



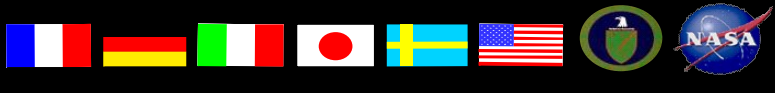
Studying High Rates on the Tracker

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Beamtest Workshop 4

14 November 2006



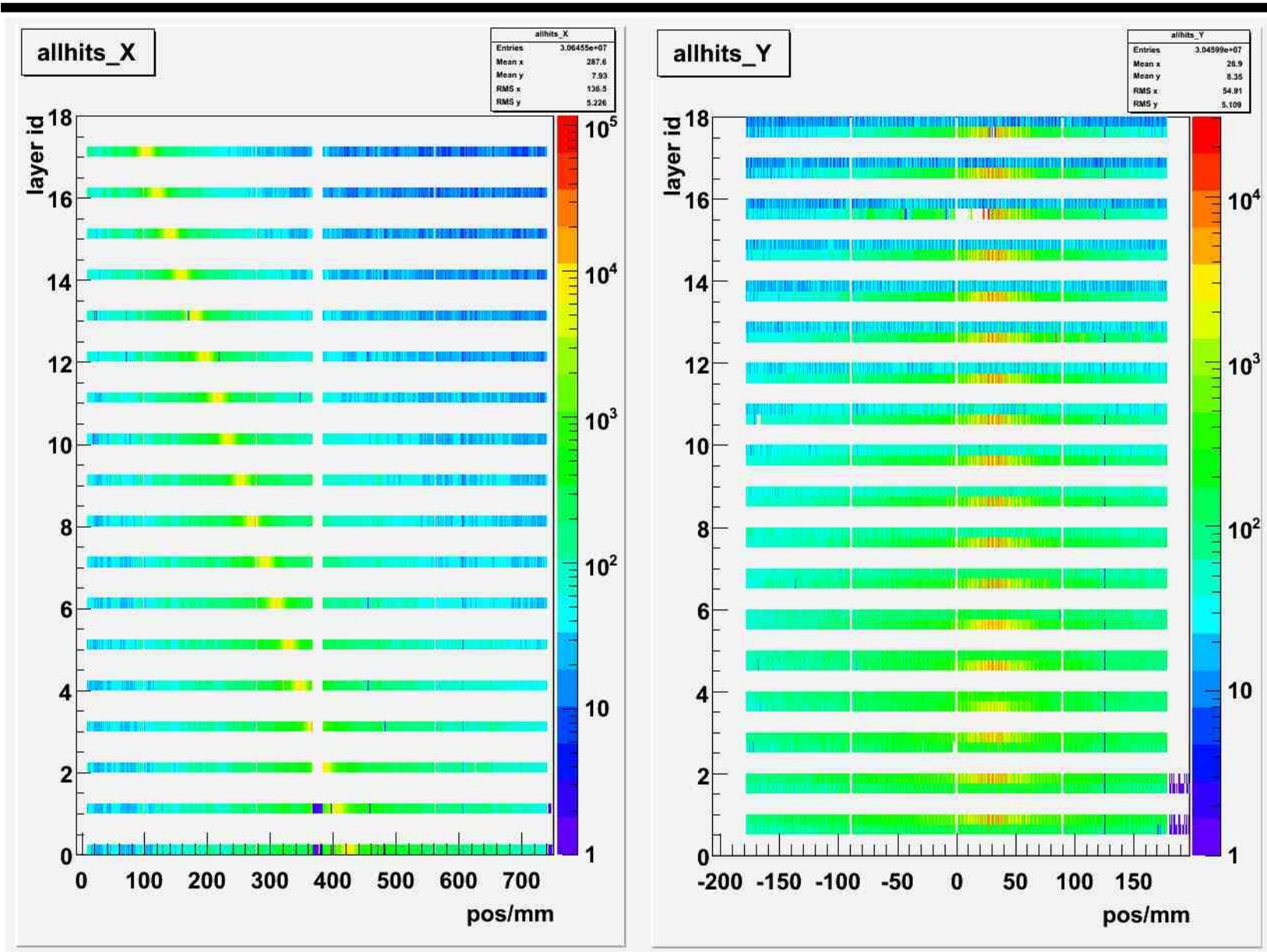


Runs

run id	particle	XYZ	p/GeV	angle/°	events	time/s	rate/Hz		
700001369	protons	-50,43,985	10	-51	30887	334	92		
700001370					986583	2682	368		
700001371					510597	1246	410		
700001372					261639	635	412		
700001373					21793	45	484		
700001374					518601	1258	412		
700001375					616383	1507	409		
700001376					505902	1229	412		
700001377					502469	1217	413		
700001378					539220	1366	395		
700001379			506498		1272	398			
sum			5000572						
700001381			6				513668	2769	186
700001382							533586	2899	184
700001383							504680	2757	183
700001384							527469	3190	165
700001385							500793	2965	169
700001388							533880	3090	173
700001389							501613	2881	174
700001391							503175	2717	185
sum	4118864								



