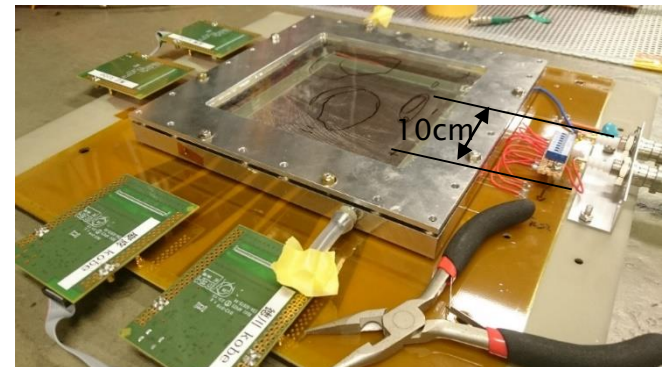
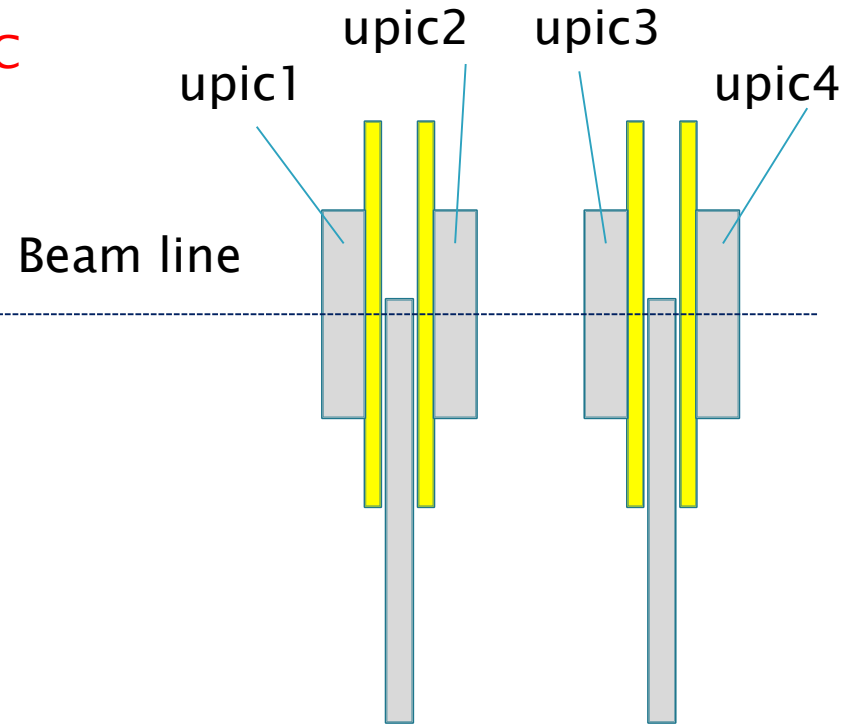


Test beam for u-PIC

Atsuhiko Ochi
Kobe University

Test purpose and setup

- ▶ Performance tests for **resistive u-PIC**
- ▶ Position resolution measurements for **angle scan** (0–40 degree) are planned
- ▶ Also, detector **performances on different surface resistivity** will be measured
- ▶ The size of the detection area is 10cm x 10cm
- ▶ The size of readout board is about 35cm x 35cm
- ▶ 2 or 4 u-PIC will be installed on the beam line.
- ▶ Two chambers will be set back to back on one stand.
- ▶ One of uPIC can be replaced to 1D-small MicroMEGAS



Infrastructure requirements

- ▶ HV (for each chamber)
 - Positive HV (~1kV) 1ch for anode
 - Negative HV (~1kV) 2ch for cathode and drift
 - Total, 4ch of +HV and 8ch of -HV are needed
 - All drift can be applied commonly → 5ch of -HV
- ▶ Gas
 - Ar + C₂H₆ (70:30) mixture gas (already delivered on site)
 - Ar + CO₂ (93:7) mixture gas (common to MM)
 - Gas flows ~100cc/min (5L/h)
- ▶ Readout
 - SRS with APV25
 - 16xAPV25 (4xAPVs for each chamber)
16 APVs will be brought from Kobe
 - 2xFEC, 2xADC (To distinguish the signal from anodes and cathodes)
 - 1xCTF module

