Tracker Week
Currents – Noise – Irrad.
(more in the sensor & mod. const meeting)

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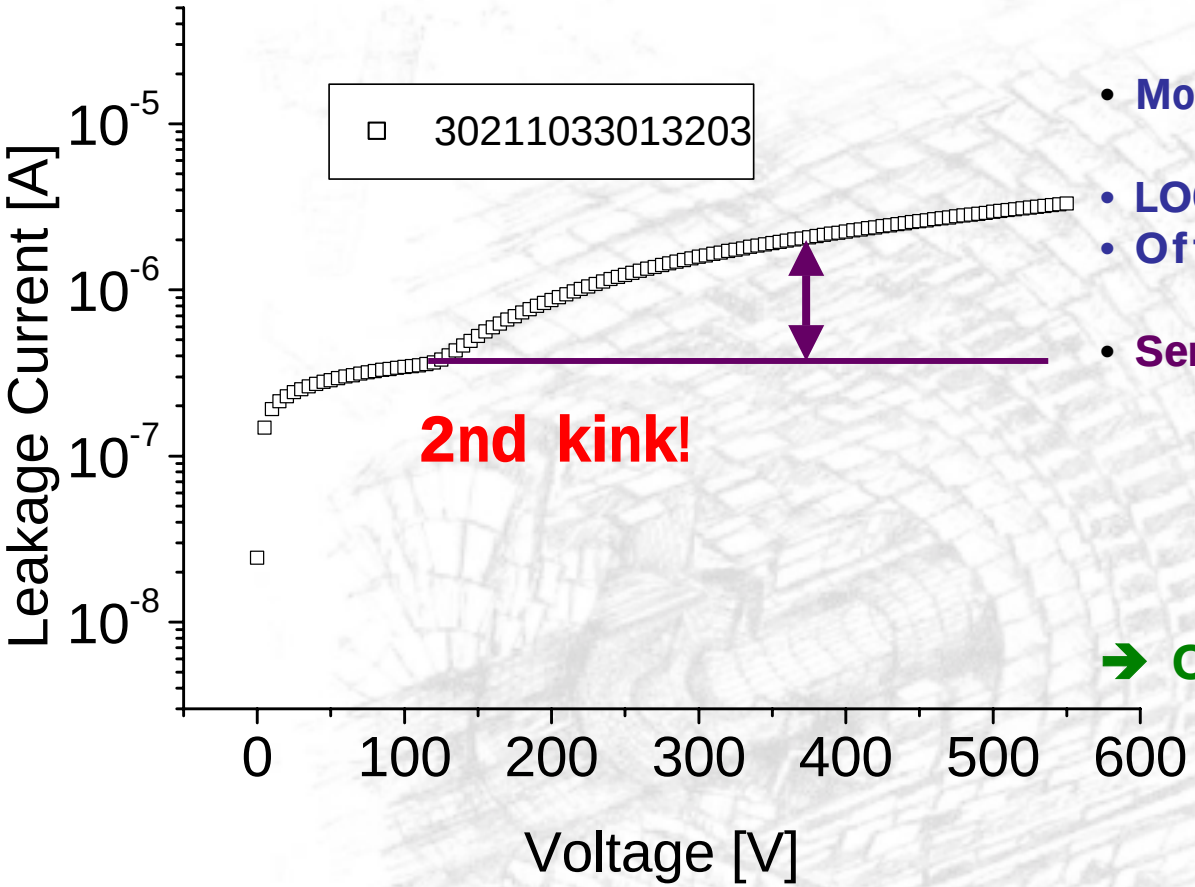
Please remember all, non-standard tests were done during the high throughput QTC phase
➔ Statistics could/should be better!

IV with 2nd kink!

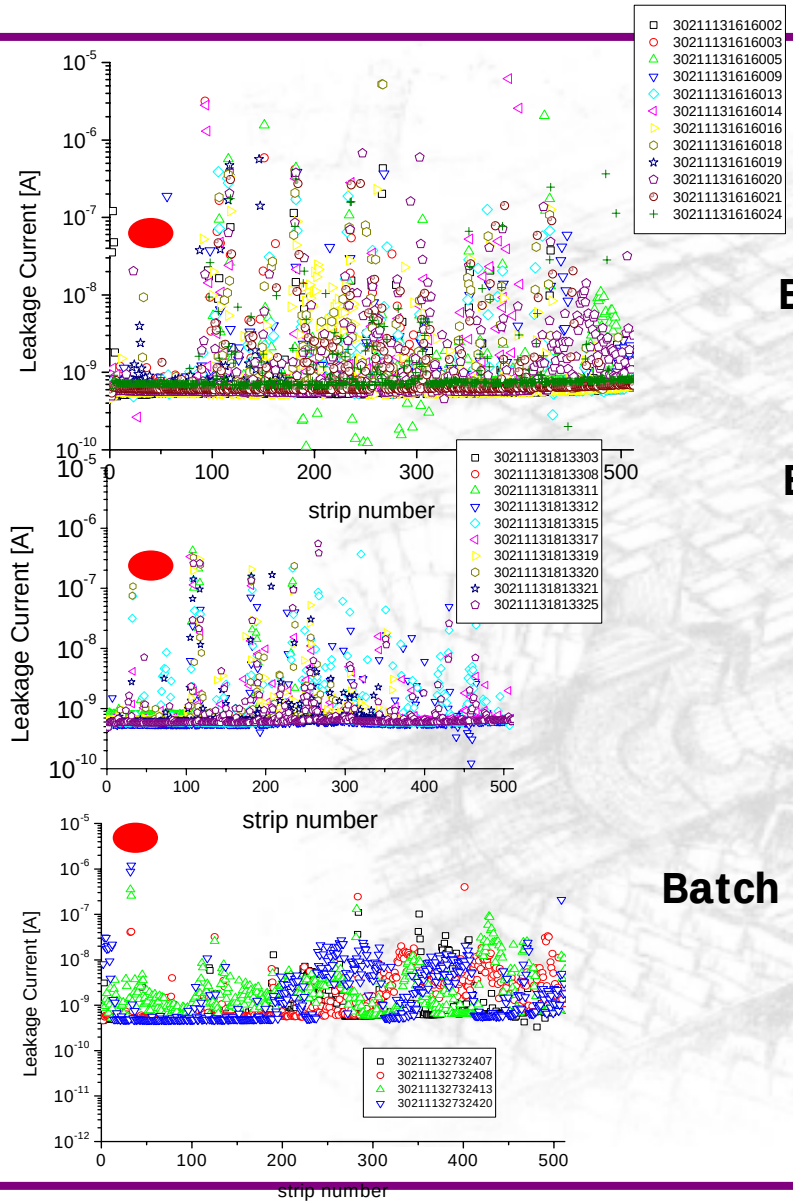


- Mostly localized on a small number of strips
- LOCAL defect (difficult to predict)
- Often accompanied by scratches or process defects.
- Sensitive to:
  - RH
  - Vacuum – mechanic deformation!
  - Time under bias
  - …
  - not to Temp.

➔ One can "play" with it!

In my personal opinion this is dangerous and difficult to predict wrt Noise/current!

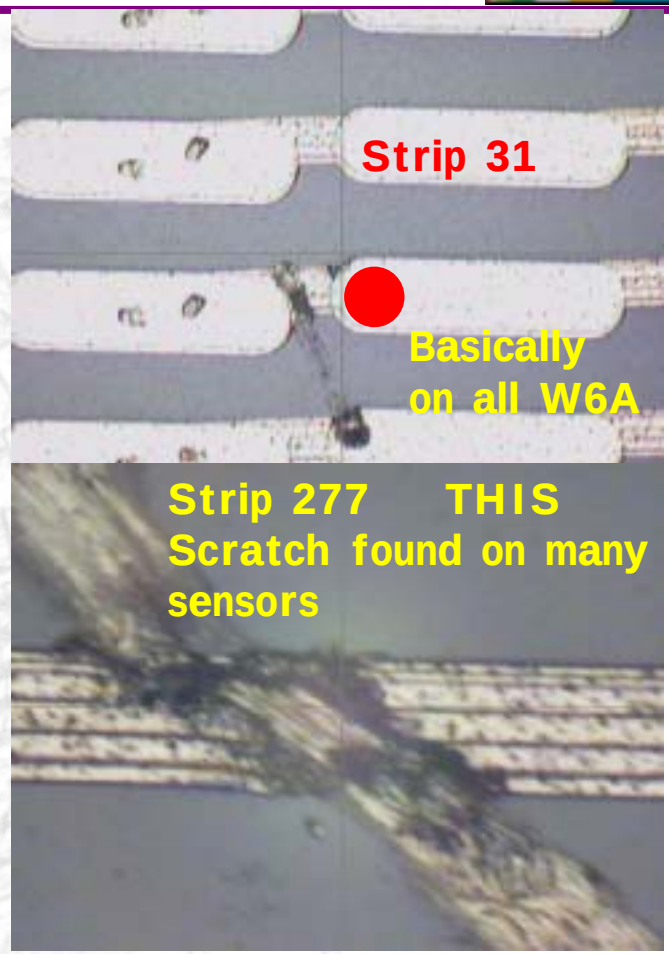
Repeatability of leaky strips
(an example)



