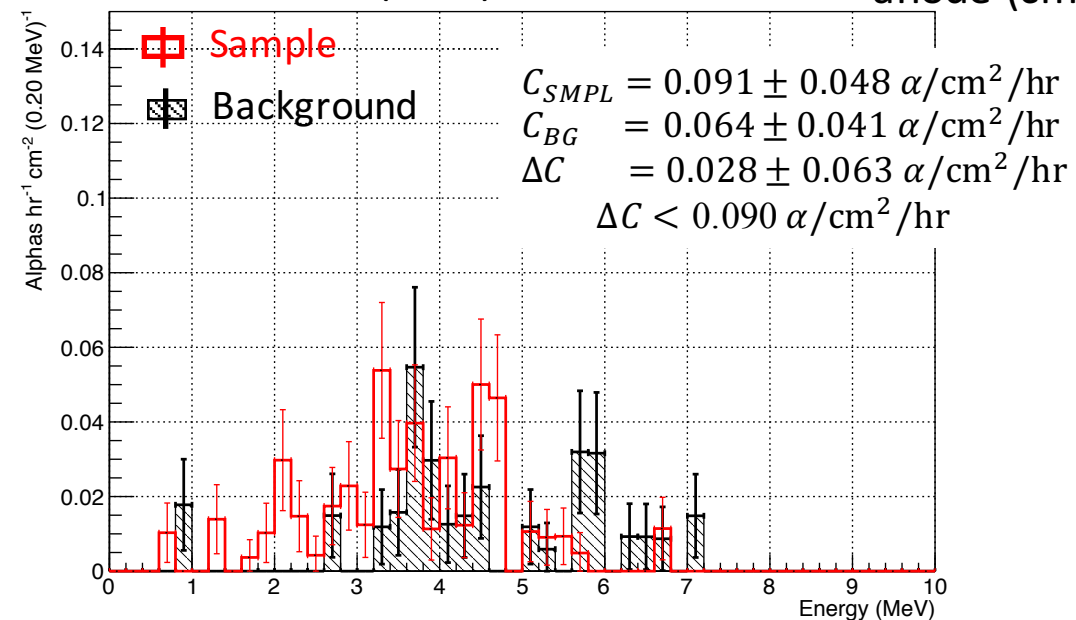
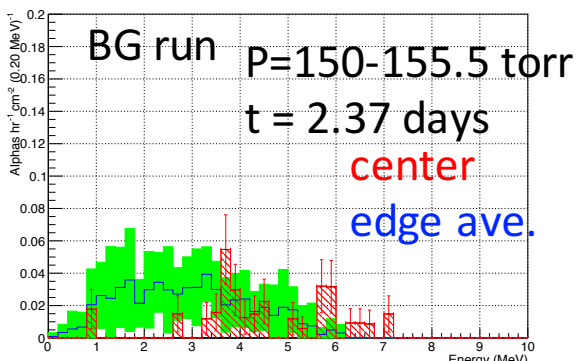
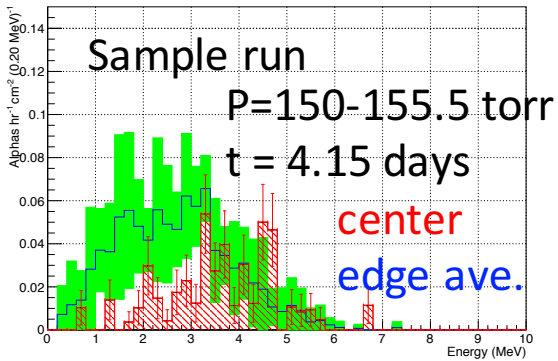
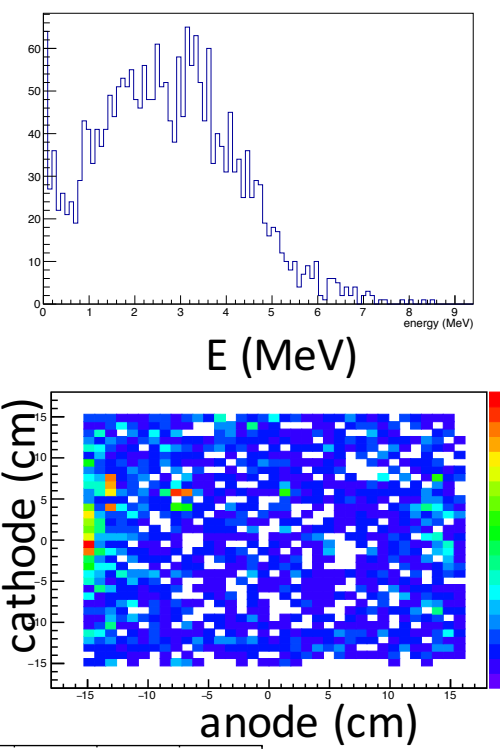
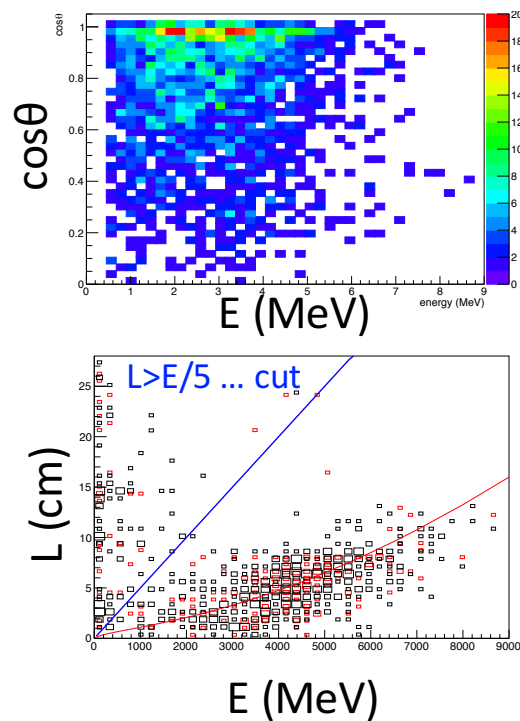
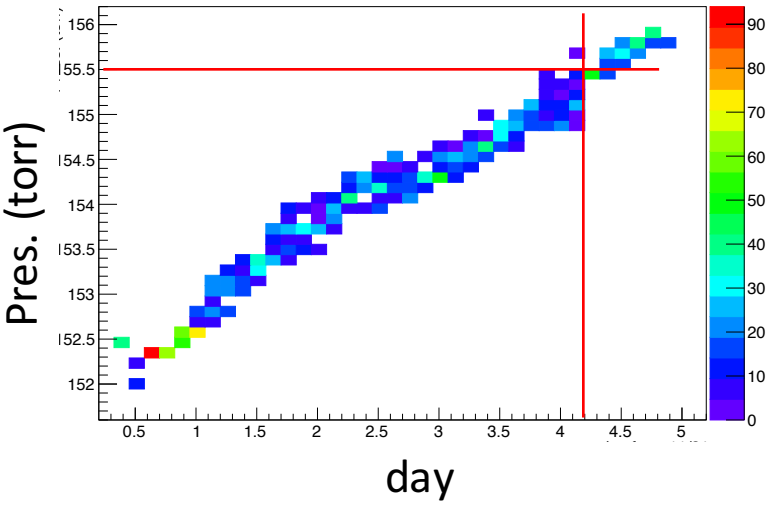


