d–Au sims

Rate estimates and grey protons d–Au collisions in BRAHMS

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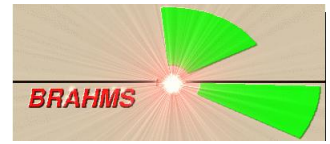
Overview

- My simulations

Overview



- My simulations
- Raw $\frac{dN}{dy}$ distributions

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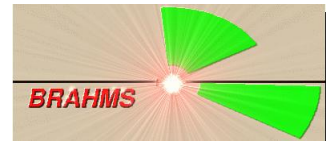

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- Grey protons at RHIC

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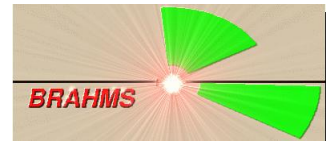

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- Raw kinematic regions

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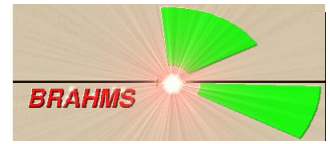

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- The triggers

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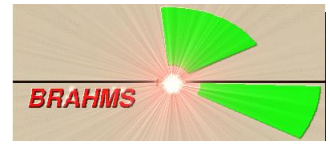

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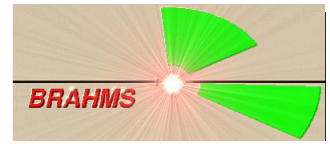
- Raw $\frac{dN}{dy}$ distributions
- Grey protons at RHIC
- Raw kinematic regions
- The triggers
- Rate estimates, FFS and partly FS

HIJING+BRAG simulations



Sims with all particles saved:

- One min–bias ($b < 10fm$) sim with 2000 events, everything saved

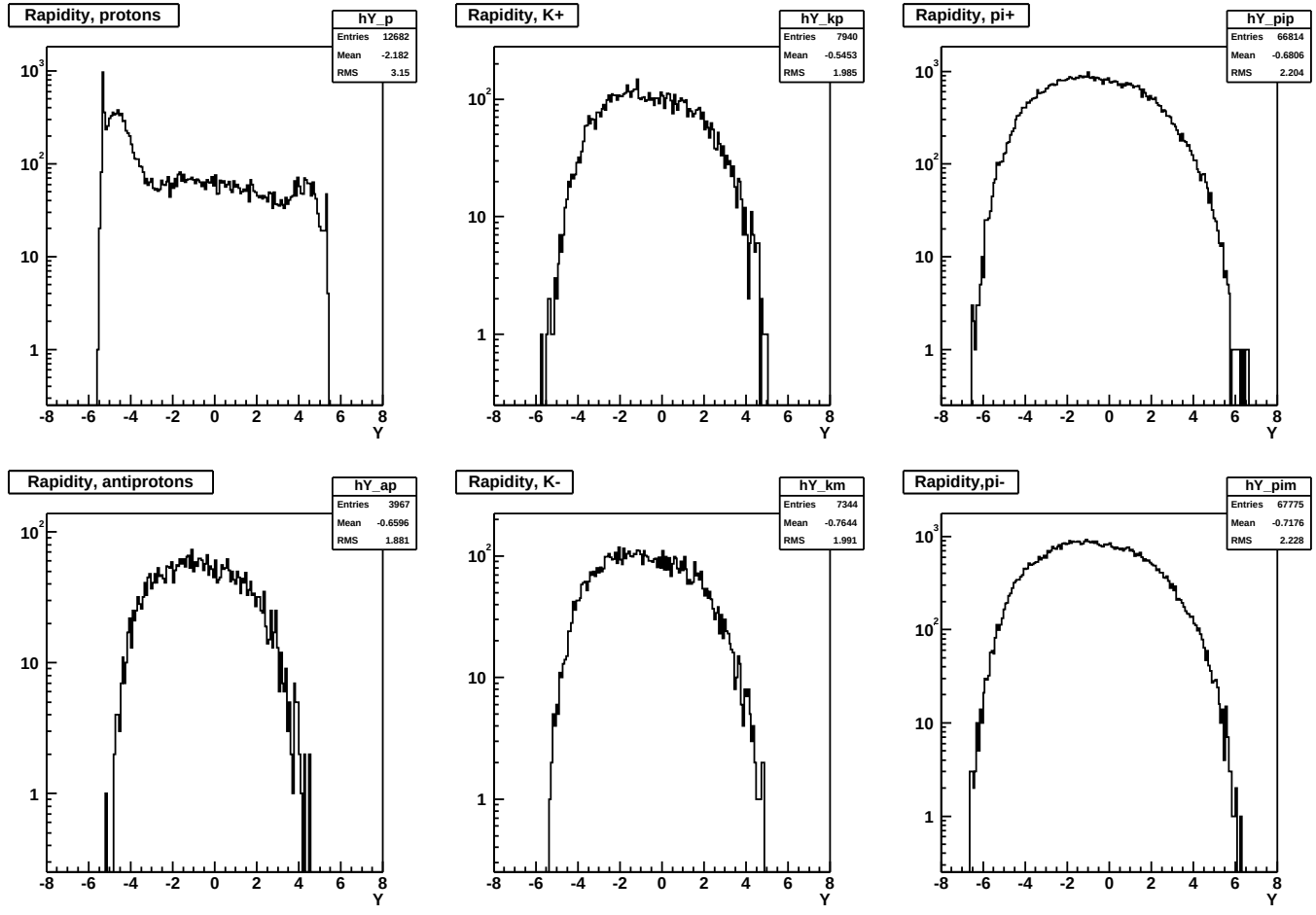
Sims with FS and INEL counters on:

- Angles: 4^o, 8^o, 12^o
- Fields: $\frac{1}{2}$A, $\frac{1}{4}$A
- $b < 2fm$
- 25k events in each setting

Sims with only the FS on:

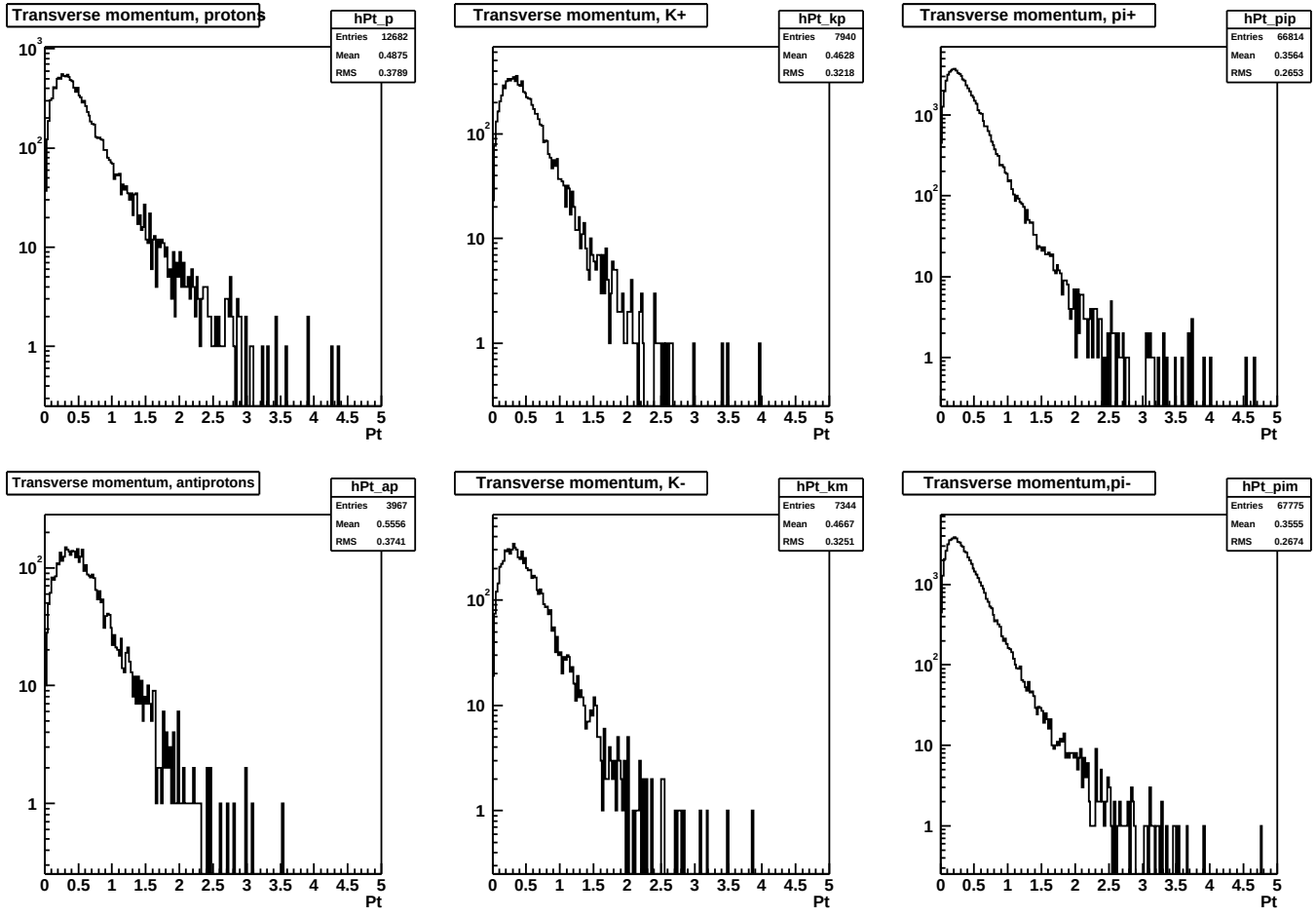
- Angles: 4^o, 8^o, 12^o
- Fields: $\frac{1}{2}$A, $\frac{1}{4}$A
- $b < 2fm$
- 1M events in each setting

The raw $\frac{dN}{dy}$ in d–Au at RHIC



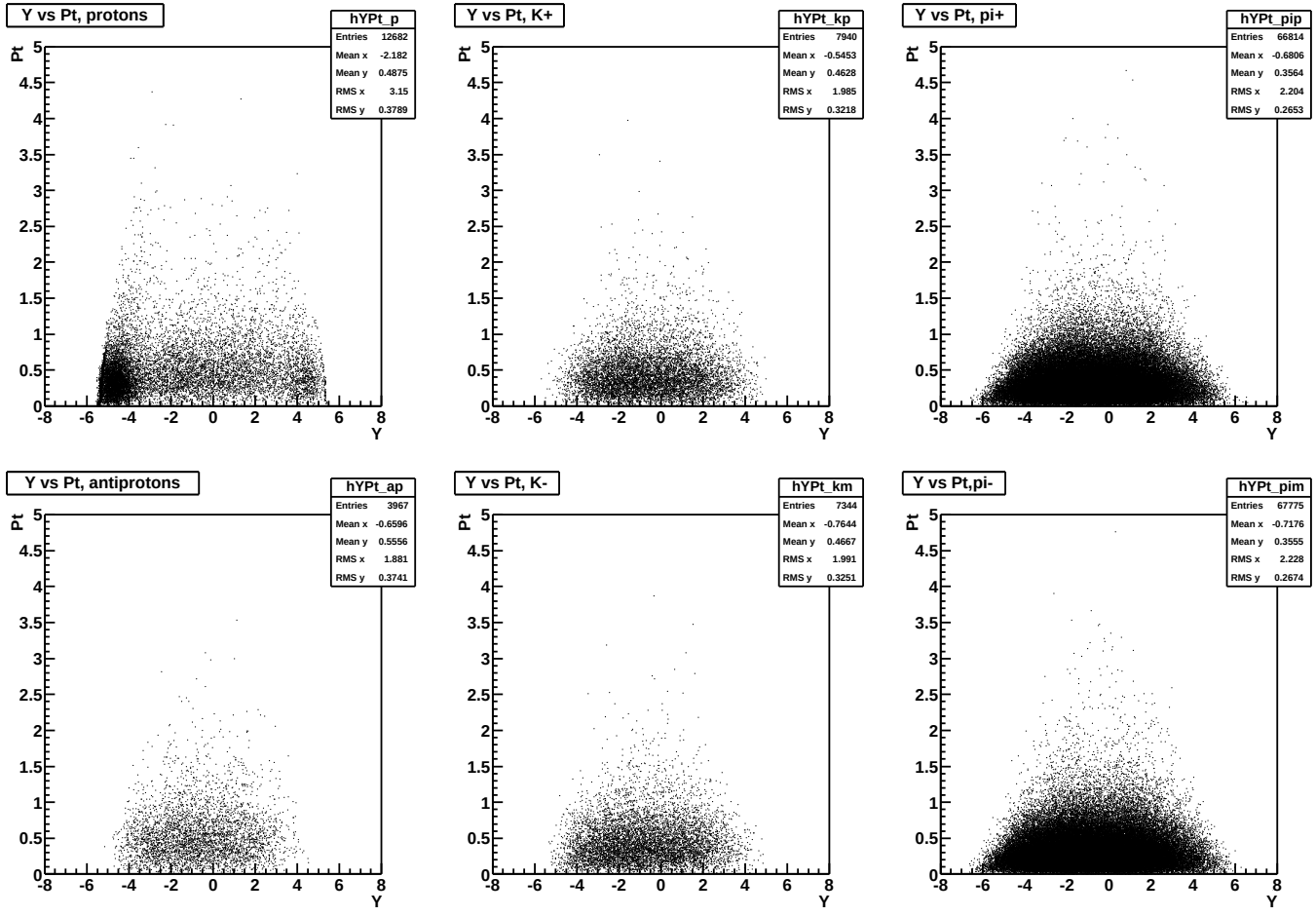
Rapidity, all primary particles, per event.

