Meeting 2016_11_23

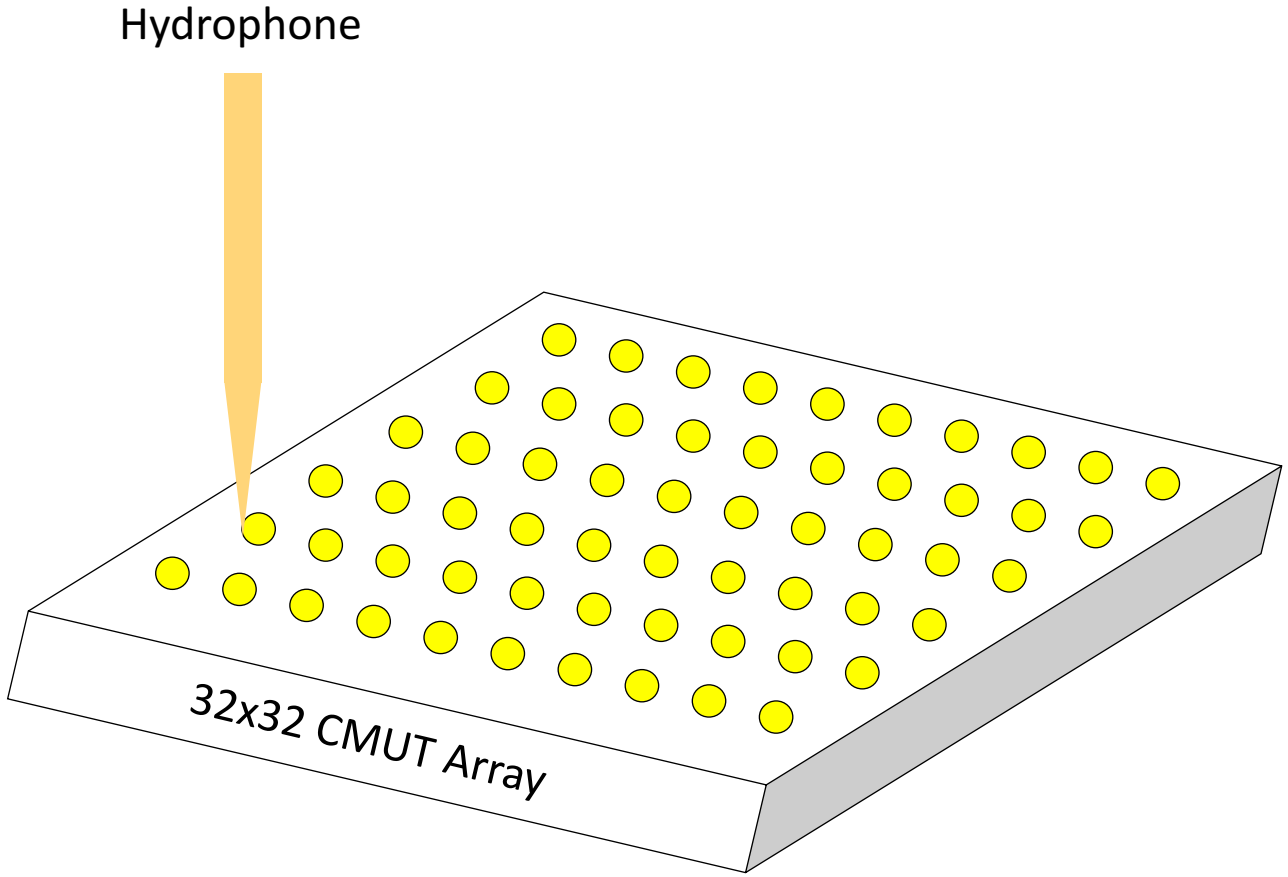
Ji Hoon Jang

Update

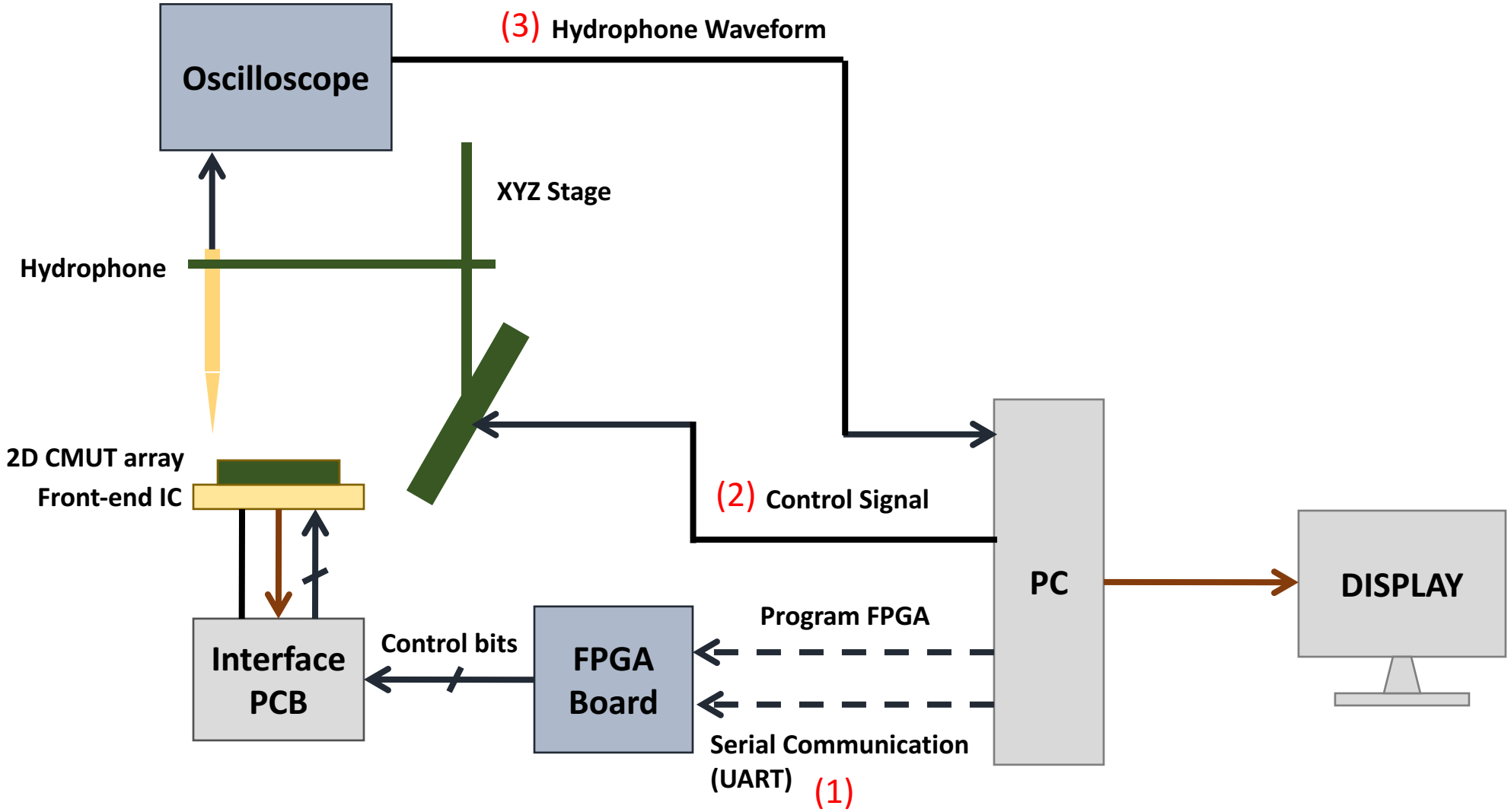
- HIFU test
  - Uniformity Test
    - GUI Program
    - Measurement Results

HIFU Test – Uniformity Test

- Method
  - Using the imaging pulser, pulse one element at a time and receive the pulse using the hydrophone. Then, compare measured pressure among transmit elements to evaluate the uniformity.
  - In total of 960 beams for 960 elements, motorized xyz stage moves the hydrophone for 960 places.



