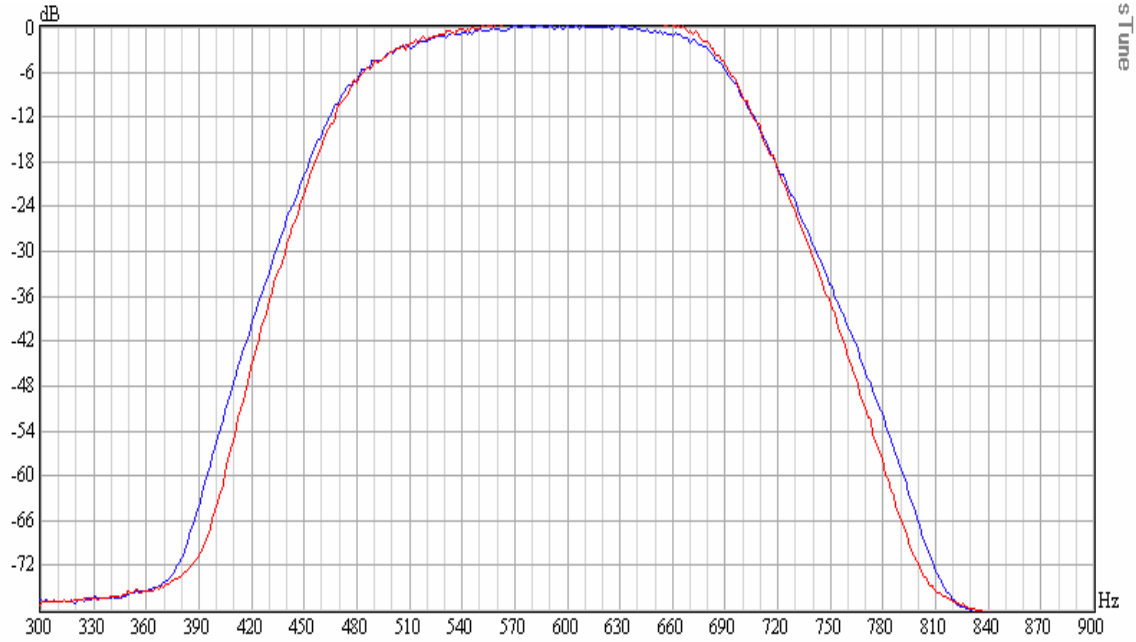
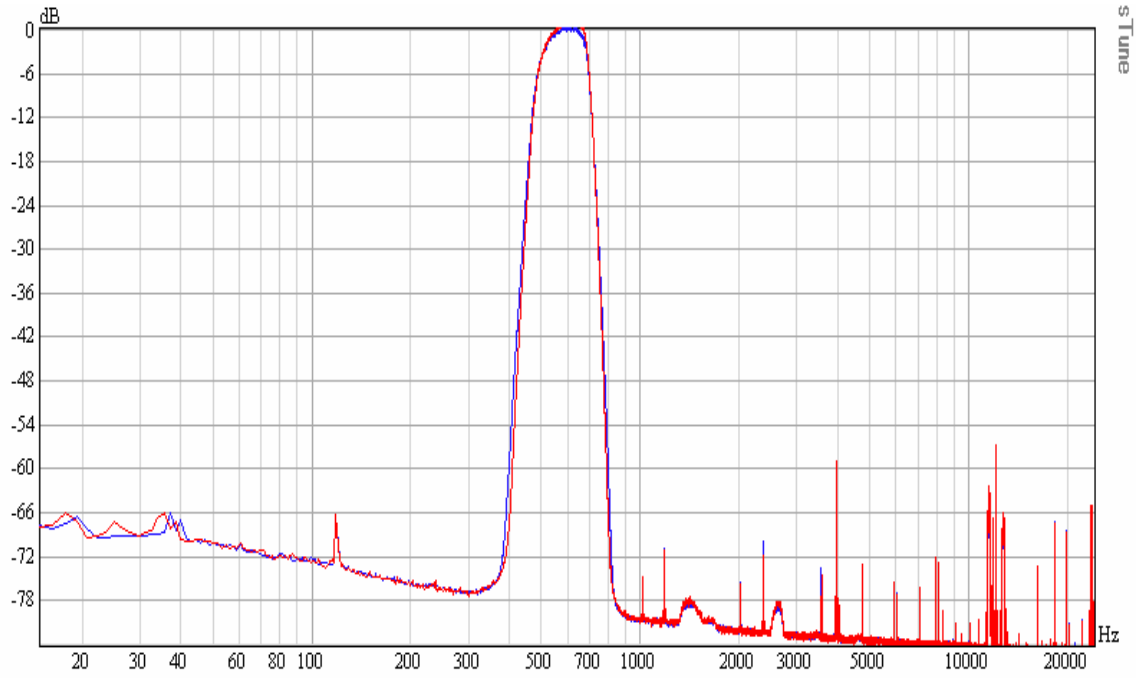
Study of Inrad 400Hz and 250 Hz 8-pole filters for K3

