INTT Sensor Test Report

NCU

Kai-Yu Cheng, Chia-Ming Kuo, Cheng-Wei, Shih

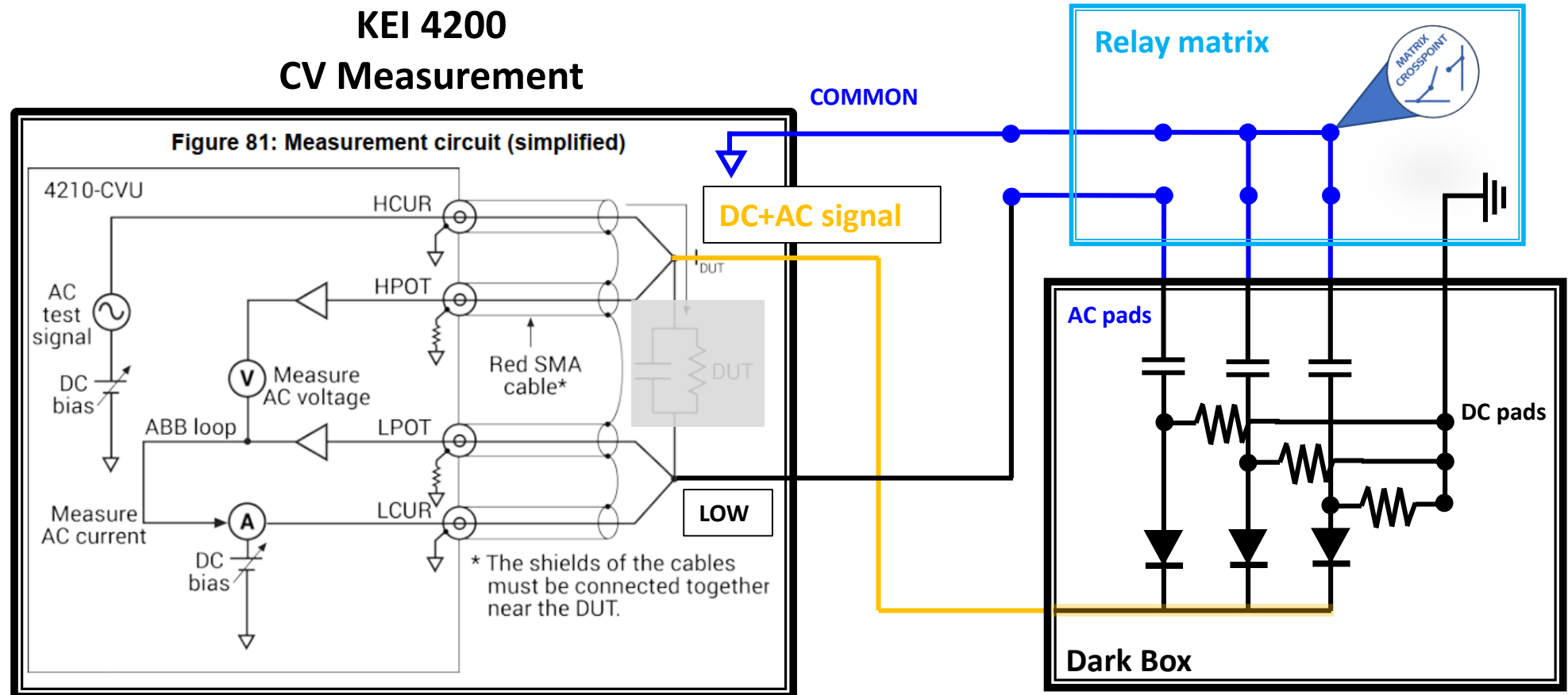# List

- The visual inspection

  - All are fine. The photos put in google driver. https://drive.google.com/open?id=1-Uo1XnLir18zpbNtpNplJfQGqDDTb4Z-

- The measure parameters test, such as frequency and delay time.

- The status of database.

