



# Studies on ATLAS12 minis at UCSC

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with

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# Measurements and Sample Availability



Have done pre-rad testing reported at AUW in November.

Measured: IV, CV, DC-style PTP, R(bias), R(interstrip), C(interstrip) → Backup slides

Irradiated samples:

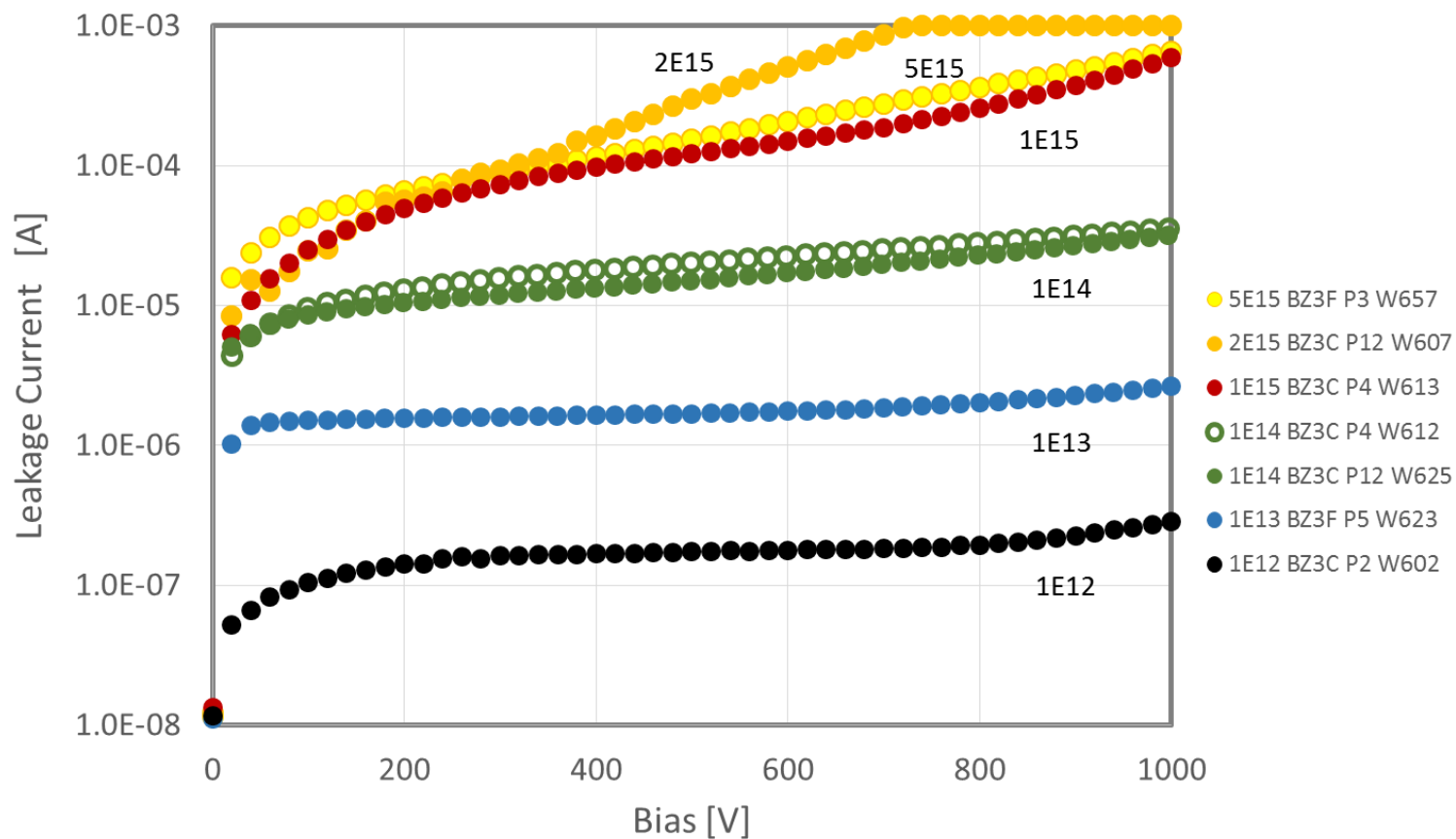
- Received samples irradiated with protons at Birmingham.
- Received 6 samples irradiated with protons at Los Alamos in September, for cross-comparison purpose (perhaps less annealing). They were sent to Liverpool for CCE measurements.
- (Note that Los Alamos run in Dec was moved to end of January!)
- Expect to receive samples irradiated with gammas at BNL in the next 2 weeks.