This data was obtained using a precision audio spectrum analyzer connected to the speaker output of one of my two K3s. Note that this is not a swept response, but rather an FFT. The excitation signal is random band noise, with no coherent noise sources present. The data is highly averaged to minimize the effects of noise. Gain was adjusted so that the top of each measurement was 0 dB.

The K3 IF is set for 250Hz bandwidth at 600 Hz pitch. The blue curve is for the 400 Hz Roofing filter, the red curve is the 250 Hz filter. The next plot is simply a wider view of the same data.

Reviewers have suggested that my previous data was flawed because I wasn't driving the K3 hard enough to see the full dynamic range of the filters. Those reviewers were right! Data on this page is new data, with the K3 driven considerably harder by noise picked up on a 160M RX antenna from a switching power supply in close proximity.





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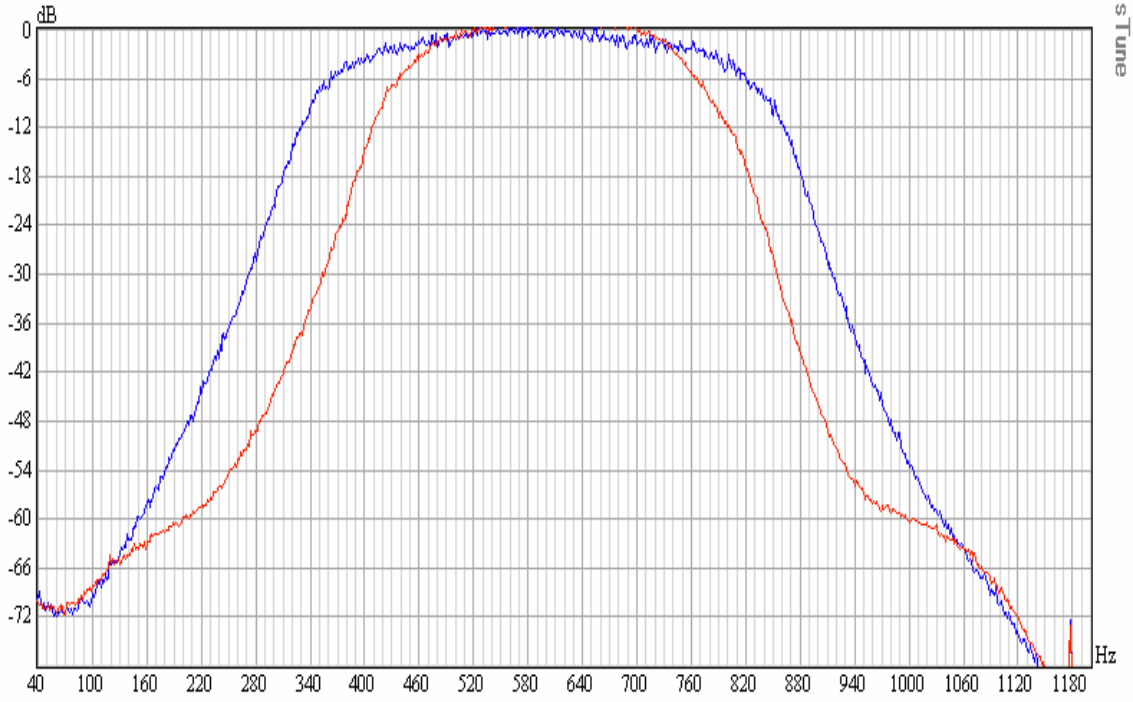
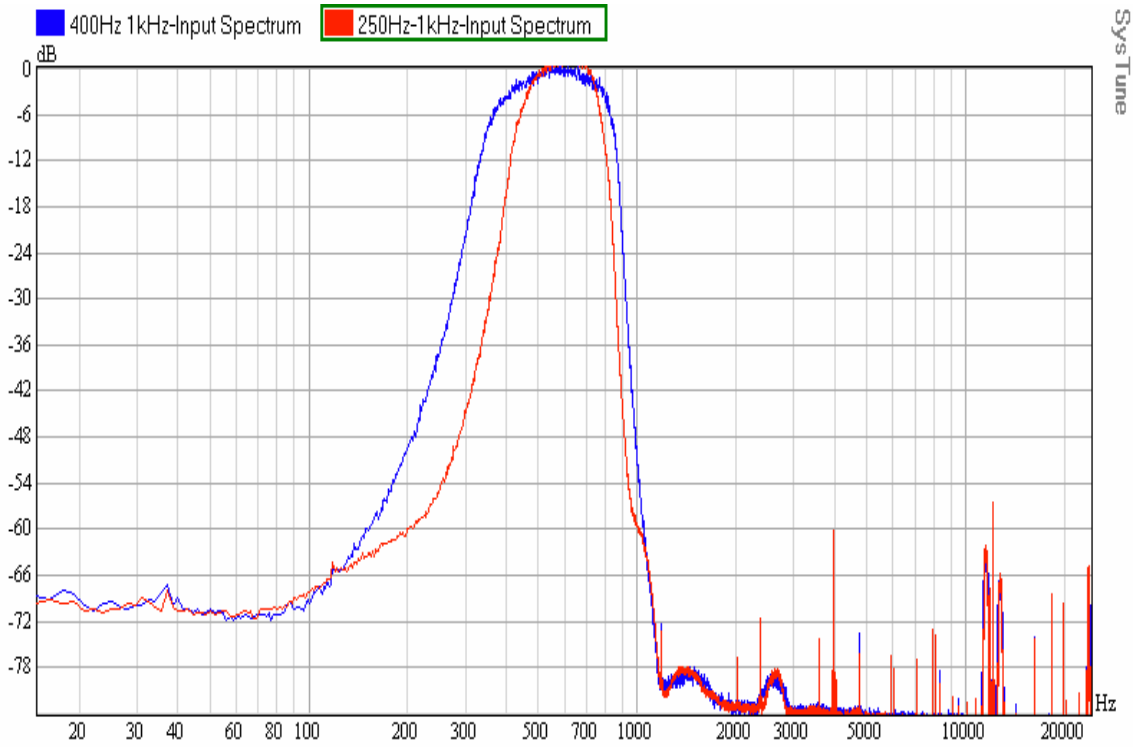
Driving the K3 with more noise made the greatest difference in the plateau effect noted in earlier measurements. The curves below is the response with the K3 IF set for 1kHz and with the 250Hz roofing filter or the 400 Hz roofing filter in place. The plateau of the response that was at about -25dB in earlier measurements is now at about -60dB. ***The plateau was, indeed, an artifact of my measurement technique. – I simply wasn't driving the K3 with enough RF noise voltage.***





