Programming Strategy

- First determine **GSel** based on the desired approximate transfer gain (approx. 50 – 200 mV/fC).
- Then depending on the value of the input capacitance (Cin), program **BWSel** to achieve fast integrator response without ringing.
- For Cin = 2 pF (1.5 pF detector + 0.5 pF parasitic):
  - If **GSel** = 000, set **BWSel** = 00000
  - If **GSel** = 010, set **BWSel** = 00100
  - If **GSel** = 100, set **BWSel** = 01000
  - If **GSel** = 110, set **BWSel** = 01100
- For Cin = 1.5 pF (1 pF detector + 0.5 pF parasitic):
  - If **GSel** = 000, set **BWSel** = 00001
  - If **GSel** = 010, set **BWSel** = 00110
  - If **GSel** = 100, set **BWSel** = 01010
  - If **GSel** = 110, set **BWSel** = 01110
- For Cin = 1 pF (0.5 pF detector + 0.5 pF parasitic):
  - If **GSel** = 000, set **BWSel** = 00010
  - If **GSel** = 010, set **BWSel** = 01000
  - If **GSel** = 100, set **BWSel** = 01110
  - If **GSel** = 110, set **BWSel** = 10101
- Program **Fb1Sel** based on the desired fall time constant
- Then program **N2Sel** to achieve the desired rise time/peaking time (rise and fall times will have some effect on the transfer gain)
- Program **Vref** to the lowest value possible that allows linear response (nominally 00)
- Based on the transfer gain, set the desired comparator thresholds

Physics	Dec	Bin
GSel	2	010
BWSel	4	1000

Relevant setting for INTT if the strip capacitance is > 2pF

Nevis	Dec	Bin
GSel	2	010
BWSel	8	1000

Relevant setting for INTT if the strip capacitance is ~ 0.5pF

From FPHX Operation Manual

Strip Capacitance

FVTX NIM

The strip length increases with radius on the sensor, and goes from 3.4 mm at the inner radius to 11.5 mm at the outer radius, with a pitch of 75 μm in the radial direction. Each sensor covers 7.5° in ϕ, and since the strips are perpendicular to the radius, they make an angle of 86.25° with respect to the centerline, as can be seen in Fig. 4.

The data words are output over two LVDS serial lines at up to 200 MHz clock rate. The total power consumption of the FPHX is ∼390 μW per channel. The noise, when the chip was wire bonded to a sensor with strips ∼2–11 mm in length (∼1–2.5 pF), was simulated and measured to be below the design specification of 500 electrons.

There are discrepancy between the actual measurement by Kaiyu, Hamamatsu, and expected value by simple scaling from FPHX by the length of the strip.

Strip	Thickness [μm]	Width [μm]	Length [mm]	Capacitance [pF]	Measurement (Kai-Yu)	Hamamatsu
FVTX			2 ~ 11 mm	1 ~ 2.5		
INTT-Type-A	320	78	12mm	2.5*	~ 1 [pF]	0.64 [pF]
INTT-Type-B			18mm	3*		

