

Sensori 3D FBK

TEST ELETTRICI SU WAFER ***Static characterization of 3D*** ***at the Wafer level***

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4 Febbraio 2011

Wafers out so far Full-passing columns

ATLAS 07 -- FE I4

Wafer #	Shipped to IZM	Thickness (μm)	Metal Deposition
2	03/02/2011	230	sputtering
3	03/02/2011	230	sputtering
5		230	sputtering
7	03/02/2011	230	sputtering
072		200	evaporatore
073		200	evaporatore
113		200	evaporatore
223		200	evaporatore
192		200	Evaporatore metal back unpatterned

ATLAS 08 -- FE I3

Wafer #	Shipped to SELEX	Thickness (μm)	Metal Deposition
2	Destroyed during packaging	200	sputtering
3	13.12.10	200	sputtering
5		200	evaporatore
6		200	evaporatore
7		200	evaporatore
8		200	evaporatore
9		200	evaporatore

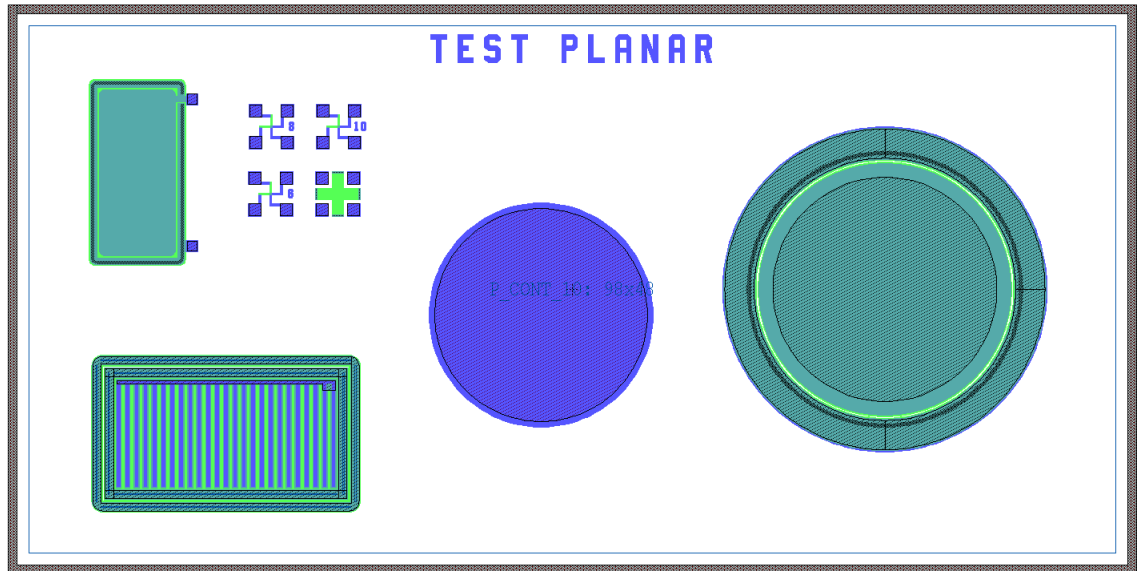
List of measurements:

Planar Test strip:

- IV 1D Diode
- CV 1D Diode
- CV MOS
- IV Gated Diode

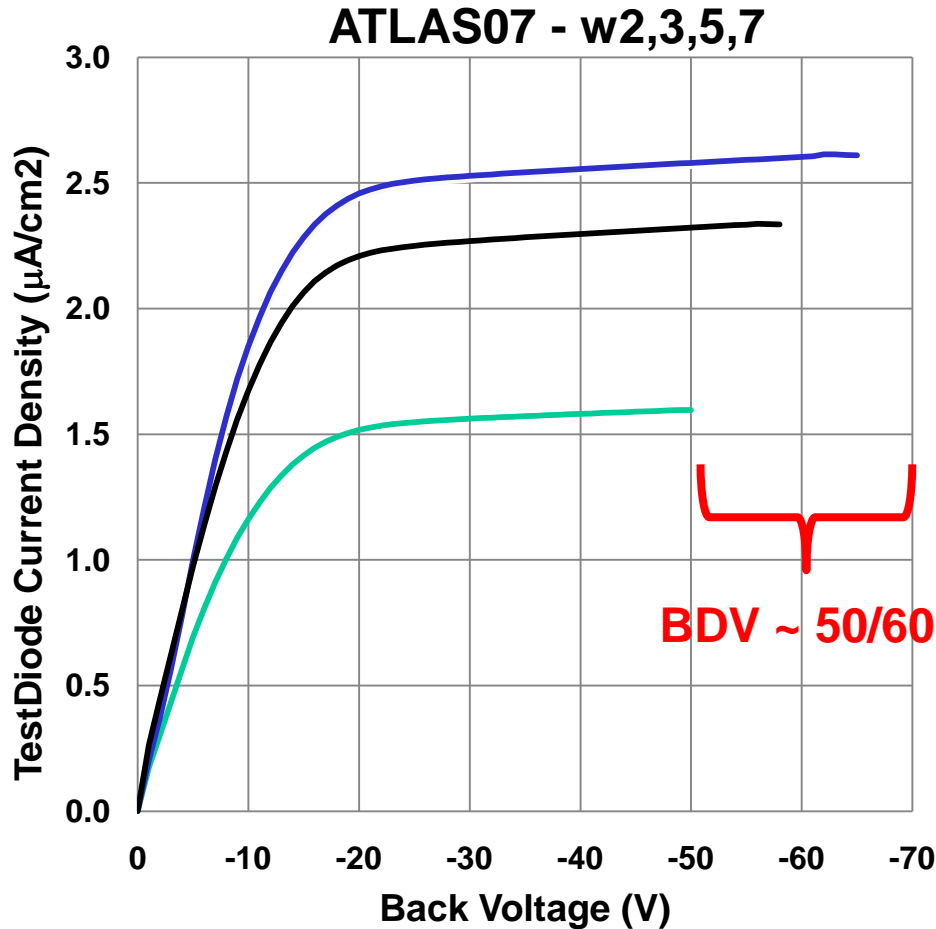
3D (test) structures:

