

Status of the prop. tubes with the new gas

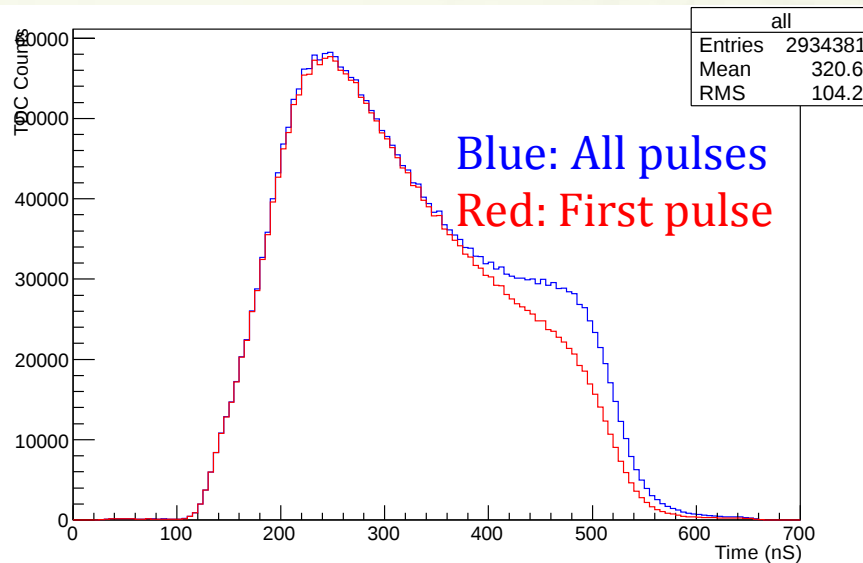
Kun Liu, Ming Liu
Oct. 28, 2011

Outline

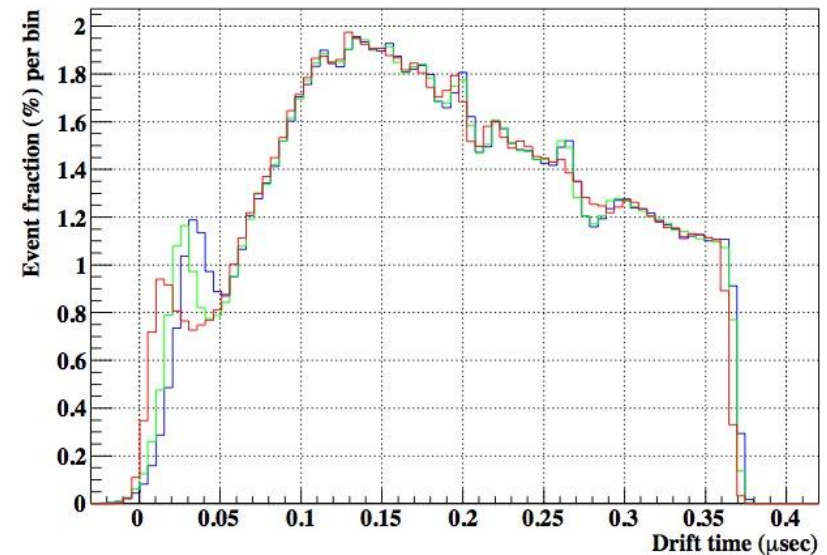
- Properties with P08:CF₄ ~ 96:4
 - Time spectrum
 - HV plateau
 - Self-reconstruction efficiency
 - Self-calibration of D-t relationship
- Comparison with other mixing ratios