p_T distributions



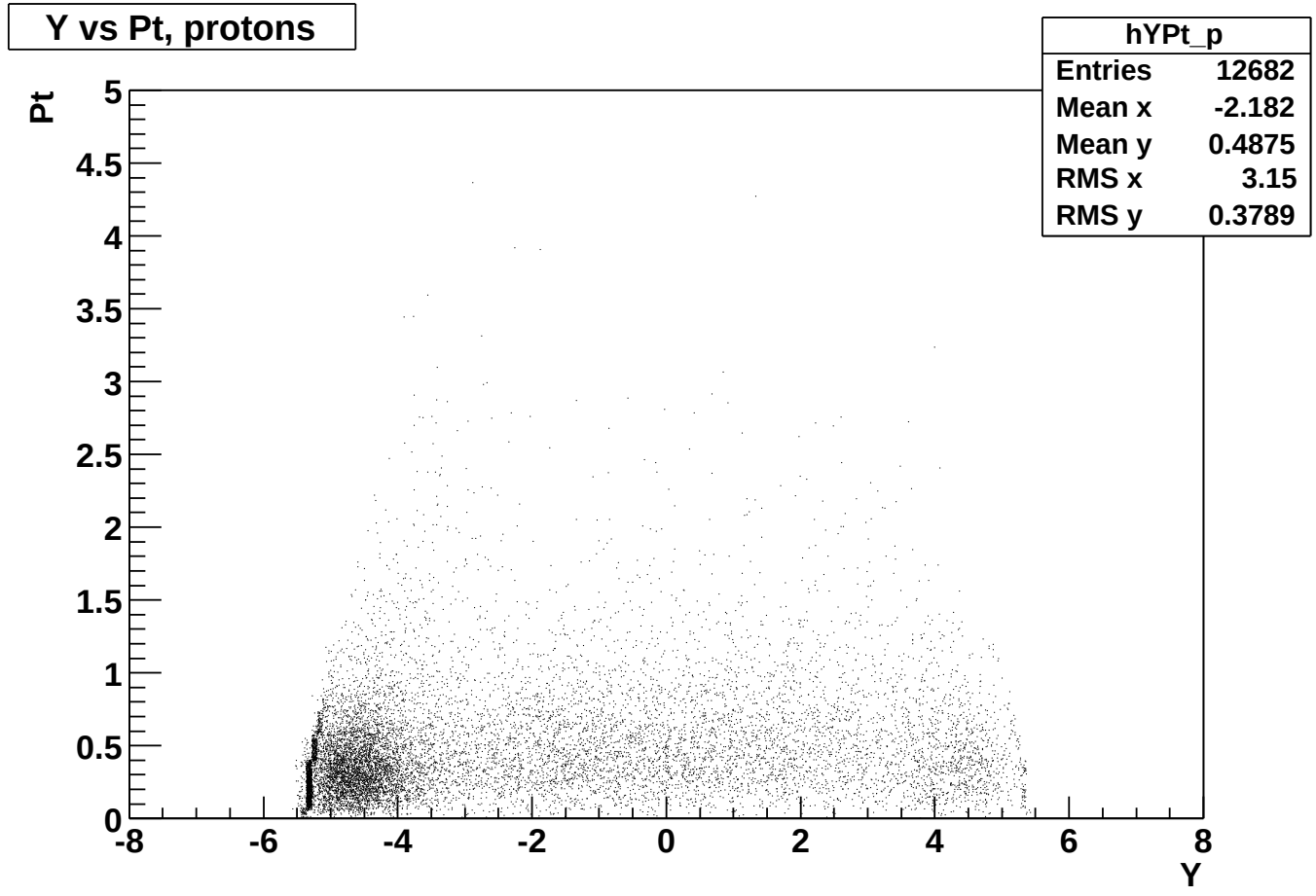
p_T, all primary particles, per event

Y–p_t distributions, greys



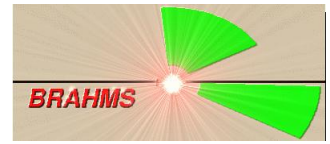
Y vs. p_T, all primary particles

Y–p_t distributions, greys



Y vs. p_T, primary protons

Grey protons



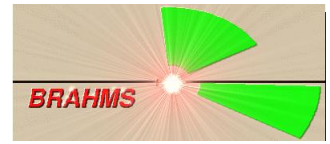
On the previous slide, in the distribution of primary protons (upper left corner), there is a clear mass of particles around

- $y \sim -4 - -5$
- $p_t \leq 0.8 GeV$

These are the 'grey' protons knocked out of the target, and could be used for centrality measurements — if we could see them:

b interval	N grey protons	N events	Greys per event (within 'blob')
0–2	755	127	5.9
2–4	1612	334	4.8
4–6	1912	570	3.4
6–8	1031	683	1.5

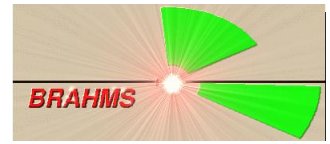
Rates: Triggers and stuff



- Since simulating the INEL counters takes a lot of time and space it is not practical to simulate a realistic trigger
- Our "real" trigger is $INEL_{right}$ + $INEL_{left}$ + TD1 + H1
- My global sim has shown that this trigger is identical (to $\sim$ 2%) to the simpler trigger TD1 + H1

Angle	Field	TD1 rate ($b < 2$)	TD1 and INEL rate ($b < 2$)
4	$\frac{1}{4}A$	0.213	0.198
4	$\frac{1}{2}A$	0.213	0.199
8	$\frac{1}{4}A$	0.111	0.100
8	$\frac{1}{2}A$	0.112	0.100
12	$\frac{1}{4}A$	0.0653	0.060
12	$\frac{1}{2}A$	0.0651	0.059

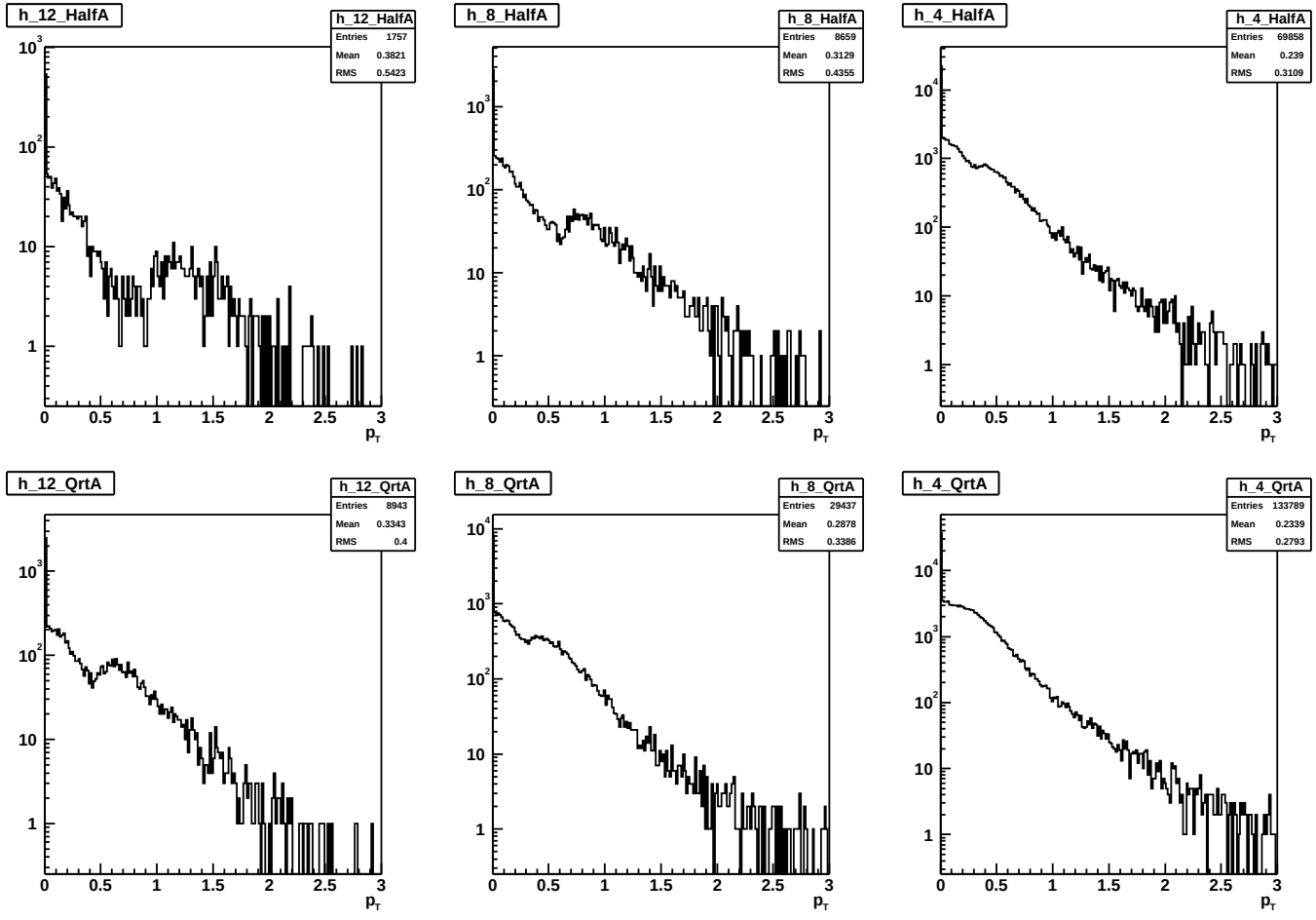
What is a rate?



