

Station 3 Drift Chamber and Status of Japanese Collaboration

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Present Japanese collaborators

- RIKEN
 - Y. Goto, **K. Nakano (post-doc)**, M. Togawa
- KEK
 - S. Sawada
- Tokyo Tech
 - T.-A. Shibata, Y. Miyachi, **M. Tamori (master student, ~ March)**
- Kyoto University
 - K. Imai, T. Nagae

Grant

- We have applied to several research grants:
 - JSPS, TORAY, Yamada Science Foundation
 - Results will be informed around this April
- Other possible resource
 - US-Japan (KEK), ...
- If we successfully get some of the grants, there will be additional support from RIKEN.

Drift chamber station 3

- After the last collaboration meeting
 - M. Tamori (Tokyo Tech), K. Nakano (RIKEN) started the chamber design work.
 - Meetings with Repic (Rin-ei) for St. 3 chamber construction
 - Cell design
 - Take E866 St. 3 as “Reference”
 - Design cell structure similar to E866 St.3 in terms of gain, electron arrival time using Garfield

E866 St. 3 (= E906 St. 2) Cell

■ Info. in chamber_electronics.pdf

cell width	20.828 mm
half gap (btwn sense & cathode planes)	7.94 mm
cathode-wire spacing	1.524 mm
<i>N</i> of cathode wires per sense wire	28
HV on cathode wires & field wire	~2.7kV?
cathode potential	uniform
typical chamber resolution	150 μm
distance btwn two sense planes	69.85 mm
distance btwn sense & guard plane	~35 mm?
wire diameter	sense = 1 mil, cathode = 2.5 mil, field = 5 mil, guard = 5 mil

*) 1 mil = 0.0254 mm

■ Info. in Bill's e-mail

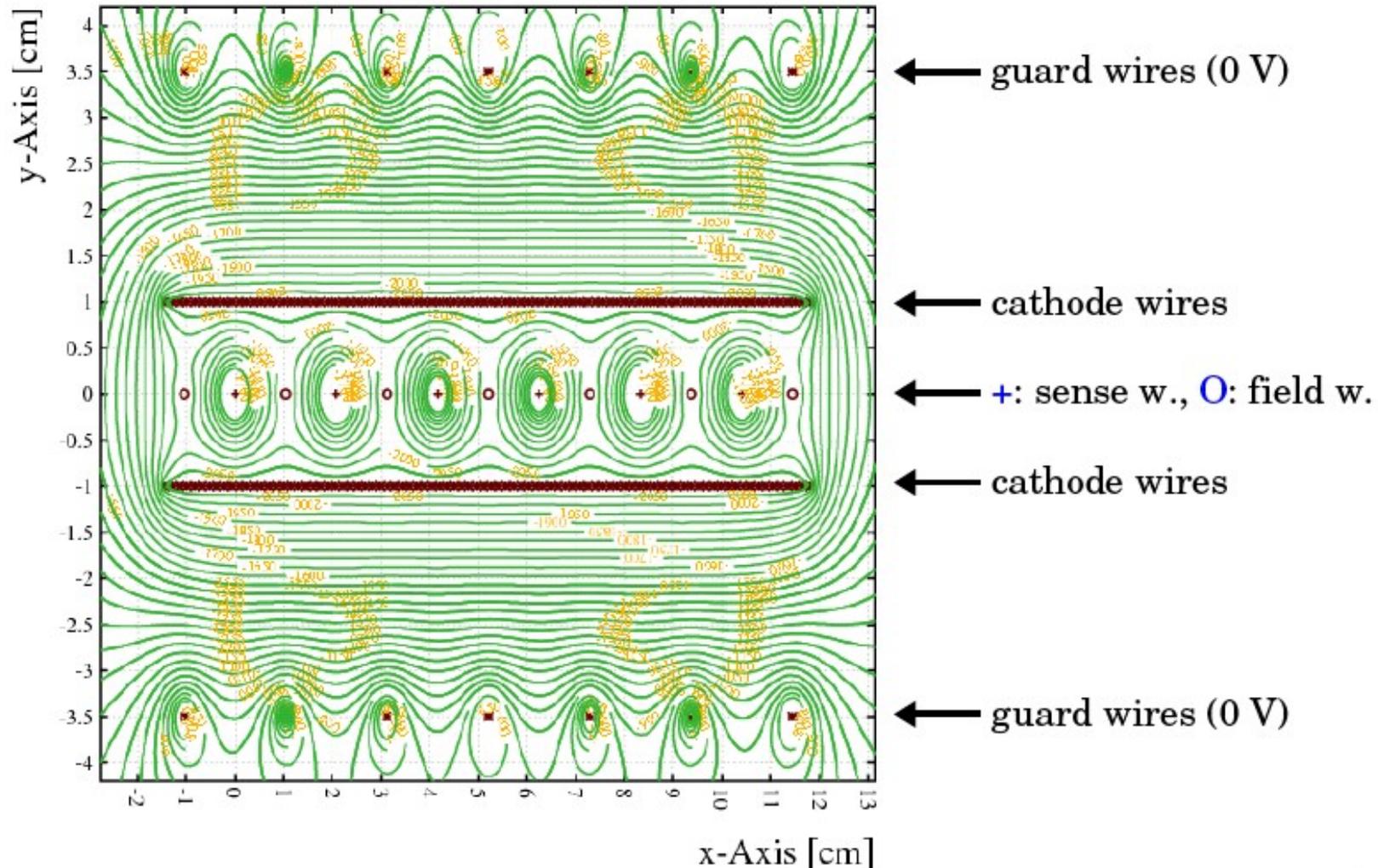
- half gap ~10 mm (increased by resistor diameter)
- added aluminized mylar planes (to reduce crosstalk)
- HV ~ 2050-2150 V for St. 3

