DESIGN & PRODUCTION OF SILICON SENSORS FOR PHENIX MPC-EX

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(Yonsei Univ.)

For PHENIX MPC-EX collaboration

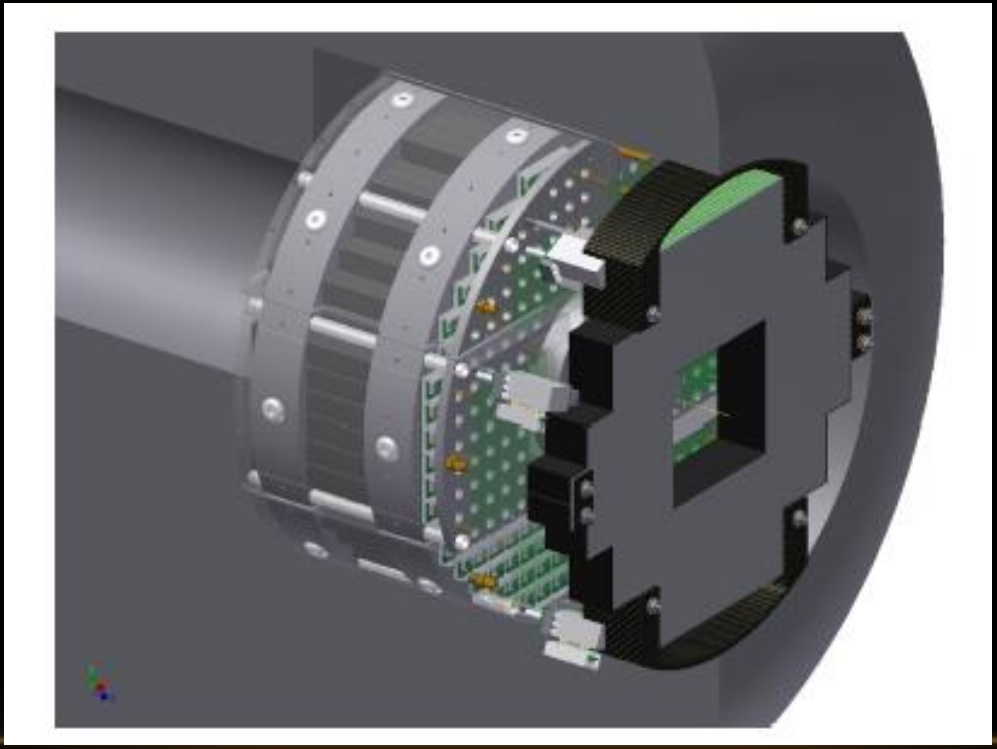
MPC-EX

- 참여그룹
  - 국외 : Brookhaven Nation Laboratory, Iowa State University, University of California-Riverside, Los Alamos National Laboratory
  - 국내 : Yonsei University, ETRI, Ewha Womens University, Hanyang University, Chonbuk National University

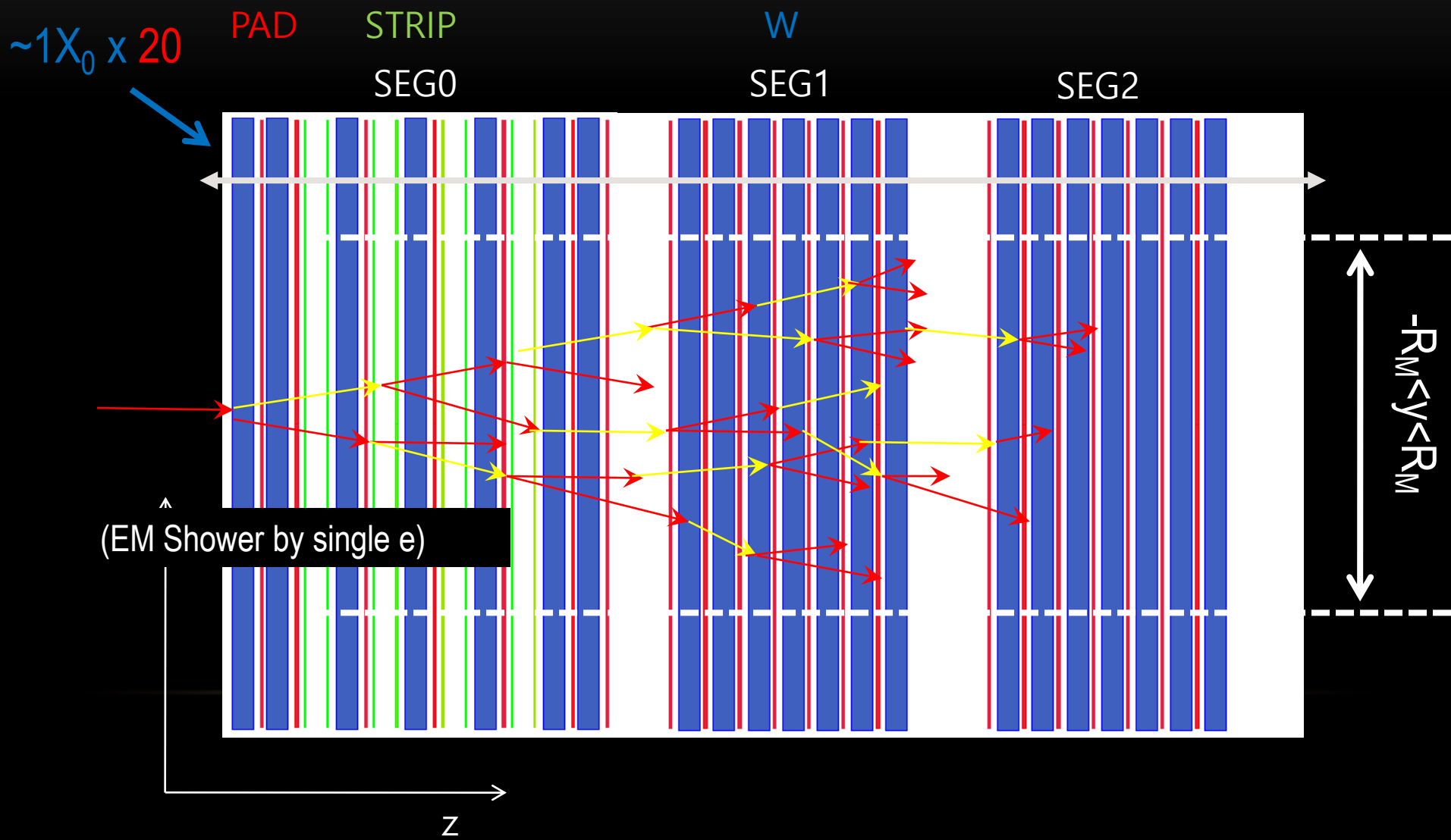
- 발표관련 기여
  - Sensor design : BNL, Yonsei & ETRI
  - Sensor production : Yonsei & ETRI
  - Sensor test : Yonsei, Ewha Womens University

