Virtual RF Generator Measures Load Impedance and Power

Calculating the load impedance and power consumptions at high frequency in RF circuits is a tedious task. The VI (virtual instrument) described in this article provides an easy way to measure these parameters quickly and effectively. The power and impedance of various types of loads (e.g., resistive, serial / parallel networks) can be measured and displayed at any given frequency. Using National Instrument LabView the programmed VI can be easily modified to accommodate any type of load with any complexity.

The system is a virtual RF generator consisting of three modules; power supply, amplifier, load select and measurement display. The amplifier module with up to 90% efficiency provides frequency ranging from 100KHz to 1MHz with adjustable AC power applied to the load. The select load and display module provides waveform type (sine/square), load selection type and adjustment.

The following examples show how the system works:

Example 1 -- Resistive Load

Adjusting the frequency from minimum to maximum has no effect on the output impedance and power. However, the effect of sine wave vs. square wave on the output power is obvious.

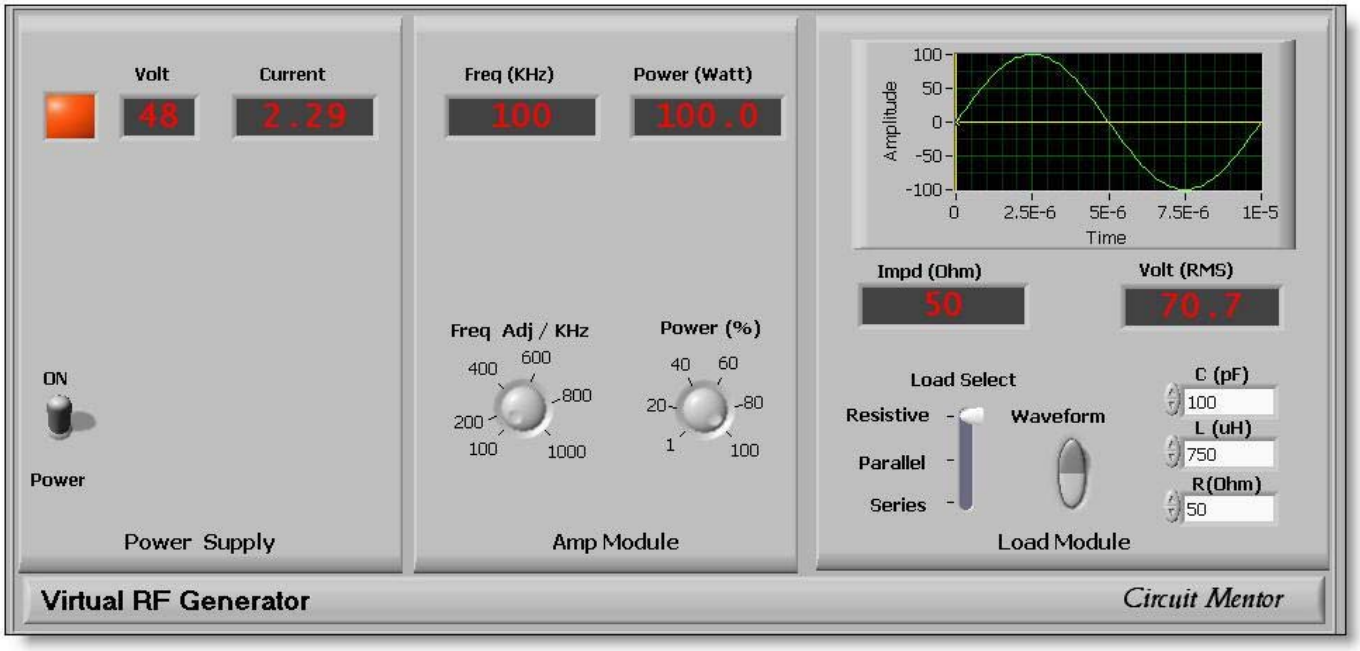

Figure 1: Resistive Load

Example 2 -- Parallel Network

The default parallel network load consists of 50 Ohms resistor +100uH inductor and 100pF capacitor. The impedance reading at 100KHz with default components value is equal to 39 Ohms, however adjusting the inductance from 100uH to 750uH will increase the load impedance to 50 Ohms at this frequency and higher frequency has no further effect.