Low-alpha 0.3 a Progress

Hiroshi Ito
2017.12.26

Result: Sample RUN12/28-1/4

Raw data



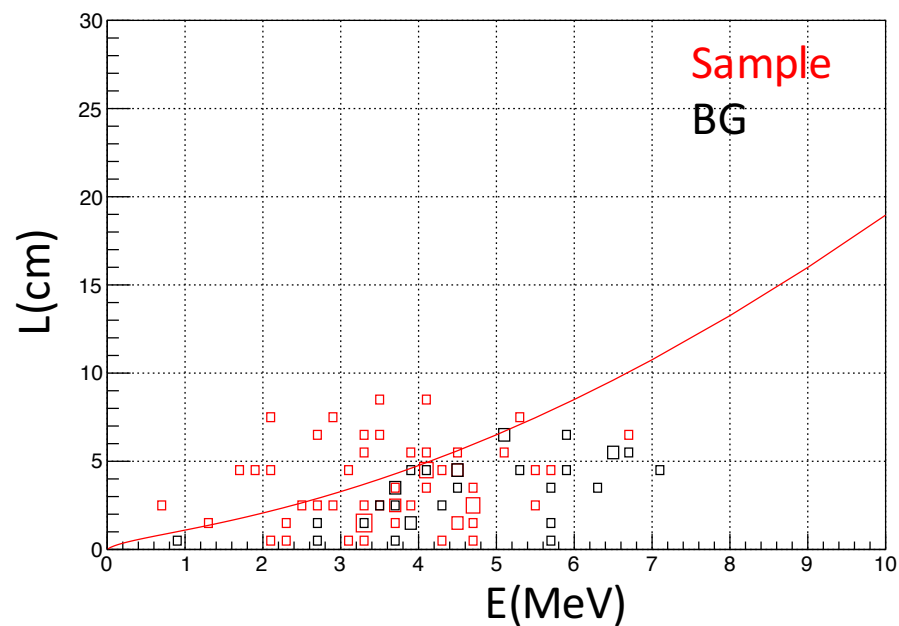
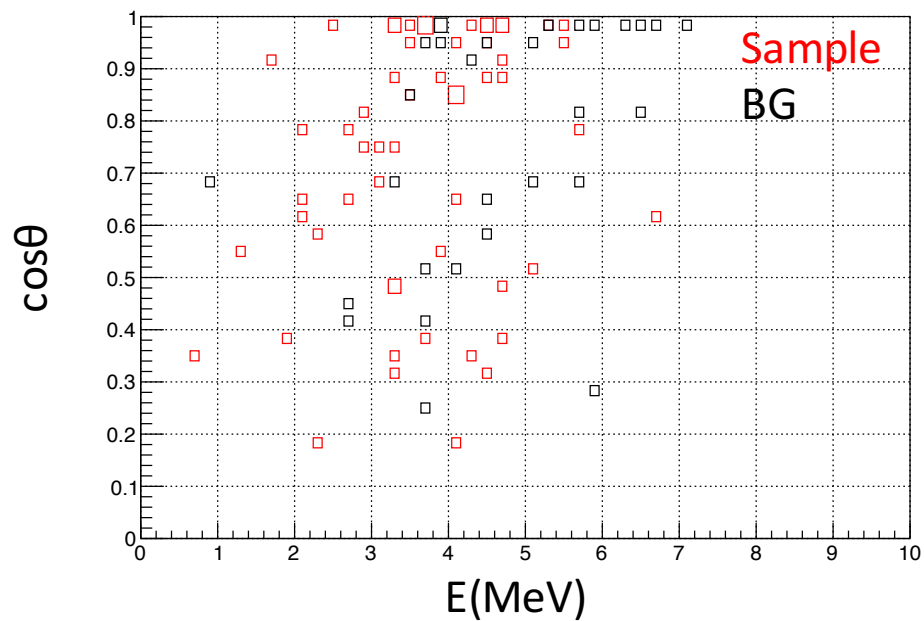
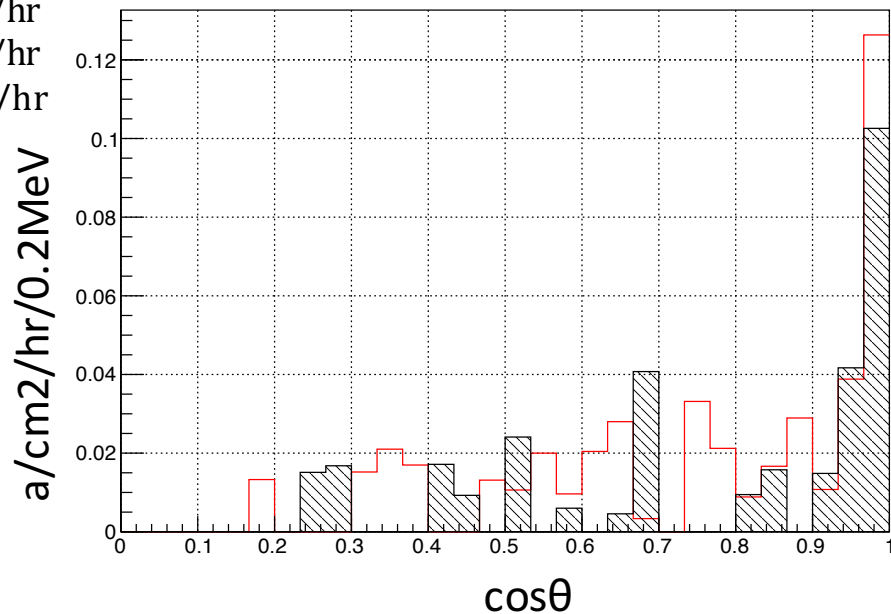
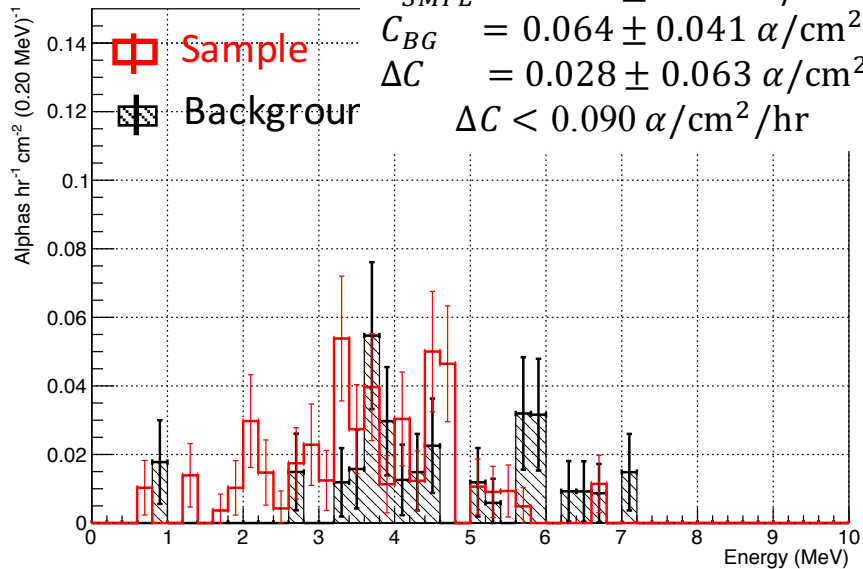
Result: Sample RUN12/28-1/4

$$C_{SMPL} = 0.091 \pm 0.048 \alpha/cm^2/hr$$

$$C_{BG} = 0.064 \pm 0.041 \alpha/cm^2/hr$$

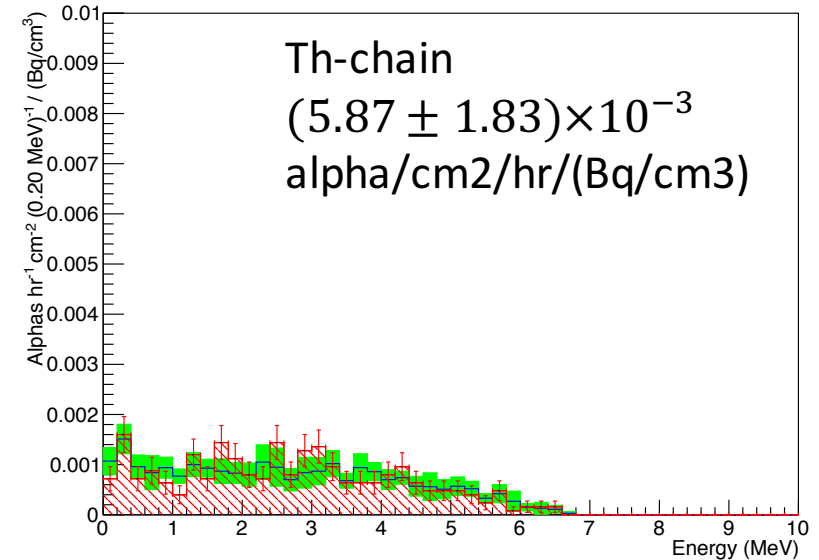
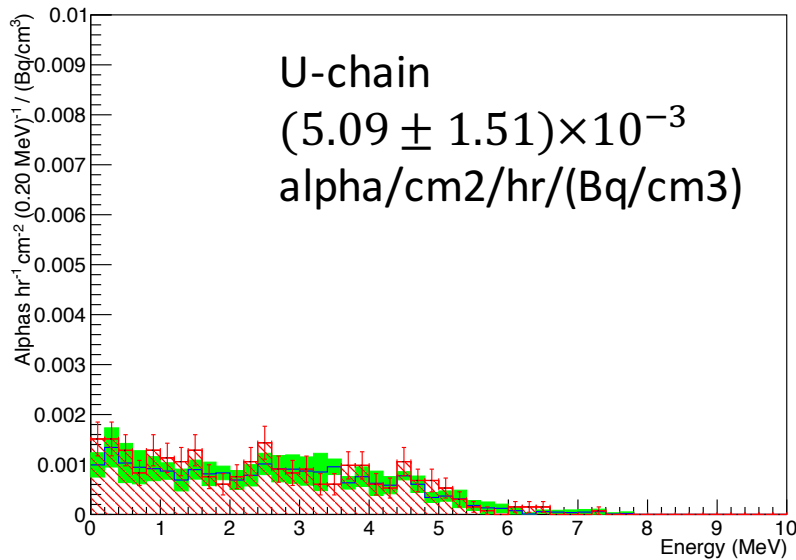
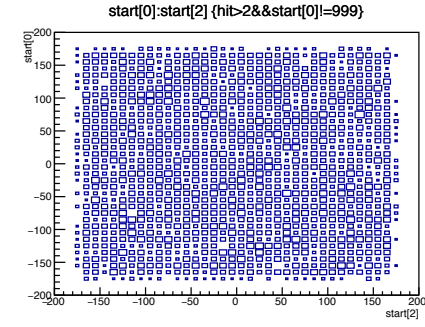
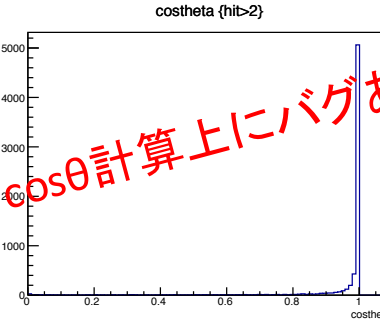
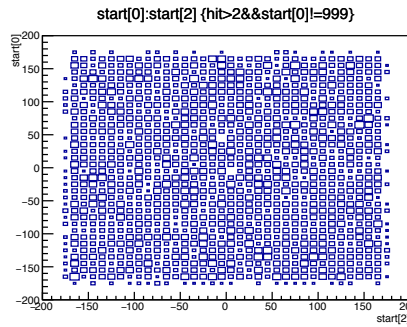
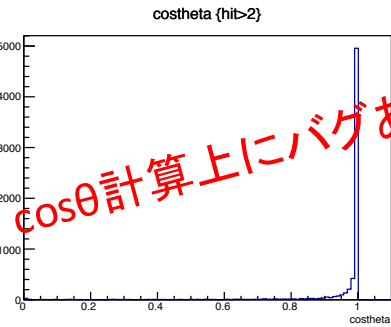
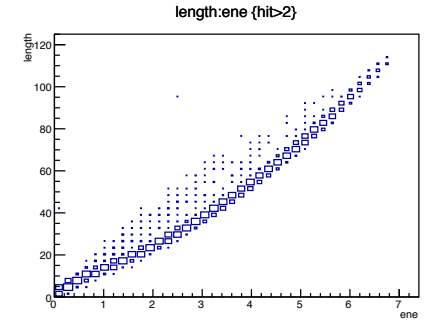
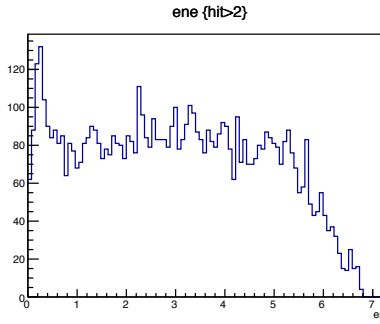
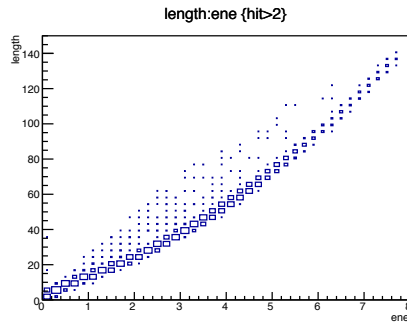
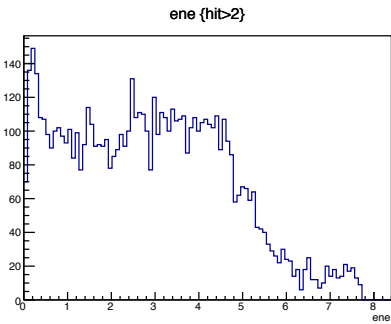
$$\Delta C = 0.028 \pm 0.063 \alpha/cm^2/hr$$

