AD9993-EBZ Evaluation Board Quick Start Guide

Getting Started with the AD9993-EBZ Evaluation Board for HSC-ADC-EVALCZ and DPG3

What's in the Box

- AD9993-EBZ Evaluation Board for HSC-ADC-EVALCZ and DPG3
- Mini-USB Cable

Recommended Equipment List

- Sinusoidal Clock Source
- Spectrum Analyzer
- HSC-ADC-EVALCZ High Speed Converter Evaluation Platform
- DPG3 Data Pattern Generator
- +3.3V Lab Power Supply

Introduction

The AD9993 is a mixed signal front end device that integrates four 14 bit high speed ADCs and two 14 bits high speed DACs. The AD9993-EBZ interfaces to the HSC-ADC-EVALCZ and DPG3 platforms as shown in Figure 1. The DPG3 automatically formats the data and sends it to the AD9993-EBZ via its DAC LVDS lanes. The HSC-ADC-EVALCZ takes data from each of the ADCs in real time via the AD9993's ADC LVDS interfaces and passes it to the visual analog software. The visual analog software performs an 8K FFT on ADC outputs and displays the results in a graph (see Figure 10). The SPI registers inside the AD9993 chip are programmed via the HSC-ADC-EVALCZ using the SPI Controller software. AD9993 clock inputs (REFCLK and CLK+/CLK-) are provided by on-board ADF4351 synthesizer ICs. The ADF4351 SPI registers are programmed via the AD9993-EBZ PIC processor (XU2). The AD9993-EBZ is powered by a 3.3V lab supply.

AD9993 Evaluation Software

The AD9993 Evaluation Board software used in this Quick Start Guide consists of the following elements:

1. ADF4351 Programming Labview Executable GUI
2. ADI SPI Controller
3. ADI DPG Downloader
4. ADI Visual Analog

Hardware Setup

1. Connect ANALOG and DIG 3.3V supply pins to a 3.3V lab power supply
2. Connect P1 and P2 to the LVDS port of DPG3
3. Connect FIFO1 and FIFO2 Connectors to the HSC-ADC-EVALCZ High Speed Converter Evaluation Platform (FIFO5)
4. Connect IOA_P SMA to a spectrum analyzer
5. Connect IOB_P SMA to A_VINP SMA
6. Connect mini USB cable from your PC to Connector XP2

