

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
HAYSTACK OBSERVATORY
WESTFORD, MASSACHUSETTS 01886

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Telephone: 617-715-5533
Fax: 617-715-0590

To: EDGES Group

From: Alan E.E. Rogers

Subject: Weighted least squares signature using low and midband data.

Some foreground terms can be shared between different data sets while others are separate. Those that are “shared” are assigned the same basis function while those basis functions are allowed to take on a different coefficient for a specific data set are assigned the same functional form with another function index. The unshared data set are assigned a function equal to zero.

Figure 1 shows the signature search using the lowband p8 data from the Nature paper and the midband data from 2018_146 to 218_218. The foreground is modeled with 5 terms using

$$\sum_{i=0}^{i=4} a_i f^{-2.55} (\log(f))^i \text{ where } f = \text{frequency}/75 \text{ from memo 278}$$

For each band with the highest order term, $i=4$, shared between the 2 bands for a total of 9 terms.

A common signature terms with $\tau = 4$, which gives the best fit, is used in a grid search over center frequency and width. The best fit parameters are given in Table 1.

Term	Index	Midband (K)	Lowband (K)	Comments
0	0	1750.86	1777.37	Unshared
1	1	-31.01	28.36	Unshared
2	2	-71.13	-71.75	Unshared
3	3	26.51	199.22	Unshared
4	4	127.72	127.72	Shared
5	0	26.51		
6	1	59.37		
7	2	-0.618		
8	3	172.71		
9	-	0.68	0.68	signature

Table 1. Best fit values

Lowband values are sum of terms with common index.

Figure 2 shows the results of using 5 unshared terms for each band for a total of 10 terms to remove the foreground. These results have lower SNR but are very close to result using a common term for the highest order foreground term. Other methods of using more common foreground information are under study.