Test schedule and man power

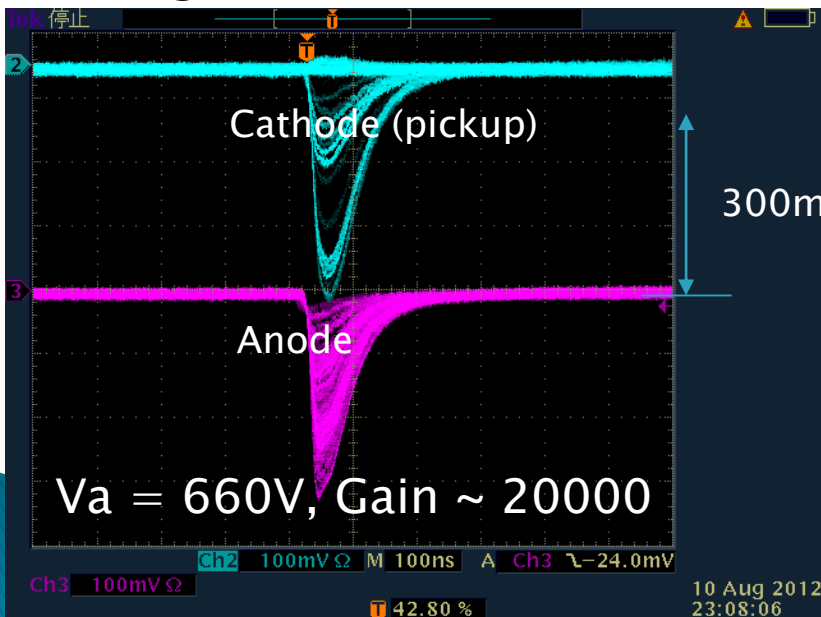
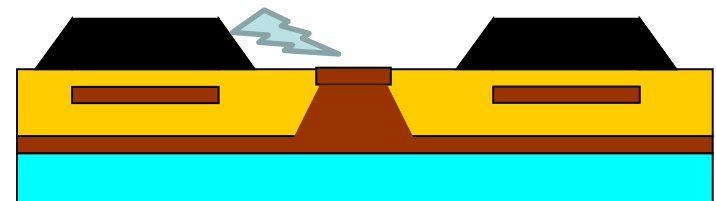
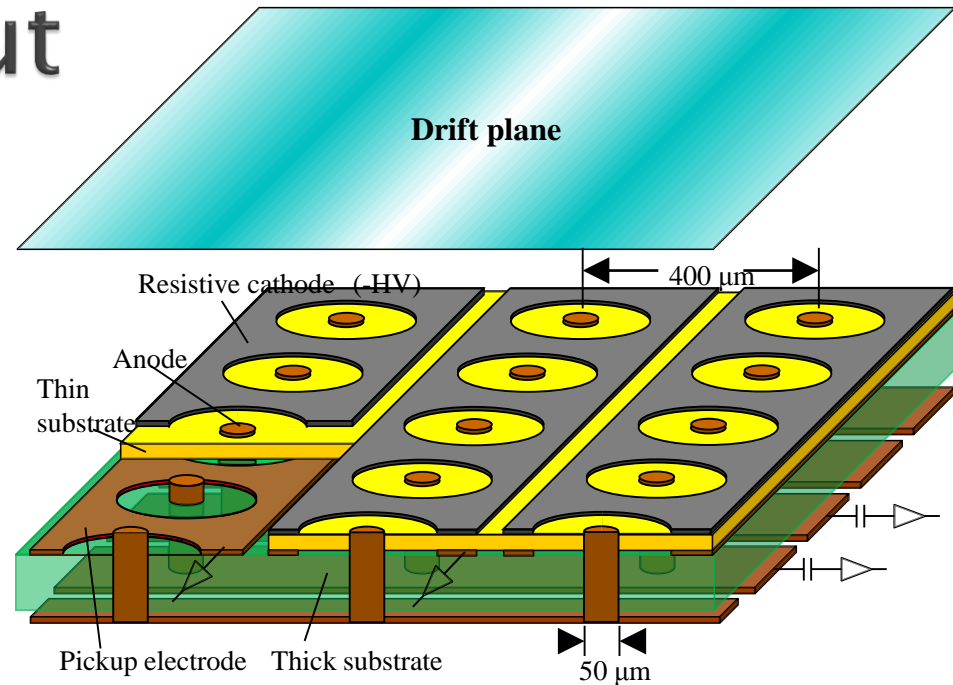
- ▶ Main Request term for the testbeam; August
 - August (second half term is preferred)
 - (If this beamtime will be move to July, it is acceptable.)
 - Man power from Kobe : 2–4 people
 - Atsuhiko Ochi
 - Yusuke Ishitobi
 - New member(s) of graduated student
- ▶ Optional; Beam time in May
 - One or two chamber(s) will be available
 - Basic properties of the test chamber will be checked
 - Man power from Kobe : 1 person (Atsuhiko Ochi)