- IV 3D Diodes
- CV 3D Diodes
- IV 3D Strips



ATLAS07-FE14

Bulk current density from Planar test diode (Area = 4 mm²) – T = 22 C



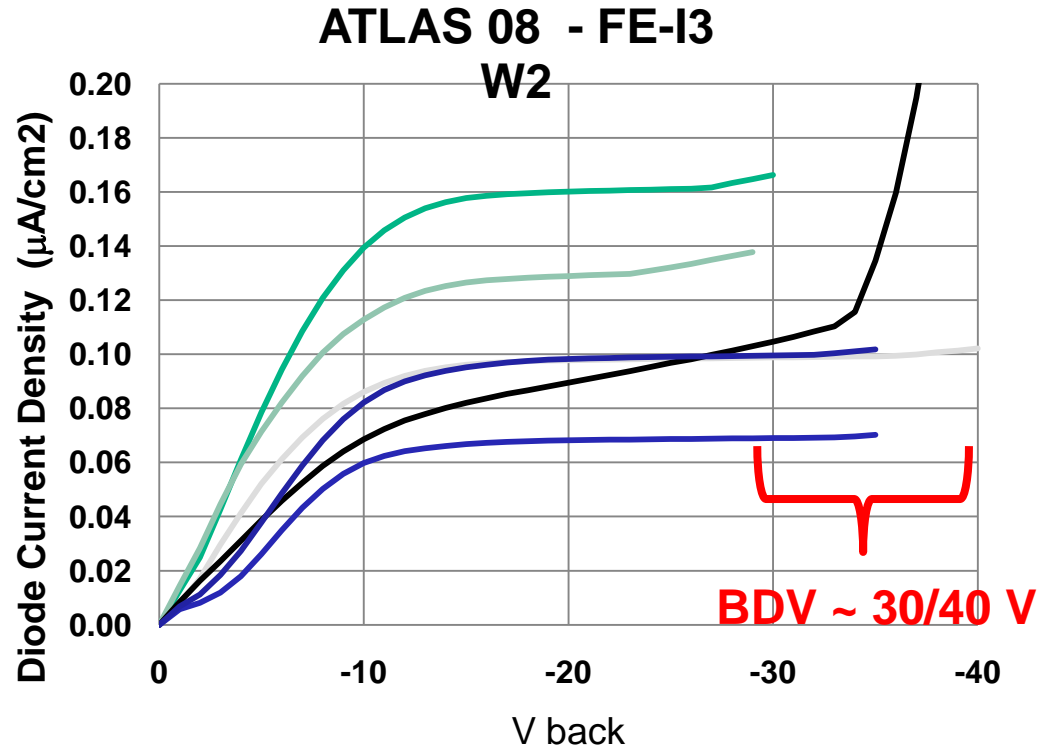
From CV measurement:
 $V_{\text{full-depletion}} = 30 \text{ V}$ ($N_{\text{doping}} = 7e11 \text{ cm}^{-3}$)

Suggesting that little current
 (i.e. defects) is generated at the
 backside

BDV ~ 50/60 V

ATLAS08-FEI3

Bulk current density from Planar test diode (Area = 4 mm²) – T = 22 C



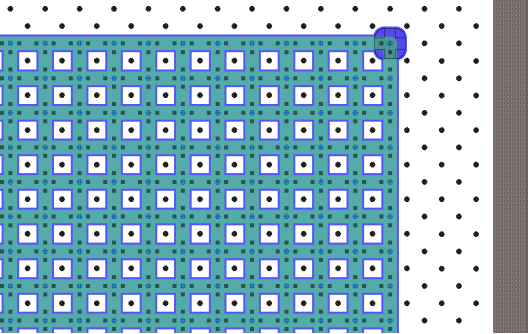
From CV measurement:

$$V_{\text{full-depletion}} = 20 \text{ V} \quad (N_{\text{doping}} = 6.25 \times 10^{11} \text{ cm}^{-3})$$

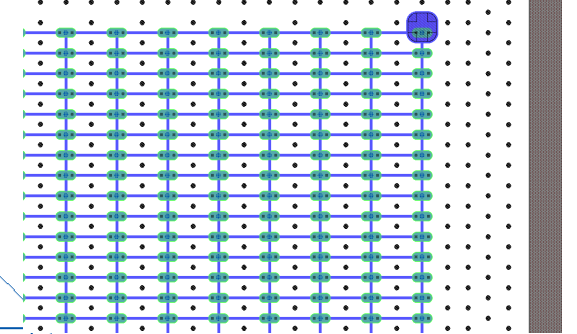
ATLAS07-FEI4

IV (2-probe) measurements on 3D-diodes

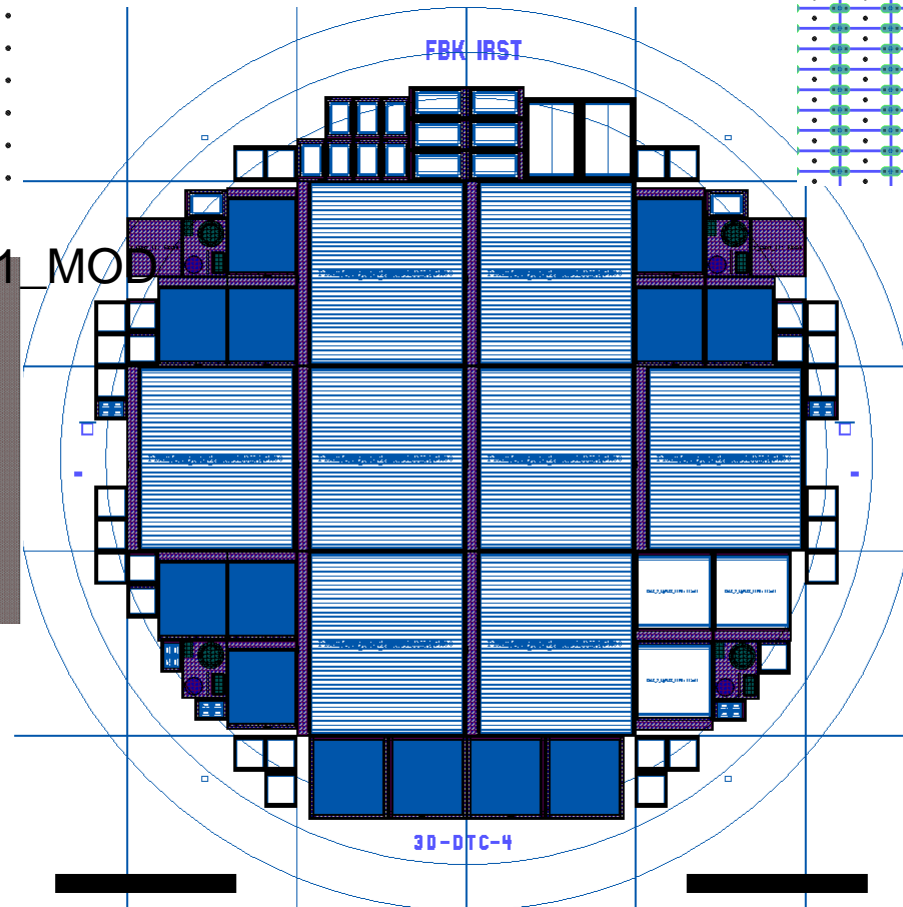
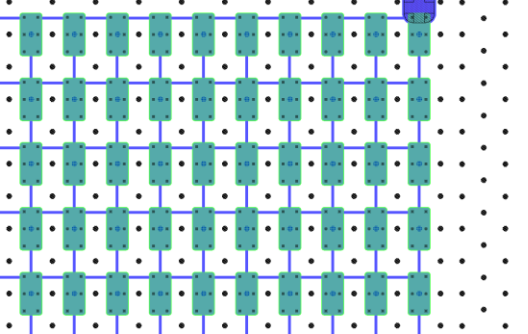
Diode3D_DTC_4_80_BIG_MOD



