P074

ADC Histogram Test for Specific Codes

AMDE2018

6th December

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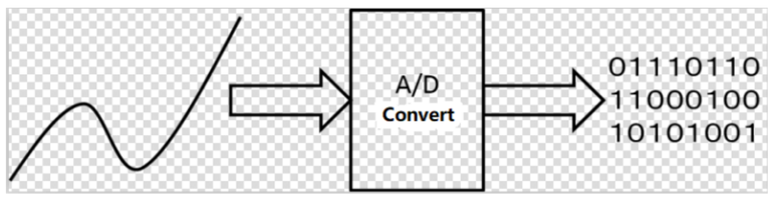
Background

Research Target

Short time, high quality testing of high resolution, low speed analog-to-digital converter (ADC)



For IoT applications

Background

Internet of Things (IoT)

Everything is connected to internet.

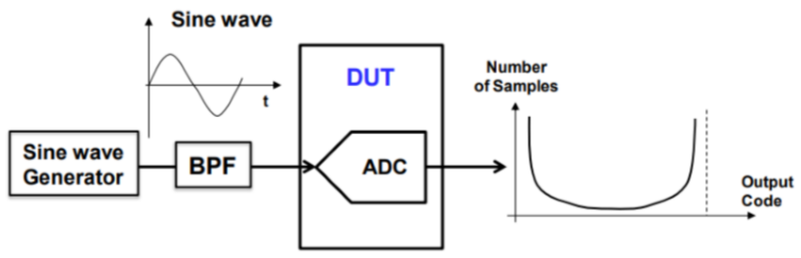
- Exchange information
- Process, analyze data on the server.

Sensor interface ADC is a key.

ADC Histogram Test

ADC test with high precision linearity

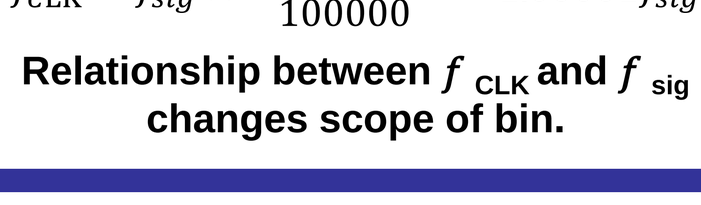
But it takes long time



Overview

Sinewave Sampling

$$x(t) = \sin\left(2\pi f_{sig}\mathrm{t} + \theta\right)$$

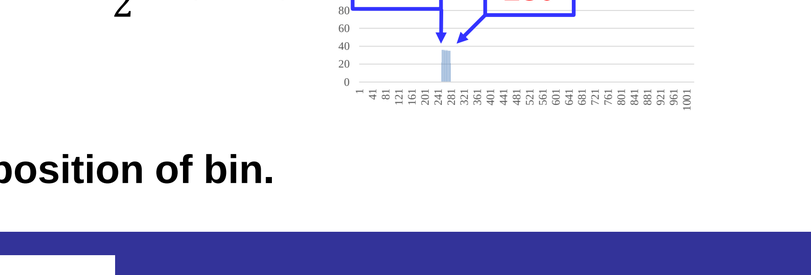


Our Approach

Shorten ADC test time by sampling only necessary range of codes.

Realize by setting proper relationship among f_{CLK}, f_{sig} and θ (initial phase)

Concentration in Specific Codes



Result

Simulation Setting (1)

