

MULTISIM DEMO 13.1: INTRODUCTION TO THE SPECTRUM ANALYZER

As you would expect, Multisim allows users to analyze signals in the frequency domain. There are two ways to do this. We'll cover the first one in this present section.

In Multisim, the instrument which can measure signals in the frequency domain is called the Spectrum Analyzer. To access this component up, click on the  button on the device toolbar or go to Simulate>Instruments>Spectrum Analyzer. Place it just like you would with any other component.

If you don't already know this, the ABM_VOLTAGE source can be used as our own customizable signal source. Place it in the circuit as well and tie its output to the IN terminal of the Spectrum Analyzer as shown in Fig. 13.1.1 below.

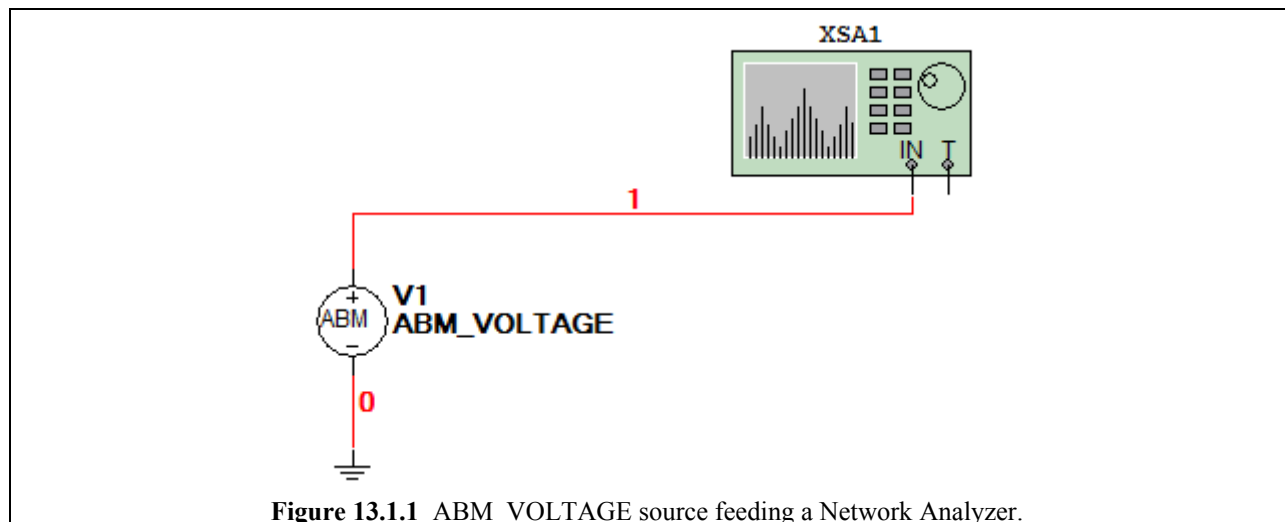


Figure 13.1.1 ABM_VOLTAGE source feeding a Network Analyzer.

In order to observe some clearly defined marks on the frequency spectrum, make the ABM_VOLTAGE source be a sum of three sinusoids, one at 1 kHz, one at 30 kHz, and one at 60 kHz. Specifically, enter the following equation into the Voltage Value field of the ABM source:

$$10 \cdot \sin(2 \cdot \pi \cdot 1000 \cdot \text{TIME}) + 5 \cdot \sin(2 \cdot \pi \cdot 30000 \cdot \text{TIME}) + 10 \cdot \sin(2 \cdot \pi \cdot 60000 \cdot \text{TIME})$$

This equates to $10 \cdot \sin(2\pi \cdot 1000 \cdot t) + 5 \cdot \sin(2\pi \cdot 30000 \cdot t) + 10 \cdot \sin(2\pi \cdot 60000 \cdot t)$ V.

Open up the window of the Spectrum Analyzer. Under the Frequency field on the Spectrum Analyzer's control panel, set the Start frequency to 1 Hz and press the Enter button. When you are ready, begin the Interactive Simulation by pressing F5 or one of the appropriate buttons on the toolbar.

While running, you should see three spikes appear, two in the middle, and a third slammed over to the extreme left of the window. You can use the cursors and their ability to find the maximum points in the plot. It may be wise to pause the simulation (F6), however, because the spikes may be jumping around slightly by a few Hz in either direction so when you go to find the Y_MAX,

it may pick a area on the graph which is not the max to you or me, but was at the exact moment when you clicked your mouse button.

Using the cursors you should obtain the following frequency and magnitude values for the three spikes present.

Spike 1: 1.000 kHz and 10.000 V
 Spike 2: 30.000 kHz and 4.999 V
 Spike 3: 60.000 kHz and 9.995 V

These match up very well with the actual values which we typed into the ABM_VOLTAGE source.

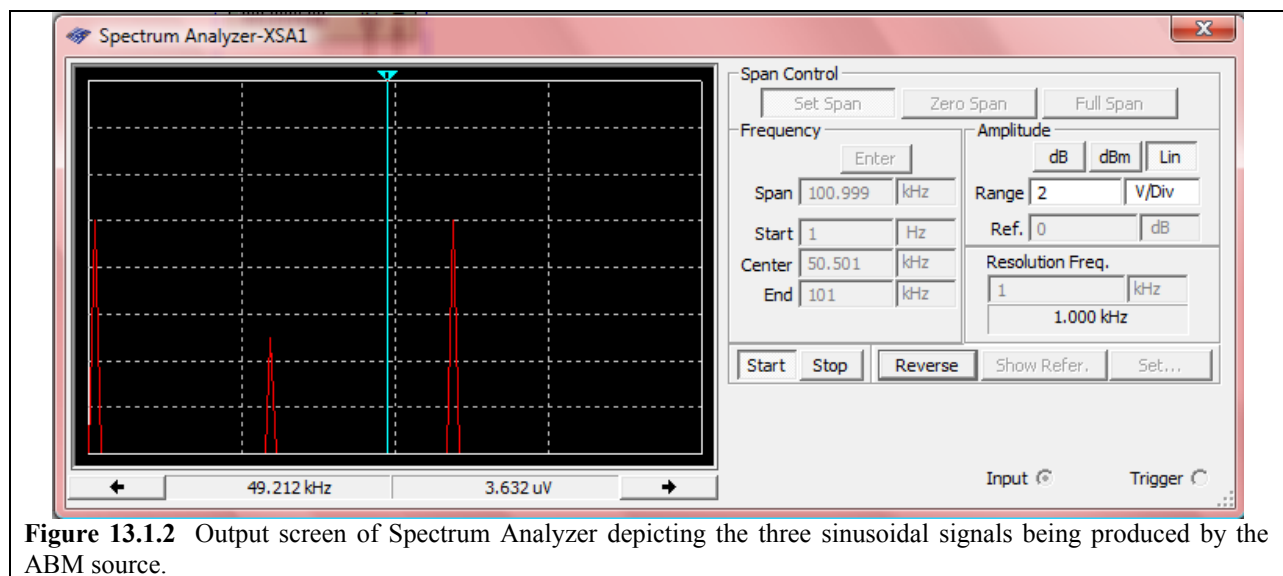


Figure 13.1.2 Output screen of Spectrum Analyzer depicting the three sinusoidal signals being produced by the ABM source.

The next Multisim Demo (13.2) will briefly demonstrate how to use Multisim's other way of analyzing circuits in the frequency domain...the Fourier Analysis.