Brigida-style event display





Efficiency of tower 2 layer 9 view 0

700001369	2	9	0	99.90 %	0.10 %	17431	18
700001370	2	9	0	99.92 %	0.08 %	575396	486
700001371	2	9	0	99.91 %	0.09 %	295880	261
700001372	2	9	0	99.92 %	0.08 %	151592	128
700001373	2	9	0	99.95 %	0.05 %	12534	6
700001374	2	9	0	99.91 %	0.09 %	300573	263
700001375	2	9	0	99.91 %	0.09 %	357445	310
700001376	2	9	0	99.91 %	0.09 %	293538	254
700001377	2	9	0	99.91 %	0.09 %	290600	253
700001378	2	9	0	99.90 %	0.10 %	305439	304
700001379	2	9	0	99.91 %	0.09 %	292911	258
700001381	2	9	0	99.93 %	0.07 %	311982	209
700001382	2	9	0	99.93 %	0.07 %	320728	233
700001383	2	9	0	99.91 %	0.09 %	295098	276
700001384	2	9	0	99.92 %	0.08 %	317331	253
700001385	2	9	0	99.93 %	0.07 %	301964	224
700001388	2	9	0	99.92 %	0.08 %	320568	244
700001389	2	9	0	99.93 %	0.07 %	303256	227
700001391	2	9	0	99.92 %	0.08 %	293839	238



Efficiency of tower 2 layer 15 view 1

700001369	2	15	1	70.97 %	29.03 %	17328	5030
700001370	2	15	1	71.62 %	28.38 %	572876	162572
700001371	2	15	1	71.83 %	28.17 %	294577	82969
700001372	2	15	1	71.82 %	28.18 %	150891	42515
700001373	2	15	1	71.59 %	28.41 %	12489	3548
700001374	2	15	1	71.90 %	28.10 %	299291	84115
700001375	2	15	1	71.59 %	28.41 %	355876	101109
700001376	2	15	1	71.74 %	28.26 %	292238	82597
700001377	2	15	1	71.79 %	28.21 %	289201	81596
700001378	2	15	1	71.50 %	28.50 %	303987	86634
700001379	2	15	1	71.88 %	28.12 %	291697	82014
700001381	2	15	1	74.47 %	25.53 %	310876	79358
700001382	2	15	1	74.62 %	25.38 %	319641	81132
700001383	2	15	1	74.42 %	25.58 %	294003	75193
700001384	2	15	1	74.48 %	25.52 %	316079	80667
700001385	2	15	1	74.56 %	25.44 %	300718	76511
700001388	2	15	1	74.41 %	25.59 %	319524	81764
700001389	2	15	1	74.37 %	25.63 %	302118	77440
700001391	2	15	1	74.54 %	25.46 %	292691	74530