MPC-EX FOR PHENIX

- Application as a pre-shower for EMCal (Electromagnetic calorimeter)

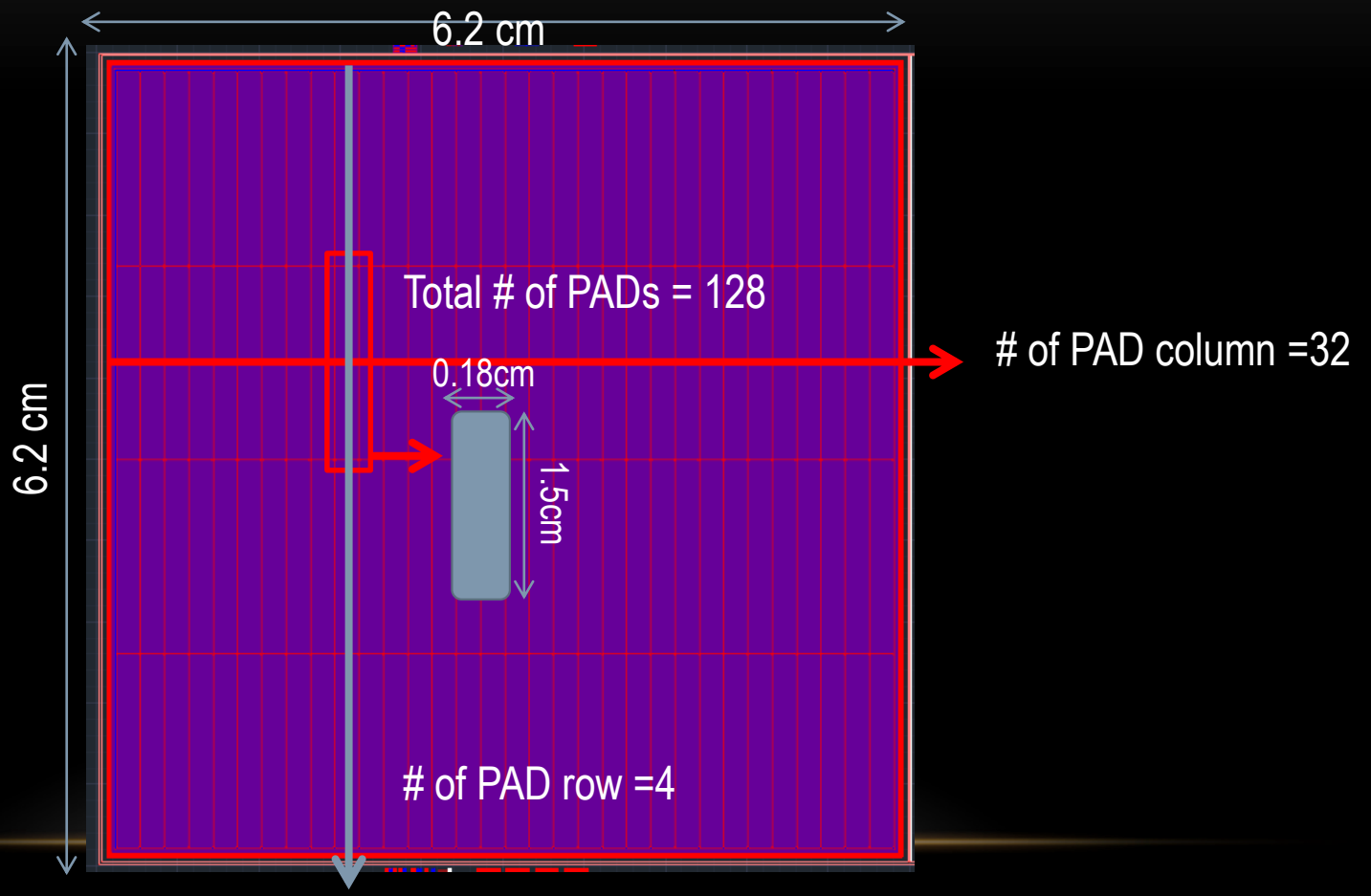


Electromagnetic Shower
(A schematic view)