$$f_{\mathrm{CLK}} = f_{sig} \times \frac{x+1}{x}$$

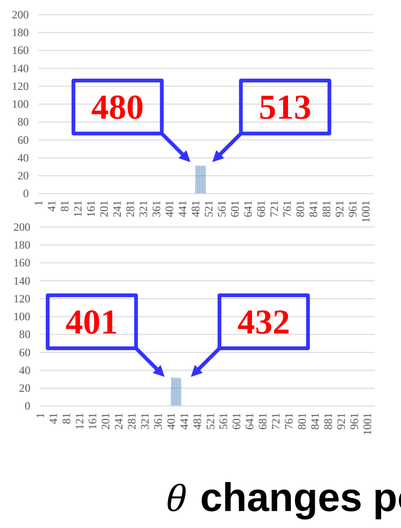
$$f_{sig} = 1000\mathrm{Hz}$$

$$f_{\mathrm{CLK}} = f_{sig} \times \frac{100000+1}{100000} = 1.00001 f_{sig}$$

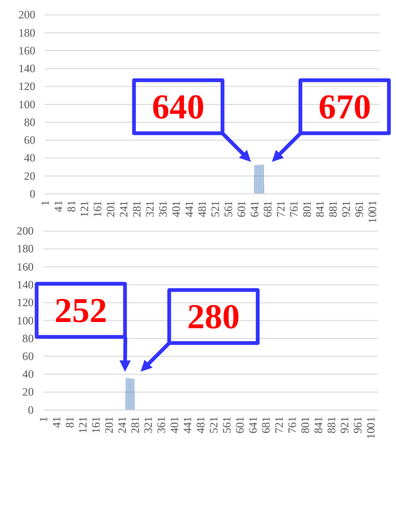
Relationship between f_{CLK} and f_{sig} changes scope of bin.

Simulation Result (1)

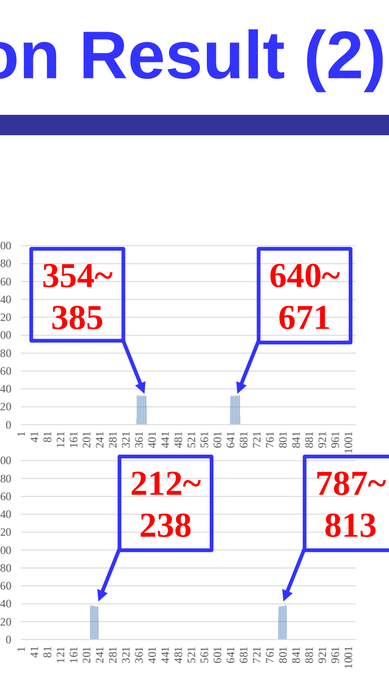
$\theta = 0$



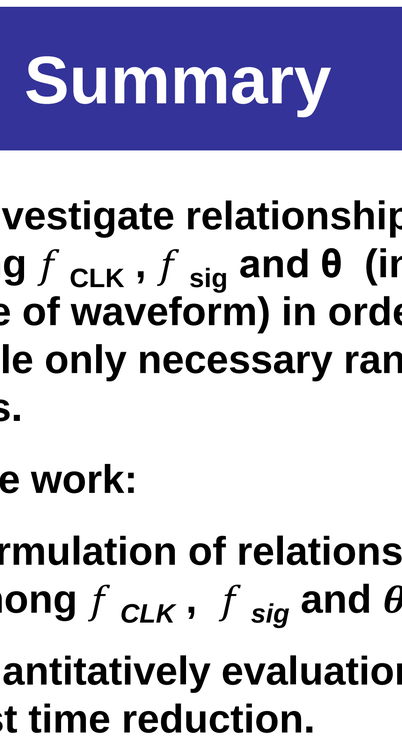
$\theta = \frac{\pi}{2} \times 0.2$



$\theta = \frac{\pi}{2} \times (-0.1)$



$\theta = \frac{\pi}{2} \times (-0.3)$



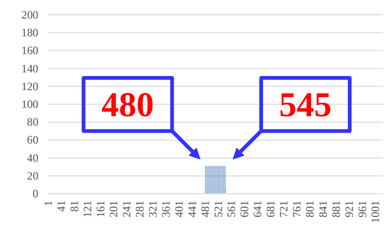
θ changes position of bin.

Simulation Setting (2)

$$f_{sig} = 1000\mathrm{Hz}$$

$$f_{\mathrm{CLK}} = f_{sig} \times \frac{2(100000+1)}{100000} = 2.00002 f_{sig}$$

$\theta = 0$



Simulation Result (2)

$\theta = \frac{\pi}{2} \times 0.2$

$\theta = \frac{\pi}{2} \times 0.4$

Summary

We investigate relationship among f_{CLK}, f_{sig} and θ (initial phase of waveform) in order to sample only necessary range of codes.

Future work:

(a) Formulation of relationship among f_{CLK}, f_{sig} and θ

(b) Quantitatively evaluation of test time reduction.