Diode3D_DTC_4_ATLAS_FEI4_MOD



Diode3D_DTC_4_CMS_1_MOD



ATLAS07-FEI4

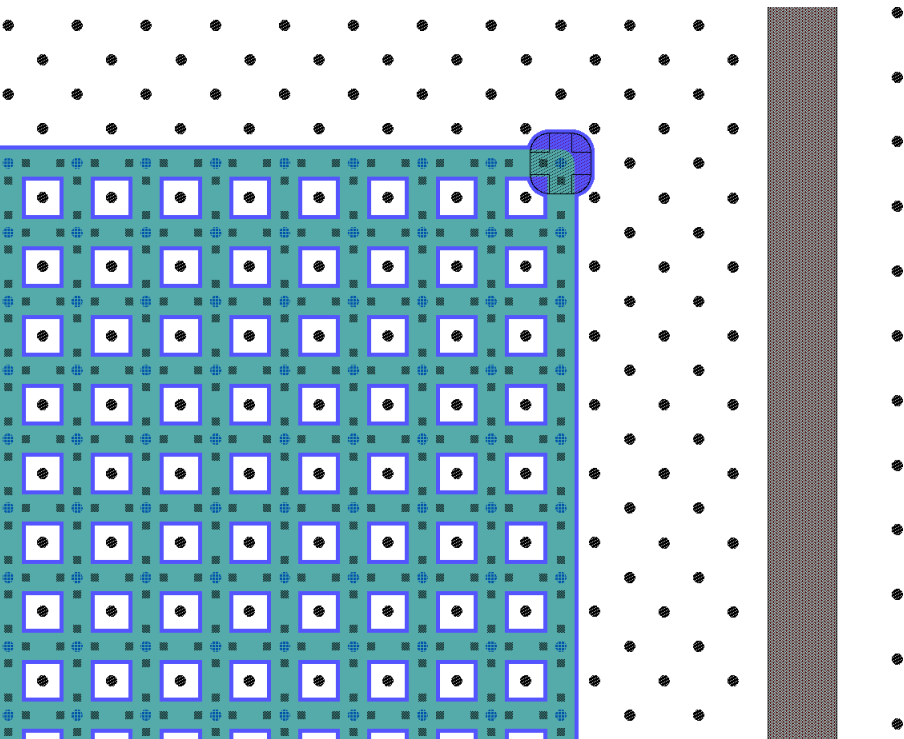
IV measurements on 3D-diodes

Diode3D_DTC_4_80_BIG_MOD

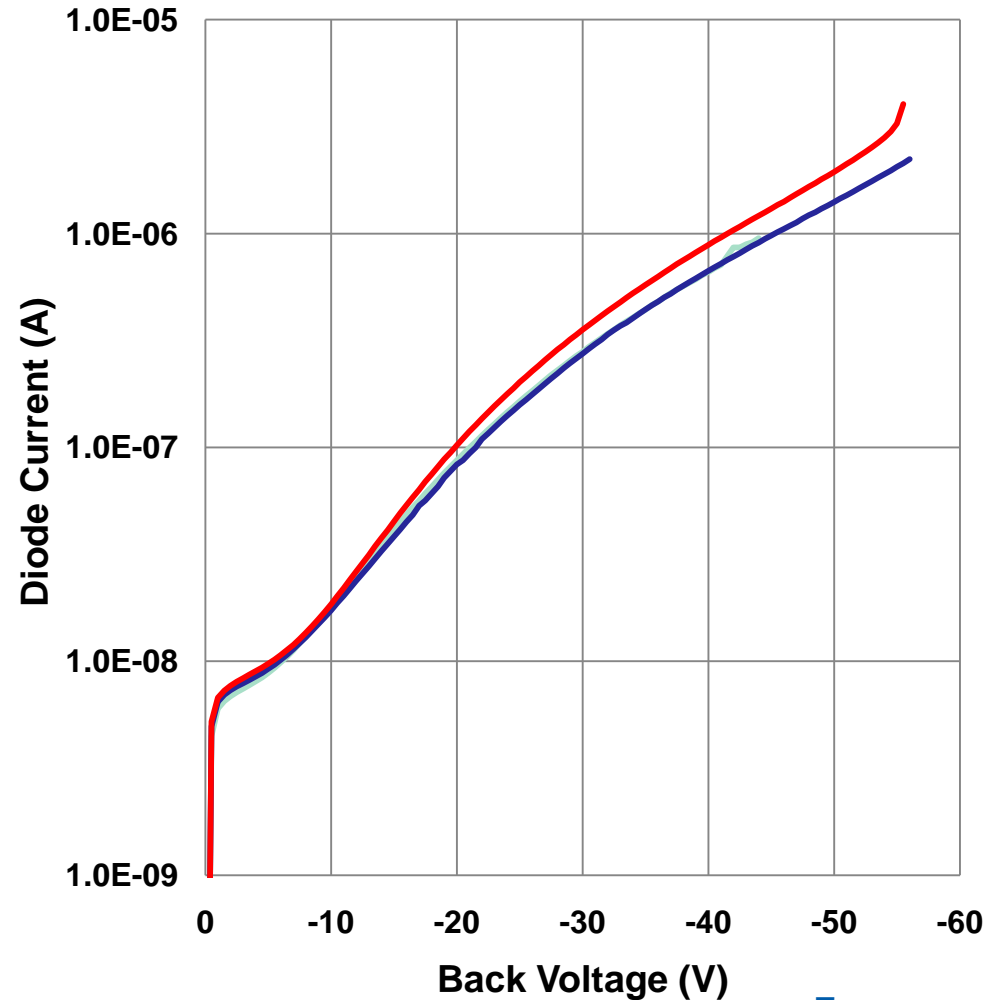
Area = 9.4 mm²

40X40 ohmic columns (p+)

39X39 Junction Columns (n+)