E866-St.3: Garfield

Whole V map, E866 St.3 DC

Contours of V

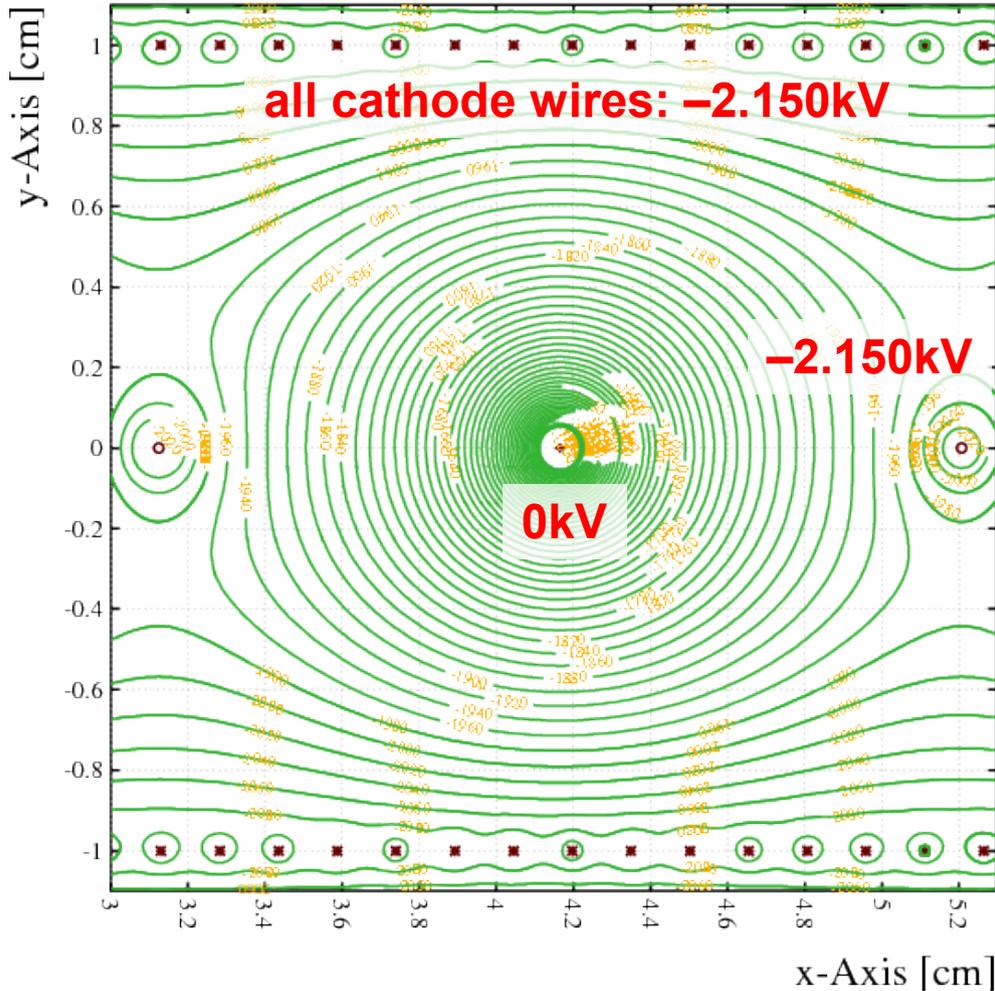
Cell: FNAL, E866 St.3 DC