KEITHLEY 4200-SCS CV Measurement System of AC readout Sensor

- Describe system with simplified circuit
- The circuit shows the contact situation when we measure one channel. Target channel connect to low port to measure current and others connect to common port
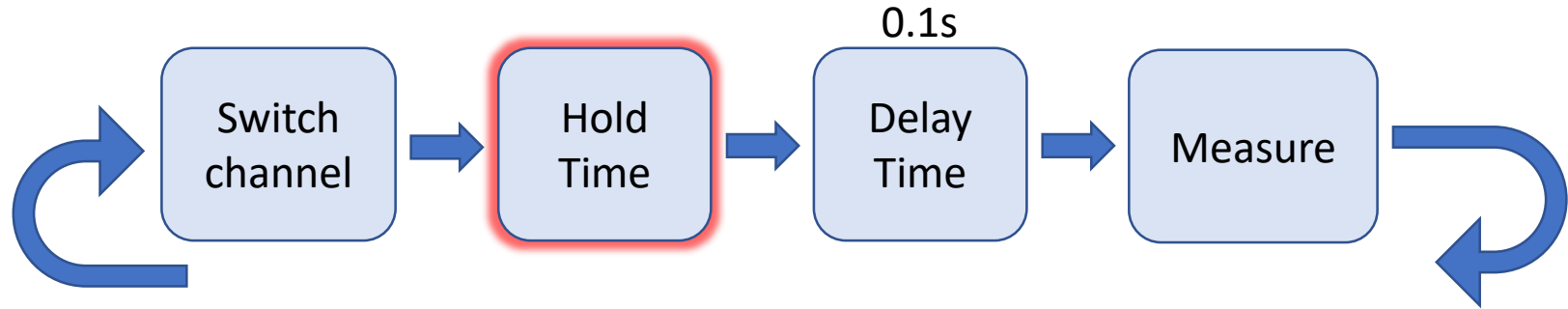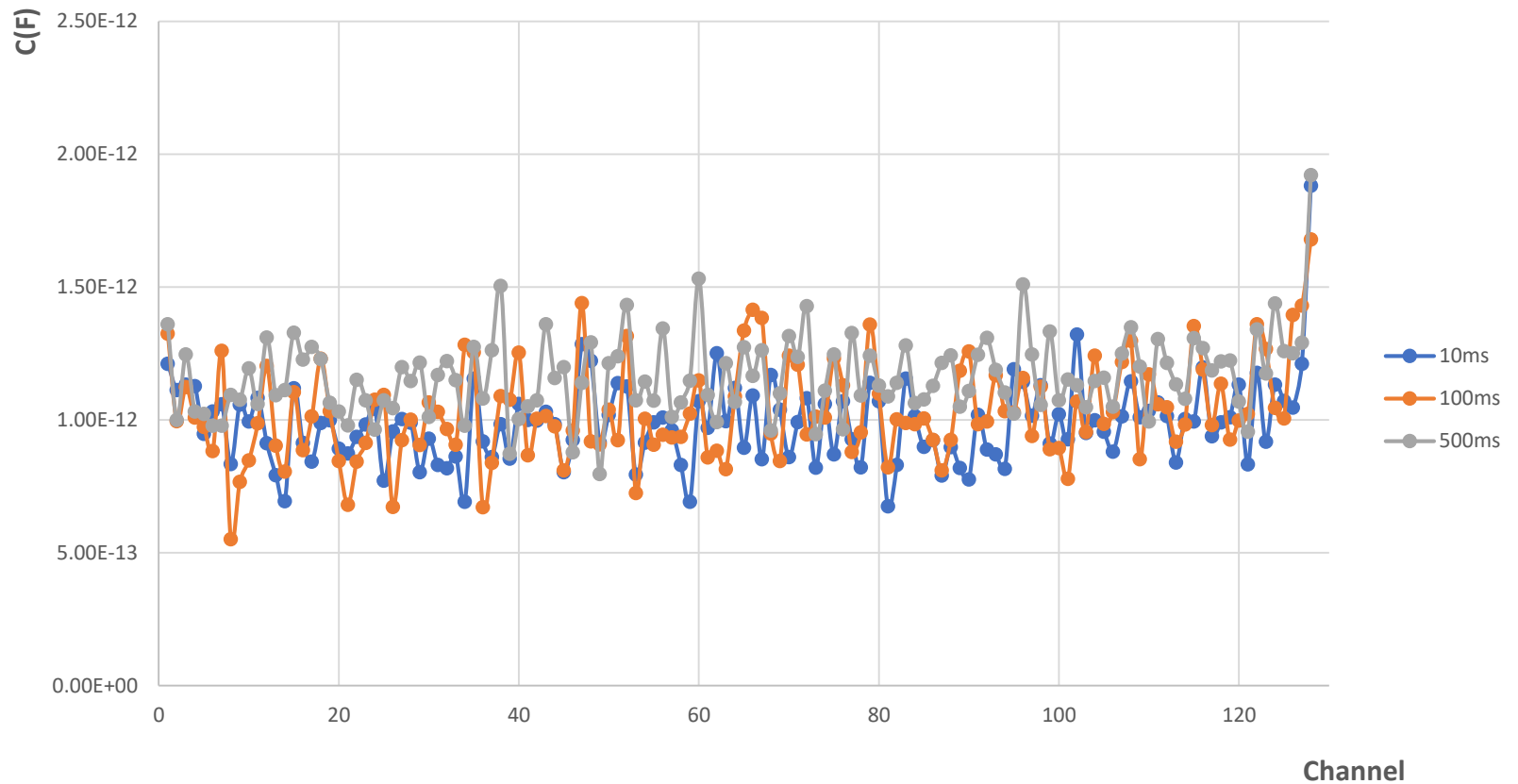

