This file summarizes an extensive series of measurements of IF and roofing filters in three radios.

FT1000MP#1 has stock 2.4 kHz filters, Yaesu 2 kHz filters, 500 Hz 8.2 MHz, 400 Hz 455 kHz, 250 Hz 8.2 MHz, 250 Hz 455 kHz, Inrad Roofing Filter.

FT1000MP#2 has stock 2.4 kHz filters, Inrad 1.8 kHz filters, 500 Hz 8.2 MHz, 500Hz Collins, 250 Hz 8.2 MHz, 300 Hz 455 kHz, Inrad Roofing Filter.

K3 has 400Hz and 1.8kHz Roofing Filters.

Measurement Setup

The radio under test was excited by random noise by feeding it from an antenna resonant on the band in use. The output of the receiver was fed to the input of an FFT analysis system designed for pro audio applications. The rear panel AF Output was used for most of the MP measurements.

Audio from the receivers was fed through a Jensen IsoMax Isolation Transformer to the analyzer input. The analyzer was set to average 32 64K sweeps with a 1.49 Sec time, yielding a resolution of 0.67 Hz. Thus each measurement took 46 seconds to complete.

Level matching within the radios and from one radio to another varied widely, depending on the bandwidth settings and band conditions. For example, one of the two MPs produced approximately 15 dB more level than the other its AF output, and no level control setting could be found to match them. Because our interest is the response of filters and to compare various filters, the measurement system was adjusted for each measurement to cause the maximum value of each curve to display as 0dB.

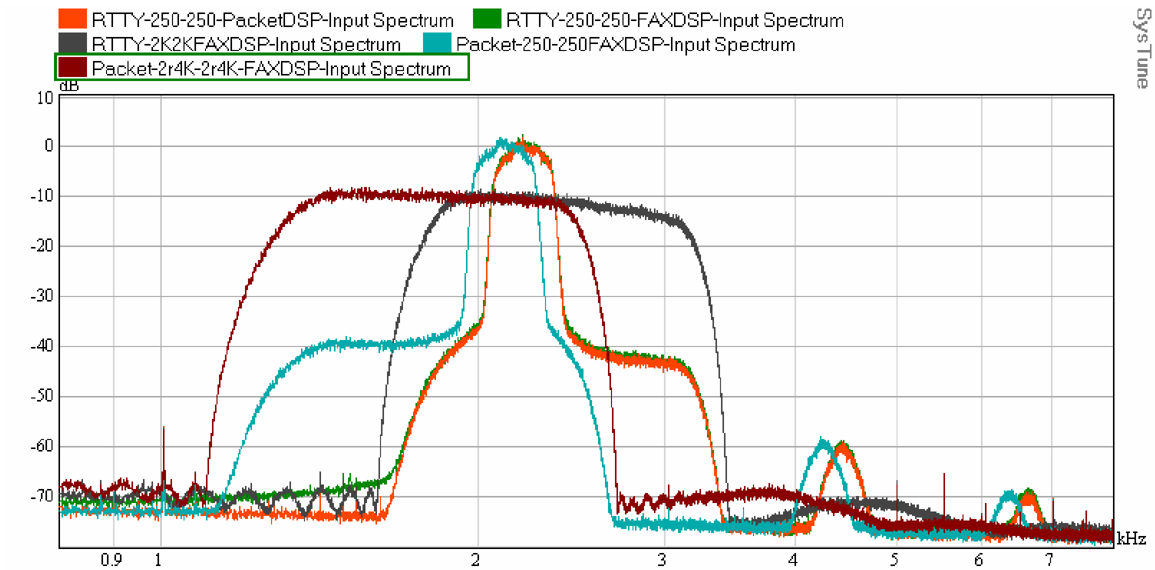
The data represents the total response of the radio from RF input to AF output, including any audio response shaping as well as anomalies and artifacts of the audio system. The Line Output transformers of the K3, for example, saturate at normal program levels. The result is LF rolloff and much higher than expected distortion. For this reason, all K3 measurements were made at the front panel Phones Output.

Likewise, every effort was made to find the reason for the relatively high noise floor in the MPs when no EDSP filtering was active, but none was found. As the data clearly shows, the noise floor relative to maximum output in the K3 is nearly 30 dB lower than in the MPs.

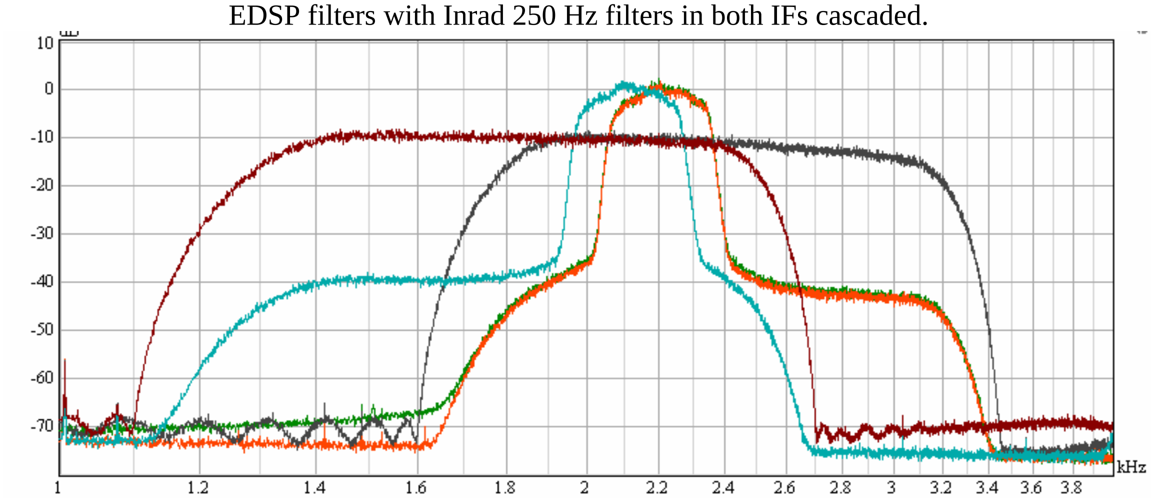
73,

Jim Brown K9YC

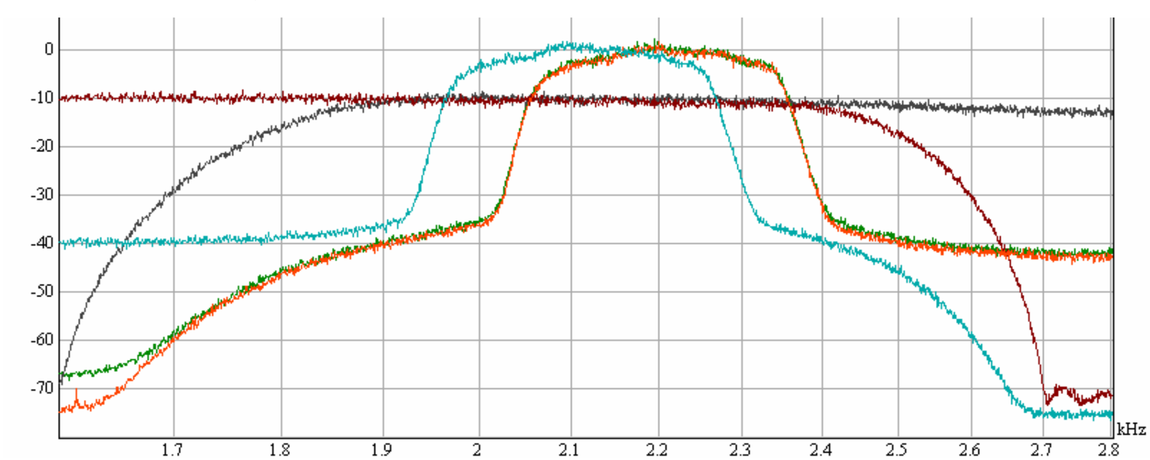
MP#1 – Filters Aligned for Digital Modes



Above is a fairly broadband look shows 2nd harmonic distortion at 0.1% and 3rd harmonic at 0.04%. The broad curves (two overlaid) show the EDSP filters with both 2.4 kHz and both 2 kHz IF filters. This is essentially the response of the EDSP filter. The narrowest curves shows the EDSP filters with Inrad 250 Hz filters in both IFs cascaded.