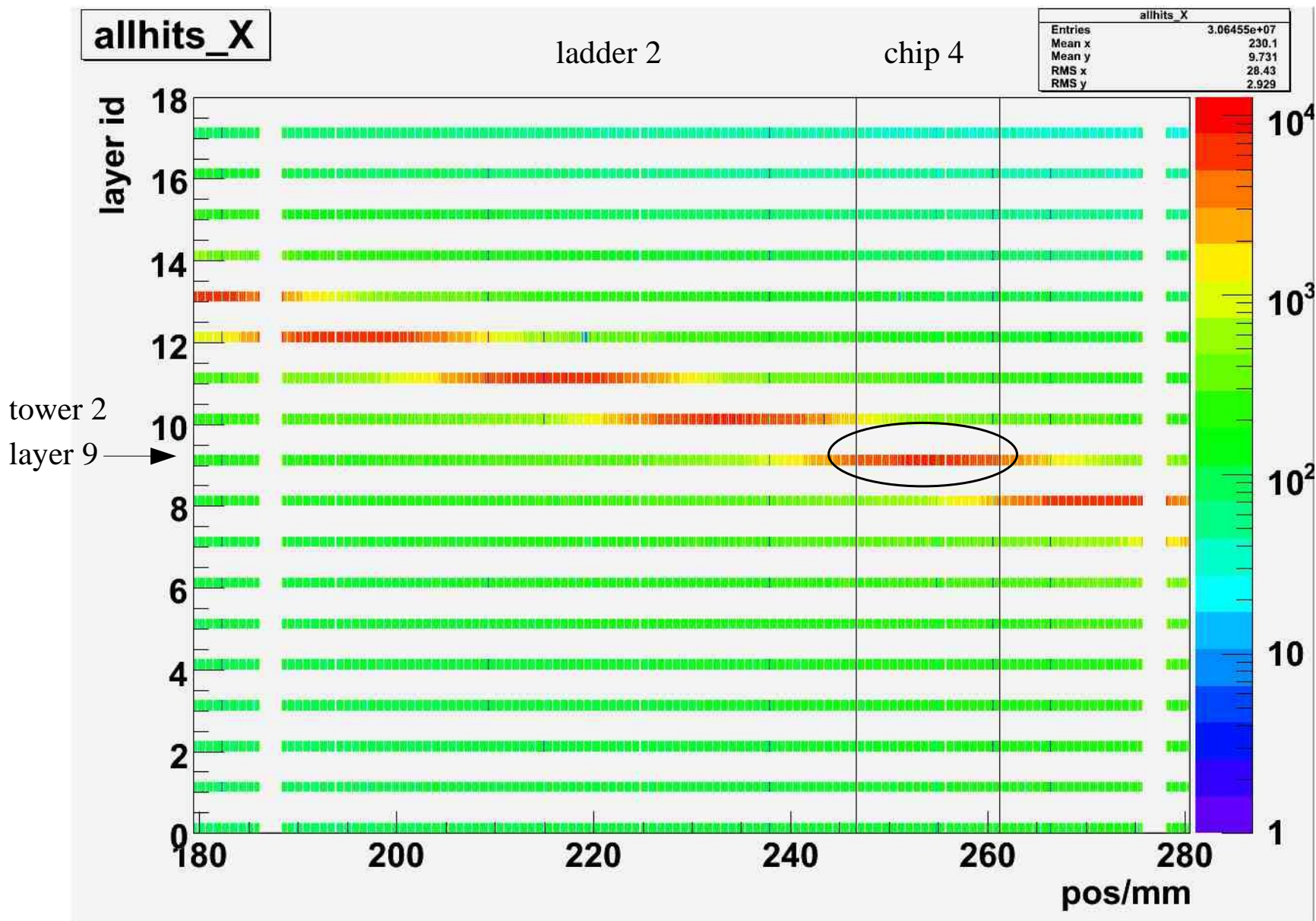


Efficiency of tower 2 layer 13 view 0

700001369	2	13	0	96.94 %	3.06 %	17425	534
700001370	2	13	0	97.07 %	2.93 %	575361	16830
700001371	2	13	0	97.05 %	2.95 %	295867	8734
700001372	2	13	0	97.02 %	2.98 %	151556	4519
700001373	2	13	0	97.18 %	2.82 %	12534	354
700001374	2	13	0	97.04 %	2.96 %	300629	8889
700001375	2	13	0	97.08 %	2.92 %	357461	10446
700001376	2	13	0	97.01 %	2.99 %	293544	8771
700001377	2	13	0	97.11 %	2.89 %	290593	8400
700001378	2	13	0	97.02 %	2.98 %	305365	9098
700001379	2	13	0	97.06 %	2.94 %	292901	8625
700001381	2	13	0	96.68 %	3.32 %	312374	10385
700001382	2	13	0	96.57 %	3.43 %	321189	11007
700001383	2	13	0	96.57 %	3.43 %	295518	10130
700001384	2	13	0	96.62 %	3.38 %	317709	10739
700001385	2	13	0	96.58 %	3.42 %	302323	10340
700001388	2	13	0	96.56 %	3.44 %	321094	11053
700001389	2	13	0	96.57 %	3.43 %	303602	10401
700001391	2	13	0	96.58 %	3.42 %	294189	10069