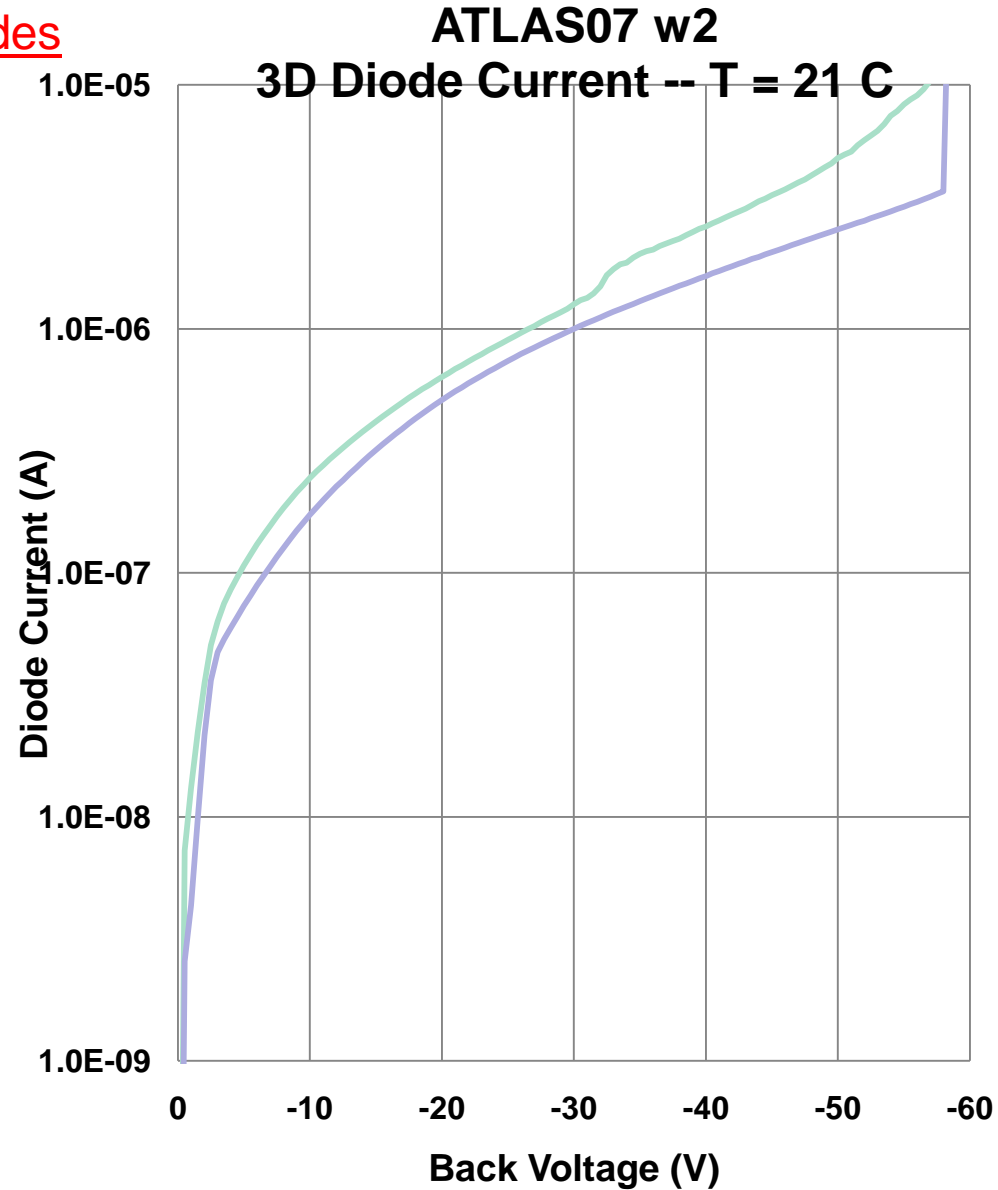
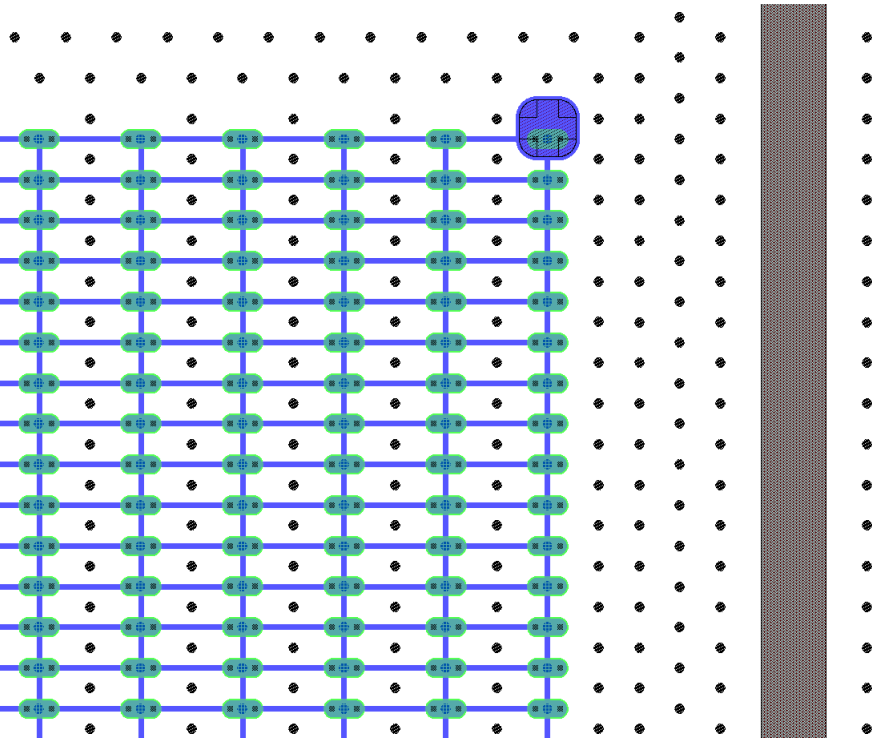
ATLAS07 w2
3D Diode Current -- T = 21 C



ATLAS07-FEI4

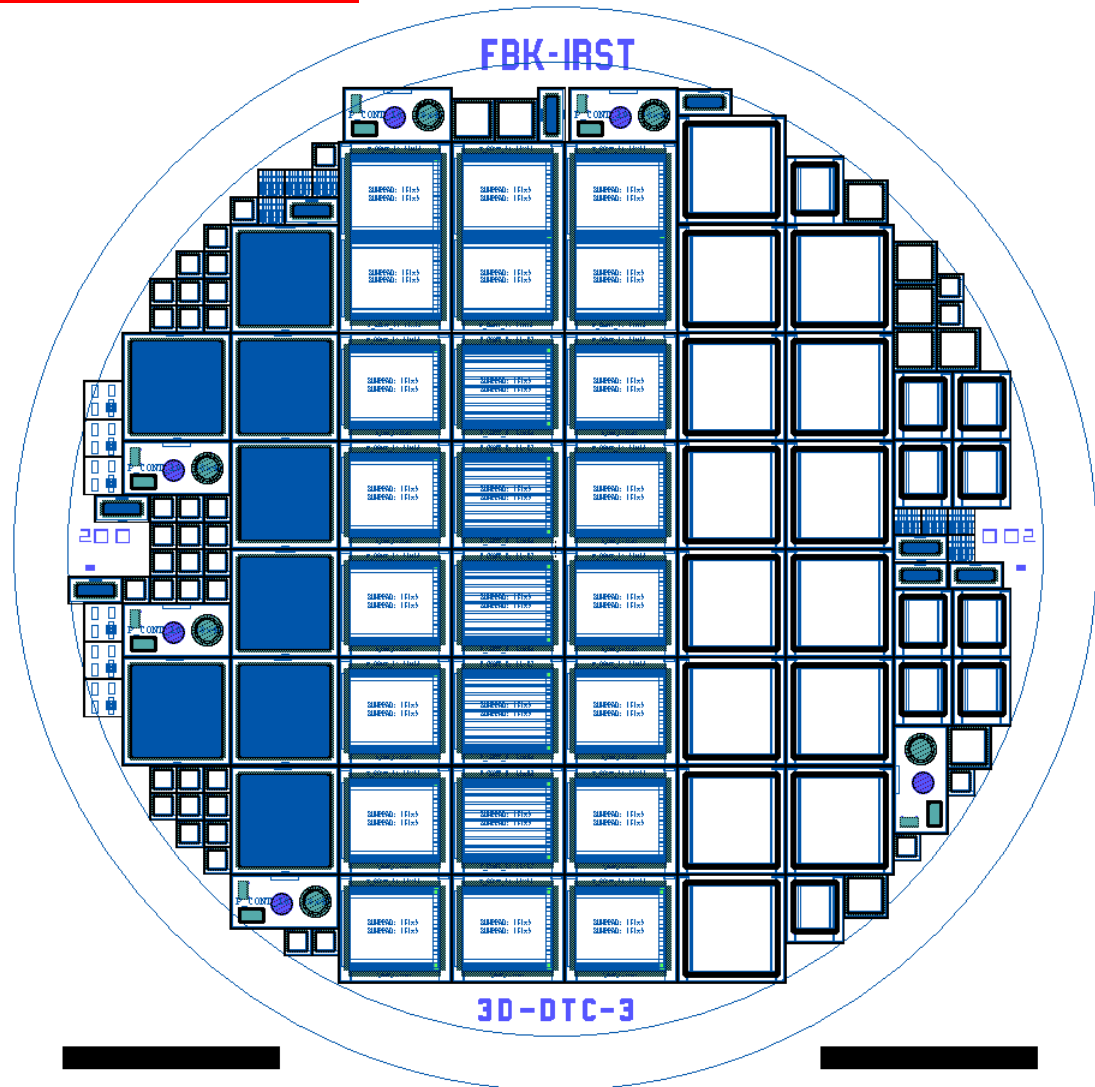
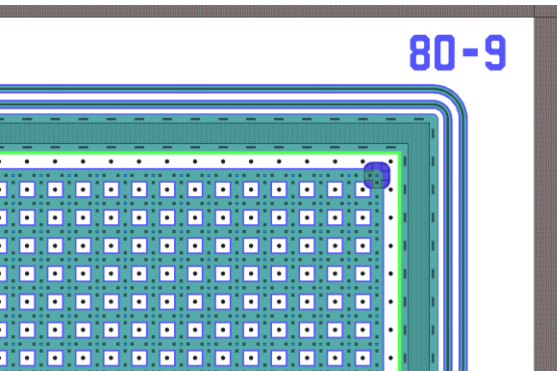
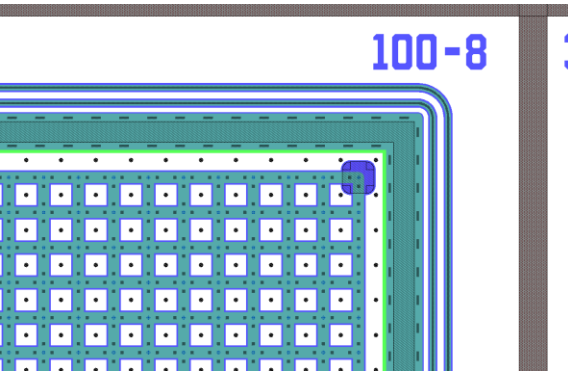
IV measurements on 3D-diodes