KEI 4200
CV Measurement

Figure 81: Measurement circuit (simplified)

Hold Time Test

Delay time   : 0.1s
Voltage   : 100V
Frequency   : 10kHz

0.1s

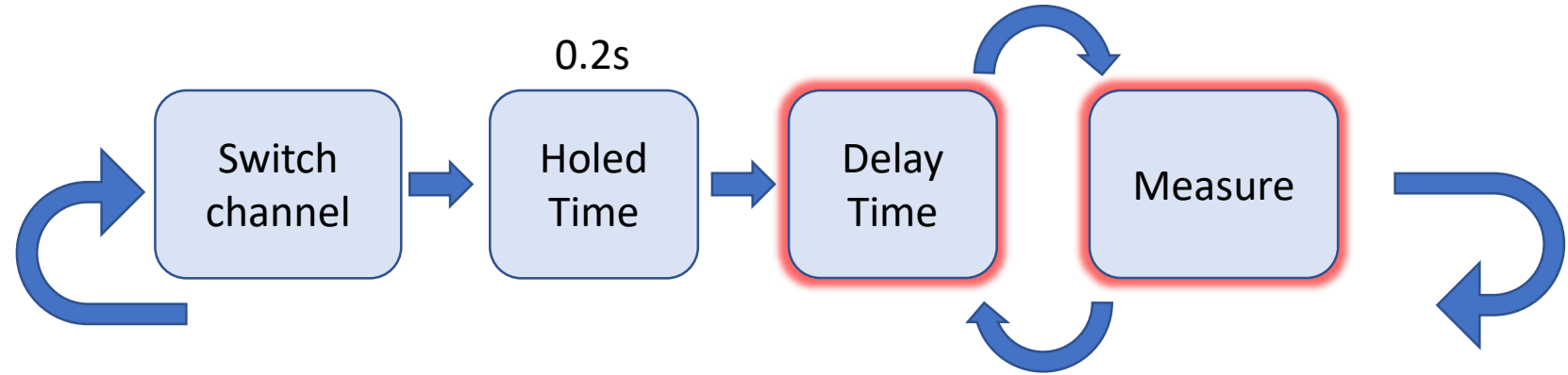Switch channel → Hold Time → Delay Time → Measure

- When matrix switch to next channel, the measurement will start in hold time.