$$\Delta C < 0.090 \alpha/cm^2/hr$$



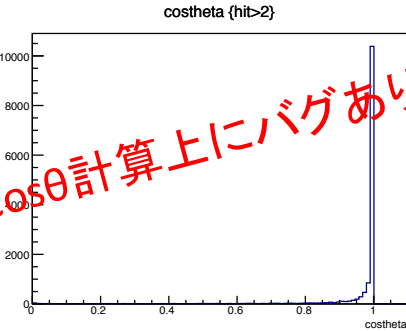
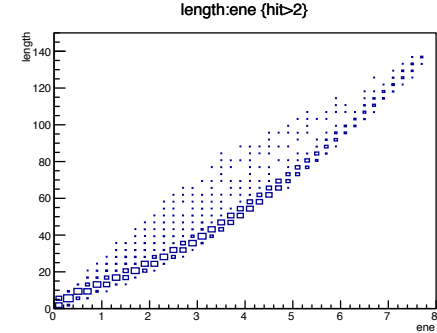
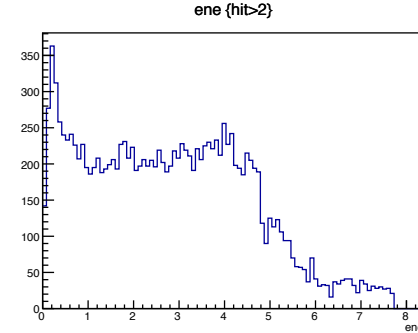
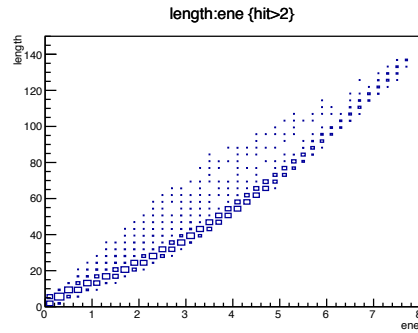
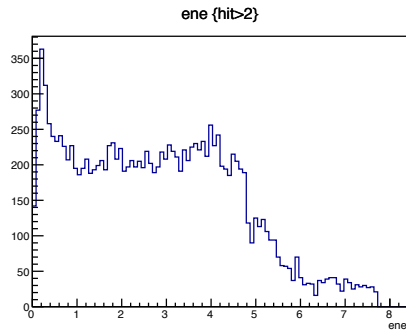
BG Simulation in G4

alpha from uPIC

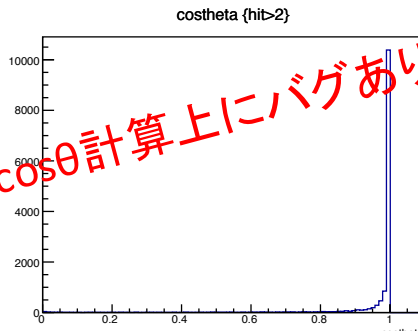
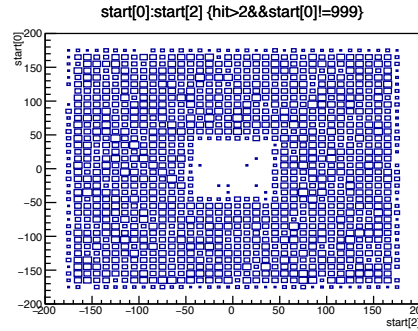


BG Simulation in G4

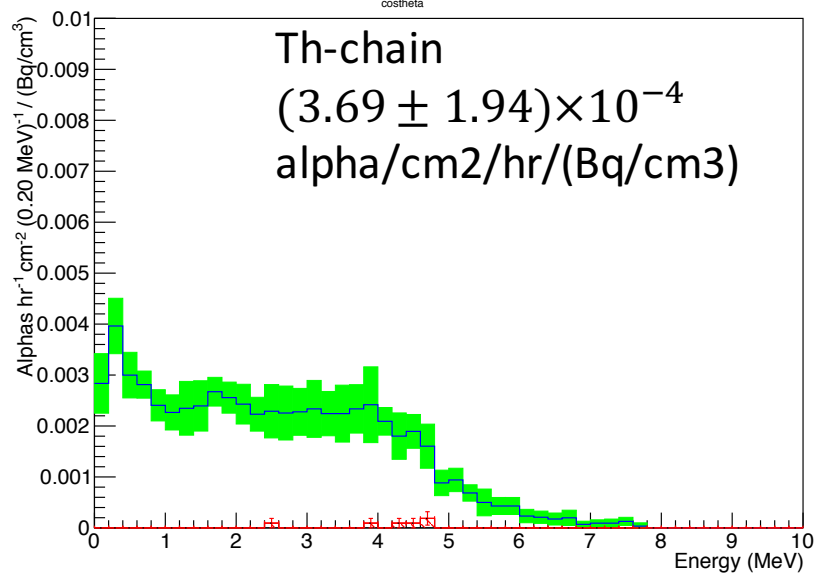
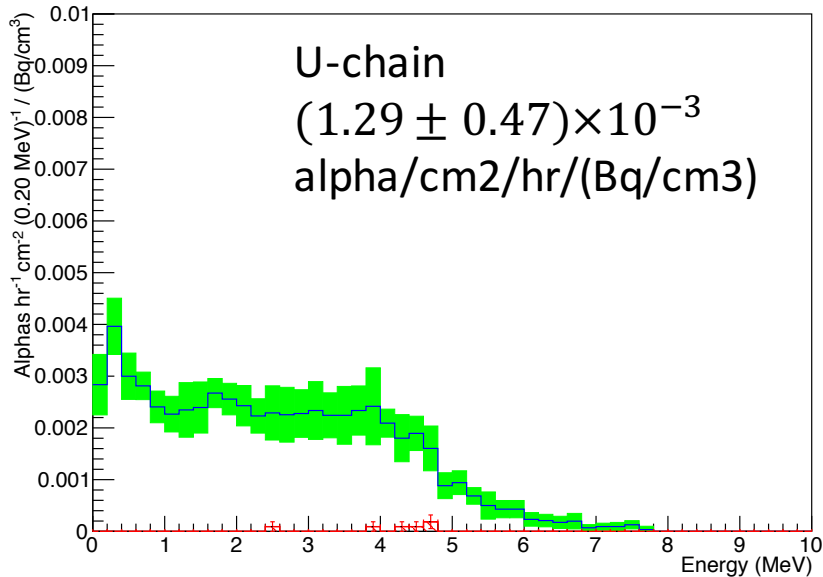
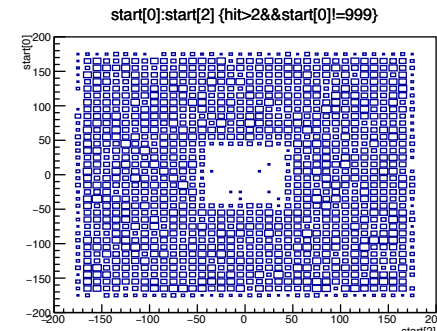
alpha from drift plate