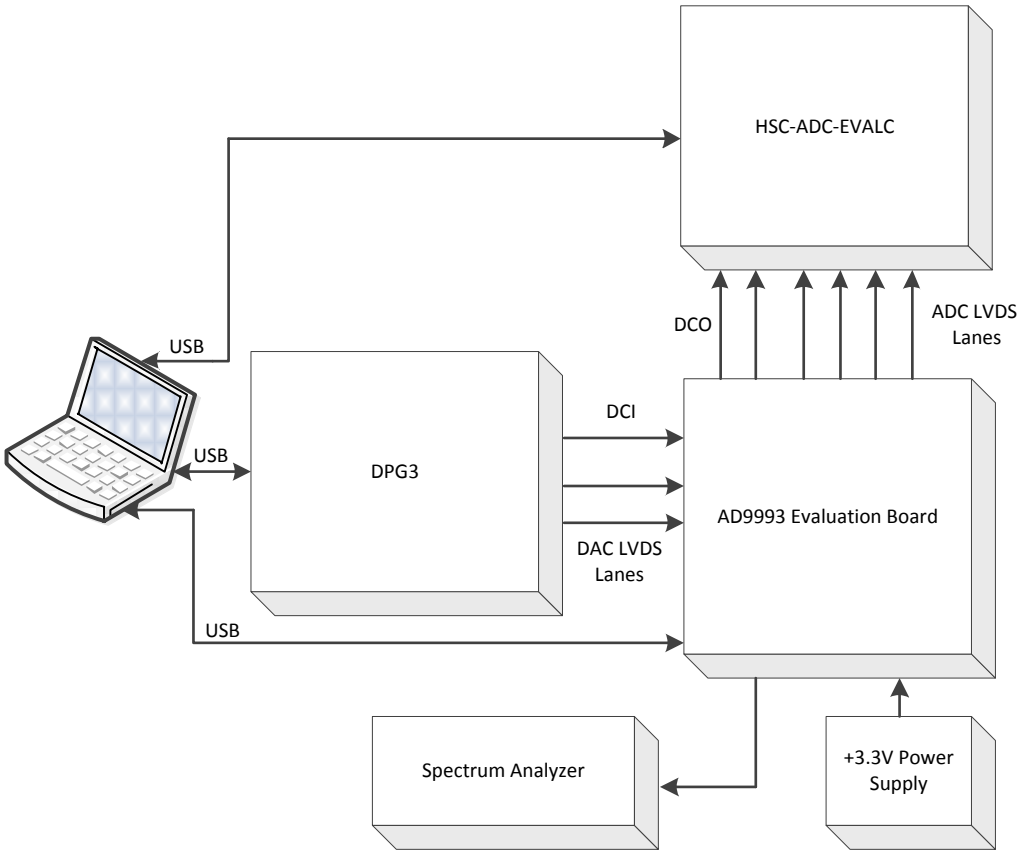

Figure 1. Block diagram of the AD9993-EBZ lab bench set-up

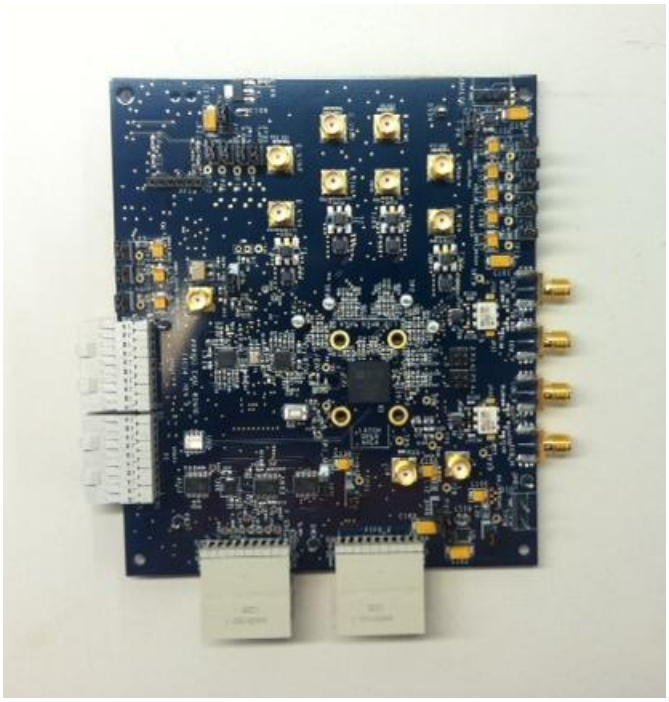

Figure 2. AD9993-EBZ Top View

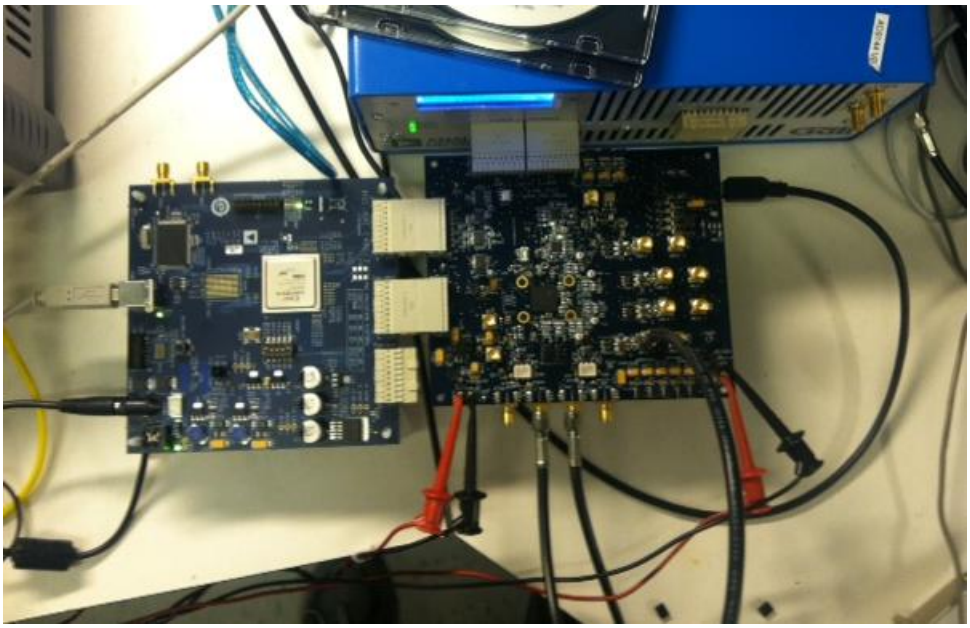

Figure 3. AD9993-EBZ Connected to HSC-ADC-EVALCZ and DPG3

Getting Started

The evaluation software for AD9993-EBZ is available on ADI web sites and can be accessed as described below..

Initial Set-Up

1. Install the High Speed DAC Update Including DPG Downloader and AD9993 support files on your PC Using the "DAC Software Suite" link on this Page:

http://wiki.analog.com/resources/eval/dpg/dacsoftwaresuite

DPG Downloader is a GUI that allows you to input data vectors to the AD9993 DACs via DPG3.

