VCO Design and Midterm Topics

Topic for this week. DC and AC Design of VCO. All of the blocks and background for Phase Locked Loop. Midterm preparation.

The photograph below is the VCO we will use to build a Phase Locked Loop. The VCO will be built and measured in stages. It is very important to assemble only the components necessary for a particular set of measurements, as the additional parts needed to build a complete voltage controlled oscillator will make the earlier measurements difficult or impossible.

The steps are as follows:

1. DC voltages and currents
2. frequency response of the amplifier - filter
3. Oscillation frequency without variable cap
4. Tuning range with variable cap
5. Voltage tuning range
6. Kvco

Ungraded Homework: Due Thursday April 30. Simulate filters: 1 2 1 Butterworth and 1 1 1 quarter wavelength lumped element equivalent to clean up the I port of the diode ring mixer in lab. Simulate the response with 50 ohm terminations, and explore the effect of different terminations on the input and output.

Next, use the simulator to find the frequency at which the phase shift through the filter is 90 degrees, and 180 degrees. These filters will make the PLL unstable!

Midterm Exam in class Thursday May 14. Closed book, no notes, no calculators. Topics:

1. VCO DC Electronics: fill in all voltages, currents etc. given a schematic
2. Transformers: given a set of ideal transformer windings, specify v and i in loads
3. Kf and Kvco, product and what it means
4. LC resonant circuit formula and effect of specific variable C
5. Draw and explain the PLL Block Diagram

The midterm will demonstrate your understanding of the use of EE fundamentals to design a PLL block diagram system and each of the blocks to the component level.