TEI0016 - DAQ Capture Demo

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Intention

This tool is intended to show the capabilities of the ADCs of the module TEI0016A and TEI0016B via FFT and DNL analysis. These two analyses complement each other.

To show the quality of the input signal the well known FFT (Fast Fourier Transformation) can be used. The overall precision of the ADC can be evaluated by DNL and INL (Differential / Integral non linearity) analysis.

Hint

When pressing connect, the tool **Auto Connects** to a **Ftdi** device in random fashion. Please disconnect therefore any other **Ftdi** respectively USB device.

Download

The download is a compressed folder, containing all necessary files for the demo - **Download-Link**

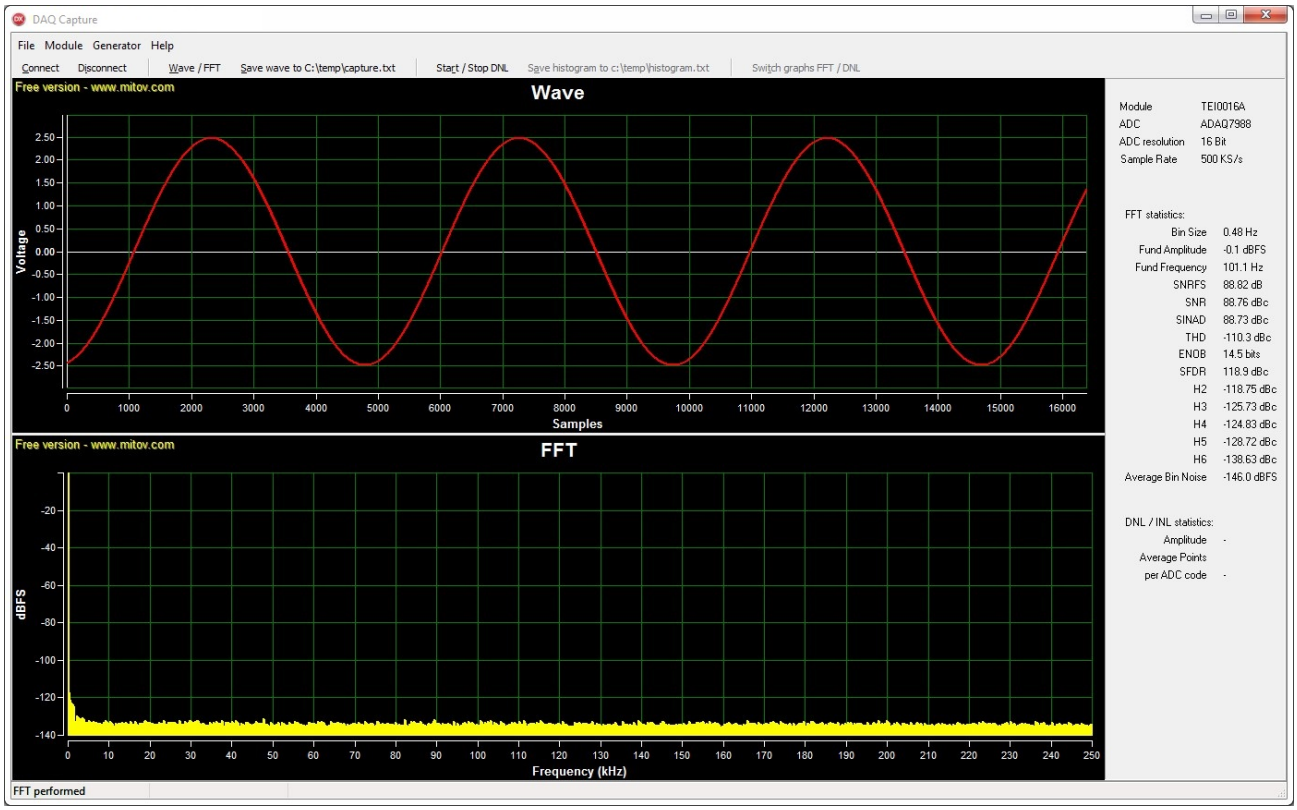
Content of the zip archive:
- The DAQ Capture Demo as an executable file for windows
- a manual for the demo as pdf-file
- the firmware for the module in a .pof-file

The compressed folder needs to be extracted, so that the contend can be used.

