

# Boiling Runs

Boiling runs: 1513–1530

HMS = 12.493 deg

SHMS = 36.88 deg

NPS = 20.58 deg

Calo HV Off, Sweep Magnet Off, EDTM = 100 Hz

RunNo	Target	ps-factor	Current	duration(s)
1513	LH2	ps3=1	5	868
1514	LH2	ps4=1	5	634
1515	LH2	ps4=3	10	735
1516	LH2	ps4=5	15	706
1517	LH2	ps4=9	25	962
1518	LD2	ps4=65	40	872
1519	LD2	ps4=33	25	659
1520	LD2	ps4=33	18	727
1521	LD2	ps4=17	10	599
1522	LD2	ps4=9	5	639
1523	0.5C	ps4=9	35	489
1524	0.5C	ps4=5	35	666
1525	0.5C	ps4=5	40	690
1526	0.5C	ps4=5	25	702
1528	0.5C	ps4=3	15	747
1530	0.5C	ps4=1	5	928

# Boiling Runs

Target	RunNo	ps4	Pre-scale	Current ( $\mu\text{A}$ )	Duration (min)	Events	Events*ps (k)
LH2	1514	0	1	5	10	1023966	1024
	1515	2	3	10	10	912408	2736
	1516	3	5	15	10	751598	3758
	1517	4	9	25	15	811950	7308
LD2	1518	7	65	40	15	521346	33884
	1519	6	33	25	10	485796	16031
	1520	6	33	18	10	289841	9563
	1521	5	17	10	10	328346	5581
	1522	4	9	5	10	345025	3105
Carbon	1523	4	9	35	10	180135	1621
	1524	3	5	35	10	156607	783
	1525	3	5	40	10	187356	937
	1526	3	5	25	10	144809	724
	1528	2	3	15	10	153366	460
	1530	0	1	5	15	190627	190

# Boiling Yield Analysis

- Fill all the **BCM4A** scaler current readouts into a 1-D histogram → Gaussian Fitting → Get  $I$  and  $\sigma$
- Use  $I - 3\sigma \mu\text{A}$  cut to calculate the charge for each run
- Apply the same cut when selecting **E1-REAL** events

## Scaler Yield

$$\frac{\text{scaler\_htrig4} - \text{scaler\_edtm}}{\text{charge}}$$

charge

Cuts for scaler counting:

- Beam current cut

## Non-tracking Yield

$$\frac{\# \text{ of events} \times \text{ps-factor}}{\text{charge} \times \text{LT}}$$

charge × LT

Cuts for event selection:

- Beam current cut
- Non-edtm
- npeSum > 2
- $0.6 < \text{etotnorm} < 1.5$

$$\text{LT} = \frac{\# \text{ of events}}{\text{scaler\_htrig4} - \text{scaler\_edtm}} \times \text{ps - factor}$$

## Tracking Yield

$$\frac{\# \text{ of events} \times \text{ps-factor}}{\text{charge} \times \text{LT} \times \text{track\_eff}}$$

charge × LT × track\_eff

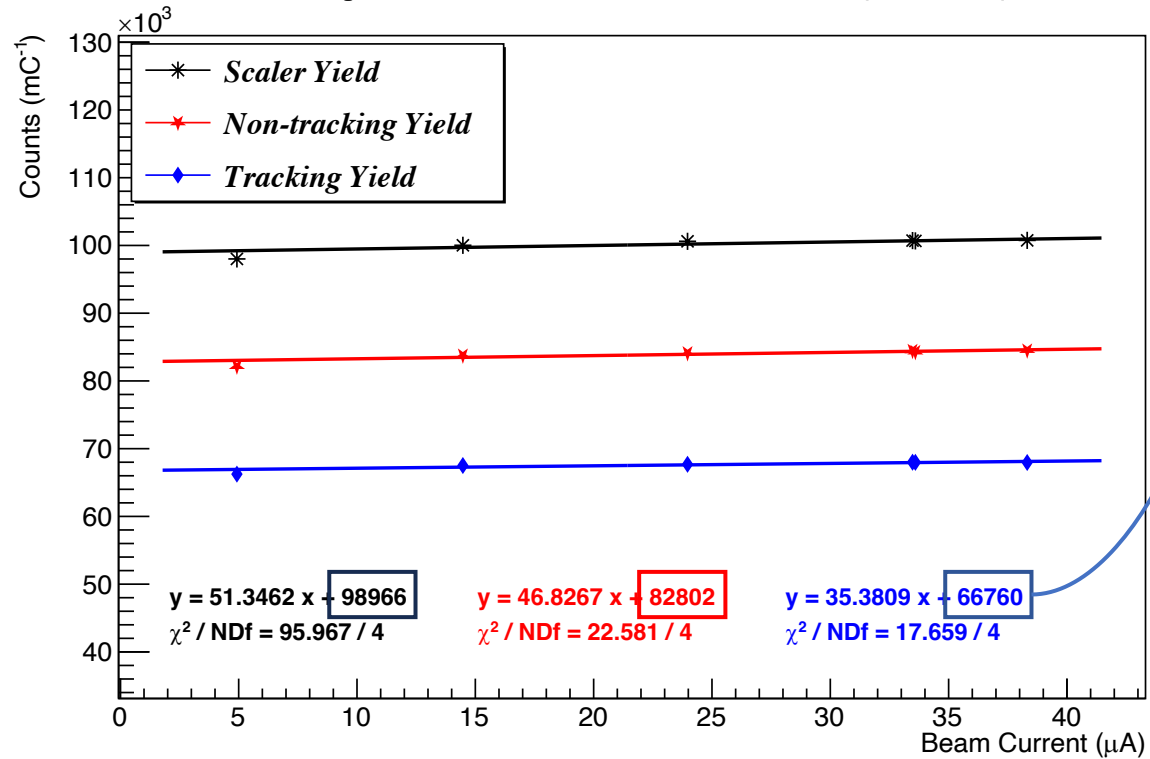
Cuts for event selection:

- Beam current cut
- Non-edtm
- npeSum > 2
- $0.6 < \text{etotnorm} < 1.5$
- $|\text{gtr\_dp}| \leq 10$
- $|\text{vtx\_z}| \leq 4$
- vtx\_ok and gtr\_ok

# Boiling Yield Analysis

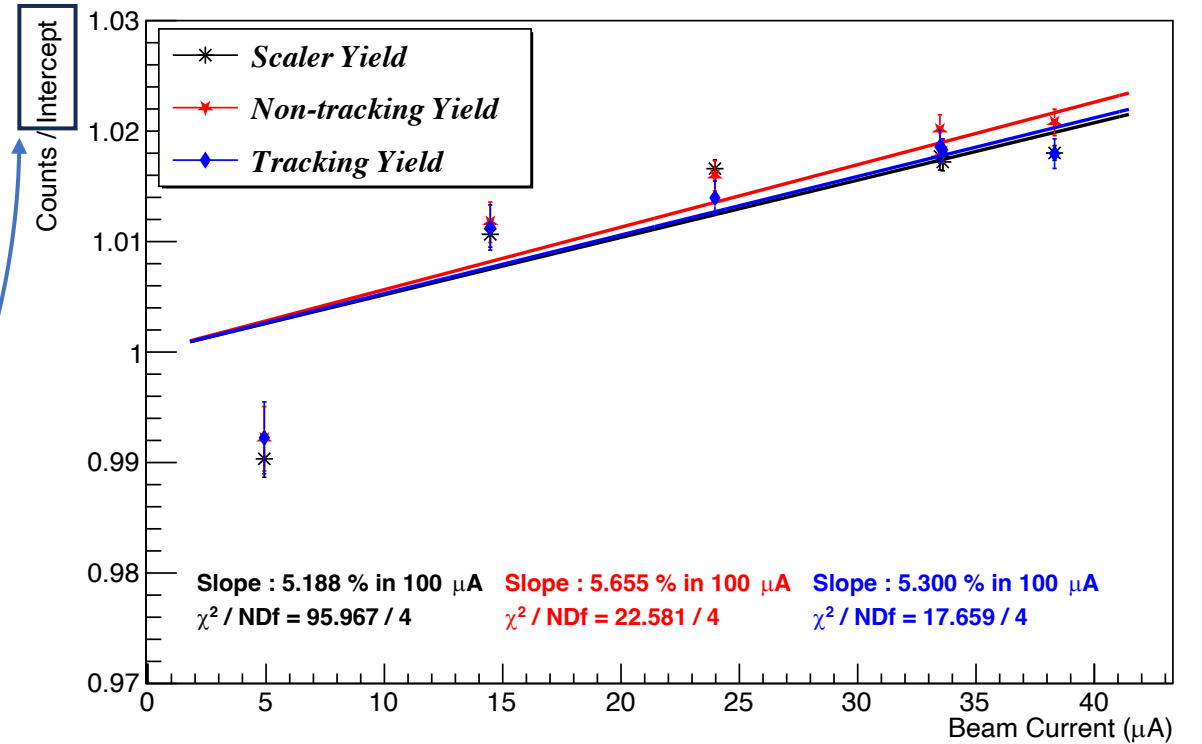
## Carbon

Charge normalized EI-Real events(Carbon)



First Fitting

Charge normalized EI-Real events(Carbon)