# IV measurements on the (irradiated) Birmingham Samples



Current-fluence scaling breaks down in  $\geq 1e15$  neq/cm<sup>2</sup> range?



# Measurement Program



Primary goals of the measurement program is to do the surface studies on the samples:

- DC-style PTP
- laser-based dynamic PTP study
- R(bias)
- R(interstrip)
- C(interstrip)

First on the irradiated samples before the annealing, then after.



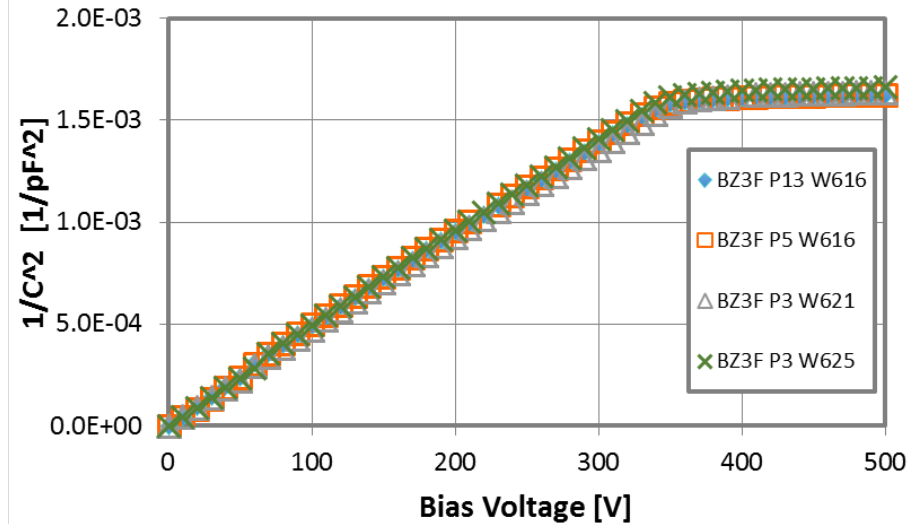
# Backup: Measurements on un-irradiated samples



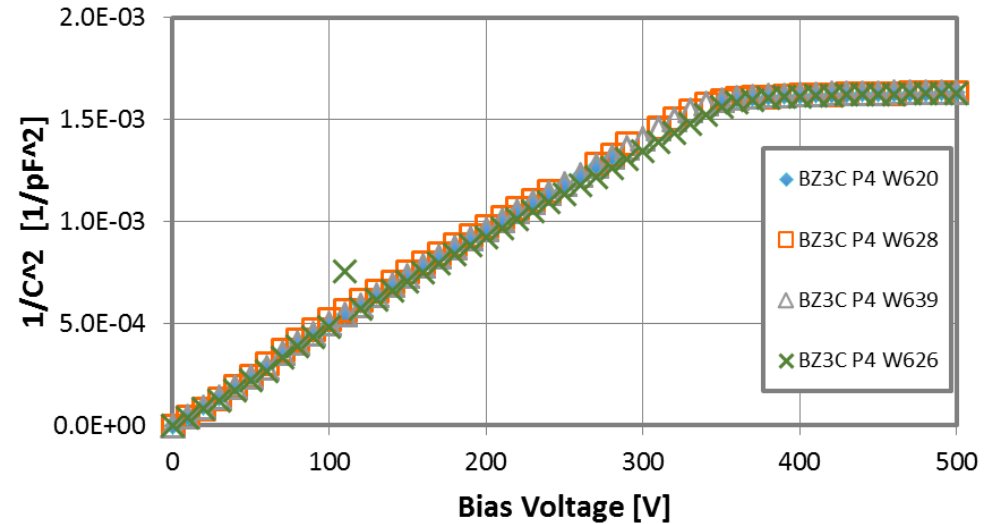
# CV, IV measurements

V(full dep)  $\approx$  340-350 V.