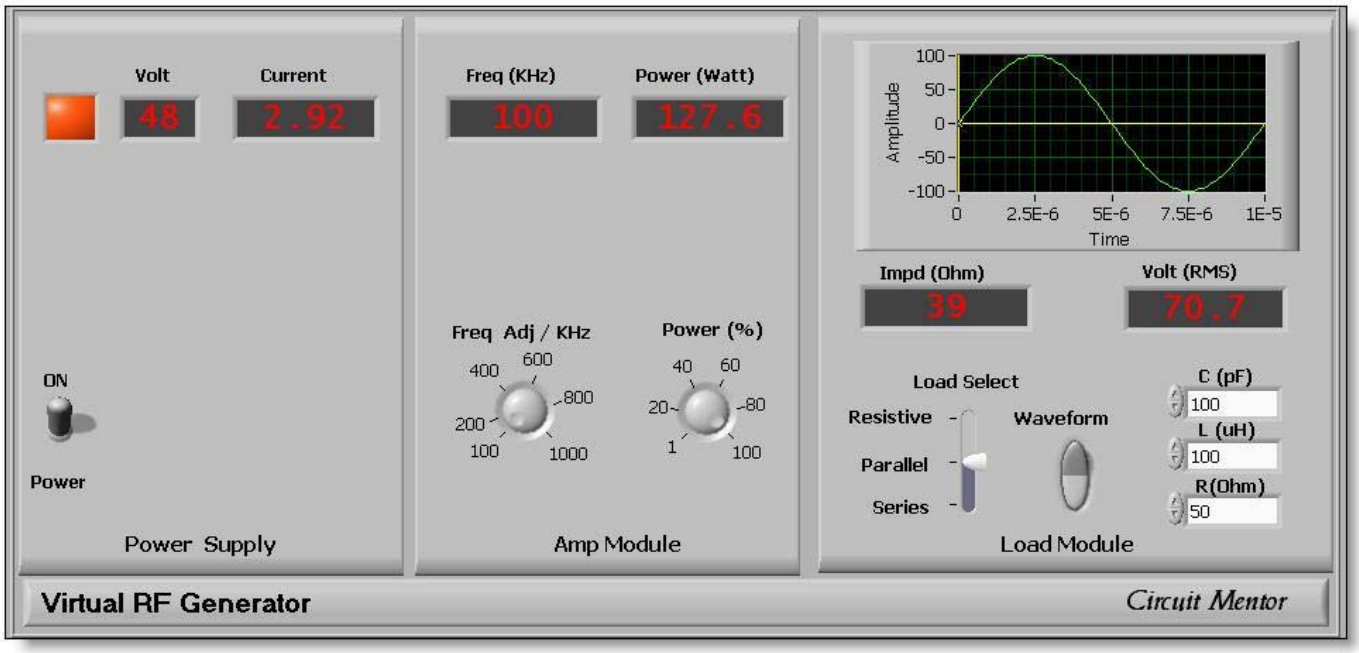

Figure 2: Parallel Network Load

Example 3 -- Series Network

Impedance reading in this mode at 100KHz with default components value is approximately equal to 16K Ohm. Increasing the capacitor value from 100pF to 25KpF will reduce the impedance to 50 Ohms. Increasing the frequency to 1MHz with the new capacitance value will change the impedance to 624 Ohms; however changing the capacitor's value to 253pF at this frequency will change the impedance back to 50 Ohms.

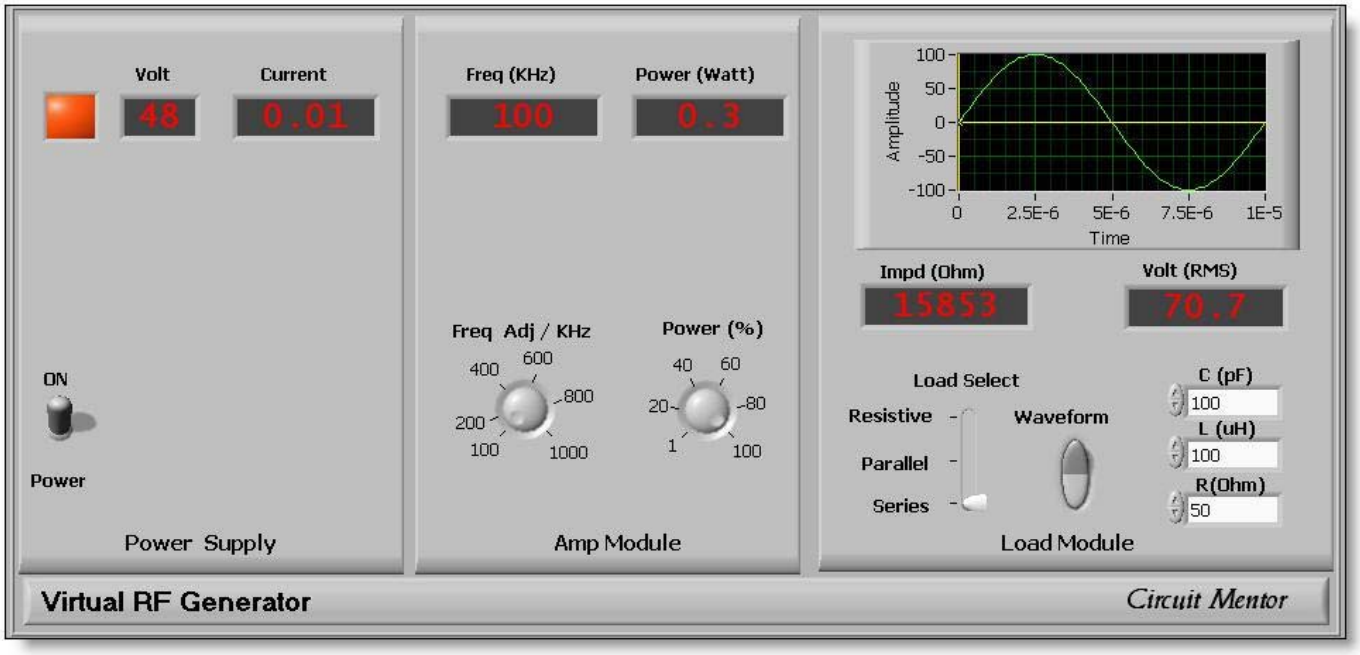

Figure 3: Series Network Load

You can download this VI, and the MathCad calculation file, or watch the Flash movie describing these examples at http://www.circuitmentor.com/downloads.shtml