Time spectrum @ 1850 V

Cosmic data

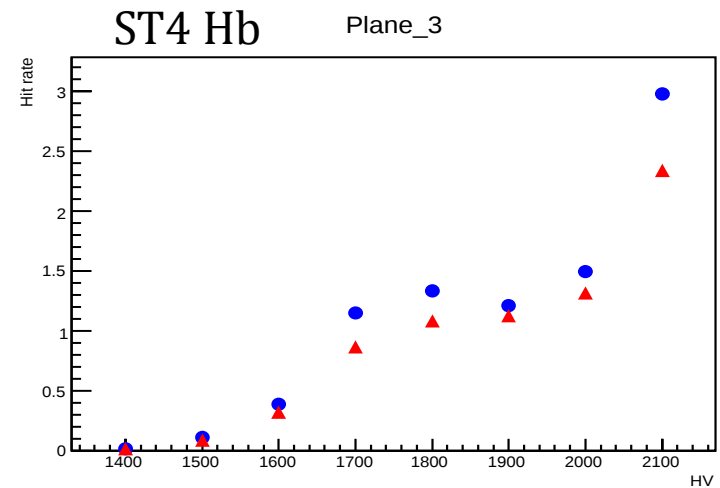
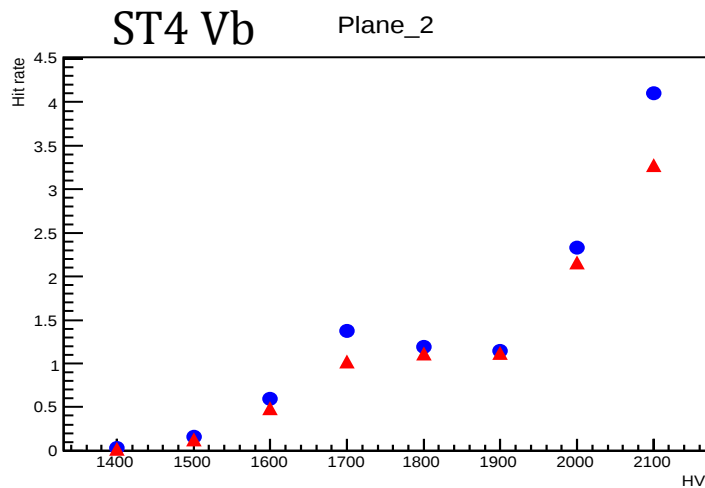
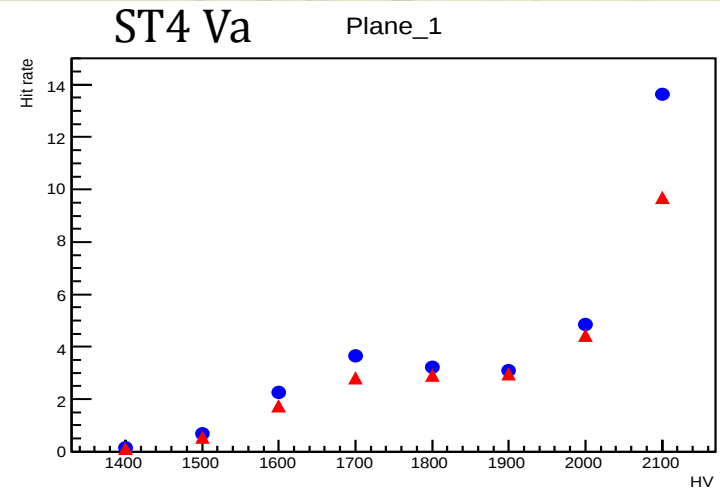
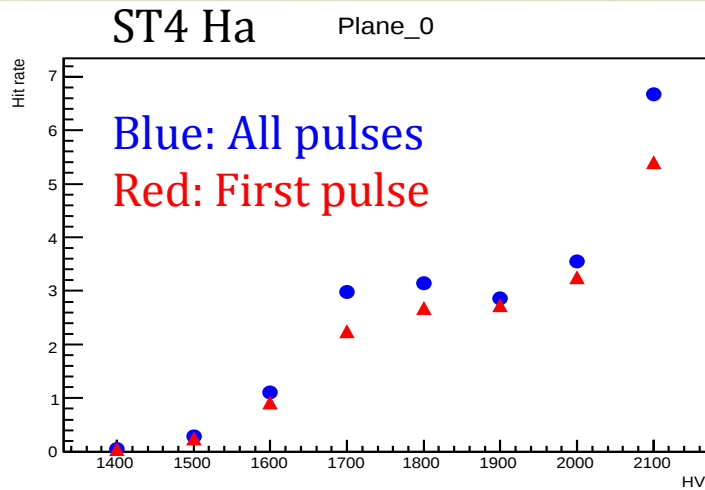


Ken-ichi's garfield simulation



- The time spectrum qualitatively agrees quite well with garfield simulation.
- Maximum drift time ~ 480 nS (Garfield simulation shows 370 nS).
- First pulse / all pulses = $(93.63 \pm 0.02)\%$

HV plateau



HV plateau is between 1.7~2.0 kV, and the optimal HV is 1.85 kV.