### ATLAS12A BZ3F

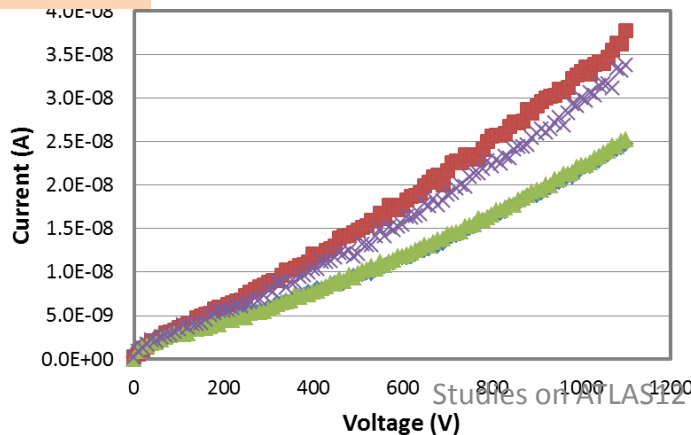


### ATLAS12A Miniature BZ3C

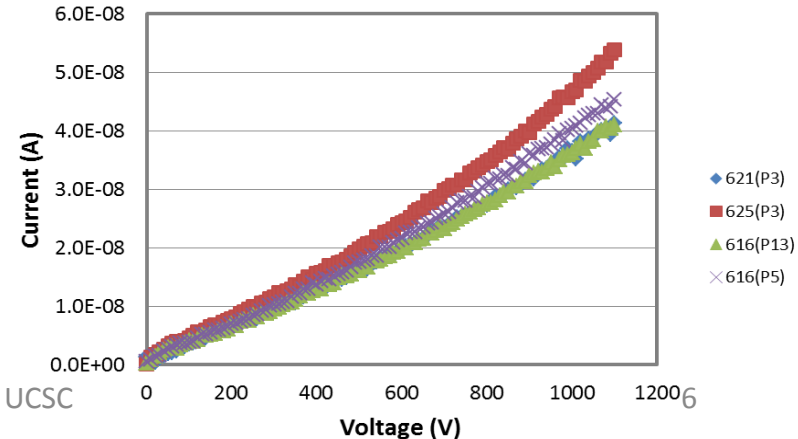


V(break) > 1100 V

### IV Curves BZ3C\_P4



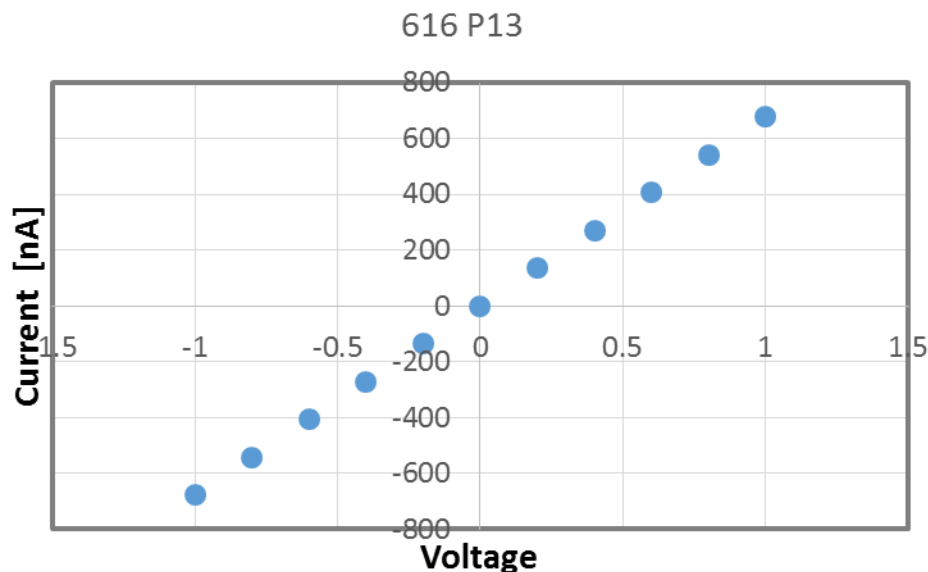
### IV Curves BZ3F





# R(bias) measurements

- $V(\text{bias}) = 200 \text{ V}$
- 3-probe measurement with parameter analyzer.
- DC-pads of 3 neighboring strips are held at the same potential.
- The current on the central strip is recorded as a function of the voltage and the resistance is derived.
- Values are within the specs of  $(1.5 \pm 0.5) \text{ M}\Omega$



