Easy Spectrum Measurement with *LabVIEW 6i*

**Note for Lab Skill Exercise M3-3:** Use the approach described here instead of the one on page M3-13 in the Workbook to build your spectrum analyzer. It’s easier to build, and more versatile.

You can build a spectrum analyzer with LabVIEW 6i that has the same set of advanced features (signal averaging, conversion to and from dB scales, etc.) of your Transfer Function measuring VI. Start with the **Acquire N Scans Multi Analog Software trigger VI** in the *anlogin.llb* file. Its diagram looks like this:

![Diagram of Acquire N Scans Multi Analog Software trigger VI](image)

**Fig. 1.** The starting VI from the examples\anlogin directory.

Right-click on the waveform graph and choose **Create -> Property Node**. Property Nodes let you control properties of graphs, cursors, etc. from a LabVIEW program. You will also need to go to the front panel and make **visible** the **Cursor Legend** for the waveform graph. Create one cursor (cursor 0) and lock it to Plot 0. The Property Node needs to contain two Properties:

- **Active Cursor** – a Read property that you can write to from your VI. (Note the arrow in this Property that points into the Property Node: this arrow shows the direction of information flow, from the main VI into the Node.)
Cursor Index – A Write property that your VI can read. (Note the arrow in this Property that points out of the Property Node: this arrow shows the direction of information flow, from the Node into the main VI.)

This property node, and the additional VI’s you need to add within the While Loop are shown below. The labels of the things you need to add to the original VI are colored orange.

![Diagram of a spectrum analyzer VI.](image)

Fig 2. Diagram of a spectrum analyzer VI.

The VI truncates the acquired waveform and passes only the part of it between \( t=0 \) and the location of cursor zero to the FFT Spectrum (Mag-Phase) VI. The Index Array VI picks out which acquired plot to spectrum-analyze. You need to Create Controls for all the other inputs to the FFT Spectrum (Mag-Phase) VI, just as you did for the Frequency Response Function VI when you built your VI for measuring Transfer Functions.

An example measurement on a square wave is shown below.
Fig. 3. Example front panel with measurement.

This VI provides you with a simple, easy-to-use, spectrum analyzer. You can add a graph for phase if you like. Note that, following the Sampling Theorem, the highest frequency about which the Fast Fourier Transform (FFT) provides any information is one half the scan rate. You can also see how the harmonic amplitudes for this square wave decrease as \((\text{harmonic number})^{-1}\), as predicted from the well-known Fourier Series for a square wave.