E866 St. 3: cell structure

Contours of V

Cell: FNAL E866 St.3 DC



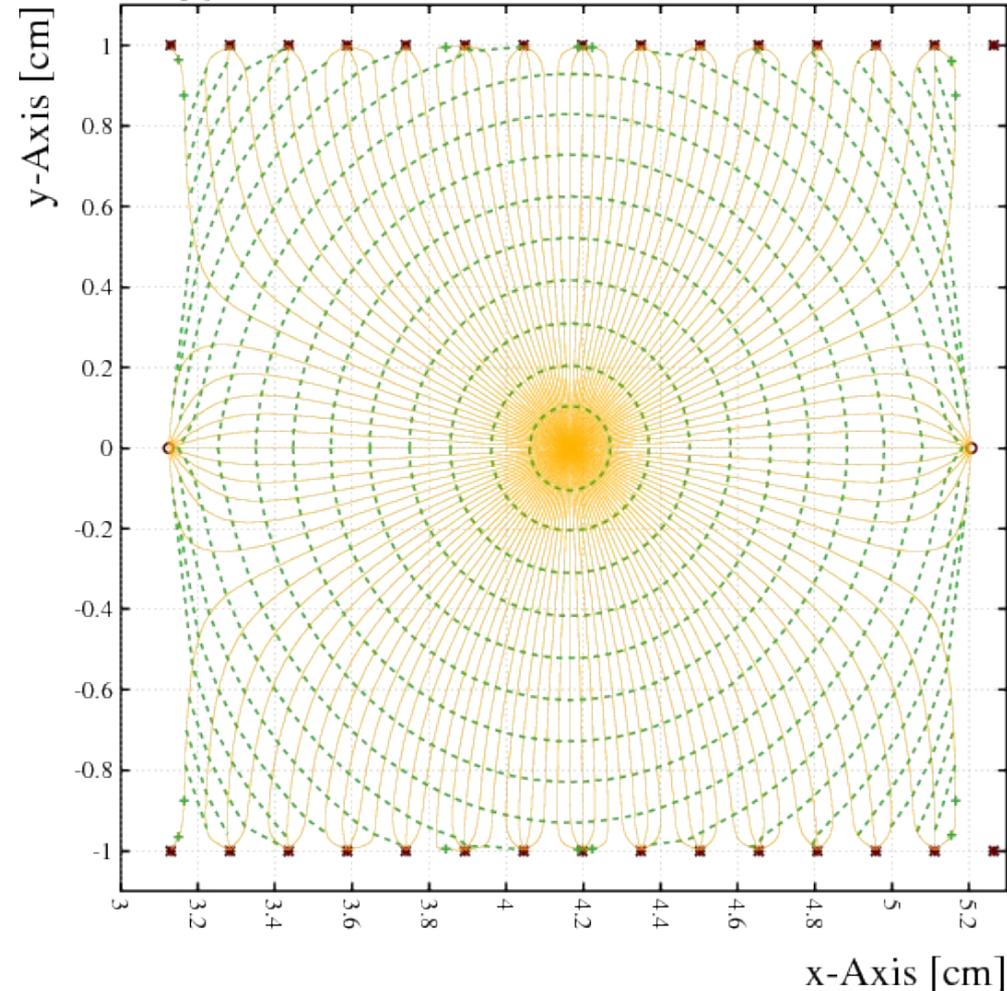
- gas gain = $8.0E4$
- Ar:C₂H₆=1:1, 1atm

