EDGES MEMO #515

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To: EDGES group

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Subject: Tests of the removal of FM and other RFI signals

The removal of FM signals from the EDGES spectra is needed for accurate measurements of the global 21-cm spectra. This is needed in order to cover frequency range of at least 50 to 100 without discarding the FM band which covers 87.5 to 108 MHz in Australia. FM reflections from the moon could down lower as Brazil's FM band goes down to 76.0 MHz but the reflections studied in memos 250 and 468 only go down to about 87.5 MHz.

Data from EDGES-3 at the MRO taken in 2023 is selected for comparison of the new python-coded Bayesian pipeline with the c-coded pipeline results reported in Memo 489.

Figure 1 show the residuals to spectra for the one hour blocks for days 285 and 286 without removing the FM signals and figure 2 shows the same data with the c-code algorithm in the acqplot function that applies the method of FM removal that allows the frequency range of the FM RFI to be used for the global 21-cm spectrum. Memos 173, 213, 227 and 244 have the details of the algorithm and memo 489 has a summary of the method used.

The list of EDGES memos below provide more details of the method of FM and RFI removal.

EDGES memo 137 very strong signals
EDGES memo 173 removal of weak broadband sliding rms
EDGES memo 213 fig 3 downweighted freq channels in blue
EDGES memo 227 effect of "second level" which is time span removed
EDGES memo 244 stages of RFI processing
EDGES memo 250 FM reflections from moon
EDGES memo 424 FM reflections from satellites
EDGES memo 468 FM reflections from moon effect of -rfi parameters
EDGES memo 469 FM reflections from meteor showers and micrometeorites
EDGES memo 501 FM reflections from moon data from 2025 day 1 to 344
EDGES memo 506 EDGES-3 data from 2026 days 80 and 81 with and without RFI excision
EDGES memo 507 need for acqplot parameters: -maxrmsf 50 -sunlim -30 -sunmin -90 -site 1 -rfi 2.1 2026 data

