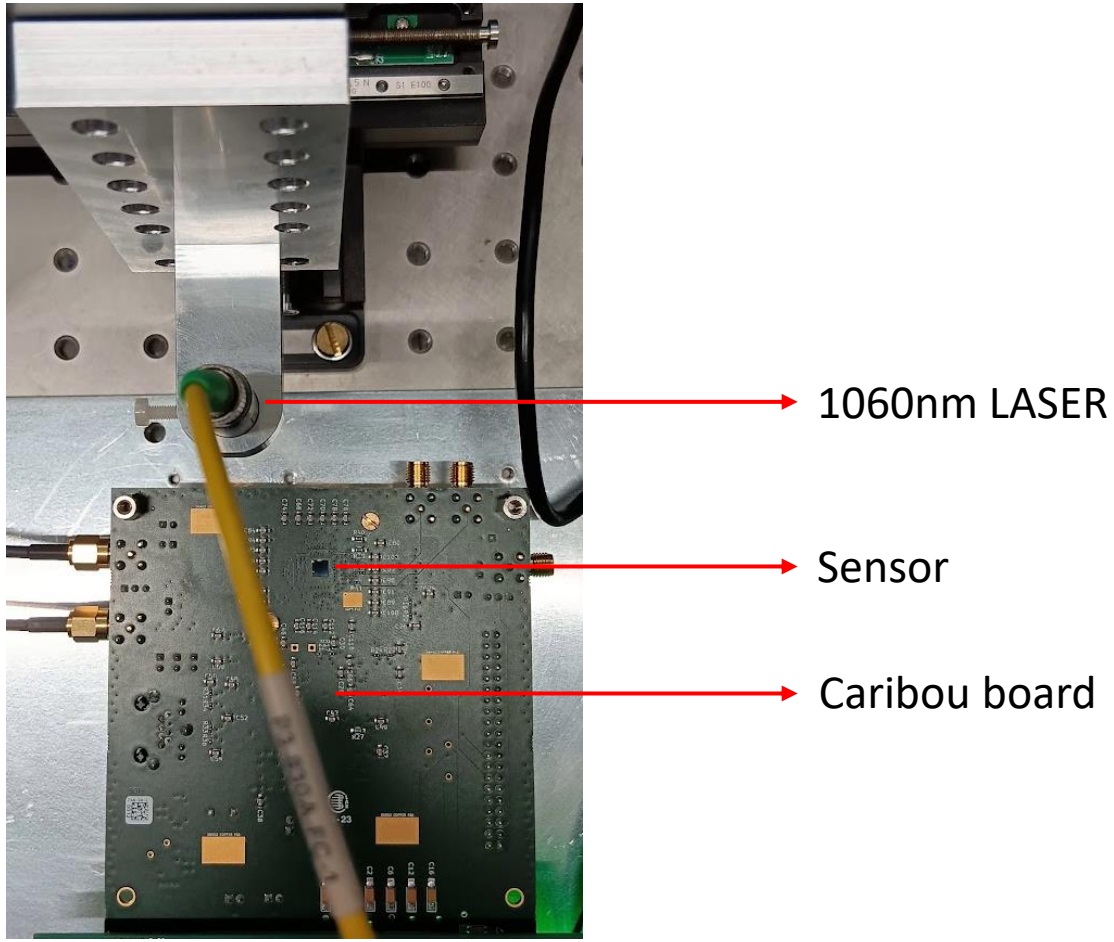
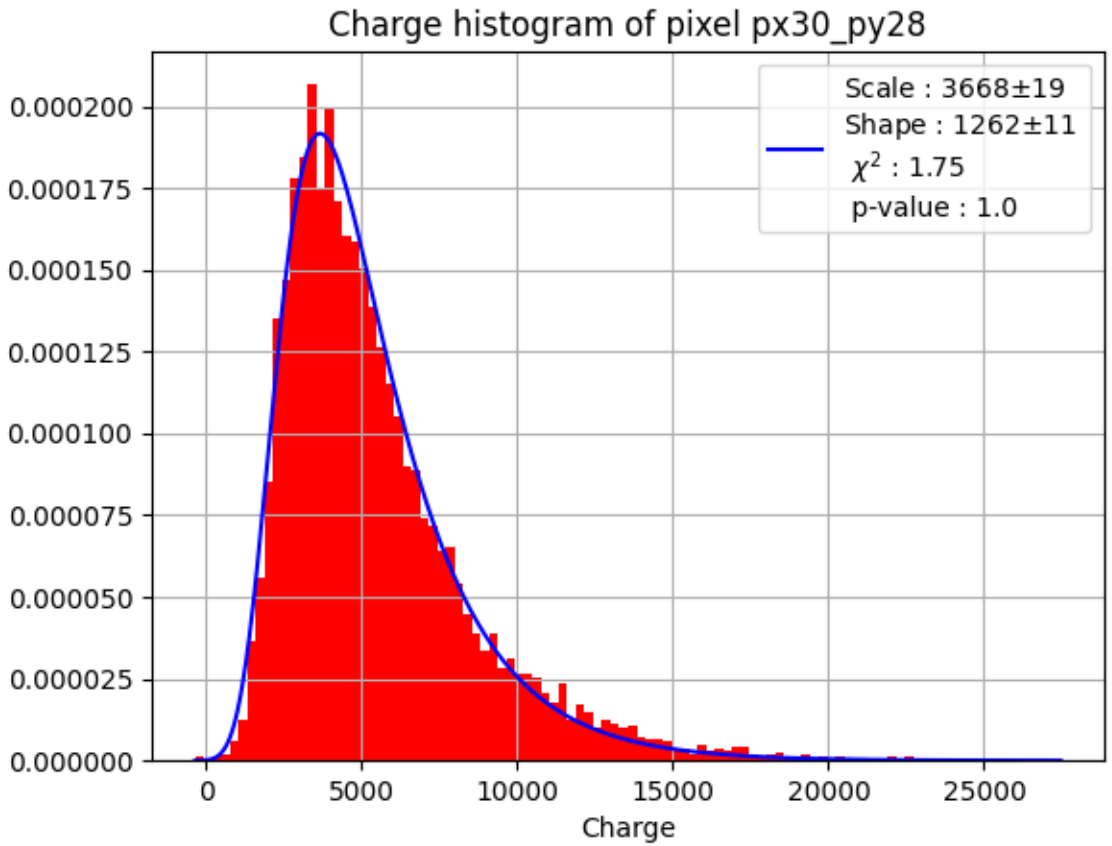
MPW4 injection and calibration problems