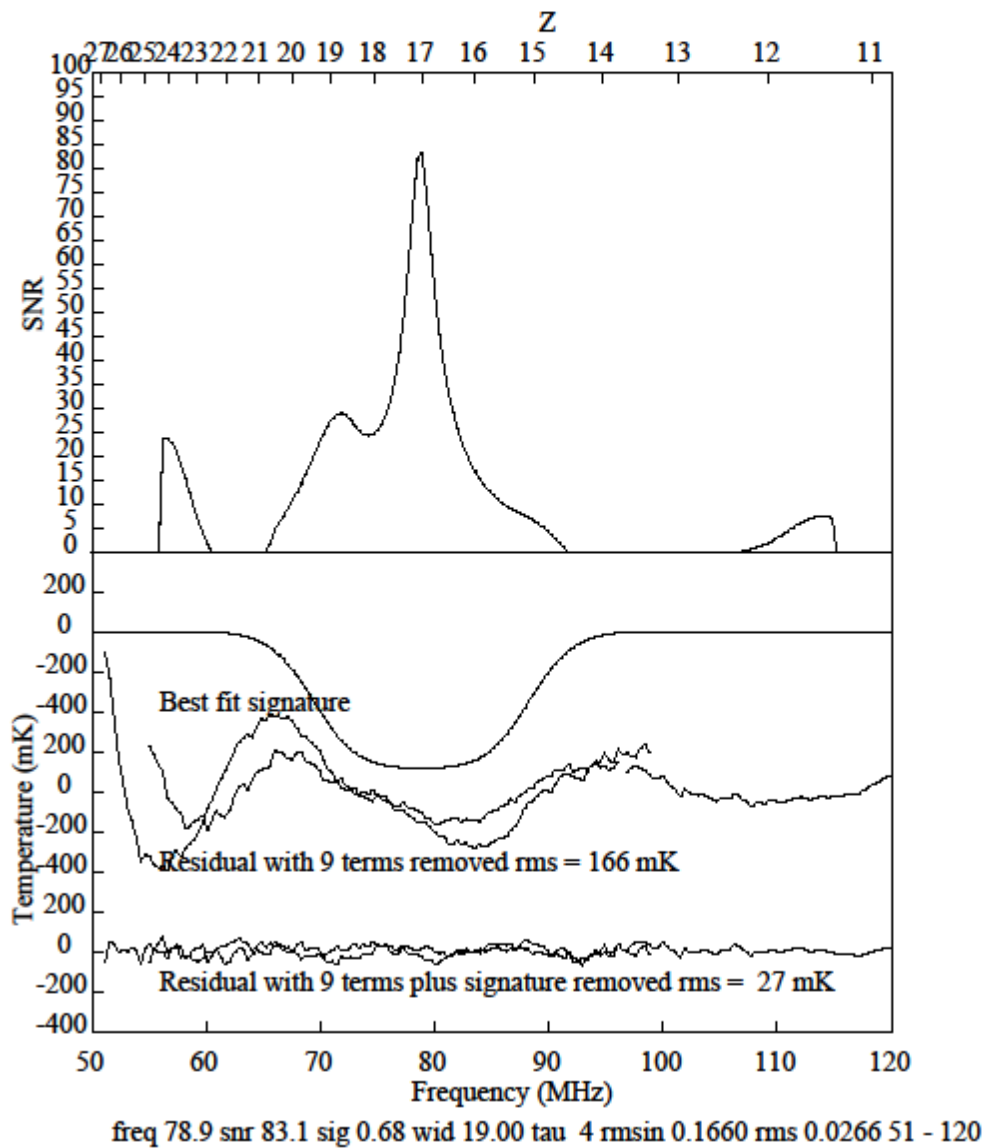


Figure 1. Signature search with one high order foreground term common to both low and midband data.

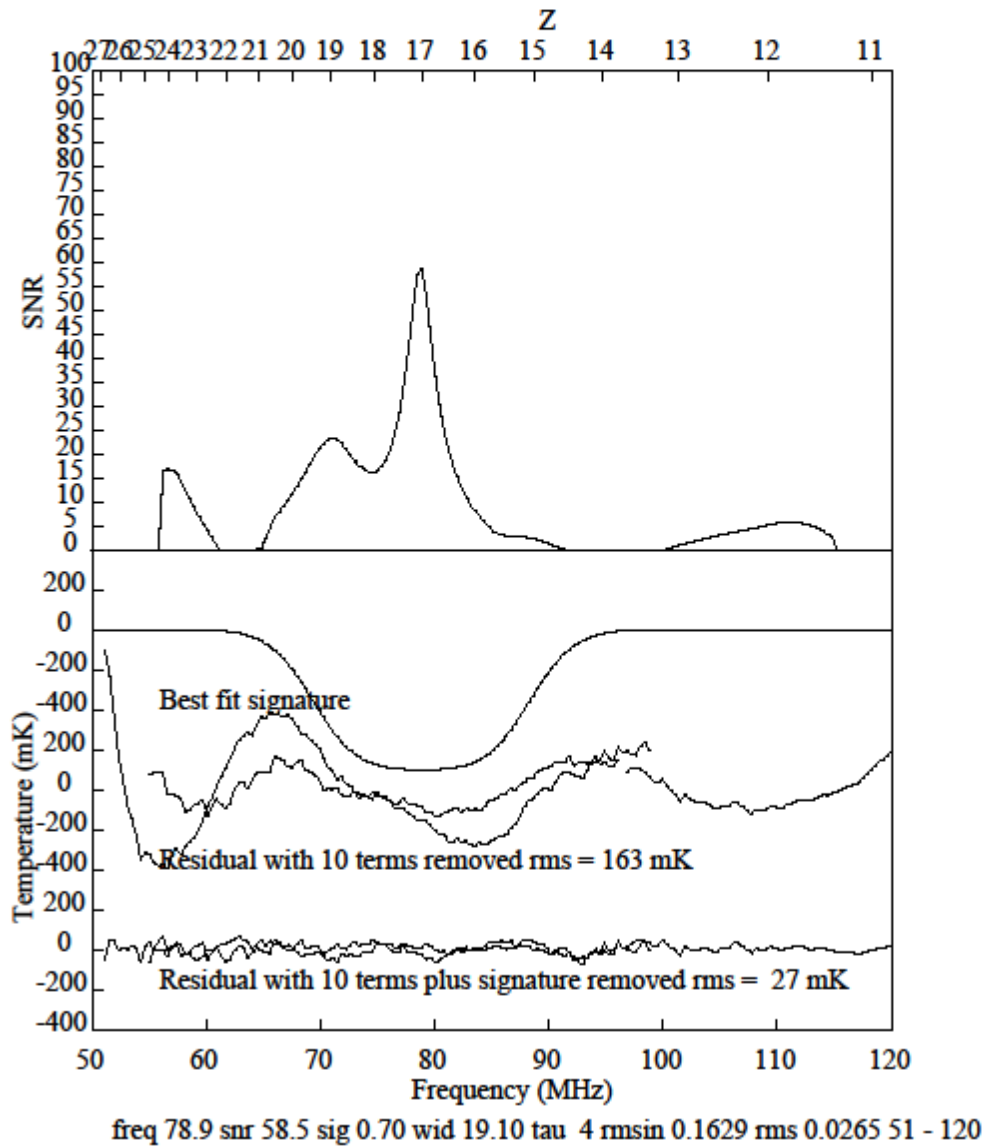


Figure 2. Search with separate foreground terms for lowband and midband.