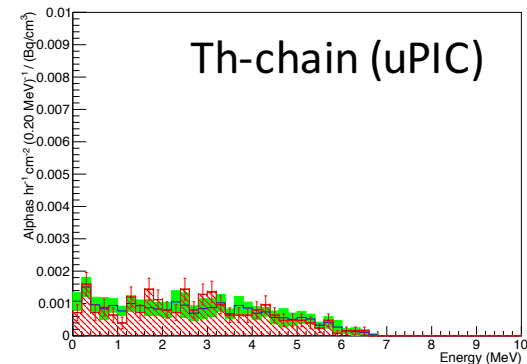
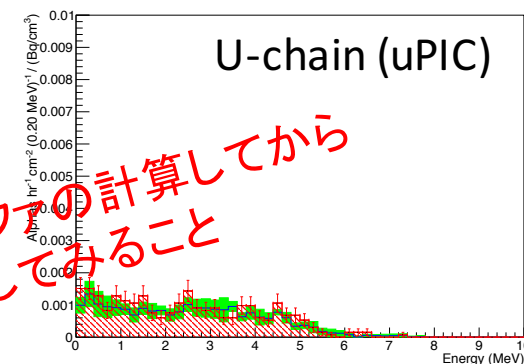
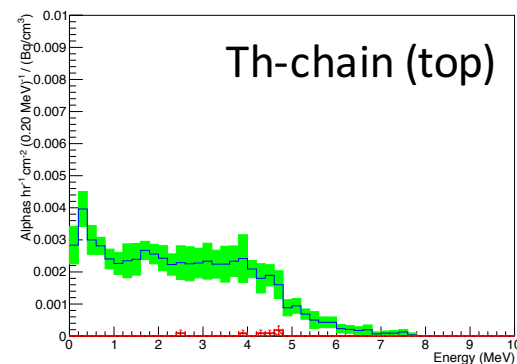
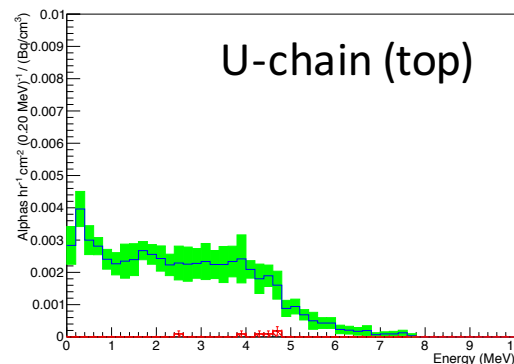
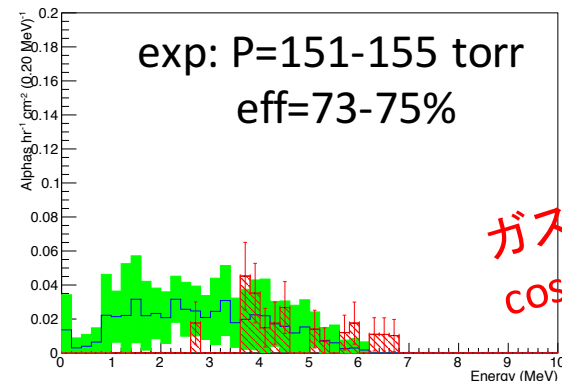
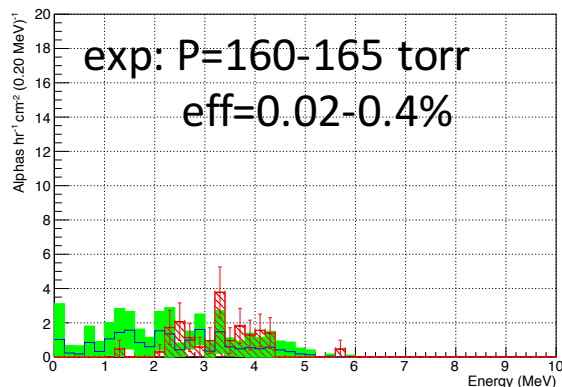
cosθ計算上にバグあり



cosθ計算上にバグあり



実験結果とSimuの比較

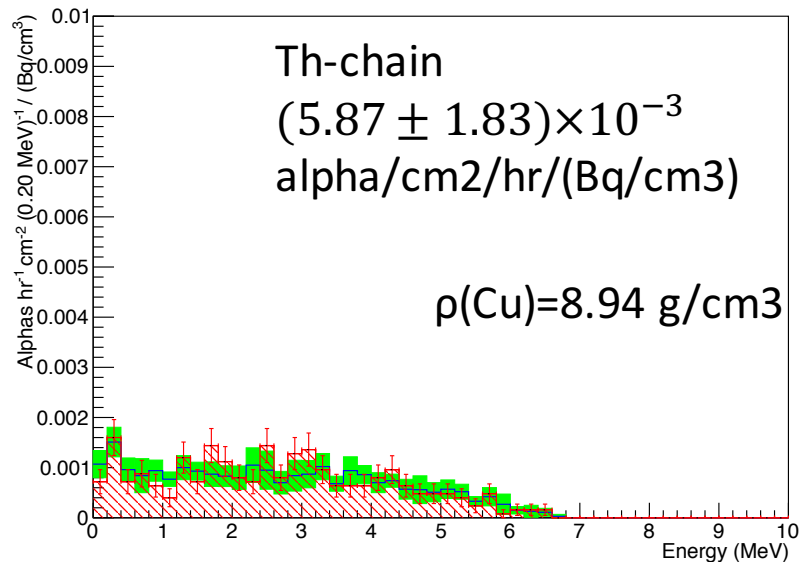
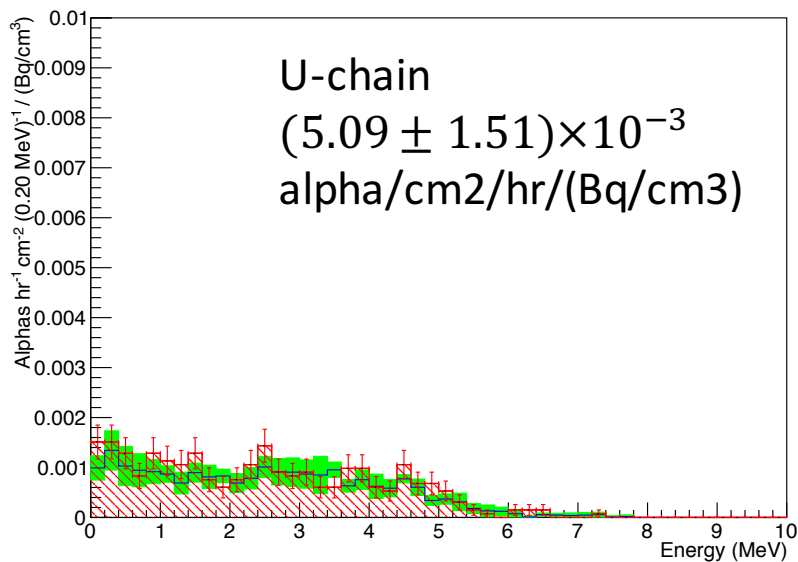
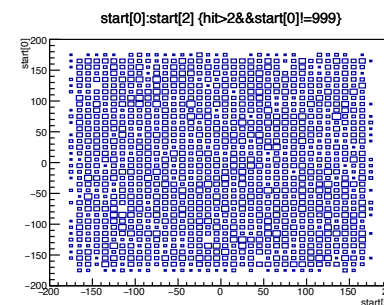
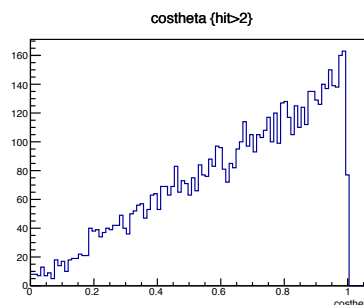
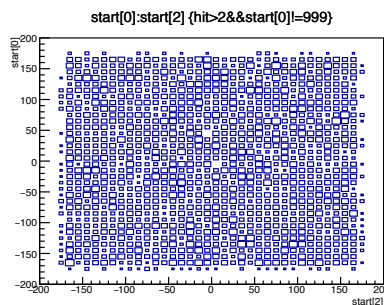
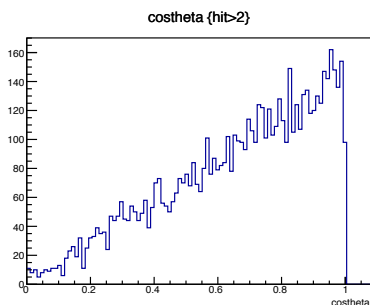
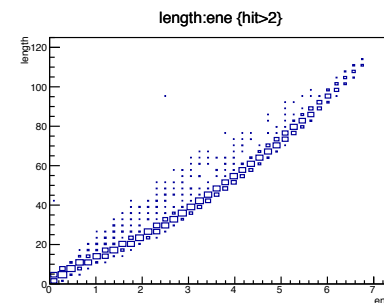
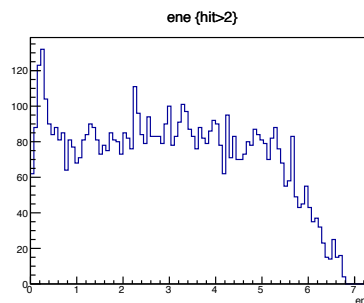
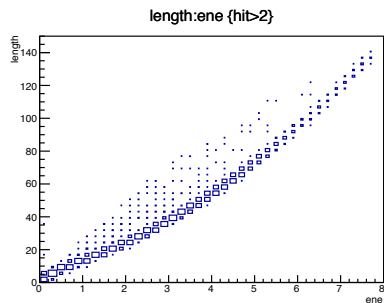
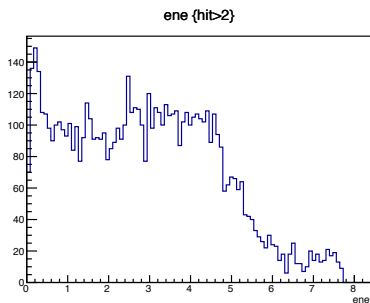