backup



μ -PIC with resistive cathode and capacitive readout

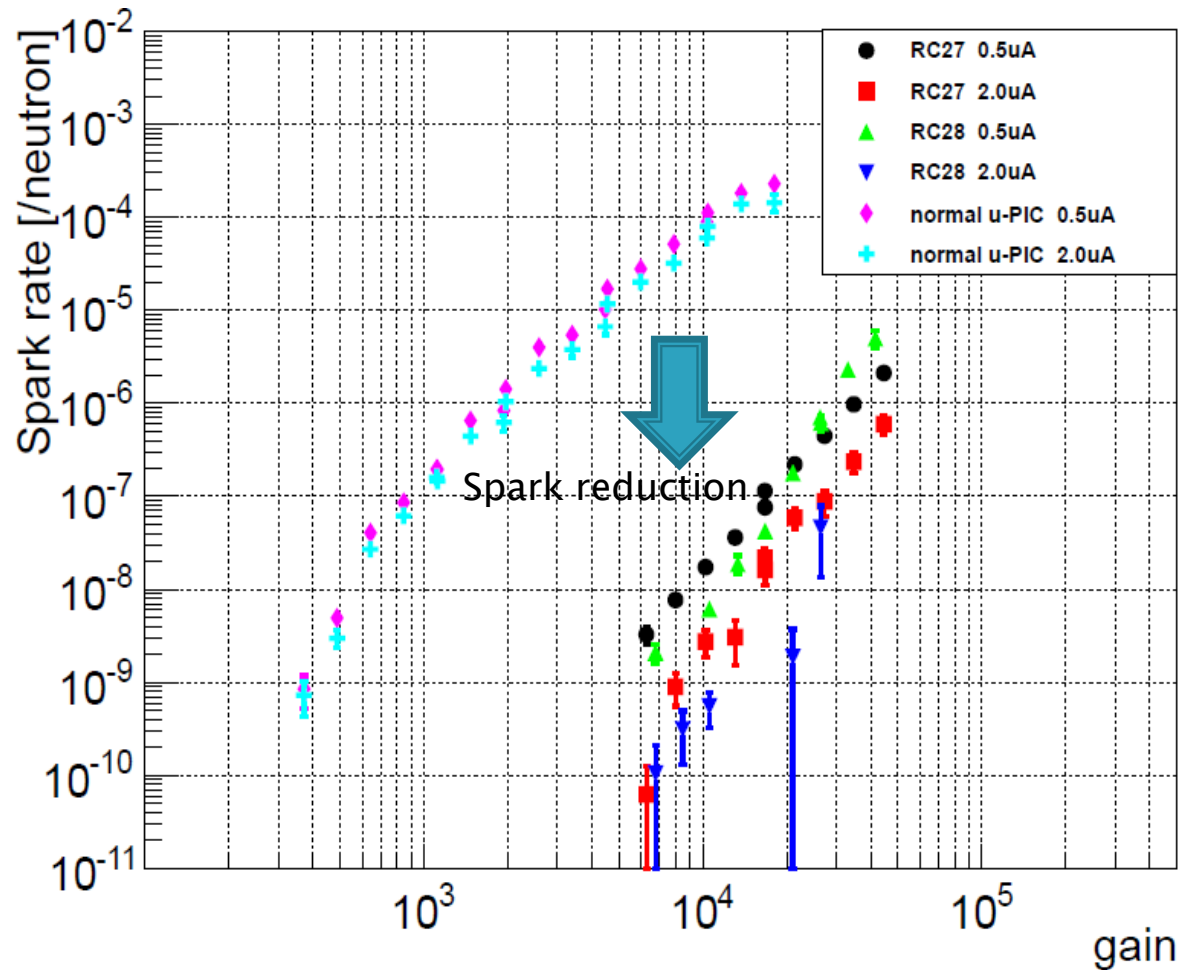
- ▶ Detector design
 - All cathodes are made from carbon-polyimide
 - Pickup electrodes are lied under cathodes and insulator
 - We have two dimensional signals



- Cathode signal on oscilloscope is inverted
- Two dimensional signal is induced on opposite sign.
- Not charge sharing.

It works well ...

- Spark probability for fast neutron ($\sim 2\text{MeV}$)
 - Conditions
 - Gas: Ar+C₂H₆ (7:3)
 - Drift field: 3.3kV/cm
 - Definition of the sparks:
 - Current monitor of HV module shows more than $2\mu\text{A}$ or $0.5\mu\text{A}$.
 - Spark probability = [Spark counts] / neutron
 - The spark rates on normal $\mu\text{-PIC}$ are also plotted as comparison (cyan, magenta plots).
 - Results
 - Reduction of sparks are obviously found. **The rate was 10^{3-5} times less than normal $\mu\text{-PIC}$ case at same gas gain.**

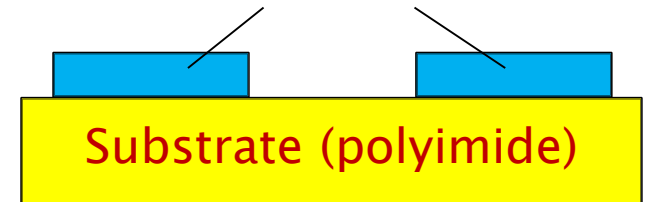


Resistive electrodes with DLC

- ▶ On beginning of 2013, we have developed resistive electrodes by DLC
 - Initially, it was developed for ATLAS MM resistive foils
 - Fine micro-patterning (um order) available → applying it for u-PIC electrodes

Liftoff process with sputtering

Photo resist
(reverse pattern of surface strips)



Developing the resists

