Low-Cost High-Quality Signal Generation for ADC Testing

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Introduction

Research Objective

High-Quality testing of ADC

Generate

- low-distortion
- low-noise

sinewave and multi-tone signals from AWG, or DAC inside SoC

ADC testing signal

Industrial Background

- Need for ADC low-cost testing
- Need for ADC high-quality testing
- Usage of AWG with low-resolution, some nonlinearities
- Usage of DAC inside SoC for loopback test

We propose a ready-to-use technique in industry

Collaboration with industry is required

- We provide Algorithm and program data
- We require Experimental data using various AWGs and ADCs
- AWG performance demand for various ADCs in industry
- We want to
  - DSP (waveform memory), DAC, filter in used AWG
  - Unique problems in industry
  - How low-cost, high-quality the proposed method is

Proposed Test Method

Distortion-Shaping Method

Noise & Distortion Shaping DSP Algorithm Implementation

Merits

Need for only DSP program change
No need for hardware change nonlinearity identification analog calibration
Easy-to-use

Expected application area
High resolution ADC testing

Comparison with conventional technique

Conventional Low-cost AWG
High-cost AWG

Proposed Technique Low-cost AWG + Proposed Algorithm

Effectiveness is verified with simulation and experiment with actual AWG

Exploits of Proposed Method

Further Exploits

- low-distortion & low-noise
- multi-tone signal

for communication application ADC testing

Limitation

- Spurious components

for communication application ADC testing

Conclusion

Algorithm development of low-distortion, low-noise sinewave & multi-tone signal generation.

Low-cost, high-quality ADC testing

Next step

Apply the proposed techniques to the real ADC testing

Clarify how much resolution and speed for the ADC are suitable for the techniques