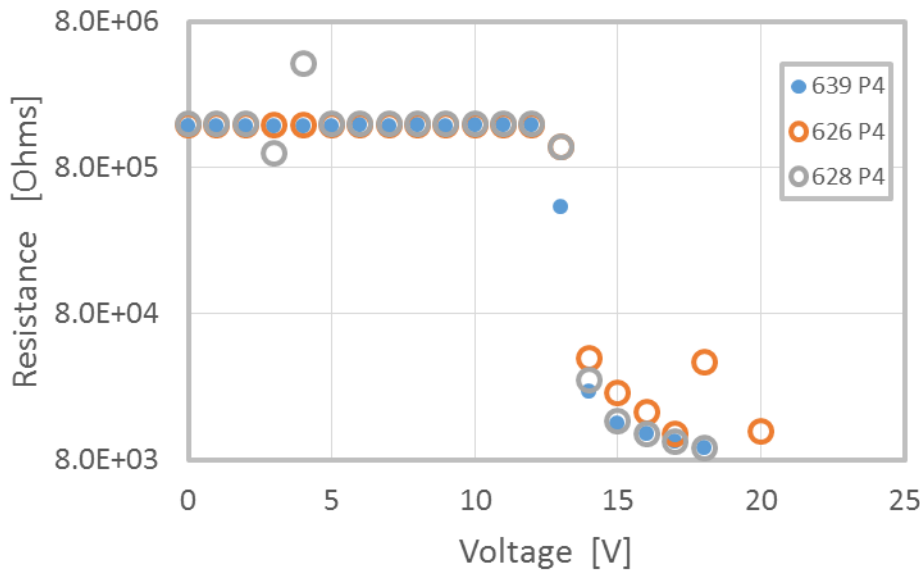
Type	Chip	Rbias [Mohm]
BZ3C	620 P4	1.584
BZ3C	639 P4	1.549
BZ3C	626 P4	1.570
BZ3C	628 P4	1.607
BZ3F	616 P5	N/A
BZ3F	625 P3	1.503
BZ3F	621 P3	1.487
BZ3F	616 P13	1.475

# PTP measurements

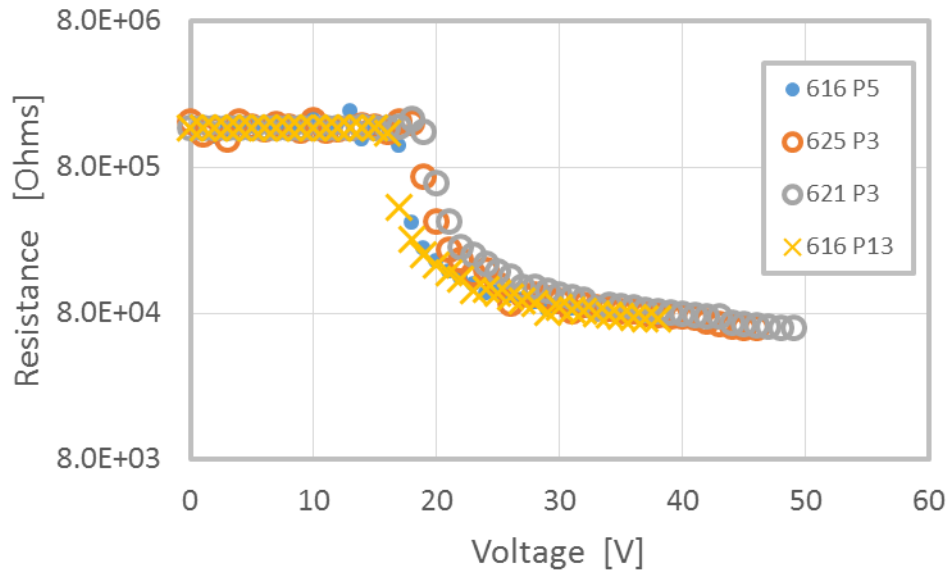


- Setup is similar to measuring R(bias), but wider voltage scan range.
- BZ3C has markedly better performance than BZ3F samples.
- This is expected: much smaller PTP distance, overhang.

BZ3C PTP R vs V

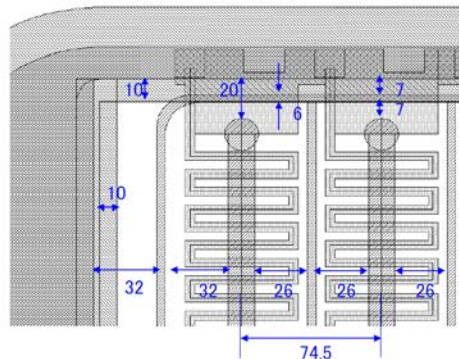


BZ3F PTP R vs V

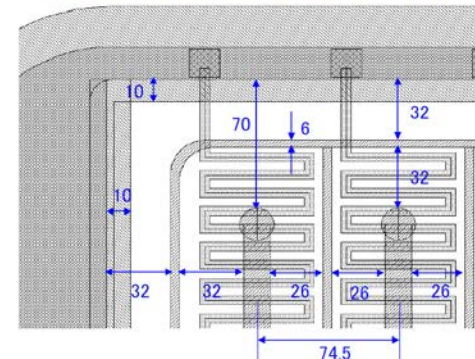


Note: measurements with laser yield information on dynamic PTP performance. In progress.

