## Tuning Instructions Bandpass Filter

Tunable Bandpass Filters from Wainwright Instruments can be tuned by tuning each resonator – either by screwdriver or by knobs. You can choose this tuning option.
Please note: non-tunable filters can only be re-adjusted, tuning them to a different frequency can damage the filter.

To tune one of Wainwright Instruments' tunable bandpass filters, you need a network analyzer, where both channels (transmission and reflection) can be seen.
This is essential!
You need to connect the filter to the analyzer and set the start and stop frequency in a way, so that the actual curve and the expected new curve can be seen.
Setting markers is strongly recommended. Please use the test report of your filter for settings. (supplied with the filter)
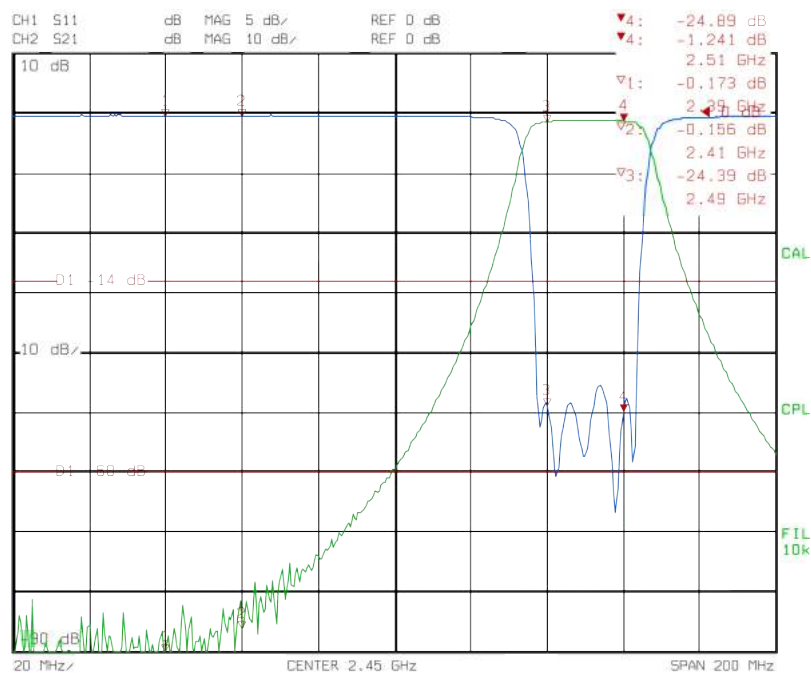
Figure 1: Bandpass tuned to high end, all markers can be seen

For better understanding we explain the tuning for a filter with 5 resonators. More or less resonators are also available – depending on bandwidth, frequency, attenuation and steepness of slopes.

If you have a filter with 5 resonators, you should start with resonator number 2.

Tune the resonator by turning the tuning screw or knob in a way that a little notch/spike will wander from the old curve to the new frequency. The notch will be visible in the curve of the returnloss (reflection), the spike will be visible in the transmission curve. We recommend looking to the reflection curve, as the notch is more dominant than the spike.

Tune the resonator, until the little notch will be at your new frequency. (turning clockwise will shift it to a lower frequency, turning anti-clockwise will shift it to a higher frequency)
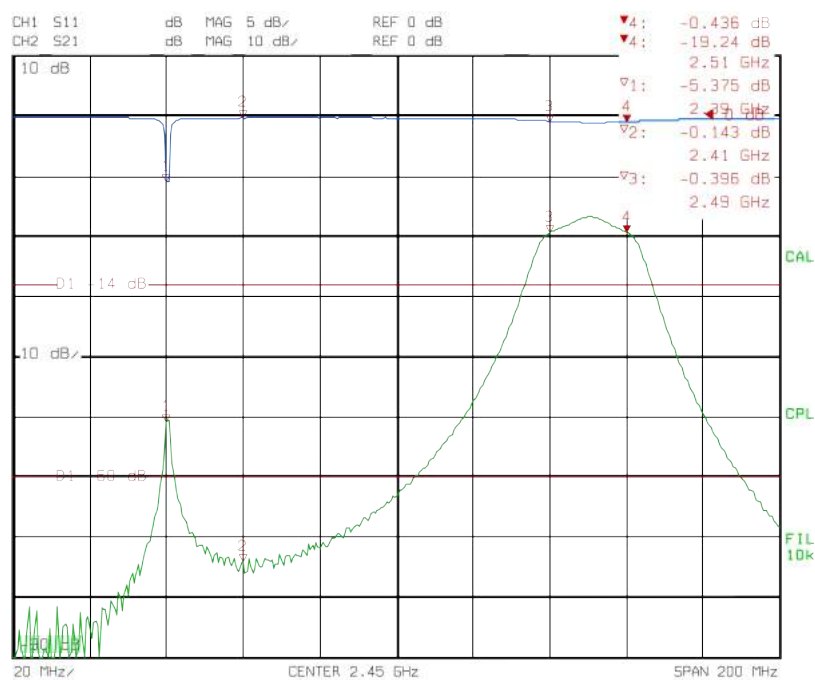