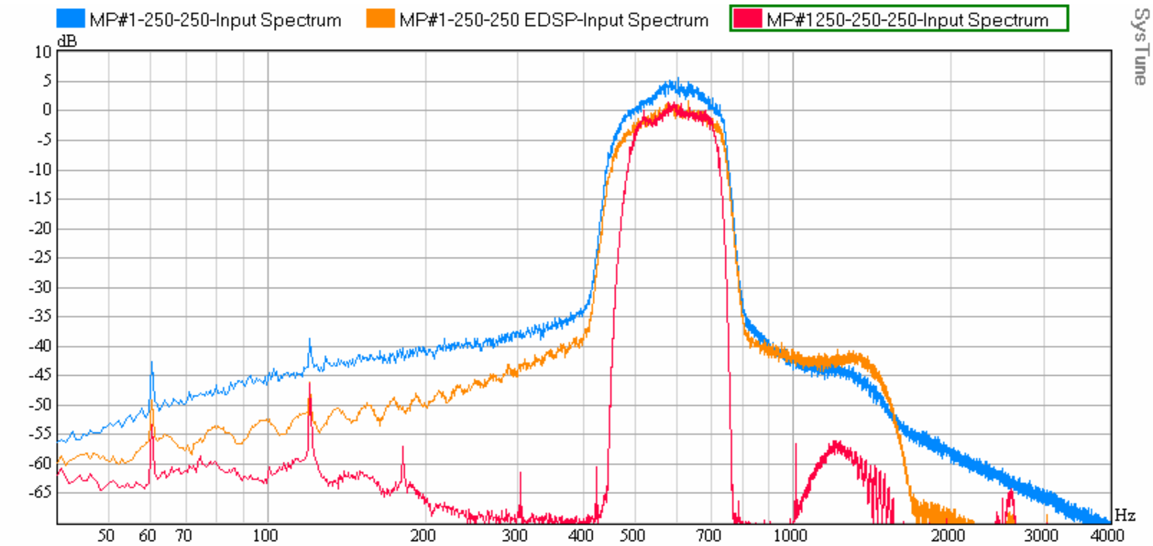


Same data, zoomed to a bit more than the full bandwidth of the EDSP filter.

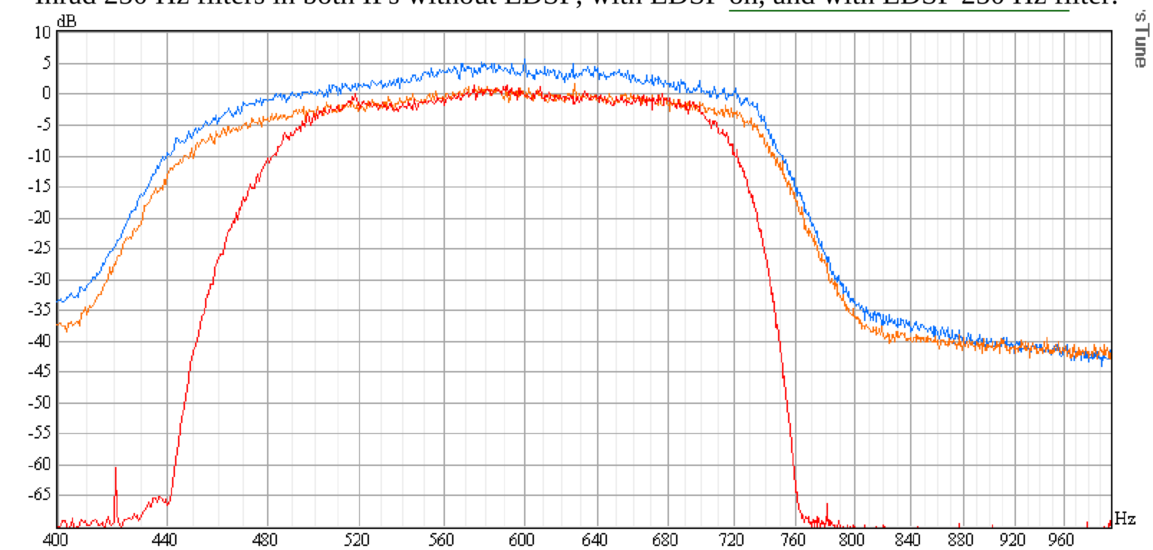


Same data, zoomed to the bottom of the skirts of the cascaded filters.
280 Hz -6dB, 335 Hz -20dB, 375 Hz -30dB

MP#1 – Filters set for 600 CW

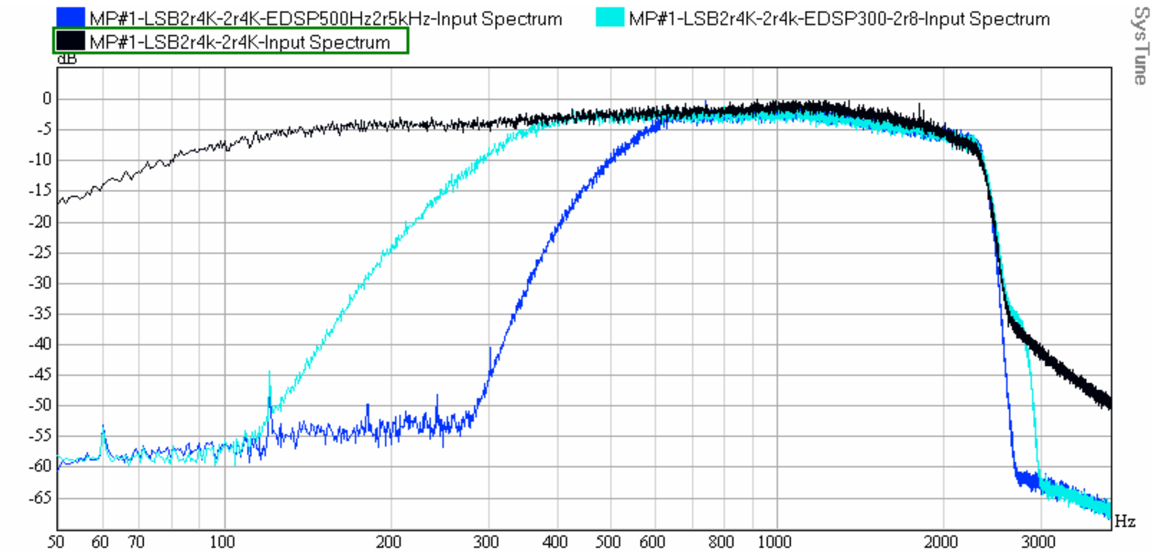


Inrad 250 Hz filters in both IFs without EDSP, with EDSP on, and with EDSP 250 Hz filter.

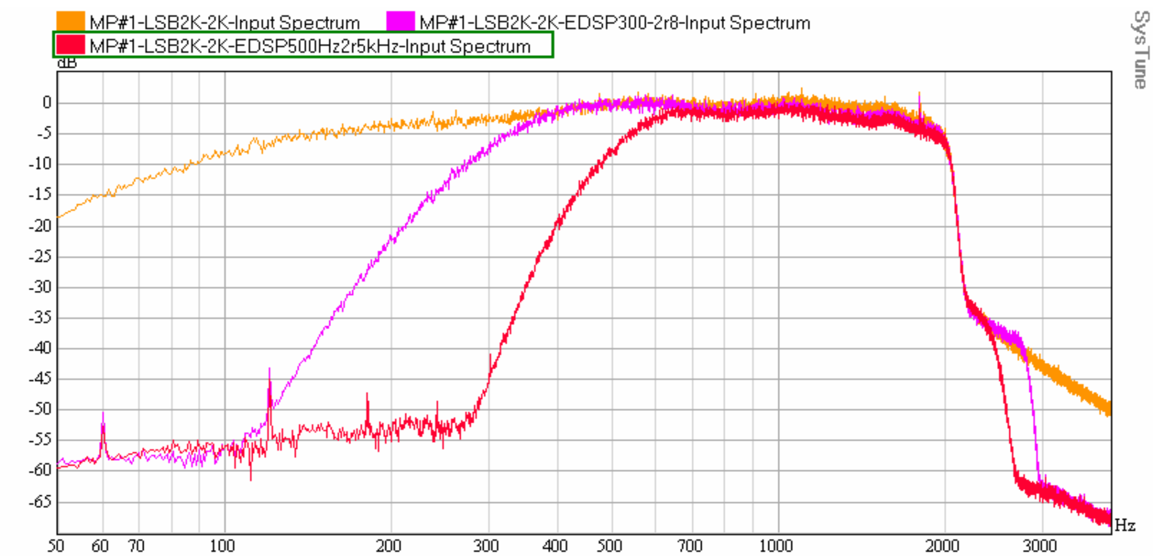


The cascaded IF filters are 270 Hz wide at their -6dB points, 330 Hz at -20dB, 355 Hz at -30dB. Adding the 250 Hz EDSP filter yields 218 Hz at -6dB, 267 Hz at -20dB, and 285 Hz at -30dB. The hum (spikes at 60, 120, 180, 300, 420 Hz) appears to be coming from the radio – note that it is attenuated somewhat by the EDSP. This may be power supply, or it may be demodulated RF noise, or a combination of both.

