

# ATLAS muon upgradeへ 向けた $\mu$ -PICの特性試験

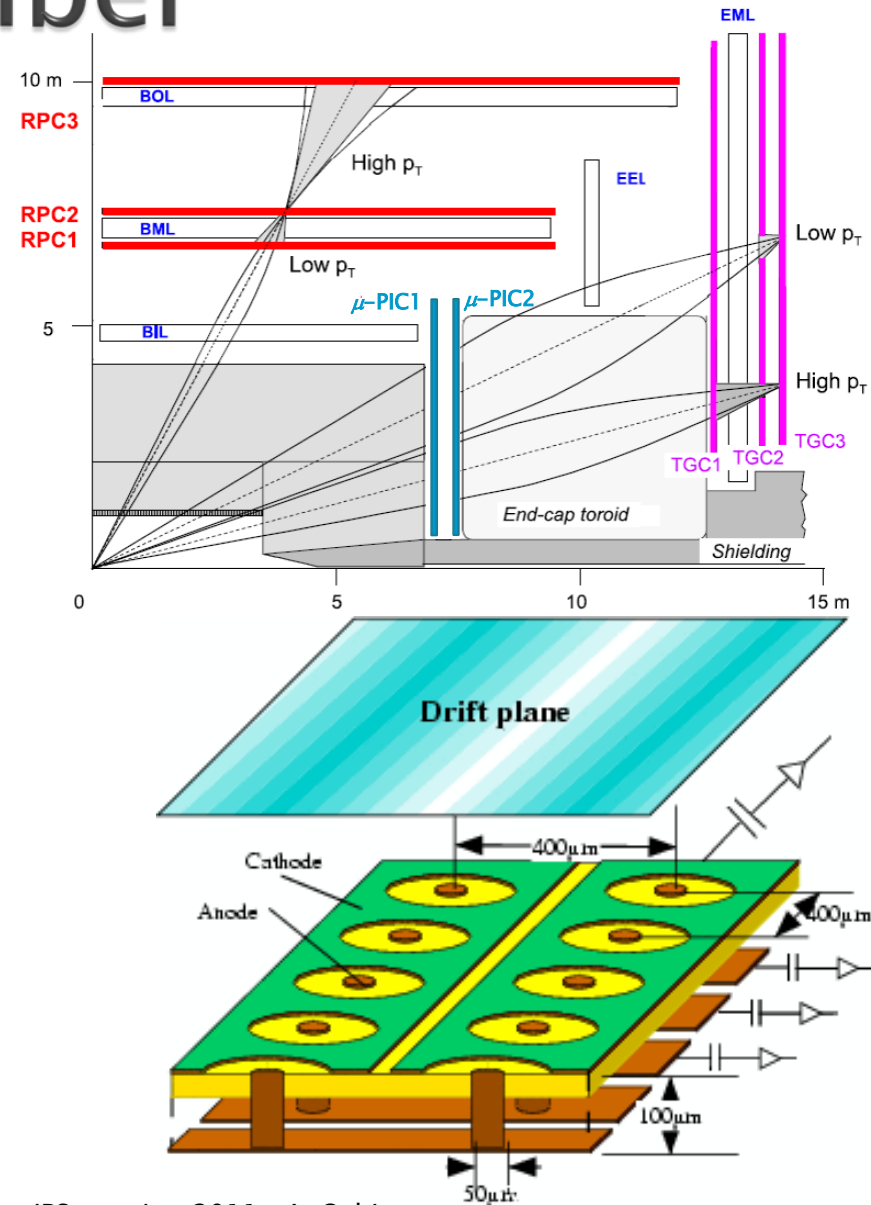
Neutron beam tests using Ar and Ne base gas

Atsuhiko Ochi (Kobe University)