2. Install the SPI Controller software using the "High Speed ADC SPI Control Software" link on this web page:

http://www.analog.com/en/content/CU_High-Speed_ADC_FIFO_evaluation_tools/fca.html

SPI Controller is a GUI that provides read/write access to AD9993 on-chip registers.

3. Install Visual Analog by pressing the "Download Visual Analog" button at this link:

http://www.analog.com/en/converters-tools/adc-tools/topic.html

Visual Analog is a GUI that facilitates analysis of ADC performance.

4. Copy "ADF4351_RevB_C_D1.exe" to your PC from the CD included in the box with your AD9993-EBZ. This is a lab view executable used to program the ADF4351 synthesizer ICs on the board.

6. Copy "single_channel.vac" and "fpga_dig_top_PHASE-SHIFT_n70.bin" from the CD in the box with the AD9993-EBZ to your PC. These files are used by Visual Analog to produce the ADC analyzer display shown in Figure 10.

7. Copy AD9993_intclk_adc_dac.mgp from the CD. This macro file is used by the SPI Controller to program the AD9993 on chip registers.

Single Tone DAC and ADC Demonstration

1. Program ADF4351 clock synthesizers
    a. Open AD9993-CLK_from ADF4351_RevB_C_D1.exe
    b. Set Up GUI as shown below for "ADRF4351 supplies Reference input to AD9993 on-chip synthesizer.
    c. Press Run Arrow.