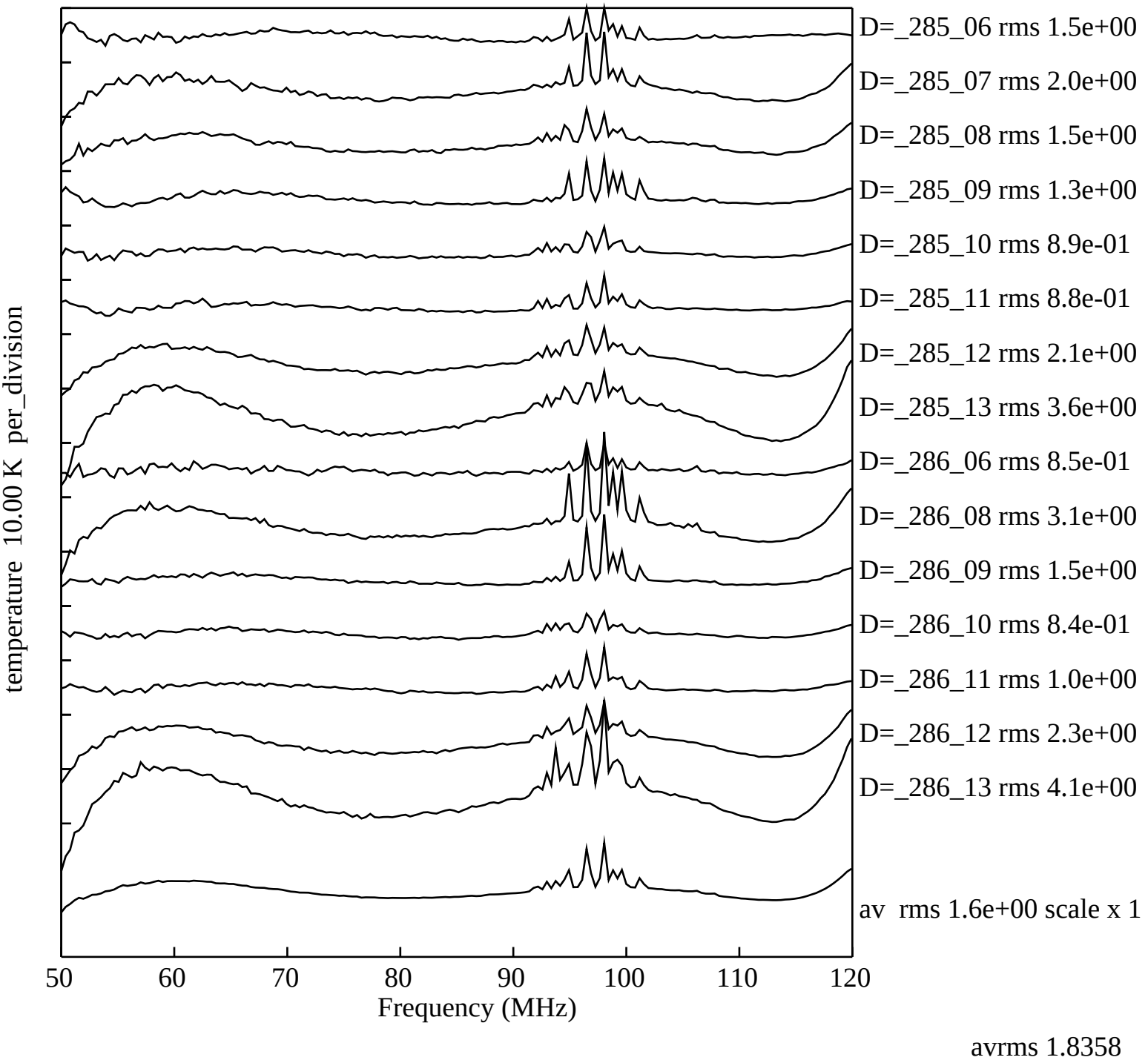

Figure 1. Residuals of one hour blocks of EDGES-3 data from 2023 days 285 and 286

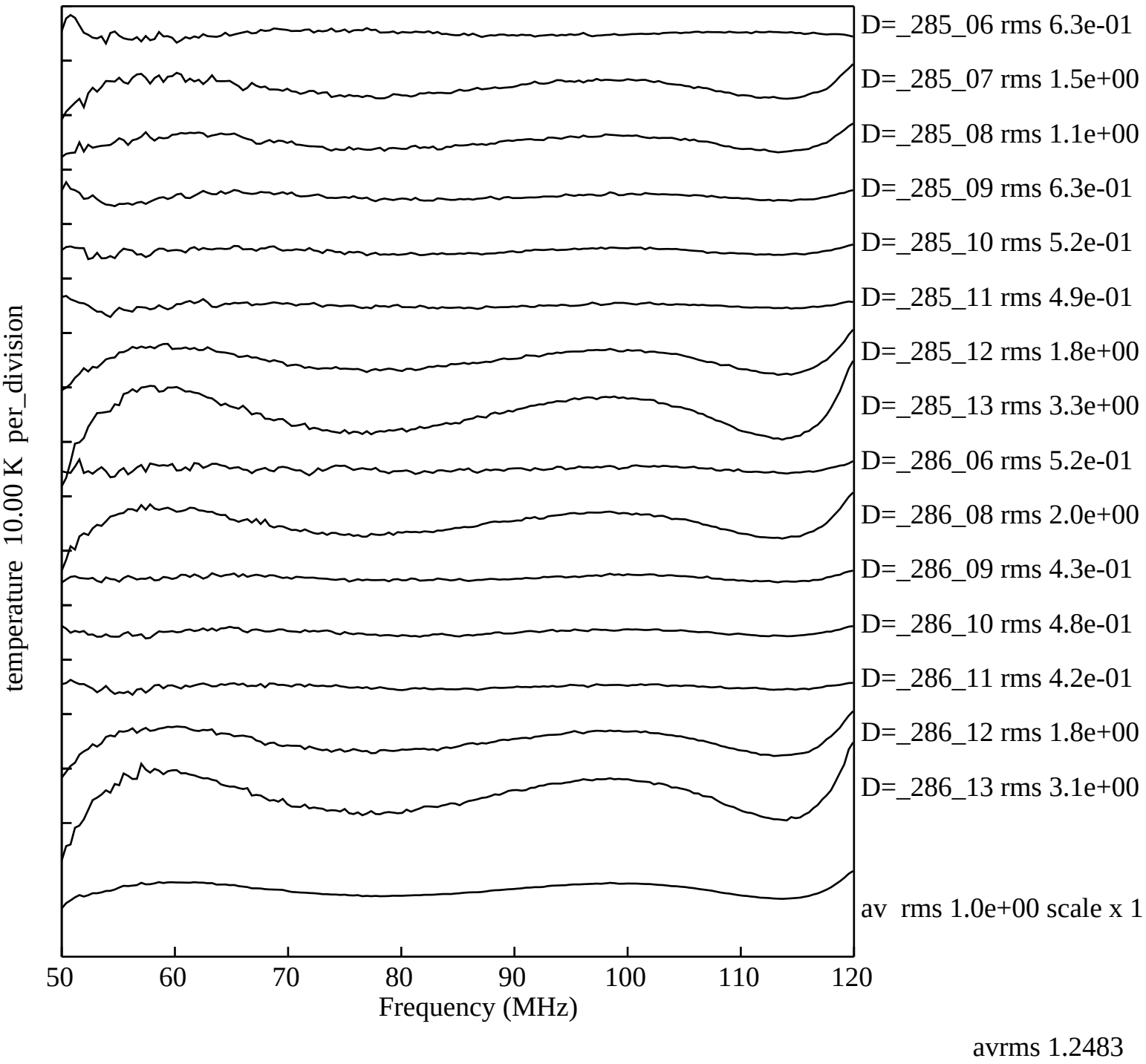

Figure 2. Residuals using a threshold of -rfi 2.5 to remove 3-position cycles