

NEWAGE experiment

new generation WIMP-search
with an advanced gaseous tracker
experiment

Kentaro Miuchi
(Kyoto Uni.)

With

T. Tanimori, H. Kubo

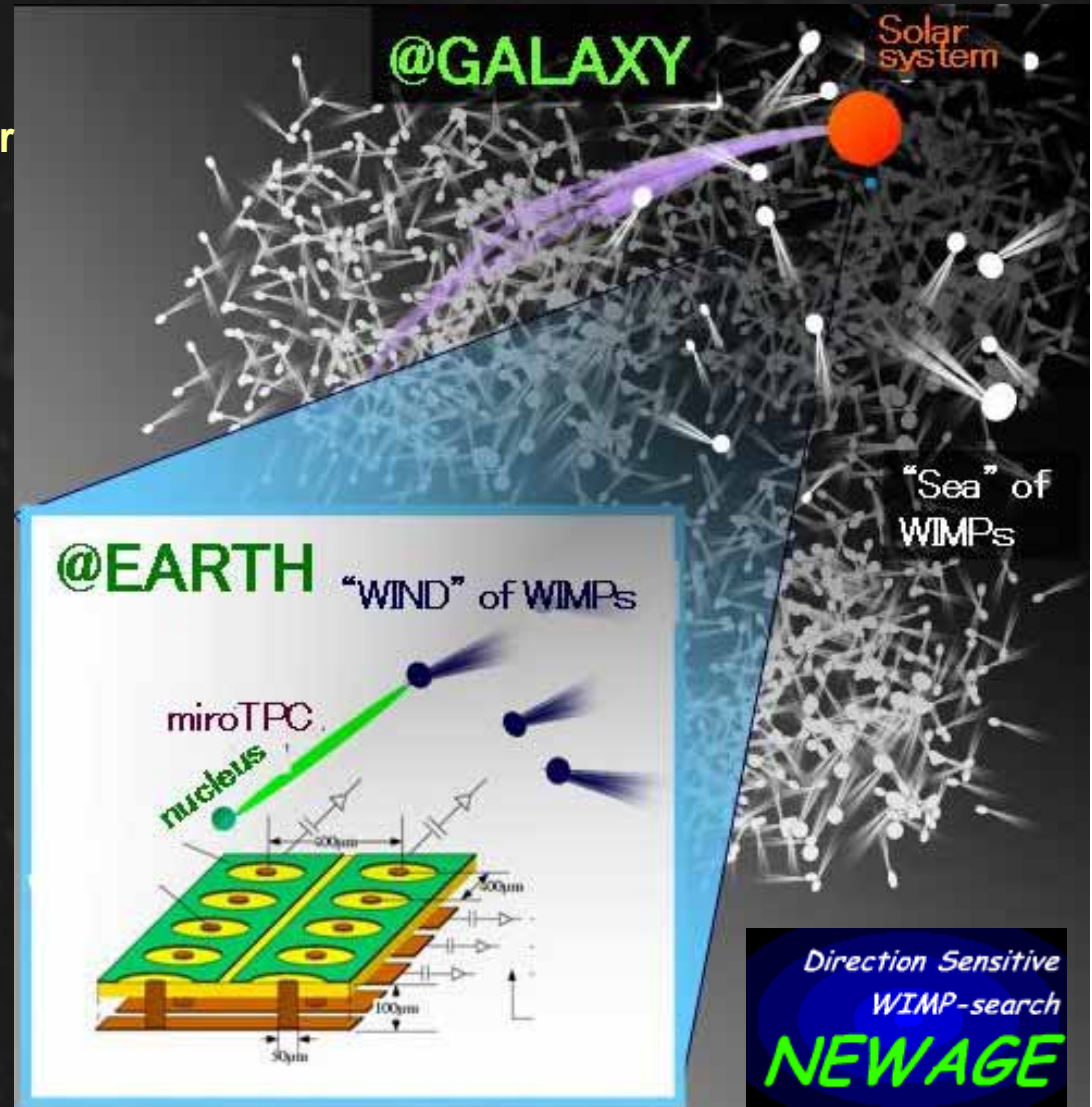
S. Kabuki, K. Tsuchiya

A. Takada, Y. Okada, H. Nishimura,

K. Hattori, K. Ueno, and S. Kurosawa

Sep. 12th 2006

Kentaro Miuchi IDM2006 Rhodes, Greece



1. Goal and current status

- ◆ **Goal: WIMP detection and direction measurement** “WIMP-anemometry”
micro-TPC (CF_4 0.05 atm) $1\text{m}^3 \times N$

- ◆ **Current: 30cm CF_4 0.2 atm @ surface lab.**

- detector response calibration method
- $\text{CF}_4 + \text{C}_4\text{H}_{10}$ for neutron monitoring