- I have so far only looked at geant hits in the hodoscopes, i.e. no digitization, no check for number of hits in TPCs etc.
- FFS track = trigger + hit in H1
- FS track = trigger + hit in H1 and H2
- The following plots are for 1M events

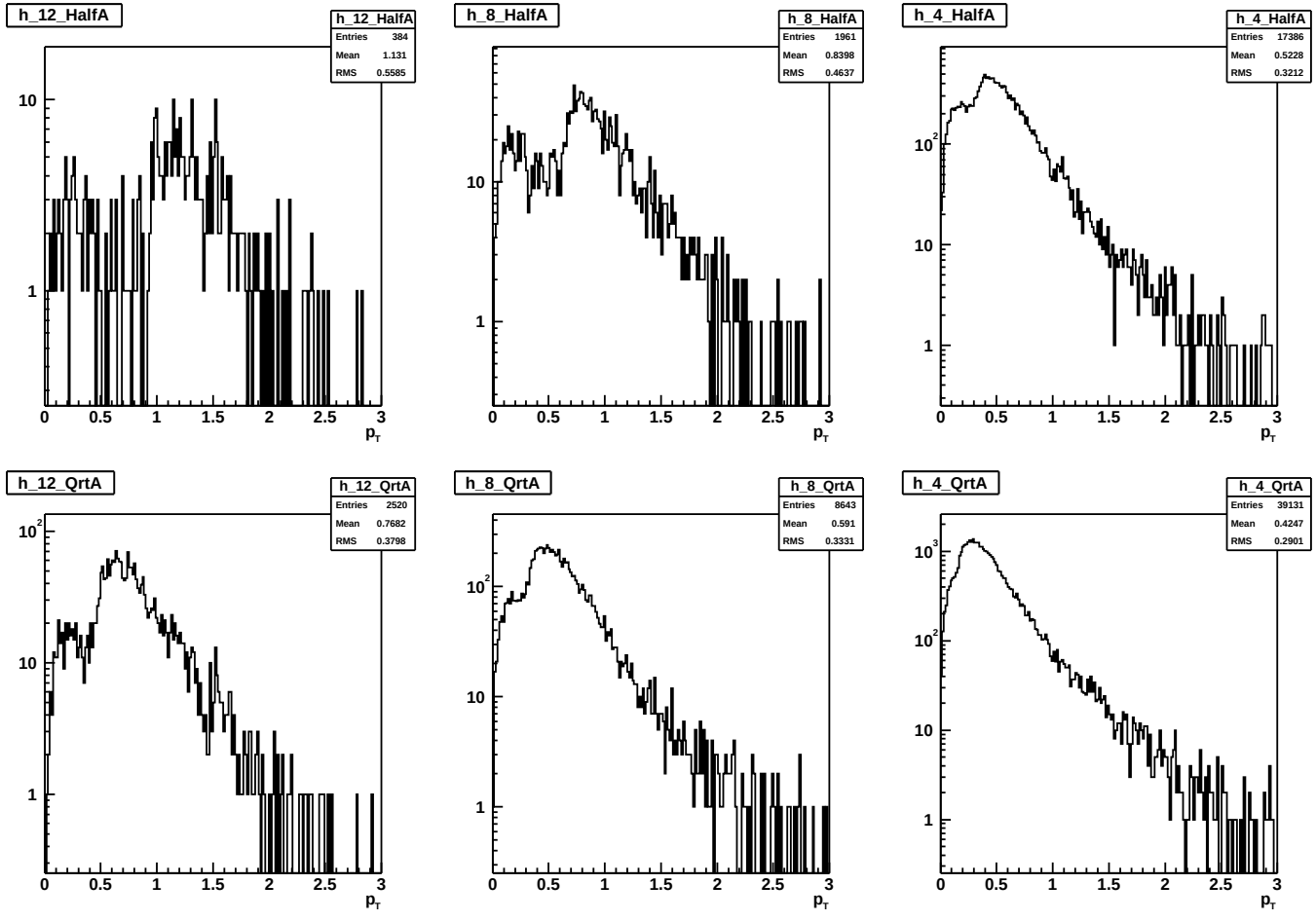
Angle	Field	Trigger rate ($b < 2$)
4	$\frac{1}{4}A$	$2.3 \cdot 10^{-2}$
4	$\frac{1}{2}A$	$1.0 \cdot 10^{-2}$
8	$\frac{1}{4}A$	$6.2 \cdot 10^{-3}$
8	$\frac{1}{2}A$	$1.4 \cdot 10^{-3}$
12	$\frac{1}{4}A$	$2.0 \cdot 10^{-3}$
12	$\frac{1}{2}A$	$3.1 \cdot 10^{-4}$

Rates: Trigger (TD1+H1) only



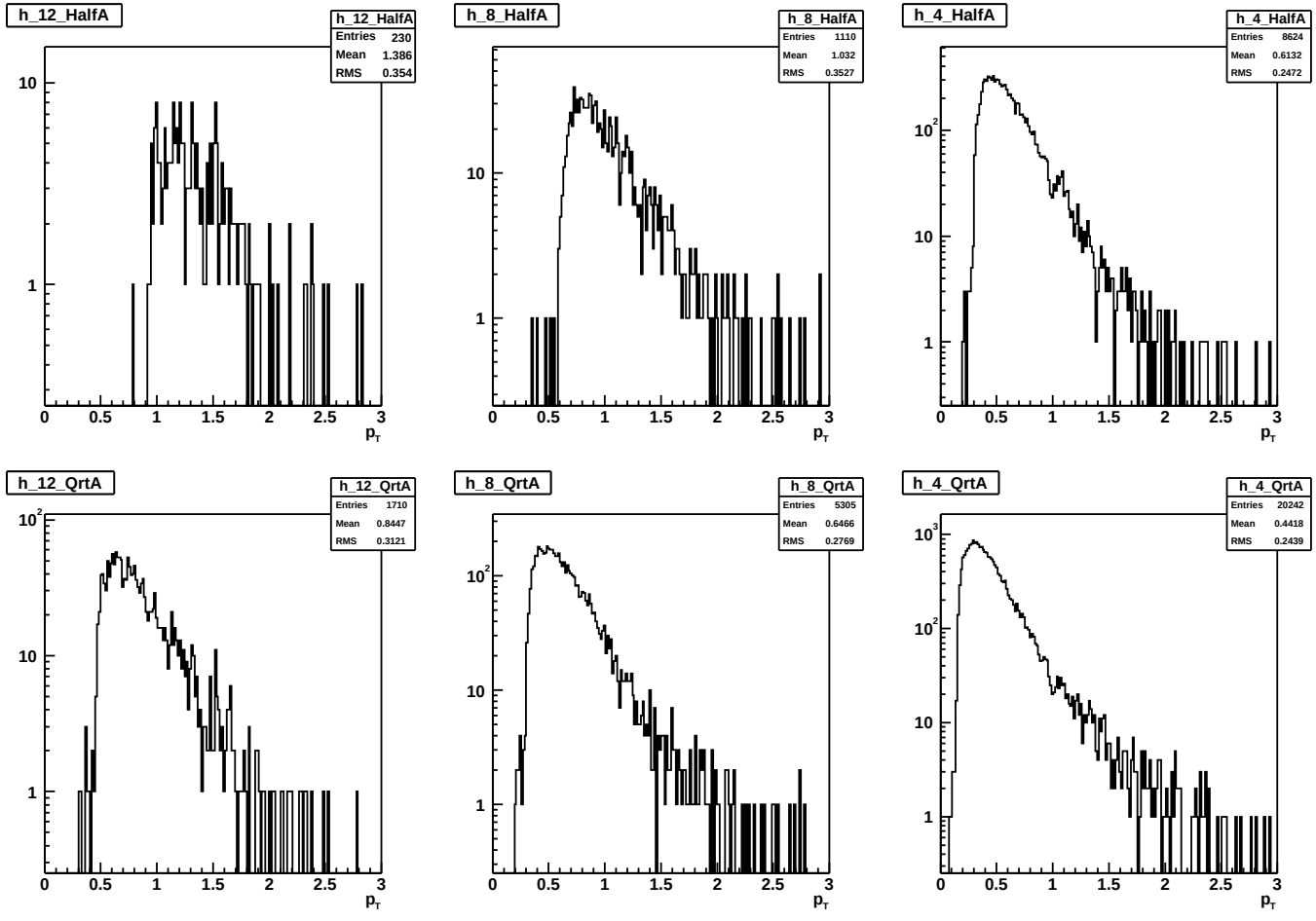
All tracks (primary and background)

