ABSTRACT

This project is relates to an invention of simple network analyzer which using microcontroller based technology. The invention comprising a software called Visual Basic to view four scattering parameters: S11, S12, S21 and S22, five frequencies sweeping selection keys members, one DUT (Device Under Test) member, four ports of terminals with two ports for S11 and S22 measurement and the other two ports are for S21 and S12 measurement. There will be one USB cable available for interfacing purposes between microcontroller and the computer.

The operating frequency of simple network analyzer is from 300MHz to 3GHz. User can measure any one of the scattering parameters by proper connection of DUT. The DUT invented is based on this project. Two SMA ports are attached at the end of DUT for measurement of scattering parameters. Accuracy of the measurement might not be as high as the commercializes type of networks analyzer as this invention is used for teaching purposes.

The general concept of project is to read the signal using microcontrollers, send the signal to computer via USB to DB9 converter then finally calculate scattering parameters and displays results in the form of graphs. The graphs displayed on the screen using Visual Basic consist of scattering parameters measured in dB versus frequency in Hertz. The microcontrollers can be programmed to a send signal to DUT. Once DUT receives the signal, it will makes the signal return back as the other side of terminal is open (impedance mismatched). With this, S11 and S22 can be determined. The signal used has amplitude of approximately 5V with various frequencies. The same thing can be done for S12 and S21. In this S12 and S21, two ports of the DUT must be connected instead of one port of connection such as mentioned in S11 and S22. When connecting two ports of DUT into invented simple network analyzer, one of the ports will be used as input to transmitting signal (with amplitude of 5V) and the other port is used for output to receive transmitted signal. As the signal flow inside DUT, it will encounter attenuation, reflection and multiple reflections, hence S12 and S21 can be computed by determine its voltage ratio.

Technical features of invention consists three 16F887 microcontrollers with two microcontrollers used for scattering parameters signal sending and reading, one is for interface to computer via MAX 232 IC, twenty push-pull buttons for frequency sweeping and four ports of terminals for scattering parameters measurement. A Visual Basic is used to auto compute the scattering parameters and display the results in the form of graphs using GUI. A reset button is created on the GUI for user repeatedly measures, compute and plotting the graphs.