Positron drift lines from a wire

Cell: FNAL E866 St.3 DC

Gas: C₂H₆ 50%, Ar 50%, T=300 K, p=1 atm

Isochrone interval: 0.02 [μsec]



- Arrival time RMS: 1 ~ 2 ns

Cell structure for E906 St. 3

- **Box type**

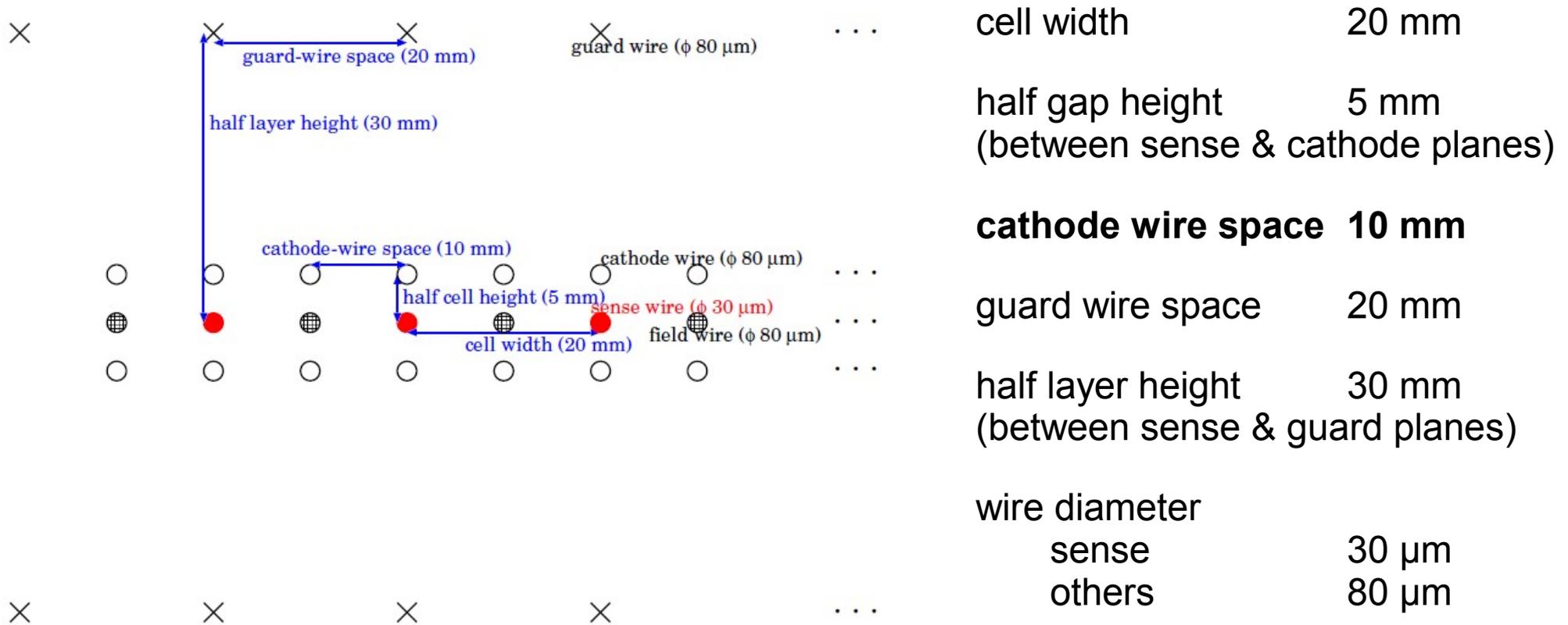
- × incident-angle dependence
- × stepping HV values
- cell height < cell width
- E strong enough
- common to other stations

- **Hex type**

- rotation-symmetric E -field
→ good for non-vertical incidence
- only one HV value
- × cell height = cell width
- × weak E at the middle of sense w.
→ bad for drift-speed stability