Figure 2: Resonator 2 tuned to new frequency

Then do the same with resonator 4. The result should be a curve with 2 little notches/spikes at your new frequency.
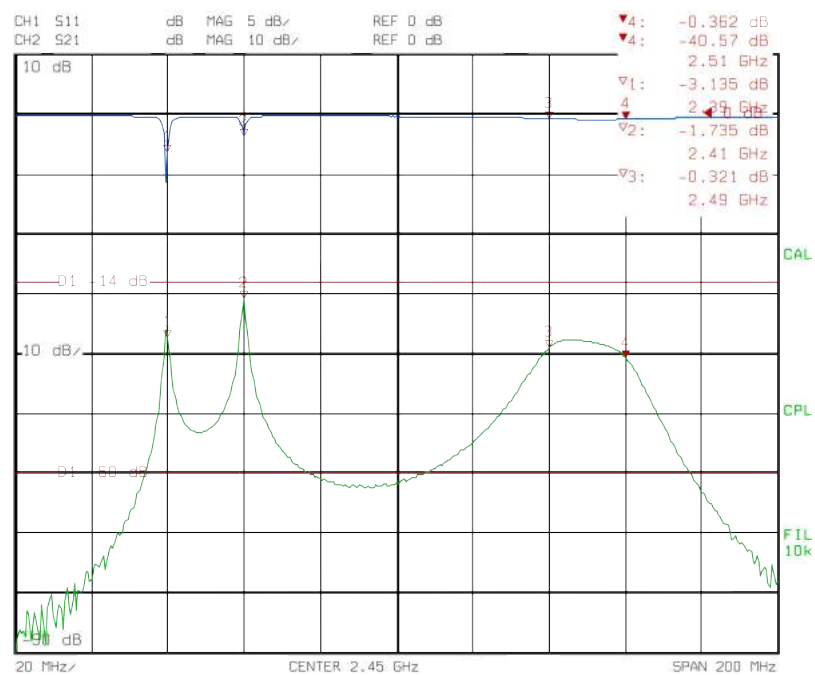