Batch 16160 (S35)

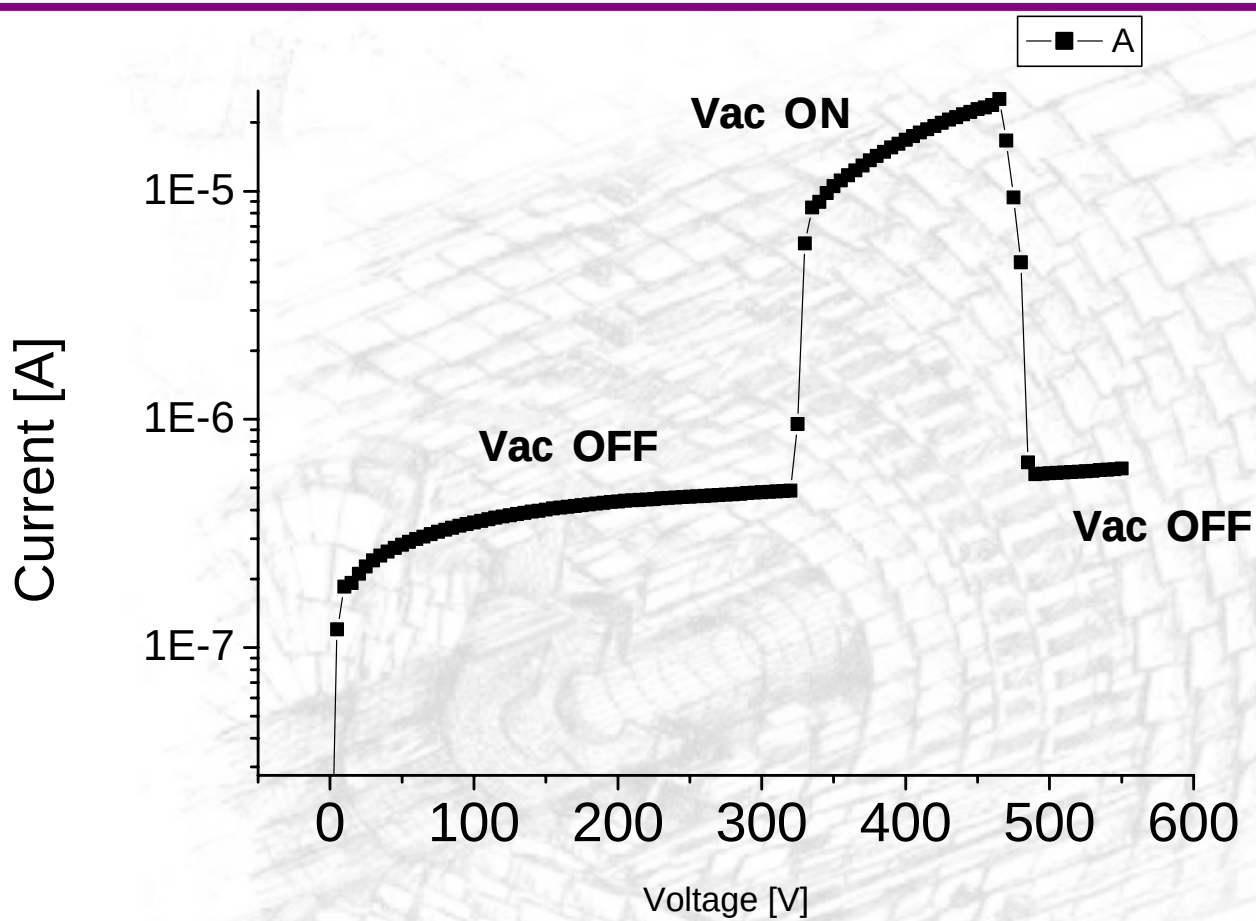
Batch 18133 (S39)

Batch 27324 (S43)



NB. ST finds quite often a short at strip 104/105 (W6A)
ST quotes some leaky strips as bad Rpoly

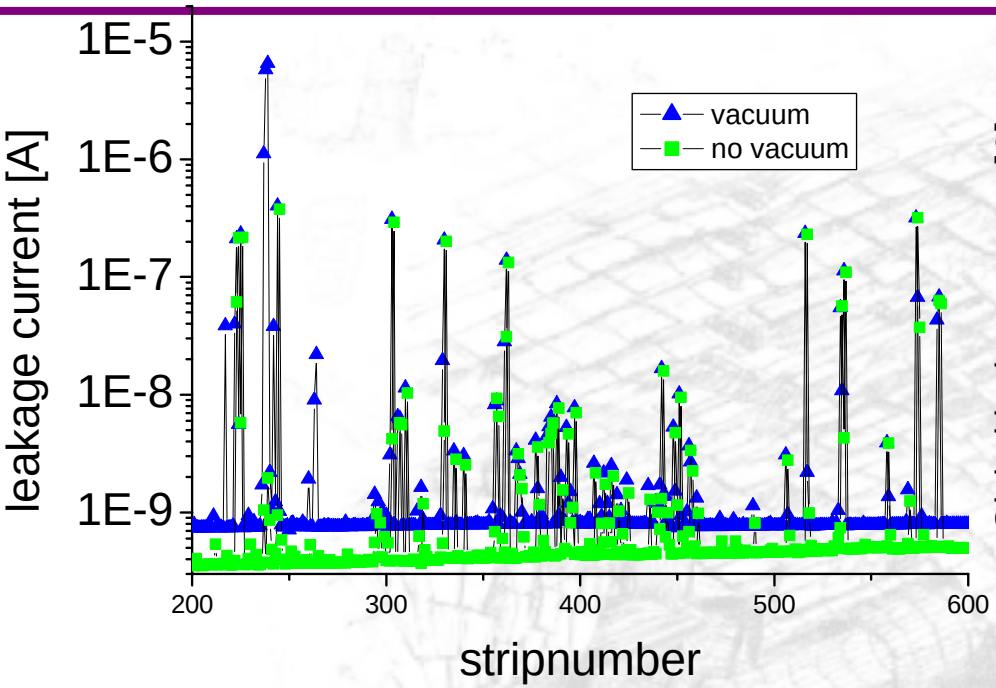
IV with different vacuum levels

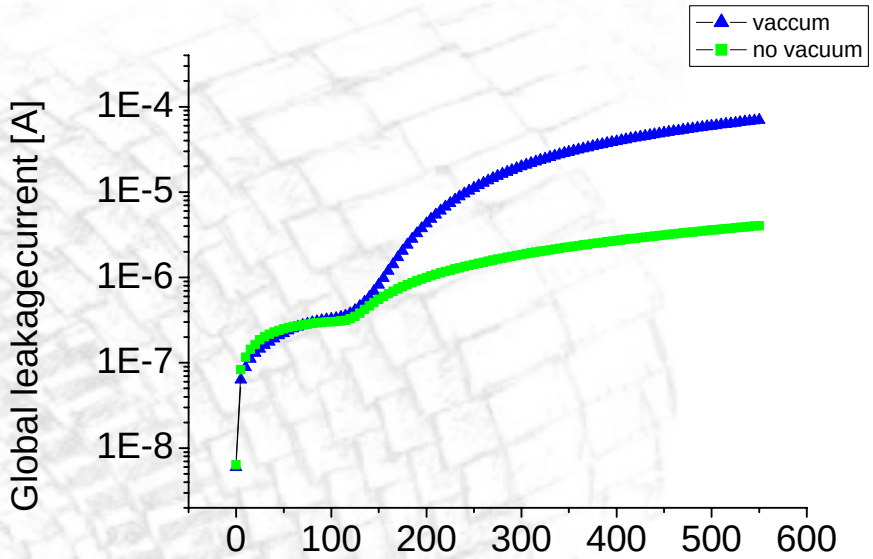


Preliminary!
Not observed on all sensors.