- drift plateからのalphaはfid cutすると、中央が少なく、周りが多い。
- expは統計が少ないがfid cutでも中央に残るため、BG runでの生き残りはtop drift plateからのalphaが支配的ではないことが明らかにわかった。
- uPIC由来が全てを支配してたら、
 - U-chain ... < 15.7 Bq/cm 3 = 176 Bq/kg
 - Th-chain ... < 13.6 Bq/cm 3 = 152 Bq/kg

$$\rho(\text{Cu})=8.94 \text{ g/cm}^3$$

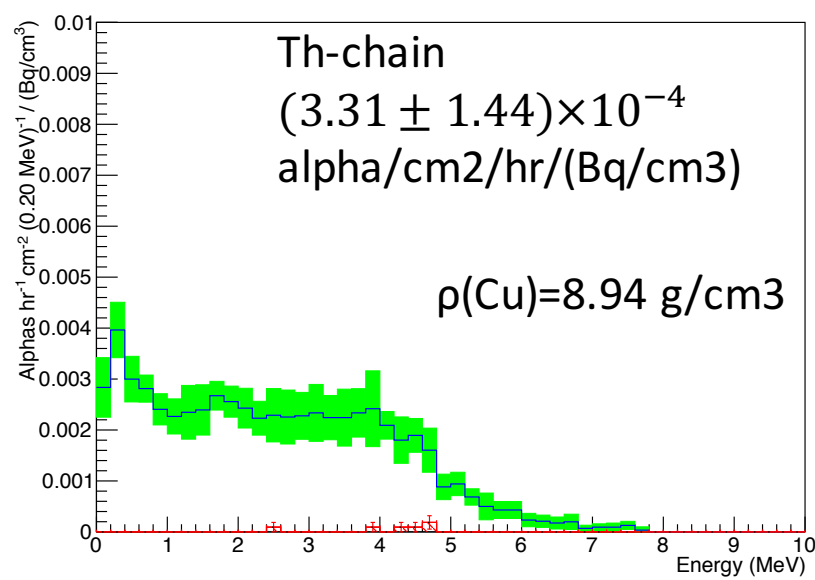
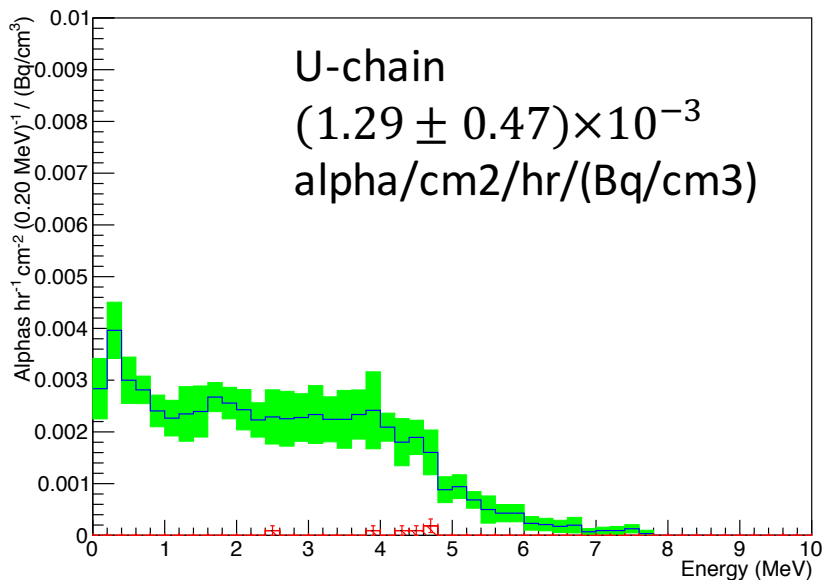
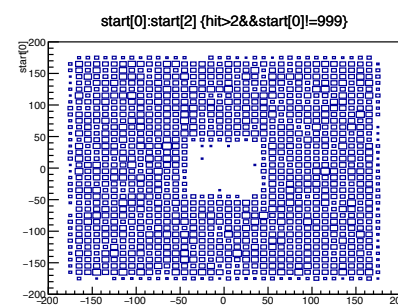
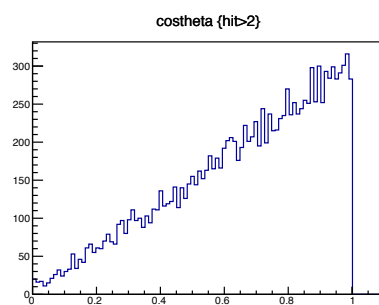
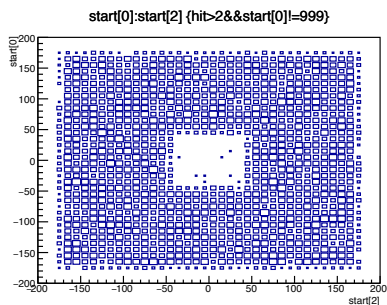
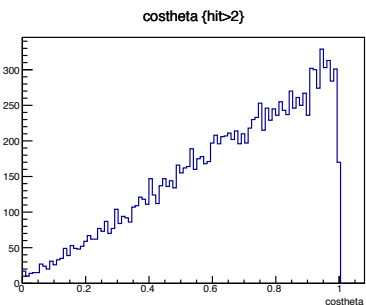
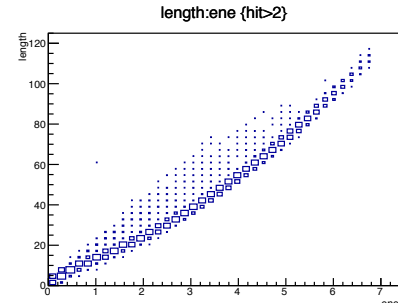
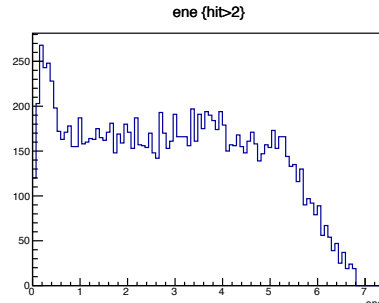
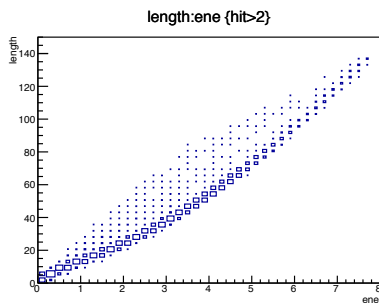
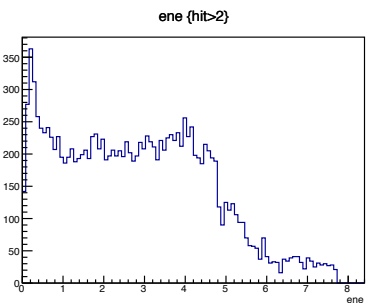
BG Simulation in G4