Top-Level Architecture



Impedance_Simple

KY_RECT32_UNIFORMITY TEST

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Set XY location of a, b, c, d

XYZ position

	X[mm]	Y[mm]
a	1	1
b	1	30
c	32	30
d	32	1

Row 32 Column 32

a position | read | plot

Move XYZ stage to specific points

Motorized Positioner

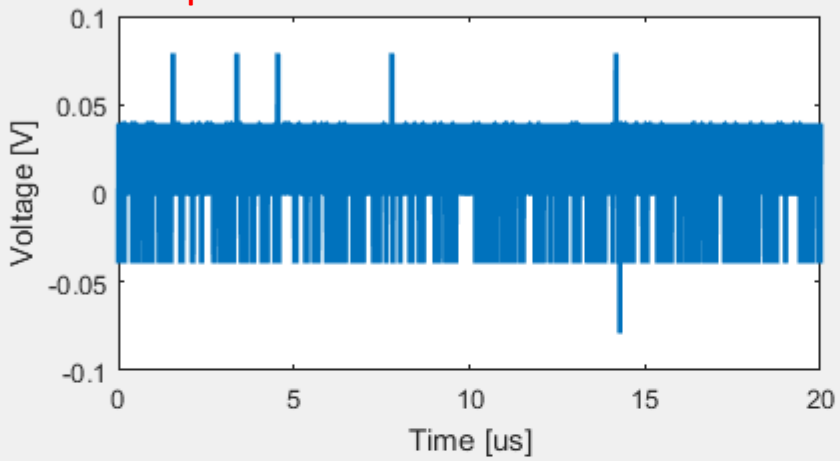
X[mm] Y[mm] Z[mm]

Row 4 Column 4

Move

Array

Scope measurement



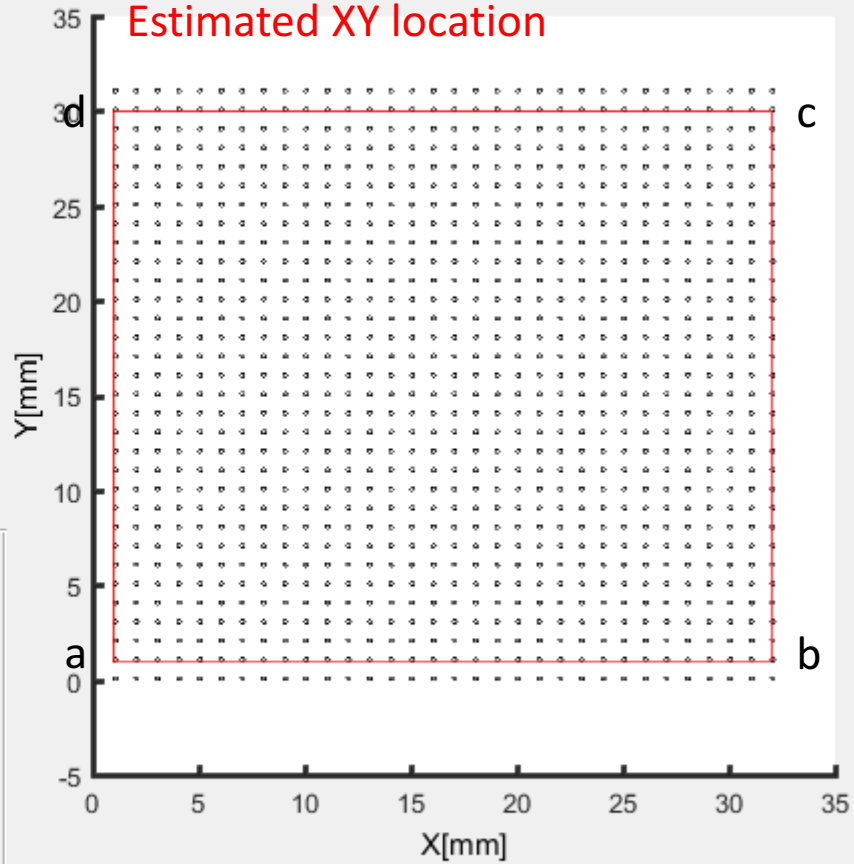
Parameter for communication

Input List

DC Start	DC Stop	DC Step	Row Start	Row Stop
35	45	10	1	2
AC Start	**AC Stop**	**AC Step**	**Col Start**	**Col Stop**
			1	2