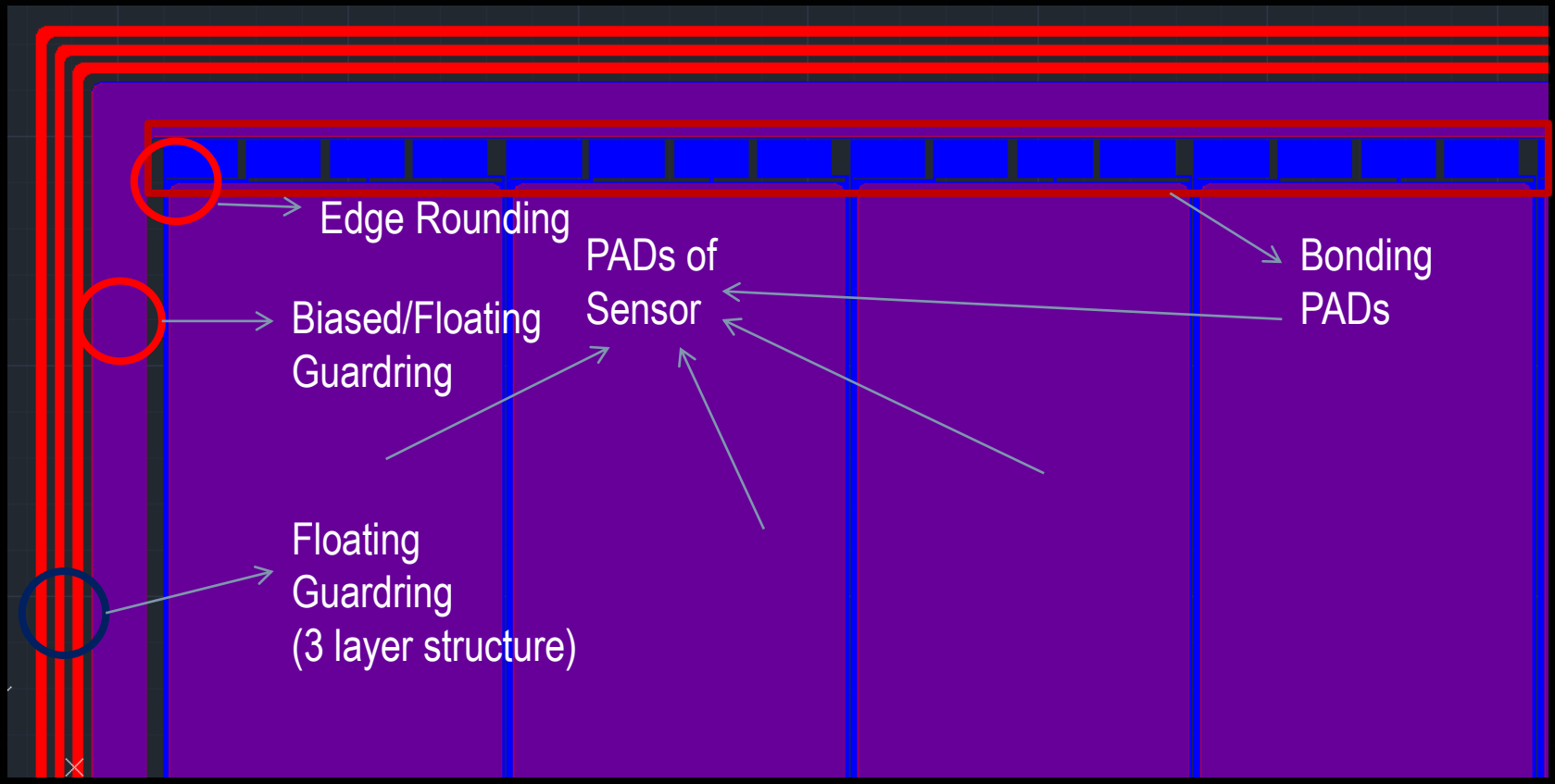


Sensor Design

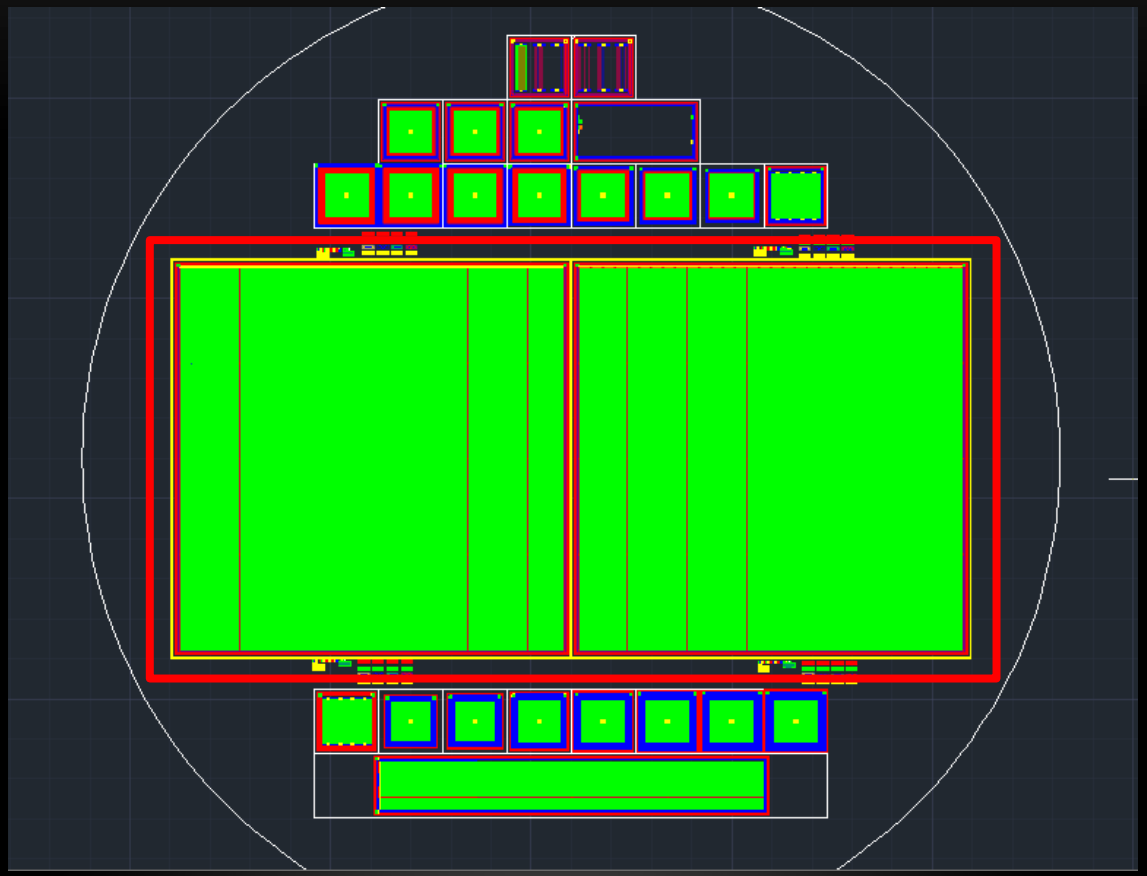
SENSOR GEOMETRY



SOME DESIGN DETAILS