alpha from uPIC



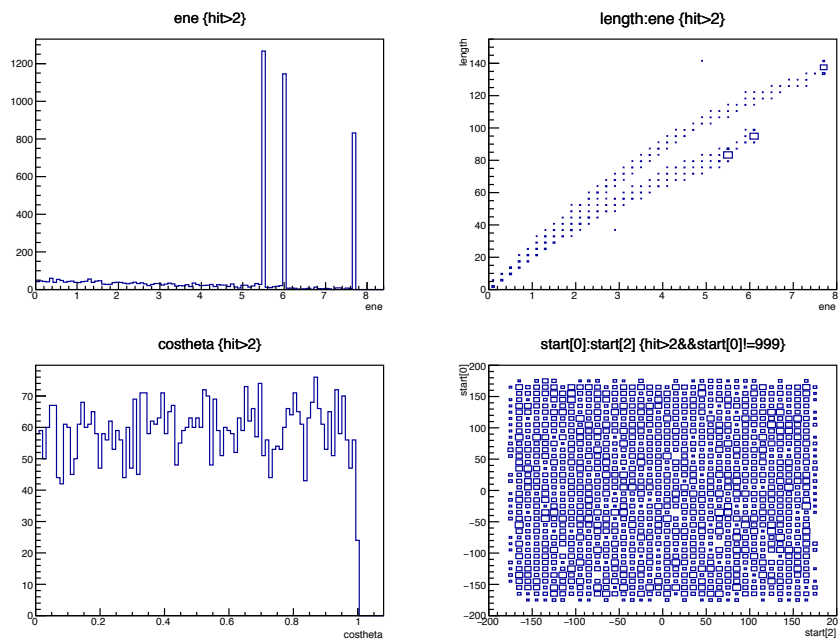
BG Simulation in G4

alpha from top drift Cu plate

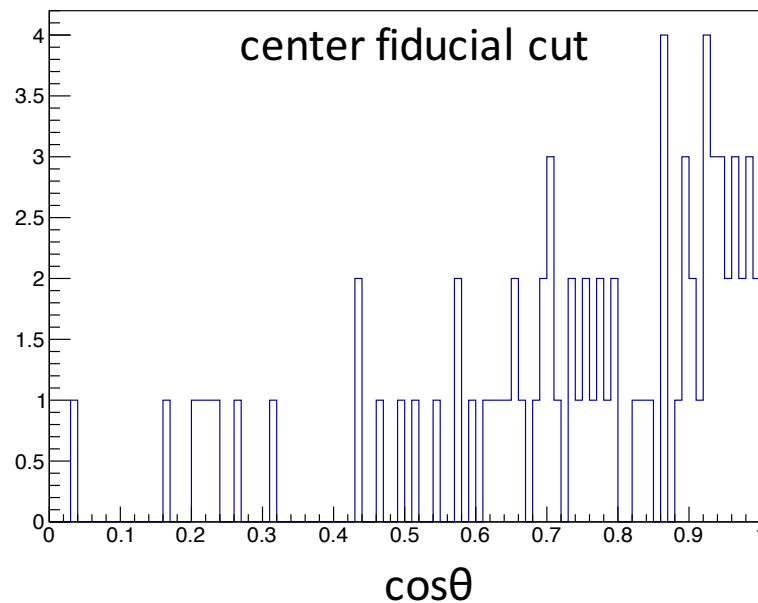
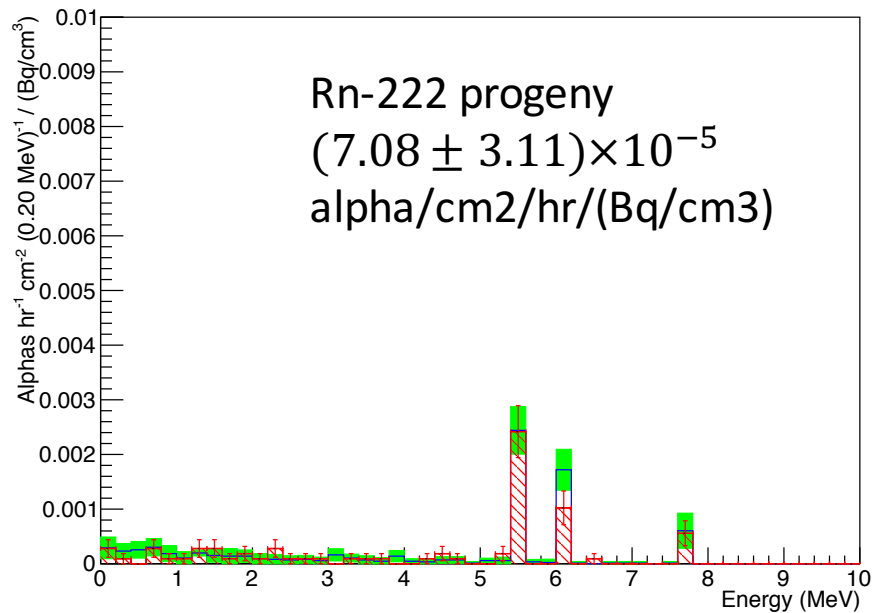


BG Simulation in G4

alpha from Rn progeny in CF4 gas

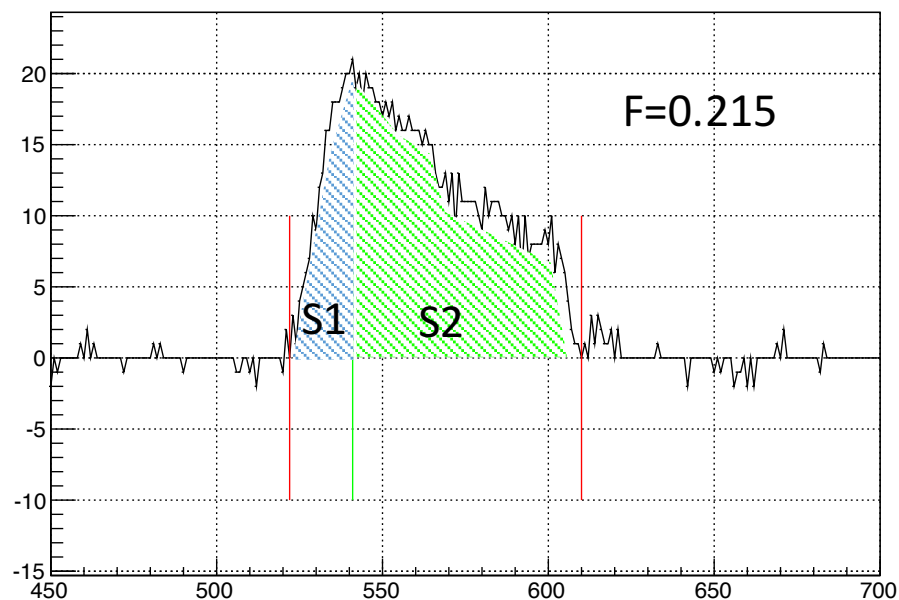


- Rn progeny Rn-222, Po-218, Po-214 alpha.
- Emission isotropically.
- After fiducial cut, $\cos\theta > 0.5$ was survived.



alpha ray head-tail method (1)

FADC in Po-210 run



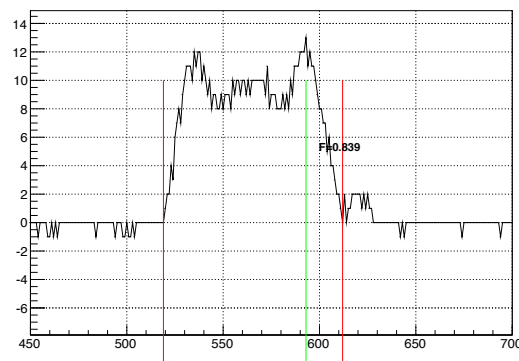
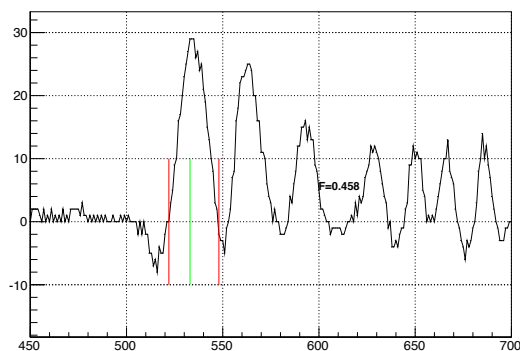
1. Select good waveform
2. Peak search
3. Rise, fall time determine
4. Each integration calculation
5. Likelihood factor determine with $F=S1/(S1+S2)$