Station 3: Box type Cell structure

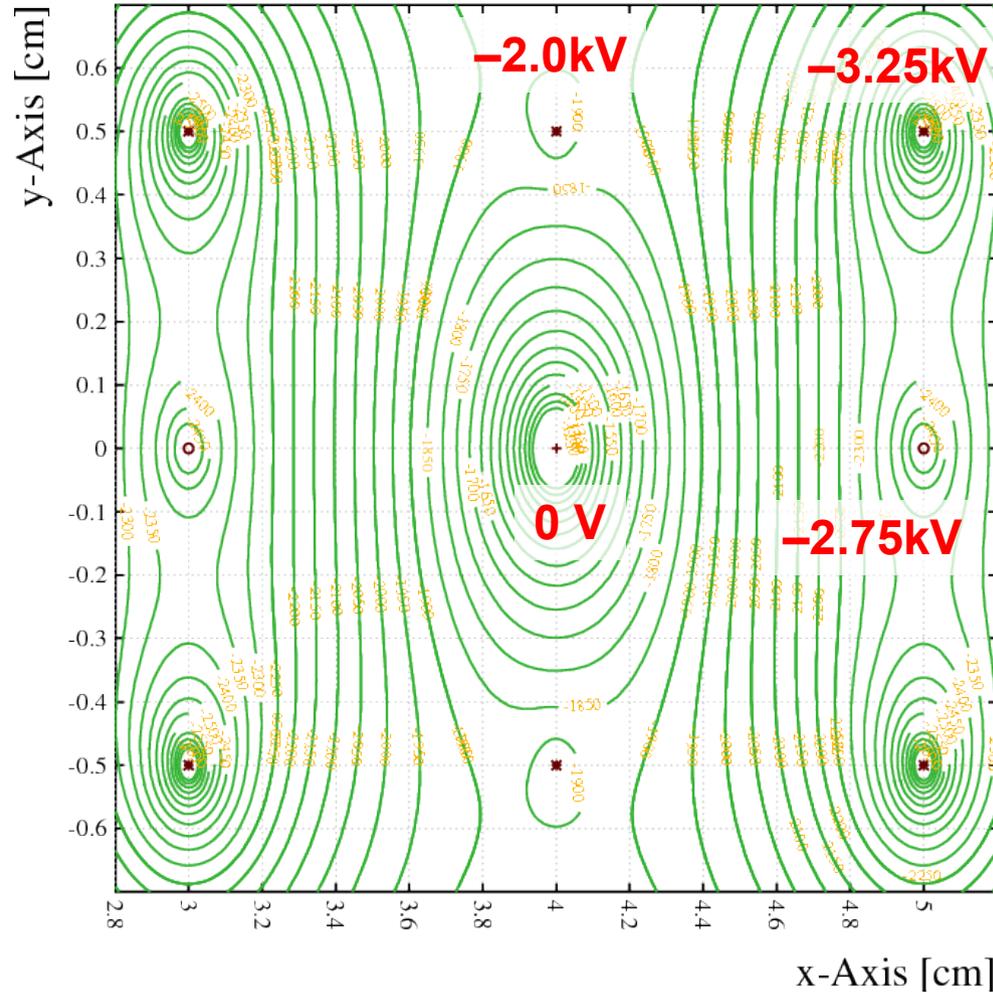
RINEI offers 2.0 m x 3.2 m chamber using feed through, which limits minimum wire spacing ~ 3 mm.



Station 3: cell structure (10 mm cathode spacing)