FPGA COM: COM14 Baud Rate: 9600 Scope Sample Size: 5000 Channel Select: Ch1

Estimated XY location



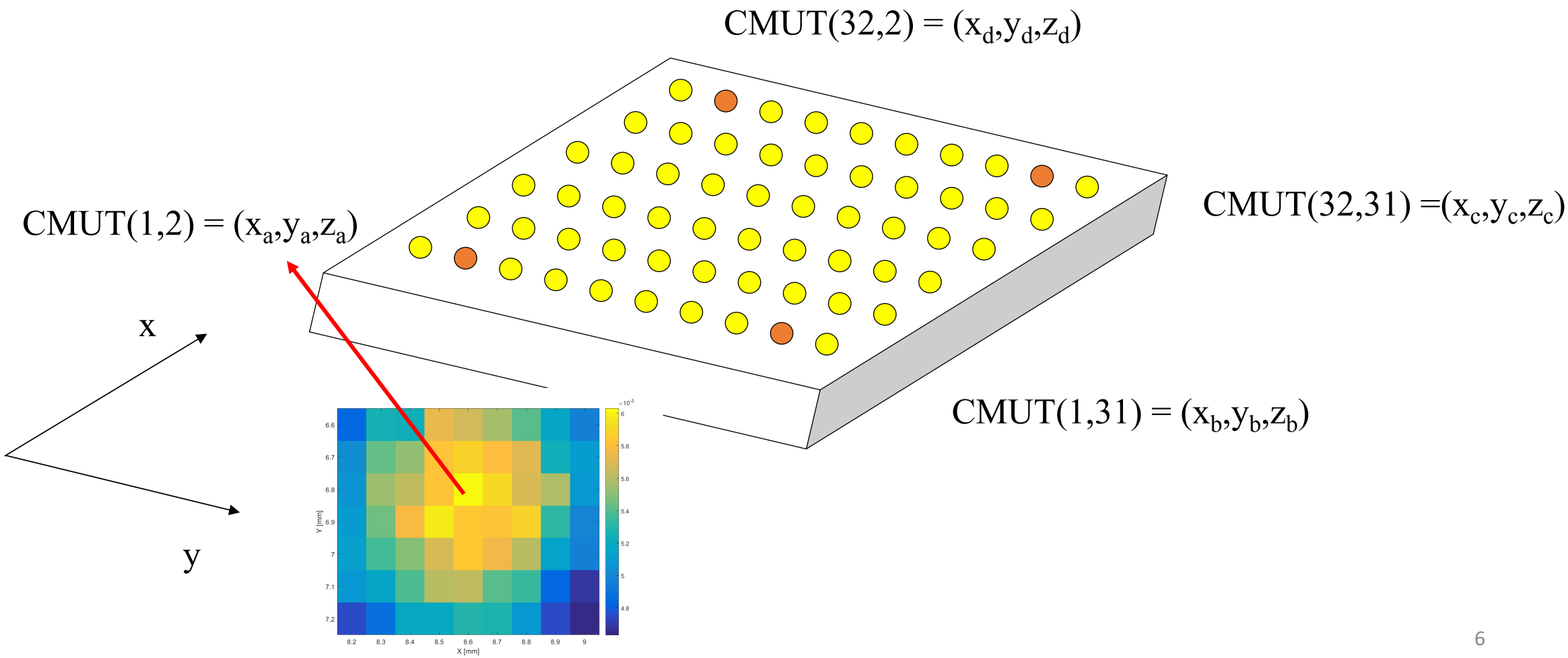
Message: C:\Users\JiHoon\Documents\MATLAB\KY_SCAN_DATA\test2.MAT Saved