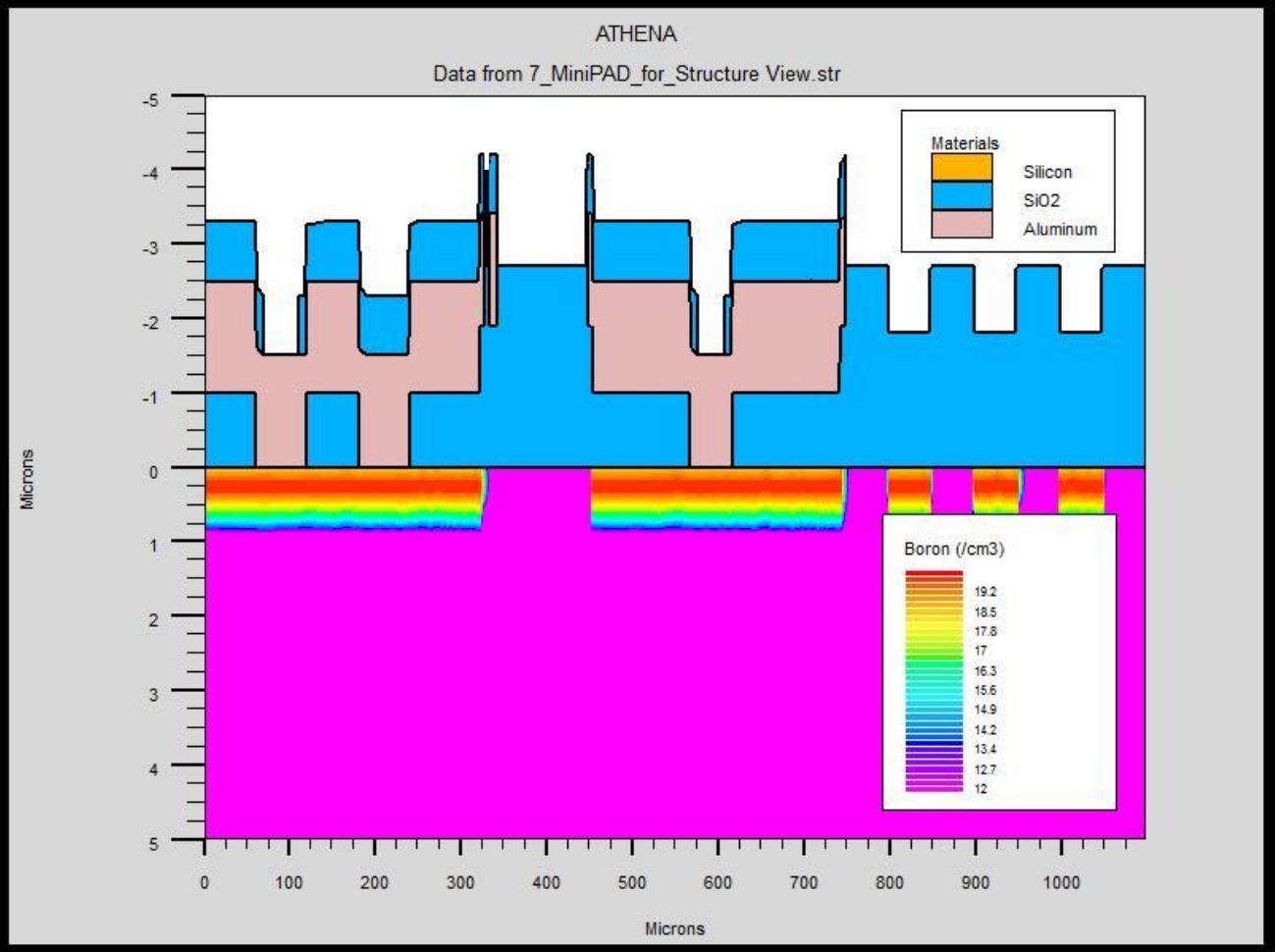


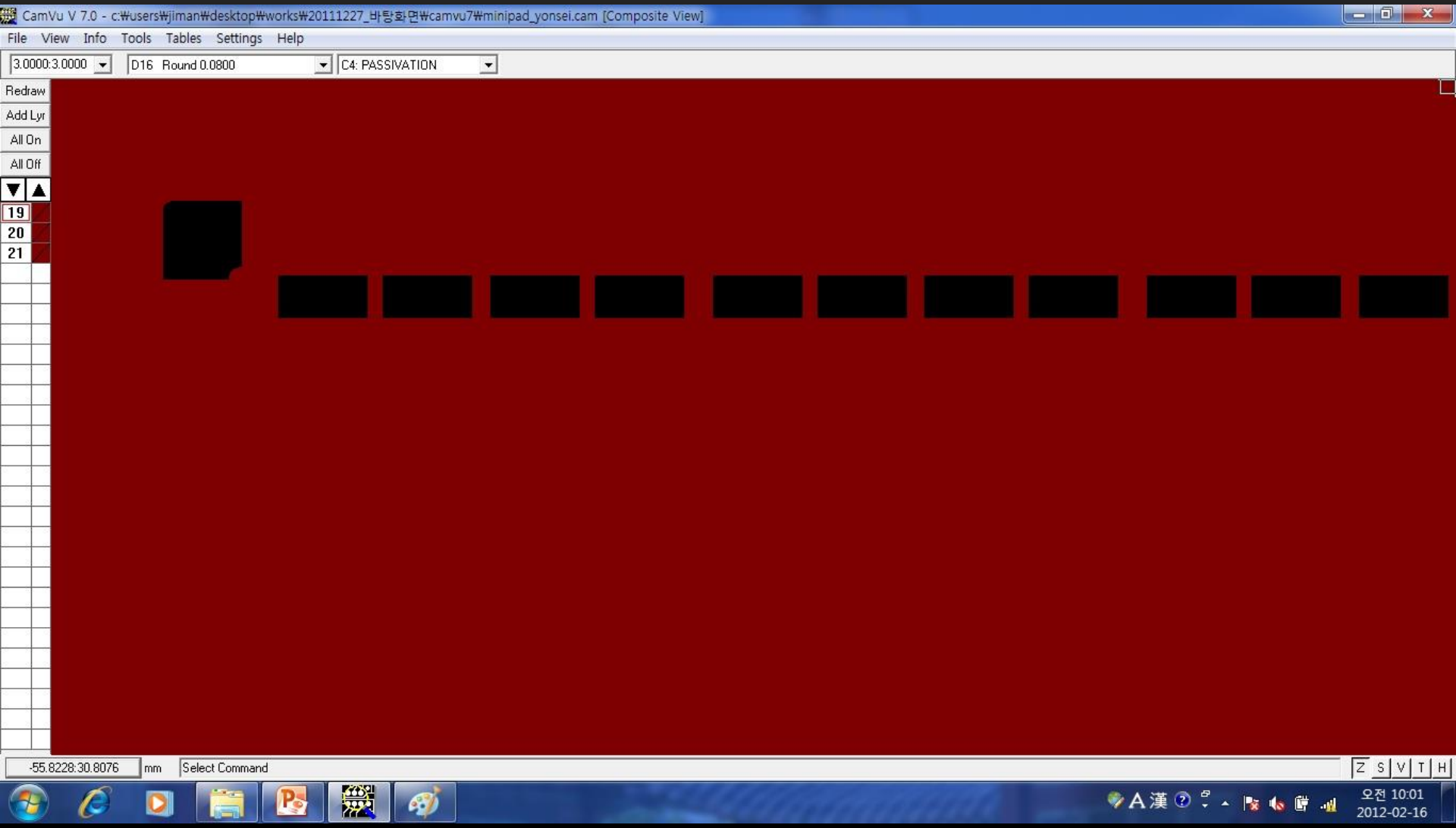
MASK DESIGN OF SILICON SENSOR



Production Mask

