Data Acquisition from Signal Analyzer Using MATLAB & Its application

RAJENDRA KUMAR.T, Engr-SD SDSC SHAR
Contents

- Brief Description of application
- Introduction
- Application Environment
- Controlling Instrument
- Test setup
- Results
## Data Acquisition from Signal analyzer using MATLAB

<table>
<thead>
<tr>
<th>Statement</th>
<th>Data Acquisiton from Signal analyzer using MATLAB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Approach Used</strong></td>
<td>Data acquired from signal analyzer and taking measurement online</td>
</tr>
<tr>
<td><strong>Tools used</strong></td>
<td>MATLAB Instrument control tool Box / SCPI commands</td>
</tr>
<tr>
<td><strong>MATLAB / SIMULINK HELP</strong></td>
<td>By using tool box help this problem has been solved easily</td>
</tr>
<tr>
<td><strong>Results</strong></td>
<td>Online measurement / data acquisition &amp; plotting</td>
</tr>
</tbody>
</table>
• Signal analyzers are used to evaluate the signal performance in all aspects.
• It can be used in time domain (zero span) or frequency domain (with span) to evaluate the signal characteristics.
• In RF filed environment signal analyzers are very much essential to analyze the signal characteristics.
• As an example, consider the radar environments, where signal analyzer or spectrum analyzers are very much useful to study the behavior of the radar return echo.
• A basic signal analyzer can does the functionality of as same as radar receiver.
• Signal analyzers can be used in test and measurement instruments, to test and qualify the Device under test in some aspects.
In my application I have considered the signal analyzer is located at a remote location, where it can be operated from control station through remote mode with SCPI commands.

In this case it is necessary to command the signal analyzer remotely and acquire the data and process for further evaluation.

A signal analyzer can be operated and commanded remotely through a standard SCPI commands, using MATLAB.

MATLAB Instrument control tool box is providing the necessary device drivers and standard SCPI commands, essential to the particular instrument such as Signal analyzer, Signal Generator etc.
Considering the RADAR antenna pattern measurement, it is necessary to measure transmit and receive radiation patterns of antennas for its performance evaluation.

- In transmit radiation pattern measurement, radiating RF power from antenna and receive the power through another known antenna located at far field region.
- The received RF power (signal strength) is measured at remote location (far field) using signal analyzer.
- Based on the signal strength received, gain of the antenna can be estimated using standard radar range equations. A basic signal analyzer can do the functionality of a radar receiver.
• Similarly antenna pattern measurement can also be carried out by moving antenna either mechanically or electronically.

• Consider the case, when antenna is rotated mechanically, and there is no data acquisition from signal analyzer, then taking the data manually is a time consuming process.

• In such a case, it is necessary to acquire the data automatically from the signal analyzer is required.

• If data acquisition can be done automatically, taking antenna measurements will become simpler. In this case it is necessary to command the signal analyzer to acquire the data and process for further evaluation.
• In this scenario, data can be acquired through the signal analyzer at required rate through programming and can be plotted.
• This process is effective and can be repeated number of times for getting accurate results.
• Signal analyzer is controlled through an interface of LAN Port and programming through MATLAB for automatic data acquisition at required data rate.
• Signal analyzer is controlled and commanded remotely i.e through programming using SCPI, MATLAB instrument control tool box.
The necessary instrument drivers are loaded in MATLAB to get the necessary instrument SCPI commands.

Its various parameter settings like Freq., VBW, RBW, SPAN, SWEEP TIME, TRIGGER LEVEL, TRIGGER DELAY, SIGNAL LEVEL (Peak) etc are controlled and read back for verification.

For radiation pattern measurement, required signal strength at far filed is one of the important parameters, it can be acquired at a higher rate of 1msec and plotted online using MATLAB by updating the plot. The data can be saved in file for further analysis. The received RF power (signal strength) is measured at remote location (far field) using signal analyzer.
Test setup

Antenna Under Test
RF Beams
Far Field
Receiving Antenna

Test setup for acquiring DATA
Signal Analyzer LAN Port Details

- LAN cable: Ethernet – RJ 45 both ends
- IP Address = 169.254.149.218
- Port Number: 5025

Remote commanding Steps:

1. Switch on signal analyzer and PC.
2. Connect LAN cable from PC to signal analyzer LAN port and make sure that connection is established.
3. Open MATLAB software in PC and send identity command to identify the instrument and verify the LAN port details.
4. After successfully identifying the instrument, the following commands will be sent to Signal analyzer from PC: Center Frequency, Span, VBW, RBW, sweep Time, Trigger source, trigger level, trigger delay, peak marker status (On/Off), peak value etc.
5. After the required settings commanded and the program starts executing as per MATLAB coding, data (signal strength / level) will be acquired at the specified rate (> = 1msec) and plot will be updated at the same time.
6. The acquired data is stored in a separate file for further analysis.
Antenna Radiation Pattern
THANK YOU