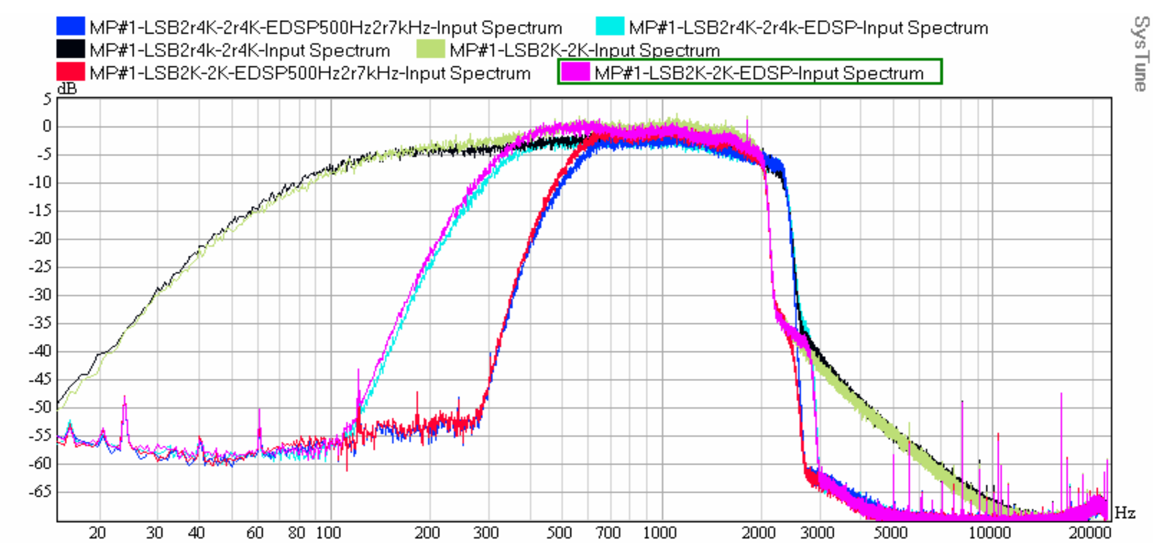
MP#1 – SSB Filters



Stock 2.4kHz filters in both IFs cascaded

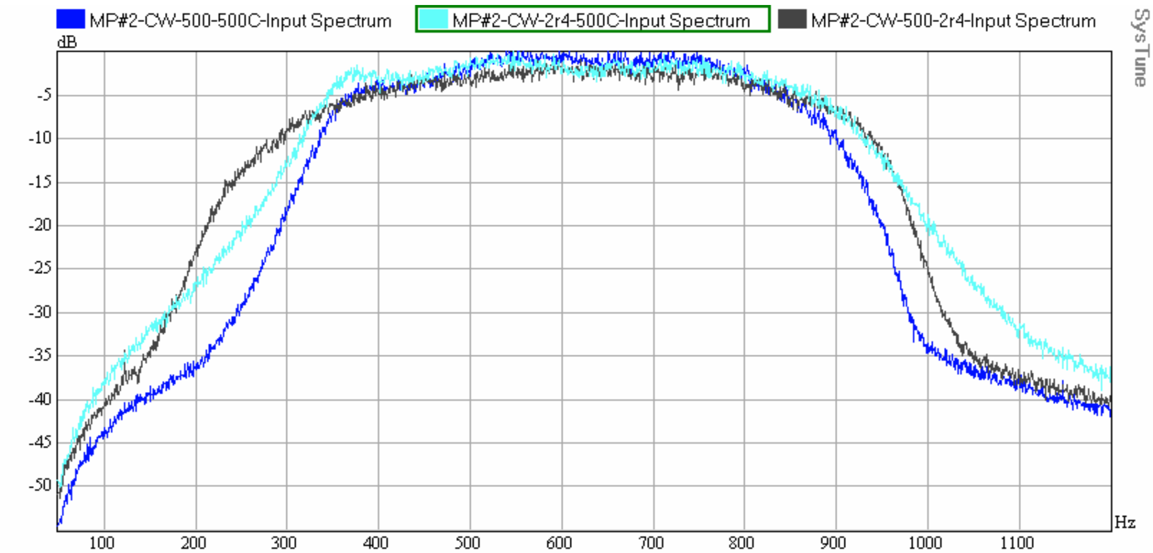


Yaesu 2kHz filters in both IFs cascaded

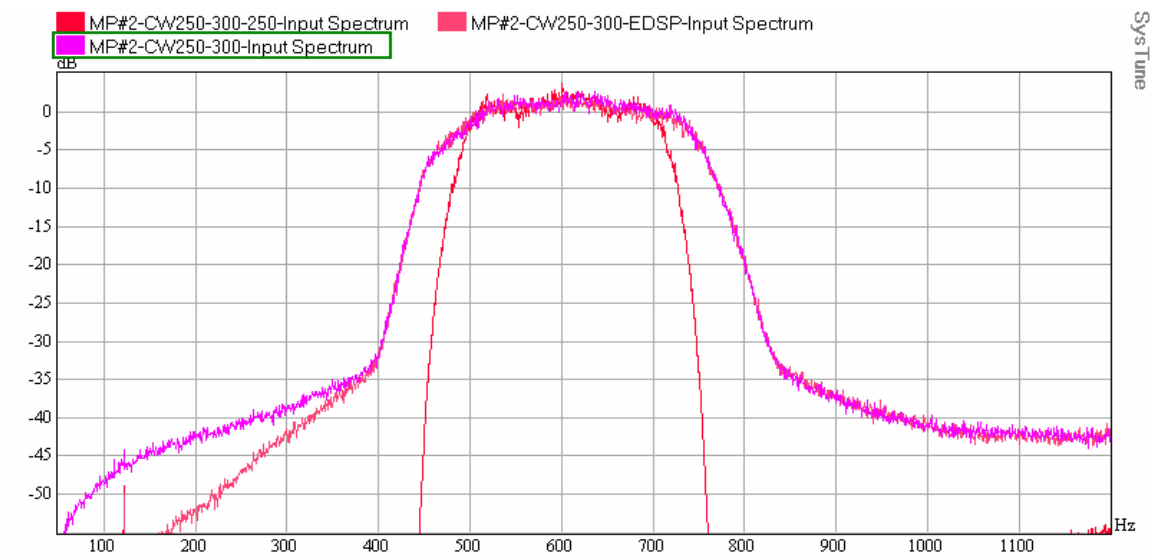


Both filters, full bandwidth

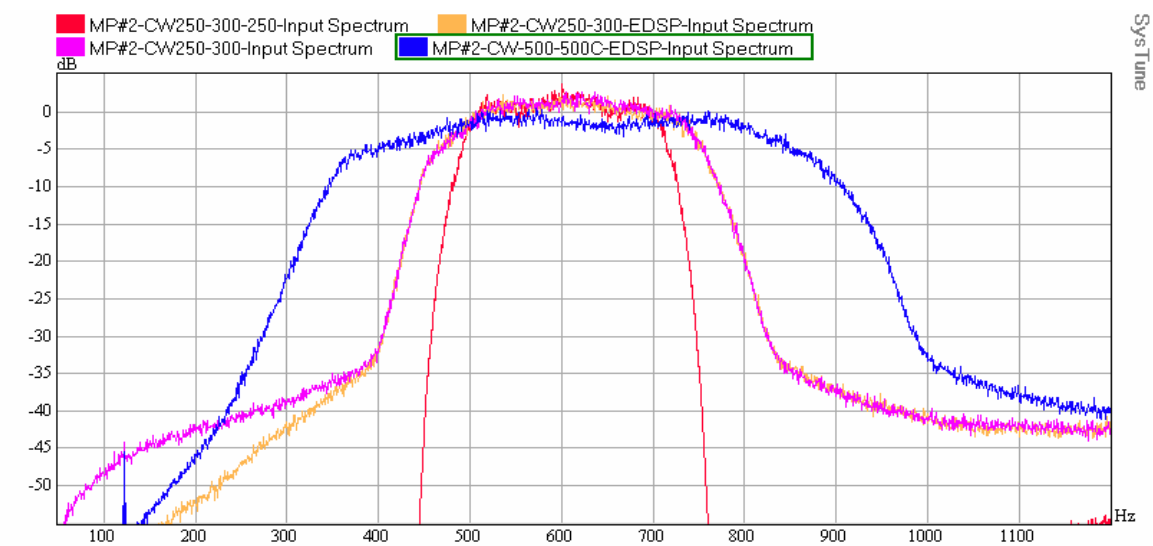
FT1000MP #2 CW Filters



500 Hz in 8.2 MHz IF, 500 Collins in 455 kHz IF

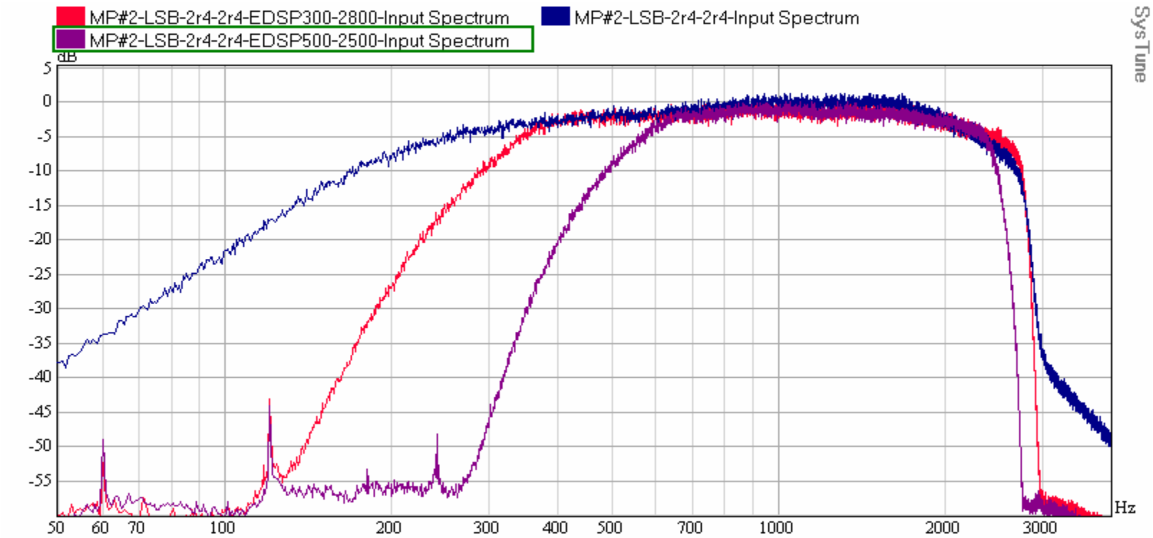


250 Hz Inrad in 8.2 MHz IF, 300 Hz Inrad in 455 kHz IF