Self-reconstruction efficiency @ 1850 V

Initial seed combination

- Initial seeds are made by the random combinations of the hits in the most upstream and down stream plane available.

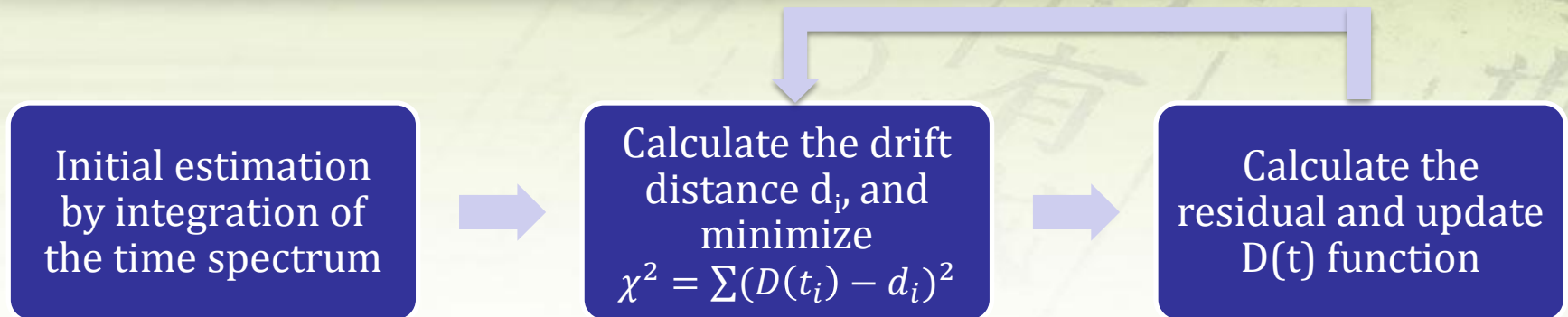
Associate hits on course

- Hits on other planes around the extrapolated position are associated to the candidate track.
- Multiple usage of hits is allowed at this stage

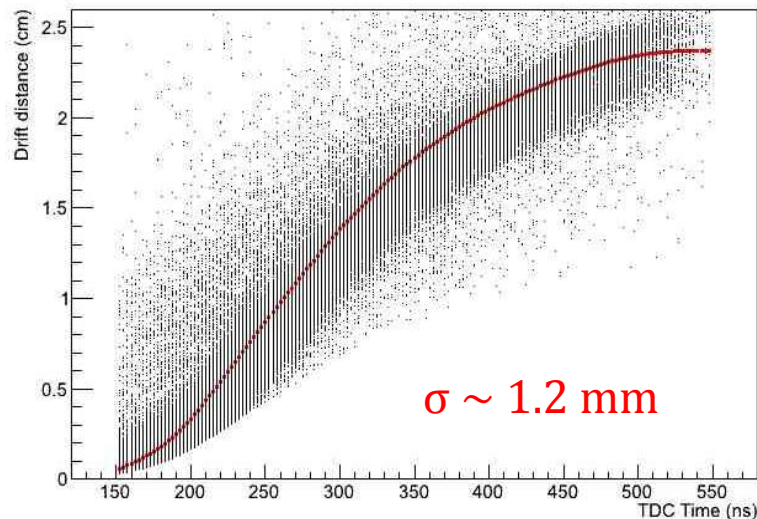
Reduce the candidates

- Retain best track which has the most hits and least χ^2 , remove its hits from the hit list of other tracks
- Above procedure is done iteratively until all tracks has their unique hits
- Track reconstruction efficiency = $(34.92 \pm 0.06)\%$
- Single tube efficiency of horizontal tubes = $(93.42 \pm 0.04)\%$
- Single tube efficiency of vertical tubes = $(87.53 \pm 0.04)\%$