Start Measurement

File Name

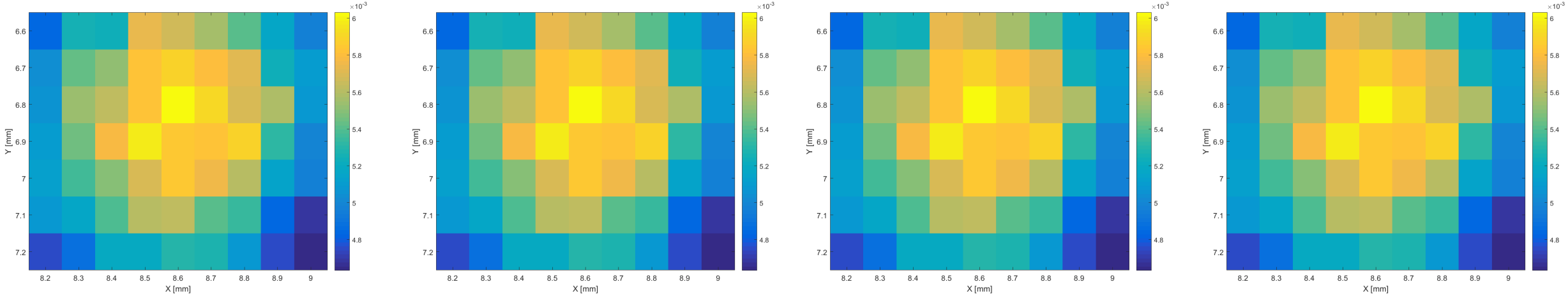
C:\Users\JiHoon\Documents\MATLAB\KY_SCAN_DATA\test2

Uniformity Test - Calibration to find X, Y points



Uniformity Test - Calibration test

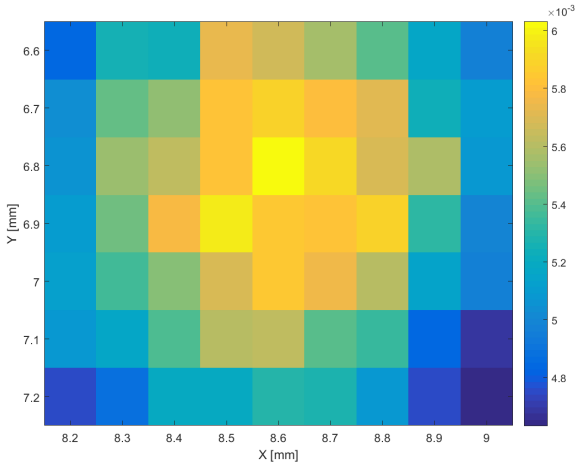
$CMUT(1,2) = (x_a, y_a, z_a)$ $CMUT(1,31) = (x_b, y_b, z_b)$ $CMUT(32,31) = (x_c, y_c, z_c)$ $CMUT(32,2) = (x_d, y_d, z_d)$



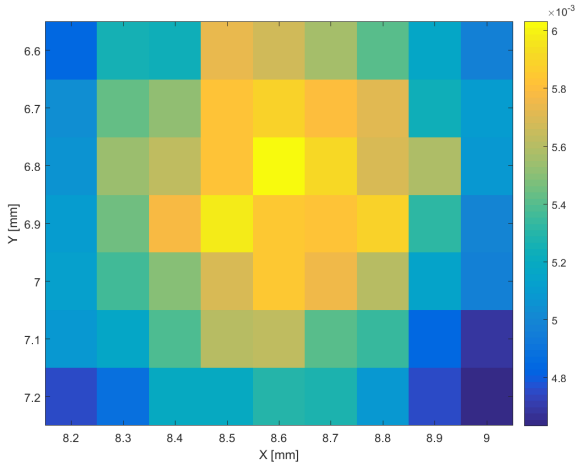
- Based on these coordinates, the locations of every elements are intrapolated and extrapoltaed.
- Then, the hydrophone was moved to top of the specific elements and scan the area to check if the location is matched to the focus.