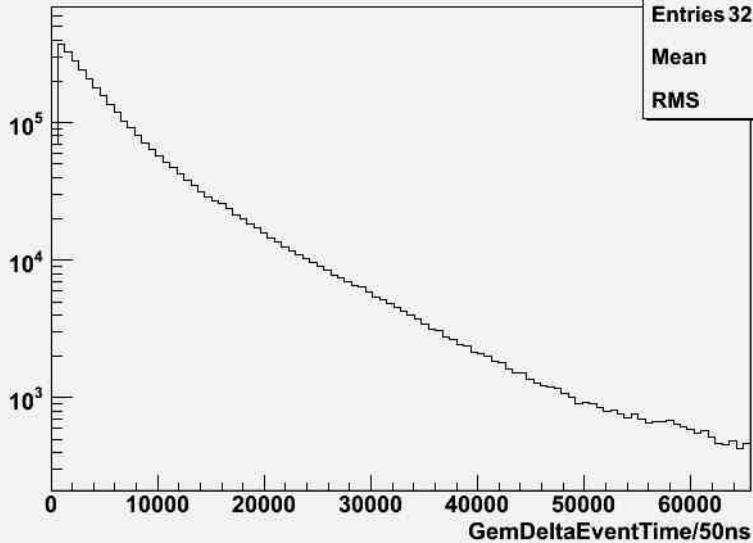
Choosing the readout chip





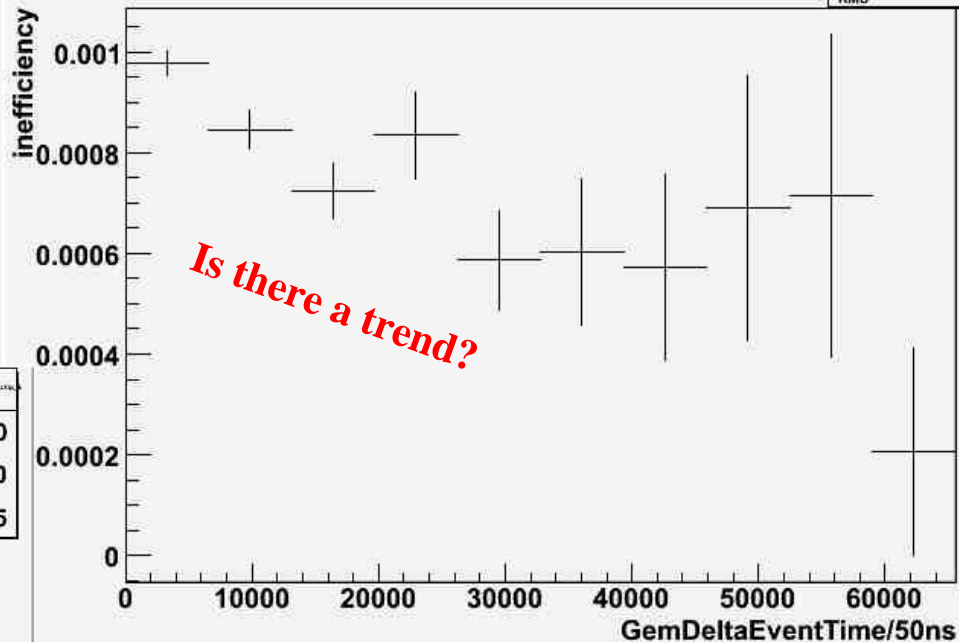
Efficiency vs. *GemDeltaEventTime*

allhits_tower_2_layer_9_view_0_ladder_3_chip_4