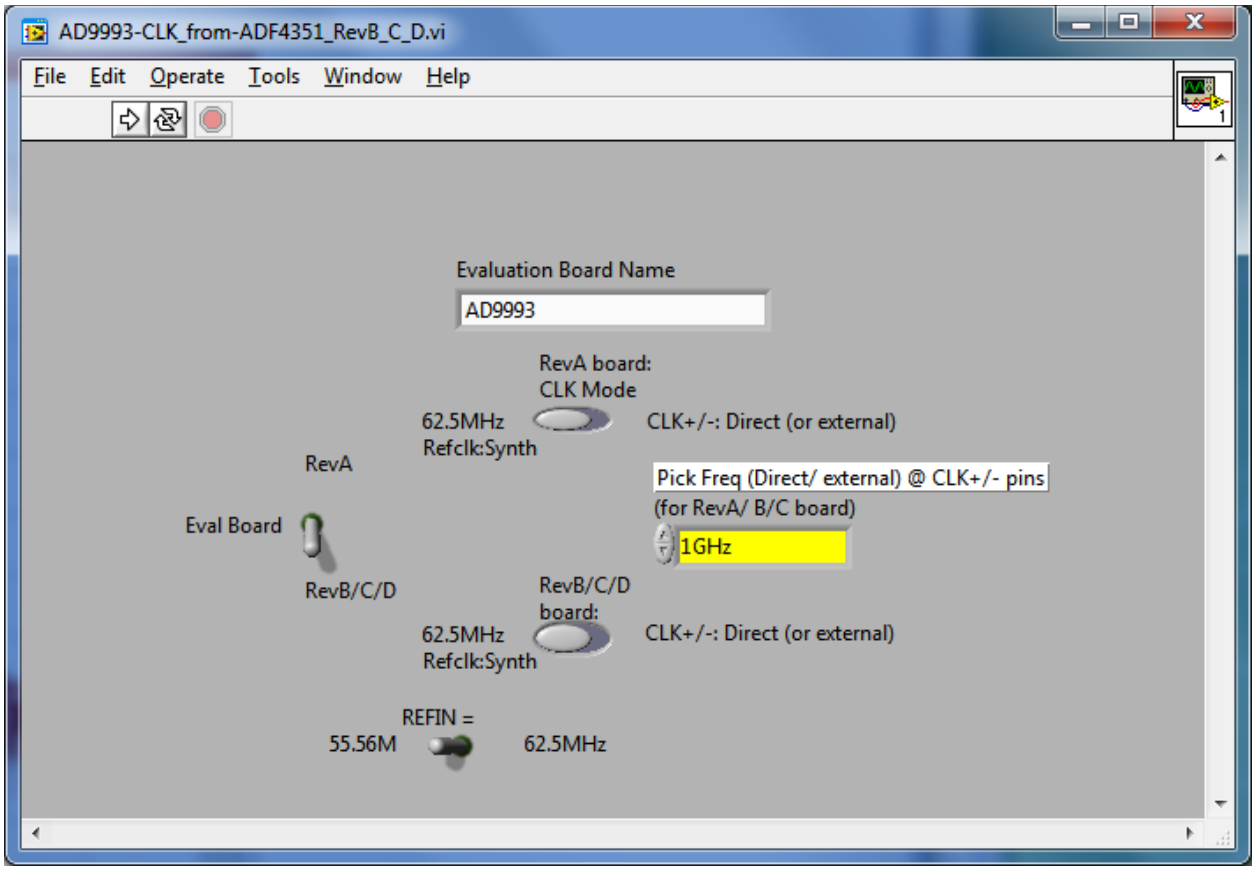

Figure 4. Configured ADF4351 Programming Labview Executable GUI

2. Open SPI Controller with configuration file AD9993_14bit_500MSspiR03.cal
    a. Press Ignore in the Reset Test Failure Message Window (Figure 5)
    b. Select: File > Macro Group Open
    c. Select and open AD9993_intclk_adc_dac.mgp
    d. Press the red run macros button in the upper left hand corner of the MacroEditor window. See Figure 7.
    e. The AD9993 will run with an internally synthesized 1.0Ghz master clock. Both DACs and all 4 ADCs are operational.