- The delay time is functional when multi-sample measurement (next page). In one sample measurement, full delay time is the sum of hold and delay.

- When hold time (or total delay time) >100ms, the result are similar.

C(F) vs Channel

Legend: 10ms, 100ms, 500ms
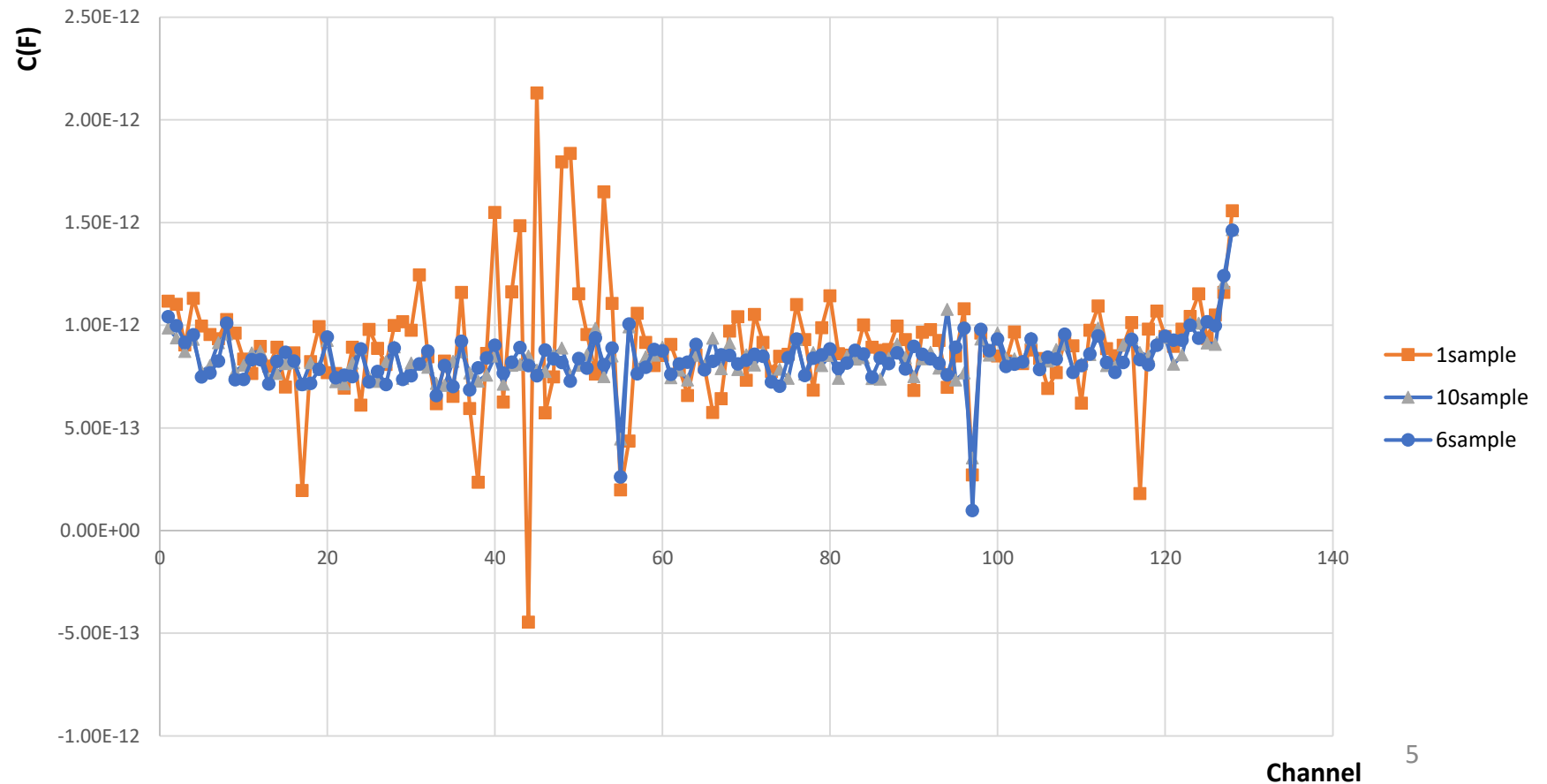
Multi-Sample Test