Sep. 12th 2006

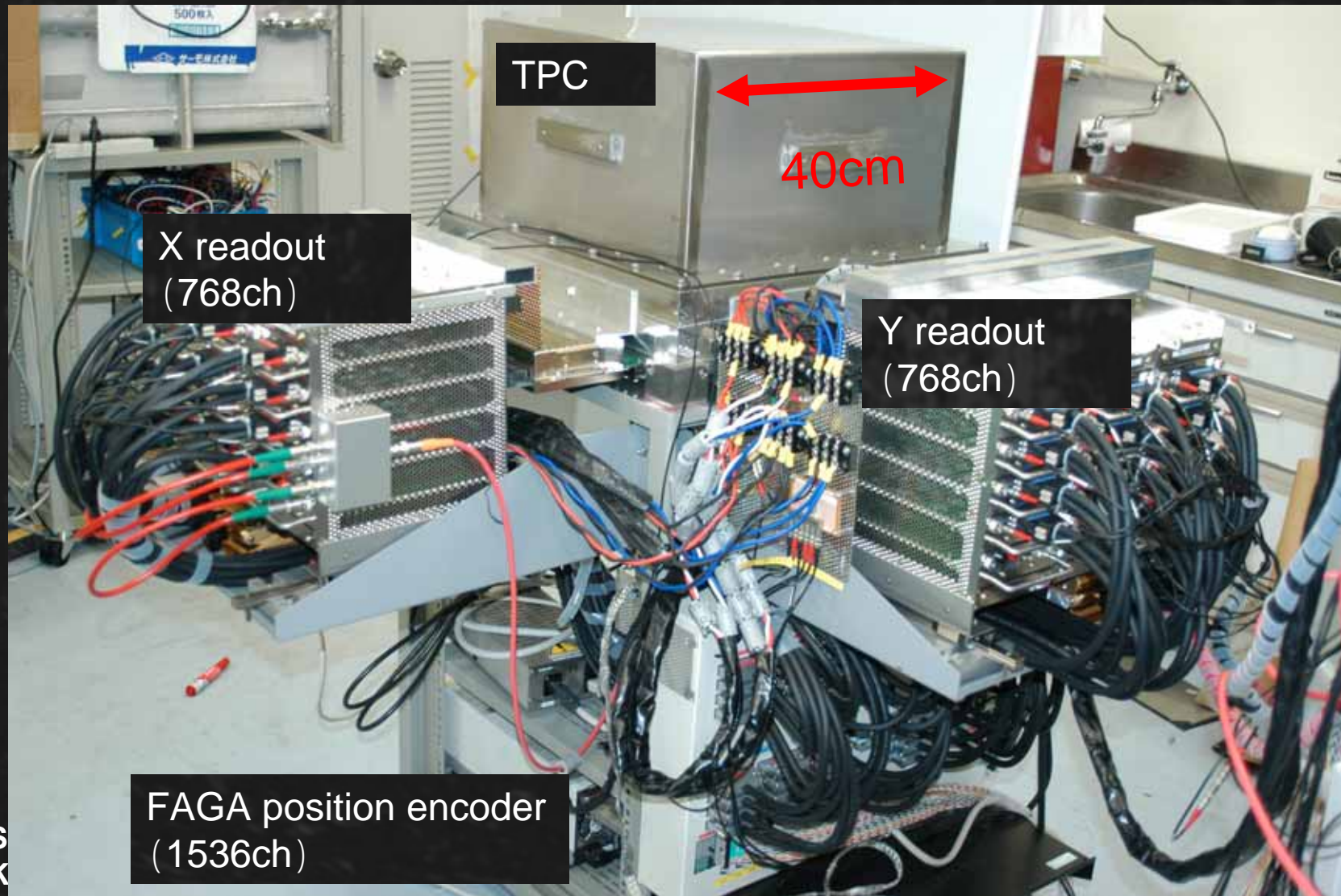
Kentaro Miuchi IDM2006 Rhodes, Greece

NEWAGE

2. 30cm micro-TPC (3-D tracker)

“WIMP-anemometer”

◆ TPC: $23 \times 28 \times 31\text{cm}^3$

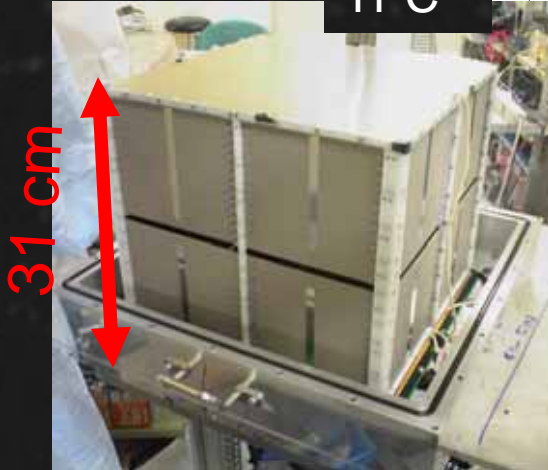
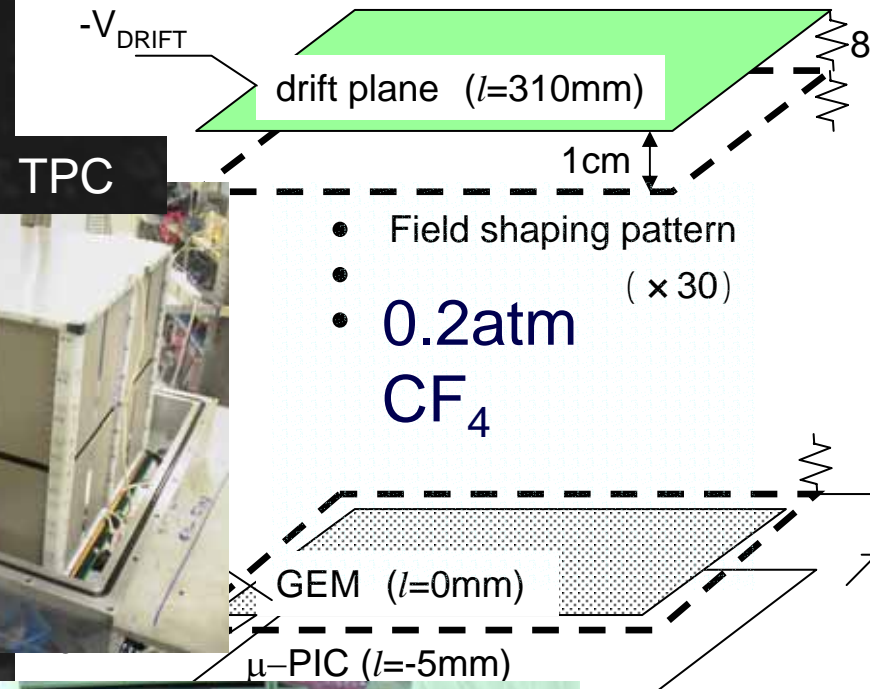
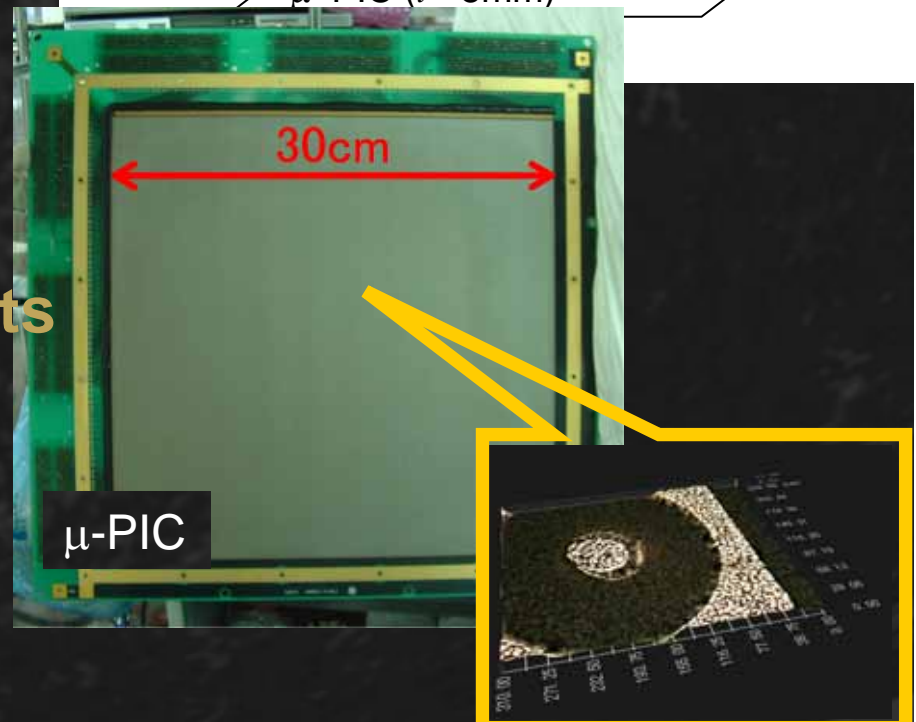