HOW DO WE MAKE IT? (CMOS PROCESS)

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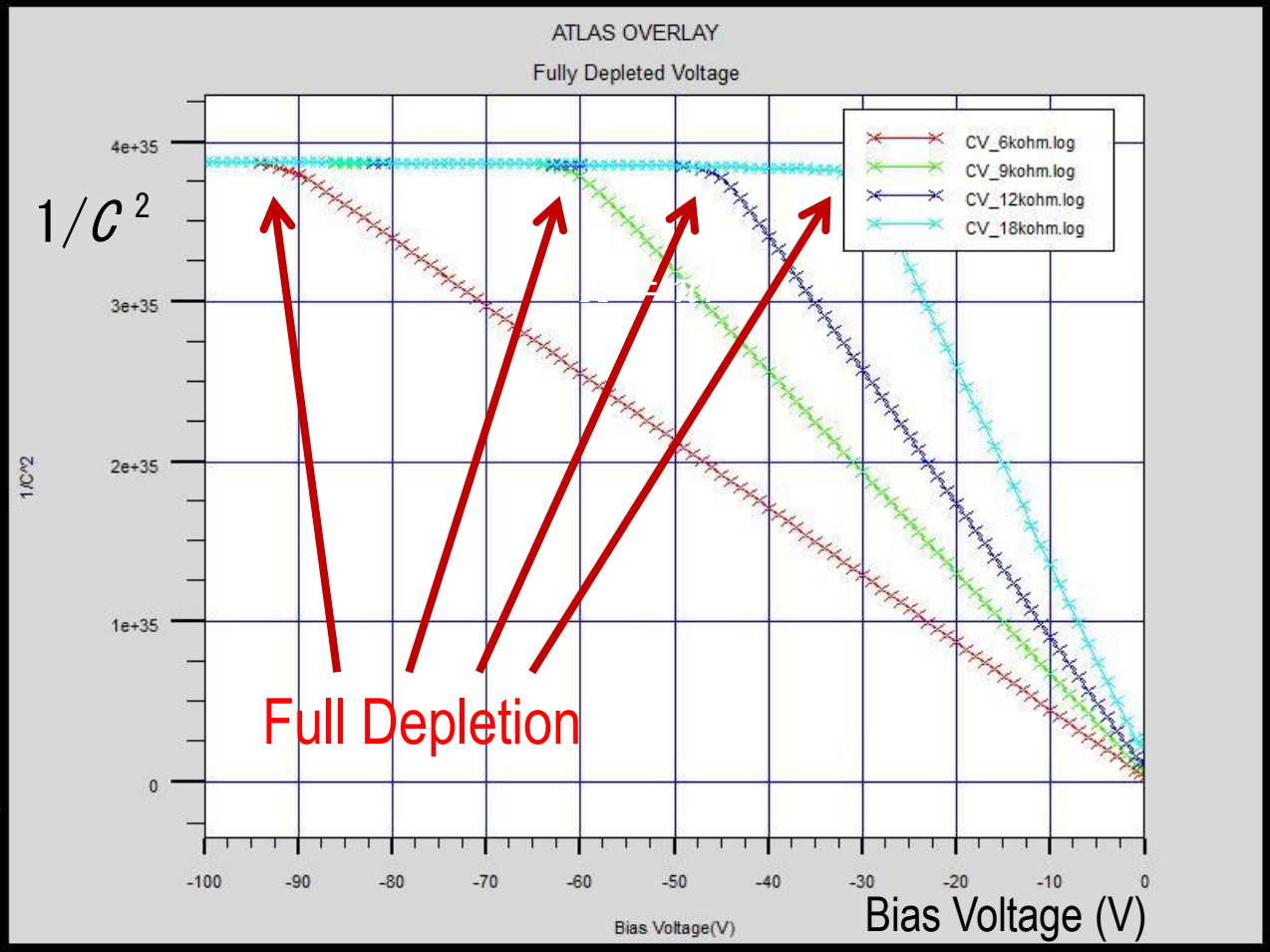
2012-02-16