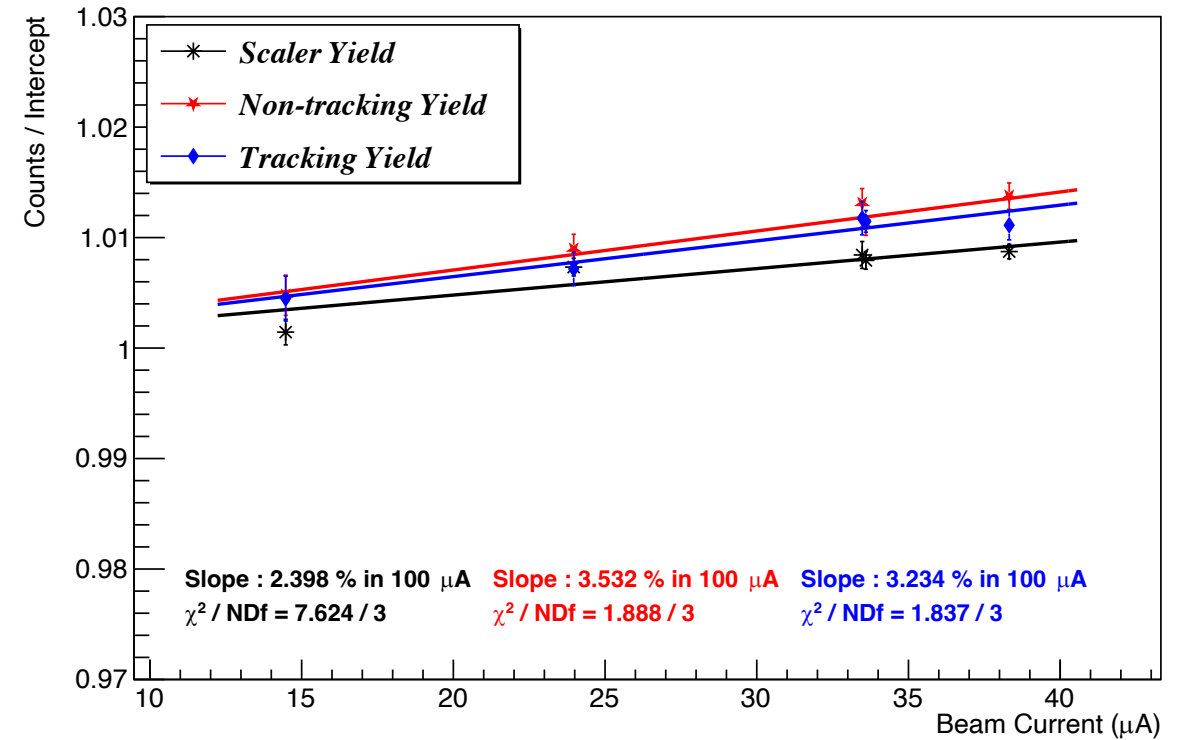
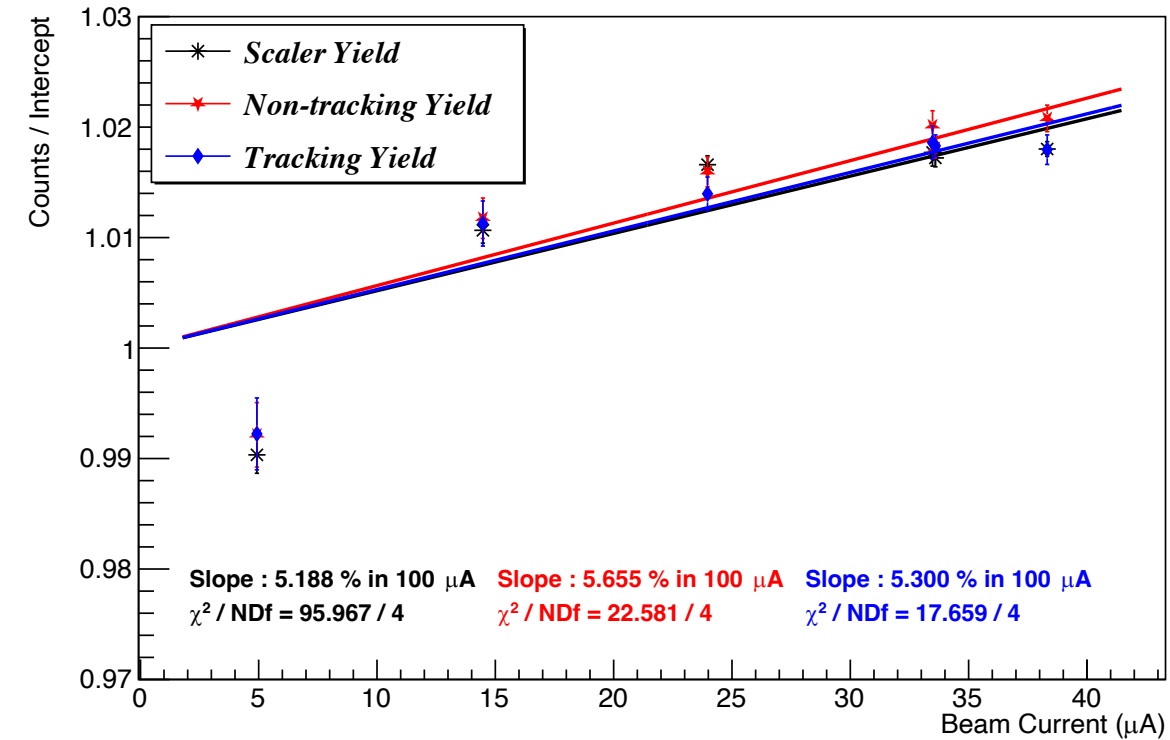
Second Fitting

# Boiling Yield Analysis

## Carbon

Charge normalized EI-Real events(Carbon)

Charge normalized EI-Real events(Carbon)