micro-TPC = 30cm μ PIC + GEM

- GEM** pre-multiplier
 - $23 \times 28\text{cm}^2$
 - Gas gain ~ 10

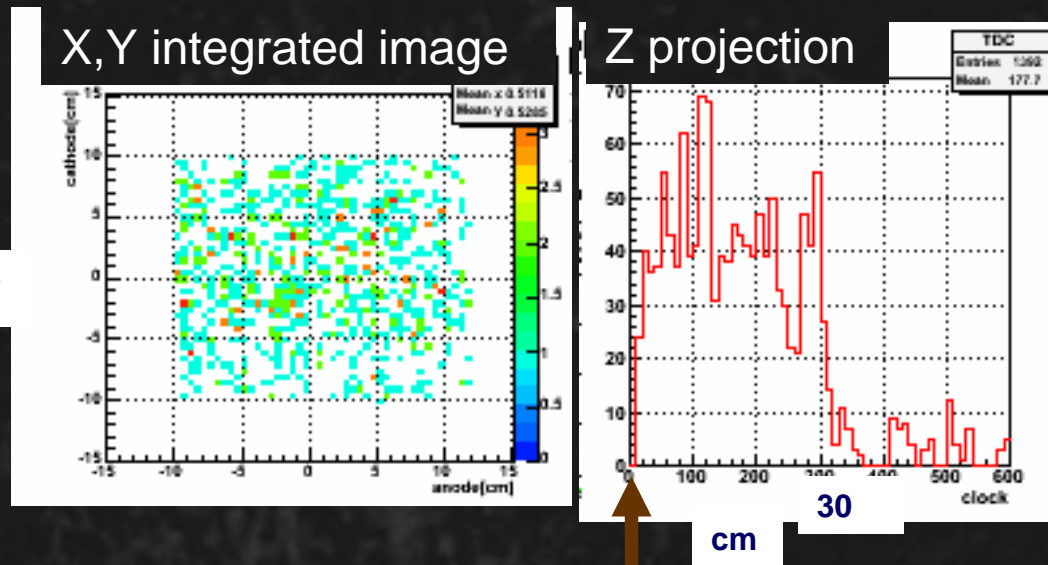
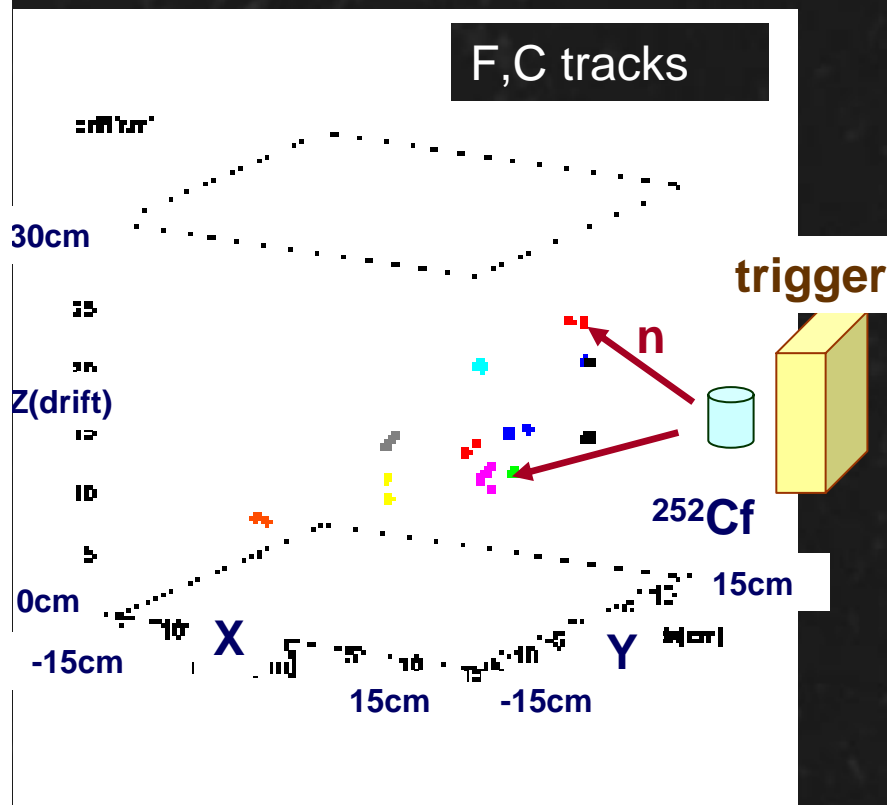