Simulations

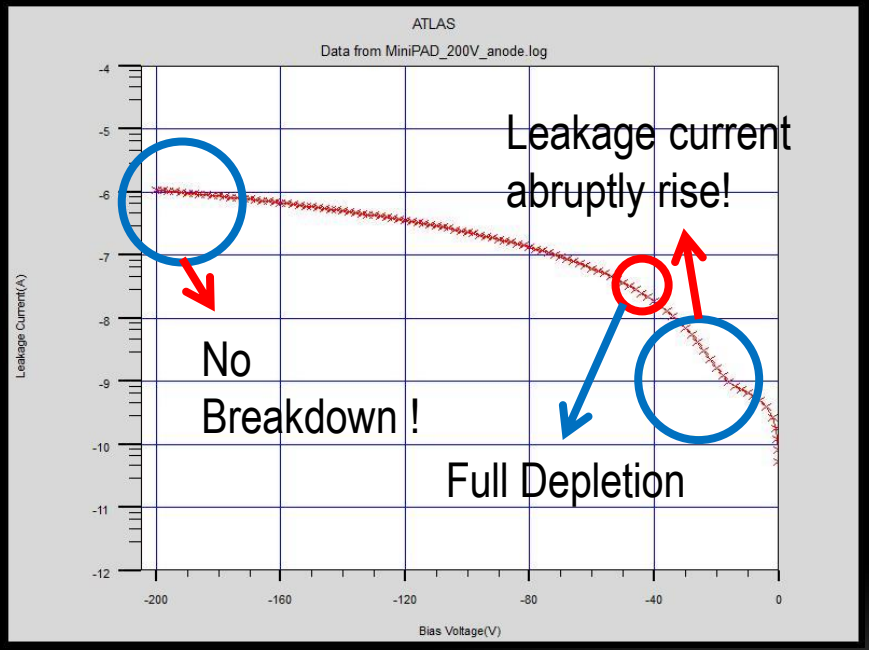
CAPACITANCE–VOLTAGE RELATION

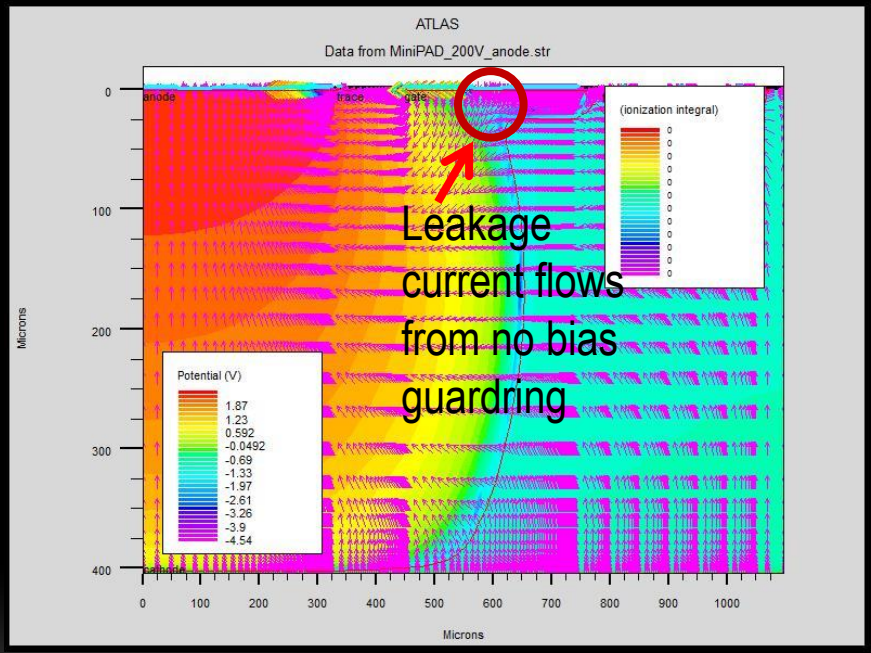
- Wafer – Resistivity = 6, 9, 12, 18kΩ·cm / Thickness = 405μm, Orientation = <100>
- Full Depletion Voltage = 90V(6kΩ·cm),60V(9kΩ·cm),45V(12kΩ·cm),30V(18kΩ·cm)



CURRENT-VOLTAGE RELATION (ONGOING WORK)

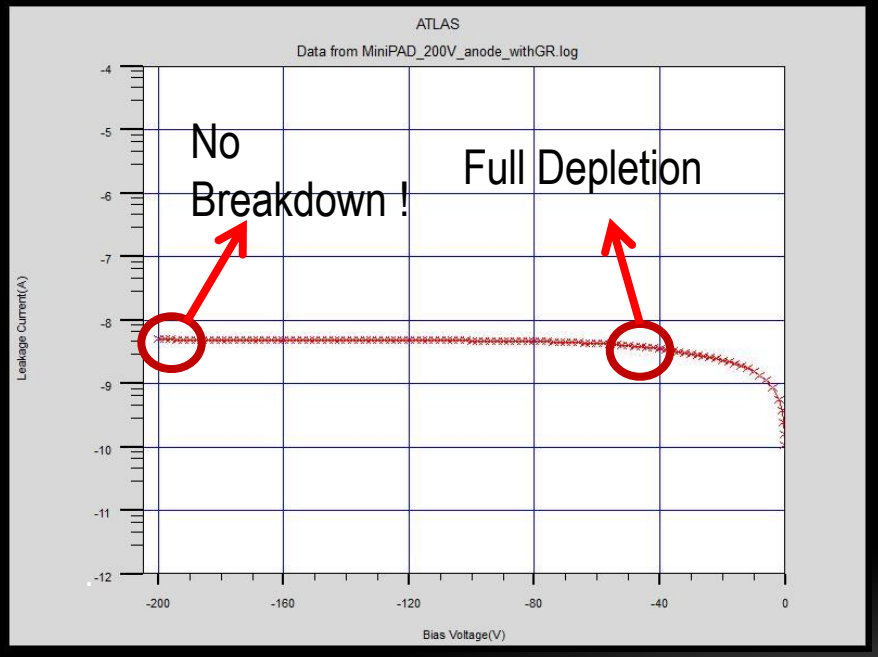
- No breakdown upto 200V but somewhat large leakage current

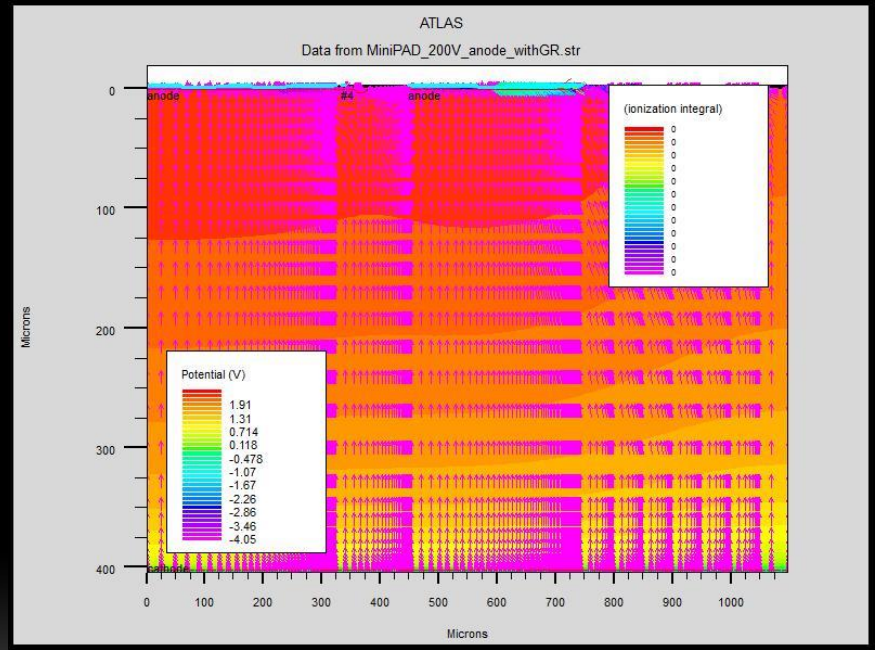




CURRENT-VOLTAGE RELATION (ONGOING WORK)