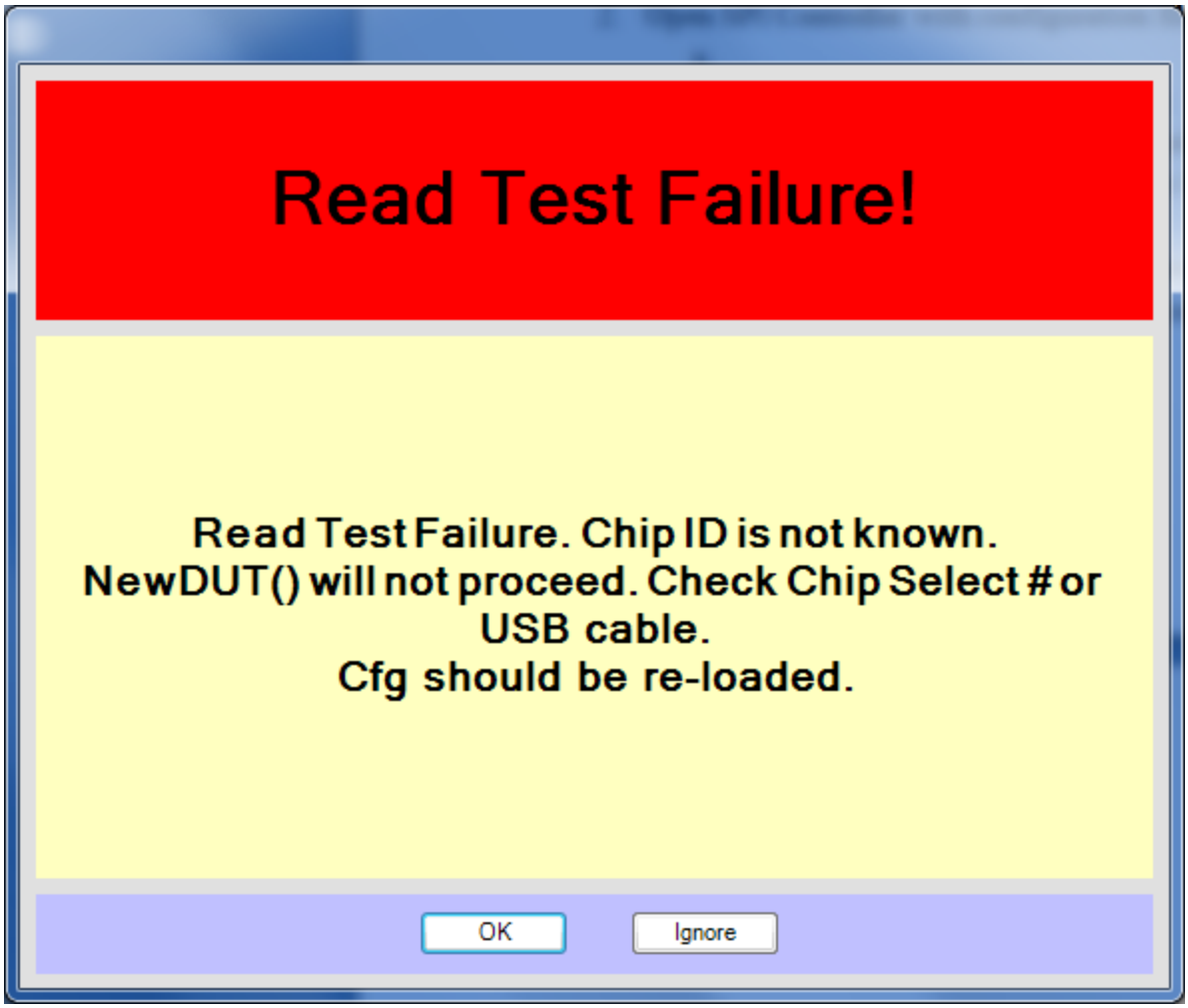

Figure 5. SPI Controller Read Test Failure Message Window

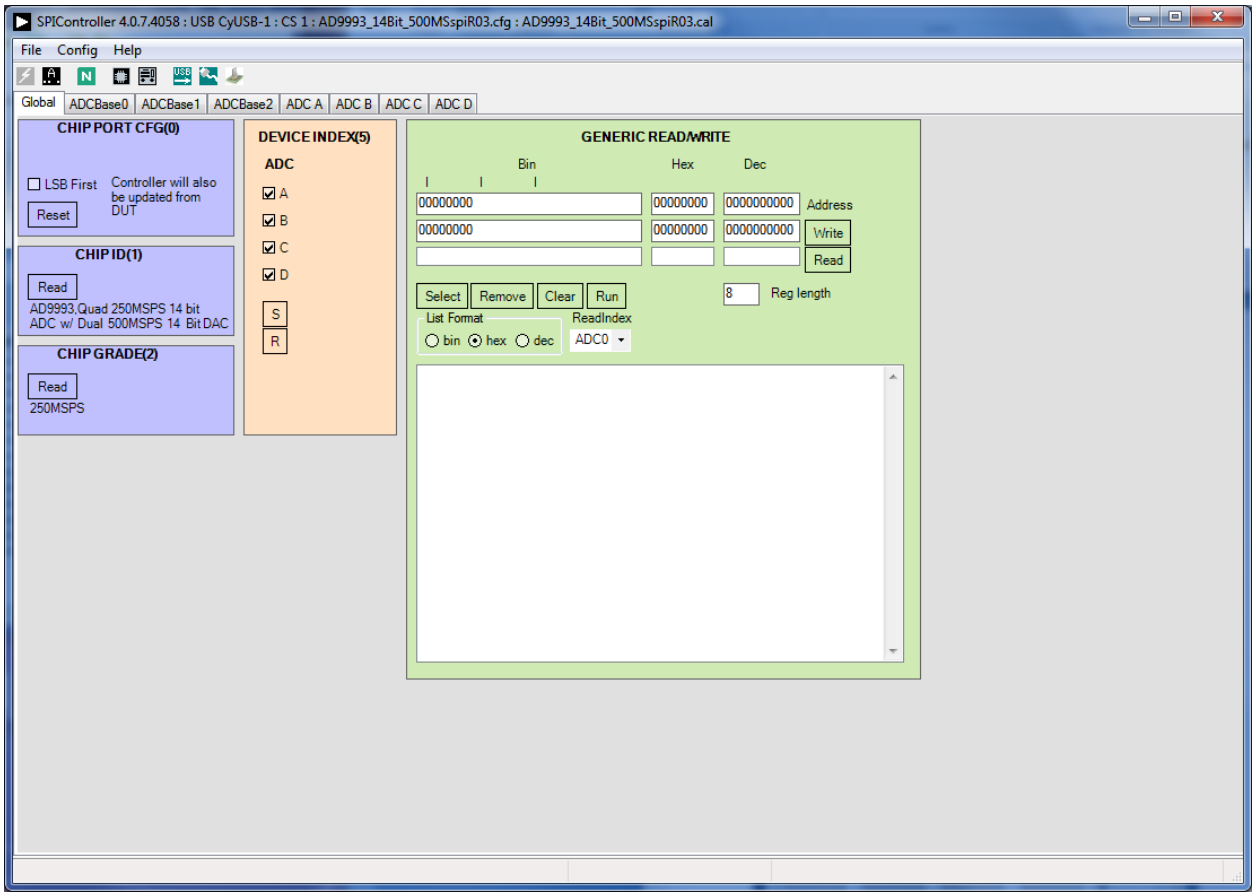

Figure 6. SPIController GUI

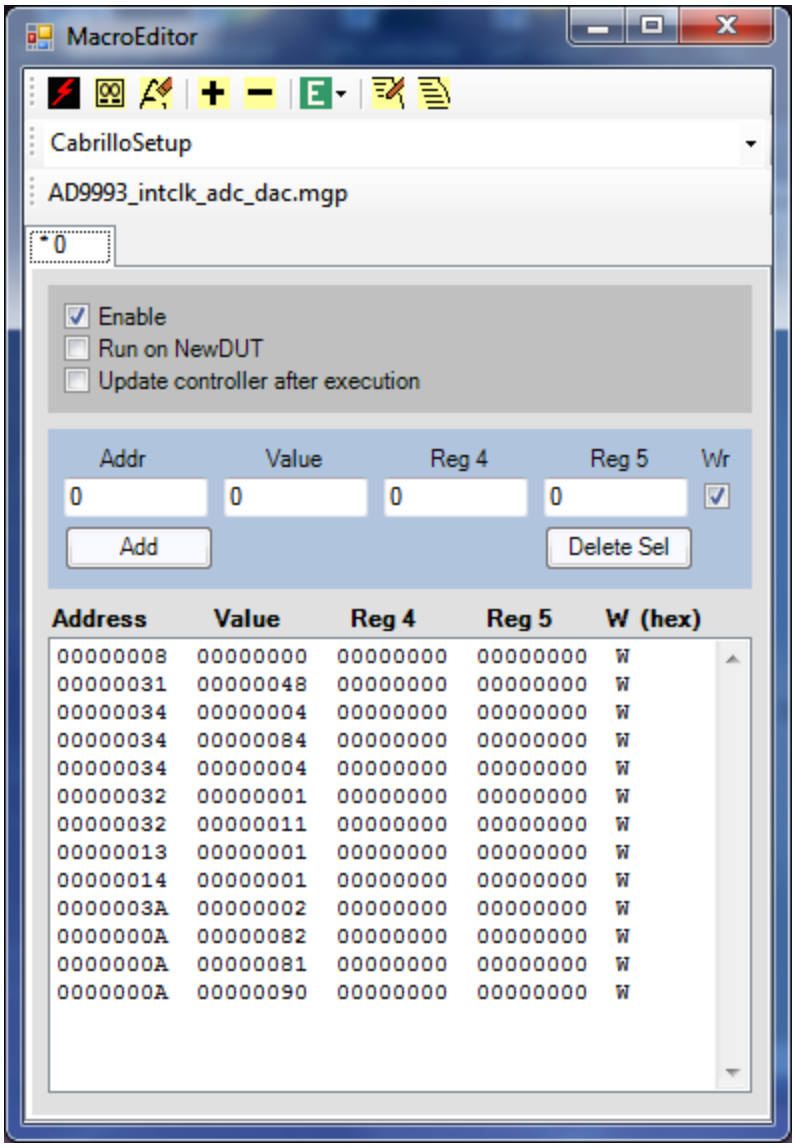

Figure 7. SPI Controller MacroEditor Widow

3. Run DPG Downloader to input digital signal to the DACs via AD9993 LVDS Data Lanes
    a. The DPG Downloader will run the LVDS pin configuration and display a 500Mhz DCO frequency
    b. Click on the Add Generated Waveforms Tab
        i. Set up a 52Mhz single tone sampled at 500Mhz as shown below
        ii. Set # bits to 14
        iii. Click Download ( ) and Play ( ). The spectrum below will appear on the output of both DACs (IOA_P and IOB_P)