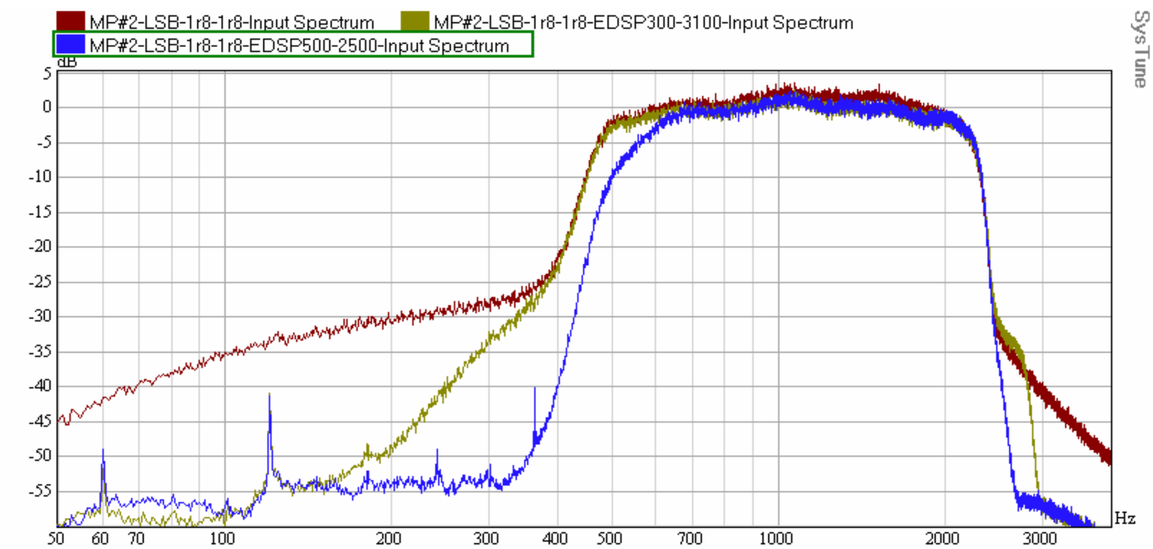


250/300 Hz Filters compared with both 500 Hz Filters cascaded

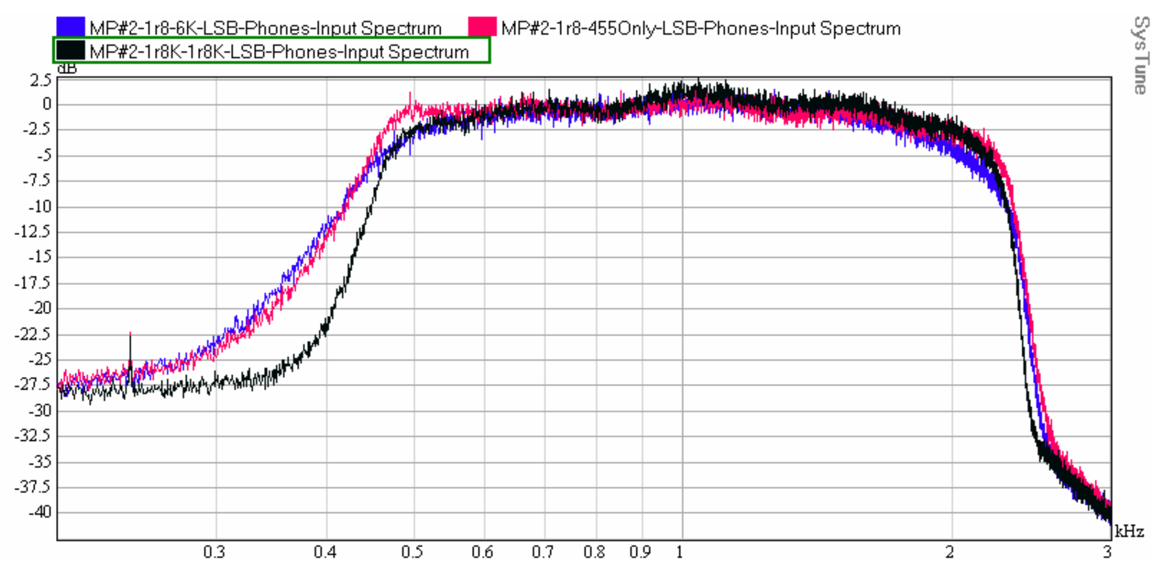
FT1000MP#2 – SSB Filters



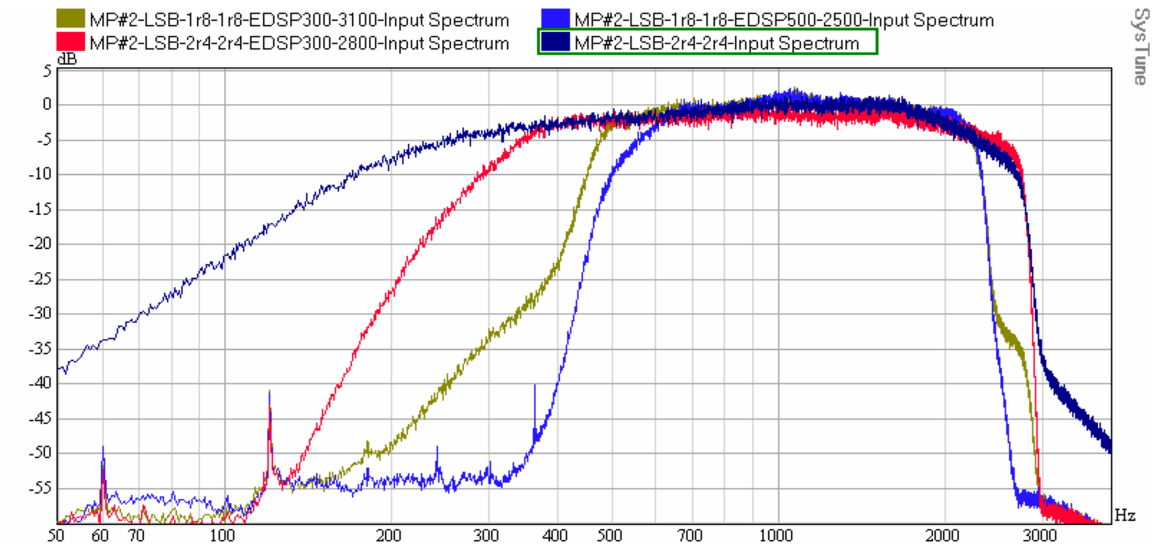
Stock 2.4 kHz Filters in both IFs w/two DSP settings



1.8 kHz Inrad Filters in both IFs w/two DSP settings

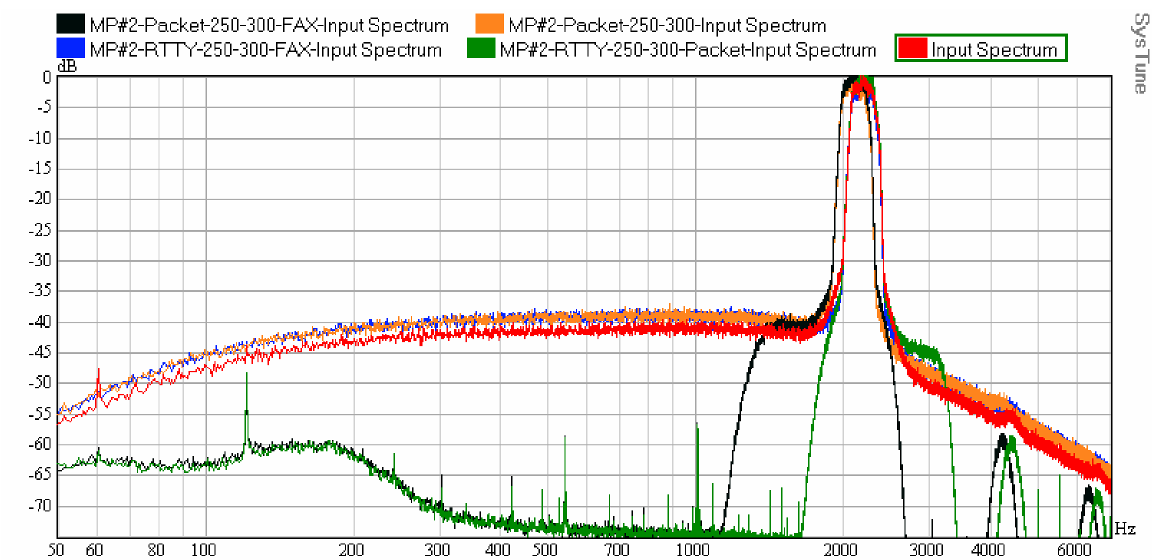


1.8 kHz Inrad Filters in both IFs, individually and cascaded, no DSP
Red is 455 IF, Blue is 8.2 MHz IF, Black is cascaded