- μ -PIC**
 - $30 \times 30\text{cm}^2$
 - $400 \mu\text{m}$ pitch
 - 768+768 readouts
 - 2D imaging
 - Gas gain ~ 5000



Response

- 400 μm pitch digital hit (for tracking)
- + summed analog (for energy detection)



Triggered time = z=0

- Flat response

● F 500keV 5~6mm in 0.2atm CF₄

Sep. 12th 2006
Kentaro Miuchi IDM2006 Rhodes, Greece



◆ Calibration / gain monitor

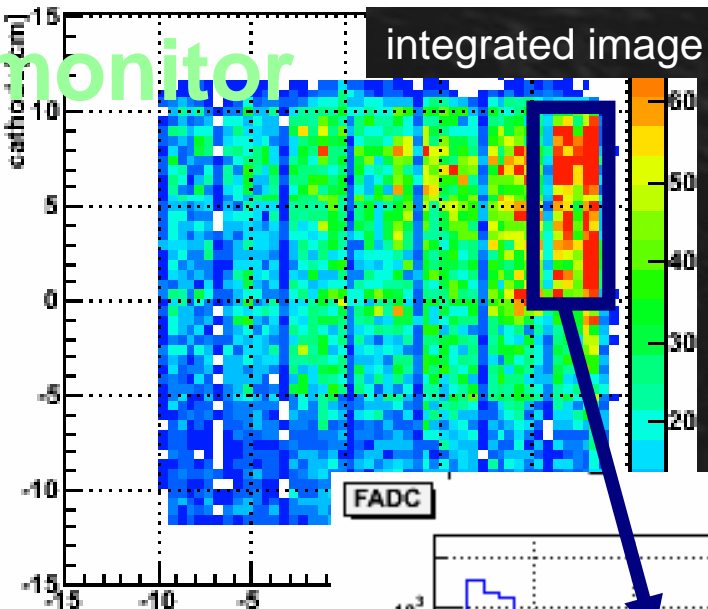
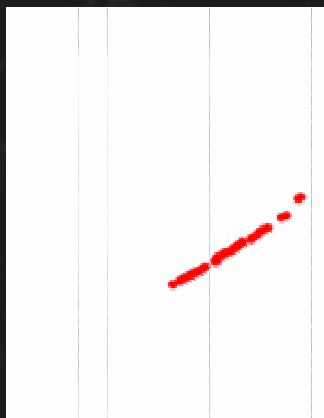
- Heavy ion (not a γ source)
- On / off from outside
- $^{10}\text{B}(n,\alpha)^7\text{Li}$ reaction
($Q=2.70\text{MeV}$ 1.8MeV for α)



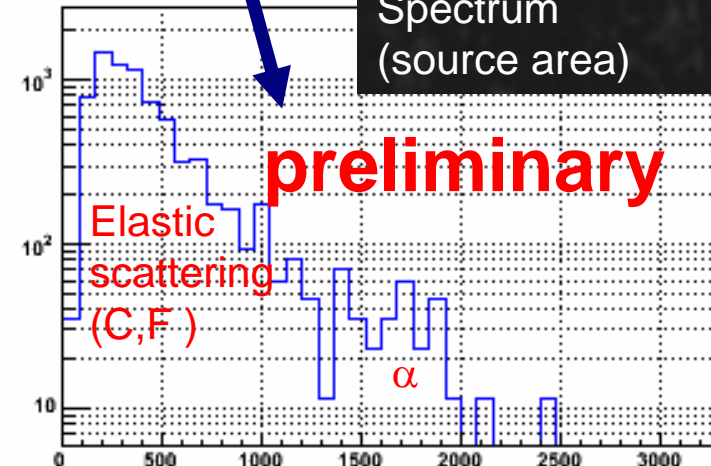
Calibration / gain monitor

● α 's are seen

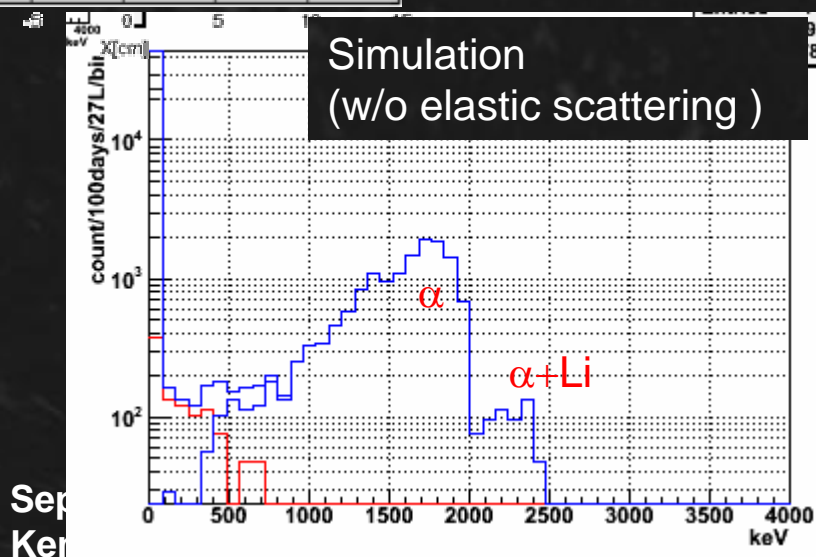
alpha tracks



Spectrum (source area)