Holed time   : 200ms
Delay time   : 0.1s
Voltage   : 100V
Frequency   : 10kHz
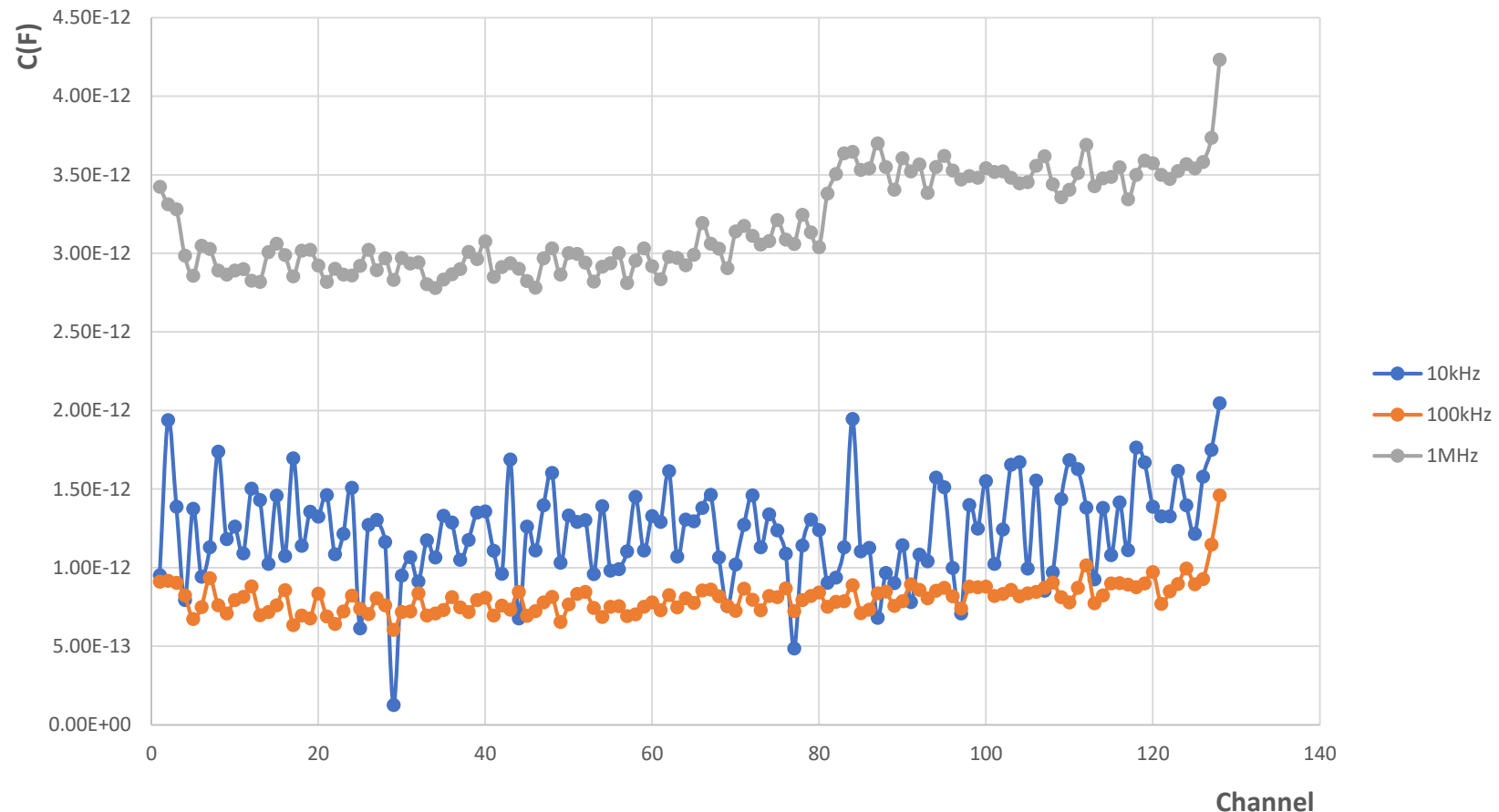