

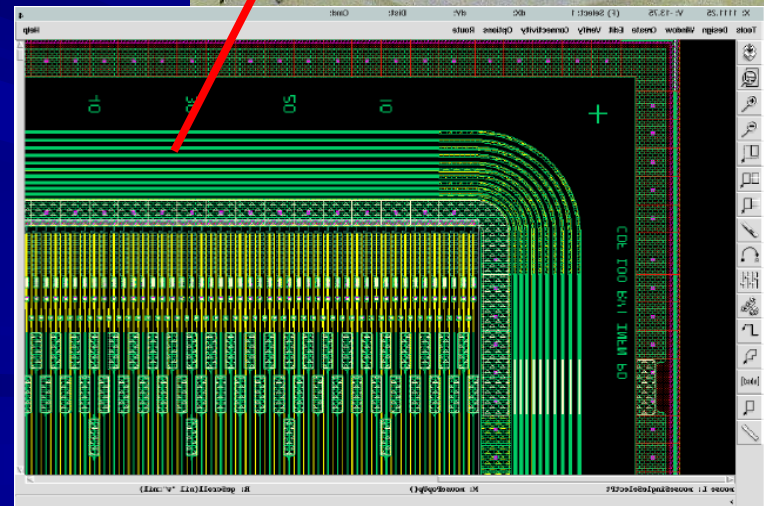
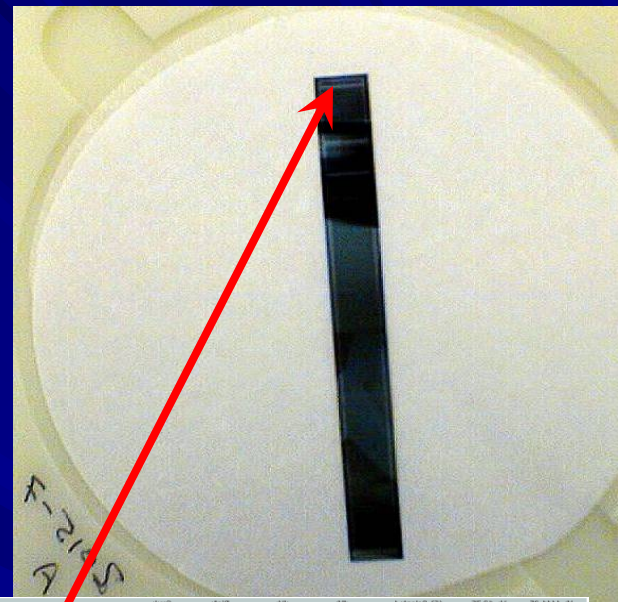
Thin silicon: Strips and Pixels development

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- **Thin silicon is interesting for precise tracking and vertexing at the LHC**
- **Purdue has started R&D both for strip and pixel sensors**
- **Review of current status and plans for the future**