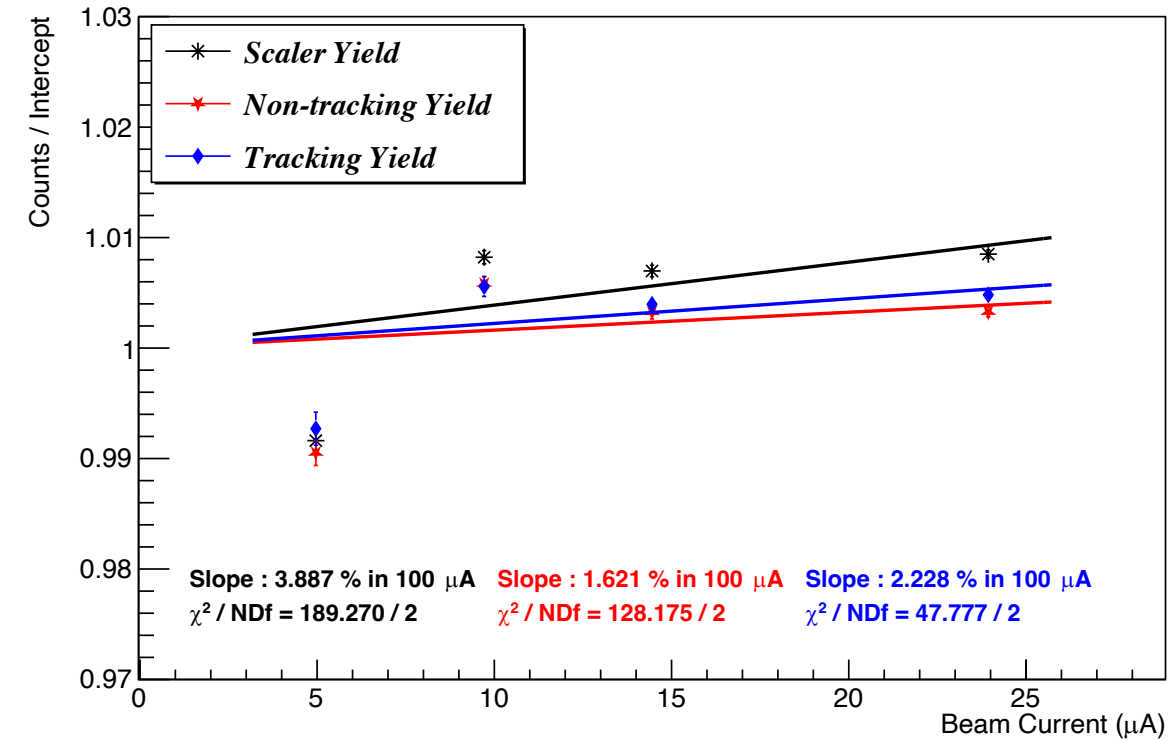
With 5  $\mu\text{A}$  run

Without 5  $\mu\text{A}$  run

# Boiling Yield Analysis

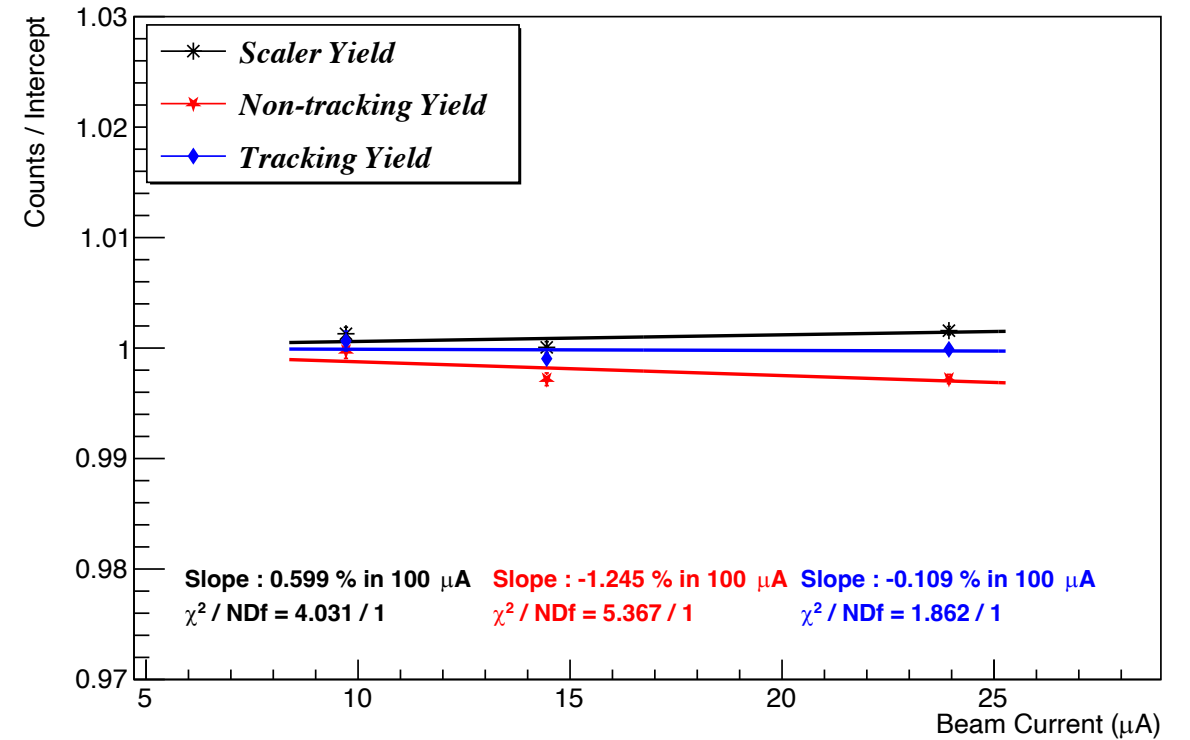
LH2

Charge normalized EI-Real events(LH2)



With 5  $\mu\text{A}$  run

Charge normalized EI-Real events(LH2)