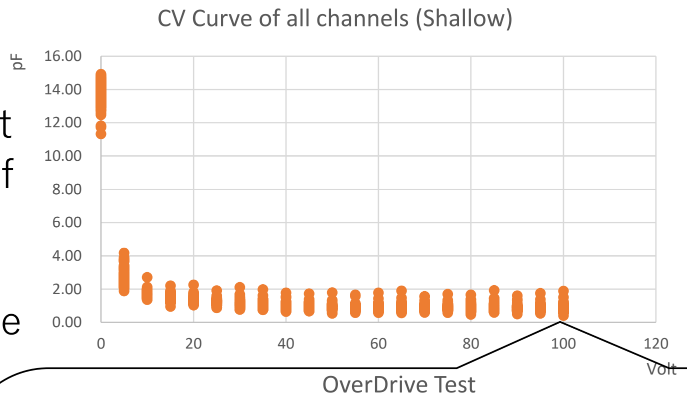
*Simple scaling from FVTX

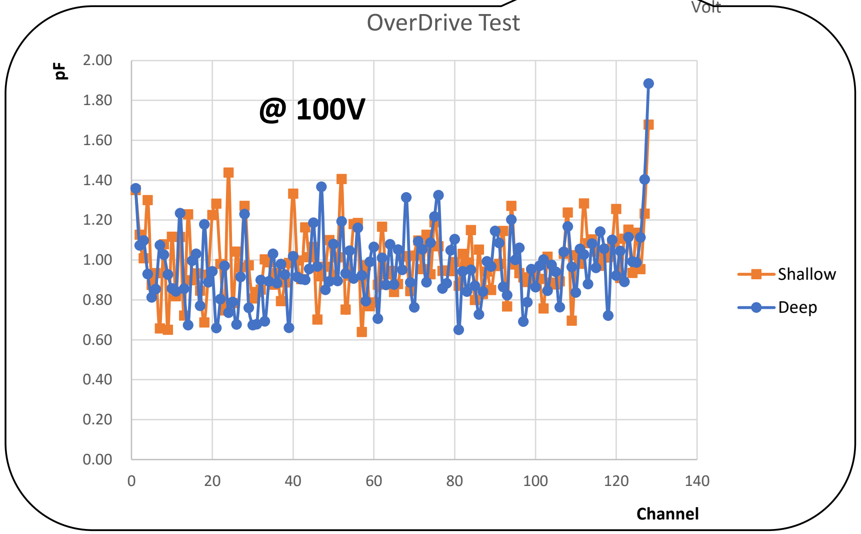
Kai-Yu's Capacitance Measurement

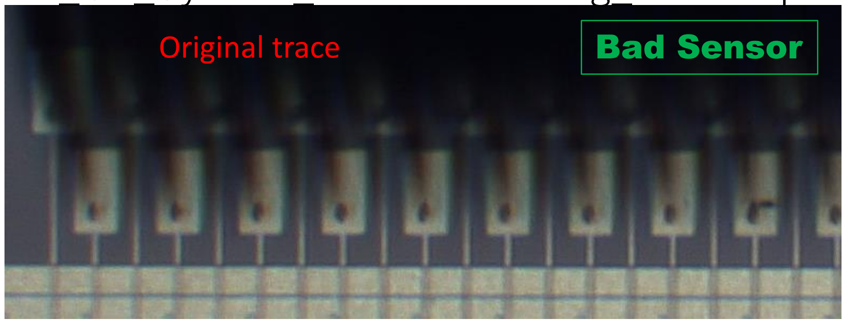
INTT_CV_System_BiWeekMeeting_200422.pdf

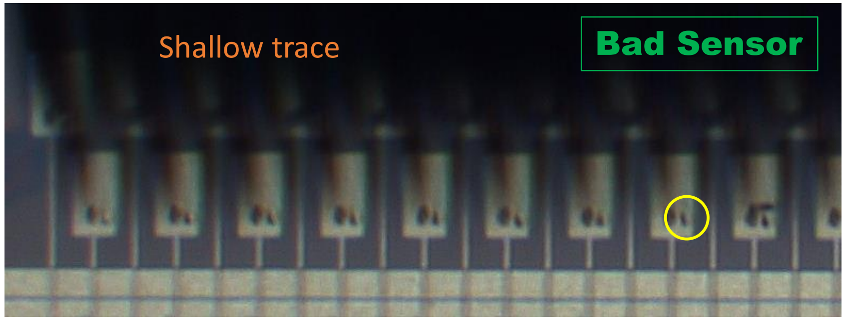
~1pF
- Is this measurement pure capacitance off the silicon?
- Don't know if the effect of readout line

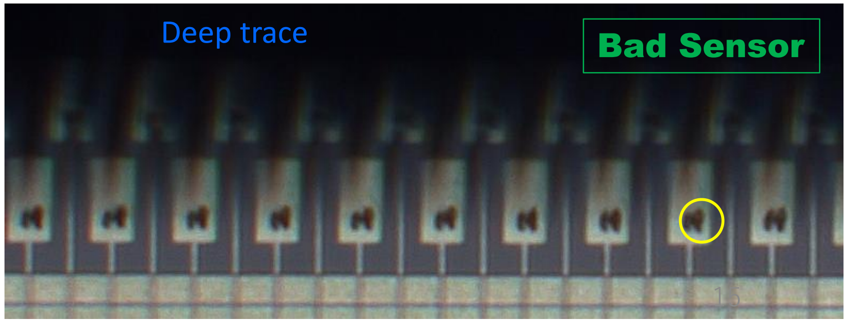
Trace Test (in Bad Sensor)