0 ... downward

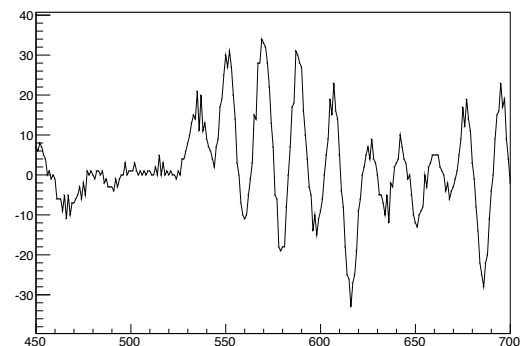
1 ... upward

-1... unknown

current issue

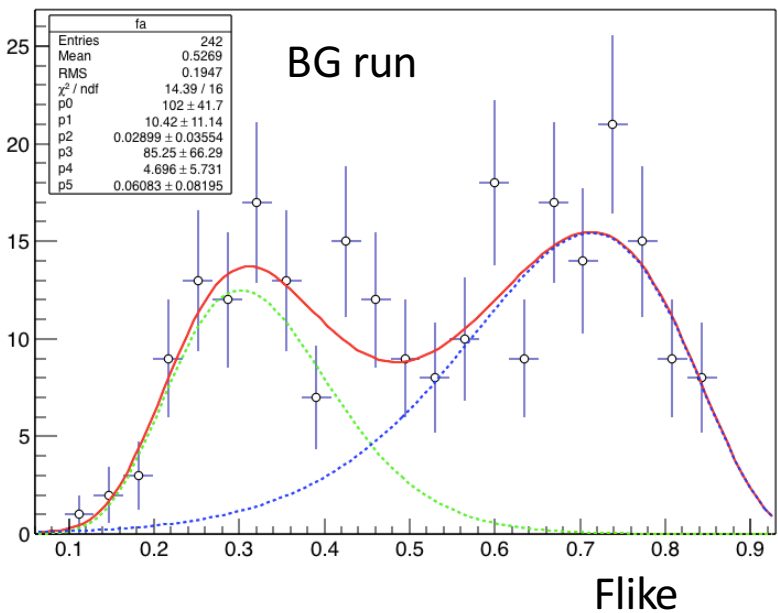
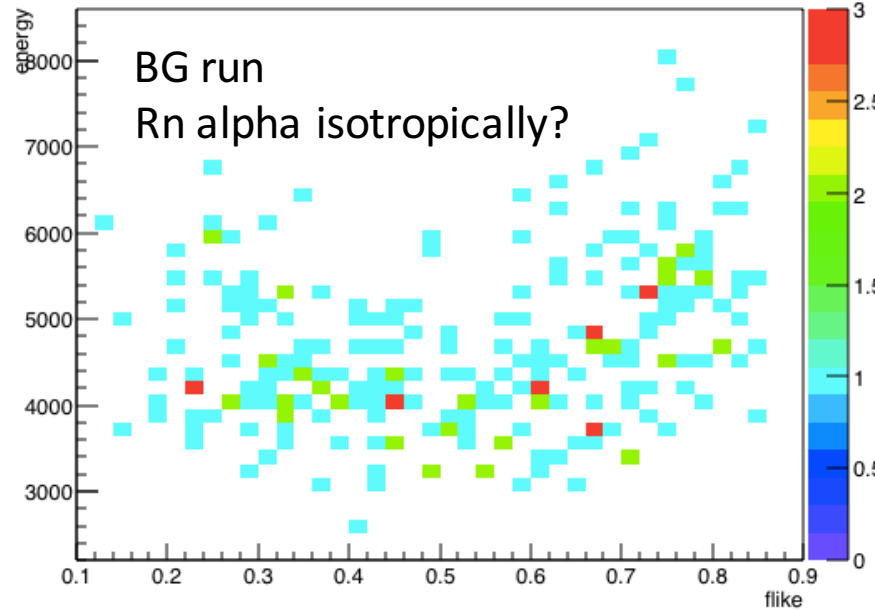
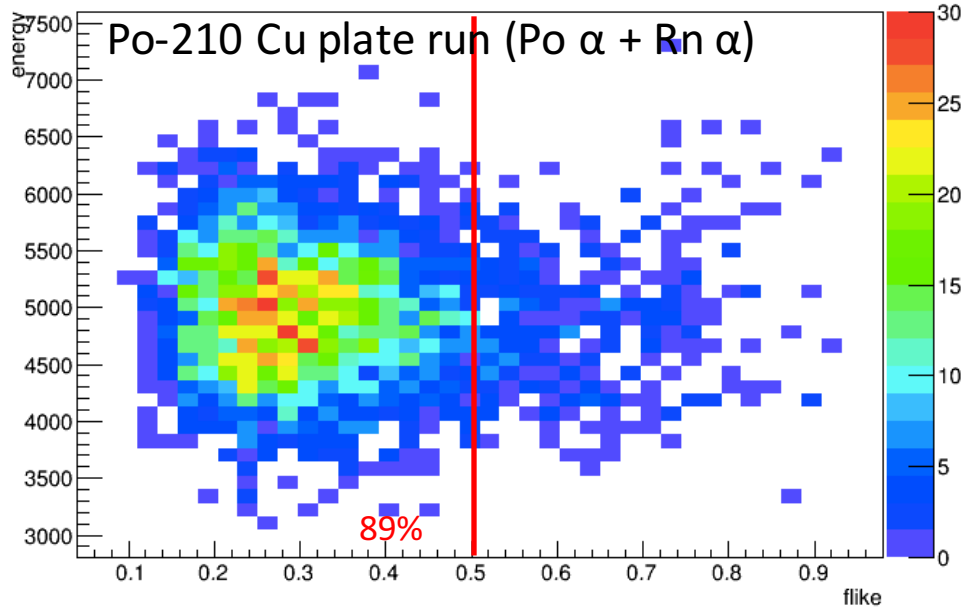


unknown



alpha ray head-tail method (1)

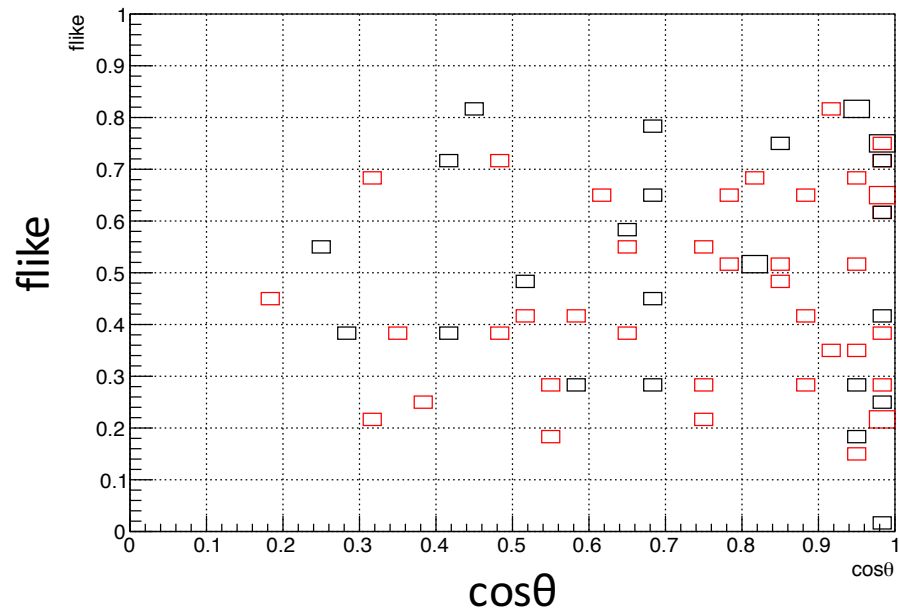
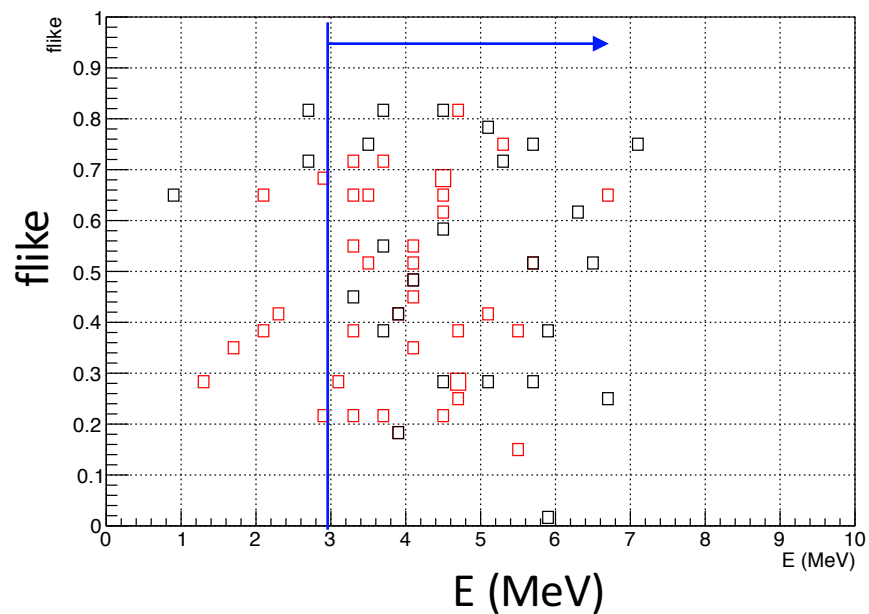
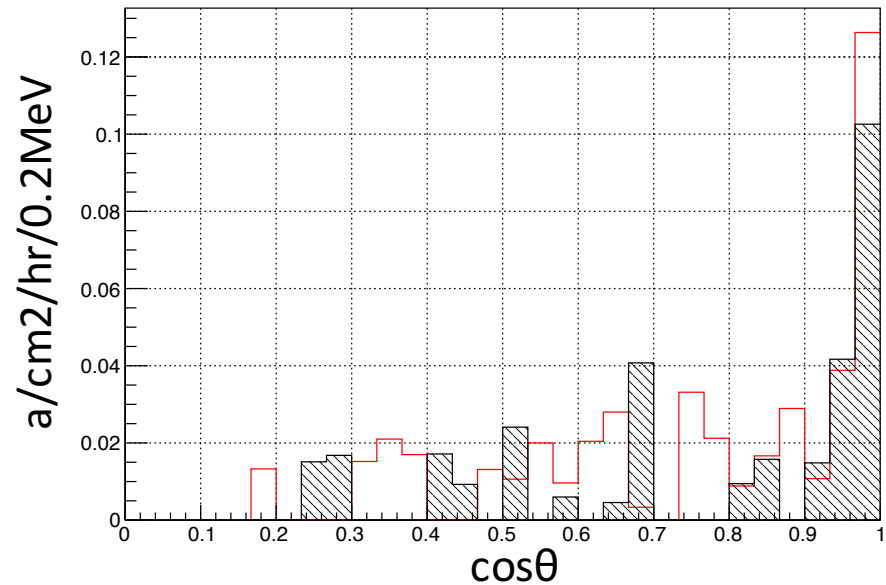
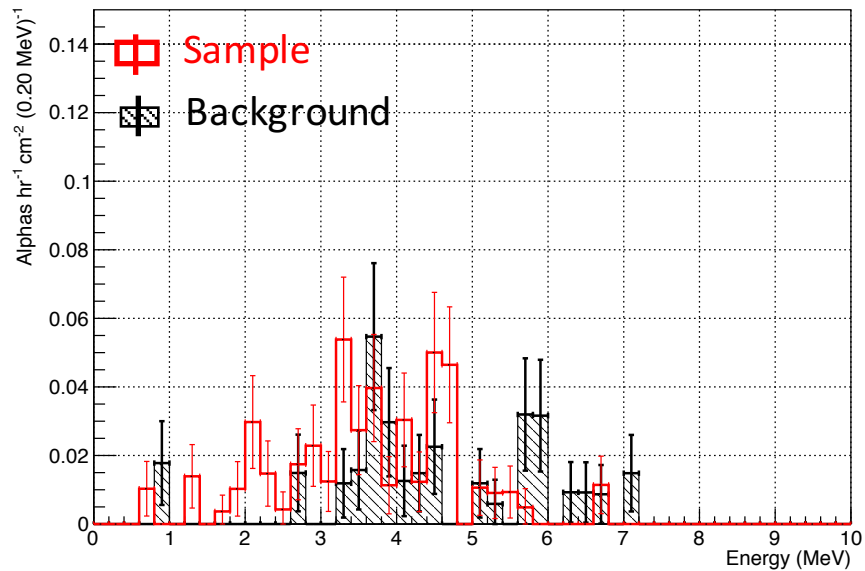
common event select condition $\left\{ \begin{array}{l} \cos\theta > 0.9 \\ \text{flike} > 0 \end{array} \right.$