Contours of V

Cell: FNAL E906 St.3 DC

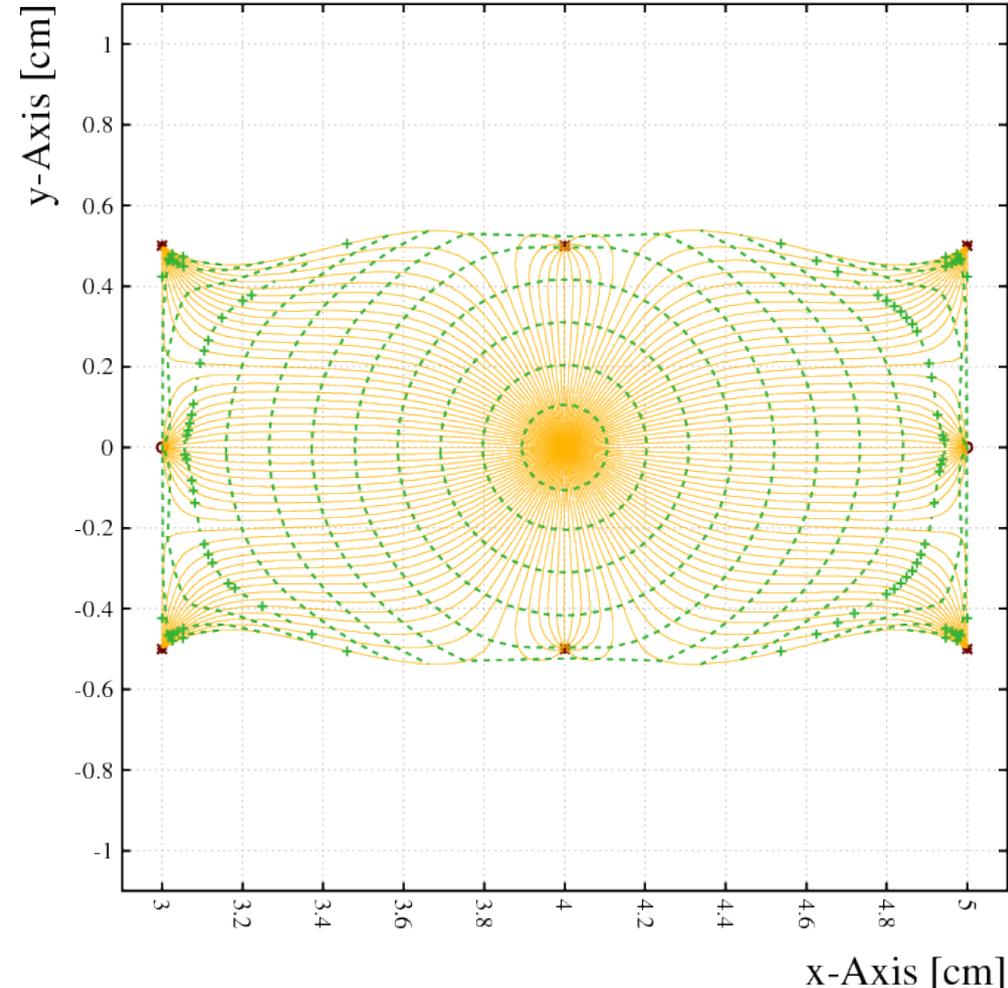


Positron drift lines from a wire

Cell: FNAL E906 St.3 DC

Gas: C₂H₆ 50%, Ar 50%, T=300 K, p=1 atm

Isochrone interval: 0.02 [μsec]



- Voltages are tuned to get gas gain $\sim 1.0E5$
- Ar:C₂H₆=1:1, 1atm

- Arrival time RMS: 1 ~ 2 ns

Station 3: schedule

- Chamber design and cost estimation based on the new cell structure: Jan ~ Feb., by Repic (Rin-ei)
- Chamber test bench at RIKEN: Jan ~
 - Test pre-amp with the existing chamber
- Finalizing the chamber design: by April
- The results of JSPS grant in aid in April
 - order the station 3 to RINEI
- “Backup plan”: Jan ~
- Track rate estimation with Geant4: (Jan ~)

Station 3: backup plan

- In case we fail to get a budget for the station 3 construction:

- Re-use E886 St. 2 for E906 St. 2, and E866 St. 3 for E906 St. 3
- Re-use existing smaller size

E866		x		y
Station	1	122.9 cm		101.6 cm
Station	2	167.6 cm		130.0 cm
Station	3	269.2 cm		233.2 cm
Station	4a	297.2 cm		304.8 cm
	4b	343.9 cm		308.6 cm
	4c	359.4 cm		363.2 cm

chambers to cover the required area

- Build the smaller chambers, and cover the area with existing small size chambers. (with E866 St.2, for example)

- In any case, acceptance, especially for large x_2 , has to be studied with MC.

Summary

- New post-doc and master student joined and have been involved in St. 3 chamber design.
- We have applied to research grants and are waiting for the results at the moment. (next US-Japan)
- St. 3 chamber design was started in touch with Repic (Rin-ei).
 - The cell structure was fixed. The first design and cost estimation from RINEI are expected in Feb.
 - Test bench will be prepared at RIKEN
 - Backup plan discussion starts soon.