Xtal measurements

Measuring Xtal motional parameters
and calculating "pulling range" and
"trim sensivity"

PRO

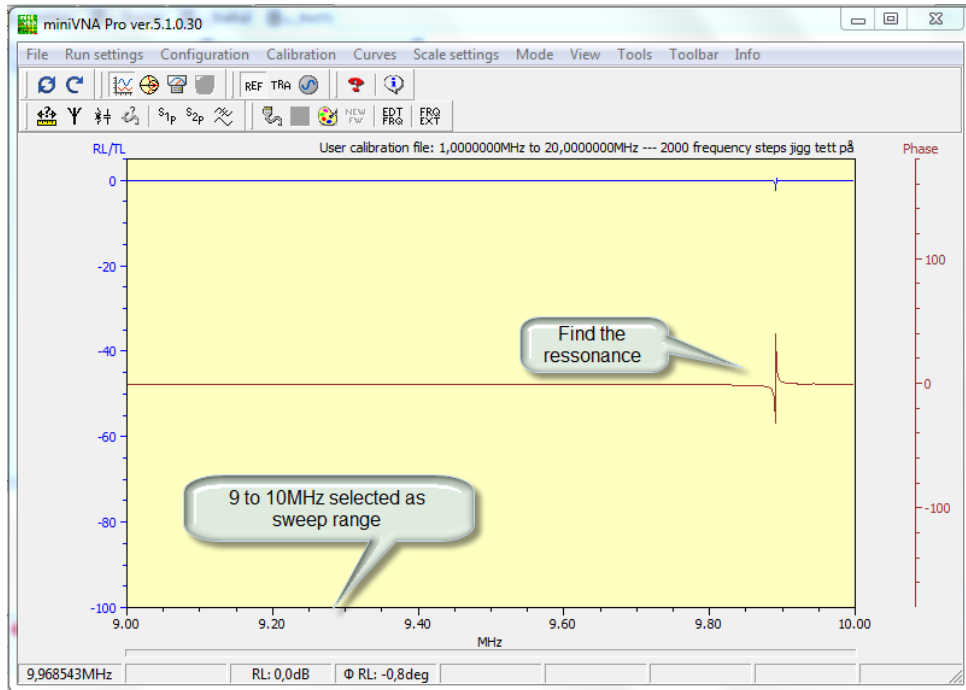# miniVNA

mini RADIO SOLUTIONS
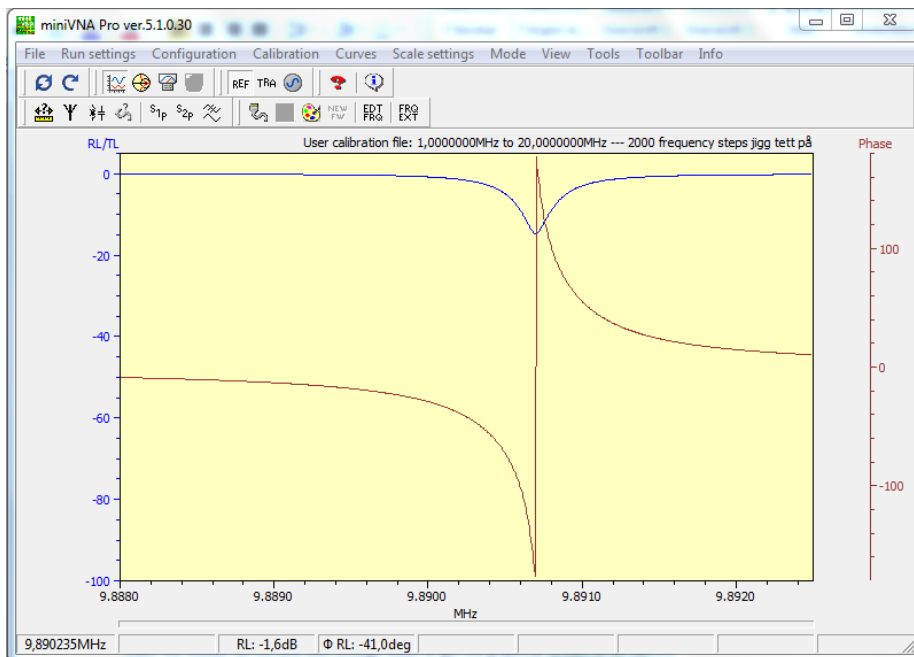
Measuring Xtal parameters

