

**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

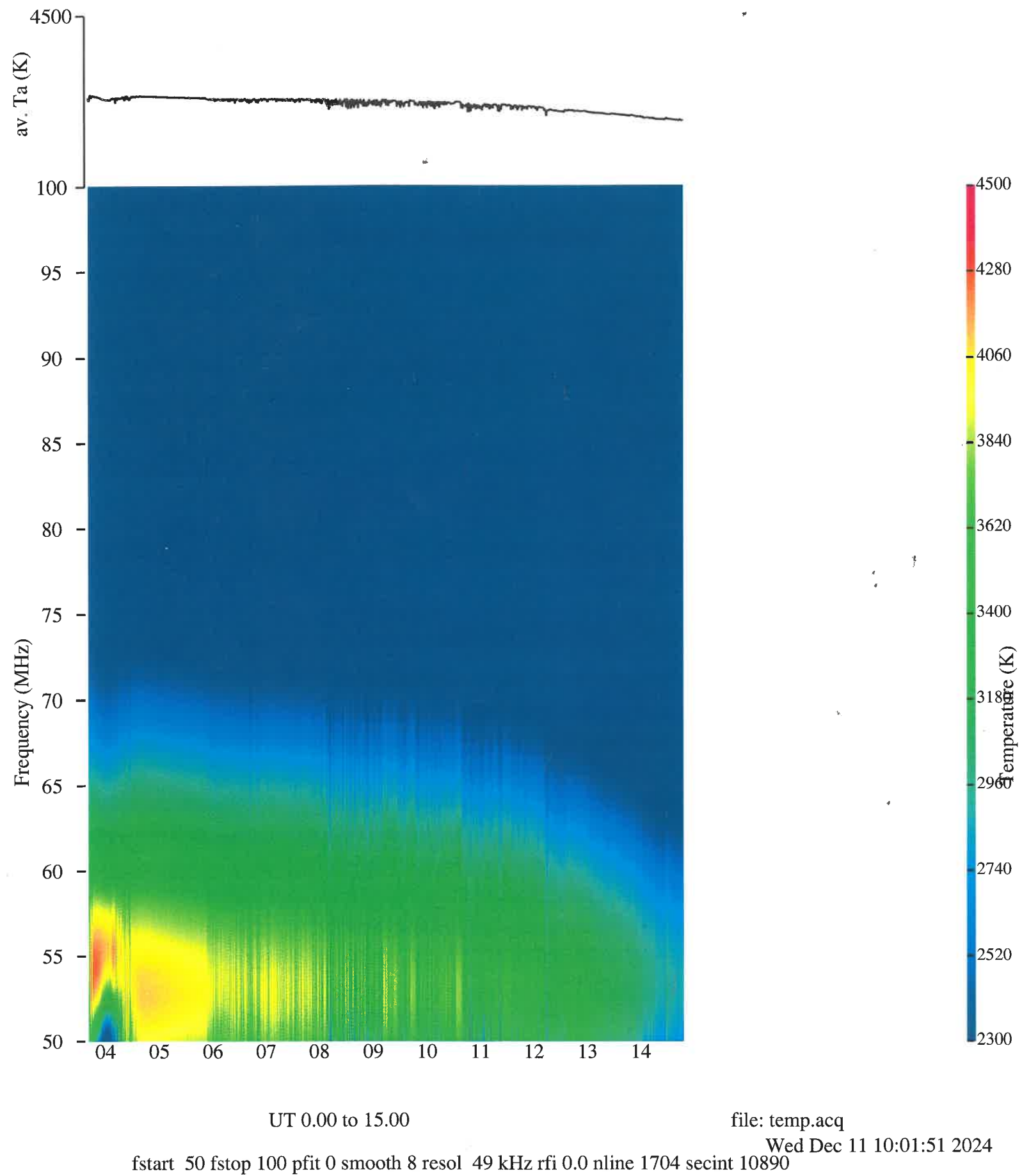
Subject: Initial data from Adak deployment

