### Introduction to 50MHZ PIC18F4550/4553 USB Antenna Analyzer by Tony / I2TZK

## USB SWR Analyzer Project's Notes:

The "SWR Analyzer" is a smart, cheap and easy to assemble "Antenna Analyzer".

The project is focused to measure the antenna performances across the HF Ham radio bands without any need to connect the transmitter to the antenna.

The following picture is an example of the Mosley Pro67 antenna analysis:
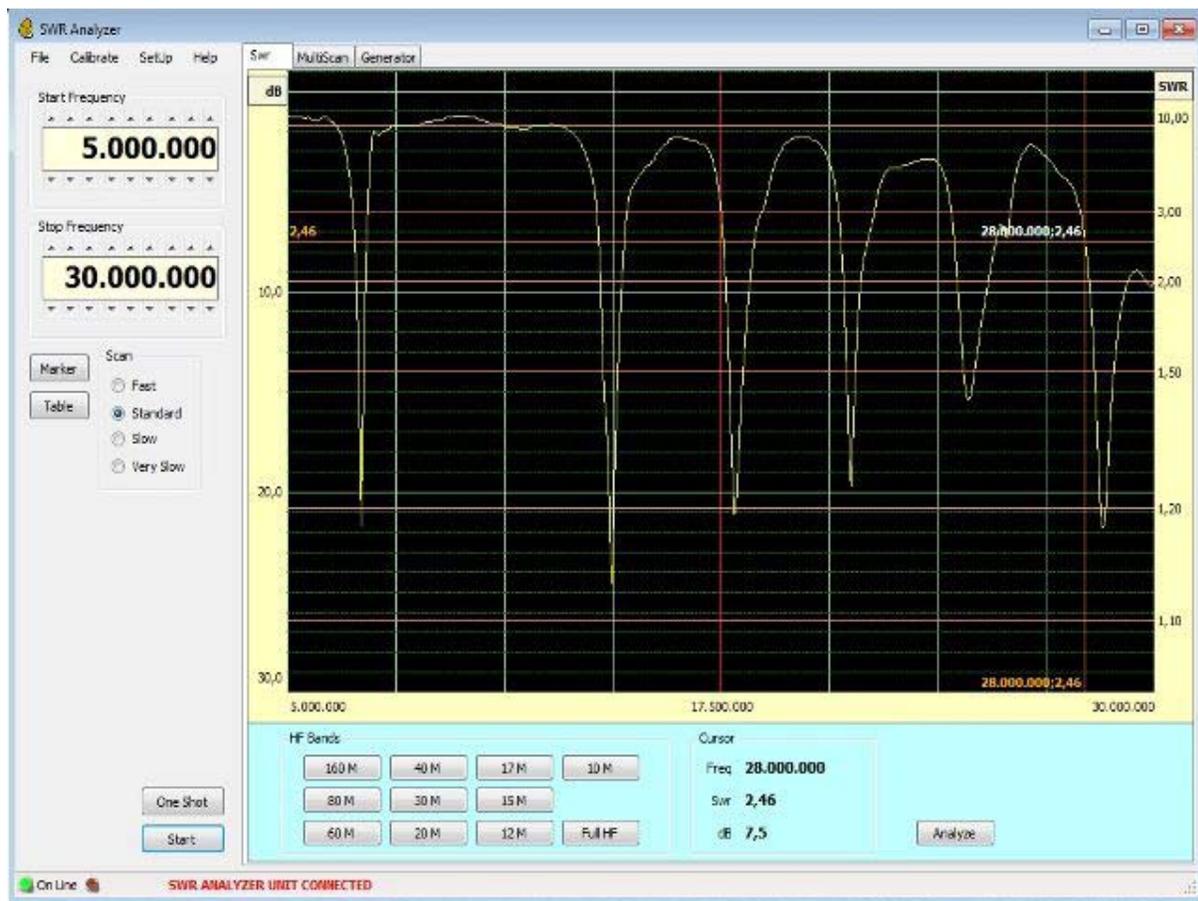
The "SWR Analyzer" is a Scalar (or single port) Network Analyzer, the following figure shows the hardware architecture.
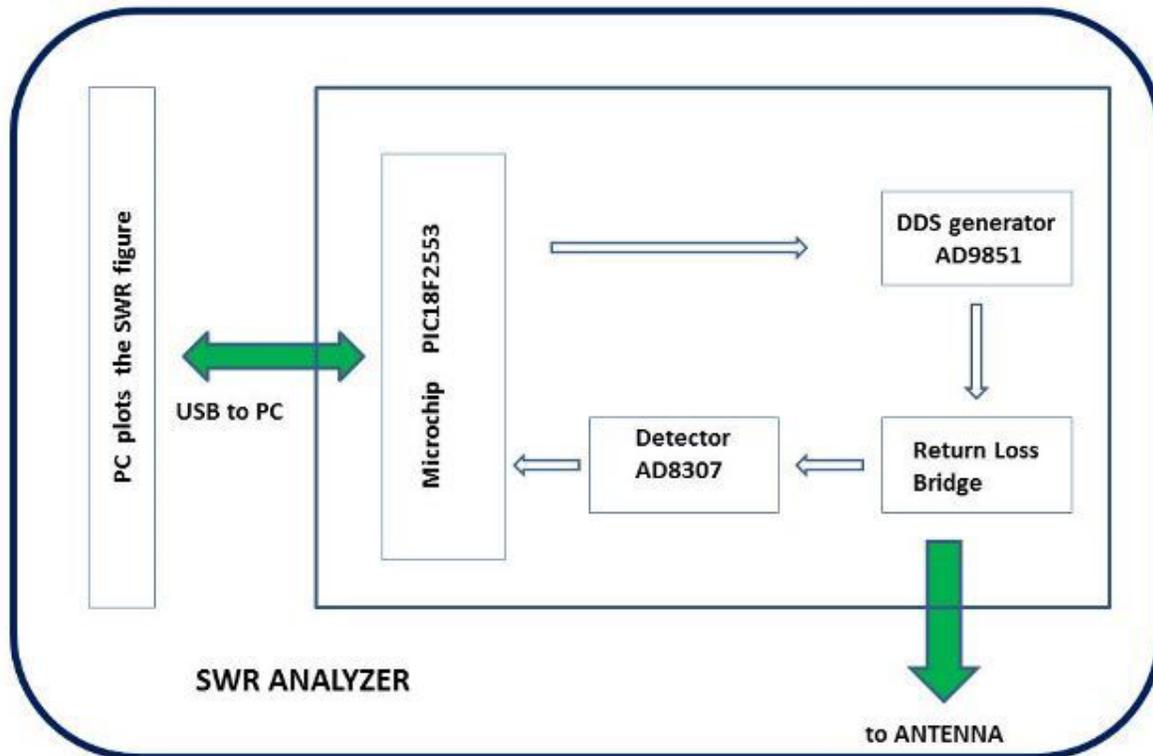
Main elements of the diagram are:

- Microchip PIC18F2553 / 2550
- DDS generator AD9851
- Return Loss Bridge
- Detector AD8307

The microcontroller PIC18F2553 interfaces the PC receiving commands to drive a RF Ggenerator (DDS) and sending back the voltage values read from the Return Loss Bridge.

The Analog Devices AD9851 is a Direct Digital Synthesizer (DDS) device which can generates a sinusoidal wave output up to 180MHz. The microcontroller drives the DDS to generate the RF signal sweepped in the HF frequency range from 1MHz to 35MHz, that feeds one end of the Return Loss Bridge.

The return loss bridge is the wideband resistive bridge network used to verify the impedance at the antenna connector. It works by comparing the "unknown" antenna impedance to a purely resistive 50 ohms, the output DC voltage corresponds to the level of impedance mismatch between the 50 ohms and the antenna impedance.

Generally, the higher the DC voltage output, the worst the impedance mismatch is.

The following stage (AD8307 configured as detector/differential comparator) amplifies the RLB output converting the signal level to a decibel form and delivering it to the microcontroller.

The Analog to Digital Converter (ADC) embedded into the microcontroller provides to generates the digital measure of the impedance, the measure is sent back to the PC.

Finally the PC program calculates the dBm values, translates the measure in a SWR figure and plots the mismatch diagram of the antenna.

The PC program, Windows based, allows to explore a single HF Band or the full range from 1 to 30MHz and plot the resonance figure.

We made our first antenna analyzer using AD9851 and AD8307 in SMT package.

However, in view to make kits easy to build by Radio Amateurs, it was decided to make final PCB with a carrier board for AD9851 and a DIP package for AD8307.

Below is the view of SMT board:
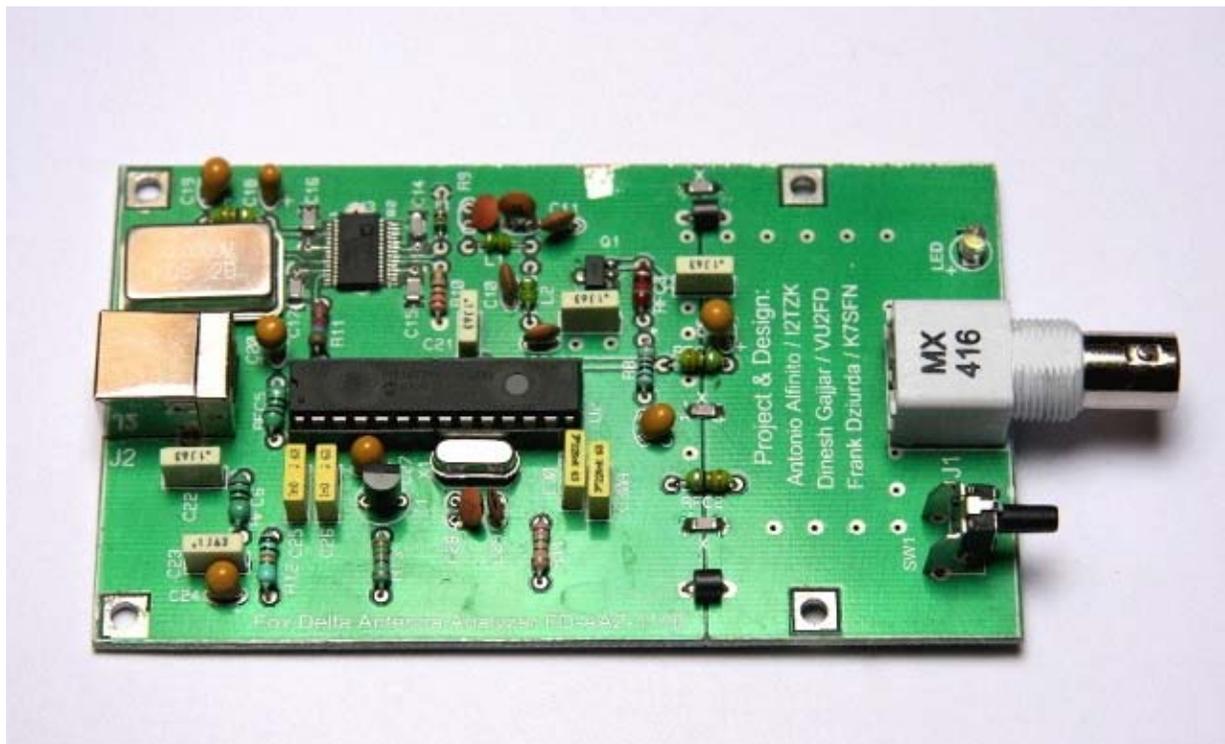
Final version of Antenna analyzer uses AD9851 carrier board where AD9851 may be supplied presoldered and a DIP8 package for AD8307:

DDS Carrier Board:

Carrier board is supplied with:

DSPTH Carrier PCB for 28SSOP Package

4 x 0.1uF 1206 capacitors

1 x 47uF / 5V Tanatlum capacitors

1 set of 0.1IN header Male/Female

73s

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