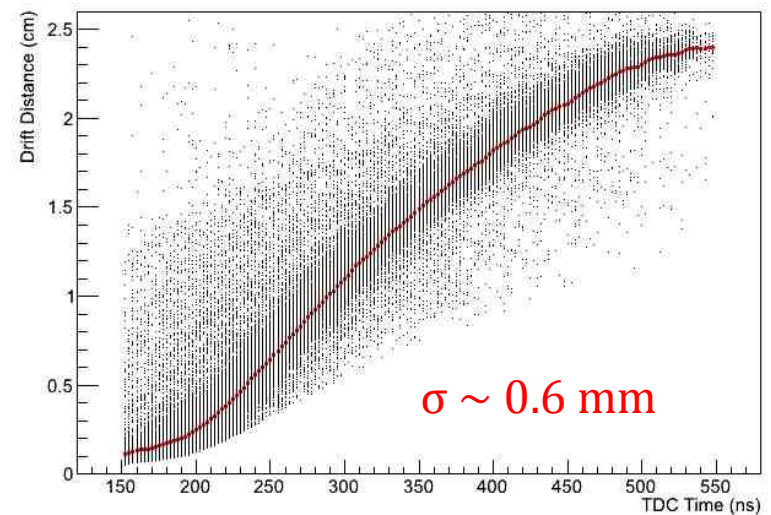
Self-calibration of D-t relationship



Initial $D(t)$ and residual



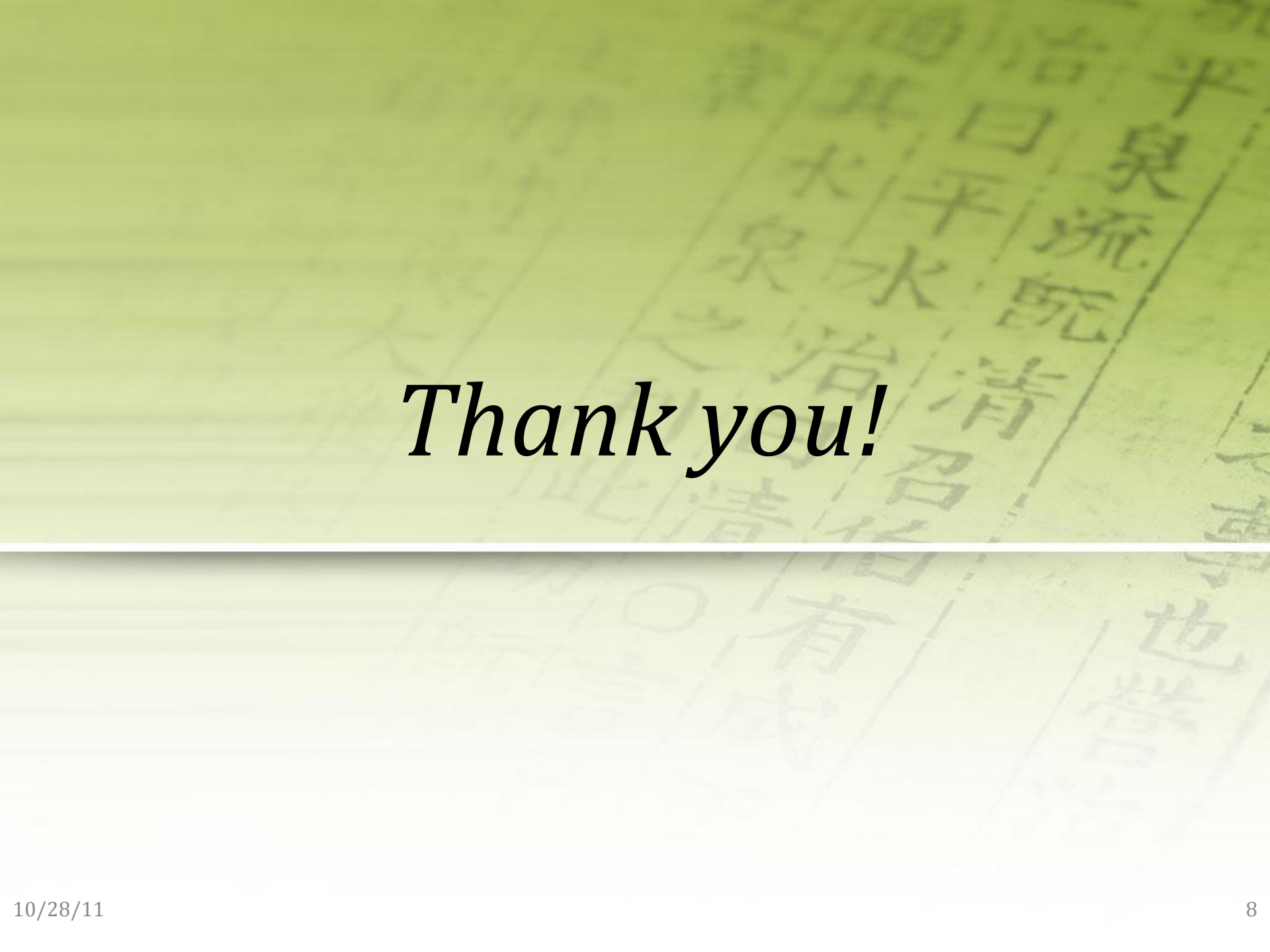
After 20 iterations



Comparison and summary

Ratio of CF4	~2%	~4%	~8%
Max. drift time (ns)	500	460	480
Max. drift time by Garfield (ns)	N/A	370	370
HV plateau/Optimal HV (kV)	1.7~1.9 / 1.8	1.7~2.0 / 1.85	1.8~2.0 / 1.9