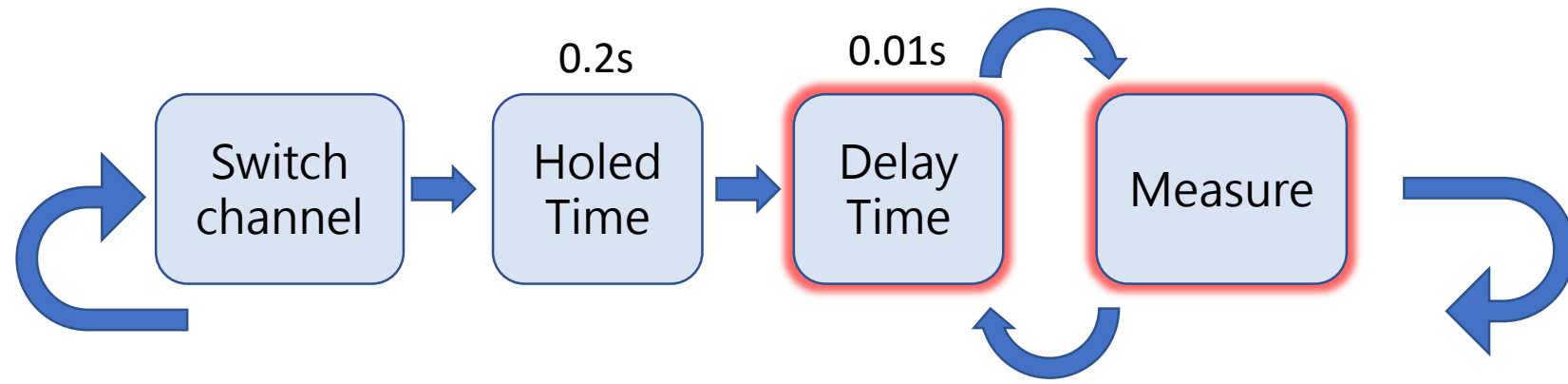
- The means of 6 or 10 samples are similar.