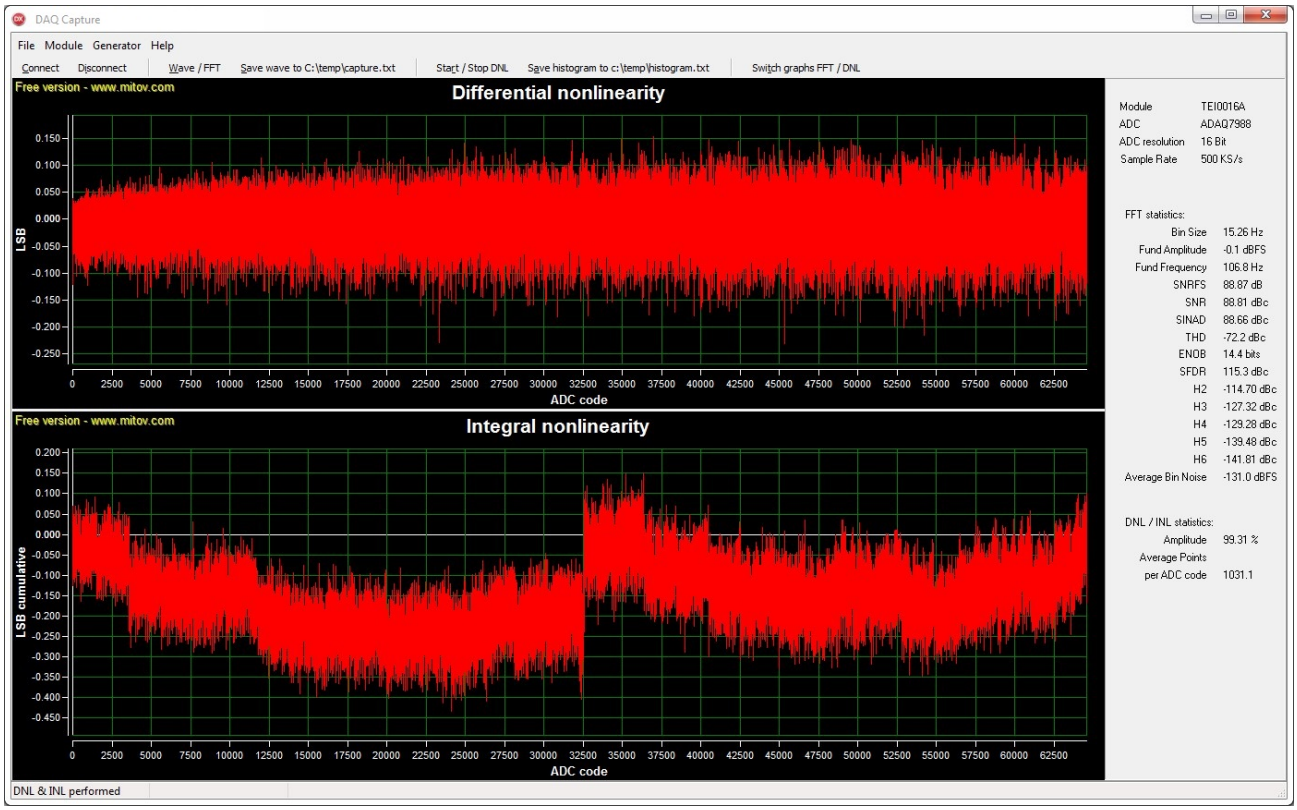
Revision History

Date	Delphi IDE	Project Build	Author	Description
2020-11-03	10.3 Update 3	TEI0023-0x-08-C8A_DAQ-Capture-Demo_V1.1.0_quartus18.1_20201103.zip	Kilian jahn	Updated firmware for TEI0023
2020-09-25	10.3 Update 3	TEI0015-0x-08-C8A_DAQ-Capture-Demo_V1.1.0_quartus18.1_20200925_1358.zip TEI0016-0x-08-C8A_DAQ-Capture-Demo_V1.1.0_quartus18.1_20200925_1358.zip TEI0023-0x-08-C8A_DAQ-Capture-Demo_V1.1.0_quartus18.1_20200925_1358.zip	Kilian Jahn	Modification of about widow
2020-09-08	10.3 Update 3	TEI0015-0x-08-C8A_DAQ-Capture-Demo_V1.0.7_quartus18.1_20200908_1342.zip TEI0016-0x-08-C8A_DAQ-Capture_Demo_V1.0.7_quartus18.1_20200908_1342.zip TEI0023-0x-08-C8A_DAQ-Capture-Demo_V1.0.7_quartus18.1_20200908_1342.zip	Kilian Jahn	Initial release