Thin silicon Strip

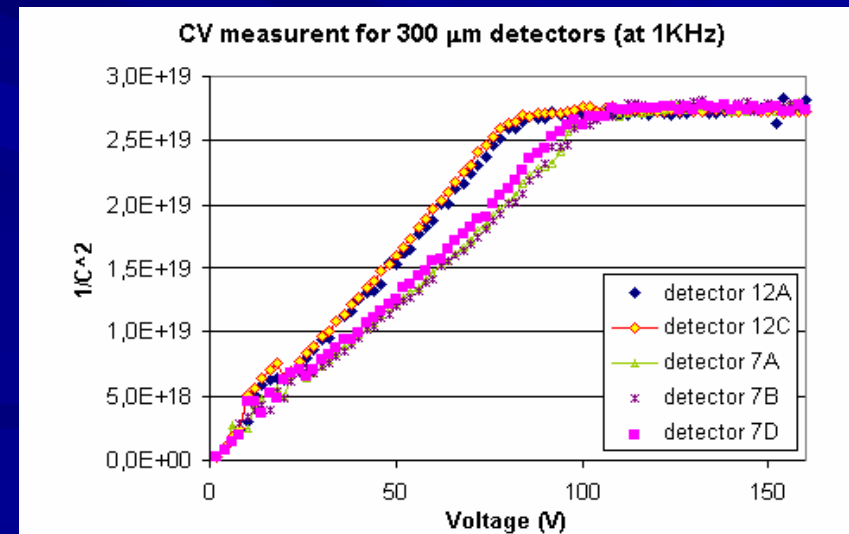
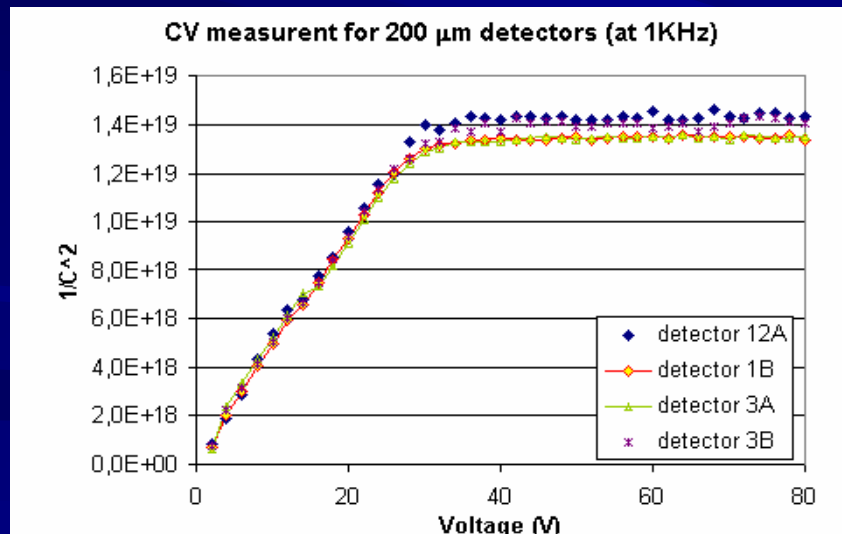
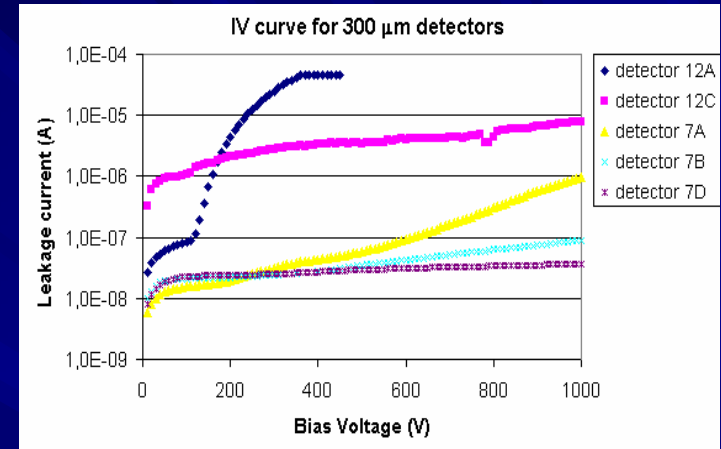
- Received thin silicon strips sensors (fabricated with CDF-L00 masks)
- Geometrical specifications
 - Readout 50 μm pitch
 - Implant 25 μm pitch
 - Dimension 0.85 x 7.84 cm^2
 - Bias scheme Polyresistor on both sides
 - Implant strip width 8 mm
 - Implant strip length 7.6 mm
- Compare: 150, 200 and 300 μm thick strip detectors
 - DC measurements
 - Performance studies using the SVX4 chip developed for the “run 2b “ of the Tevatron



First Results: DC measurements

List of measurements:

1. IV
2. CV
3. Coupling capacitance
4. Polysilicon resistance
5. Interstrip resistance
6. Interstrip capacitance



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Summary DC measurements

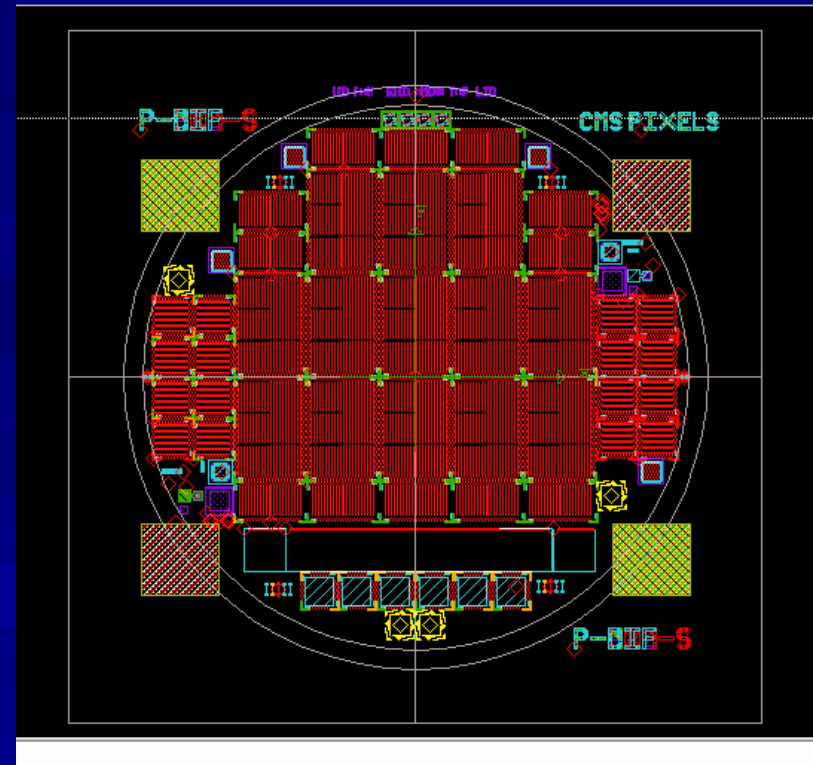
Thickness	300 μm	200 μm
Depletion Voltage (at 1KHz)	~ 90 V	~ 30 V
Total leakage current	~ 25 nA	~ 15 nA
Strip leakage current	~ 0.2 nA	~ 0.08 nA
Bulk capacitance	~ 190 pF	~ 260 pF
Coupling capacitance (at 1KHz)	~ 87 pF	~ 130 pF
Polysilicon Resistance	~ 0.49 M Ω	~ 1.8 M Ω
Interstrip Capacitance (at 1MHz)	~ 4.5 pF	~ 4.5 pF
Interstrip resistance	not yet tested	

Future plans

- **Connecting sensors to readout electronics (SVX4)**
- **Study of charge collection efficiency with a laser scanning system**
- **Irradiation of sensors and further characterization**

Thin silicon Pixels

- Pixel wafer
 - CMS-Pixels sensors
 - RD50 PAD structures for SLHC
 - Structures to study bump bonding
- 300 μm thick pixel detectors have been received. Thinner sensors available in ~ 1 month.



Area is dominated by CMS pixel devices compatible with the 0.25 μm chip

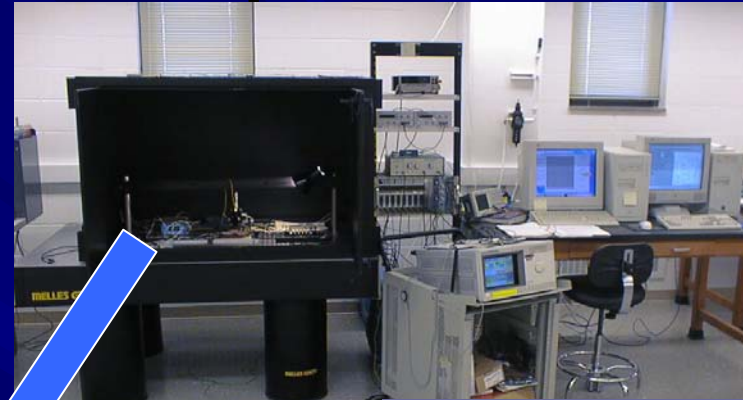
CCE measurements of pixels

- Laser measurements at Purdue
- Use 1064 nm laser to study the CCE of pixel systems
 - Beam size about 10 μm
 - Acquiring shorter wavelength laser to study SCSI