JPS meeting 2011

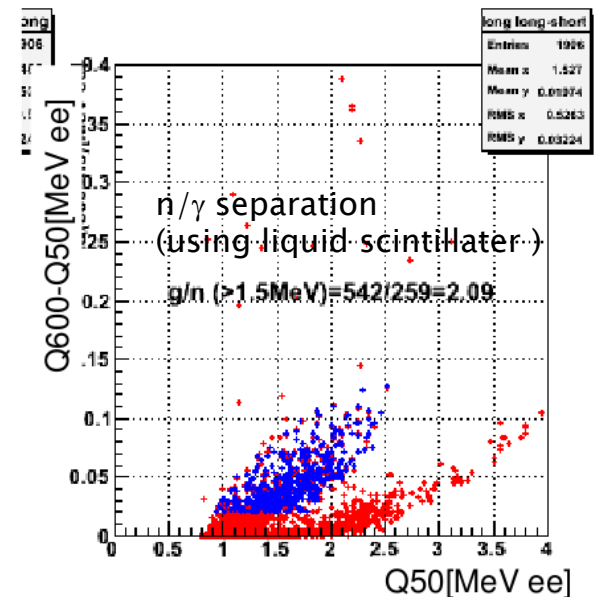
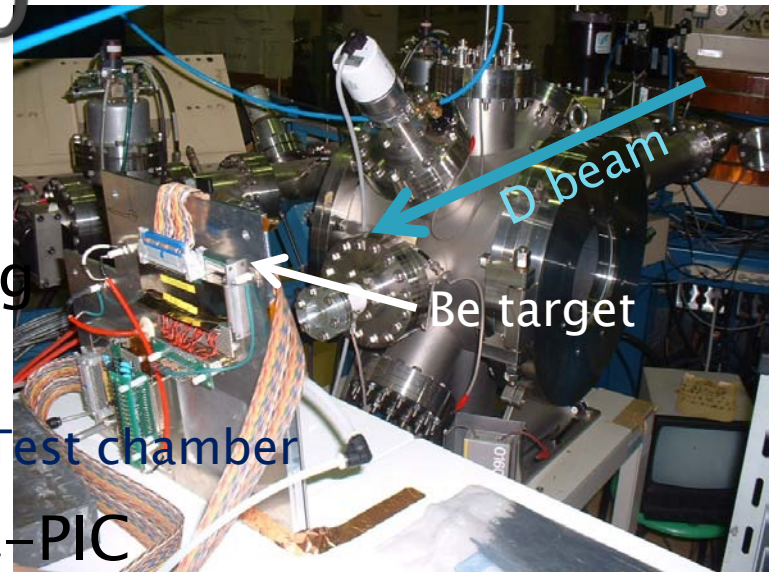
# Micro Pixel Chamber

- ▶ Replacement of inner endcap muon system
  - For Phase-II upgrade
  - Improving rate capability and LVL1 trigger performance
- ▶ Based on Micro Pattern Gas Detector (MPGD)
  - Position resolution  $\sim 100\mu\text{m}$
  - High rate capacity  $> 10^7\text{cps}/\text{mm}^2$
  - Both precision and trigger detector
- ▶ Mass production is available using PC board technology
- ▶ Thin gap structure is proposed for ATLAS muon system
  - For fast signal and high gas gain



# Beam tests in 2010

- ▶ 7 – 13 June, 2010
  - Accelerator operation training
  - Neutron beam studies
- ▶ 21–28 June, 2010
  - Neutron irradiation test for  $\mu$ -PIC
- ▶ 17–24 November, 2010
  - Spark rate measurements using
    - Ar + C<sub>2</sub>H<sub>6</sub> mixture
    - Ne + C<sub>2</sub>H<sub>6</sub> mixture