FFT - 101.09 Hz sine wave - 1024 kSamples



DNL - 101.09 Hz sine wave - 64 MSamples



Control elements

Top row:
The section **Module** contains radio buttons for setting up the parameters:

- **Gain** - Select the signal / wave pre-amplification.
- **Samples FFT** - Select the sample length of consecutive data points for the FFT analysis**.**
- **Samples DNL** - Select the size of data points for a DNL analysis.
- **Input Span Compression** - Feature of modules TEI0015 and TEI0023, which reduces ADC reference voltage to 0.8.
- **High-Z Mode** - Feature of modules TEI0015 and TEI0023, which reduces ADC current consumption.

The section **Generator** controls the square wave generator.
The section **Help** contains links to the product page of every module and information about the program.

Bottom row:

- **Connect** - Connects via UART / Serial connection to the module.
- **Disconnect** - Terminates the connection to a module.

The following buttons are only enabled when a connection is established and after an analysis has been performed. During an analysis these buttons are disabled.

Wave / FFT - Triggers a FFT analysis according to the parameters set in the section Module.
Save wave to C:\temp\capture.txt - Available after a FFT analysis, saves the measured ADC values of the previous FFT analysis. The values are stored as integers in a text-file at c:\temp\capture.txt . The folder needs to created manually.
Start / Stop DNL - Begins a DNL / INL analysis according to the parameters set in the section Module. When pressed during an analysis it terminates the analysis.
Save DNL histogramm to c:\temp\histogram.txt - Saves the histogram values of a previous DNL analysis. The values are stored as integers in a text-file at c:\temp\histogram.txt . The folder needs to created manually.
Switch graphs FFT / DNL - Switches between the different sets of graphs for FFT and DNL analysis.

Input Signal for a DNL analysis

The DNL analysis assumes a sine wave input. The validity of its results depends heavily on the quality of the sine wave input signal. The better the sine wave input signal the more meaningful the results will become.

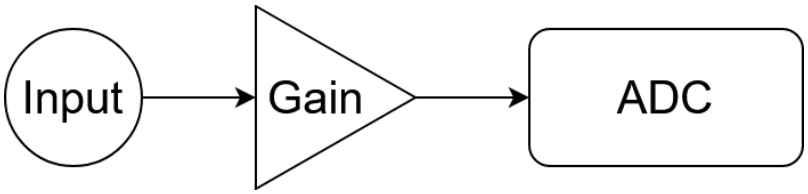
The sine wave should have an **amplitude** just above 100 %, therefore some clipping occurs and all ADC codes are present in the analysis. The sample length should ensure the **average data points per ADC code** to be **well above 150**.

These values are visible in the lower part of the statistic section to the right under **DNL / INL statistics:** .

An other aid for good results is the input frequency. The construction of the modules leads to a desired input frequency of 101.09 Hz. Best practice is to supply the input signal differentially.

Usage

Apply a signal to the modules inputs. Connect a single module to your PC and start the program. Press **Connect** for a connection to the module. A connection applies the default **Gain** of 1, enables the buttons **Wave / FFT**, **DNL / INL** and the sections **Module** and **Generator**.



Select values for pre-amplification **Gain**, **Sample FFT** respectively **Samples DNL** and module specific features as you like. Press **Wave / FFT** or **DNL / INL** to run the analysis.

During operation, the sections **Module**, **Generator** and most **buttons** will be disabled and afterwards re-enabled. Additional buttons / functions are available after an analysis.

FFT analysis:
After a FFT analysis, the graphs are plotted, the signal statistics will be evaluated and the button **Save wave to C:\temp\capture.txt** is enabled. The button stores the Integer wave values from the ADC as text-file for interaction with the demo **Data Capture**.

DNL analysis:
A DNL consists of two steps, first a FFT analysis, second the DNL analysis. Following the DNL analysis, the buttons **Save DNL histogramm to c:\temp\histogram.txt** and **Show DNL / INL** (Show Wave / FFT) will be enabled. The statistics for DNL are updated.

Disconnecting from the module or closing the program disables all module specific features and the square wave generator.