- Also try repeat with 10ms delay, the result also fine.

0.2s

Switch channel → Holed Time → Delay Time → Measure

Frequency Test

Holed time   : 200ms
Delay time   : 10ms
Voltage   : 100V
Frequency   : 10kHz
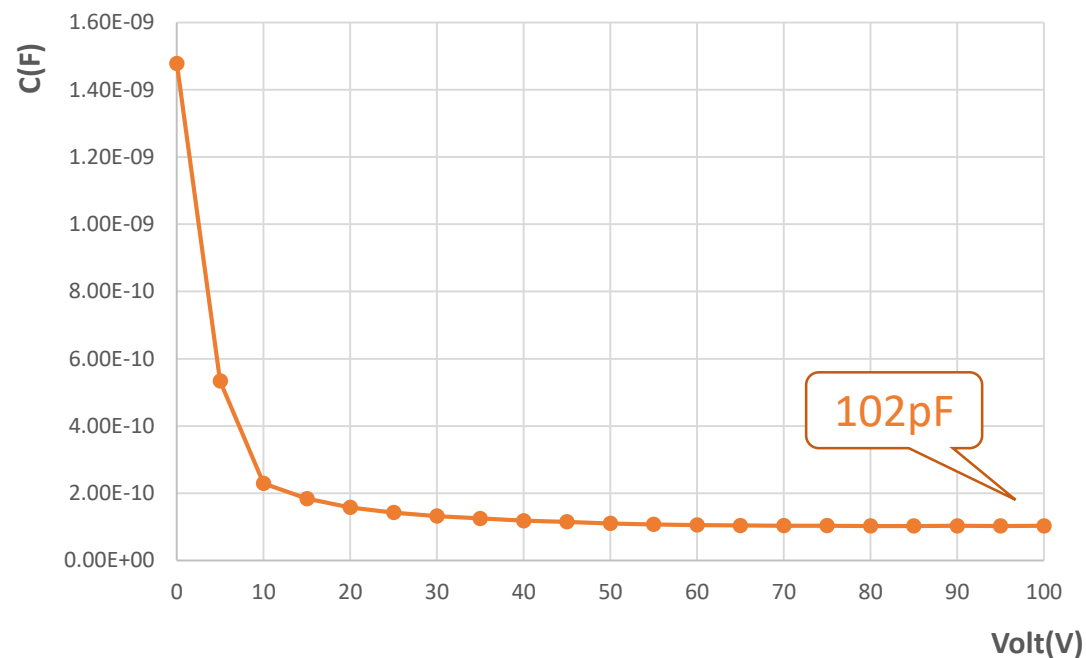Sample   : 9

- HAMAMATSU test CV with 1kHz signal, but our system doesn't work in 1kHz.

- The capacitances are similar in 10kHz and 100kHz, but 100kHz is more stable.

- The 1MHz is affected by cable or system, because the frequency is close to high-frequency measurement (>5MHz).

```
      ┌──────┐    ┌──────┐    0.2s        0.01s
 ──►  │Switch│ ──►│Holed │ ──►│Delay │ ⟲ │Measure│ ──►
      │channel│   │Time  │    │Time  │    │       │
      └──────┘    └──────┘    └──────┘    └───────┘
```


2020/5/6

6

Compare Result

- Compare the result between single channel, one chip and HAMAMATSU inspection.

- My result come from the bad sensor, so the sensor is different with HAMAMATSU inspection

- The ratio between single channel and one chip is correct.

Bad Sensor
Single channel :   0.8pF @100V
One Chip: $0.8 * 128 = 102.4$ 102pF @100V

Full sensor(expect):   1632pF @100V

HAMAMATSU(full sensor):   930pF @100V

One Chip Measurement (Type A)

Data Base

- During the parameters test, I found sometimes the few channel result is like the probe floating, but when I check the pad the probe already touch to the pad. In this situation, usually repeat measurement few times could back to normal result.

- I write another program to overwrite the single channel result, but need add comment to describe this value is upgraded and why we re-measure it.

- To put HAMAMATSU inspection and visual inspection, I prefer to create different tables to save data, because the structure is different. Therefore, the data base will have one table to save HAMAMATSU inspection and another table to save visual inspection.

- Still study how to link the database to web page and plot the curve on website.

    - For plot: Highcharts, jFree Charts, Google Charts API…

➢ Schemas :
➢Tables : Sensor_ID_NCU
 ➢Columns : key_ID
   Chip
   Channel
   Capacitance
   …
➢Tables : Sensor_ID_HAMAMATSU
 ➢Columns : Volt
   C
   I
➢Tables : Visual_Inspection
 ➢Columns : Sensor_ID
   Comment
   Photo_link

Summary

- In the visual inspection, all sensor are good.

- 100kHz test signal is better in our system. Using 200ms hold time, 10ms delay time and measure 9 times could give more stable result and doesn't spend long time.

- If just calculate the measure time, scan one chip in above setting is taken 6 min:20 sec. If consider the calibration of position and re-measure some channels, the time of finish one chip testing is about 8-12mins.

- Keep learn how to create website and select the data to plot on website.