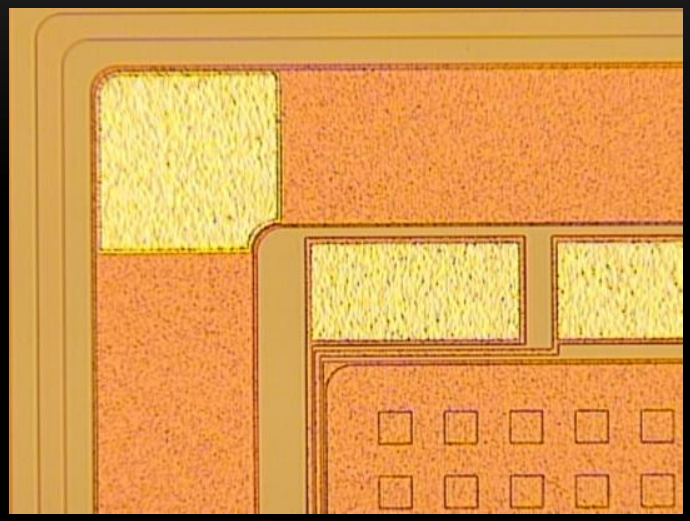
- No breakdown upto 200V and reduced leakage current

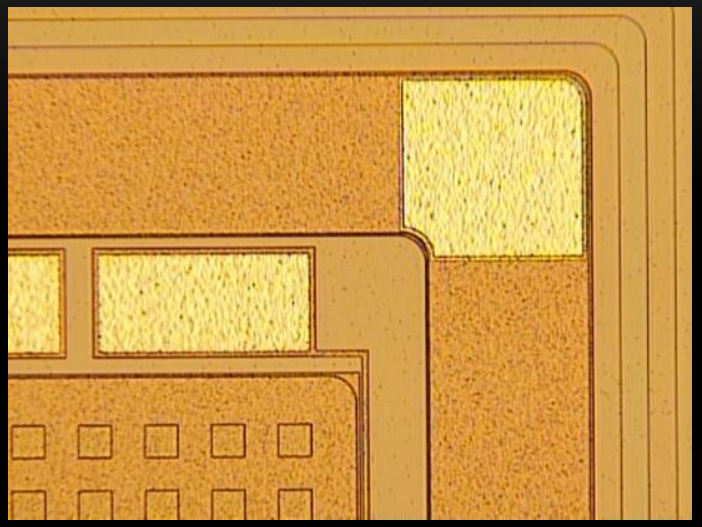


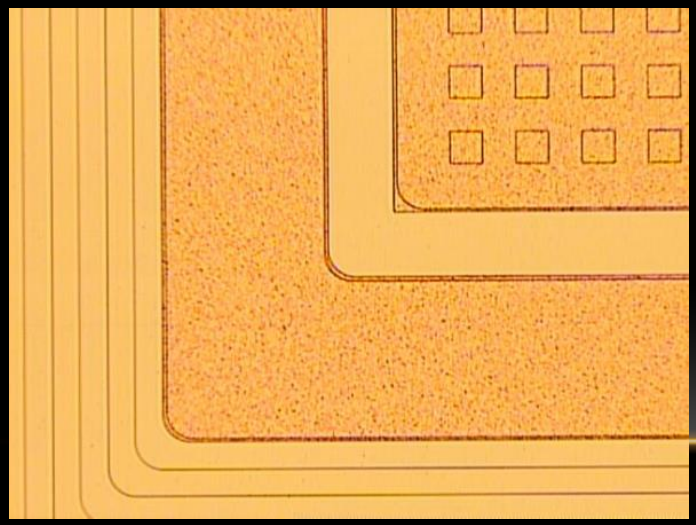


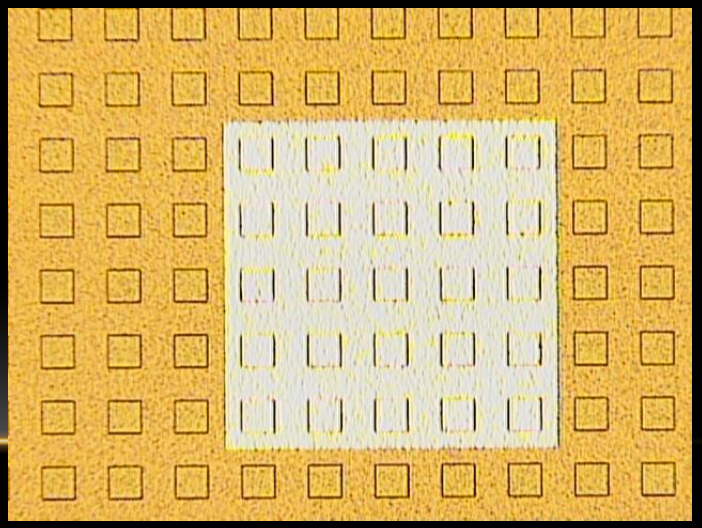
Fabrication Monitoring

ALIGNMENT