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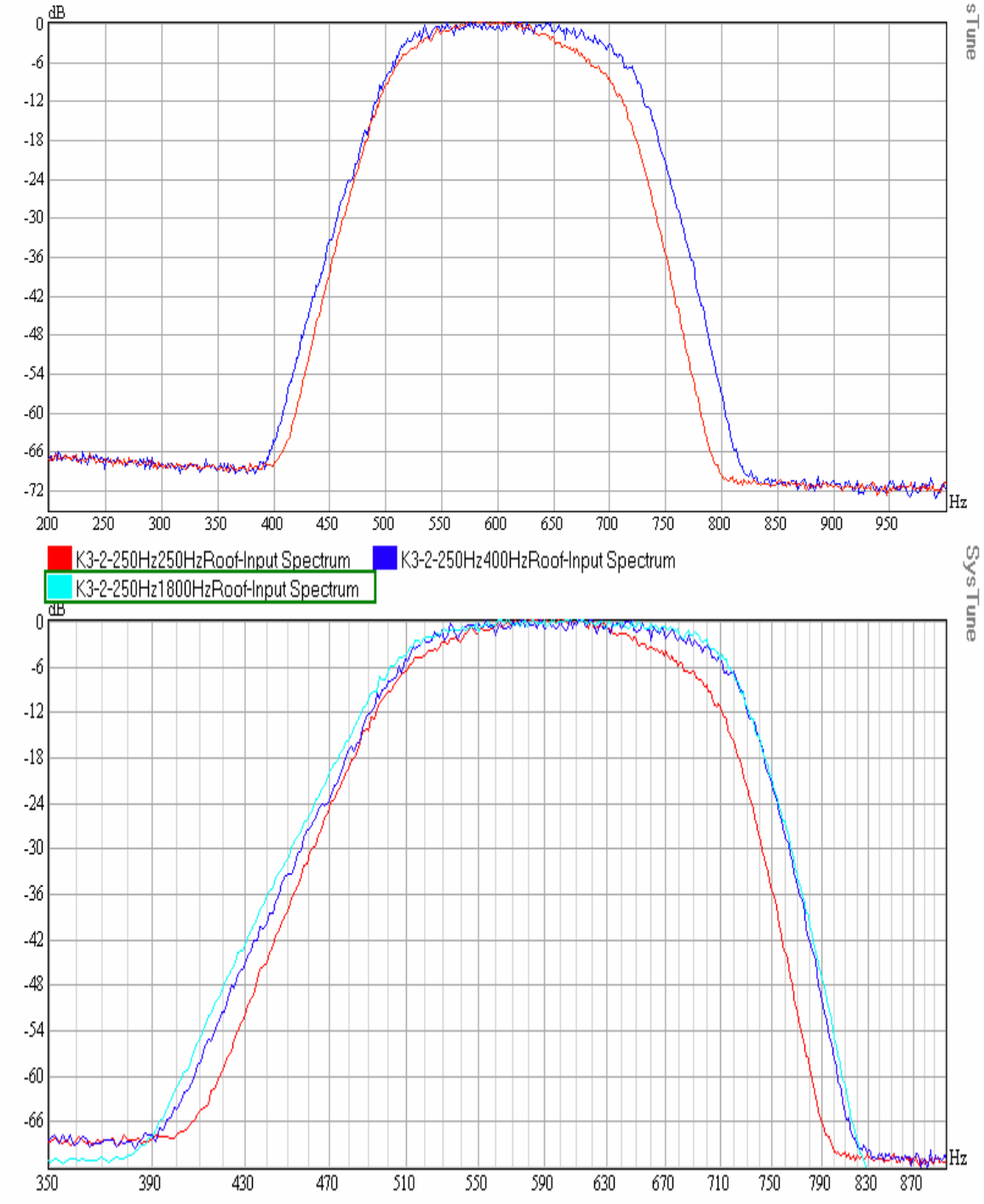
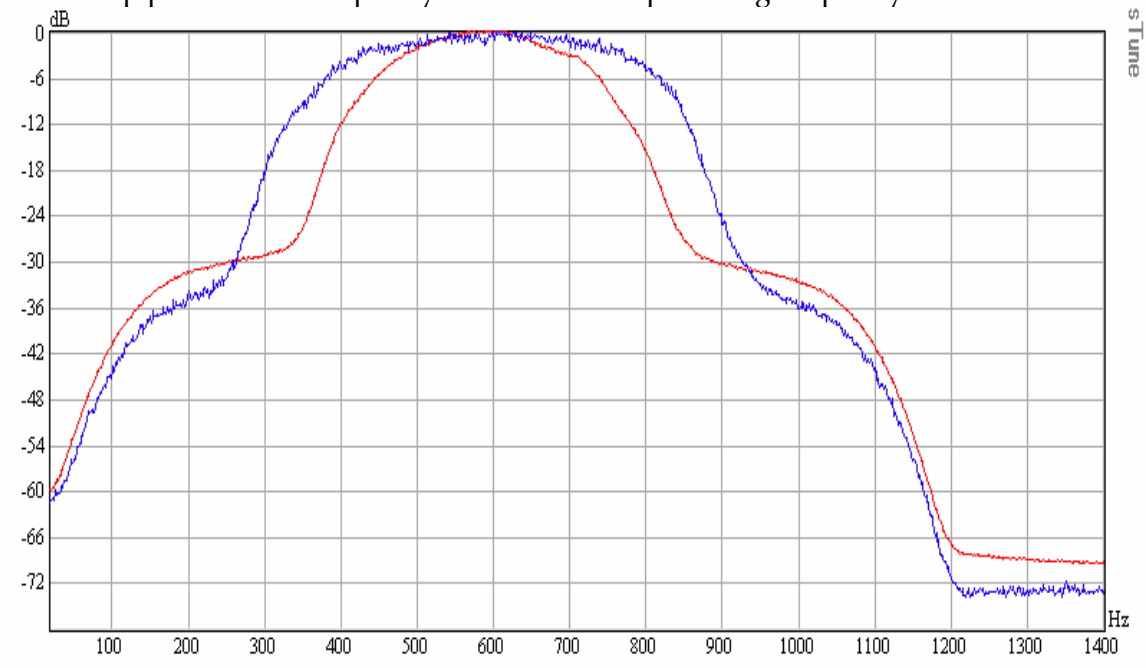
What follows is the original data set, with the K3 driven by insufficient noise voltage. Note that this data is from a different K3, which has different filters of the same type. Data on this page is for 250 Hz IF bandwidth with 250 Hz or 400 Hz roofing filters in place.