Rates: Trigger (TD1+H1) only



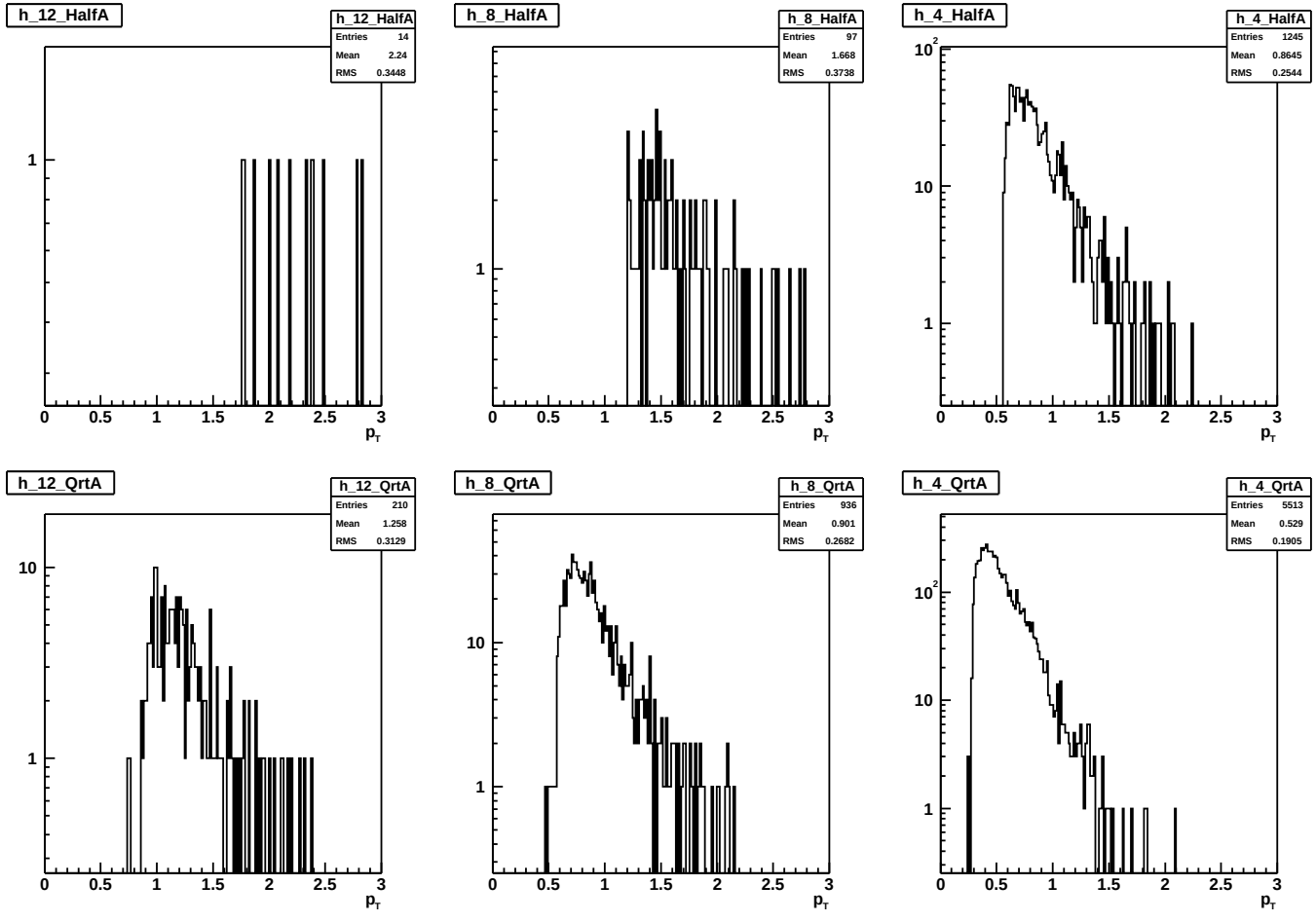
Primary tracks ($|v_x| < 0.5$ && $|v_y| < 0.5$ && $|v_z| < 0.5$)

Rates: FFS (Trigger + hit in H1)



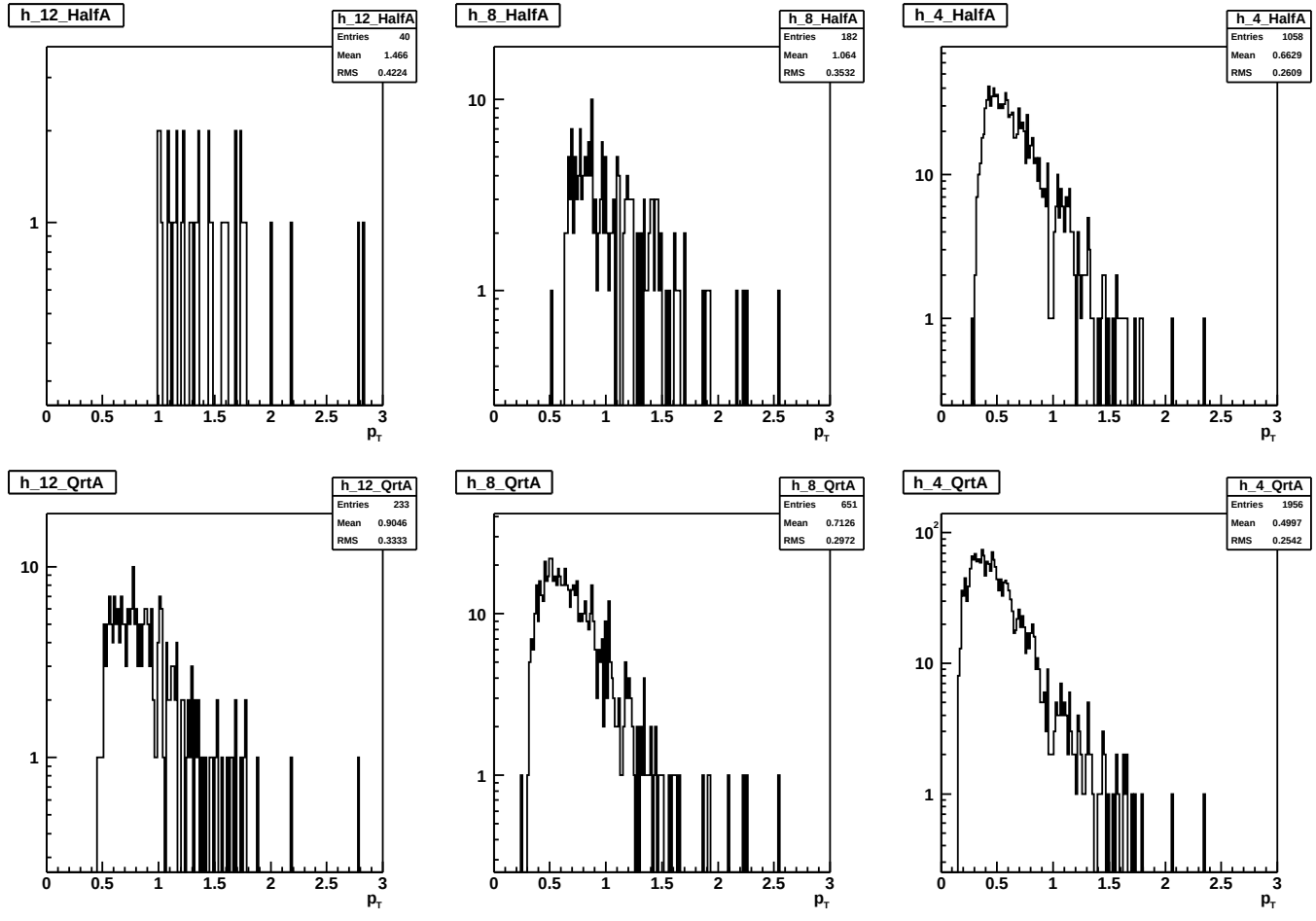
Primary tracks ($|v_x| < 0.5$ && $|v_y| < 0.5$ && $|v_z| < 0.5$)