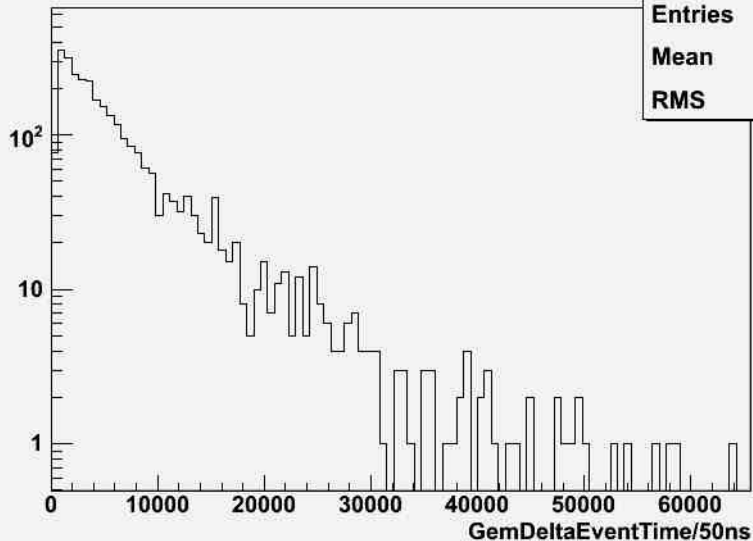
Entries	3253286
Mean	7264
RMS	8315

ineff



ineff	2930
Mean	2.854e+04
RMS	1.854e+04

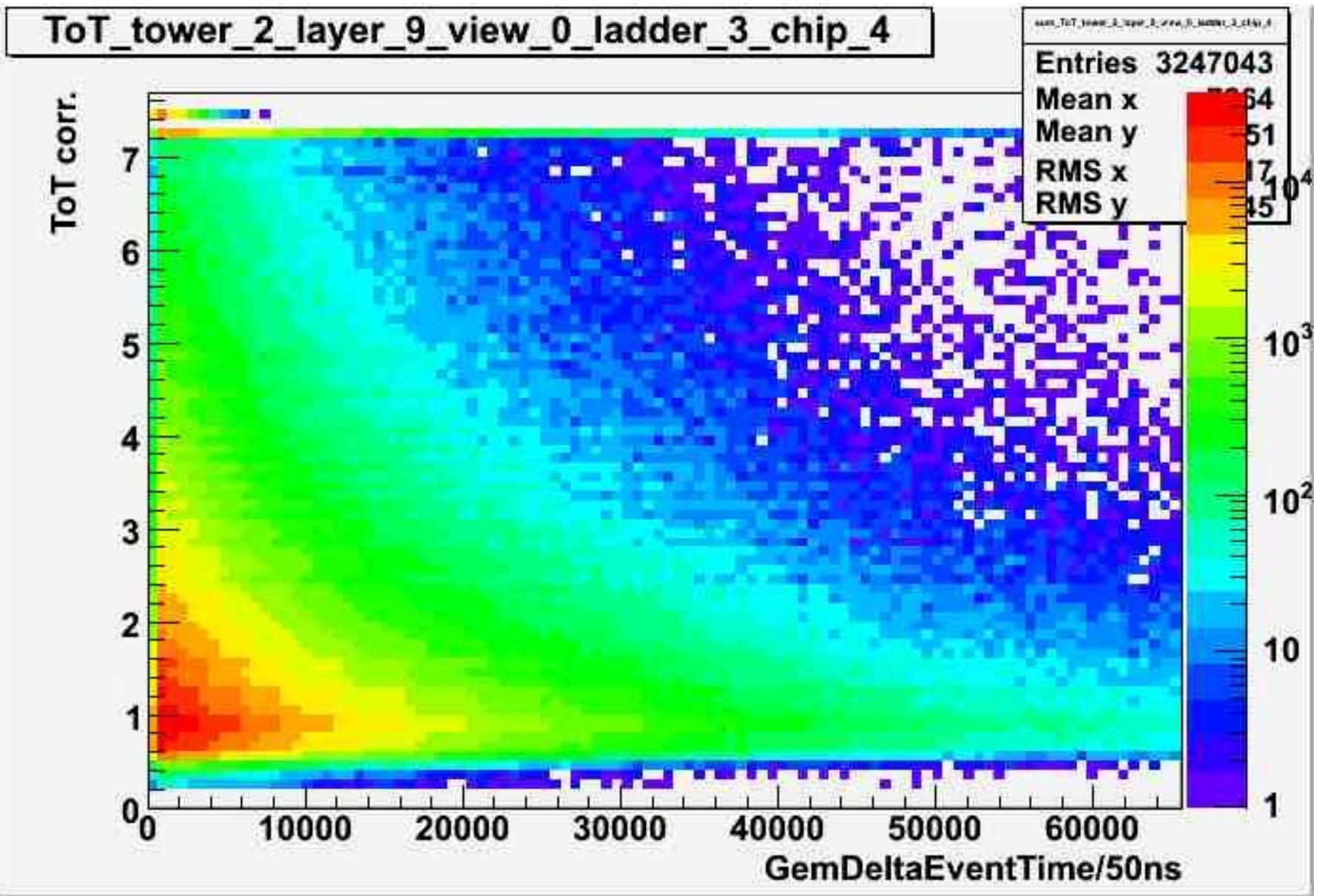
hitsUnknown_tower_2_layer_9_view_0_ladder_3_chip_4