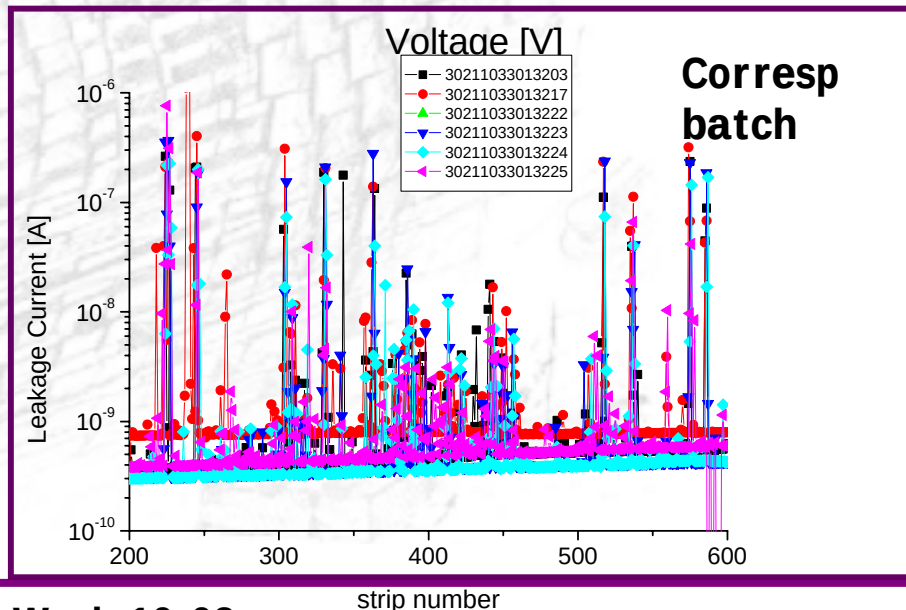
Sensor bow ~50µm → vacuum will impose slight mechanical deformation!
What is the level of mechanical stress in the final experiment?

Leakage currents vs. vacuum





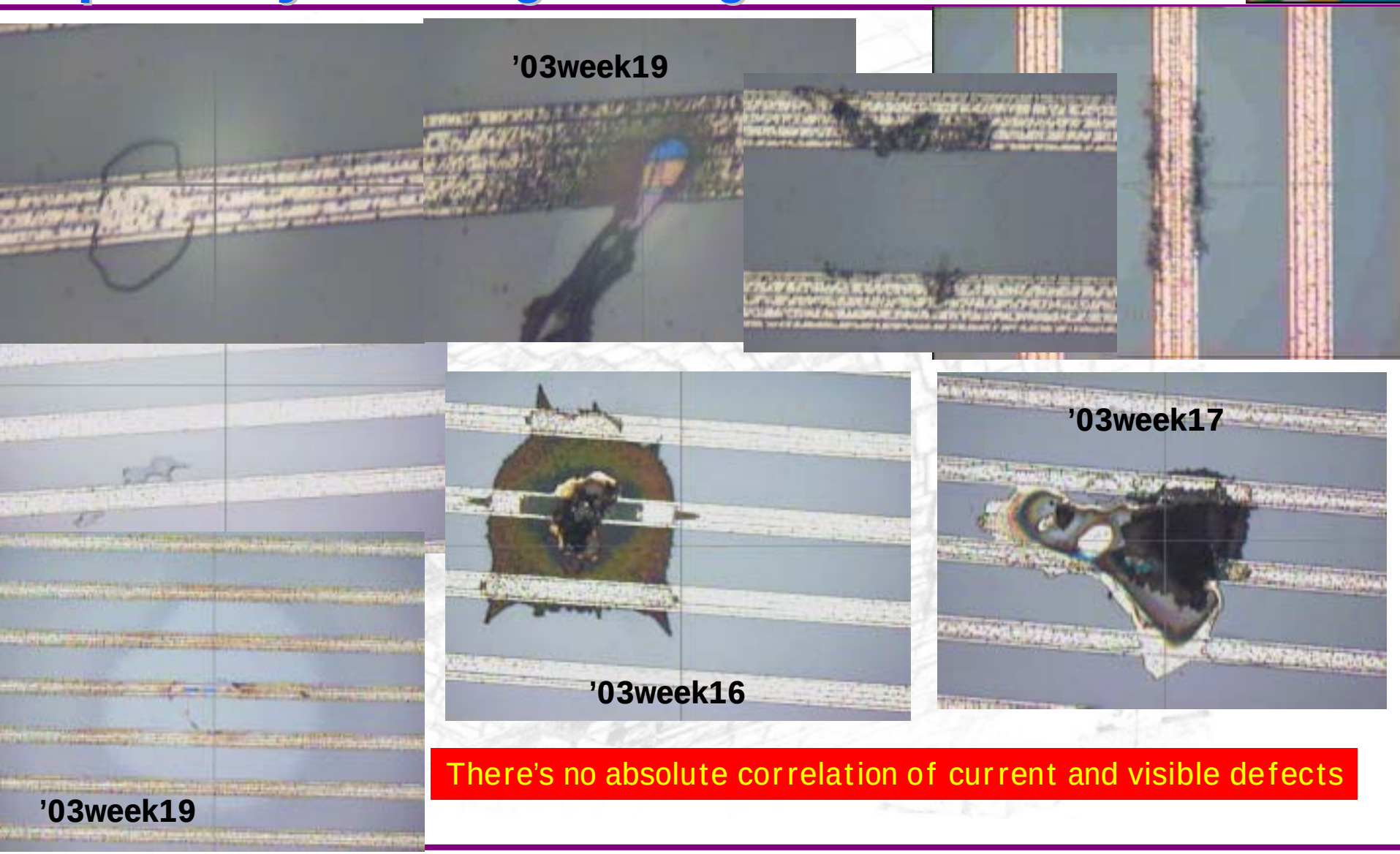
ST production week 30 W5B
30211033013222



Corresp batch

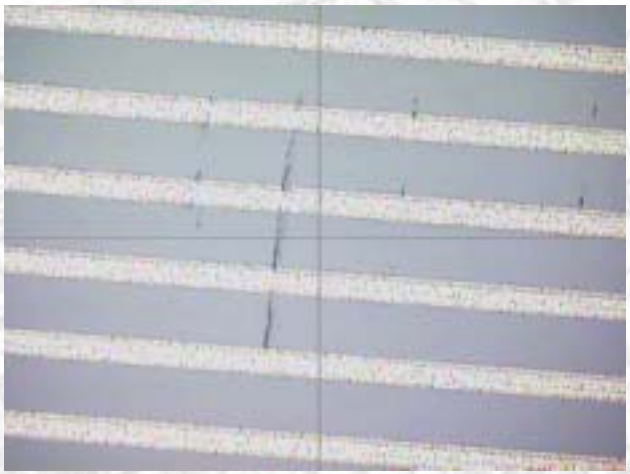
No visual damage observed
On the critical strips!!!