Rates: FS (Trigger + H1 and H2)



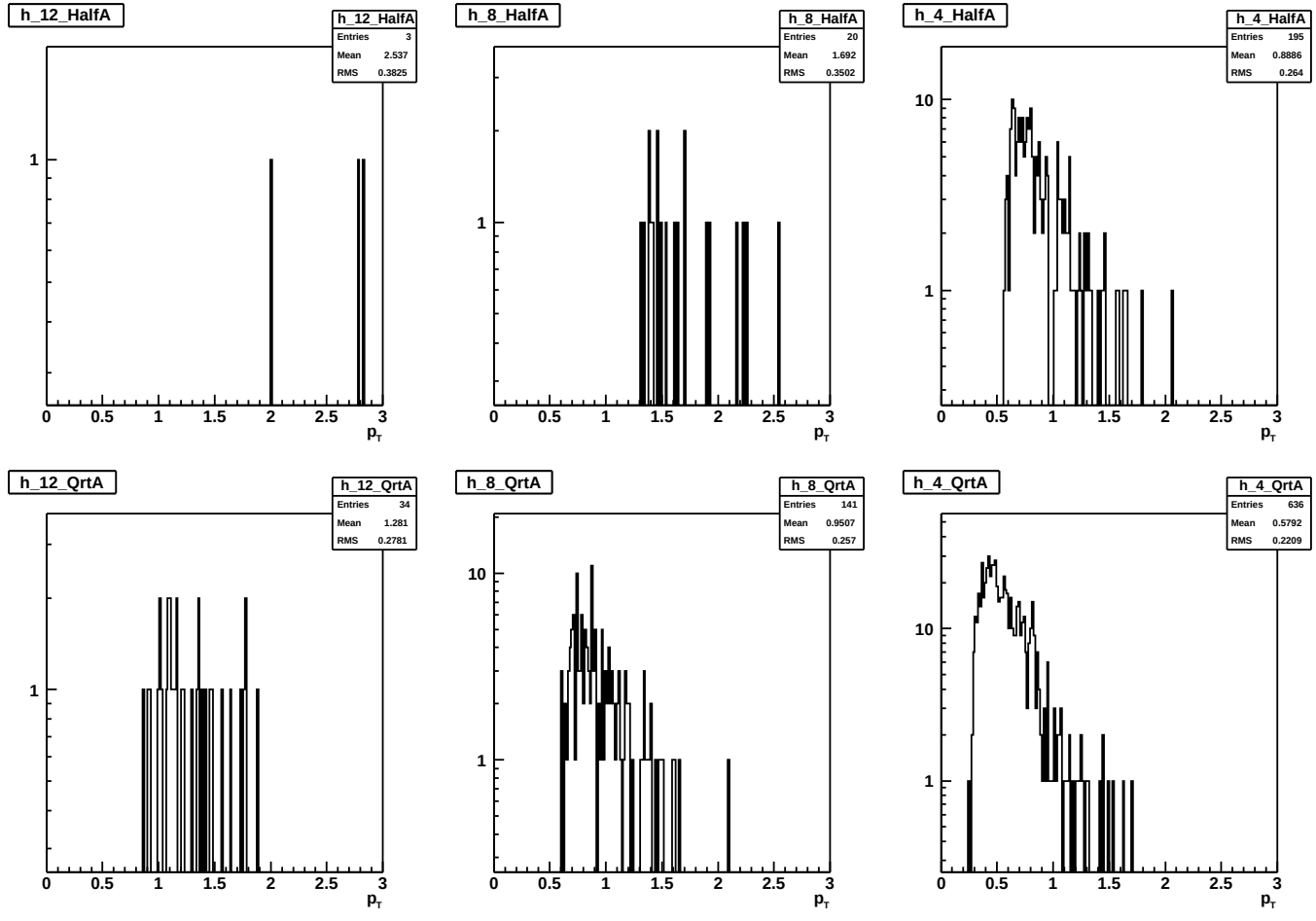
Primary tracks ($|v_x| < 0.5$ && $|v_y| < 0.5$ && $|v_z| < 0.5$)

Rates: Primary $\overline{p}$



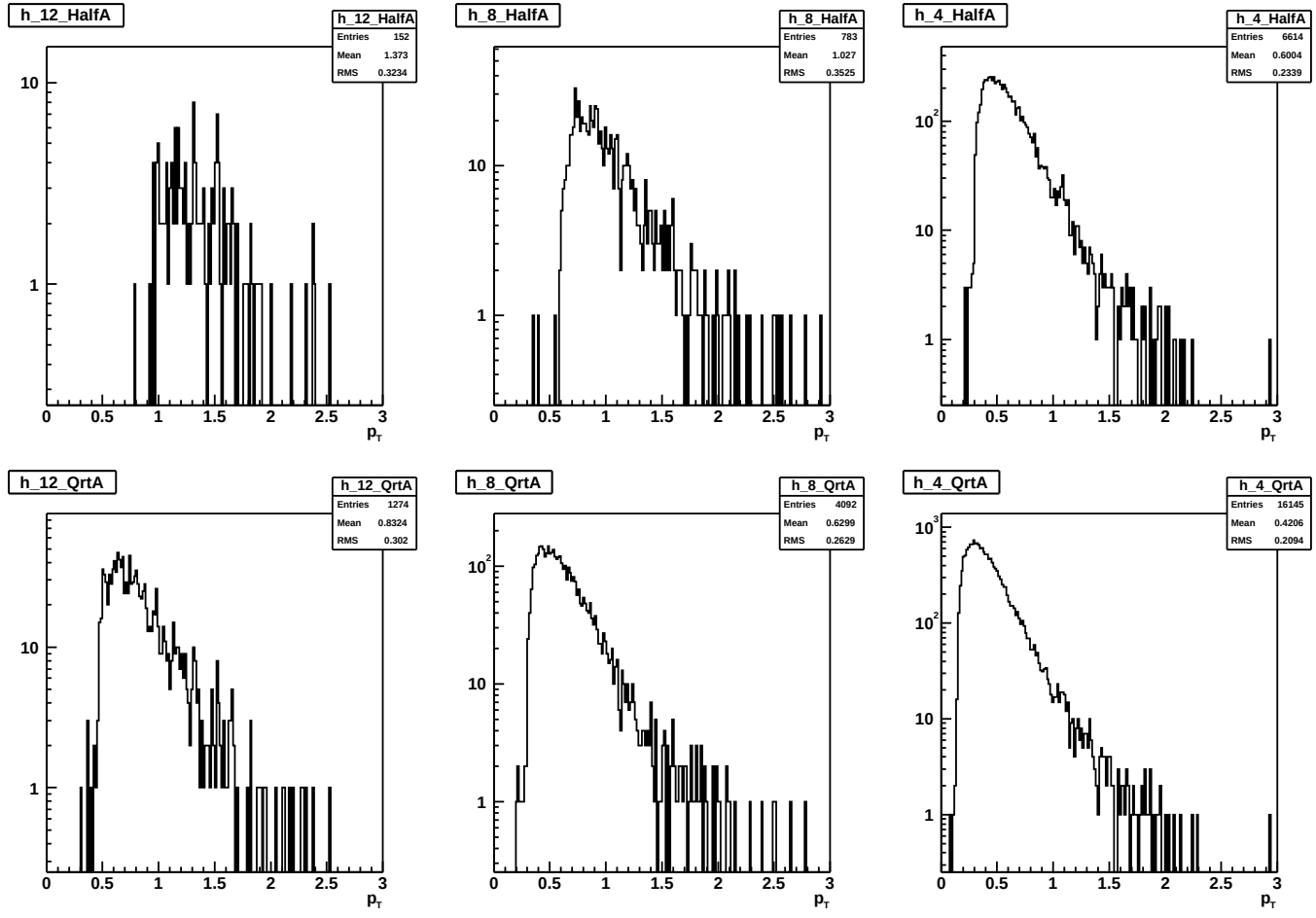
FFS, Primary tracks ($|v_x| < 0.5$ && $|v_y| < 0.5$ && $|v_z| < 0.5$)