Figure 3: Resonator 2 and 4 tuned to new frequency

Continue with resonator 3.
Now do some fine adjustments on the resonators you have already tuned to your new frequency to make sure they form an even curve.
Now your new curve has the right bandwidth, but is not really pretty. (it looks more like the crown of a king than the curve of a bandpass)
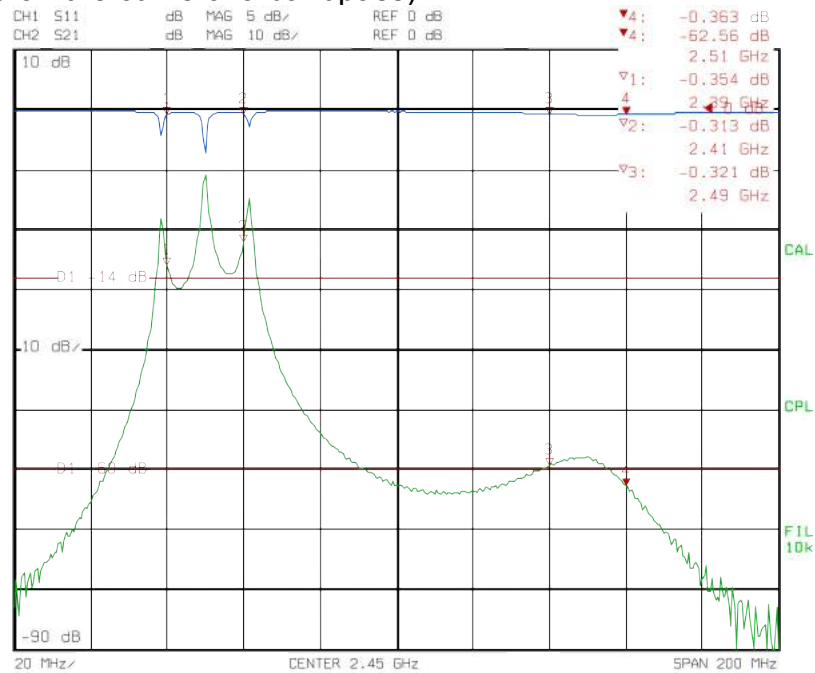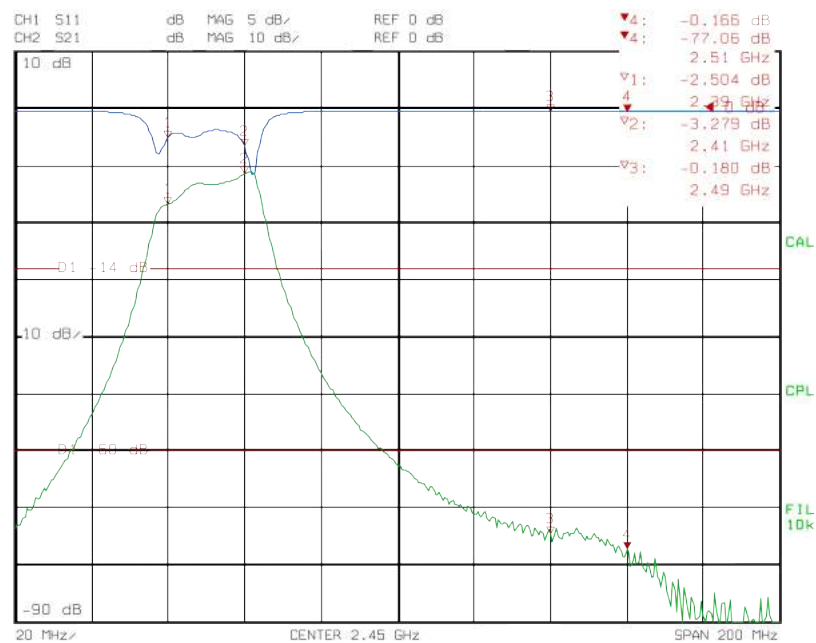

Figure 4: All inner resonators tuned to new frequency

To get some more attenuation, tune resonator 1 to the new frequency. You will not see a notch/spike wandering, but you can see if the curve gets better.

Figure 5: one of the outer resonators also tuned to new frequency

To receive a good curve, turn resonator 6 in the same direction.
The curve gets to where it should be - very little passband loss and steep slopes.
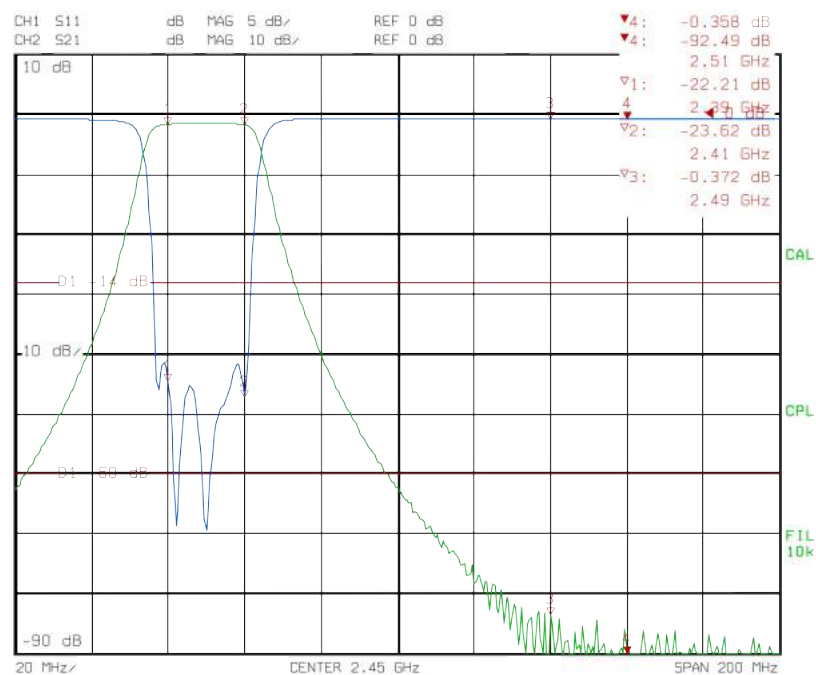
Figure 6: last resonator tuned to new frequency, fine adjustments have been made