Select «Reflection mode», Return Loss and Phase, a sweep range and calibration file to be in the "area" where the Xtal's fundamental resonance frequency is supposed to be. Make a single sweep and get a similar screen as shown in the screenshot below.

Make the sweep narrow and with enough steps to get the graphical screen similar to the screenshot below:

Select "Xtal motional parameters" in the "Tools" menu and a new window will pop up!
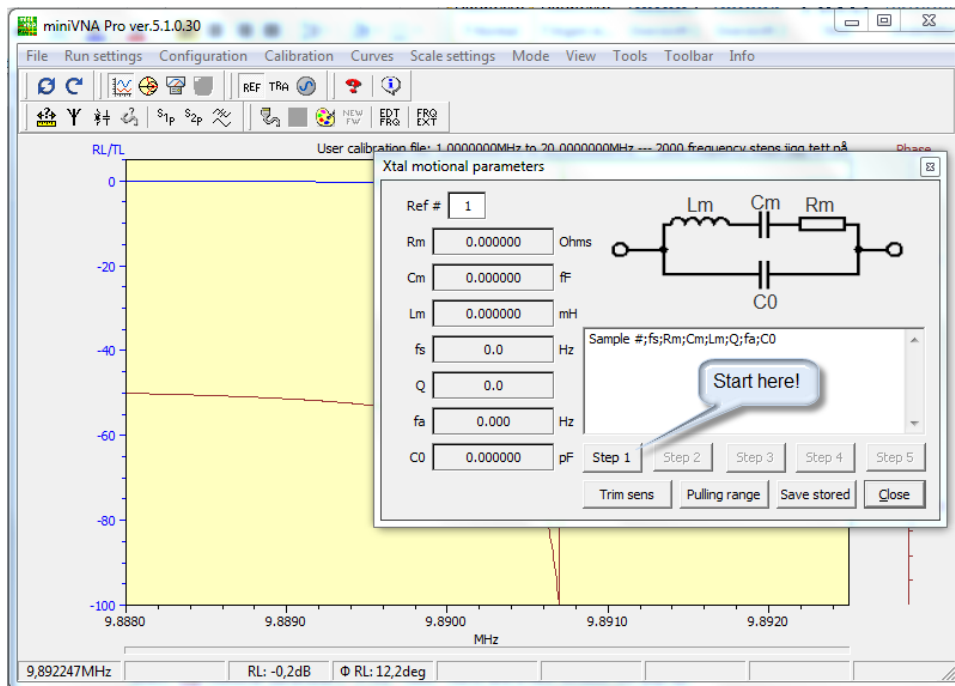
The 5 buttons marked "Step 1" to "Step 5" do the necessary measurements and calculations. Please give the unit time to make sweeps – a progress bar in main window, just above the status line, shows the progress of the sweep.