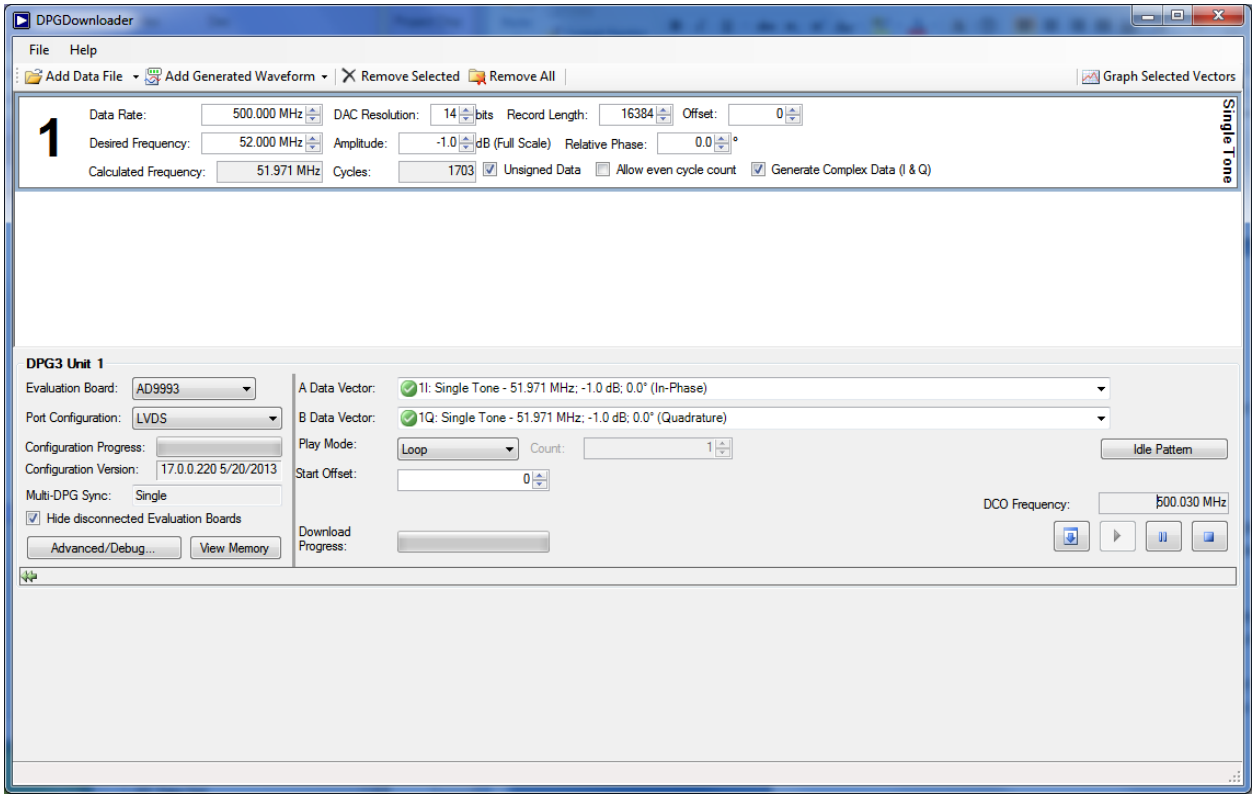

Figure 8. Fully Configured DPG Downloader GUI

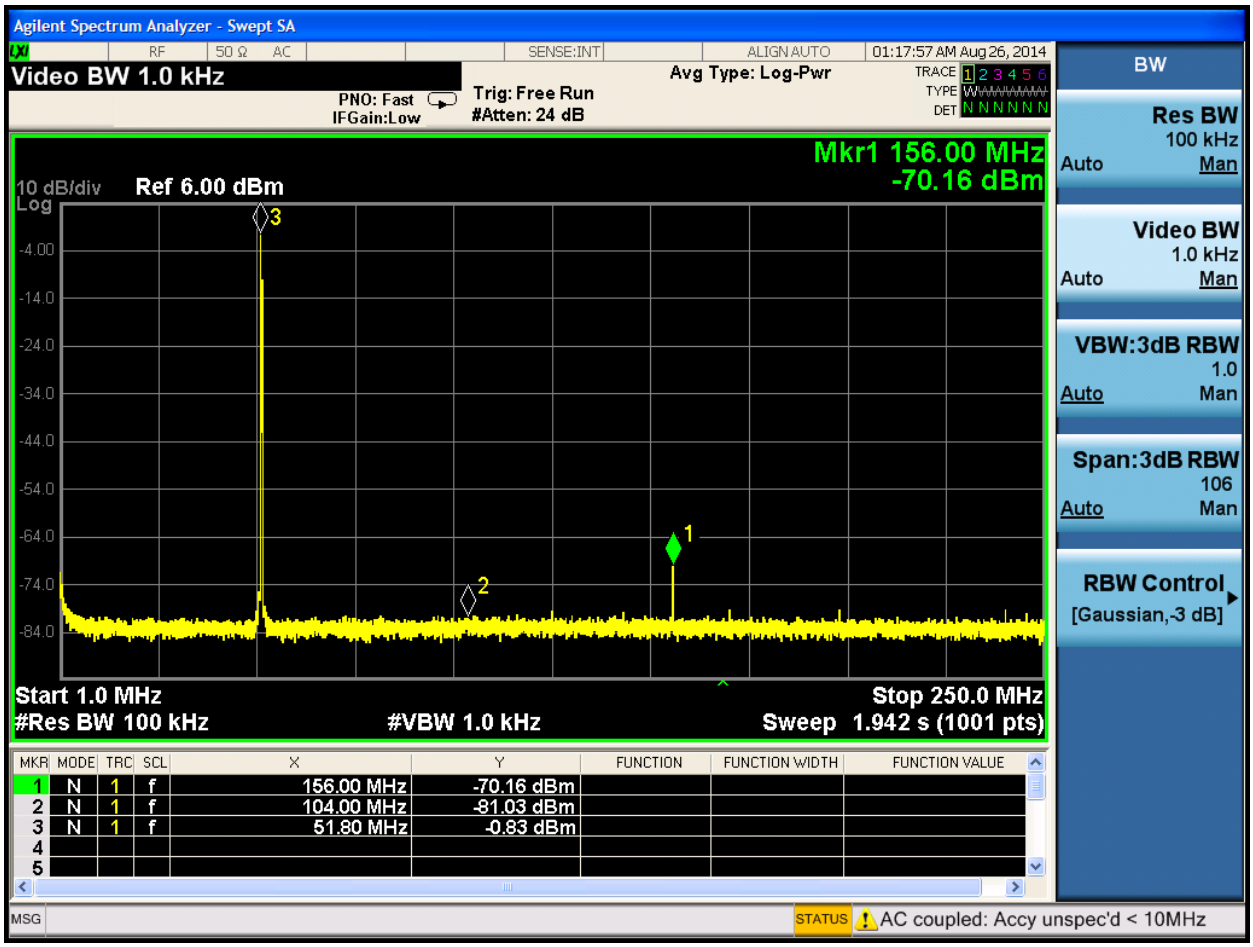

Figure 9. 52Mhz Single Tone Output of AD9993 DAC A

4. Run Visual Analog
    a. Select single_channel. vac
    b. Open ADC Capture Settings in the ADC Data Capture Box (see Figure 10)
        i. Press Capture Board tab
        ii. Program File = AD9993_ADC\fpga_dig_top_PHASE-SHIFT_n70.bin which is the HSC-ADC-EVALCZ FPGA Program File