Simulation (w/o elastic scattering)



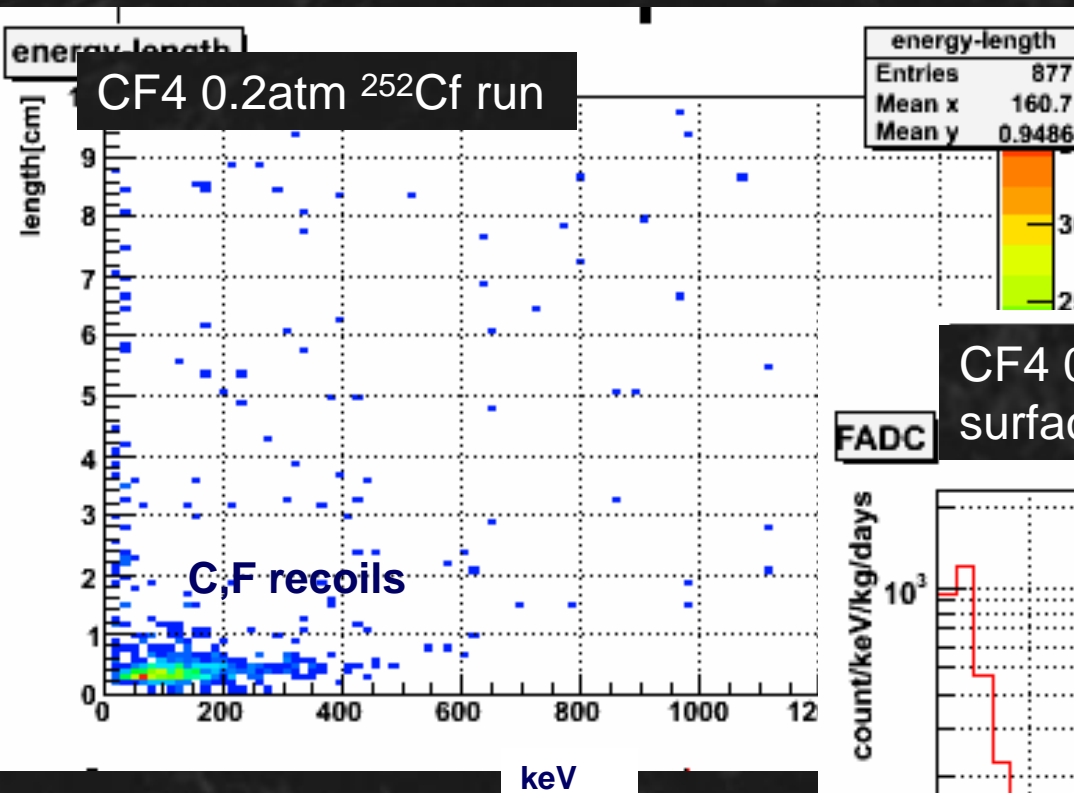
MORE STUDY, then

- energy calibration
- gain stability
- thermal neutron monitoring