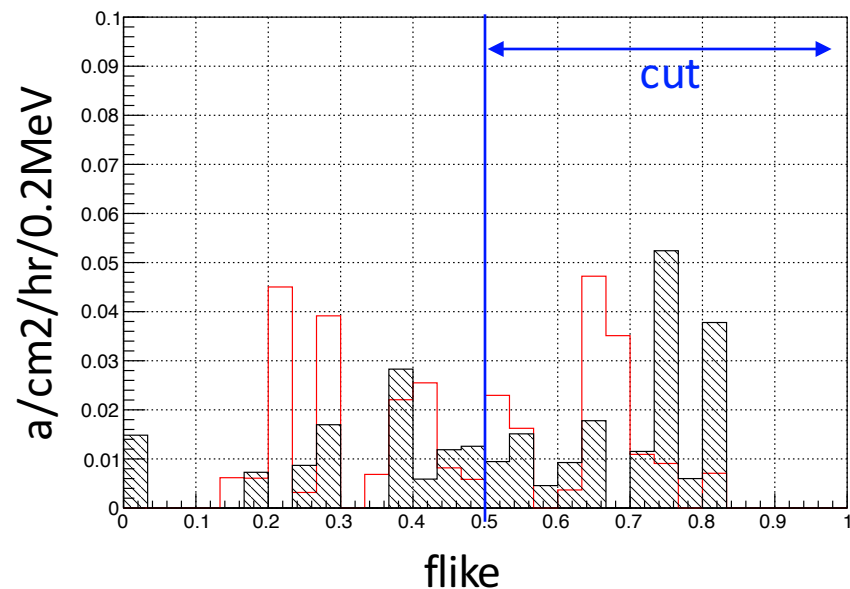
- PID power in Flike threshold of 0.5
- Po-run
Downward: 89% or more
 - BG run
Downward: 94%
Upward: 86%

エネルギーCutはしてないが、綺麗な波形を抜き出すとほぼE>3MeVになる

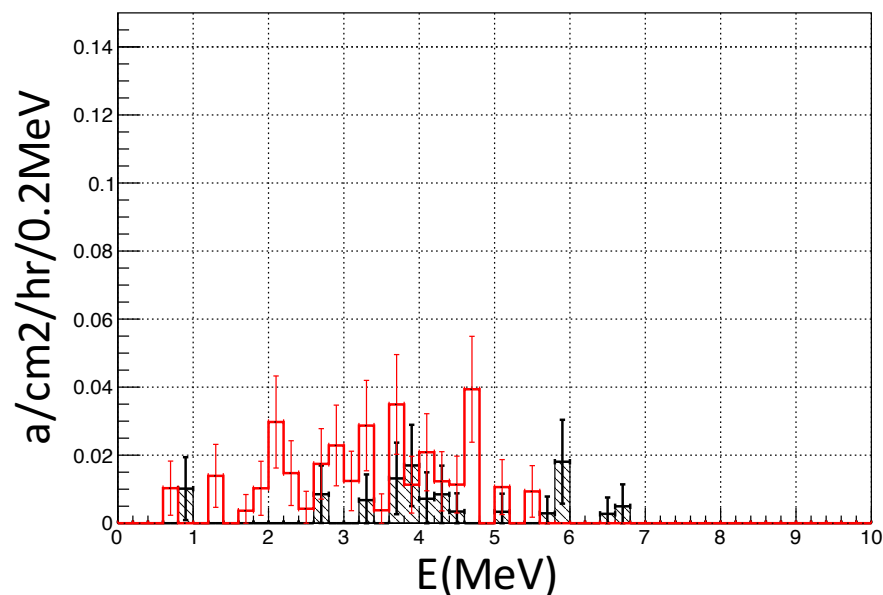
Head-tail method applied to Sample RUN



Head-tail method applied to Sample RUN



cut条件

- $E \geq 3 \text{ MeV}$ & $0.5 \leq \text{flike} < 1$ 「明らかに上方向に放射している3MeV以上の α 線を除去する」

cut前

$$C_{SMPL} = 0.091 \pm 0.048 \alpha/\text{cm}^2/\text{hr}$$

$$C_{BG} = 0.064 \pm 0.041 \alpha/\text{cm}^2/\text{hr}$$

$$\Delta C = 0.028 \pm 0.063 \alpha/\text{cm}^2/\text{hr}$$

$$\Delta C < 0.090 \alpha/\text{cm}^2/\text{hr}$$

$$\text{BG level} < 0.105 \alpha/\text{cm}^2/\text{hr}$$

cut後

$$C_{SMPL} = 0.064 \pm 0.038 \alpha/\text{cm}^2/\text{hr}$$

$$C_{BG} = 0.021 \pm 0.021 \alpha/\text{cm}^2/\text{hr}$$

$$\Delta C = 0.043 \pm 0.043 \alpha/\text{cm}^2/\text{hr}$$

$$\Delta C < 0.086 \alpha/\text{cm}^2/\text{hr}$$

$$\text{BG level} < 0.042 \alpha/\text{cm}^2/\text{hr}$$

Summary until 9 Jan.

- Sample run (12/28-1/4) was analyzed.
- $\Delta C < 0.90$ a/cm²/hr @BG level 0.1 a/cm²/hr
- Head-tail method was developed and imported in analysis, then the sample run was applied.
- $\Delta C < 0.86$ a/cm²/hr @BG level 0.42 a/cm²/hr after upward track rejection

現在の解釈

- BG runのデータ取得時、ある時刻からの立ち上がりはラドンが影響していると考えられる。
 - しかし、ガス劣化とともにeffが減少するので、ラドンのカウント数は飽和しない
- ガス交換してから初期(2日間)は $\cos\theta$ も一様だが、次第に $\cos\theta$ は1にたつ
 - ガス劣化に伴ってanode-cathodeのcoincidenceの相が悪化し、鉛直方向のトラックはcoincidenceしやすいので生き残る。
 - HIT数も減少していることも裏付けられる。

今後の課題の予定

- ガスリークチェック
- DAQモード3 -> DAQモード5
- 活性炭循環システムの導入