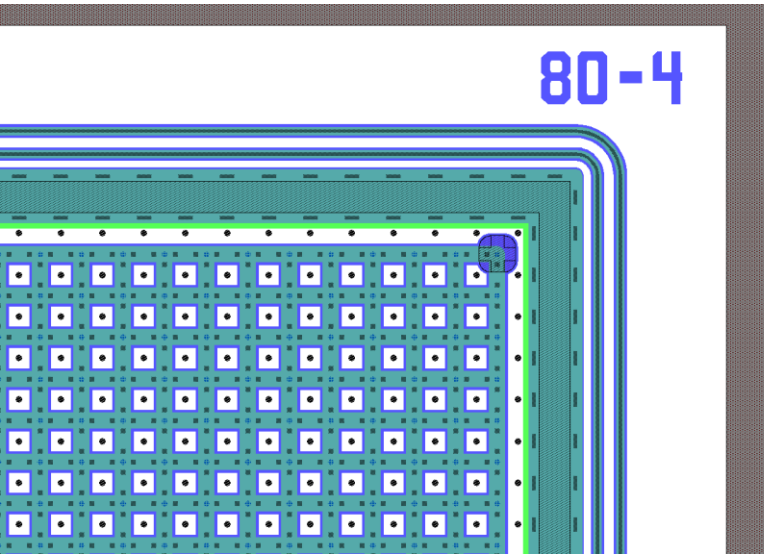
Diode3D_DTC_4_ATLAS_FEI4_MOD



ATLAS08-FE13

IV measurements on 3D-diodes

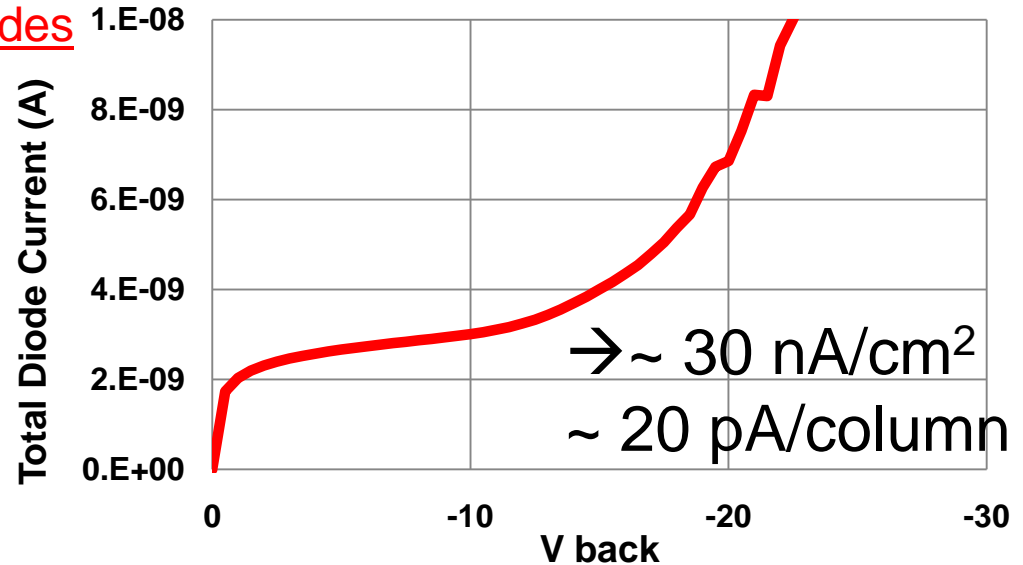




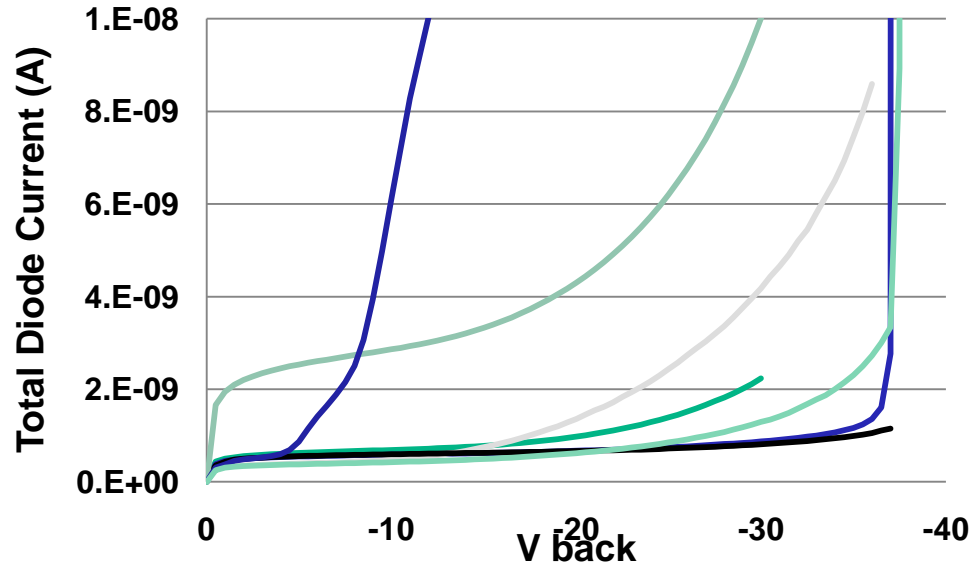
BIG version (9.4 mm²):
 40X40 ohmic columns (p+)
 39X39 Junction Columns (n+)