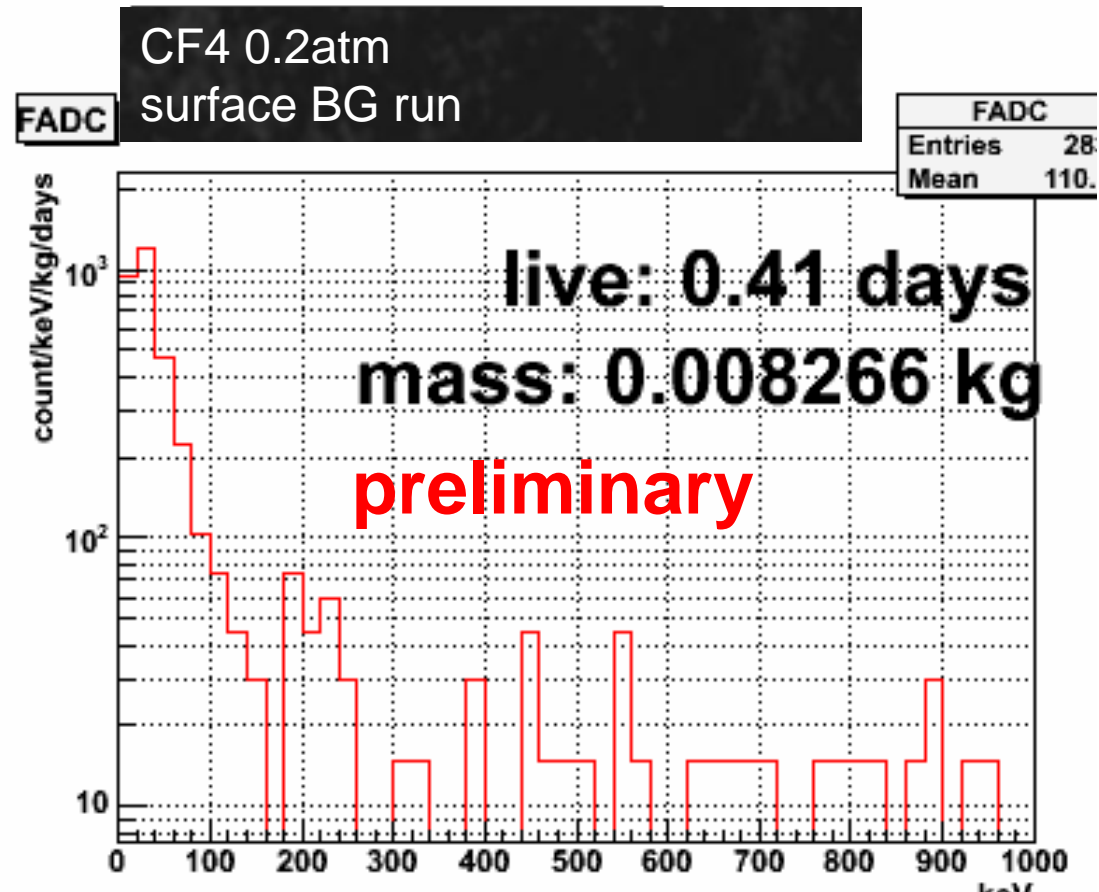
keV

CF4 0.2 atm results

Energy-length dependence

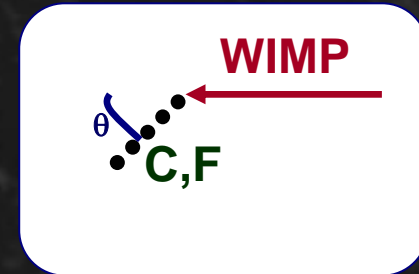
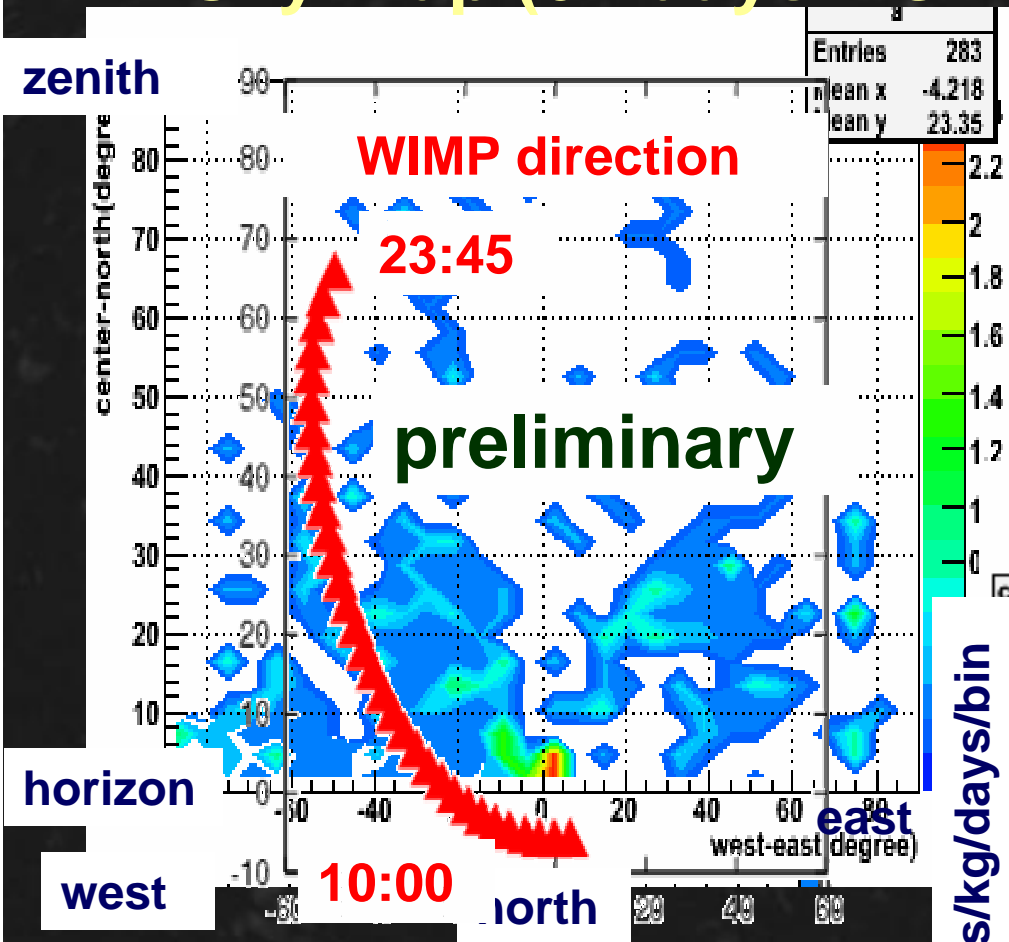