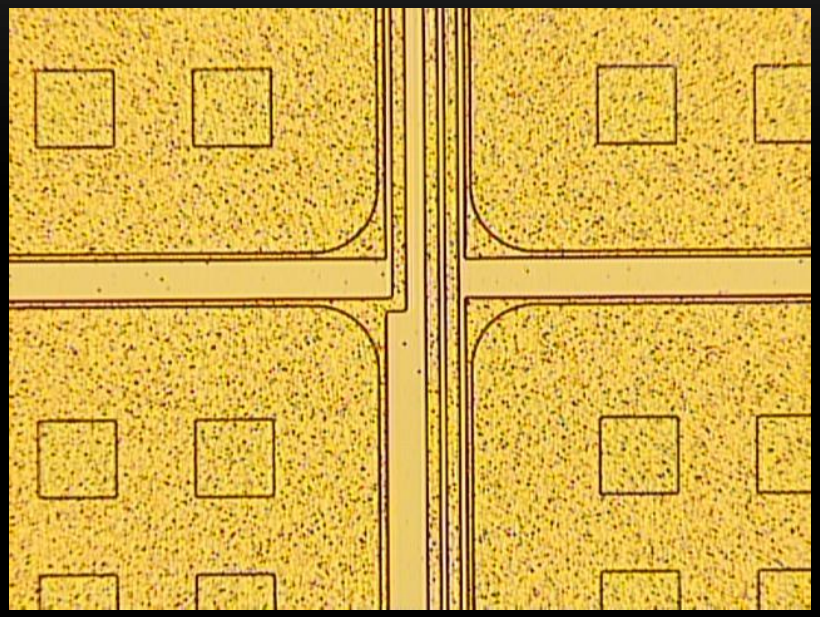


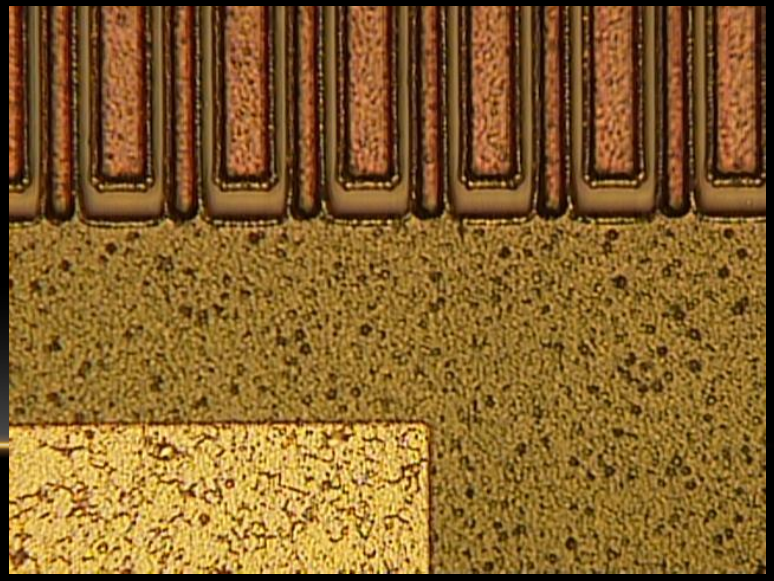




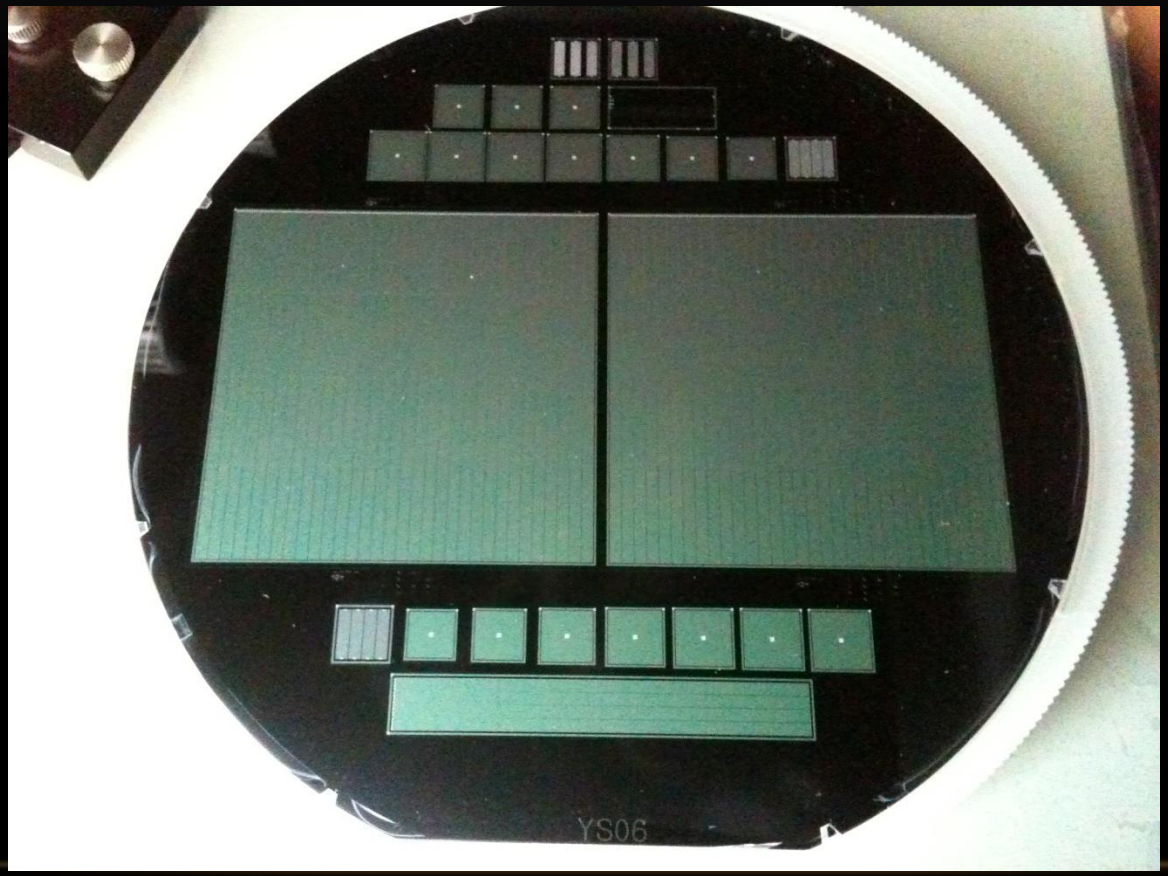


ALIGNMENT





완성된 WAFER 사진



SUMMARY

- MPC-EX is a pre-shower detector in Si/W sandwich structure.
- We designed and fabricated a prototype of the relevant Si sensor.