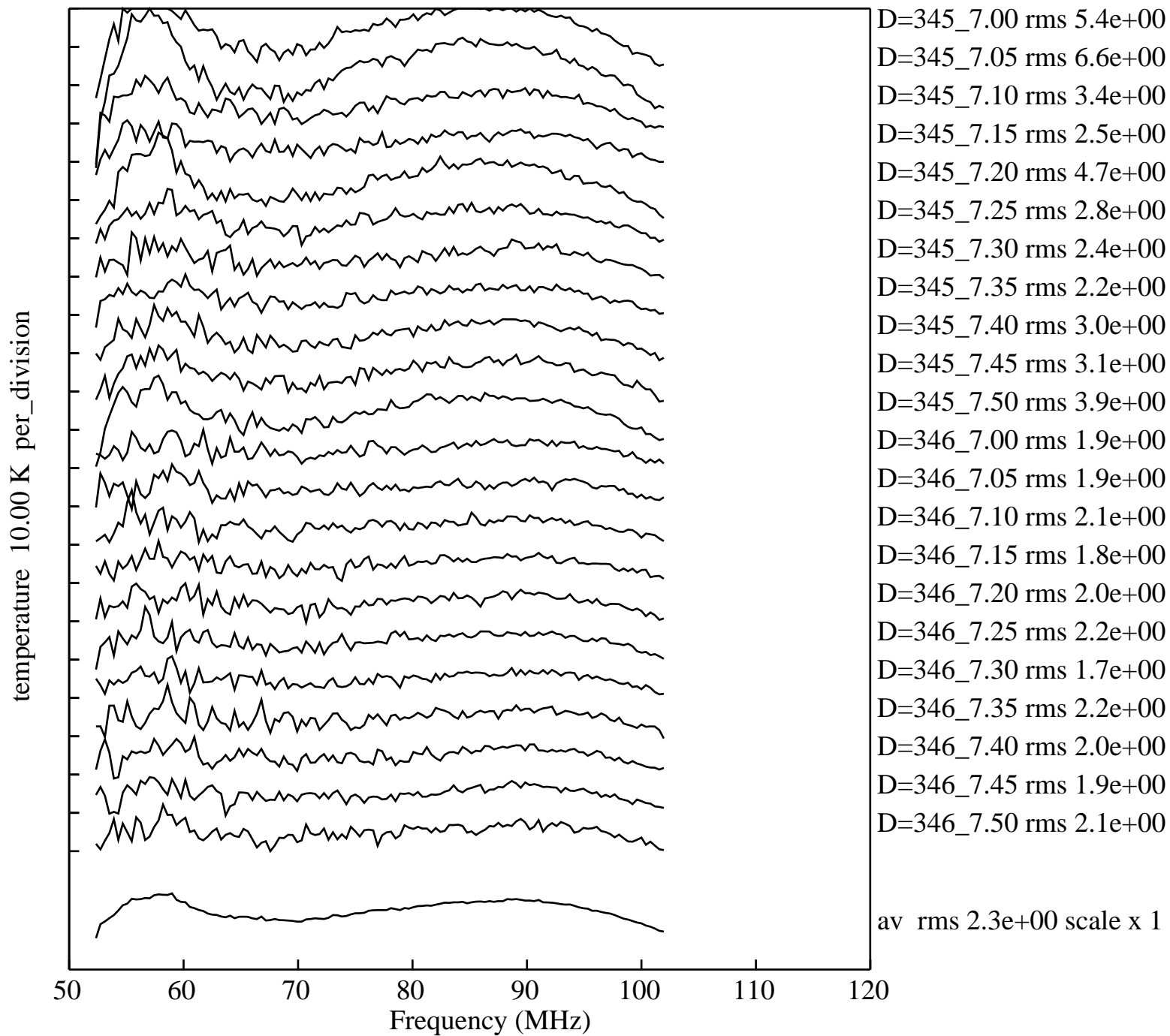
The first sky spectral data returned from Adak Island was from days 345 and 346 of 2024. This data was accompanied with S11 data of the antenna and partial set of calibration data so an initial analysis was made using calibration data taken at Haystack. Figure 1 shows the waterfall plot of the uncalibrated data from day 345 which shows the presence of some scintillation which is probably from the radio source Cas A and figure 2 shows the calibrated data from some 3 minute blocks of data at the same UT times on days 345 and 356. These spectra which are unfiltered with 4 physical terms removed show a large variation from one spectra to the next especially on day 345.

Based on this large variation it is clear that filtering is needed. A grid search test for the global 21-cm signal using a calibration using the antenna S11 measured at Adak and a combination of some data from Adak and data taken at Haystack prior to deployment is shown in Figure 3. For comparison the same test is made using the data from the WA on days 345 and 346. The data from Adak and the WA are limited to the sun elevation below 20 and 30 degrees respectively. From this comparison it is clear that with the preliminary calibration the data from just 2 nights at Adak is clearly limited by systematics. Some of the systematics are due to the large changes in the Adak data which will be reduced when more data is available so that a lower noise level can be reached with more filtering out of data with large residuals.