Single version (2.4 mm²):
 21X21 ohmic columns (p+)
 20X20 Junction Columns (n+)

Diode3D_DTC_3_80_BIG



Diode3D_DTC_3_80_Single

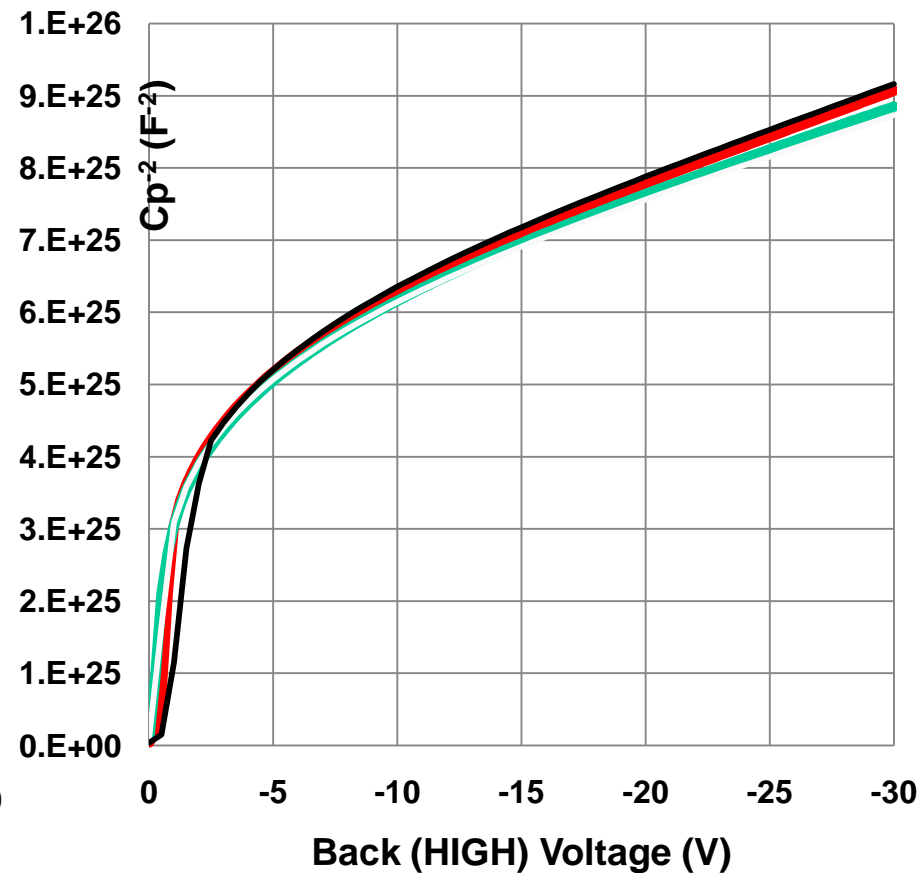
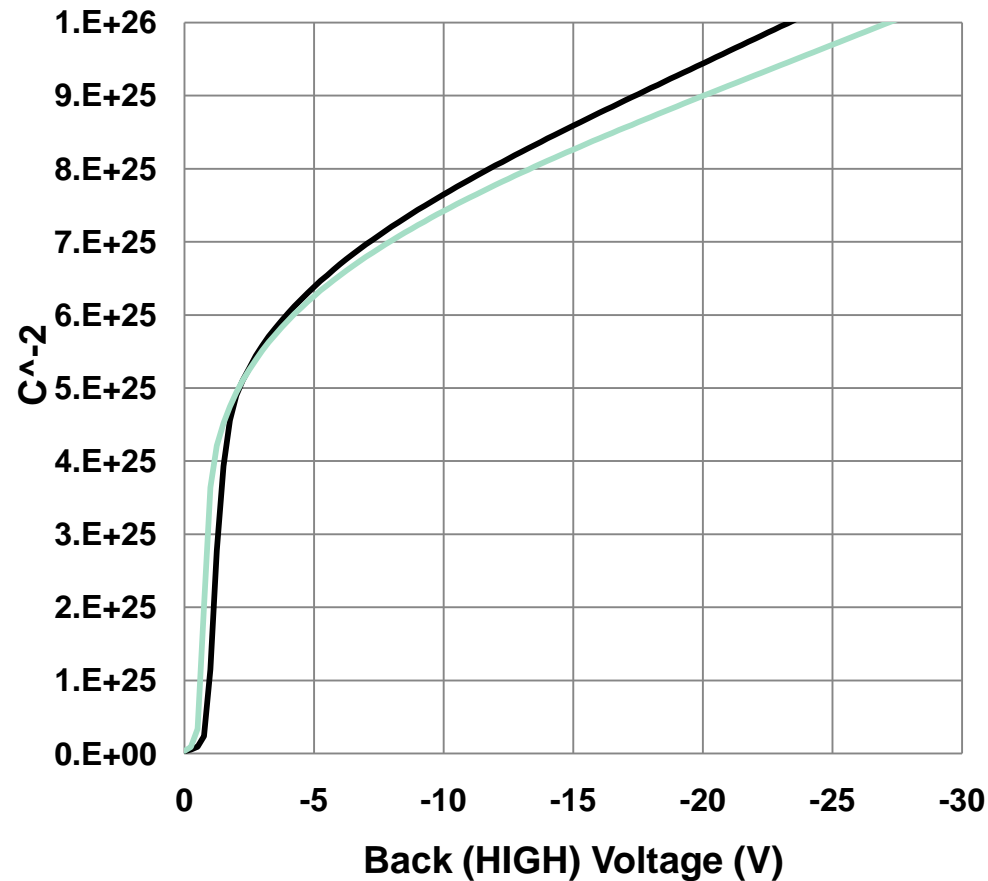


ATLAS07 & ATLAS08 - CV 3D Diode (f=10 kHz) Normalized to # of pixels

The capacitance of 1 pixel (1 n+ column) towards backside (all p+ columns) is ~ 0.1 pF
Interpixel capacitance ~ 0 (it is shielded by p+ columns)