# The neutron beam in Kobe Univ. (Faculty of Maritime Science)

- ▶ Tandem Electostatic Accelerator

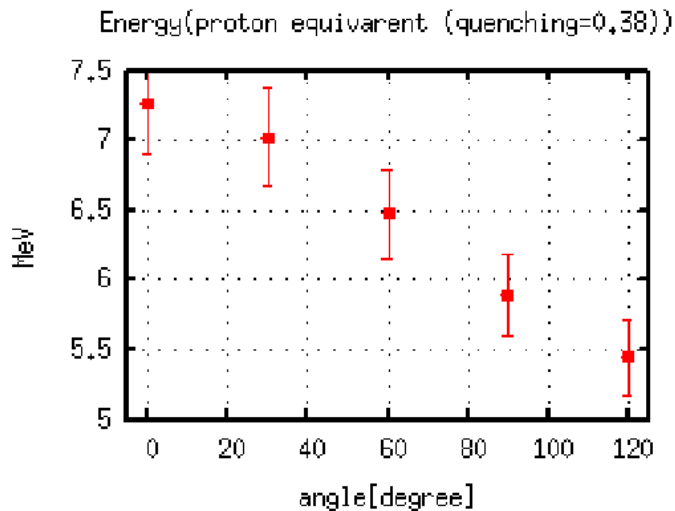
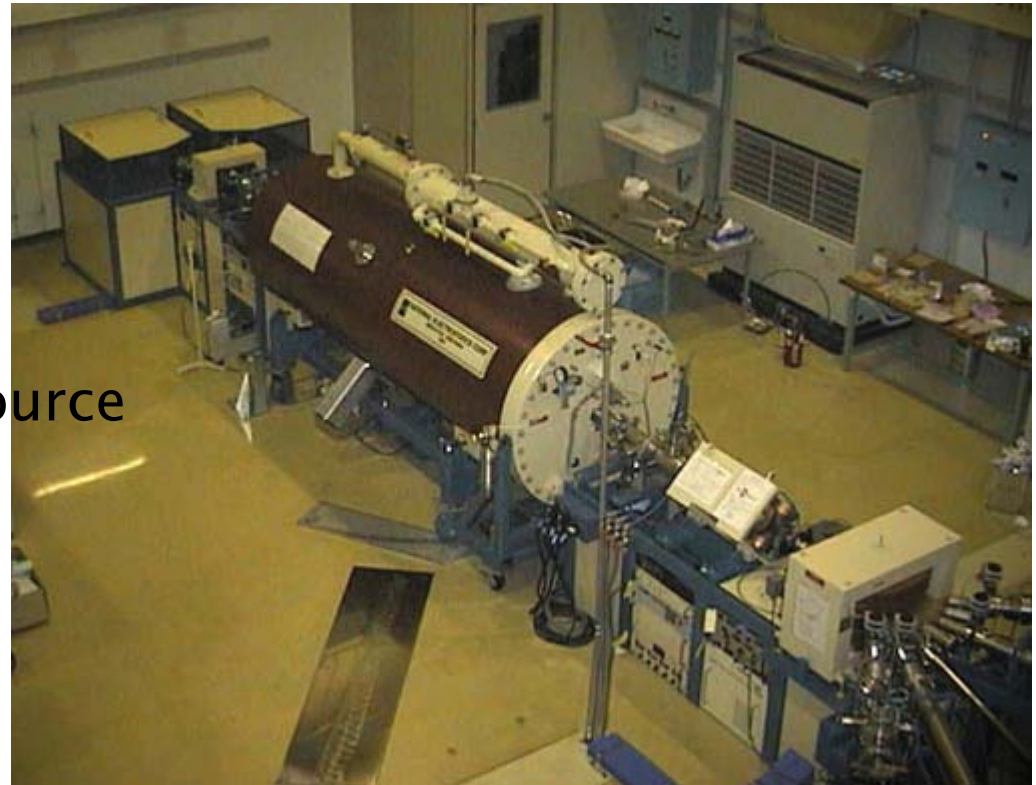
- 1.5MeV + 1.5MeV  
= 3MeV d/p beam

- $I \sim 1\mu\text{A}$

- ▶ Be target on BL

- ${}^9\text{Be} + d \rightarrow {}^{10}\text{B} + n$   
( $\sim 7\text{MeV}$ )