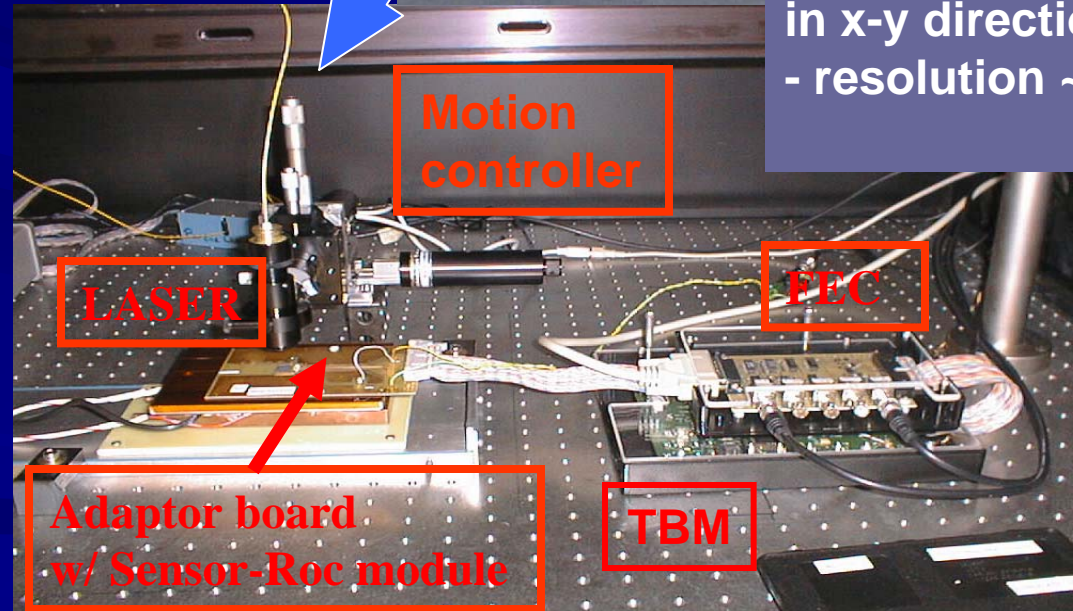
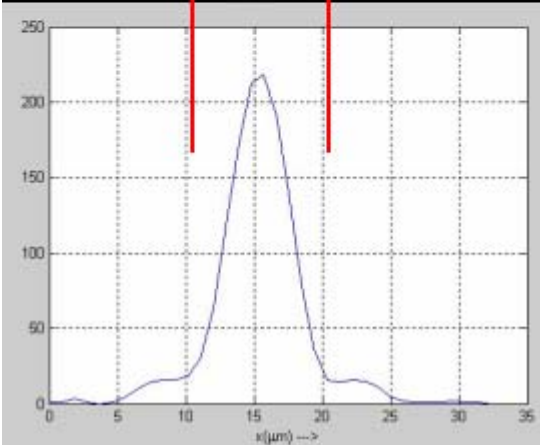
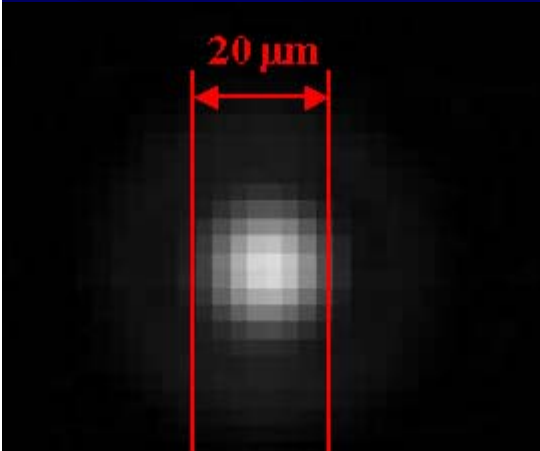
LASER setup