Rates: Primary $\overline{p}$



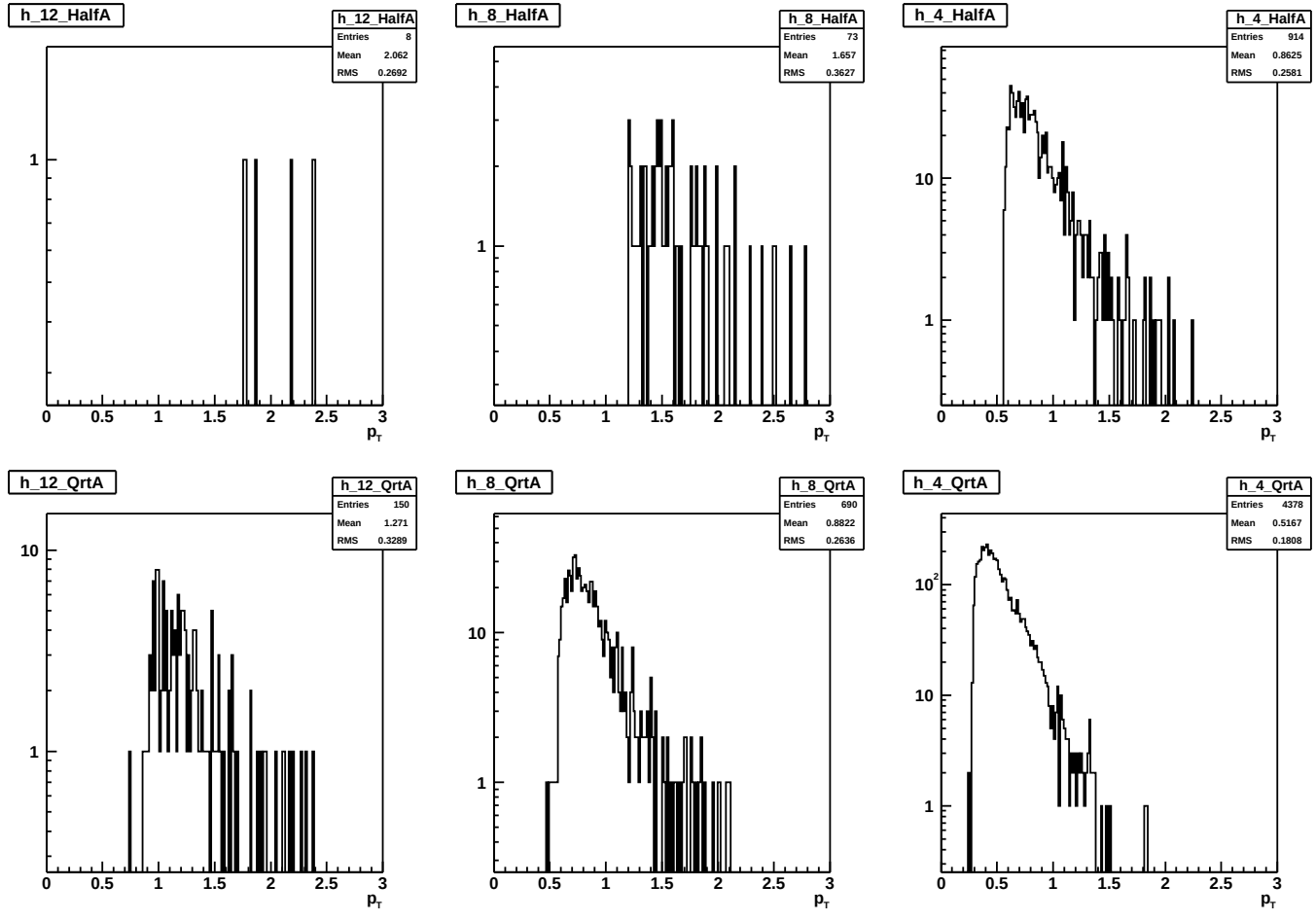
FS, Primary tracks ($|v_x| < 0.5$ && $|v_y| < 0.5$ && $|v_z| < 0.5$)

Rates: Primary π^-



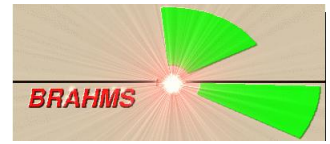
FFS, Primary tracks ($|v_x| < 0.5$ && $|v_y| < 0.5$ && $|v_z| < 0.5$)

Rates: Primary π^-



FS, Primary tracks ($|v_x| < 0.5$ && $|v_y| < 0.5$ && $|v_z| < 0.5$)

From p_t to rates



$$\frac{Particles}{Hour} = \frac{events}{hour} \cdot \frac{central}{events} \cdot \frac{triggers}{central} \cdot \frac{particles}{trigger}$$

$$\frac{Particles}{trigger}(p_t) = \frac{Particles}{Bin}(p_t) \cdot \frac{1}{binSize} \cdot \frac{1}{triggers}$$

- Design luminosity: $2.1 \cdot 10^{28} \rightarrow 44kHz$
- Spokesman's pessimism: "I would count on $\sim$ 1/5 this rate early on"
- $\frac{N_{cental}}{N_{total}} \approx 0.05$
- Central events per hour: $\approx 1.5M$

S rater piminus@

Angle	Field	Rate at 1.5GeV	Rate at 3.
4	$\frac{1}{4}A$	5	$1 \cdot 10$
4	$\frac{1}{2}A$	9	$7 \cdot 10$
8	$\frac{1}{4}A$	6	$5 \cdot 10$
8	$\frac{1}{2}A$	10	0.1
12	$\frac{1}{4}A$	6	0.1
12	$\frac{1}{2}A$	-	-