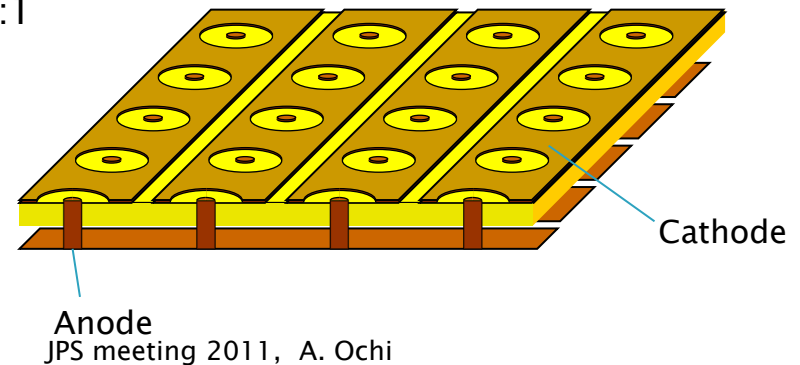
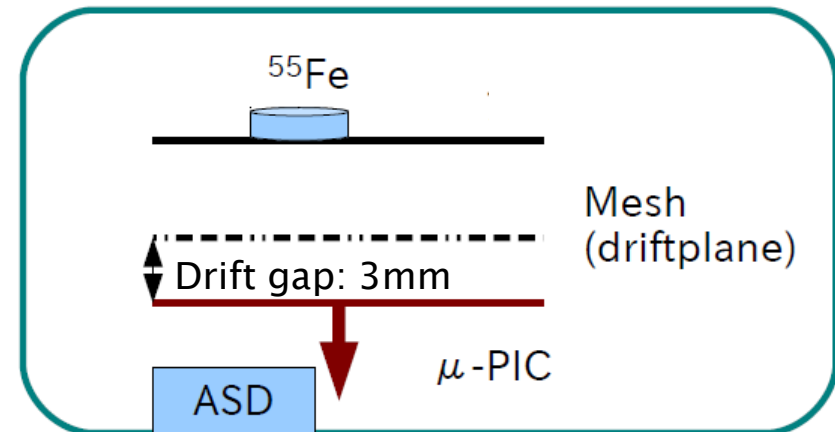
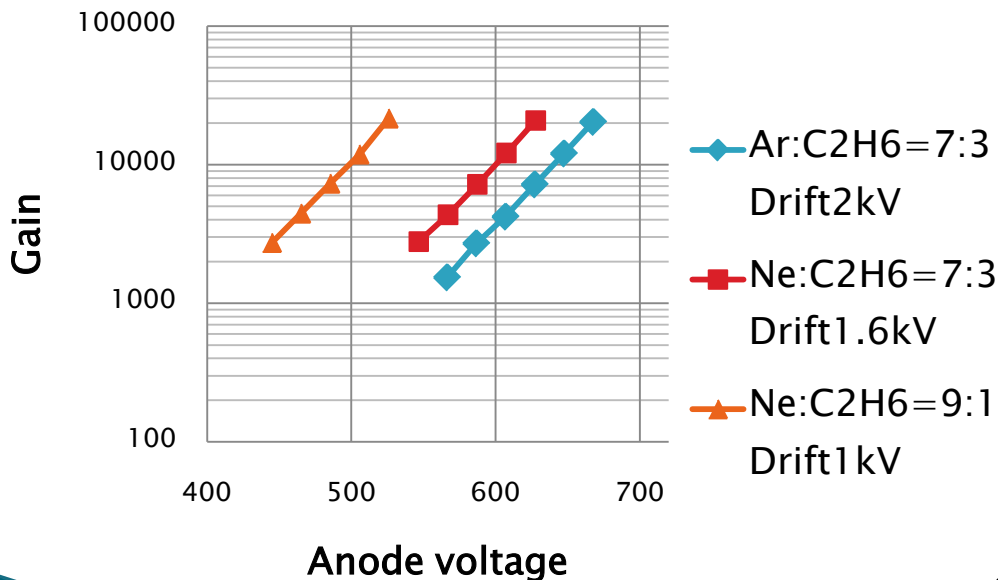
- $\sim 10^7$ neutron/sec. @source



# Gain curve difference (Ar and Ne)

- ▶ Mixture gas of Ar+ethane and Ar + CO<sub>2</sub> were tested
- ▶ Gas gains are measured using <sup>55</sup>Fe (5.9keV) X-ray

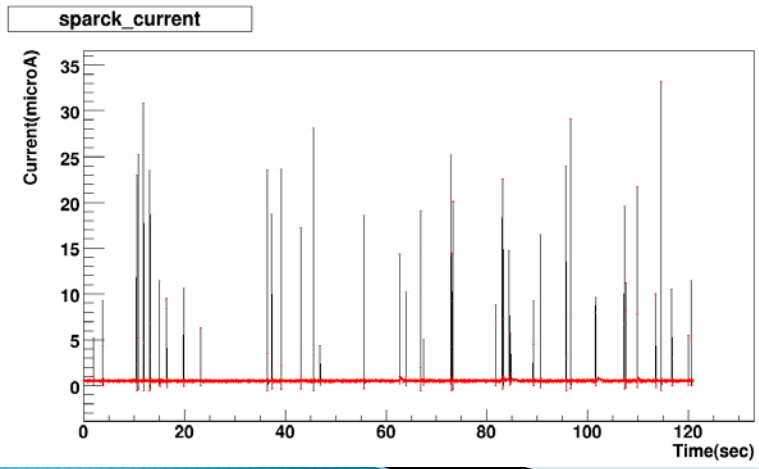
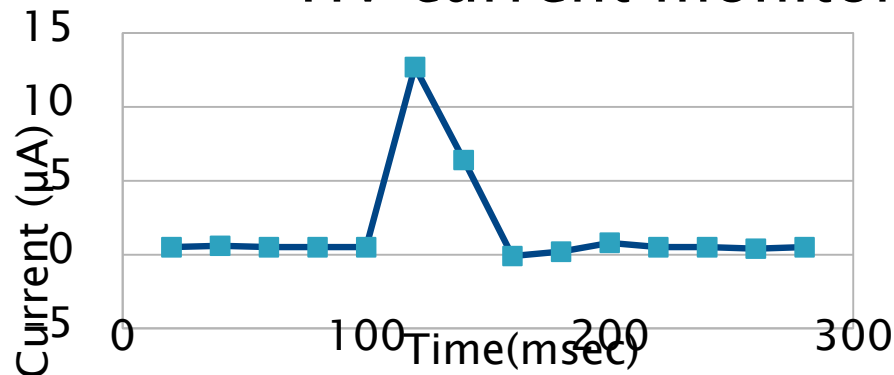
Gain curve using Ar and Ne based gas



