EDGES MEMO #445

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To: EDGES group

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Subject: EDGES-3 RFI filter parameters for absorption data 2023_363 to 2024_087

A study of the RFI filter parameters for 2023_054 to 2023_135 was made in memo 418 using

1] first stage processing with acqplot7amoon
days 54 to 135
30 min GHA blocks from 5 to 19 GHA
-maxrmsf 200 -maxfm 500
-rfi 2.5 -nrfi 4
-smooth 8 50 – 100 MHz

Following more tests some small improvement was seen using

1] first stage processing with acqplot7amoon
days 2023_363 to 2024_087
30 min GHA blocks from 5 to 19 GHA
-maxrmsf 200 -maxfm 2000
-rfi 2.1 -nrfi 2 -sunlim -20
-smooth 8 50 – 100 MHz

to help get the lowest residuals when it was necessary increase the FM threshold to 2000 to get more data accepted when only data with the sun more than 20 degrees below the horizon. Using only data with the sun more than 20 degrees below the horizon was needed to avoid the scintillation effects described in memo 438.

Test	Center freq MHz	SNR	Width MHz	rmsin mK	rms mK
nrfi 2	79.7	44.9	19.8	133.2	21.3
No maxfm	79.7	41.5	19.8	134.6	23.0
nrfi 1	79.7	43.9	20.0	134.8	22.3
nrfi 0	79.7	39.9	20.3	144.9	28.3
nrfi 4	79.7	38.3	20.2	127.1	23.2
nrfi 8	79.7	27.9	20.9	109.5	26.7

Table 1. Results of 5 loglog term foreground fit plus absorption tau = 4 58 – 102 MHz

Plots of the tests are shown in Figure 1. The lowest final residual is obtained with nrfi = 2 and the other parameters in the first stage of processing listed above. With nrfi = 2 two 6.1 kHz frequency channels each side of the frequency channel which exceeds the RFI detection threshold of 2.1 is assigned zero weight. The FM band in Australia covers 87.5 to 108 MHz with 200 kHz so it would take nrfi = 16 to completely exclude all RFI but then it would be difficult to get any data in portions of the FM band. Memos 2, 52, 53, and 54 discuss the reflections from meteors. Memo 244 studies the

reflections from the moon. Memo 137 studies the iterative process used in the excision. Figure 4 of memo 244 shows that while it might be possible to get corruption of the absorption with a rise in the FM band the rise would not be smooth. The sharpness of the rise is shown in figure 1 memo 250. An example of of the difficulty of getting data in the FM band is shown in the test deployment of EDGES-3 in Oregon described in memo 310.

The results in Table 1 and shown in Figure 1 confirm that even in the more severe environment which requires only using only data with the sun more than 20 degrees below the horizon an absorption consistent with the EDGES-2 2018 result is obtained without evidence of a rise in the absorption profile as a result of RFI from FM radio signals. In summary the start of the smooth rise in the absorption which just happens to start close to the start of the FM radio band is almost certainly just coincidence.

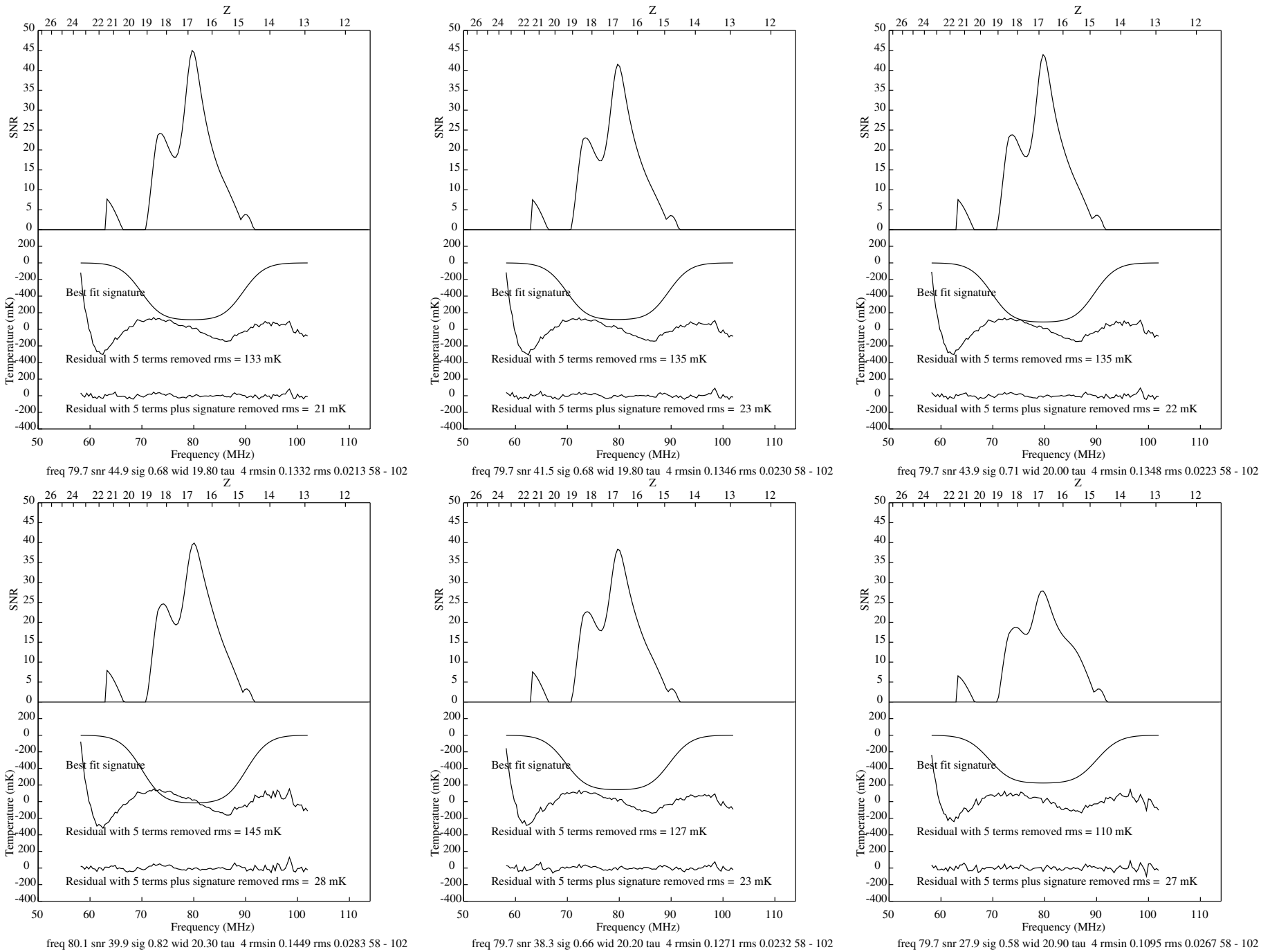

Figure 1. Plots of spectra for the cases in table in order top left to right to bottom left to right.