137 kHz Bandpass Filter

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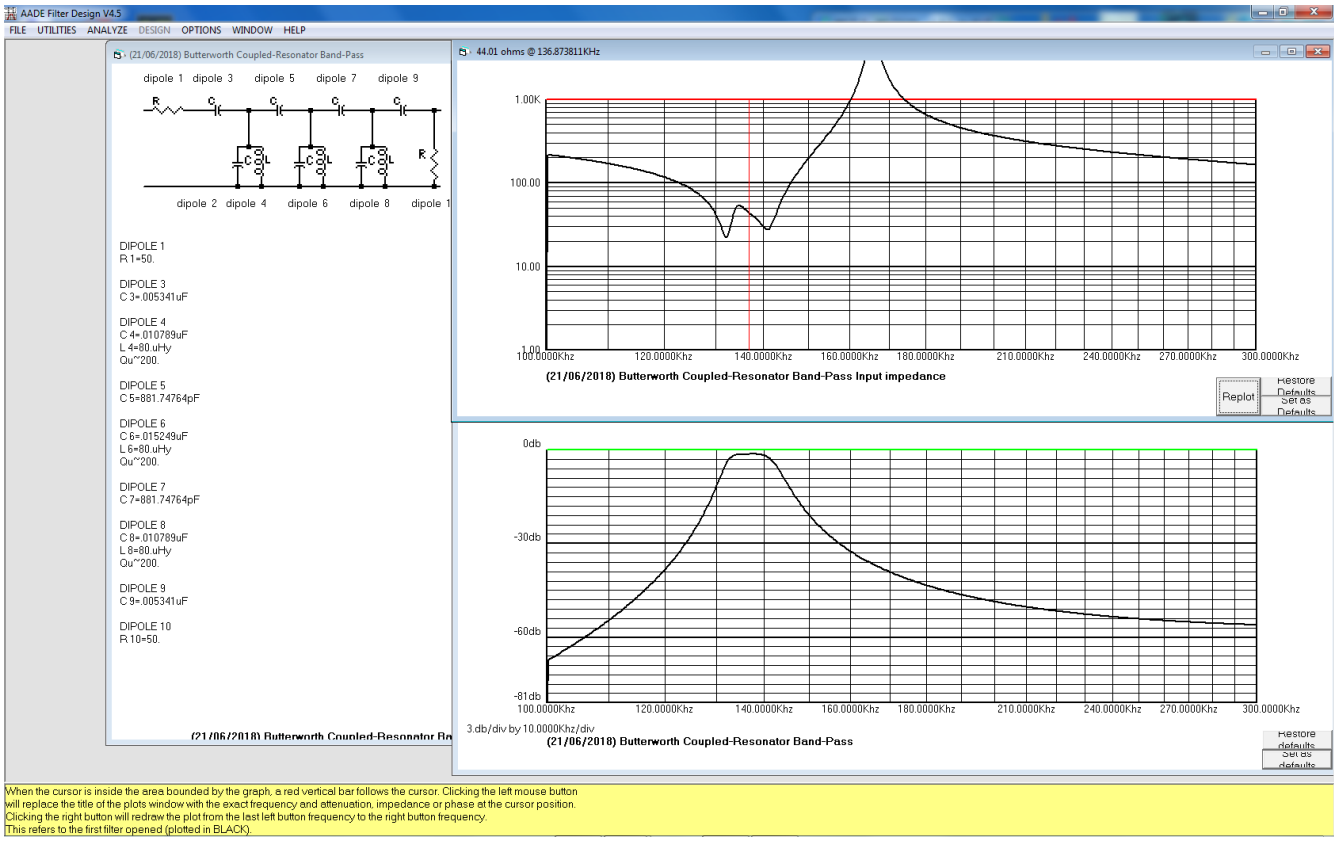
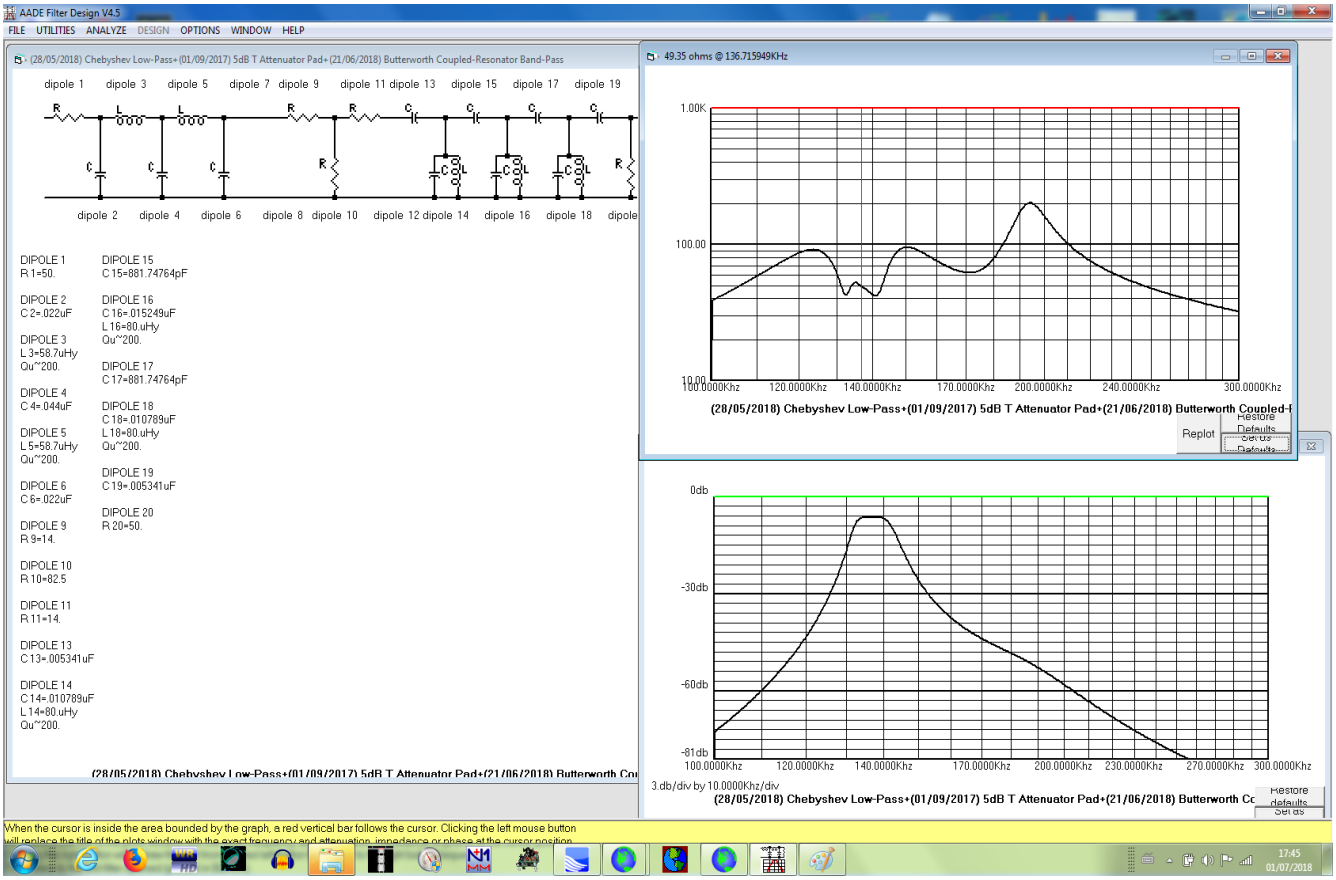
This filter was designed, using the AADE software, to provide 10 kHz bandwidth centered on 136.8 kHz. A Butterworth coupled resonator design was chosen since the modelled components had more practical, and less sensitivity to tolerance, values than what I found for a Chebyshev design, at the expense of less steep skirts.

