

5mm LED varicap measurements

Written by Hans Summers

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I performed some careful measurements on my 80m 74HC74 VFO. I wanted to investigate the linearity of the tuning when using an ordinary 5mm red LED as varicap, and also to investigate the effect of changing the DC-blocking coupling capacitor between the varicap and the rest of the VFO tank (I used 330pF in my 2- and 3-chip stabiliser projects described on this page). The results were in line with theoretical expectations.

{gallery}minled{/gallery}

Notice that the VFO linearity is actually not at all bad. As expected, the effect of using a smaller coupling capacitor is to reduce the frequency range. Effectively it adds an additional capacitor in series with the LED, which reduces the overall capacitance, leading to both a higher VFO frequency and reduced range, since the variation in capacitance becomes a smaller proportion of the total capacitance in the VFO tank circuit. The graph on the left shows the measured frequency and reverse voltage, for three capacitors.

To check if the different capacitors have any effect on linearity, I applied shift and scaling factors to the three sets of actual measurements, such that all three would be normalised to a 100KHz range from 3.55 to 3.65MHz. The choice of coupling capacitor does not affect VFO linearity. The only effect of choosing a small coupling capacitor is to decrease the tuning range. I decided to use a 330pF capacitor because the range was almost maximum. I decided that if I wanted to reduce the tuning range, I would do it by adjustment of other components in the oscillator. As it happened, I had 170KHz of the 80m band which I didn't want to reduce anyway.