BZ3C (same design as ATLAS12M Main Sensor)



BZ3F (same design as ATLAS12M Main Sensor)

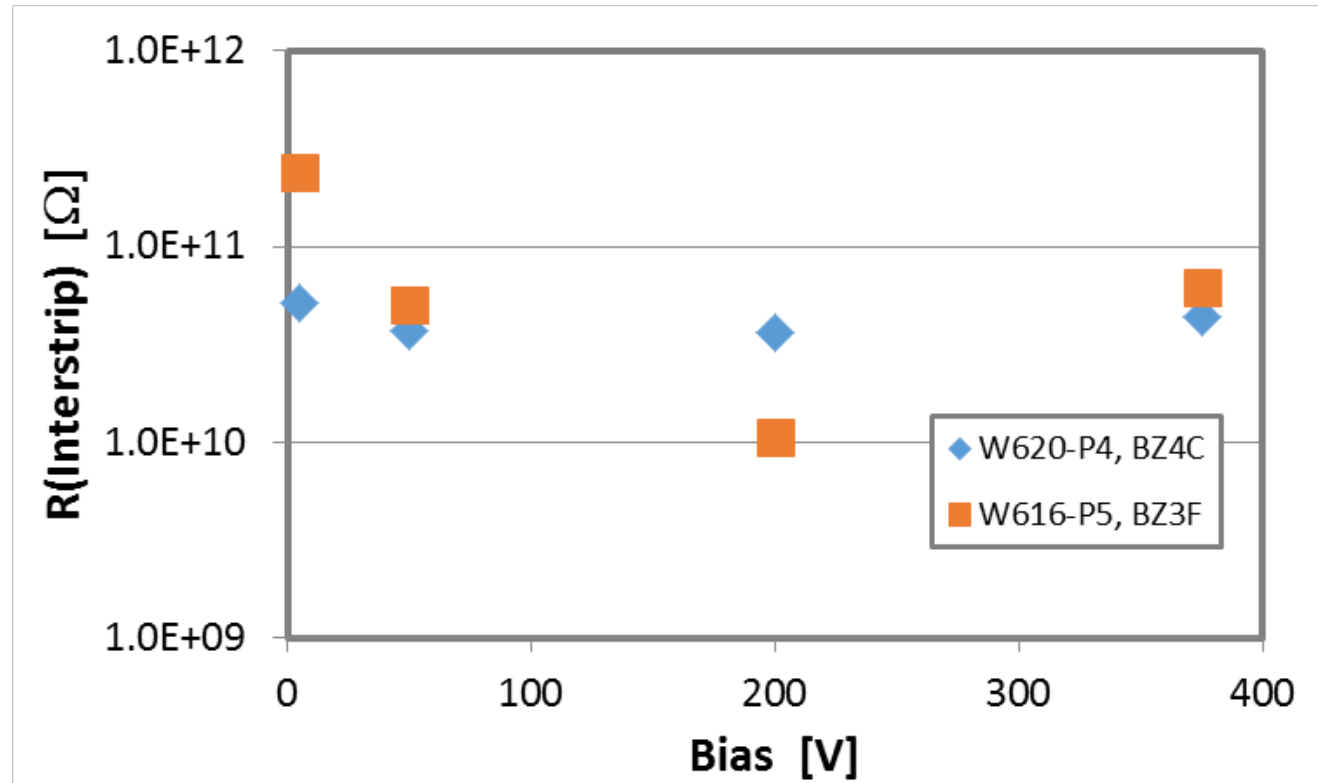




# R(interstrip) measurements



- Setup is similar to measuring R(bias), but the central strip is held at 0V when the potential of the neighbors is scanned.
- Observe expected high strip isolation.



# C(interstrip) measurements



- 5-probe setup with 2<sup>nd</sup> degree neighbors grounded.
- It was important to ground-reference the 3 strips connected to the LCR meter as well.
- The values at full depletion are 0.6 pF, within the spec of “<0.8 pF”.