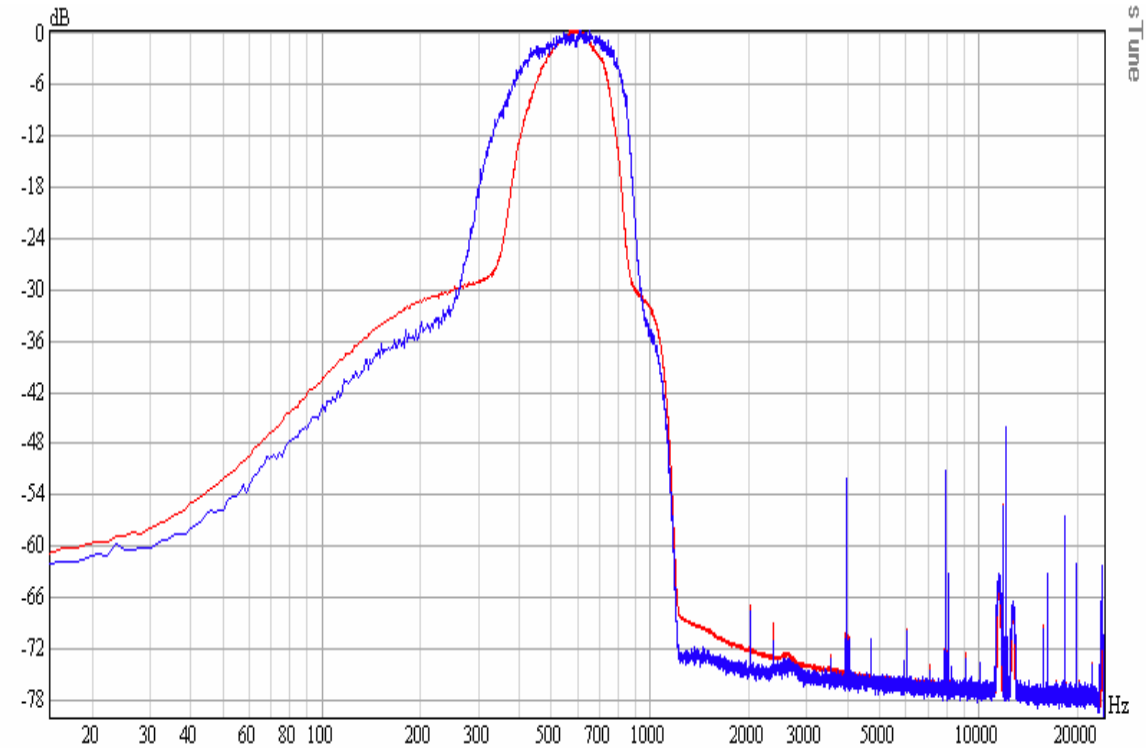


Study of Inrad 400Hz and 250 Hz 8-pole filters for K3

Again, data on this page is earlier, flawed data. The curve below is the response with the K3 IF set for 1kHz and with the 250Hz roofing filter in place. The plateau of the response at about -25dB is the result of not driving the signal chain with enough broadband noise voltage.

The next plots compare 250 Hz and 400 Hz roofing filters with the K3 IF set to 1kHz. Note that the top plot is linear frequency while the lower plot is log frequency.





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Executive Summary

The curves showing the roofing filter response with a 1kHz wide IF clearly show that the 250 Hz filter is about 22% narrower than the 400 Hz filter in the range where my data can be trusted. That's 333 Hz vs. 464 Hz at -6dB, 501 Hz vs. 645 Hz at -30dB, 620 Hz vs 771 Hz at -48dB. ***As a roofing filter, it is clearly a 22% improvement the 400 Hz filter.*** That does, however, fall far short of the 38% improvement suggested by the ratio of the nominal bandwidth of these filters, 400 Hz and 250 Hz. I think we all still want a real 250 Hz filter!

The curves showing the cascaded response of the two filters with the 250 Hz DSP IF shows very little narrowing of the response by the narrower filter. To see significant benefit from cascading, one would need to set the switching point of these two filters to wider bandwidths – perhaps 500 Hz and 350 Hz. In fact, it has been noted that many users have chosen this path.

73, Jim Brown K9YC