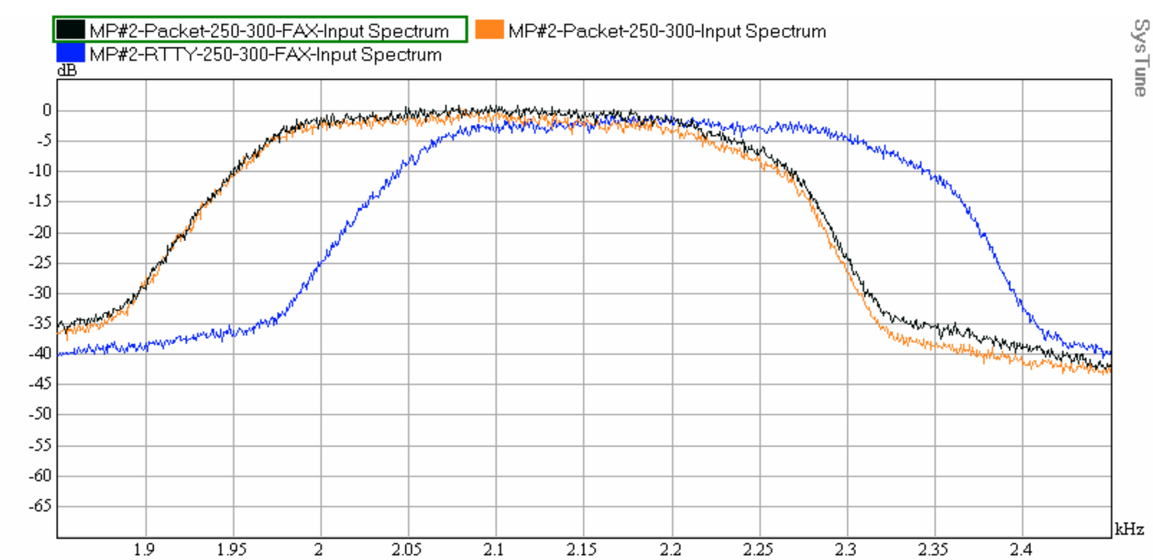


All SSB Filters with selected DSP settings

FT1000MP #2 – Digital Modes

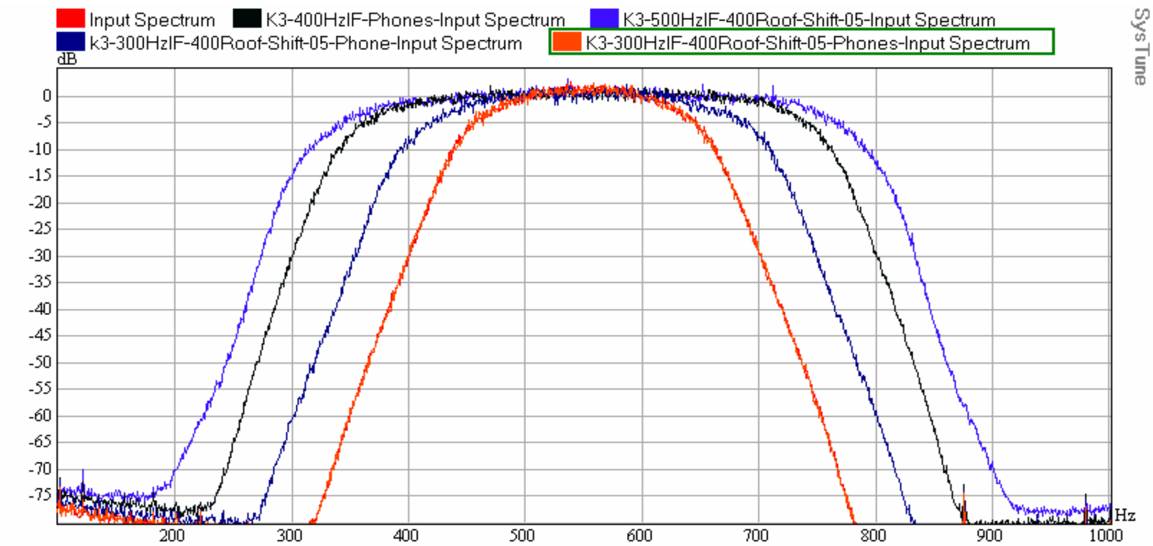


Wideband shows 0.1% 2nd harmonic distortion, 0.4% 3rd harmonic distortion

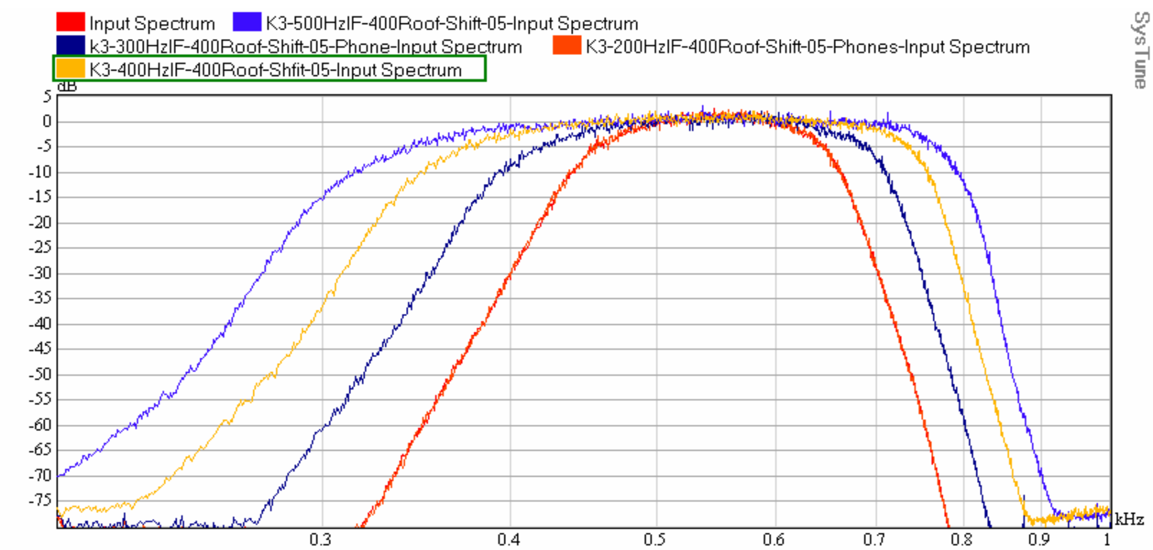


RTTY MP#2 250-300-FAX -6dB 280Hz, -20dB @ 370 Hz, -30dB @ 420 Hz

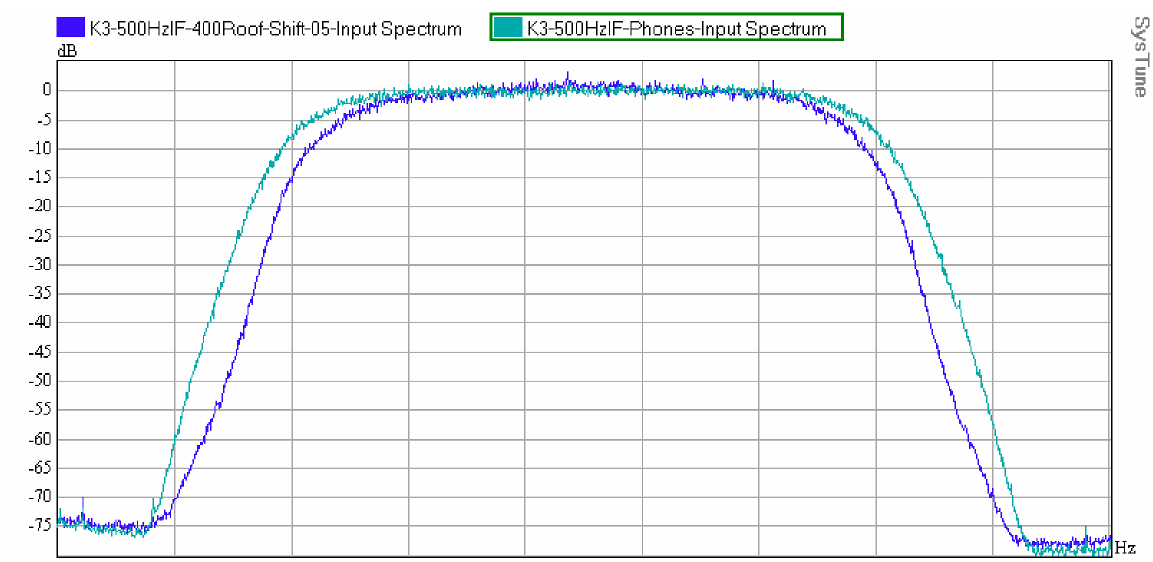
K3 CW Filters



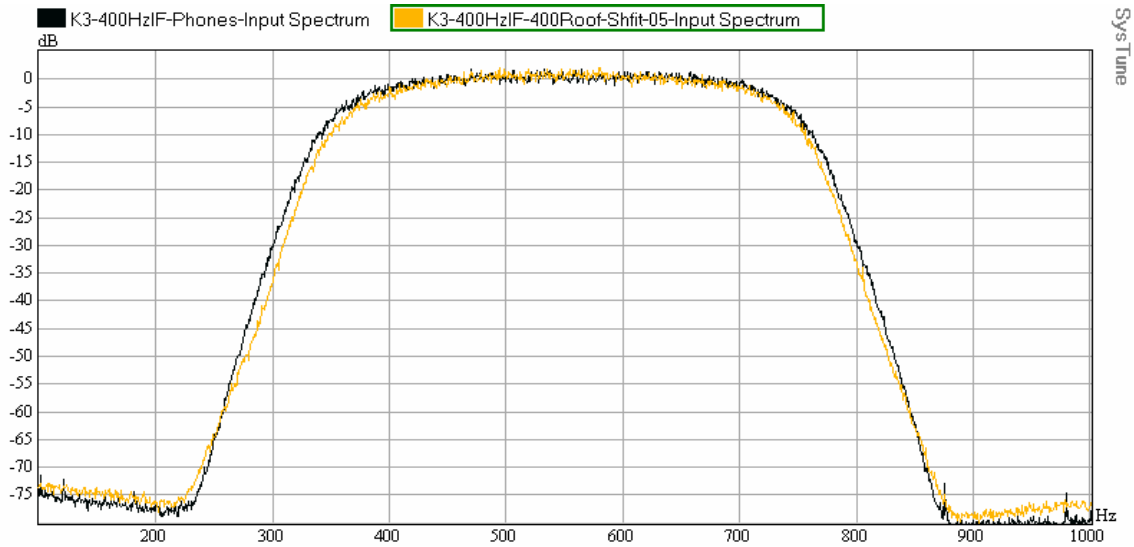
CW Filters – 200 Hz to 500 Hz, with 400 Hz Roofing Filter, Linear Frequency



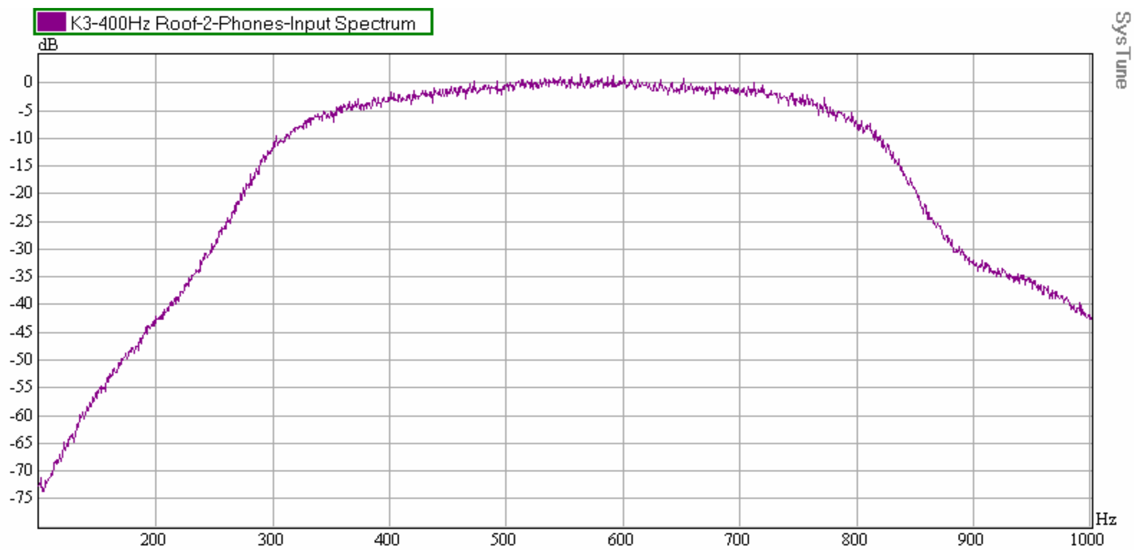