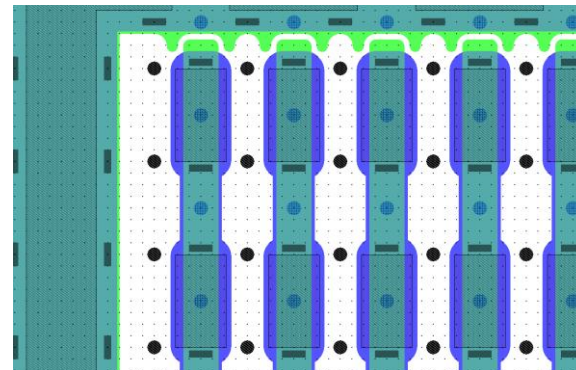
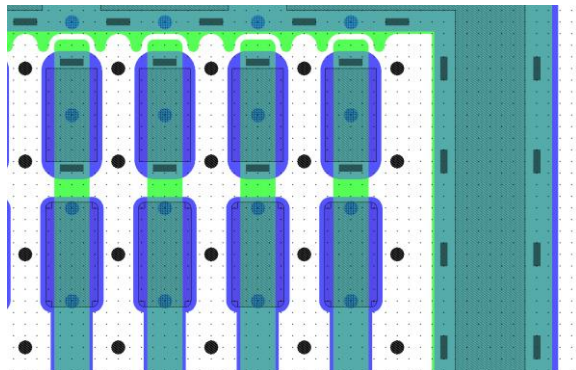
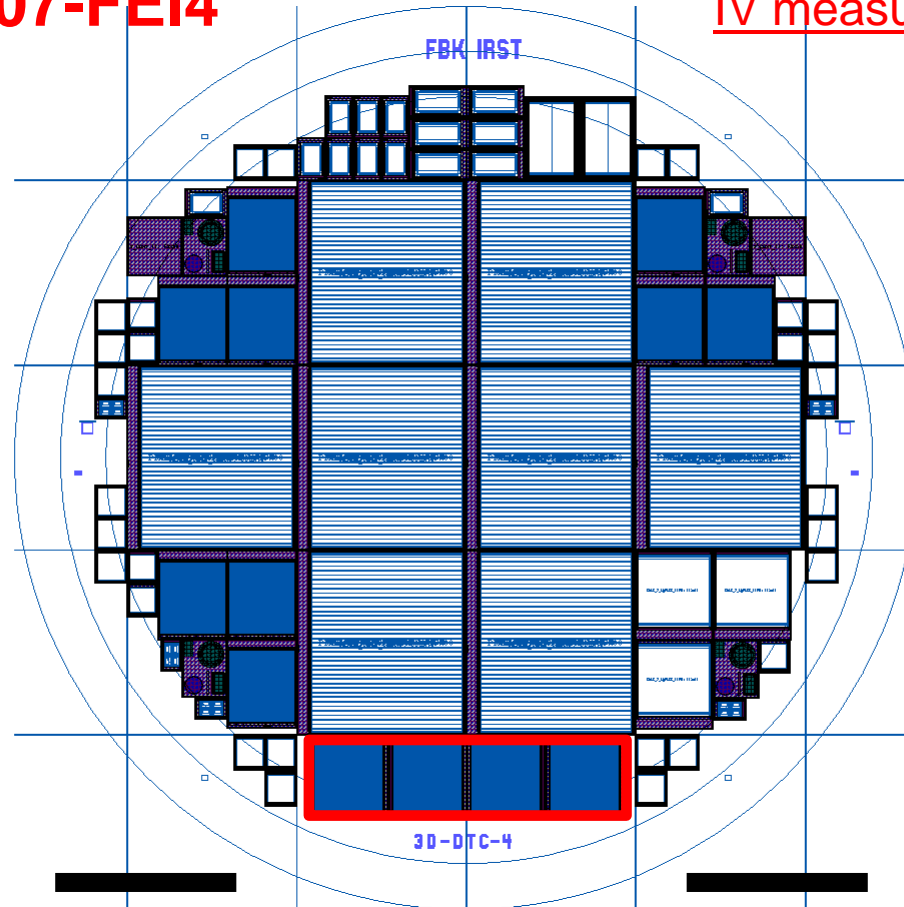
ATLAS07 - w2 – Diode “80”

ATLAS08 – w3 -Diode “80”



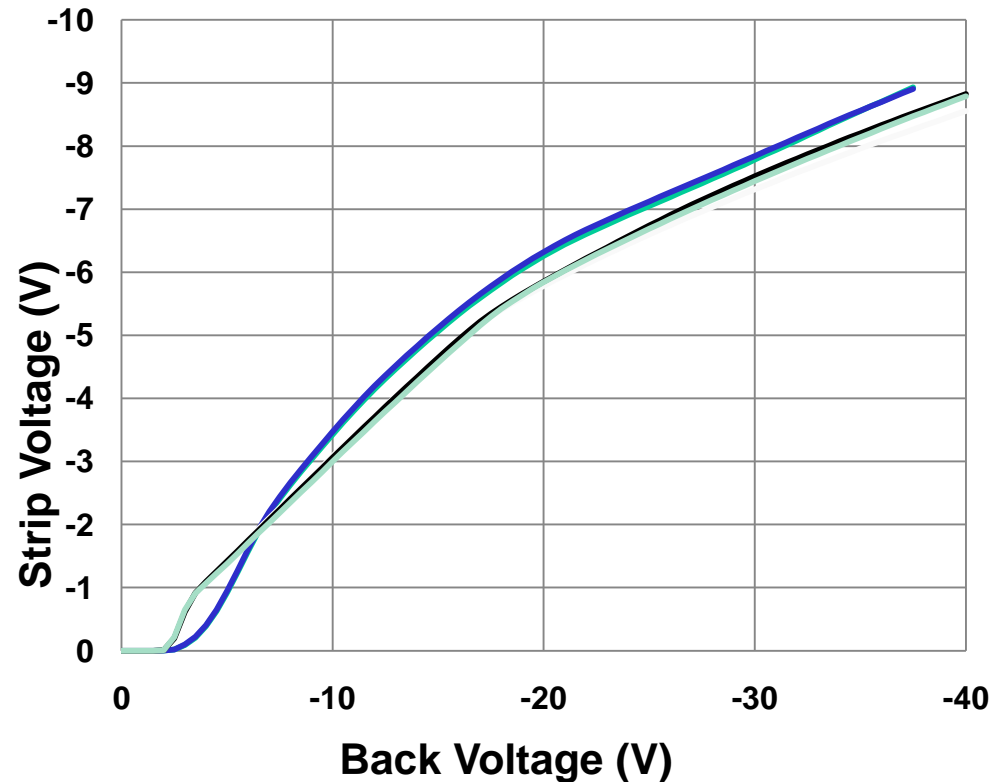
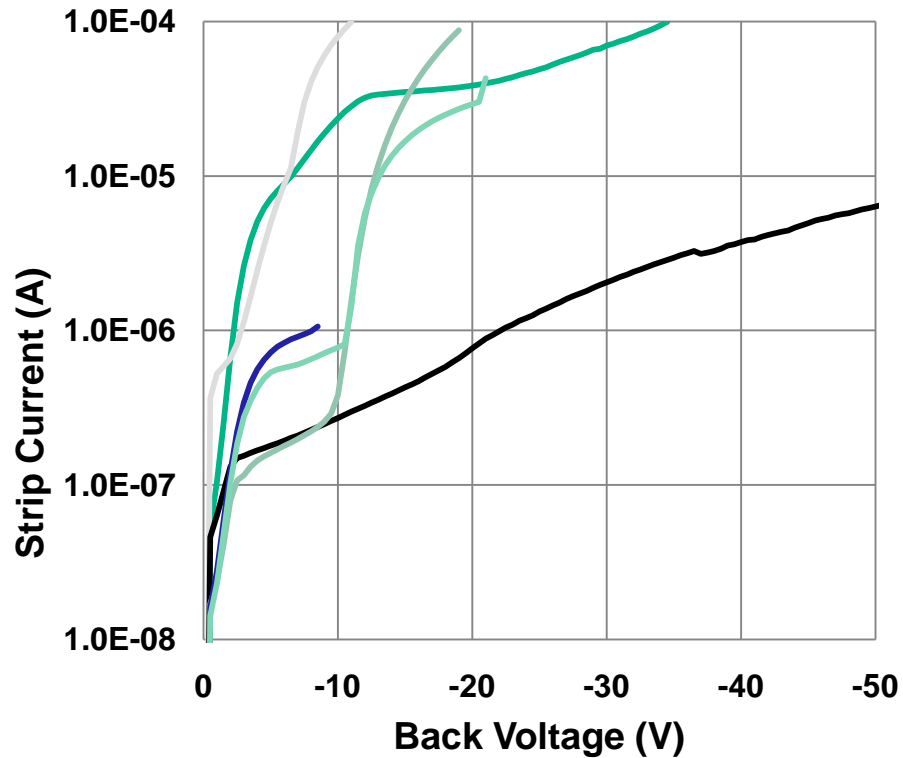
ATLAS07-FEI4