Efficiency (%)	34.31 ± 0.06	34.92 ± 0.06	34.72 ± 0.06
First pulse/ all pulses (%)	87.84 ± 0.02	93.63 ± 0.02	85.15 ± 0.02

- Compared with Argon/CO₂, P08/CF₄ significantly reduces the maximum drift time, allowing us to have the full time spectrum within the TDC time window.
- Considering other factors, P08:CF₄ ~ 96:4 appears to be the optimal mixing ratio.

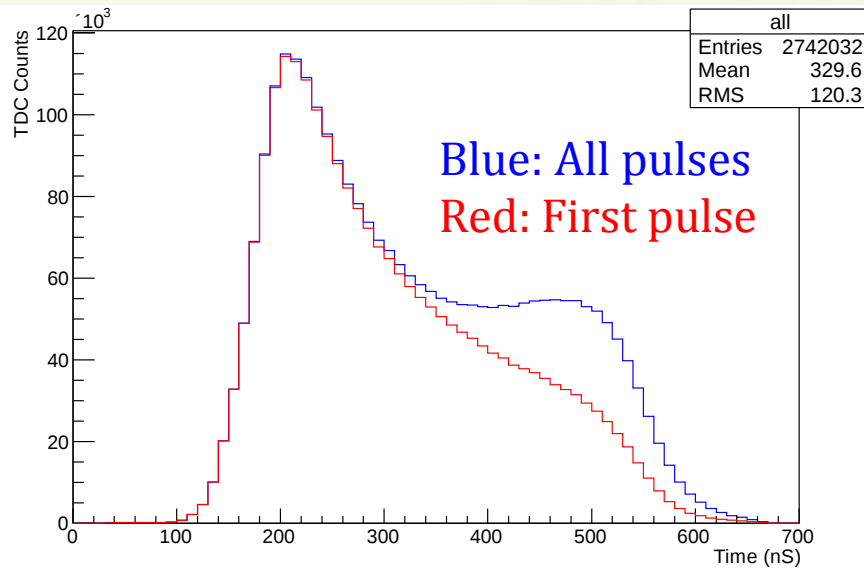


Thank you!