BG spectrum

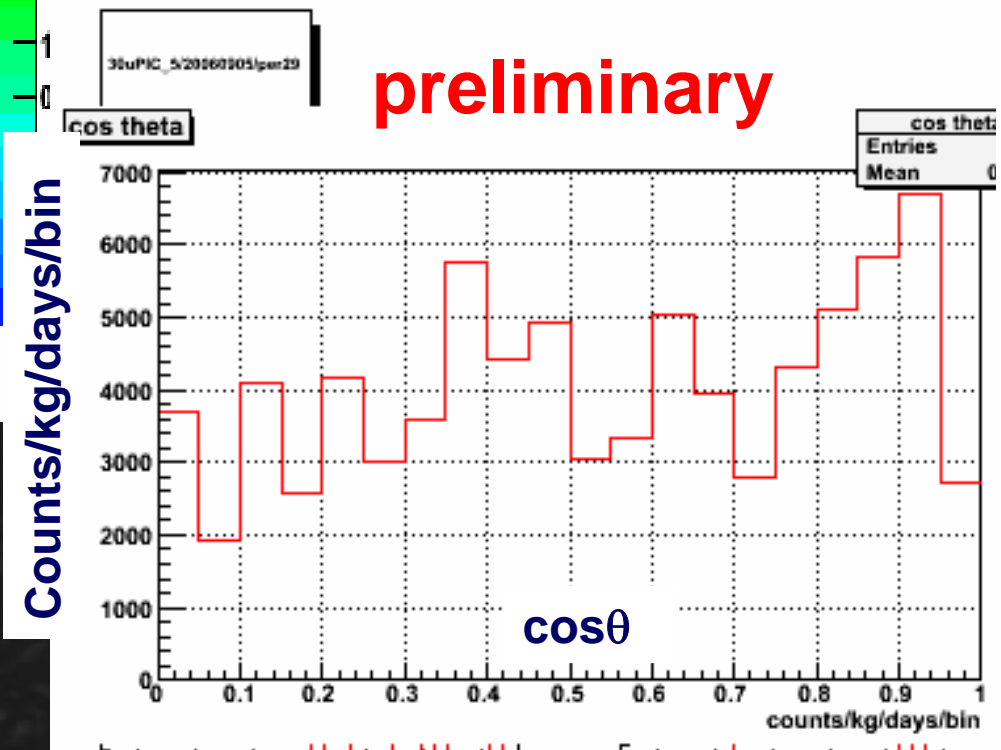


CF4 0.2 atm direction-sensitive results

Sky map (0.4days BG run surface)



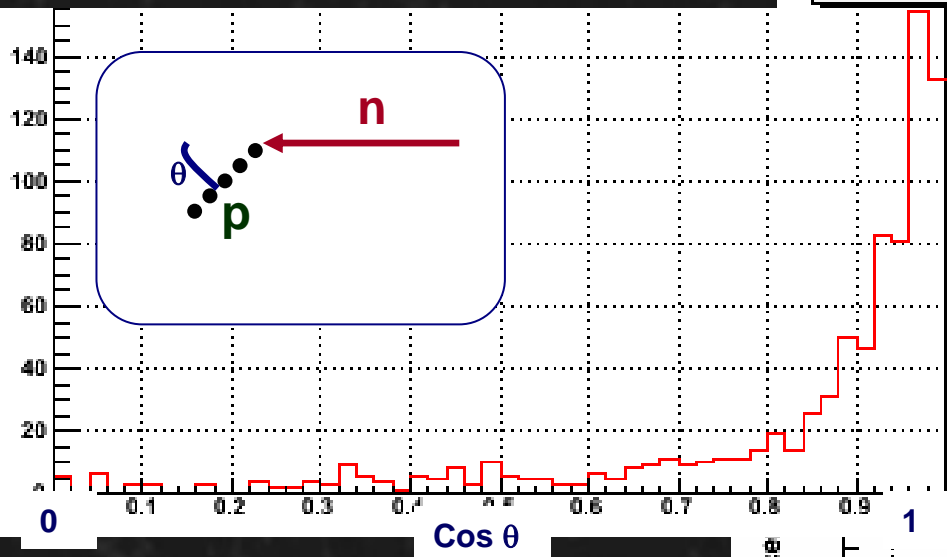
cos θ distribution



- $n \rightarrow p$ Forward scatterings are clearly seen (this is what we want to do with WIMP $\rightarrow F$ with lower pressure gas)

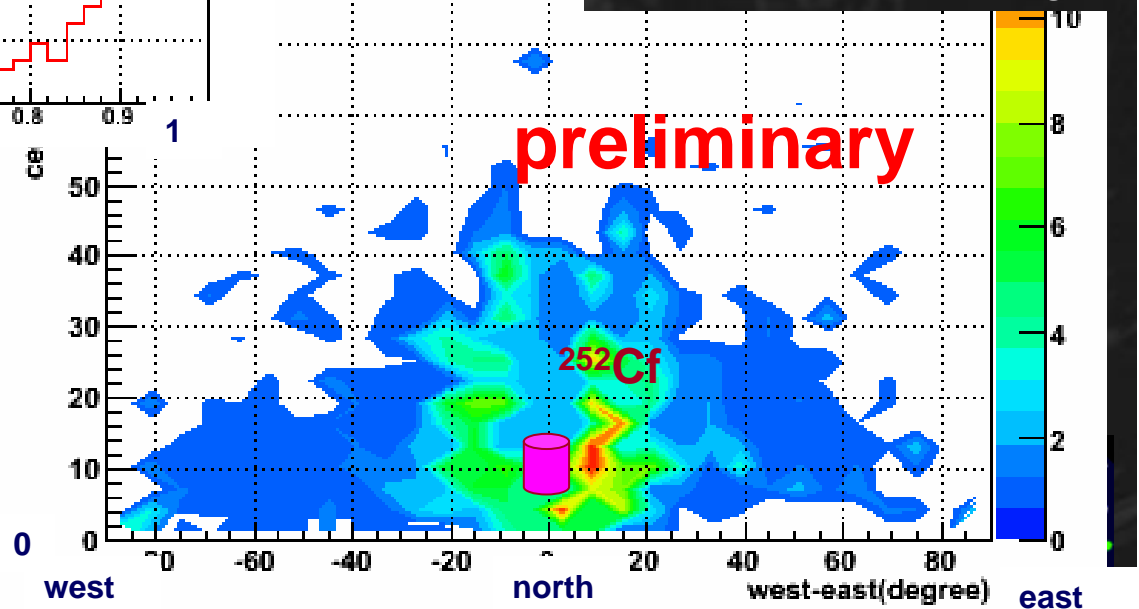
CF4+C4H10 0.2atm ^{252}Cf run

cos theta	
Entries	66
Mean	0.839



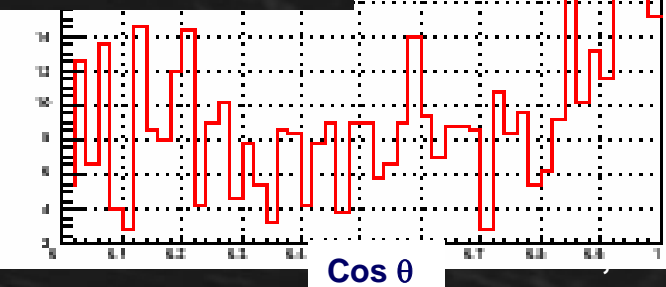
CF4+C4H10 ^{252}Cf run

Recoil direction image



CF4 0.2atm
 ^{252}Cf run

cos theta	
Entries	112
Mean	0.5274



4. SUMMARY

- ◆ **30cm micro-TPC for “WIMP-anemometry”**
- ◆ **CF₄ 0.2atm**
 - calibration method are being studied
 - Surface BG run (direction-sensitive)
- ◆ **CF₄+C₄H₁₀ 0.2 atm**
 - Neutron directions are taken well