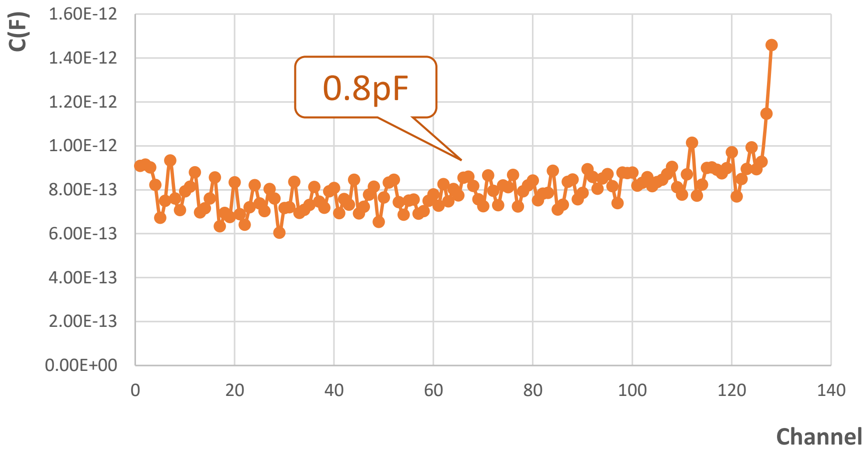


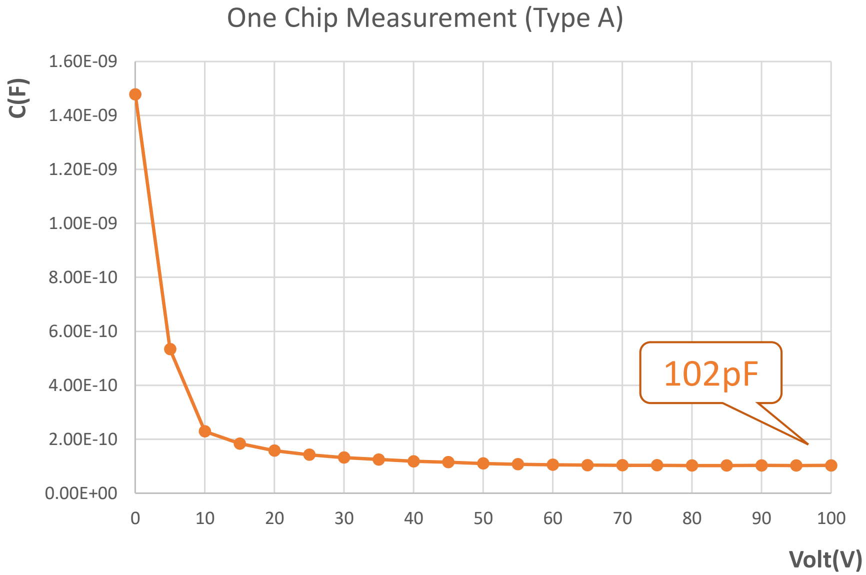
Compare Result

- 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.

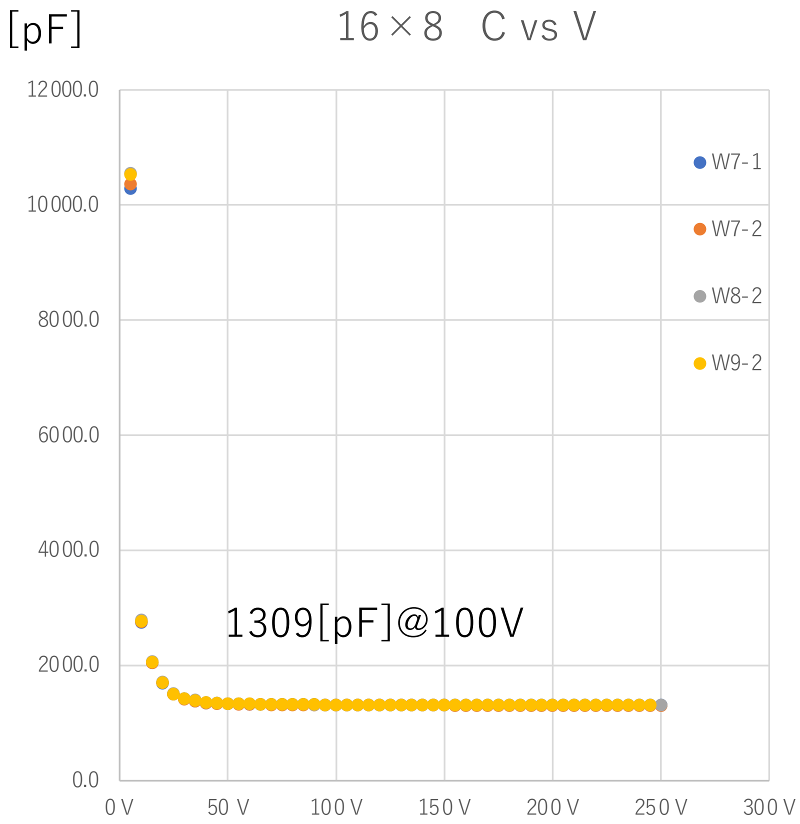
Bad Sensor

Single channel :		0.8pF @100V
One Chip:	$0.8 * 128 = 102.4$	102pF @100V
Full sensor(expect):		1632pF @100V
HAMAMATSU(full sensor):		930pF @100V





Hamamatsu's Measurement



$$\frac{1309\ [pF]total}{128\ [strip]\ 16\ [cell]} = 0.639\ [pF/strip]$$

170322_S10938-5821 datasheet