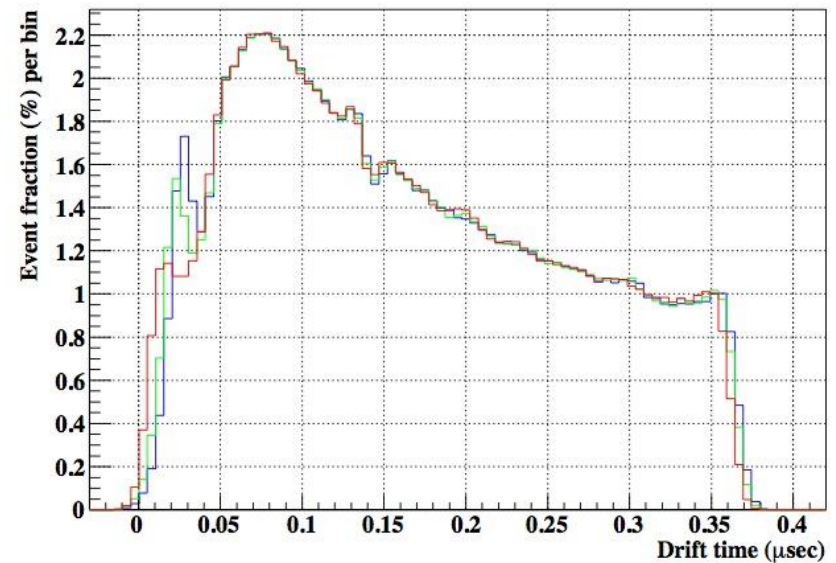
Backup slides

Time spectrum with 8% CF₄ @1900 V

Cosmic data

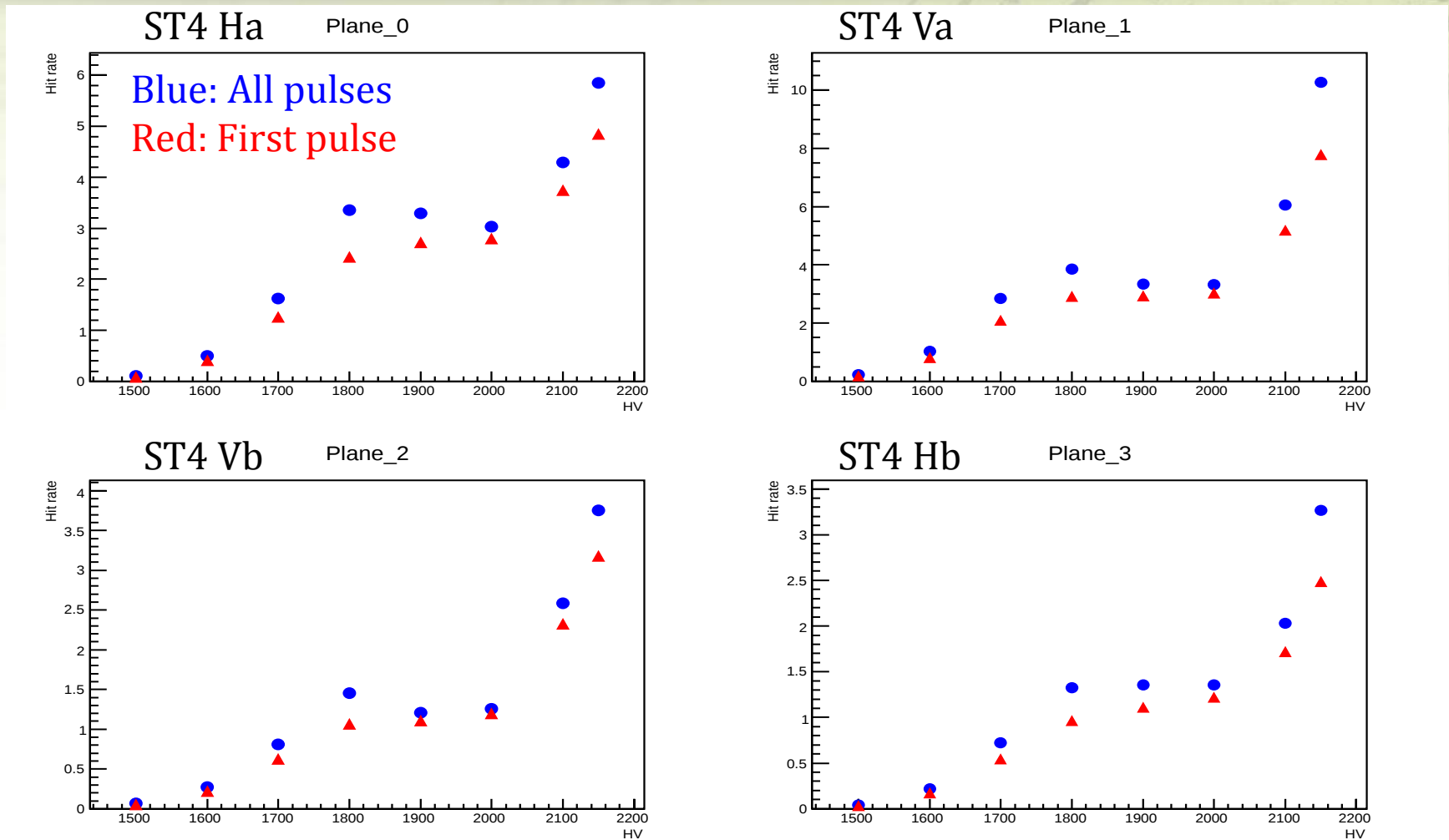


Ken-ichi's garfield simulation



- The time spectrum qualitatively agrees quite well with garfield simulation.