        iii. Press General tab
        iv. Select ADC A to observe with 8K FFT
    c. Press the green run continuous button in Visual Analog GUI
    d. A continuously updated FFT Spectrum shown in Figure 10 will appear on ADC A's digital output.

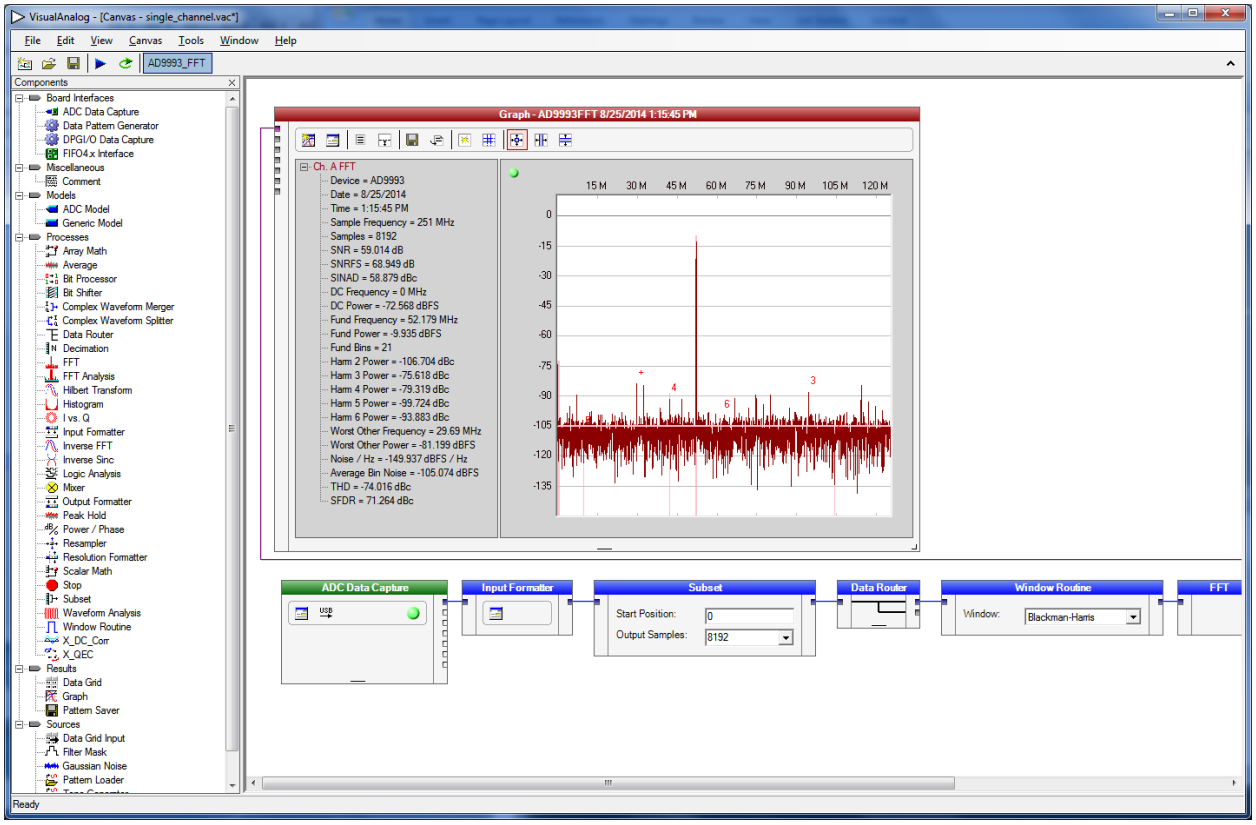

Figure 10. FFT of AD9993 ADC Output. ADC is Driven by a 52Mhz Single Tone Output from AD9993 DAC B