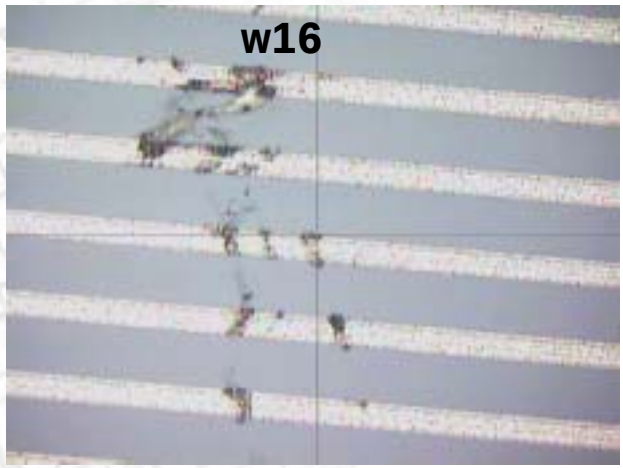
Some defects possibly leading to high current/noise

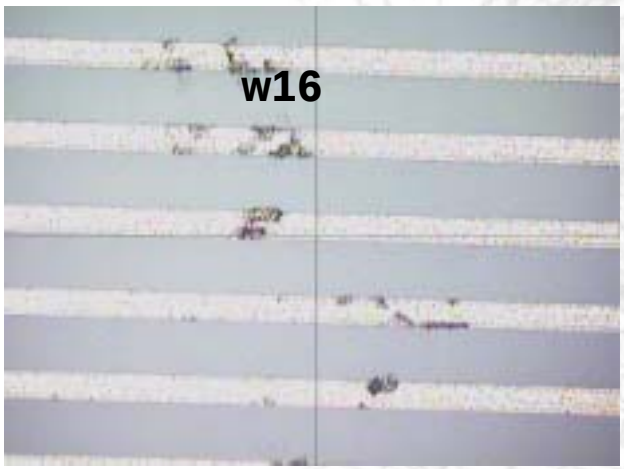


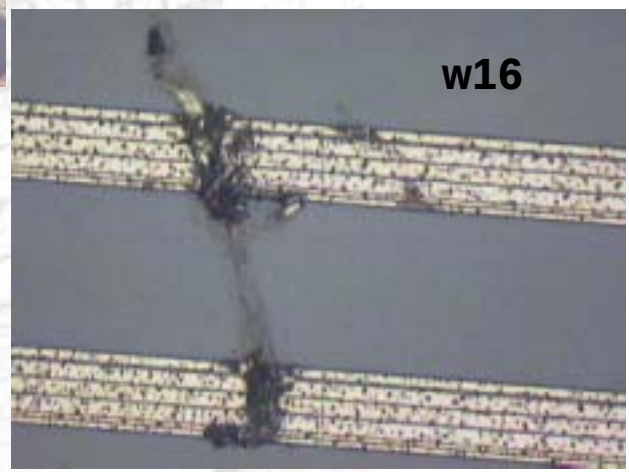
There's no absolute correlation of current and visible defects

Scratches '03



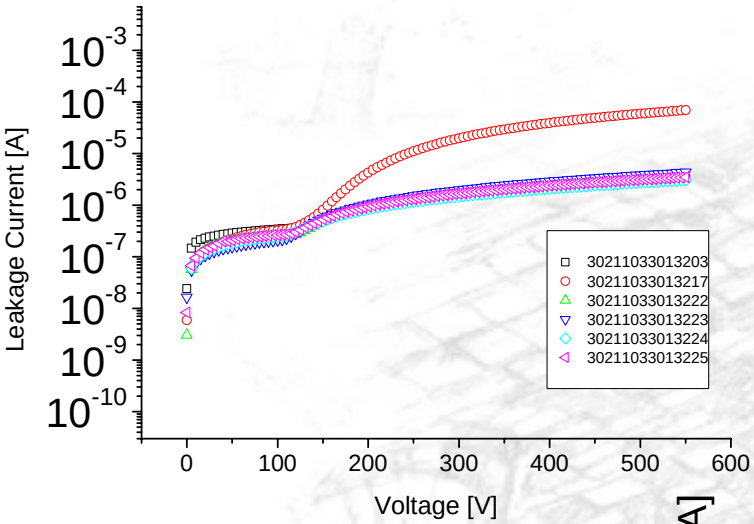


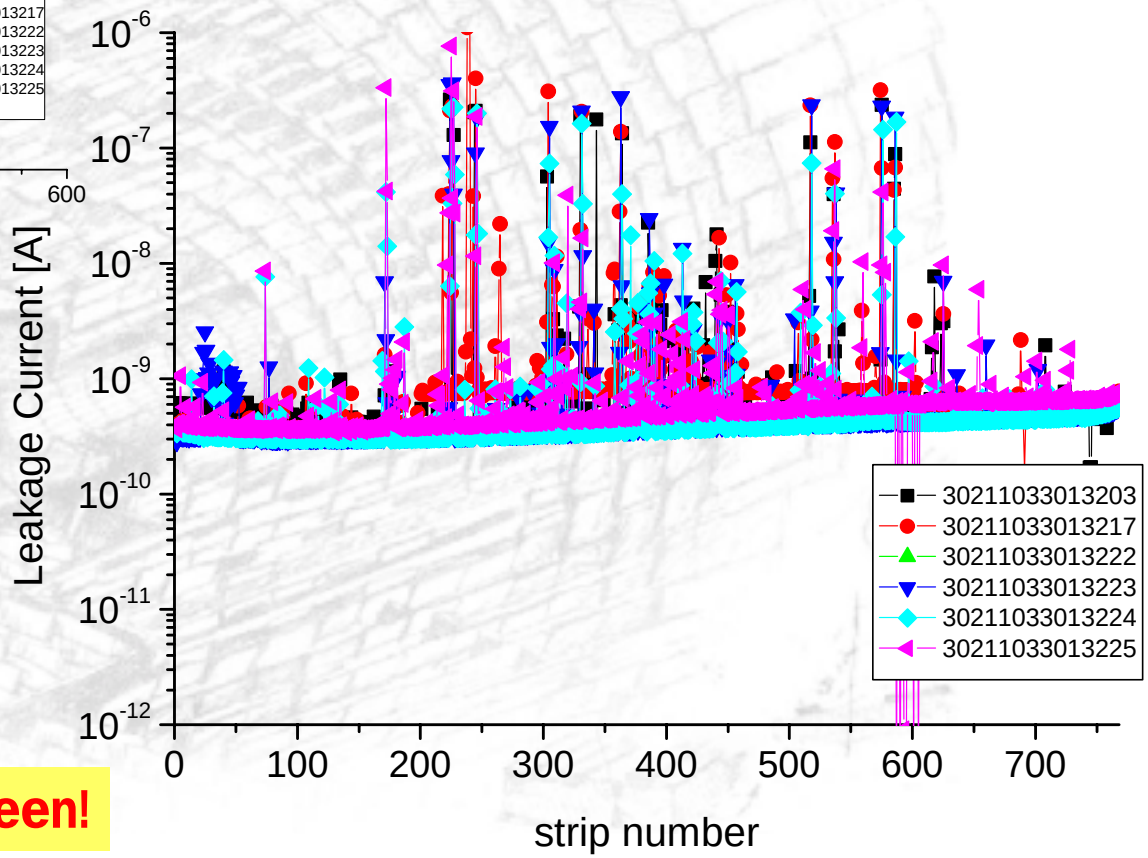




Still long scratches!