- Maximum drift time ~ 480 nS (Garfield simulation shows 370 nS).
- First pulse / all pulses = $(85.15 \pm 0.02)\%$

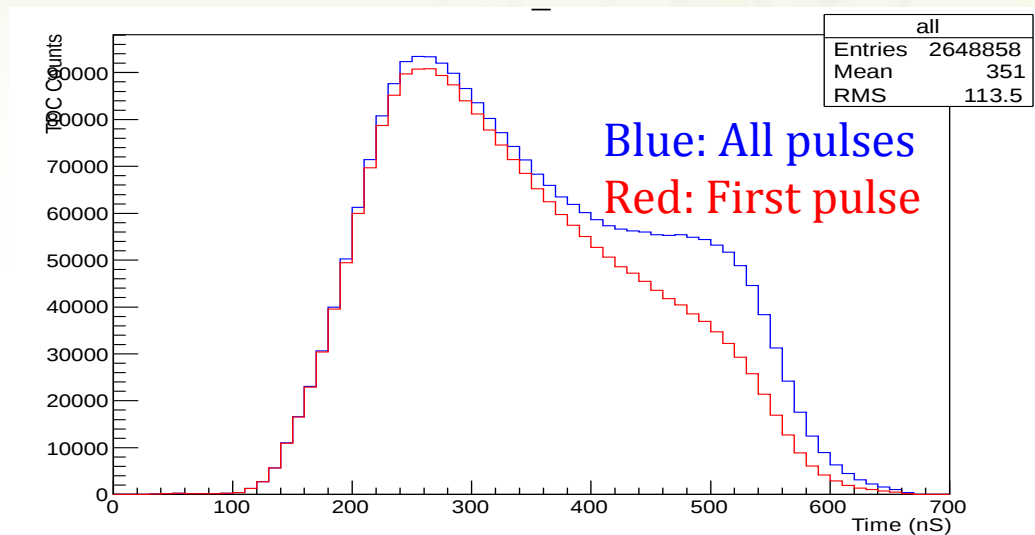
HV plateau with $\sim 8\%$ CF₄



HV plateau is between 1.8~2.0 kV, and the optimal HV is 1.9 kV.