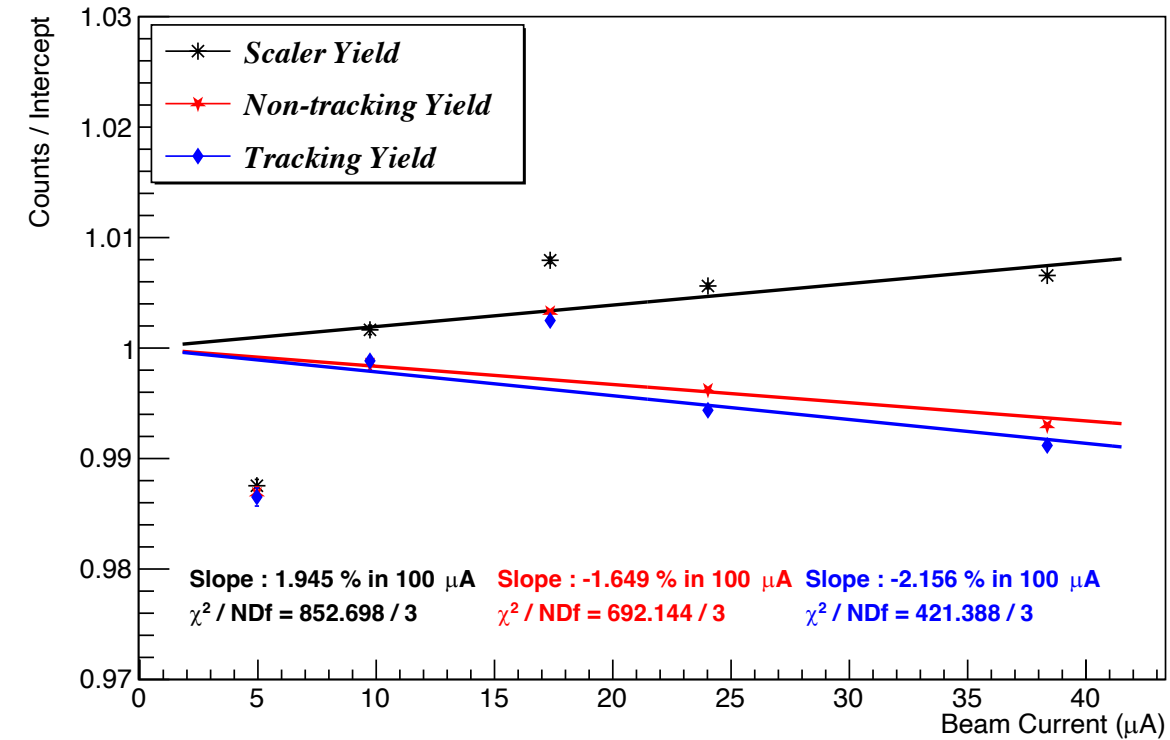


Without 5  $\mu\text{A}$  run

# Boiling Yield Analysis

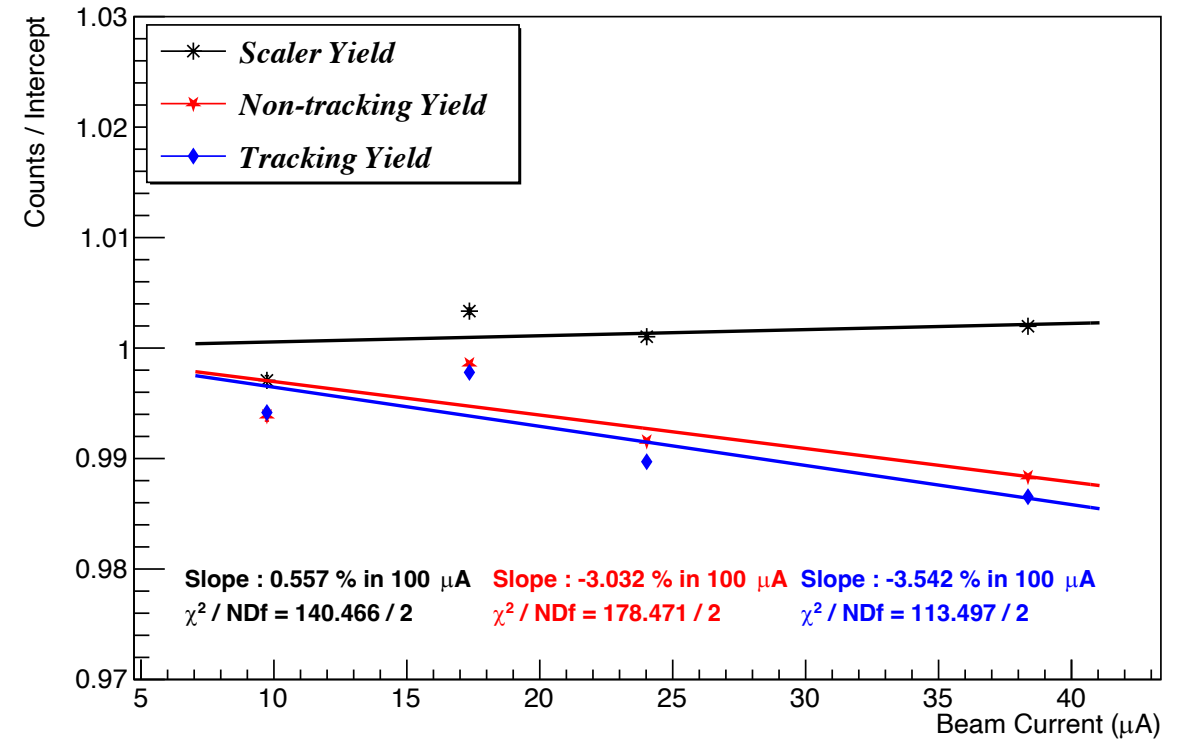
LD2

Charge normalized EI-Real events(LD2)



With 5  $\mu\text{A}$  run

Charge normalized EI-Real events(LD2)