Uniformity Test - Calibration test

$CMUT(5,10) = (x_a, y_a, z_a)$



$CMUT(22,26) = (x_b, y_b, z_b)$

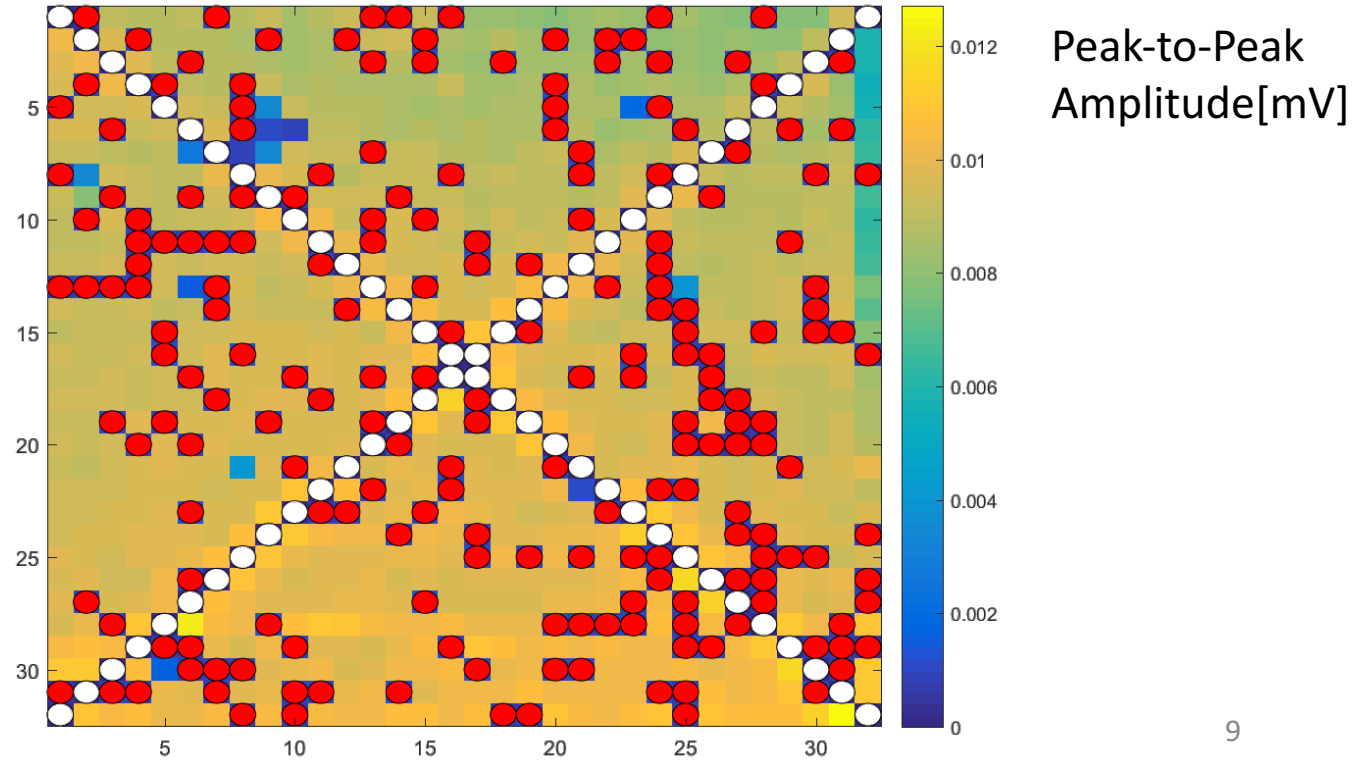


- Even though it is not exactly at the focus, the location is near the focus. The difference of peak-to-peak amplitude is less than 5%.
- The estimation of the location of the elements is relatively correct.

Uniformity Test – Measurement Results

- It took about 5 hours to scan every 960 elements.
- Here is the measurement result overlapped with impedance map.
- In the figure, it shows that the amplitude is quite uniform around the array. Also, there are 13 more elements that don't fire even though they are connected to IC.

- The color represent the peak-to-peak amplitude of the burst waveform.
- The white circle shows where the receivers are and the red circle shows where the disconnected element



Summary & Next Step

- UART communication was developed and the calibration of the element location was interpolated and extrapolated based on four locations.
- The peak-to-peak amplitude of the hydrophone waveform for each element was plotted.
- This CMUT array is relatively uniform.
- The next step is
  - To measure the surface pressure of the element using the burst mode
  - To adjust the phase of 8 channels to increase the focus gain