CW Filters – 200 Hz to 500 Hz, with 400 Hz Roofing Filter, Log Frequency



500 Hz CW IF, 400 Hz Roofing Filter



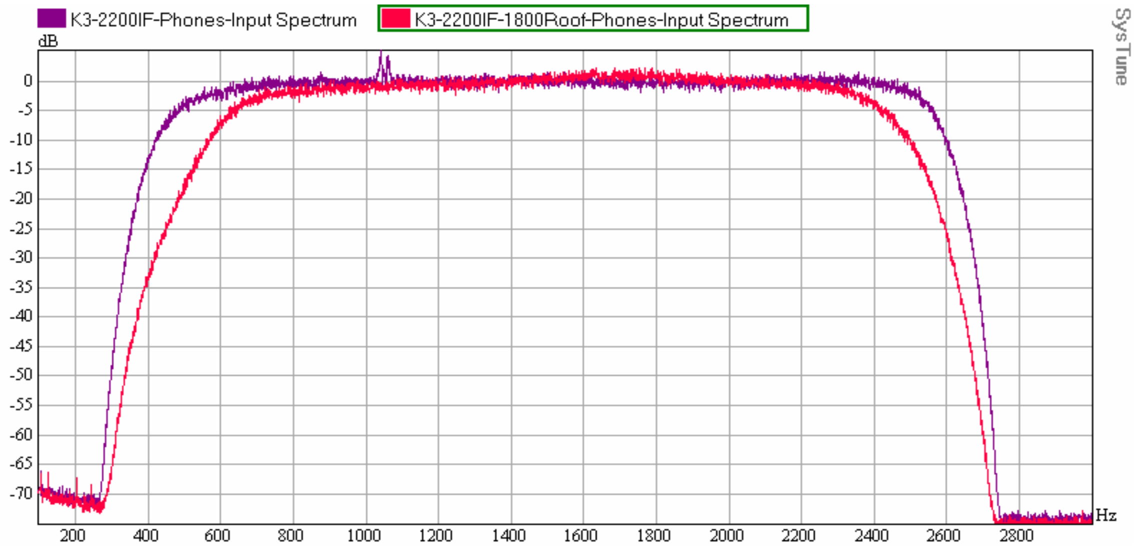
400 Hz CW IF, 400 Hz Roofing Filter (after centering filter)



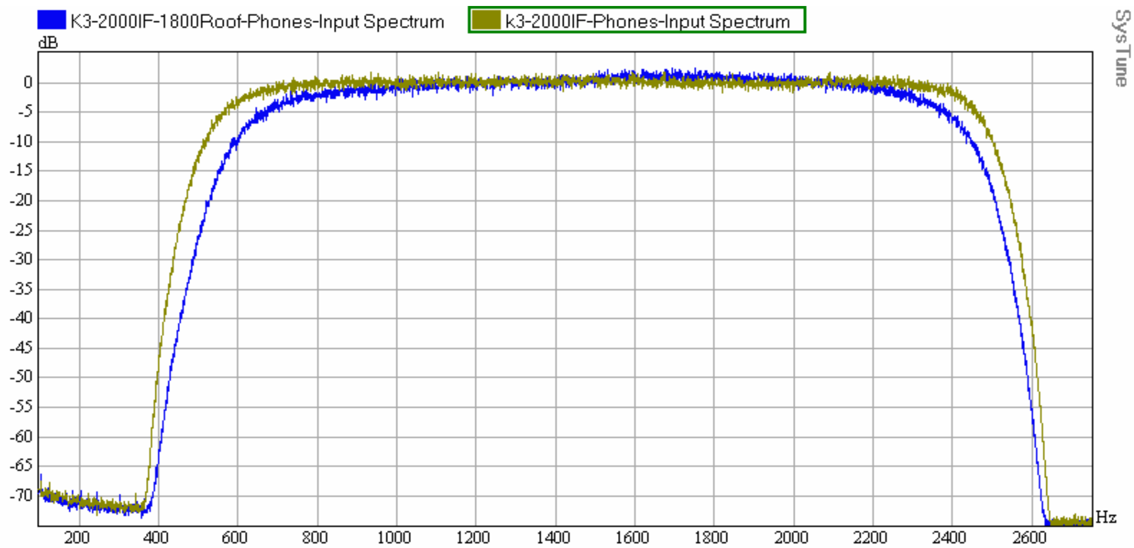
400 Hz Roofing Filter 466 Hz at -6dB, 578 Hz at -20dB, 640 Hz at -30dB
(Measured CW width 1.5 kHz, centered 250 Hz)

Note that in order to measure this filter alone, the IF filter was set much wider and shifted in frequency, so the position of this filter within the IF is <u>not</u> represented by the calibrated axis.