ΝΕΩΑΓΓΕ εξπειμεντ

νεω γενερατιον ΩΙΜΠ-σεαρχη

ωιτη

αν αδωανχεδ γασεουσ τραχικινγ εθυιπμεντ

Κενταρο Μιυχηι

(Κψοτο Υνι.)

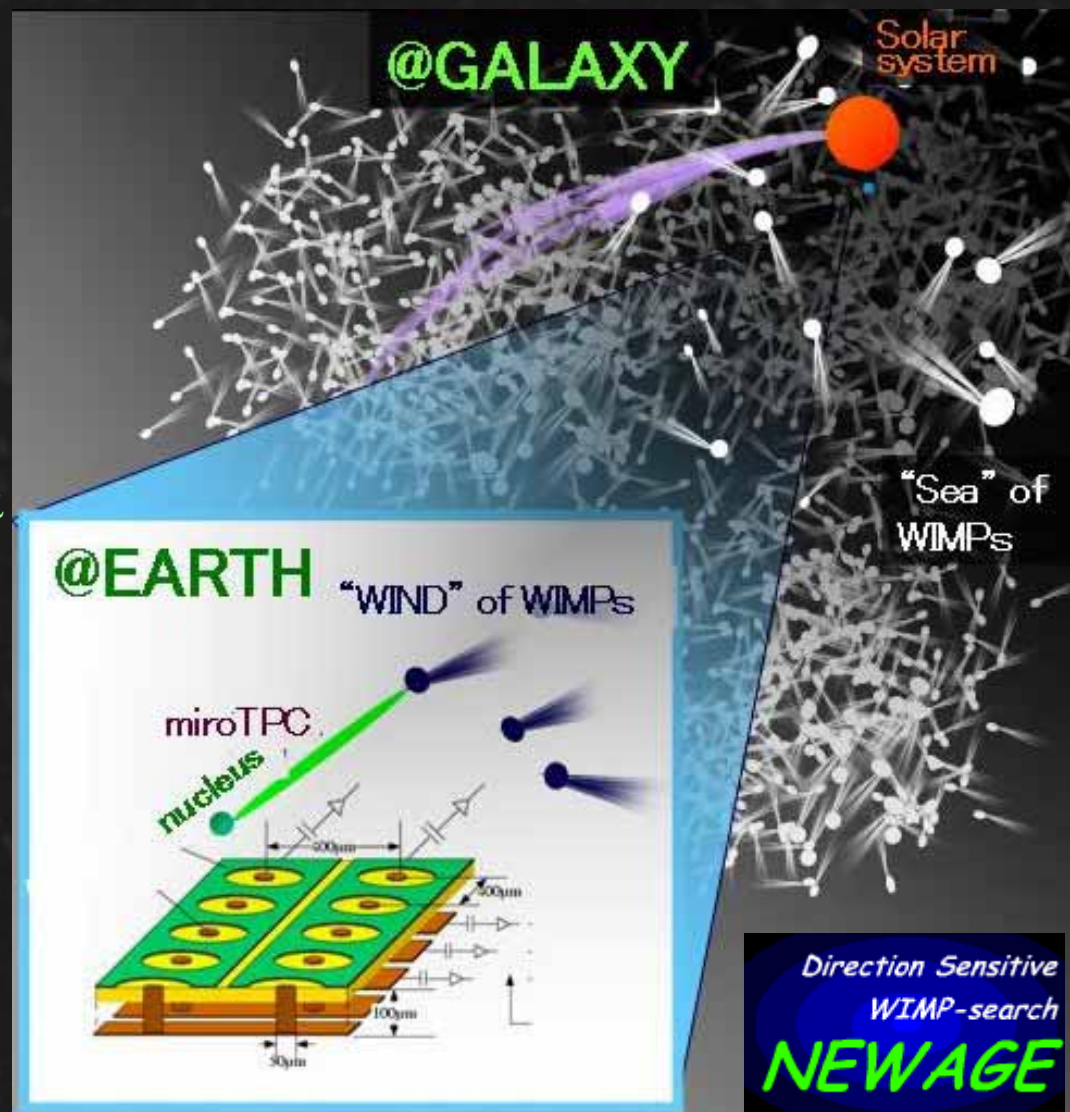
Ωιτη

Γ. Τανιμορι, Η. Κυβο

Σ. Καβυκι, Κ. Τσυχηιψα

Α. Τακαδα, Ψ Οκαδα, Η. Νισηιμυρα,

Κ. Χαττορι, Κ. Υενο, ανδ Σ. Κυροσαωα



Sep. 12th 2006

Kentaro Miuchi IDM2006 Rhodes, Greece

CF_4	100keV	300keV	500keV
C	1mm	3mm	5mm
F	1mm	3mm	4mm

$\text{CF}_4 + \text{C}_4\text{H}_{10}(8:2)$	100keV	300keV	500keV
H	4mm	1cm	2cm
C	1mm	3mm	4mm
F	1mm	2.5mm	4mm