- Sensor: **Topside biased MPW4 HV-CMOS**
- Depleted with -200V, threshold of 0.94V
- Al upcoming plots are from pixel 30x28, but the same effects have been observed in other pixels



Incorrect Charge

- SR-90 Source, 10000 hits
- Minimum ionizing particle: 80 e-h pairs per micron → 24000 e-h pairs
- ~3000 electrons measured from fit of Landau distribution



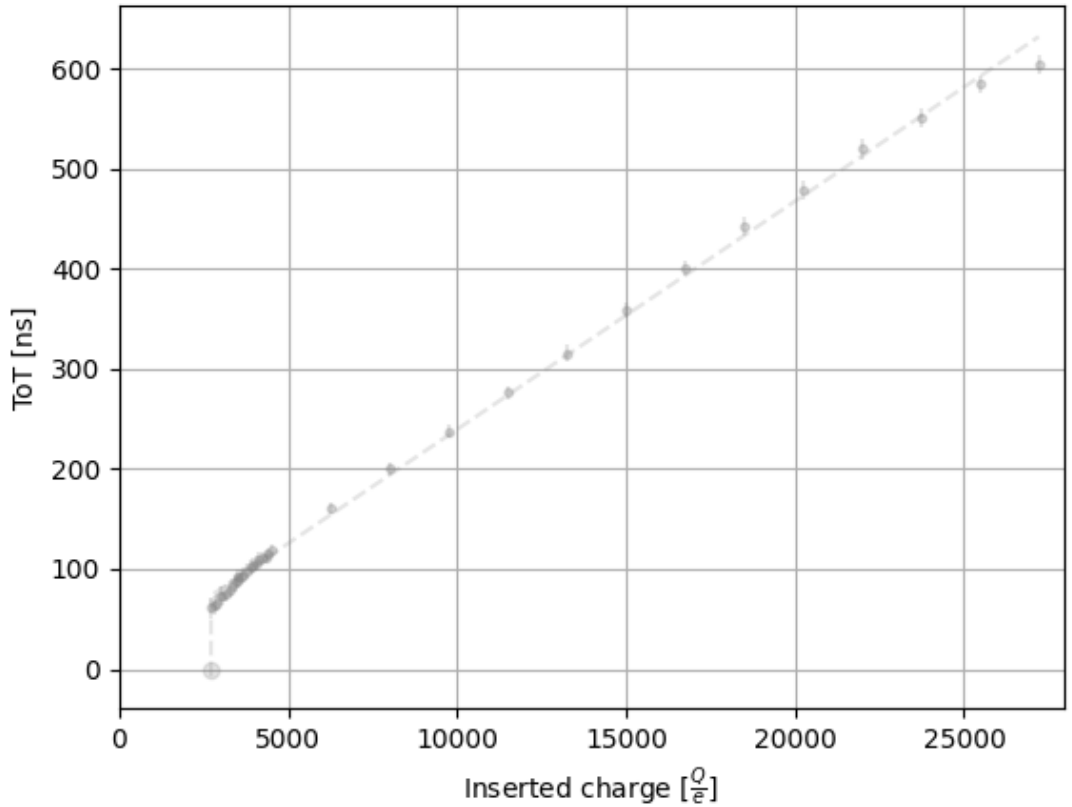
Problem with Calibration

- Insert charge with caribou
- Measure ToT
- Capacitance: 2.8fF

→~17360 #e/V

Voltage range of 0.0-1.8V

→0 – 31248 #e



Problem with Calibration

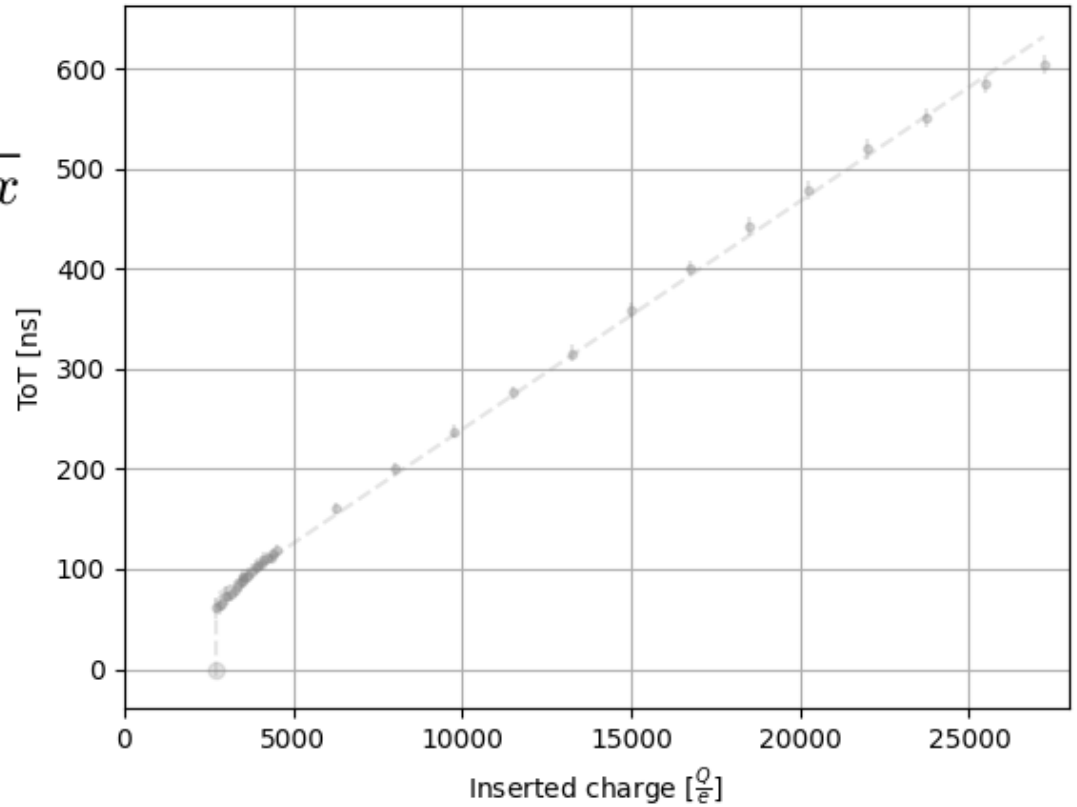
Fit given by:

$$f(x, p_0, p_1, p_2, p_3) = p_0 + p_1 x - \frac{p_2}{p_3 - x}$$

With slope parameter

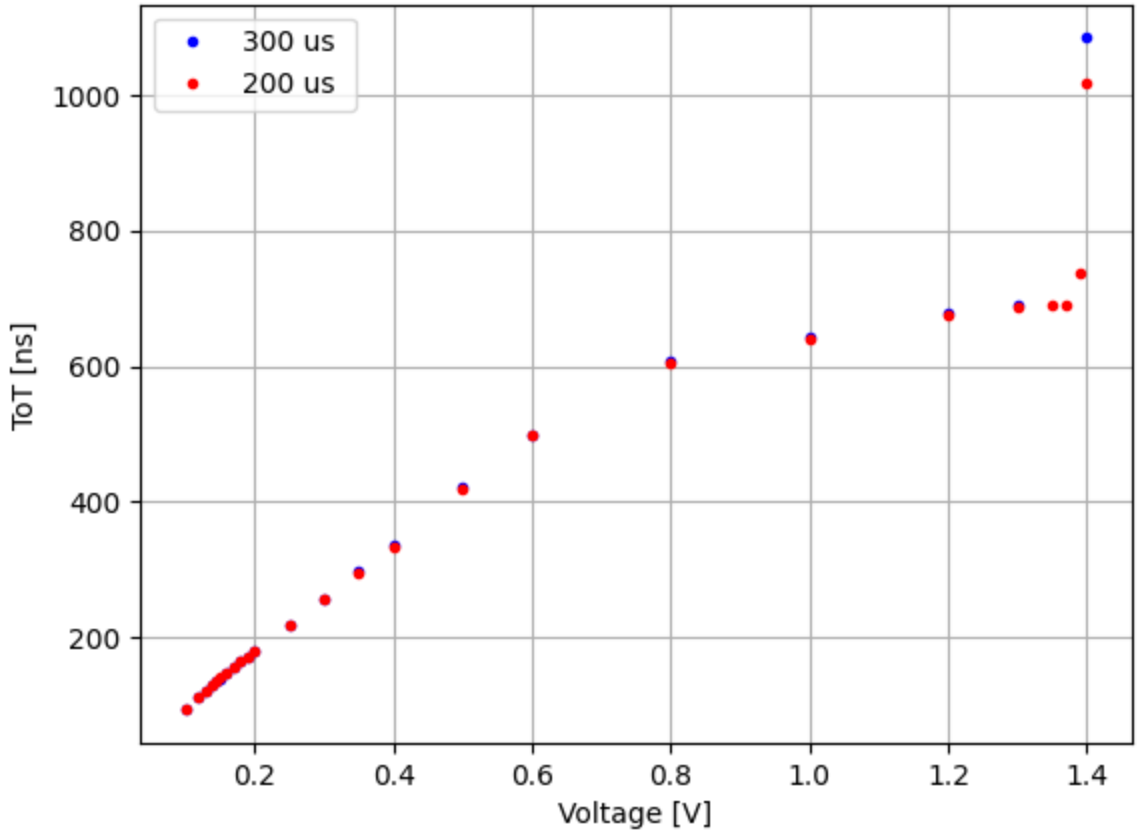
P1 = 2.28e-02 ns/#e

= 396 ns/V



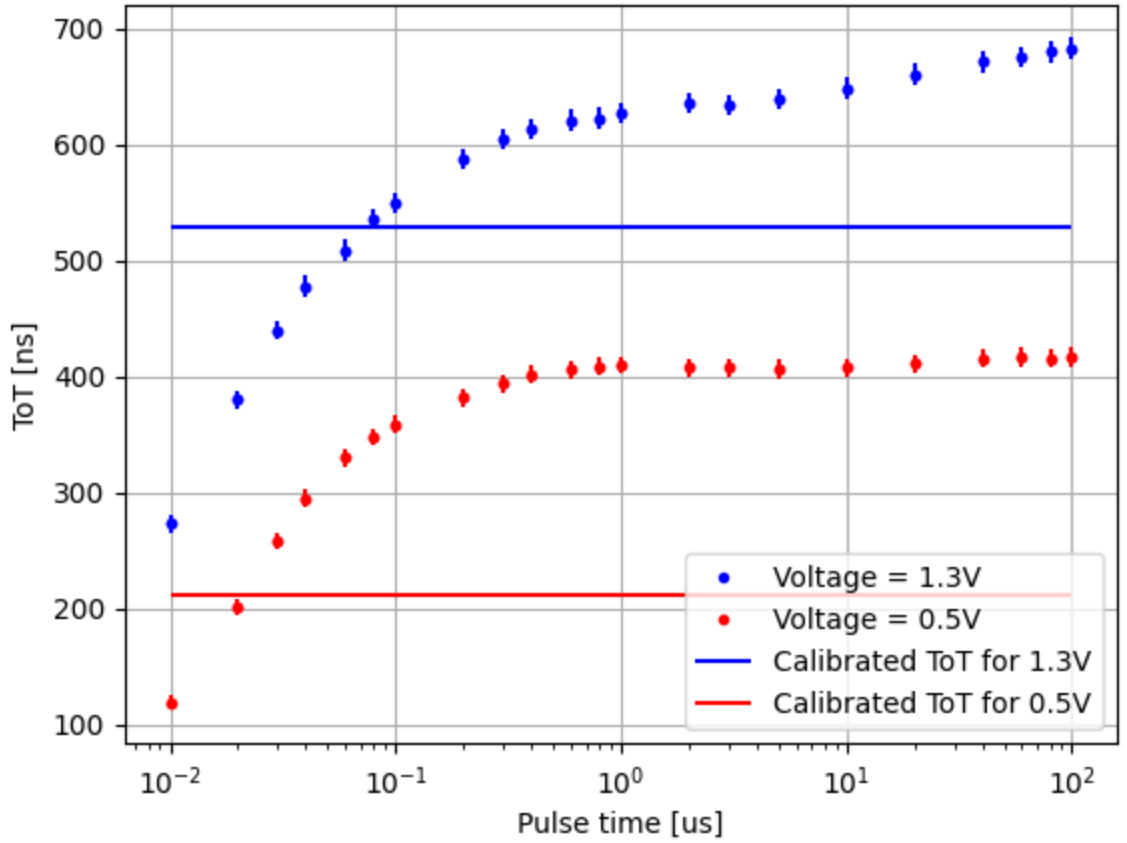
Injected voltage

- External injection to board via pulse generator
- Voltage of injected pulse plotted against the measured ToT for two different pulse lengths (300 and 200 us)
- Weird behaviour at 1.4V