Without 5  $\mu\text{A}$  run

# Boiling Yield Analysis

	With 5 $\mu\text{A}$ run			Without 5 $\mu\text{A}$ run		
% in 100 $\mu\text{A}$	Scaler	Non-Tracking	Tracking	Scaler	Non-Tracking	Tracking
Carbon	5.188	5.655	5.300	2.398	3.532	3.234
LH2	3.887	1.621	2.228	0.599	-1.245	-0.109
LD2	1.945	-1.649	-2.156	0.557	-3.032	-3.542

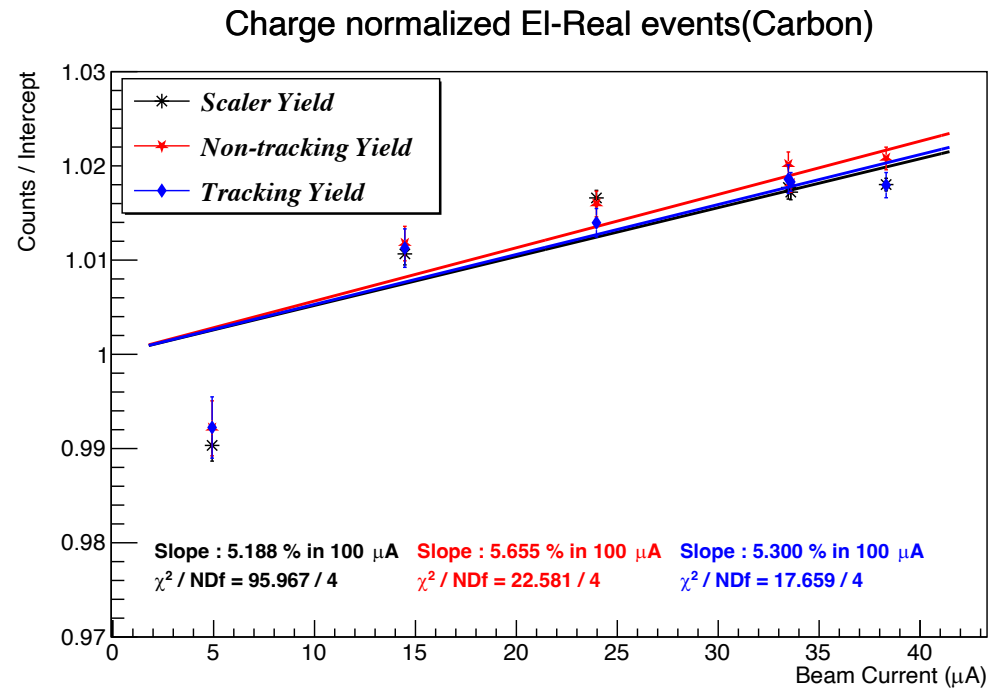
The Maximum current for LH2 is 25  $\mu\text{A}$  ?



# Low Current BCM Calibration

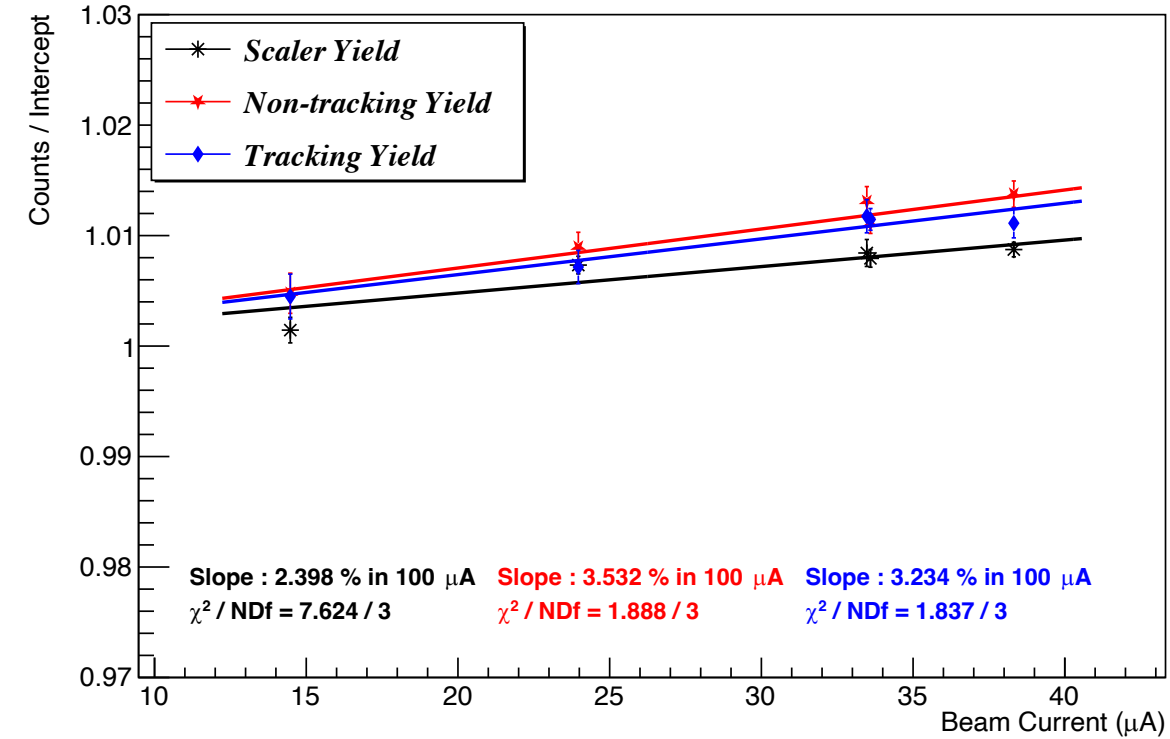
The formula to calculate the BCM4A current:

$$I_{BCM4A} = \frac{(scaler_{diff} \div Time_{diff}) + 1605}{9570}$$



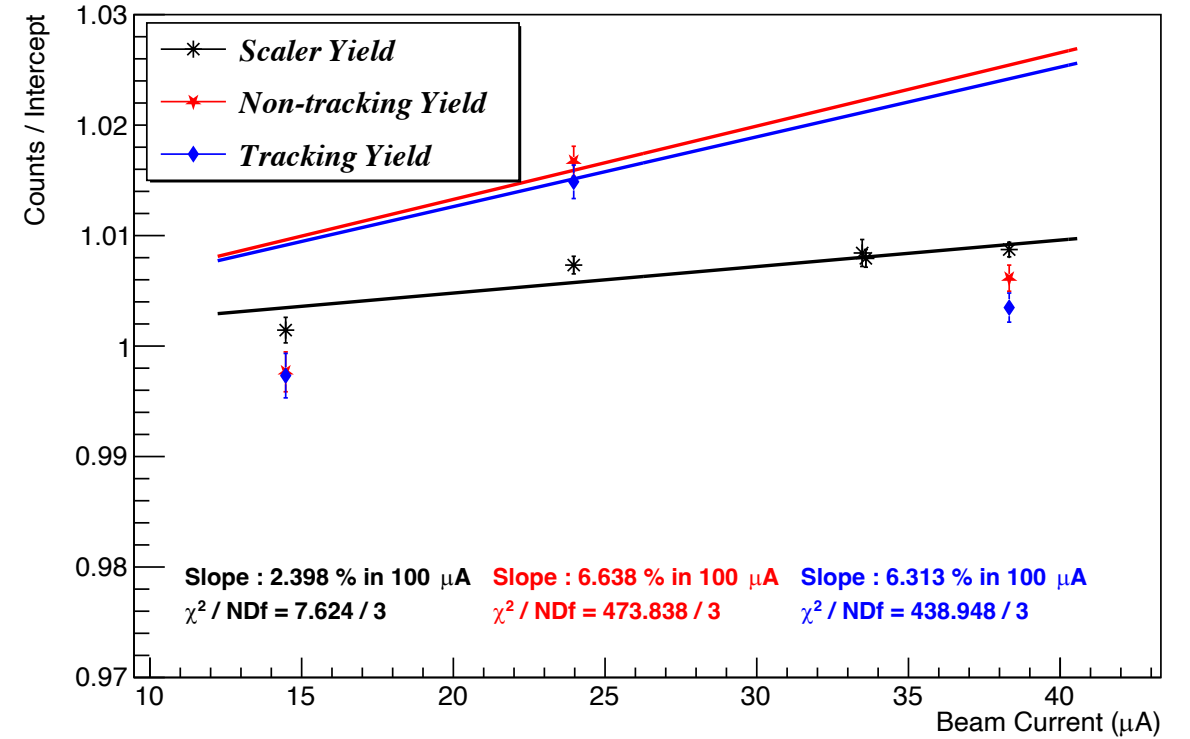
# LT Calculation

Charge normalized EI-Real events(Carbon)



$$\text{LT} = \frac{\text{\# of events}}{\text{scaler\_htrig4} - \text{scaler\_edtm}} \times \text{ps-factor}$$

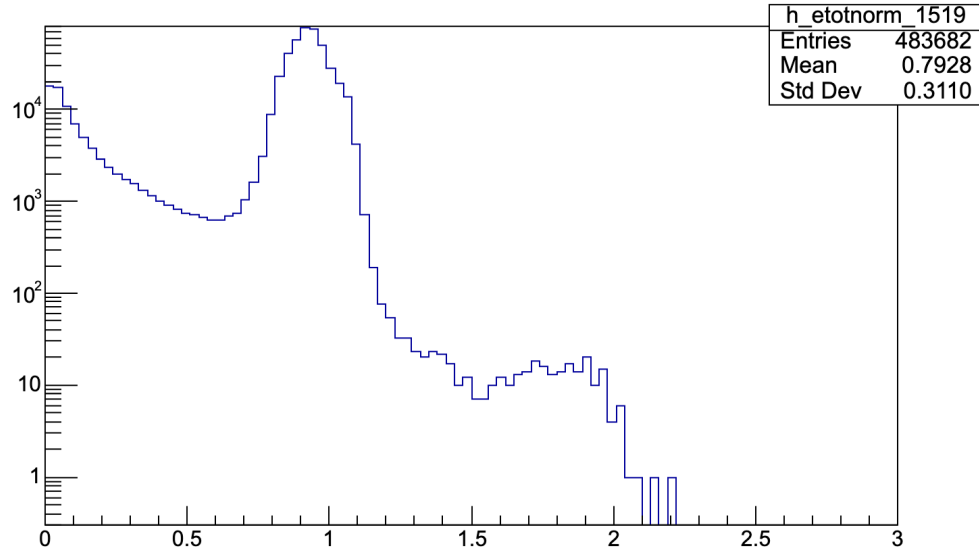
Charge normalized EI-Real events(Carbon)