Tests made by adding an antenna loss and offsets to the LNA and antenna S11 are unable to remove the peaks in the residuals at 55, 60, 75 and 95 MHz in prior to fitting the absorption in figure 3. More tests show these peaks are present because the 5-terms which model the scale, spectral index, ionosphere attenuation, ionosphere electron emission and spectral curvature is unable to model the sharp bend at 60 MHz that is present the residuals with only 3 physical terms seen in Figure 5. This curvature is primarily present on day 345 where it reaches a maximum residual of 10 K at 10 UT but is also present with a more constant residual of about 5 K on day 346. Understanding and removing a problem with the instrument or better modeling the effects of the structure in the ionosphere is needed.

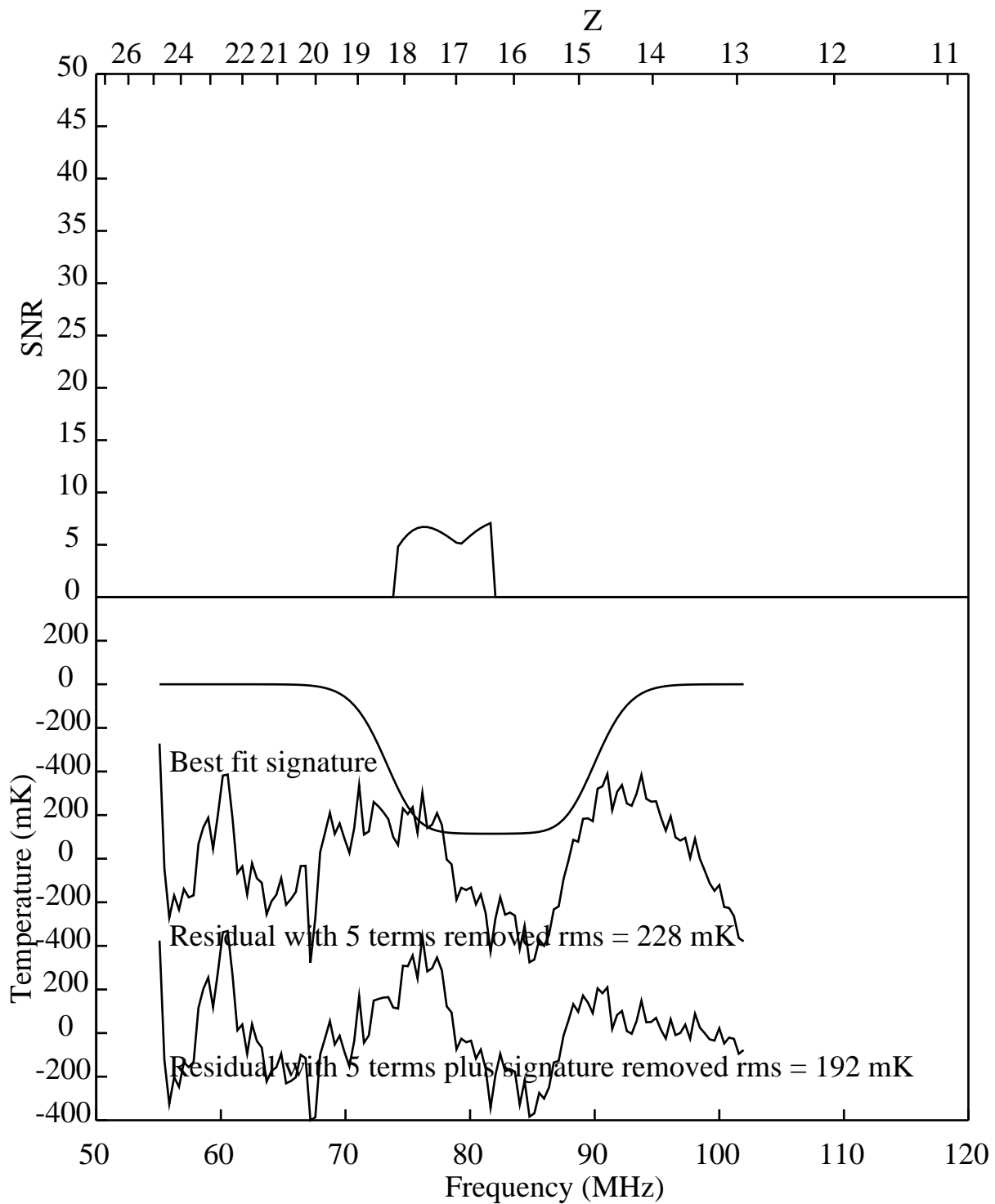
Figure 1. Data from 10 December (day 345) 2024 from Adak Island