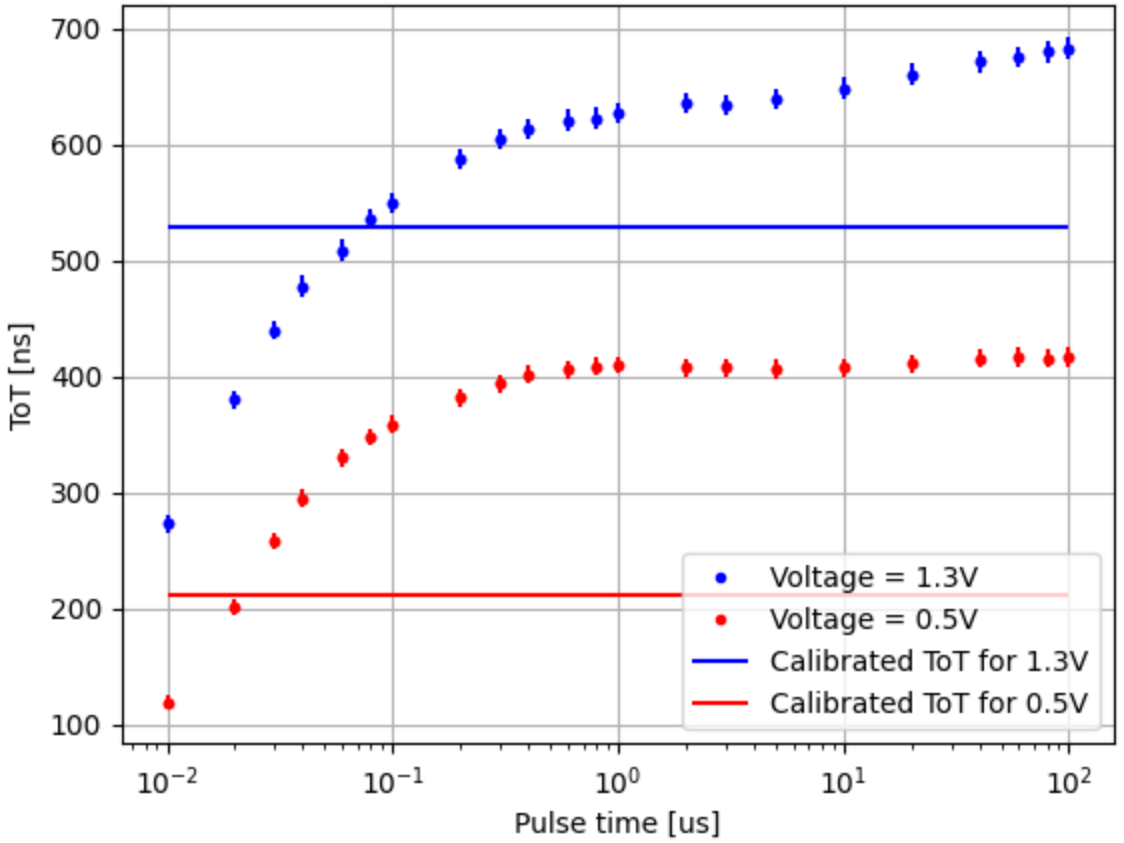
Injected voltage

- Pulse time plotted against the measured ToT for two different voltages (1.3 and 0.5V)
- ToT expected from calibration corresponds with low pulse times
- Is the capacitor fully charged with the InjectVoltage command in the Caribou?



Injected voltage

- Sam suggested to Inject signal at the injection source selection jumper to find differences when using the same input voltage settings.
- The observed difference might be explained by a difference in input impedance of the chip, or it might be because of the rise time of the injection circuit.



Injected voltage

- Weird behaviour at injection of 1.4V
- Small dip at 1 us