KA-S49 prod week 30

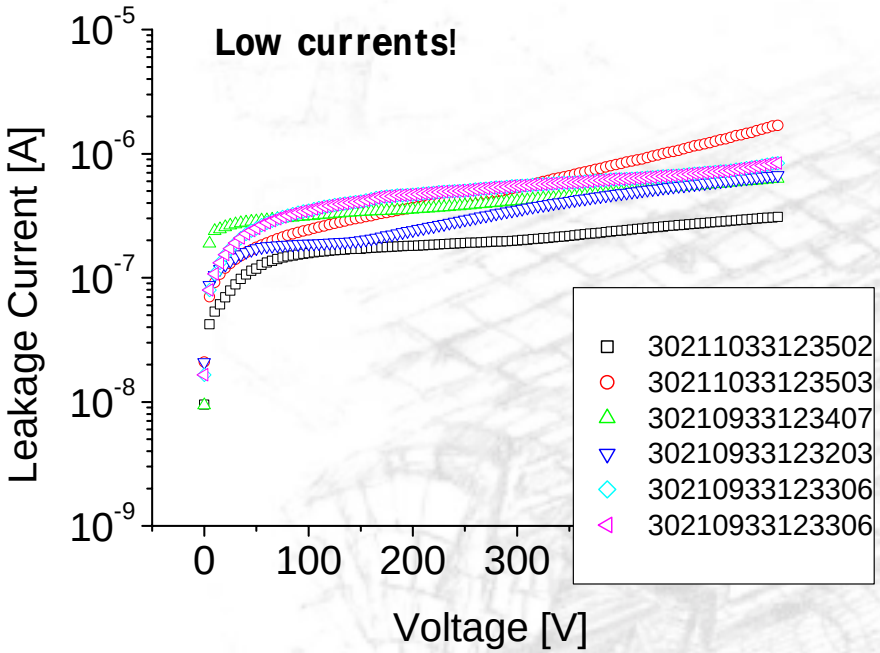


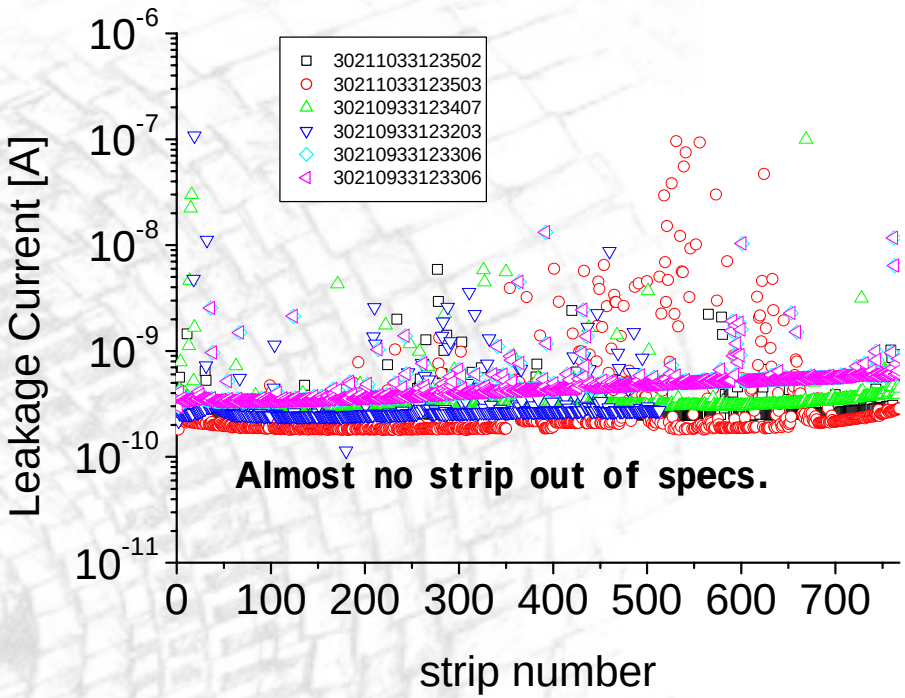


Due to #leaky strips/sensor 9,9,7,9,6,4
At the same positions!
➔ Complete batch rejected!

Worry: no visual defect seen!

Prod. week 31

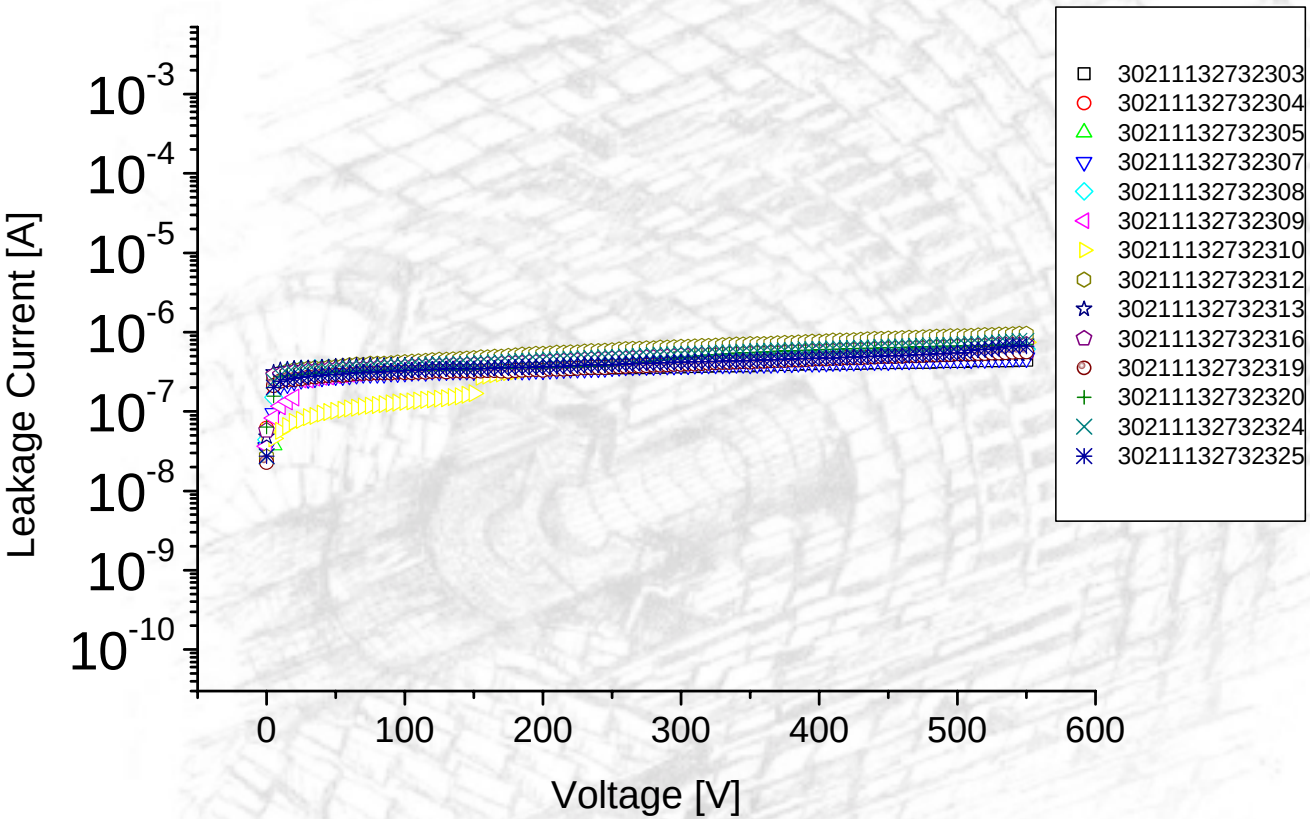




- **Latest available batches in KA!**
- **Small statistics! (7)**
- **Sensors from Set KA-S53,54,55,60**
- **No vacuum dependence observed!**
- **Still some leaky strips!**
- **Still 2nd kink**

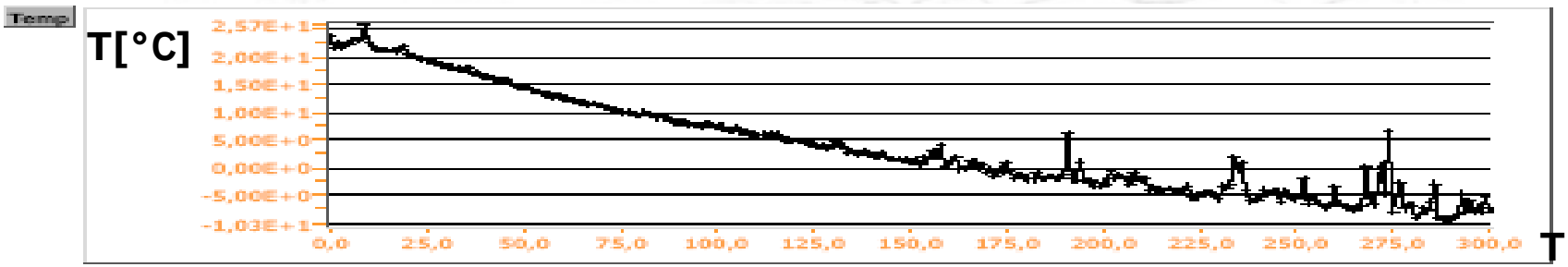
STM:
All processes frozen WEEK 32!
Add. passivation layer WEEK 39

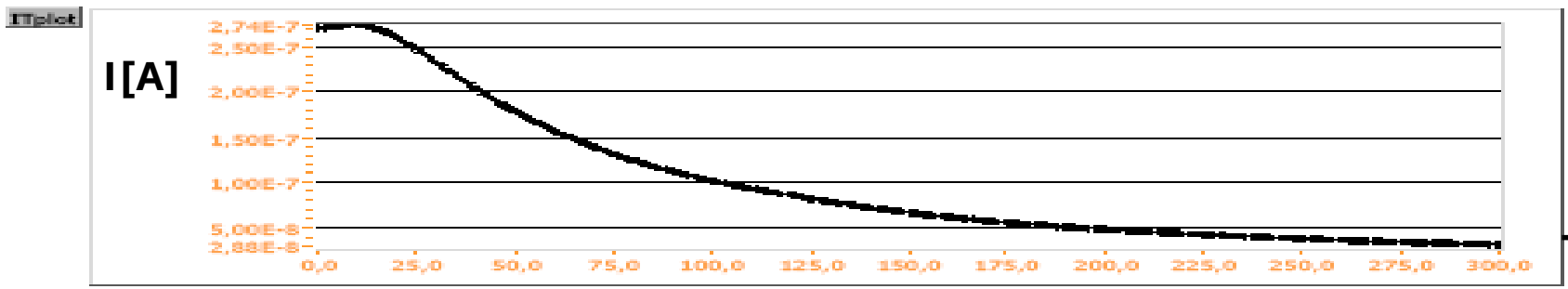
Good batches!

