Component Sensitivities vs. Monotonicity

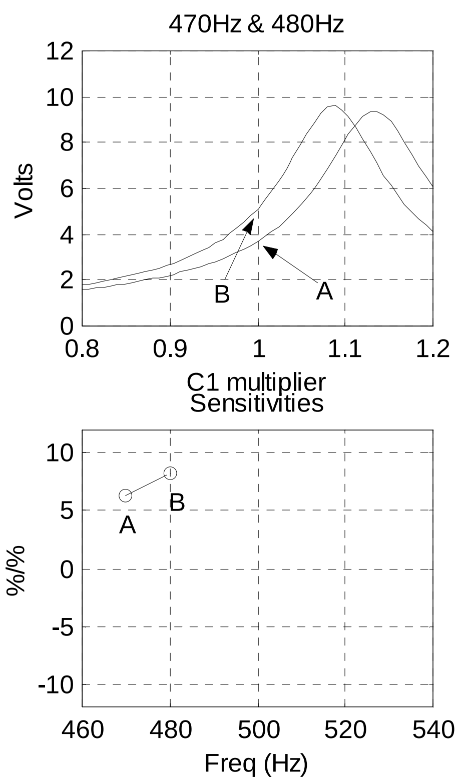
In order to get a better insight into the relationship between bipolar sensitivities and non-monotonicity, the M-file bpfinflpts.m was created. The plots from this M-file are shown below for the bandpass filter analyzed on page 29 of the MATLAB book.

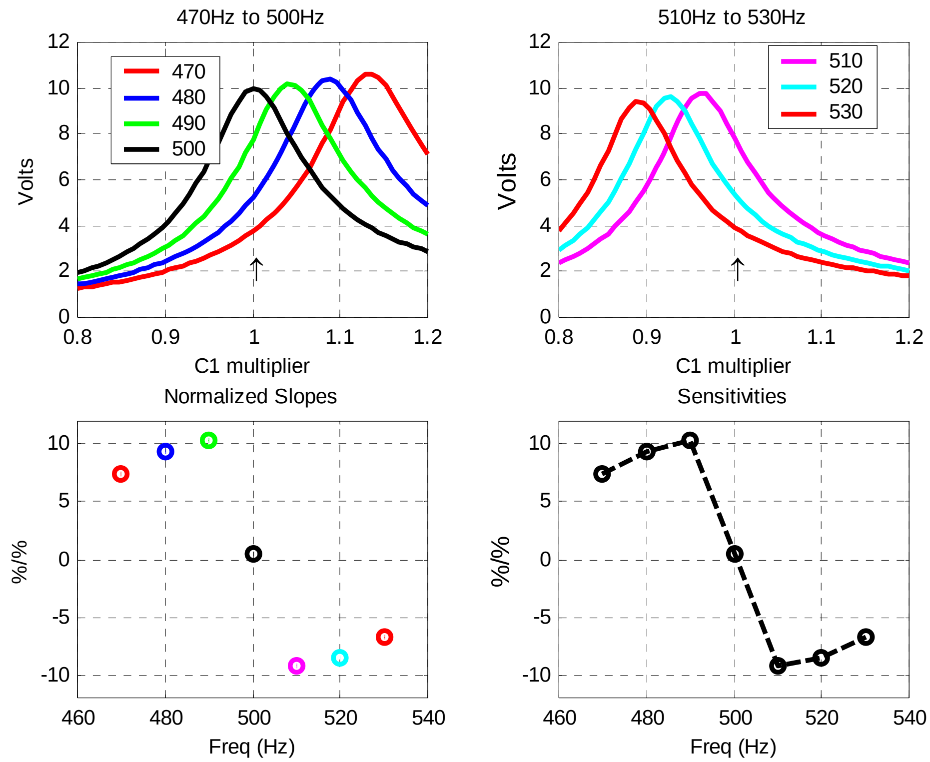
The first plot below shows a -20% to +20% (factor of 0.8 to 1.2) variation of the capacitance value of C1. The right-most curve is at a fixed frequency of 470Hz, while the one to the left of it is at a fixed frequency of 480Hz. One can easily see that the degree of non-monotonicity is somewhat severe.

By calculating the slopes at the nominal value of C1 (points A & B), we can plot the normalized sensitivity of C1 vs. frequency on the second plot below. (Recall that the normalized sensitivity is the slope dVo/dC1 multiplied by C1/Vo; in affect, a normalized slope.) Hence the normalized sensitivity of 470 Hz is about 6 %/%, while the 480Hz point is about 8 %/%.

The next set of four plots continue this process for frequencies of 490 thru 530 Hz (points C, D, E, F, & G). The seven points are then multiplied by C1/Vo and are given for the seven frequency points on the lower plot. If more frequency points were used, this curve would duplicate the sensitivity curve of C1 given in Figure 2, page 36, and Figure 56, page 118 of the MATLAB book.

Hence this shows that bipolar sensitivities indicate non-monotonic components. This means that EVA/RSS should not be used on the circuit since the analysis will yield misleading and erroneous results. (An example of erroneous output is shown on figure 4, page 37 of the book.) MCA is then the method of choice for circuits with non-monotonic components.





Run the following MATLAB M-file: bpfinflpts.m

Associated function M-file: B2w.m