ADC Test Tool for LabVIEW

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Abstract **– An easy-to-use LabVIEW tool for ADC testing is presented. The tool provides a comprehensive collection of data processing algorithms which are able to ensure the best possible results in ADC testing, and to help to recognize bad parameter settings during the measurement. The core routines are migrated without change from our well tested MATLAB toolbox. Full test of the ADC can be done easily by almost everyone, since use of the tool needs no thorough knowledge about ADC testing. Moreover, the tool can be freely downloaded from the site: http://www.mit.bme.hu/projects/adctest/.**

I.   INTRODUCTION

Characterization of analog-to-digital converters (ADC) is an important task of measurement technology. One of the aims of the test methods defined in the IEEE Standard [1] is to characterize accurately the nonlinearities of the ADC under test. However, these methods have several weaknesses:

- The accuracy of the test methods depends strongly on the parameters of the excitation signal, but there is no method to recognize bad parameter settings.
- The aim of the tests is to measure the nonlinearities accurately, however the methods themselves provide inaccurate results if a nonlinear ADC is measured.
- Even if an ideal quantizer is excited with a signal of optimal parameter settings, the performance of the proposed methods do not achieve the theoretical bound.

A measurement system was developed using NI devices and software, which is able to handle the problems above and guarantee the quality of test results. The system is based on the NI9201 analog input, and the NI9263 analog output. Our alternative test algorithms were developed using the Mathscript node to ensure effective and fast signal processing, by the use of routines tested in MATLAB. The system is able to test A/D converters online and offline, tune the test parameters and reach (asymptotically) the theoretical bound of the precision of the results.

II.   LABVIEW TOOL FOR ADC TESTING

The main goal was to create an easy-to-handle tool which offers characterization of the ADC. The use of the tool needs no comprehensive knowledge about ADC testing. The quality of the results is ensured due to the complex data processing algorithms. However, these are totally hidden from the user so the tool can be used without special knowledge. It is able to recognize bad sine parameter settings, and in this case new parameters are recommended to ensure the accuracy of the test results. Features of the ADC test tool are the following (see details in [5]):

- FFT test
- Checking signal parameters to guarantee the quality of test results,
- Histogram test, ENOB and SINAD calculation,
- Maximum likelihood estimation of parameters.

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Figure 1. INL characteristics of the tested ADC
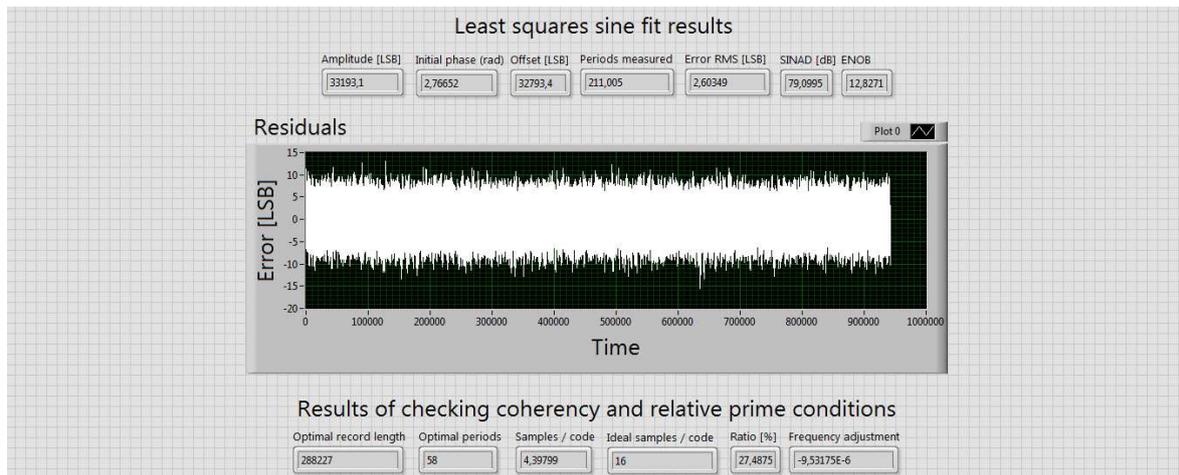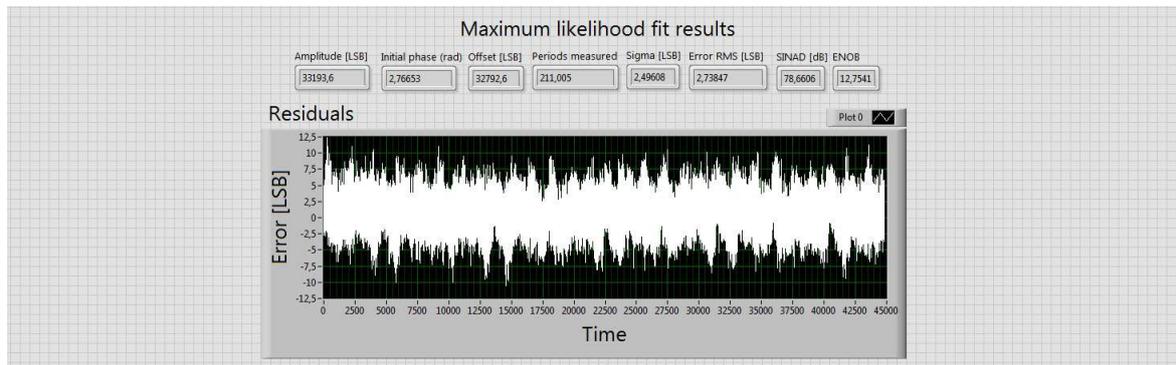

Figure 2. Checking signal parameter settings

Figure 3 Maximum likelihood estimation of sine parameters

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