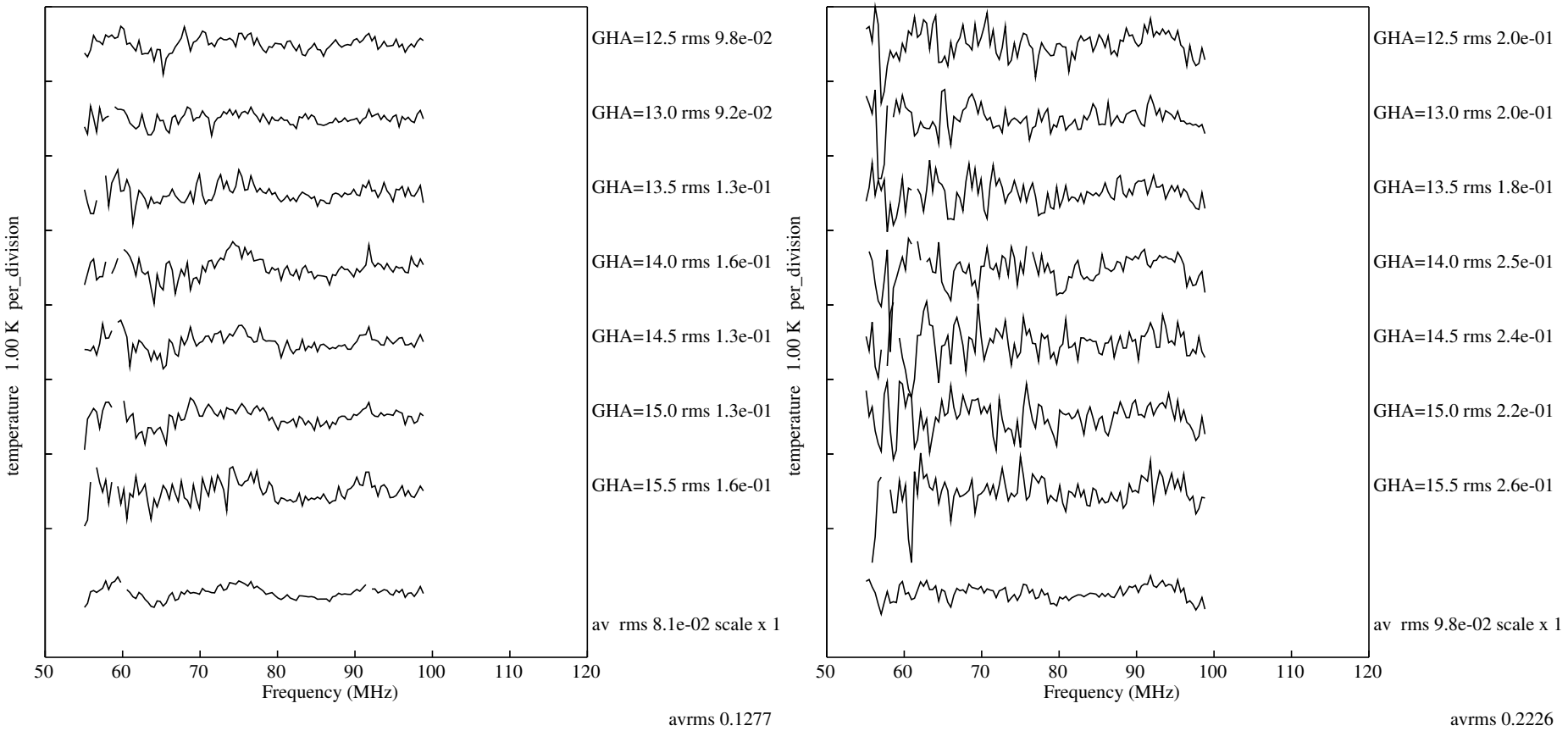

Figure 1. Residuals for 5-terms removed in 2022/2023 on the left and 2023/2024 on the right.