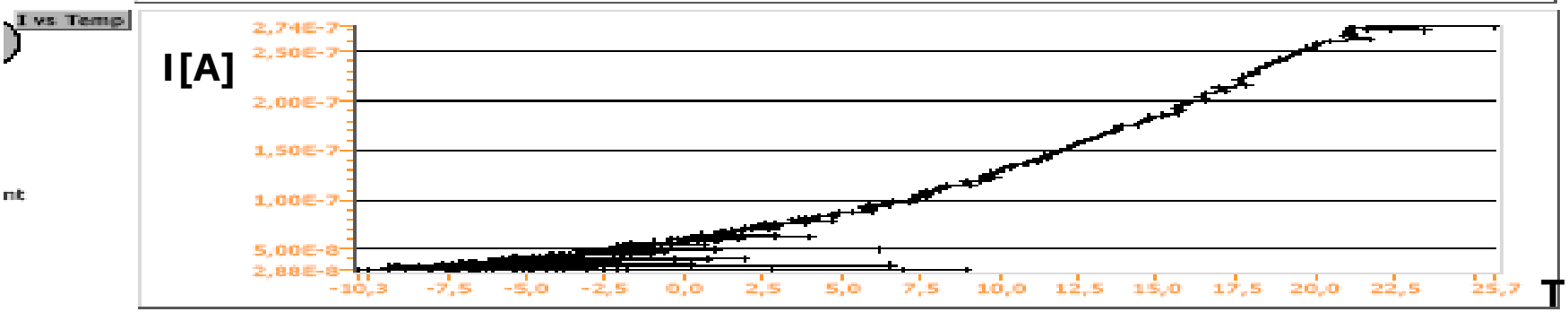


No kink, very low currents!

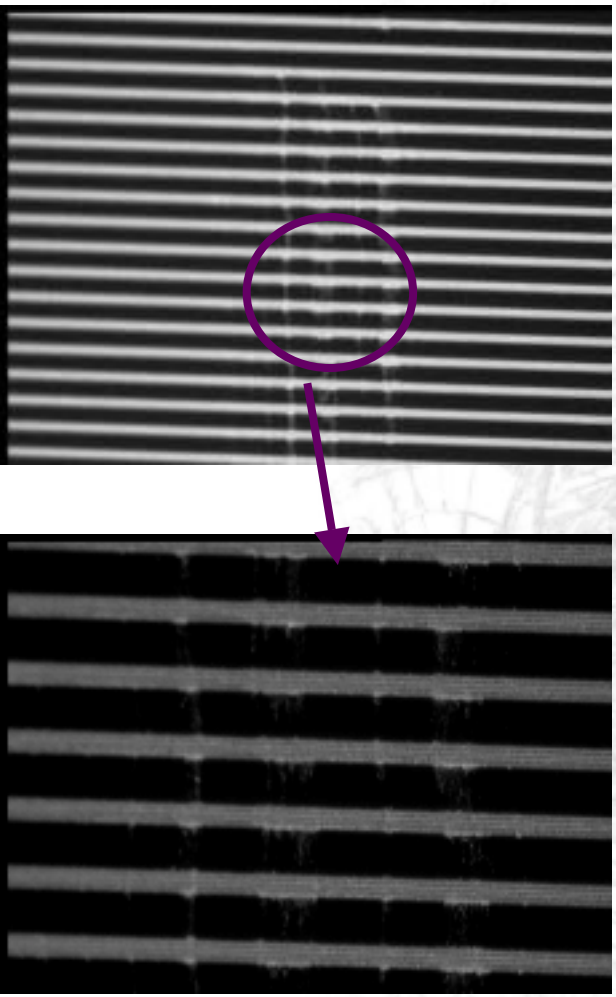
Strip current vs. T of a dubious/failed strips

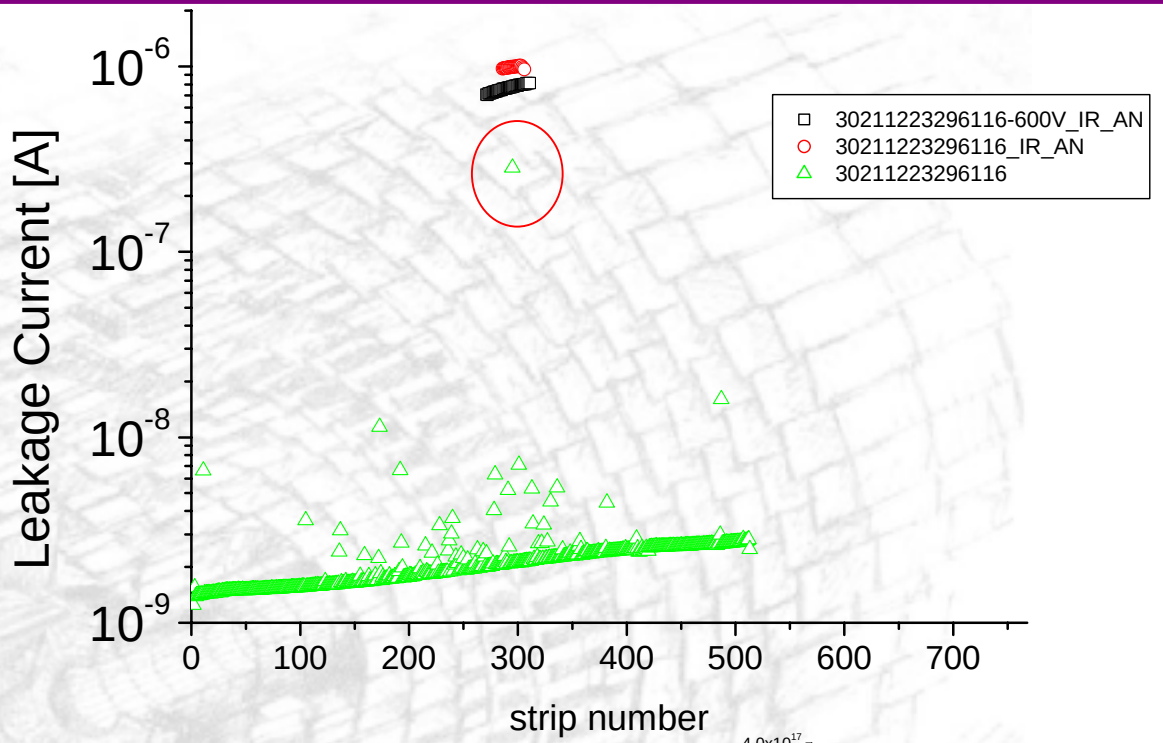




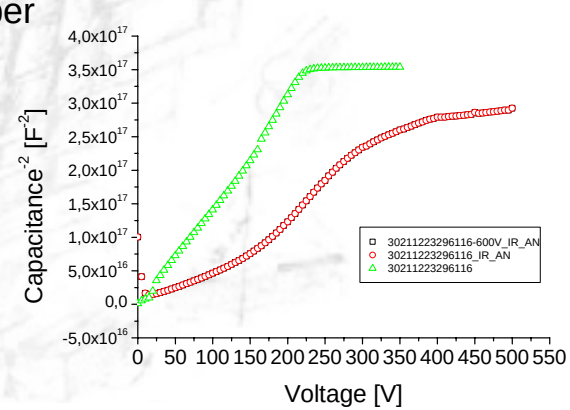


Strip after irrad. (on sensor)