avrms 2.8119

Figure 2. Residual spectra using 3 minute blocks with 4 physical terms removed



freq 81.7 snr 7.1 sig 0.69 wid 17.00 tau 7 rmsin 0.2277 rms 0.1916 55 - 102

Figure 3. Global 21-cm grid search test using the data from Adak on days 345 and 346

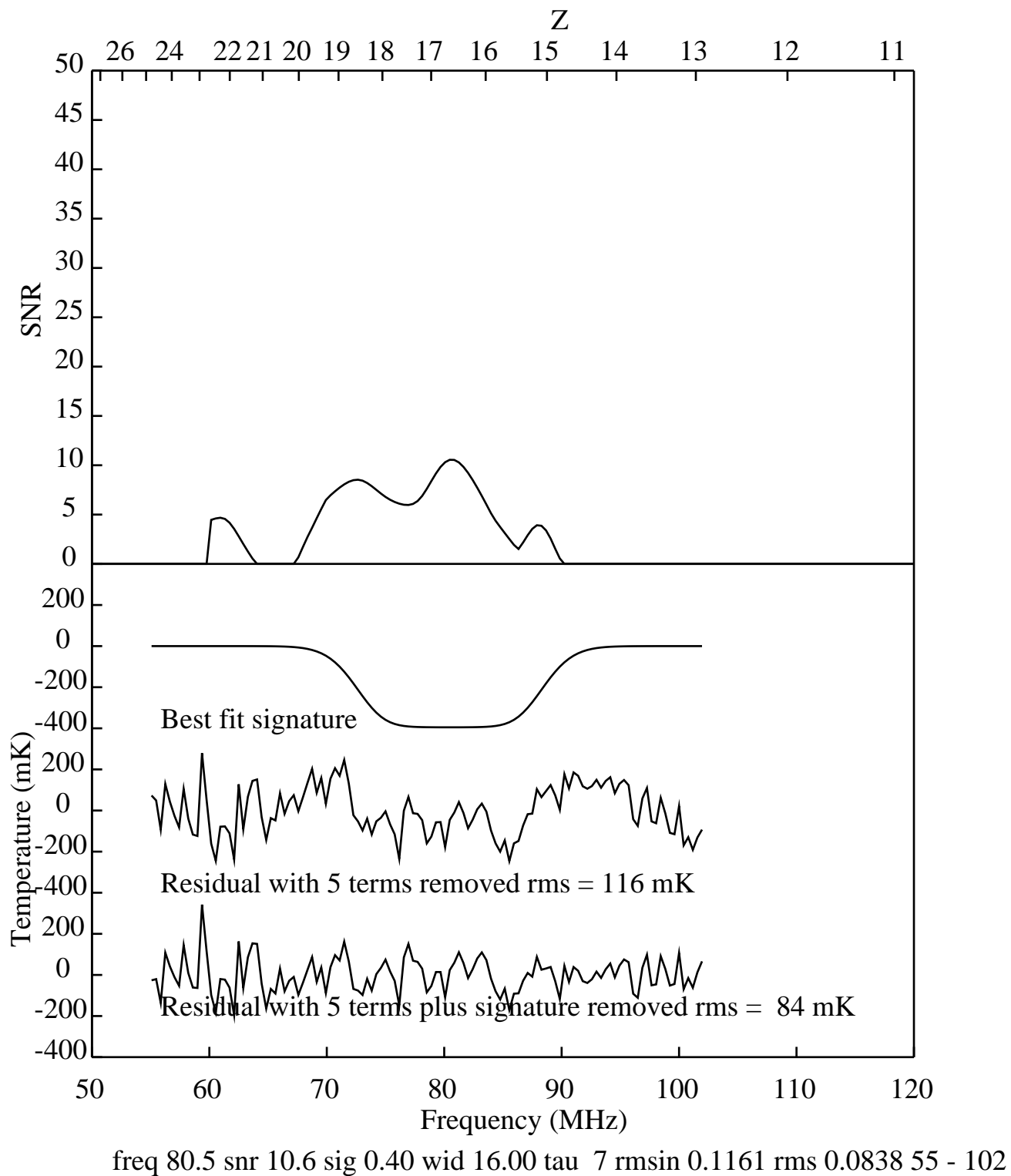


Figure 4. Global 21-cm grid search test using the data from WA on days 345 and 346