Laser spot taken with IR camera

- wavelength 1064 nm
- the spot size $\approx 10 \mu\text{m}$ (focused)
- focal length $\sim 2.18 \text{ cm}$



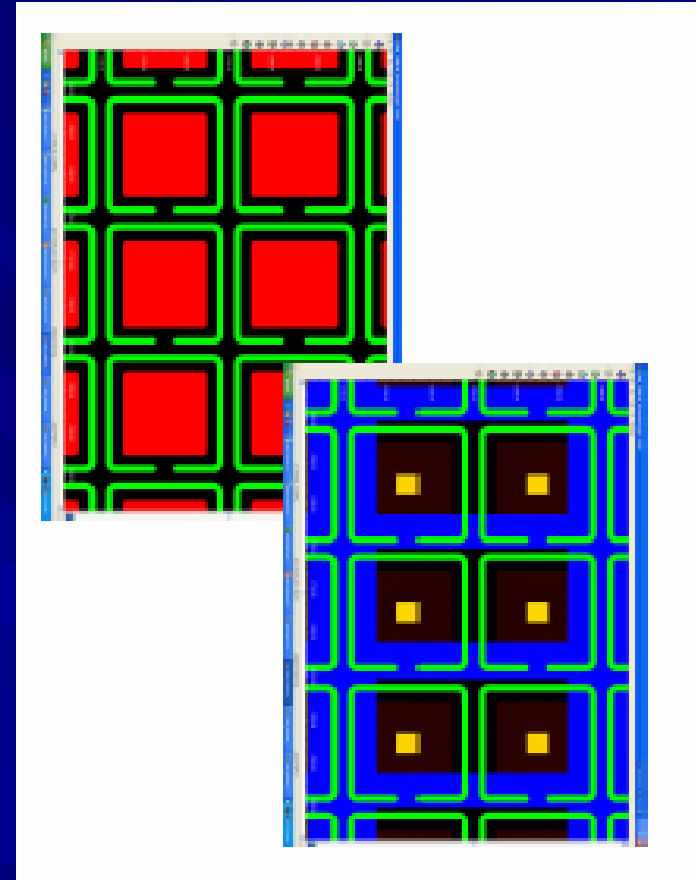
Motion controller
in x-y direction
- resolution $\sim 1 \mu\text{m}$