After "Step 5" is done, the result is stored in the small editor. These lines could be saved as a csv-file by clicking on the "Save stored" button.
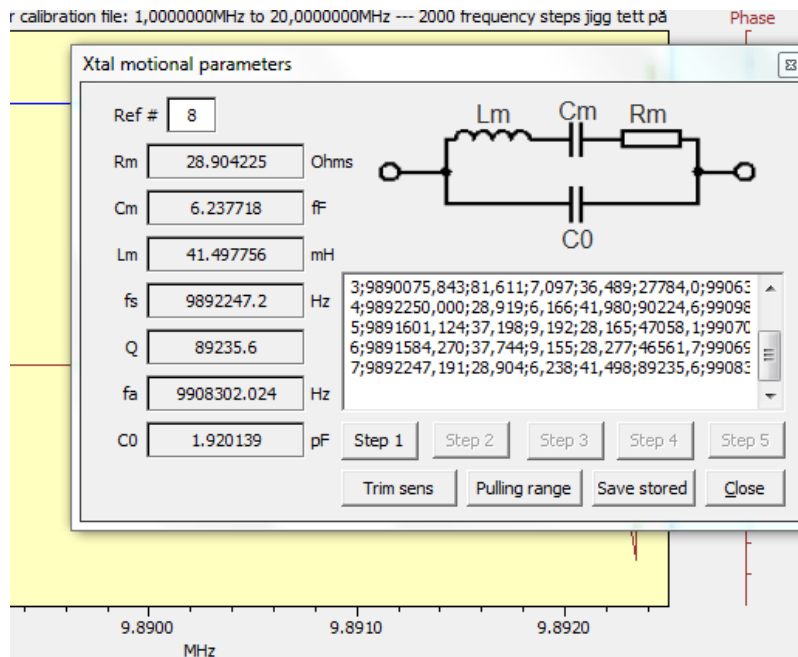
Many applications require changing the frequency of the crystal. One example is a VCXO (Voltage Controlled Crystal Oscillator), where it is necessary to tune the operating frequency to a desired value or to vary the

frequency over a desired voltage range. As the capacitive load in series with the crystal is varied, the crystal frequency is pulled.

By clicking the "Pulling range" button, a new window pops up.
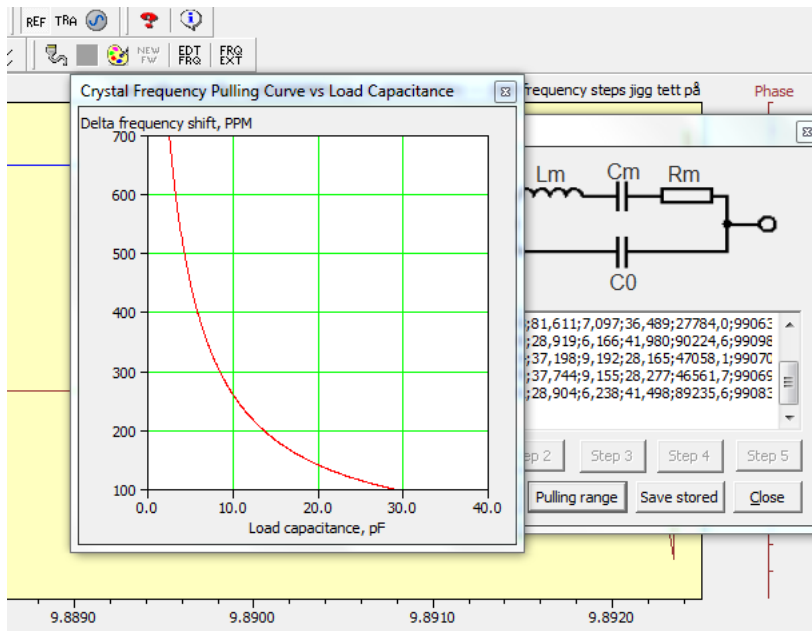
The "pulling curve" is only shown for the last Xtal examined. The window is sizable and by right click in the graphical area, the graph could be copied to the clipboard to be transferred to other programs.

A plot of the "Trim sensitivity" is shown when the "Trim sens" button is clicked! Sizing and clipboard function also apply to this window. The "Trim sensitivity" gives an important insight into how to choose the load capacitance value for the crystal. If the designer's goal is make a fixed frequency oscillator, such as in a microprocessor application, then he/she chooses a large load capacitance value like 18 -22pF. If the designer wants to pull the crystal, then he/she chooses a small load capacitance value like 9pF - 14pF.

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