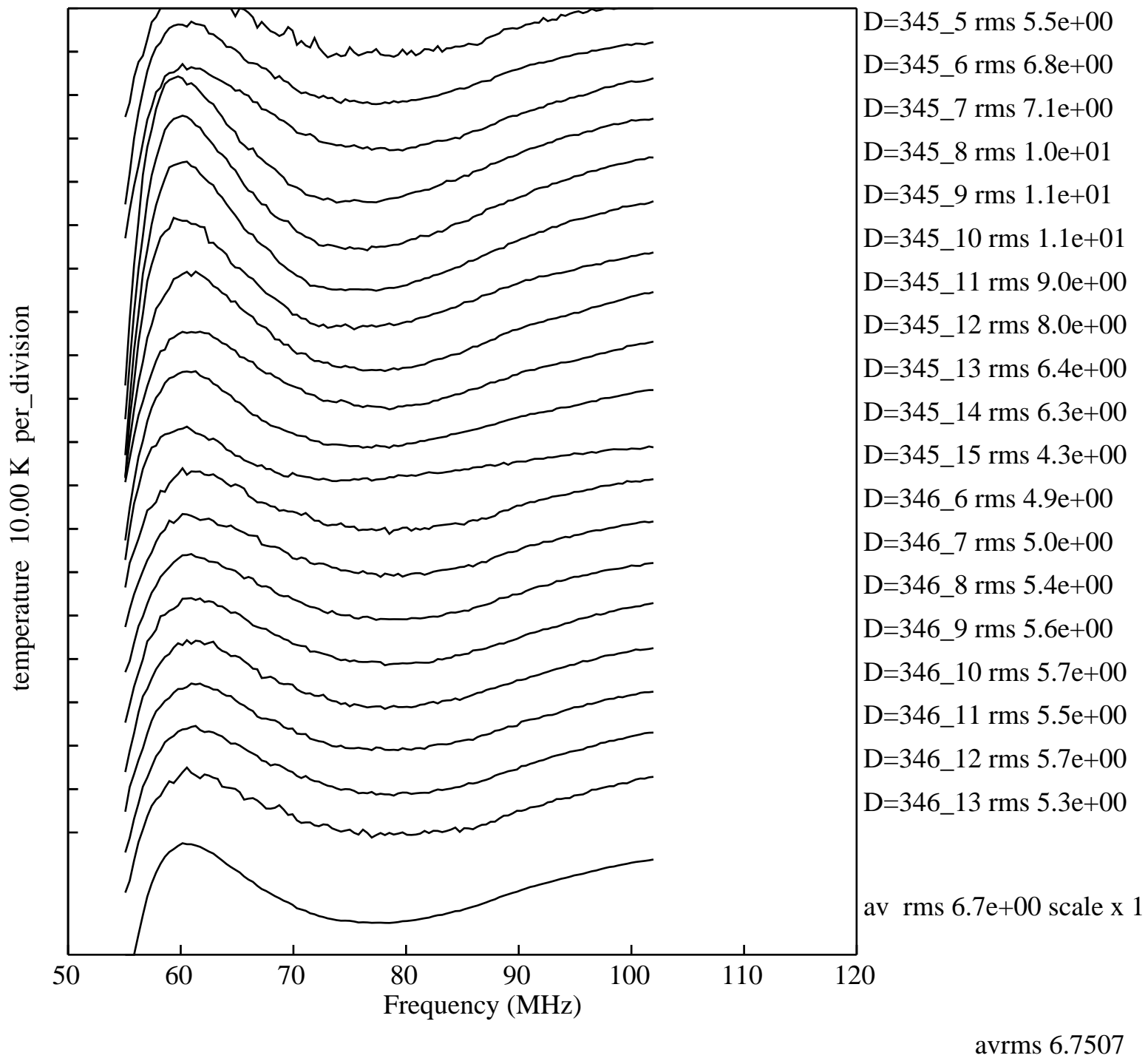


Figure 5. Residual spectra using 1 hour blocks with 3 physical terms removed