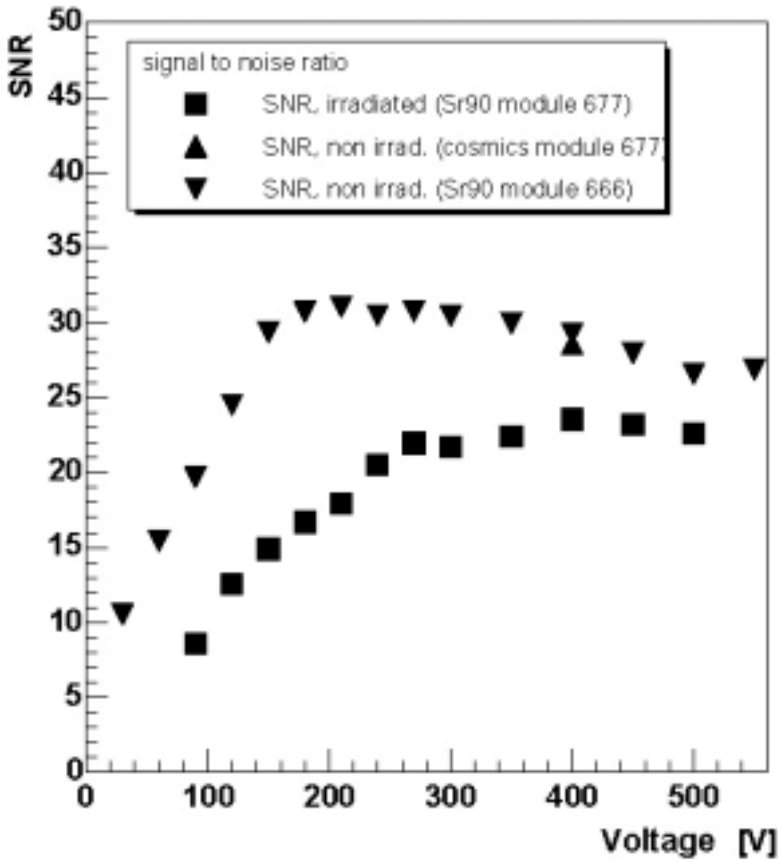


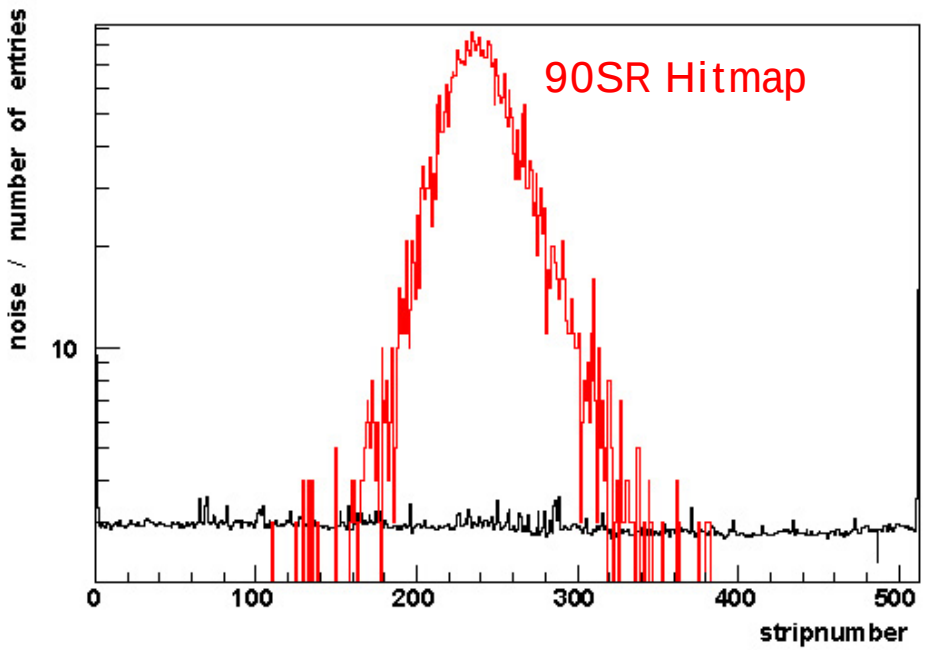
Critical strip before irrad.
Does not show after irrad.



After irrad. ~10Y OB
(more in the module construction)

Preliminary result of a defective module irrad. (thanks to FNAL/UCSB)