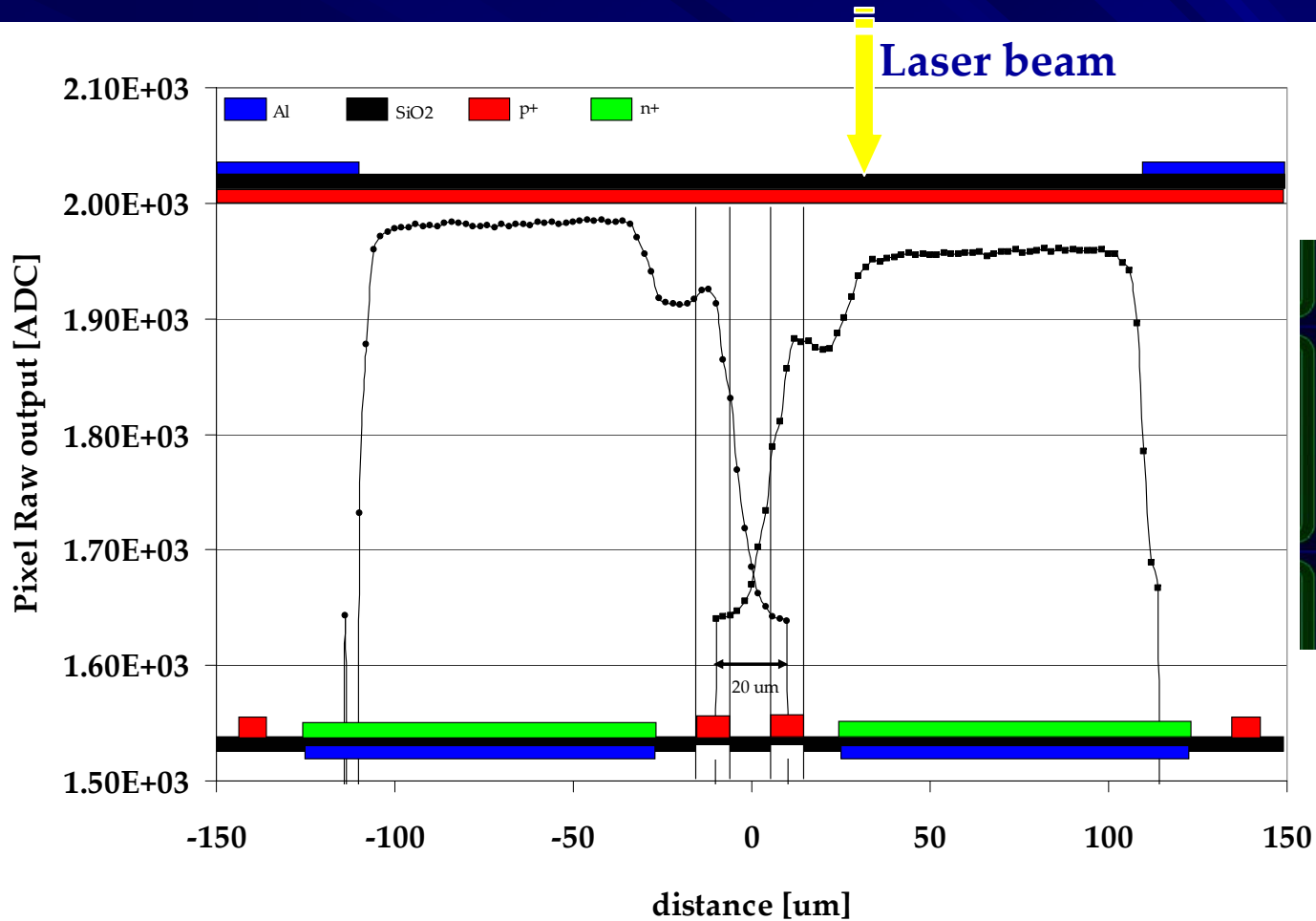
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Sensor Geometry

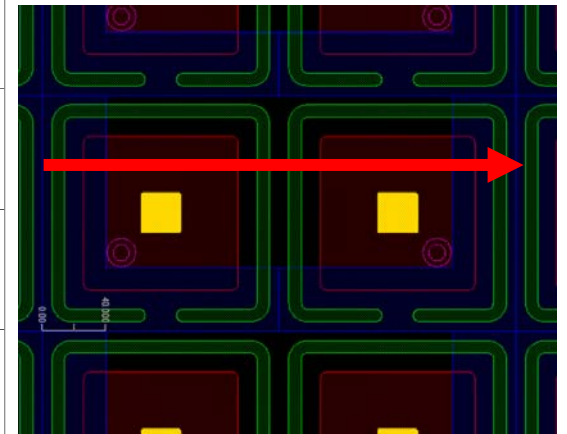
- Implanted n+-pixel (metalized) ~98%
- P-stops rings 8 μ m wide with 12 μ m gaps
- Metal grid on the p-side
- Contact between the Al and n+ pixels



A laser scan



Si top surface



Si bottom surface
bumped to the PSI43

Conclusions

- Thin detectors in hand (strips)
- DC measurements started
- Setup for CCE measurements for pixels already working
- Waiting for SVX4 chips to measure CCE on strip sensors
- Study of mechanical assembly and bump-bonding requires funding which is currently not available
- MC studies of tracker and vertex detector options necessary to guide R&D