# Spark rate measurement

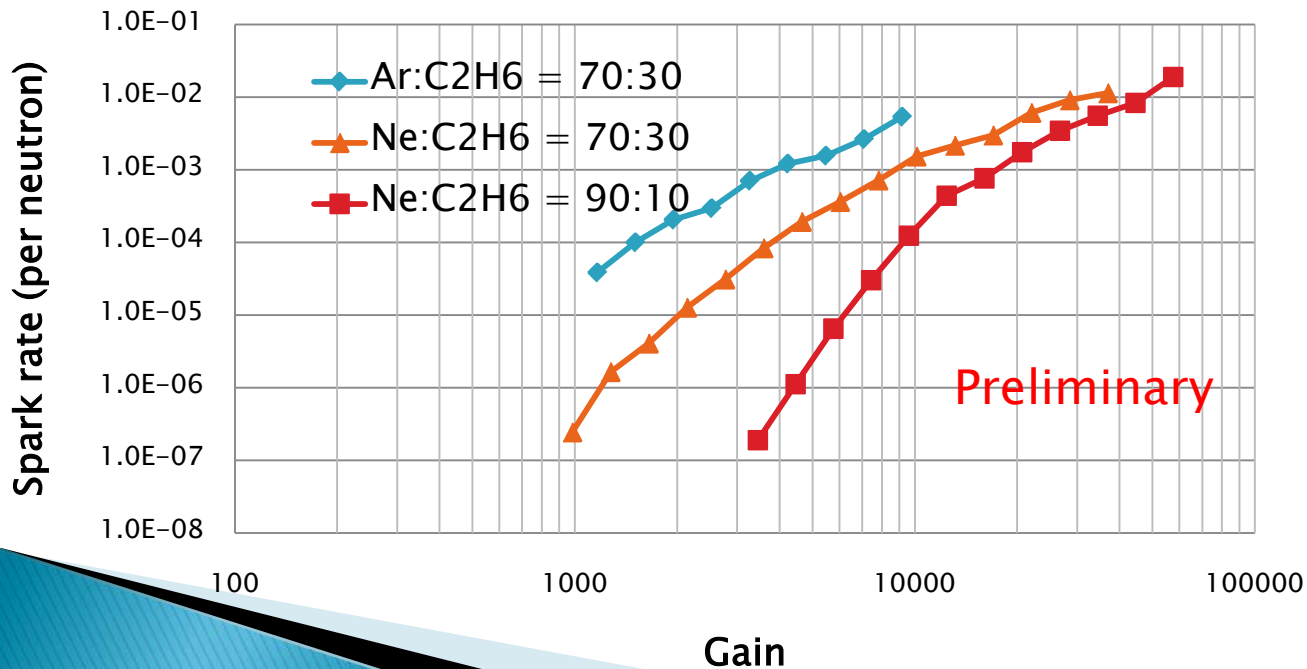
- ▶ Big pulses were counted using current monitor on HV source.

HV current monitor



# Spark rate for fast neutron

- ▶ Spark rates are measured using Ar and Ne based gas.
  - Ar:ethane = 70:30
  - Ne:ethane = 70:30
  - Ne:ethane = 90:10
- ▶ Spark rates are drastically reduced using neon gas



# Summary of current R&D status and Future prospects

- ▶ Fast neutron ( $\sim 7\text{MeV}$ ) tests are performed
  - We found good suppression of spark rate using Ne base gas under gas gain of a few thousand.
  - The  $\mu\text{-PIC}$  with resistive cathode is also tested.
    - The signal reductions for HIP are observed
    - More countermeasure should be need to avoid big spark.
- ▶ Next beam test
  - Spring or Summer 2011 ... intense neutron source (OCTAVIAN, Osaka Univ.)
    - 100 times intense neutron comparing with Kobe Univ. ( $d+\text{Be} \rightarrow \text{B}+n$ )
    - Resistive type will be tested to check spark tolerance
- ▶ Future prospects
  - Until 2012 ... R&D, improvements and performance tests of basic structure
  - 2013–14 ... Developments for Readout and large size detector
  - Mass production will be available using existence line in private company.