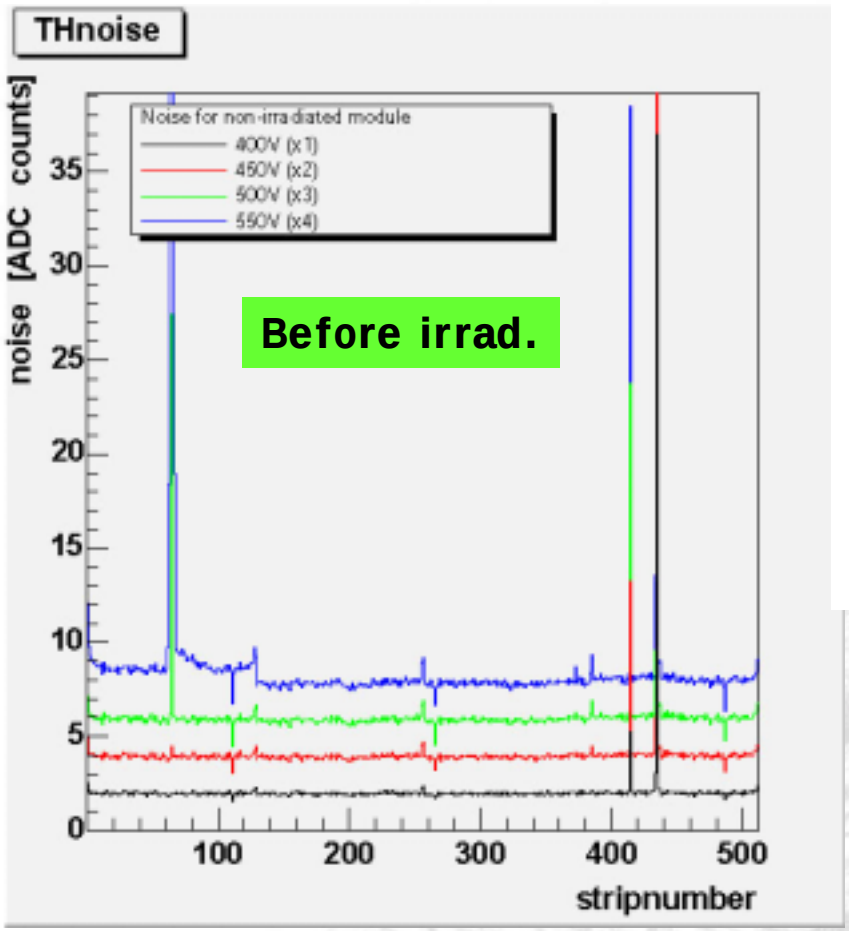


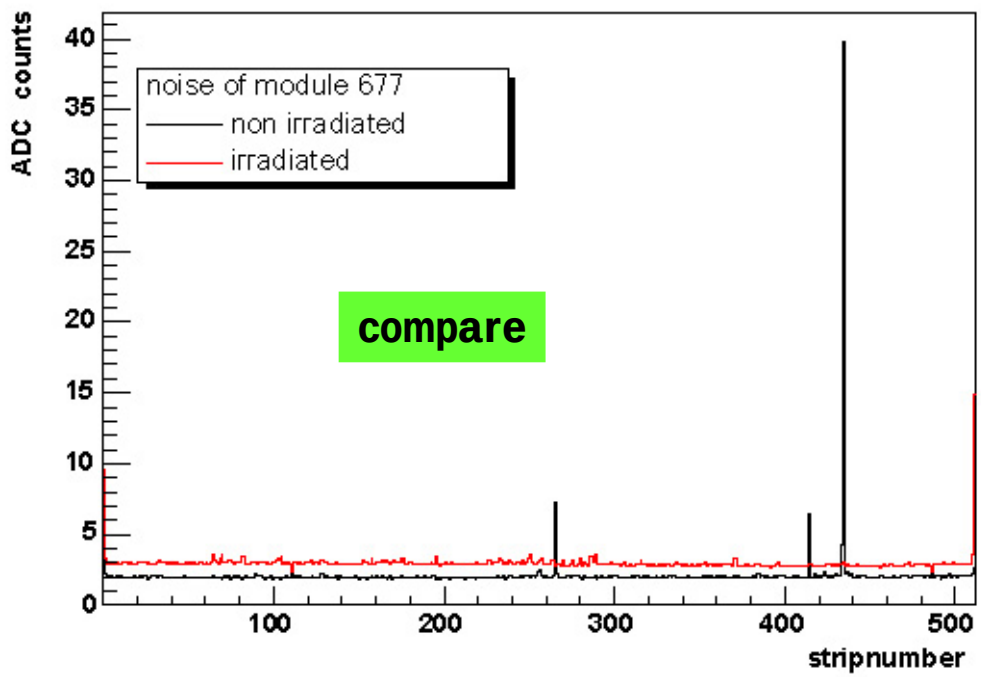


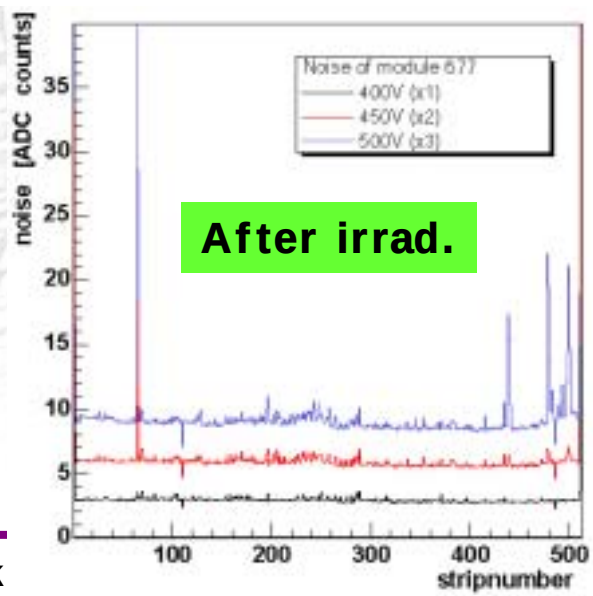
More measurements after irrad with cosmics & betas will follow, especially on the "defect" regions.

Noise before/after irrad

preliminary (not fully annealed)



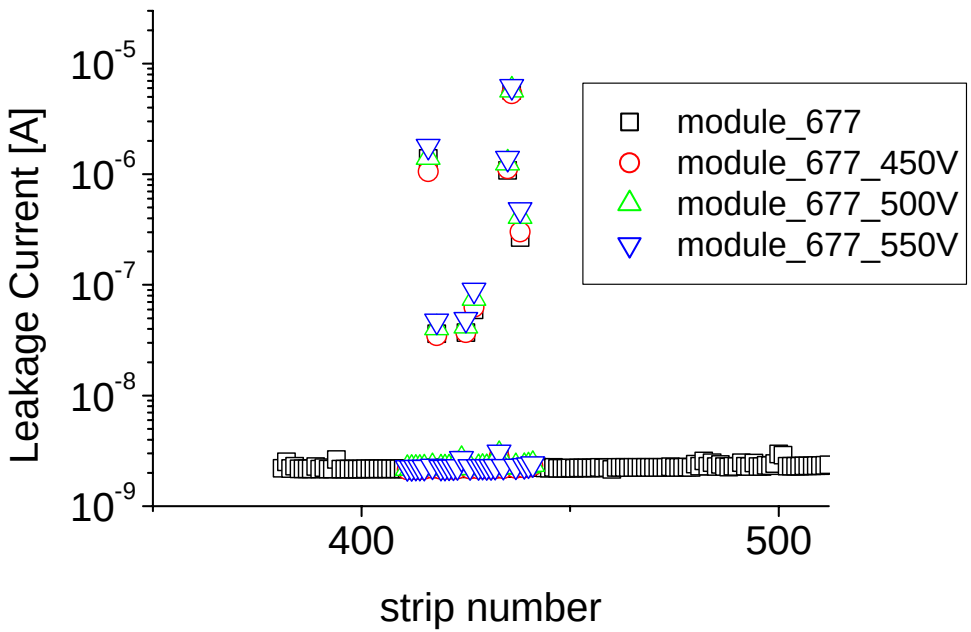




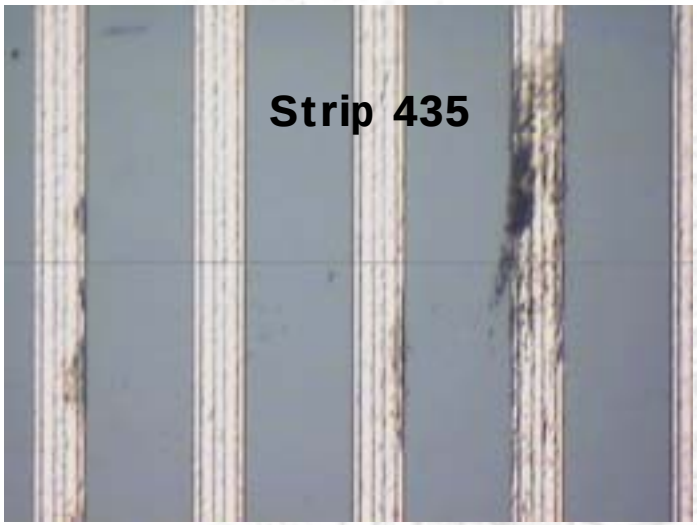
Module continued

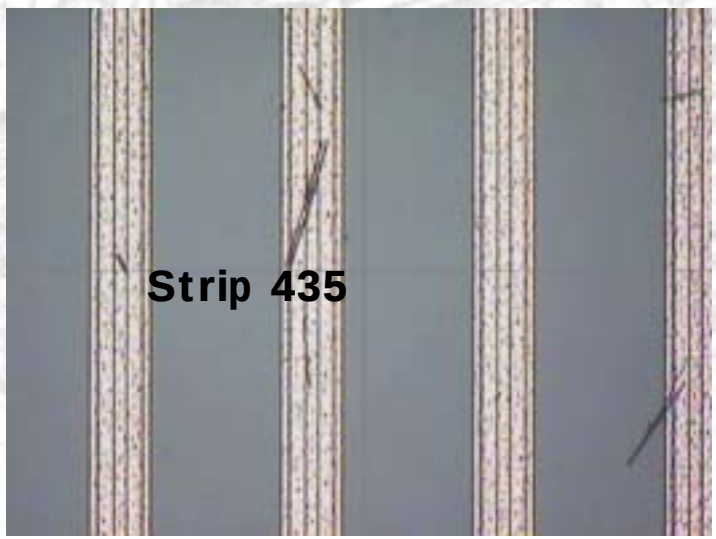
As expected the things are "better"
at least not worse after irrad.
(type inversion ➔ lower field on junction
Effect shifted to higher voltages
➔Implications on the voltage vs. operation
➔Lorentzangle
➔ More measurements to come!!

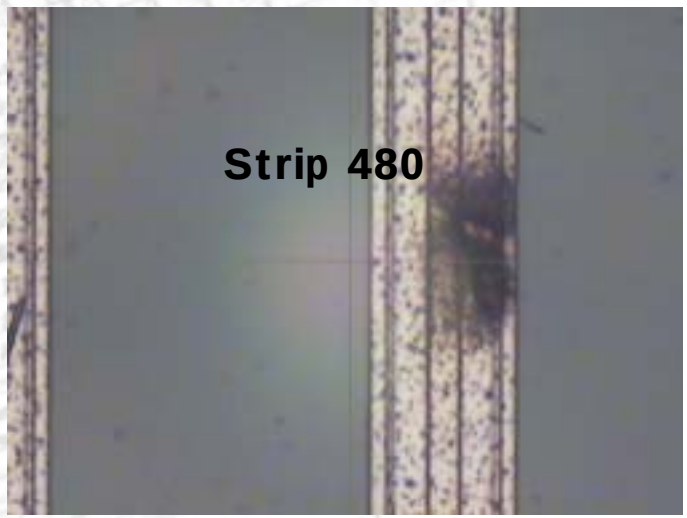
Strip currents on module



Some pictures of the module







Tests ongoing

- Assembly of 2 modules with particularly “bad” sensors
- Strips@ 1nA, 50nA, 300nA, 1µA, xµA

➔Parallel noise & strip current measurement to have a absolute correlation

(unfortunately with low statistics)

Modules were assembled & bonded yesterday, under measurement right now (hybrids arrived last friday).

"MY" Conclusions

- There are NO conclusions but the fact that sensors with a 2nd kink are difficult to predict wrt noise & currents.
- They are often sensitive to
  - RH
  - Possibly mechanical stress
  - Vbias
- They often come with visual defects!
- The effect is mostly localized with different sources.
- The effect lessens after irrad. or at least does not worsen.
- On a statistic of one the noise behave properly with T

Due to the huge number of sensors (& modules to come)

it will be more and more difficult to investigate these problems!

Possibly we are just one week before the final perfect sensor production! There are good & bad batches!