Entries	2930
Mean	6450
RMS	7265



ToT vs. GemDeltaEventTime

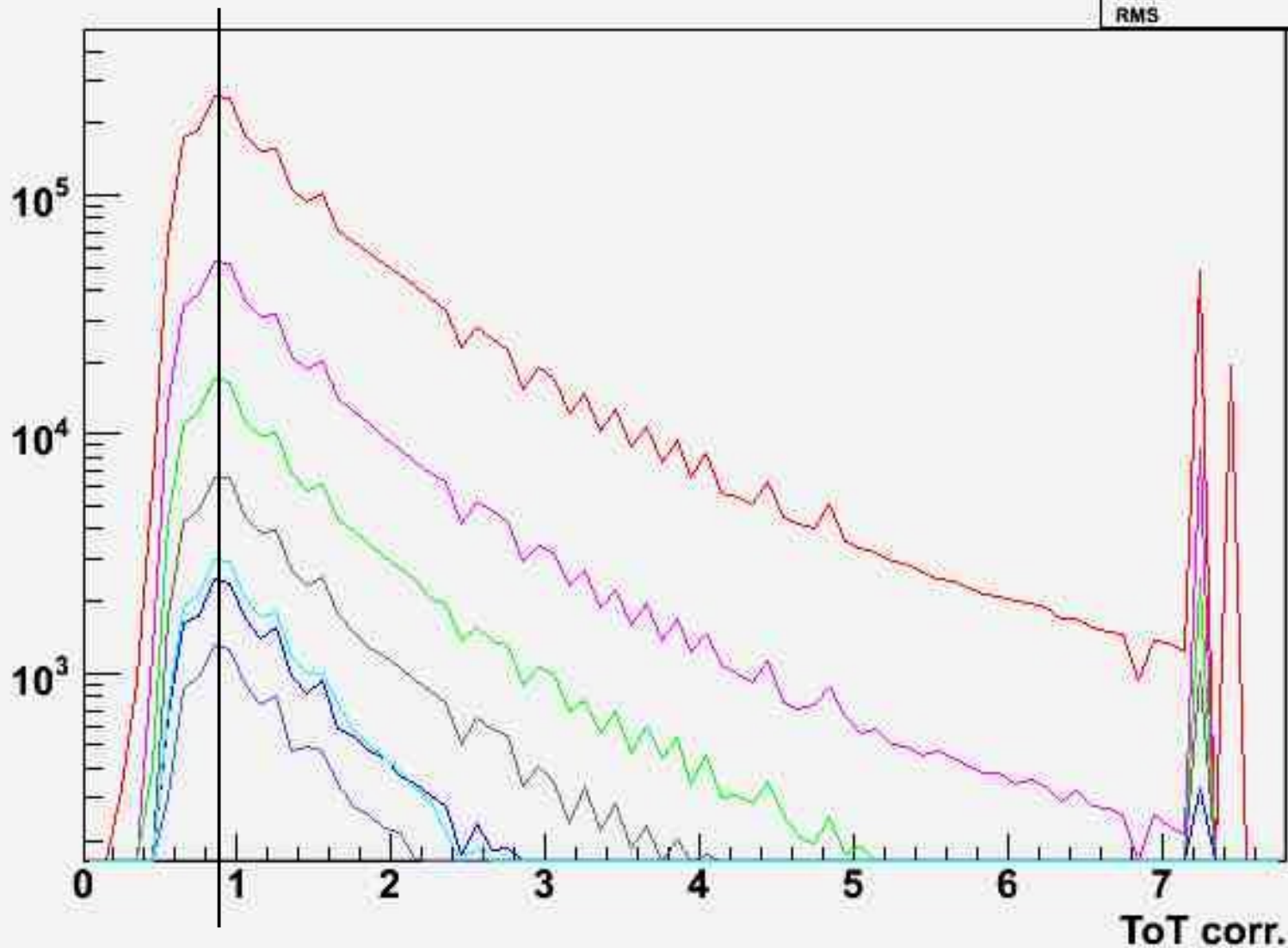




ToT vs. GemDeltaEventTime II

ToT_tower_2_layer_9_view_0_ladder_3_chip_4

Entries	19805
Mean	1.672
RMS	1.375





Summary

- “traditional” efficiency algs fail if the planes are not illuminated uniformly (beam test is an extreme case)
- one could argue that the single strip efficiency worsens for small GemDeltaEventTime at rates of some 100Hz/chip
- the ToT is not affected by the conditions above
- **Note: 400Hz average rate on a single chip is equivalent to $400\text{Hz} / 0.1 \text{ duty cycle} * 6 \text{ chips} * 4 \text{ ladders} * 16 \text{ towers} = 1.5\text{MHz}$ on LAT**