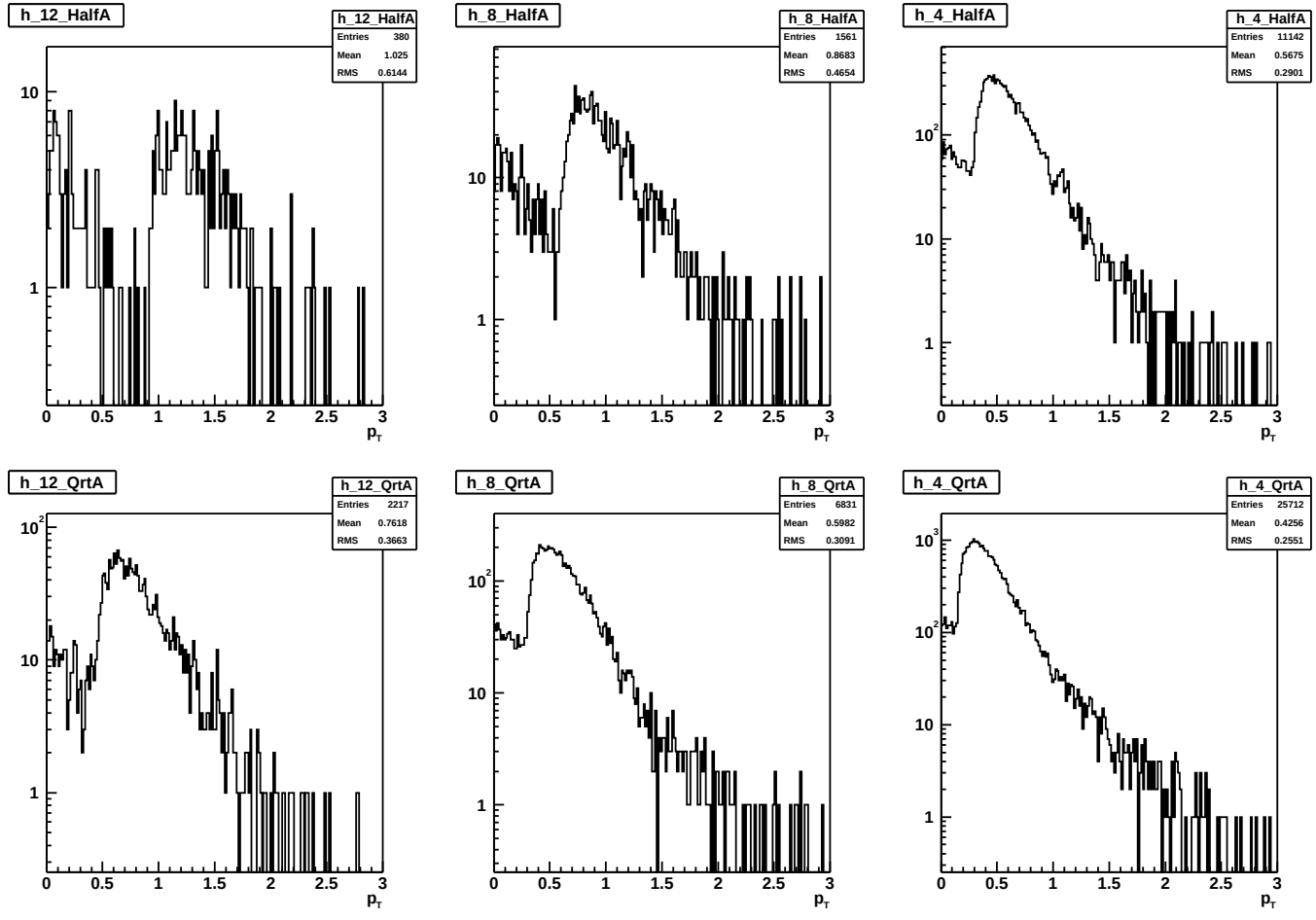
To get FS rate, multiply by $\sim$1/3 – 1/4 (to first order, a

S rater pbar@

Angle	Field	Rate at $p_t = 1.5GeV$	Rate at $p_t = 3$
4	$\frac{1}{4}A$		
4	$\frac{1}{2}A$		
8	$\frac{1}{4}A$		
8	$\frac{1}{2}A$	-	-
12	$\frac{1}{4}A$	-	-
12	$\frac{1}{2}A$	-	-

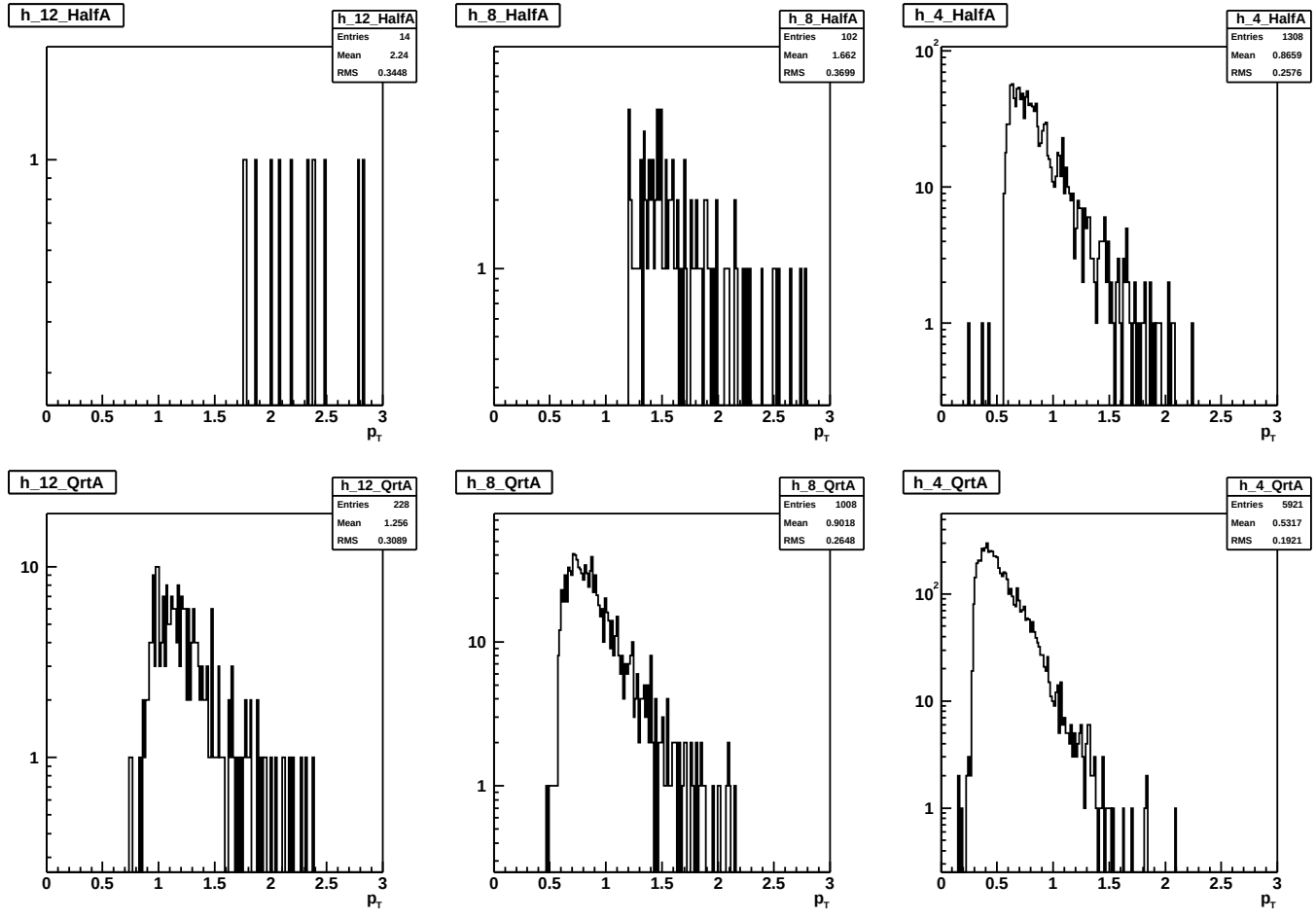
To get FS rate, multiply by $\sim$1/3 – 1/4 (to first order, anyw

Rates: FFS (Trigger + hit in H1)



All tracks (primary and background)

Rates: FS (Trigger + H1 and H2)



All tracks (primary and background)