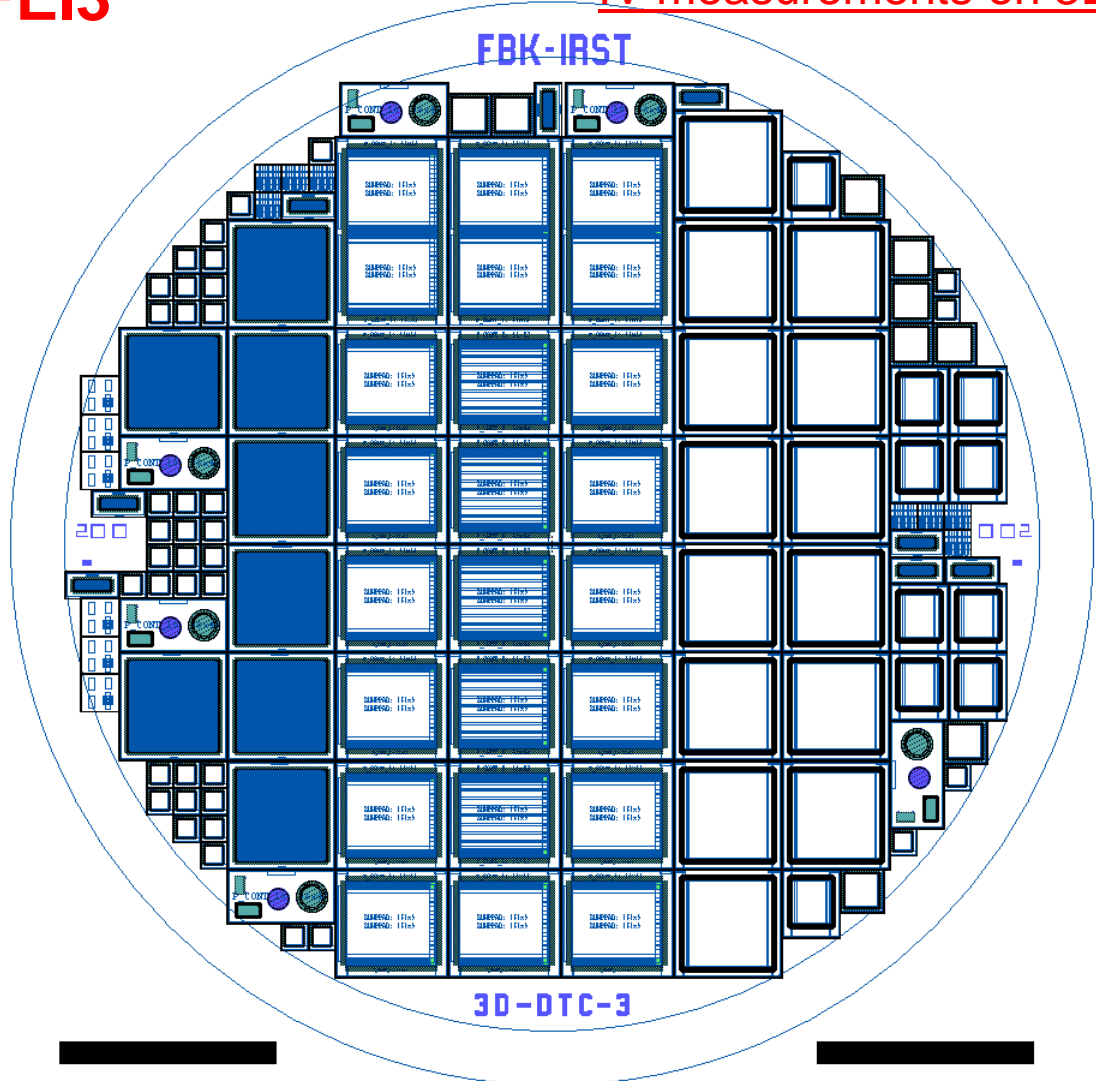
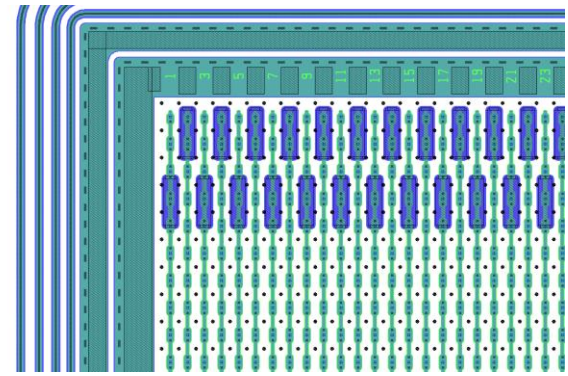
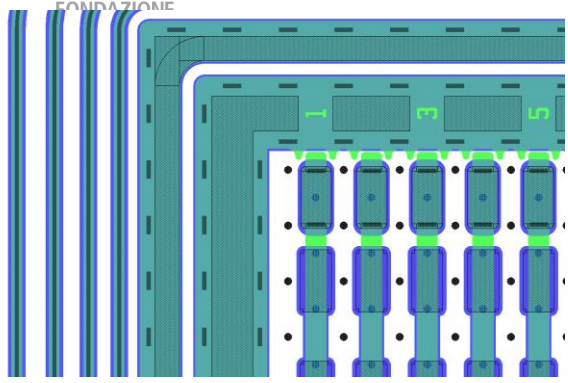
IV measurements on 3D-strips



ATLAS 07-FEI4 (w2)

- IV measurement on Strip sensors (~1 cm²) (Bias line @ GND)
- Punch-Through potential of the strips





ATLAS08-FEI3 (w5)

- IV measurement on Strip sensors (~1 cm²) (Bias line @ GND)
- Punch-Through potential of the strips