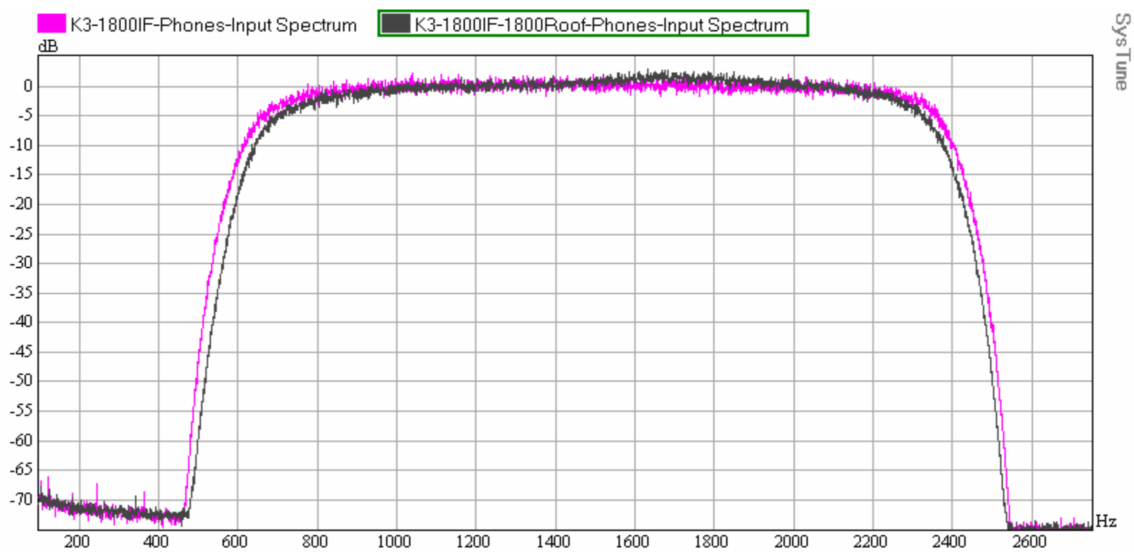
K3 SSB Filters



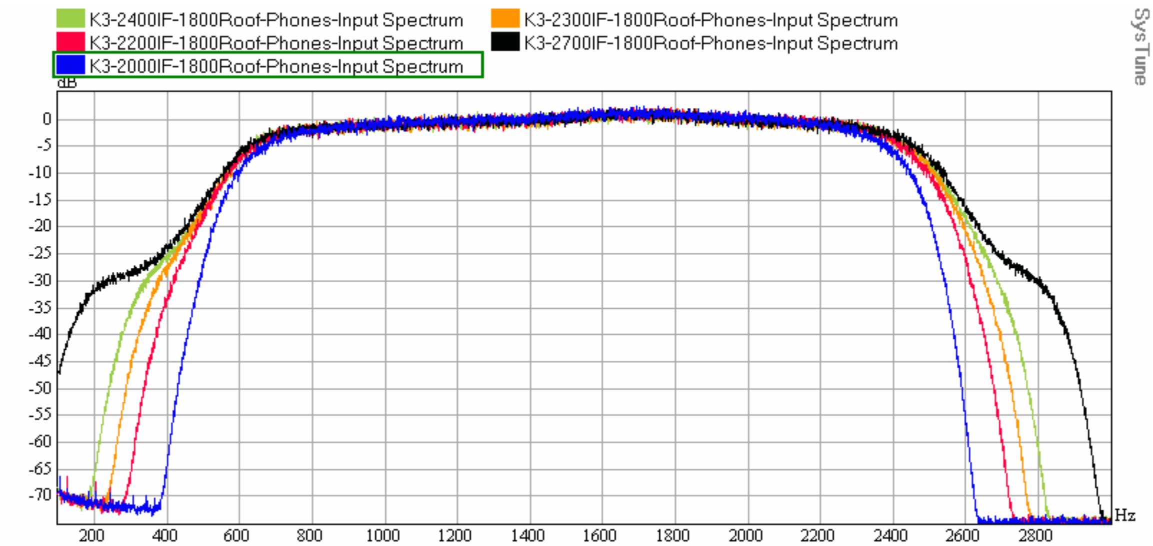
2,2 kHz IF, with and without 1.8 kHz Roofing Filter



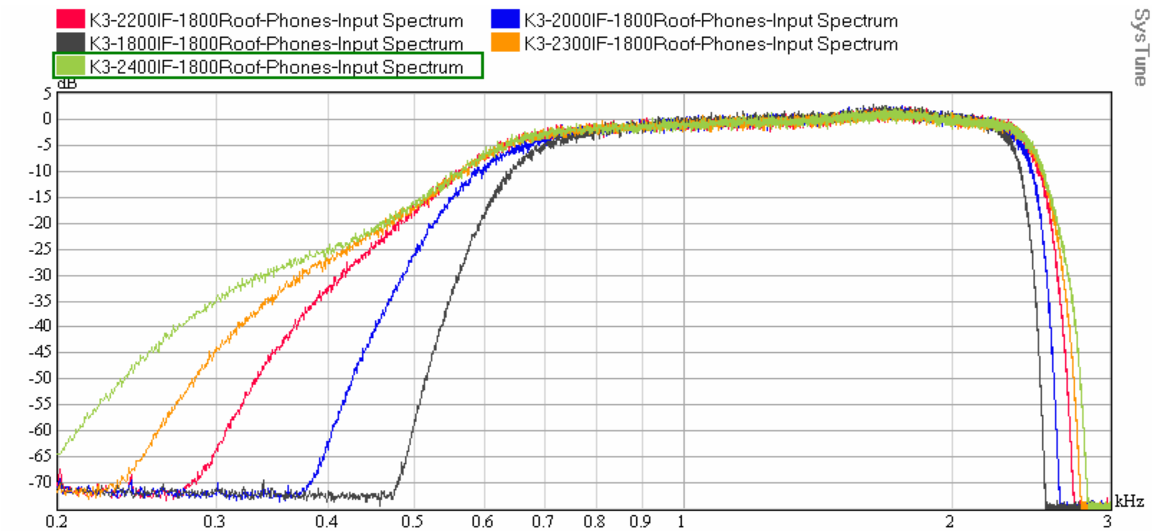
2 kHz IF, with and without 1.8 kHz Roofing Filter