The image below shows the filter component values and predicted response with ideal 50 Ohm source and termination. The passband attenuation is approximately 1.5dB. I used 5600 pF, 680 pF paralleled with two 100 pF, .01 uF, .015 uF caps, all selected to provide the closest match to the design values. The 80 uH inductors are 68T on T50-3 toroids.

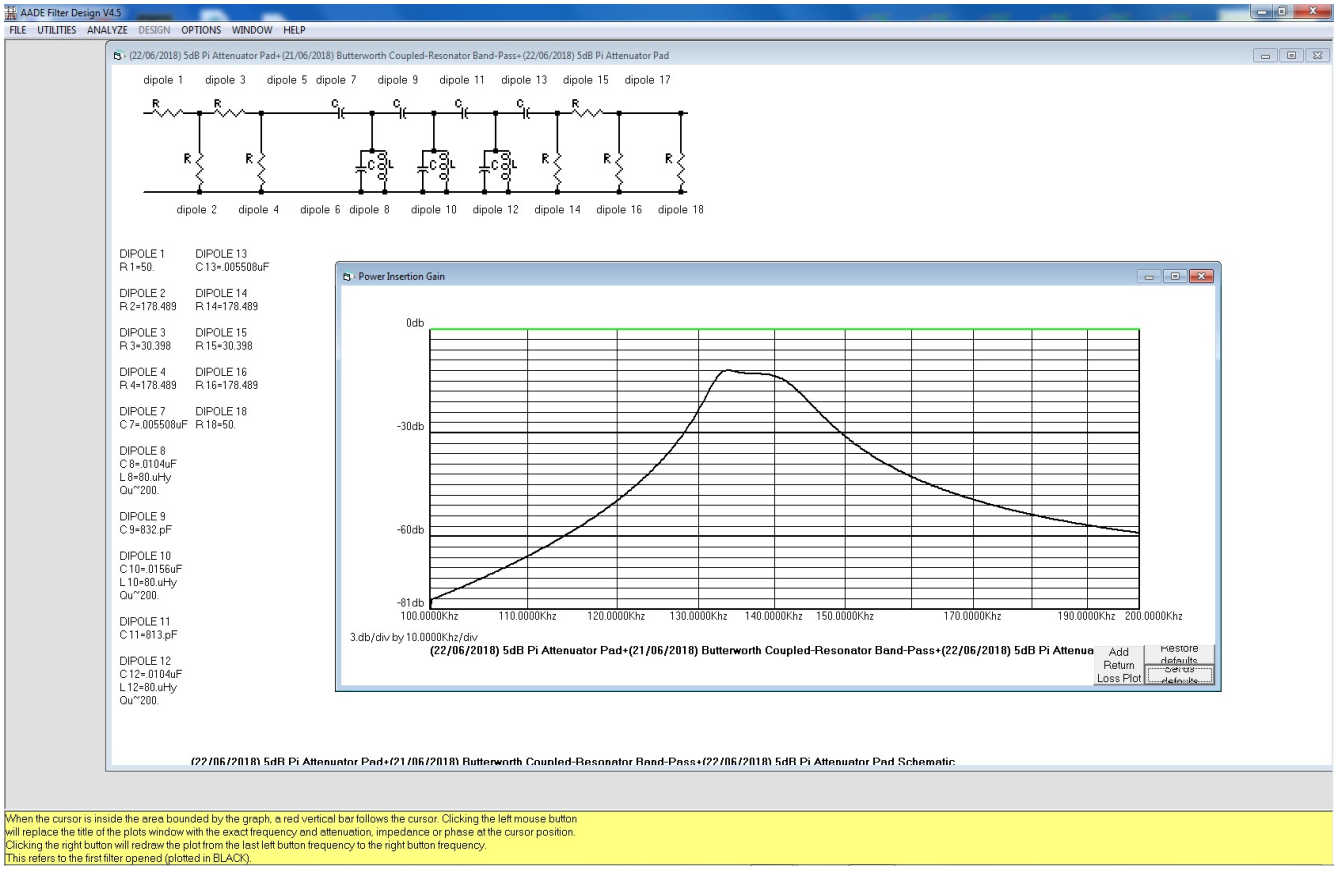


This filter will be installed in the receive pathway of my modified Softrock RXTX transceiver, http://qsl.net/ve7vv/Files/2200-160 Meter RXTX Modification.pdf, following a Pi form low pass filter. After designing the band pass filter, the filter attenuation was checked with the LPF inserted before the BPF. The AADE analysis showed that the high side skirt attenuation was severely degraded. Accordingly, a 5 dB 50 Ohm attenuator was added to the input of the BPF.

The image below of the predicted response of the two filters in series separated by a 5 dB pad shows that most of the high side skirt roll-off has been preserved.



The BPF output goes to the Tayloe switching mixer in the RXTX, which would be non-50 Ohms and reactive at frequencies distant from 137 kHz. Thus, a 50 Ohm attenuator should also be installed at the output of the BPF so that the filter will see an approximate 50 Ohm resistive load. Accordingly, a second 5 dB attenuator was added on the output side or the filter. The next image shows the complete bandpass filter with input and output 5 dB attenuators and the predicted response.



The final image below shows that the actual performance of the filter, as measured with a NanoVNA, is very close to the predicted performance. The additional 10 dB of loss from the attenuators leads to about -13 dB passband gain.