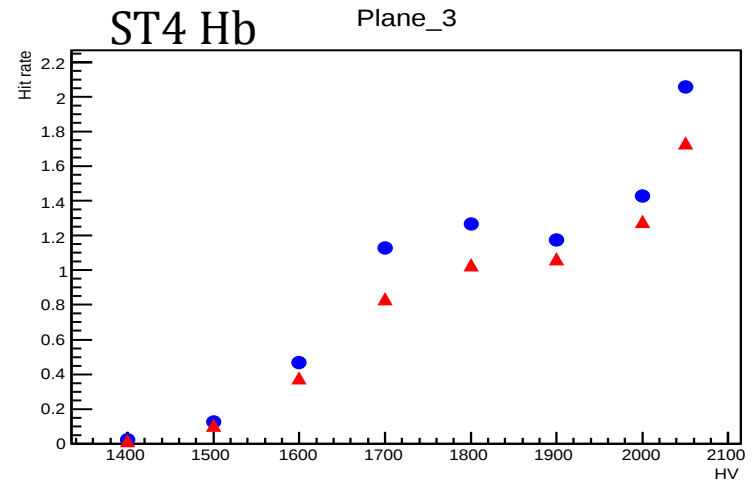
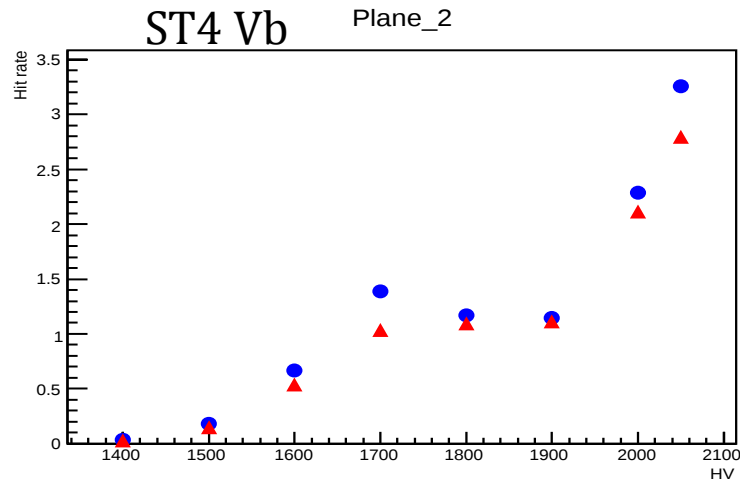
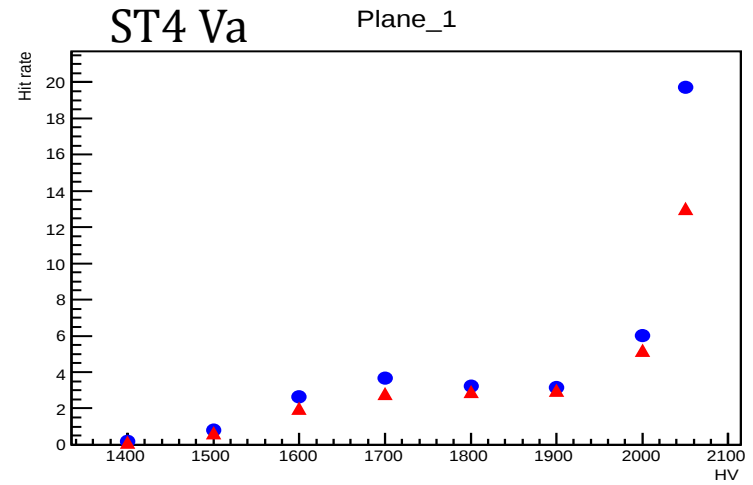
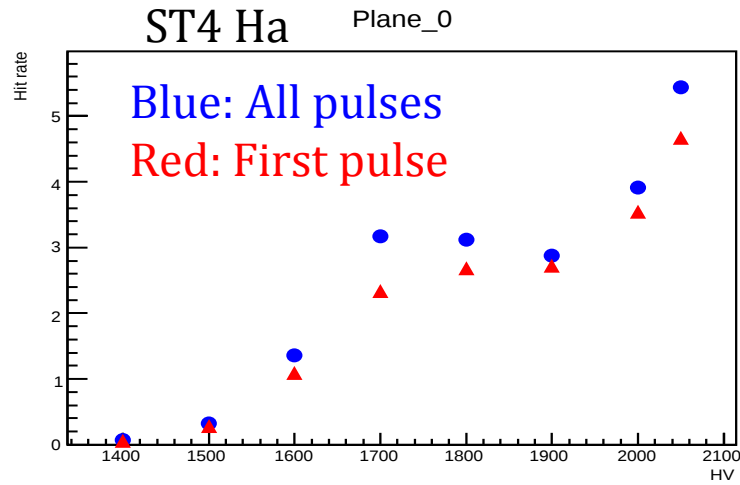
Time spectrum with 2% CF4 @1800 V

Cosmic data



- Maximum drift time ~ 500 nS.
- First pulse / all pulses = $(87.84 \pm 0.02)\%$
- No simulation available

HV plateau with $\sim 2\%$ CF₄



HV plateau is between 1.7~1.9 kV, and the optimal HV is 1.8 kV.