1.8 kHz IF, with and without 1.8 kHz Roofing Filter

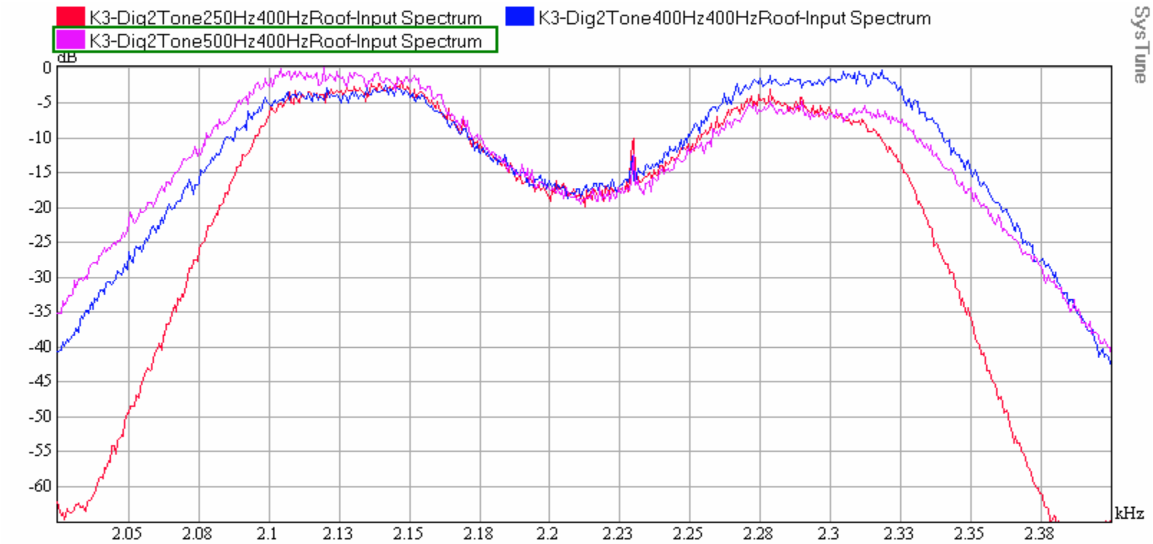


1.8 – 2.7 kHz IF Filters with 1.8 kHz Roofing Filter – Linear Frequency Display

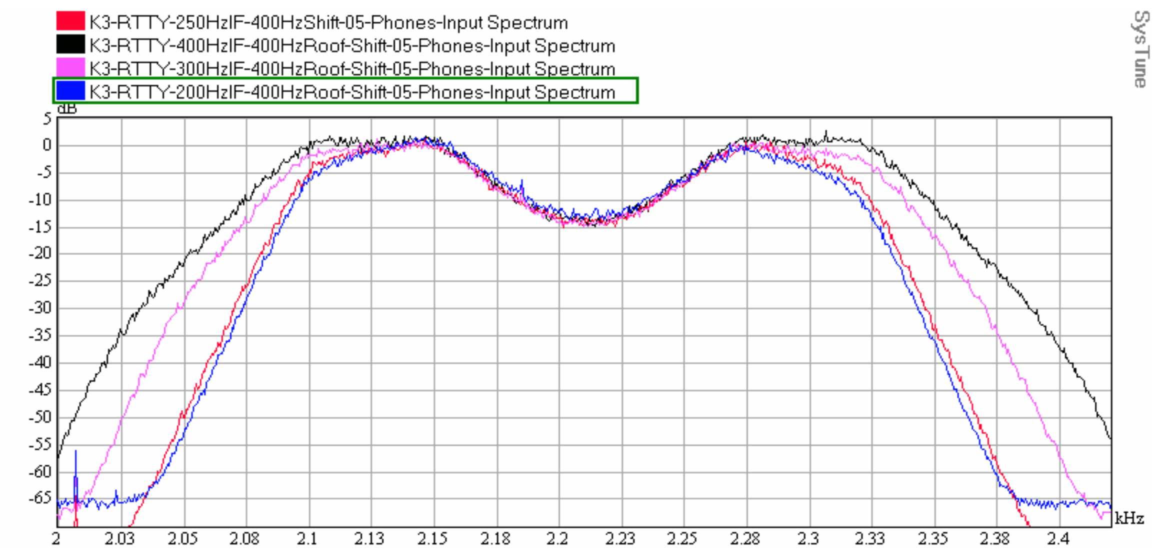


1.8 – 2.4 kHz IF Filters with 1.8 kHz Roofing Filter – Log Frequency Display

K3 – RTTY Filters

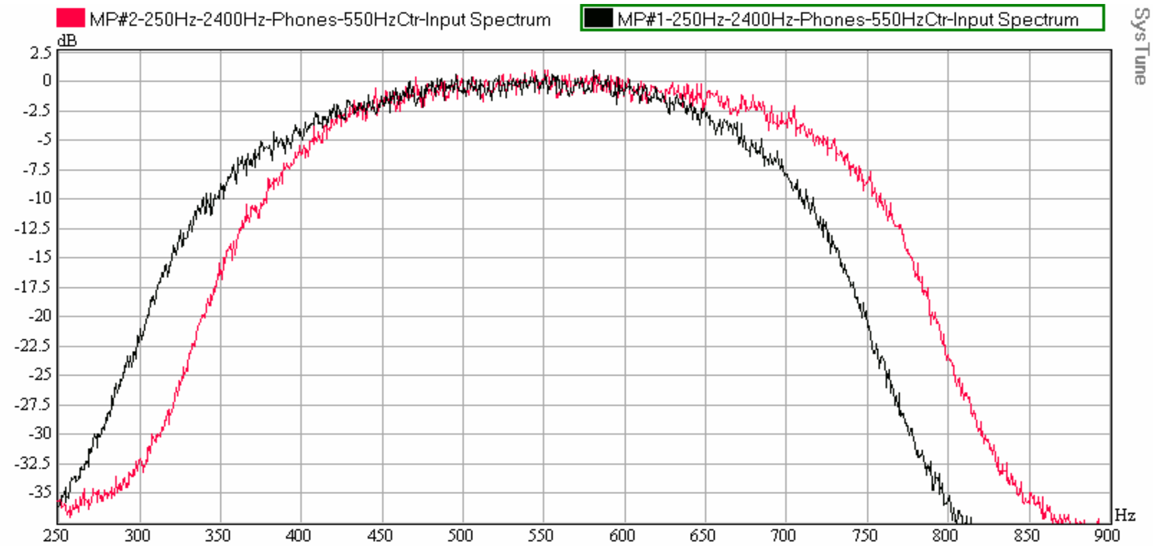


RTTY Filters Measured before Shifting 400 Hz Roofing Filter
RTTY 2-tone 250 Hz with 400 Hz Roof 258Hz -20dB, 278 Hz -30dB, 343 Hz -60dB
(this data before centering 400 Hz Roofing Filter)

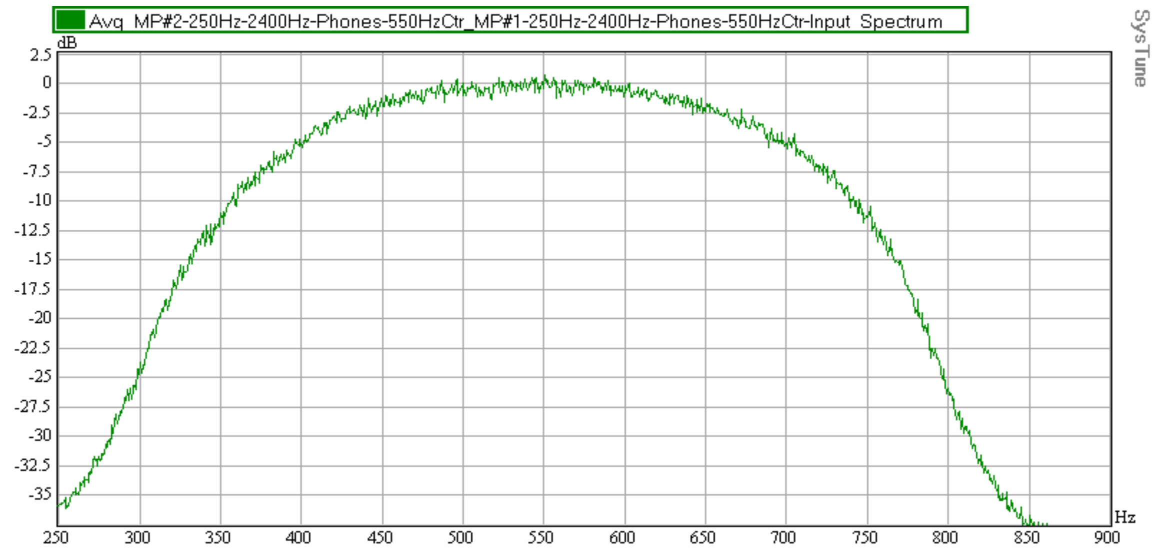


RTTY Filters Measured After Shifting 400 Hz Roofing Filter -.05

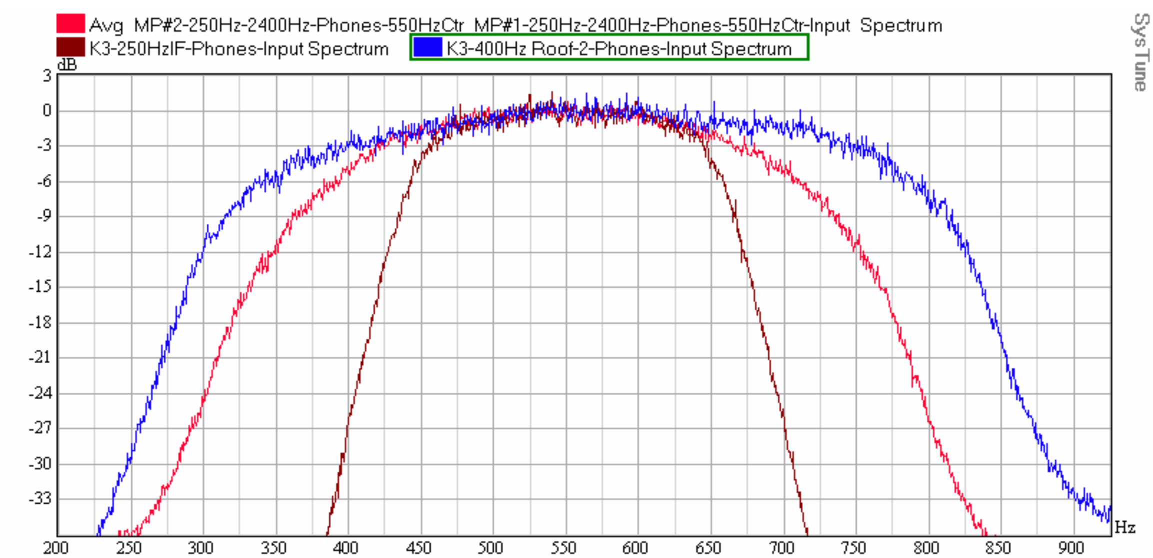
K3 250 Hz Roofing Filter Study



Inrad 250 Hz 8.2MHz Filters in two MPs



Average of two 250 Hz 8.2 MHz Filters



Red = avg of two Inrads in two MPs. Blue = 400 Hz filter in K3, Brown = 250Hz IF Filter, no Roofing Filter. Is the 250Hz Roofing Filter Worth it?