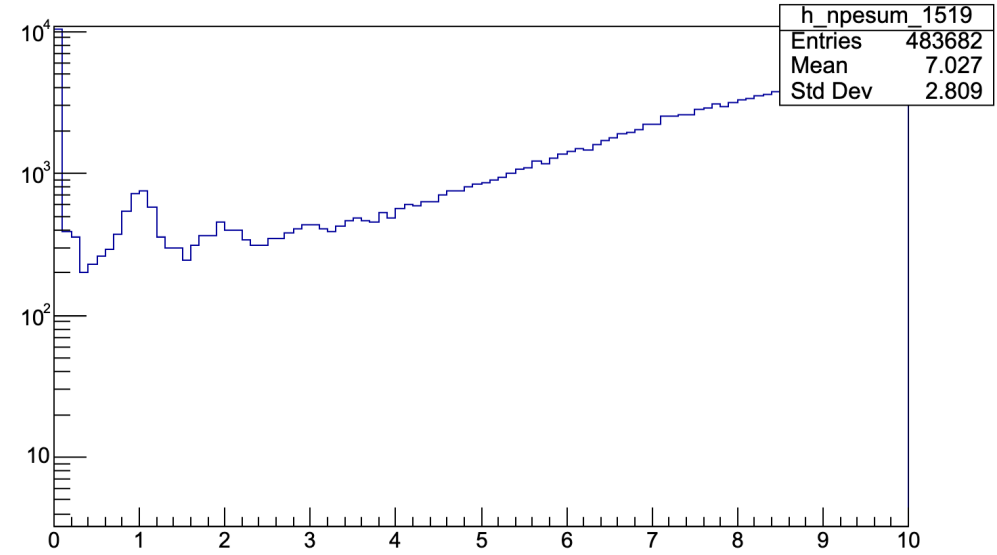
Directly from the report file  
 (“HMS TRIG4 Computer Live Time”)

# Distributions

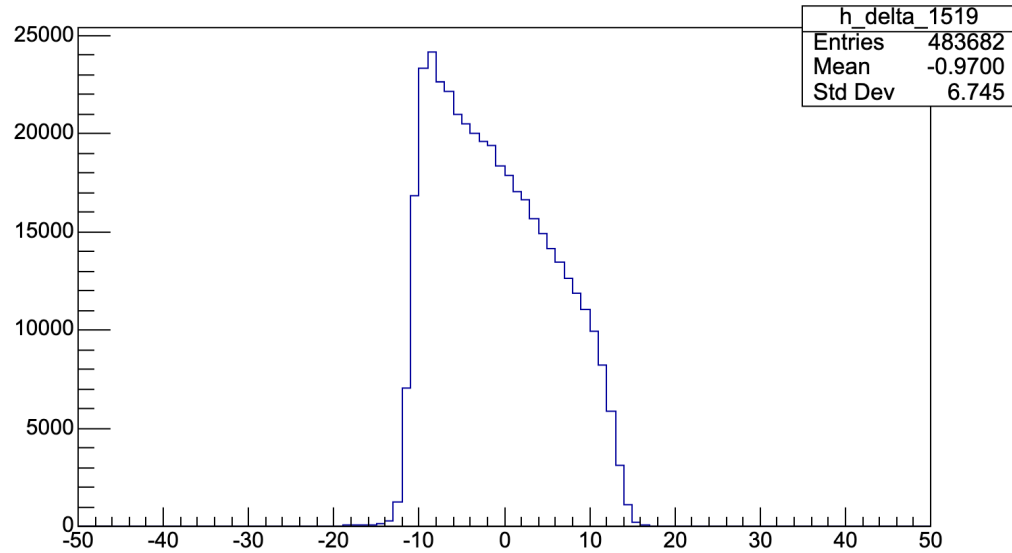
h\_etotnorm\_1519



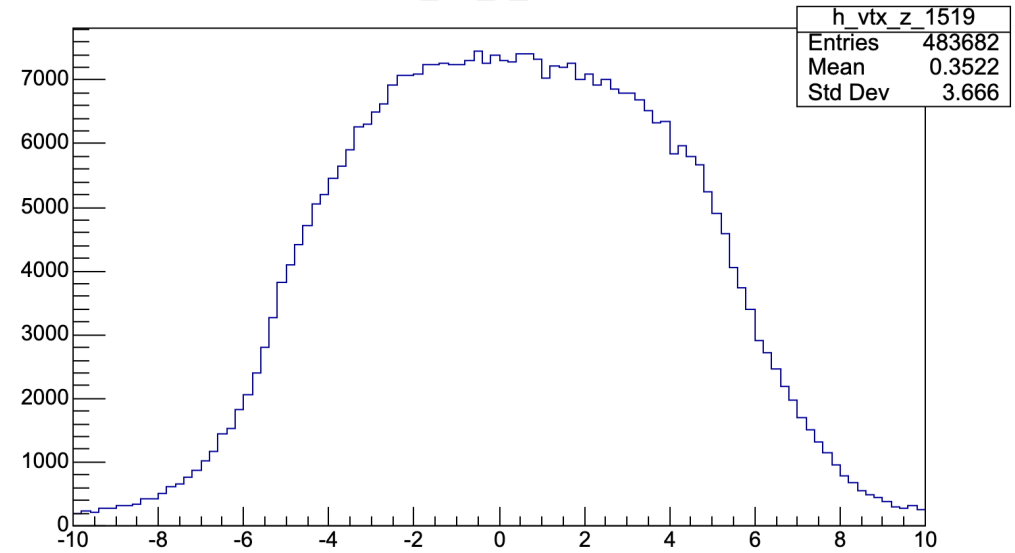
h\_npesum\_1519



h\_delta\_1519



h\_vtx\_z\_1519



# Distributions

