Status of L1 CFT/CPS Simulation: CFT, CPSAxial and CPSStereo

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- Authors: Vivek Jain, Bruno Thooris, Kin Yip
  - DFE Boards - CFT, CPS
  - CTOC Boards, CTTT Board, CFT_TM Board, CTQD Boards
  - CPS Stereo
- Packing/Unpacking of information sent to L2
- Packing/Unpacking of information sent to L3
- Brigitte Vachon, Yuri Gerstein, Liang Han have been working on the comparison between simulator and online trigger

Table and following plots from Brigitte

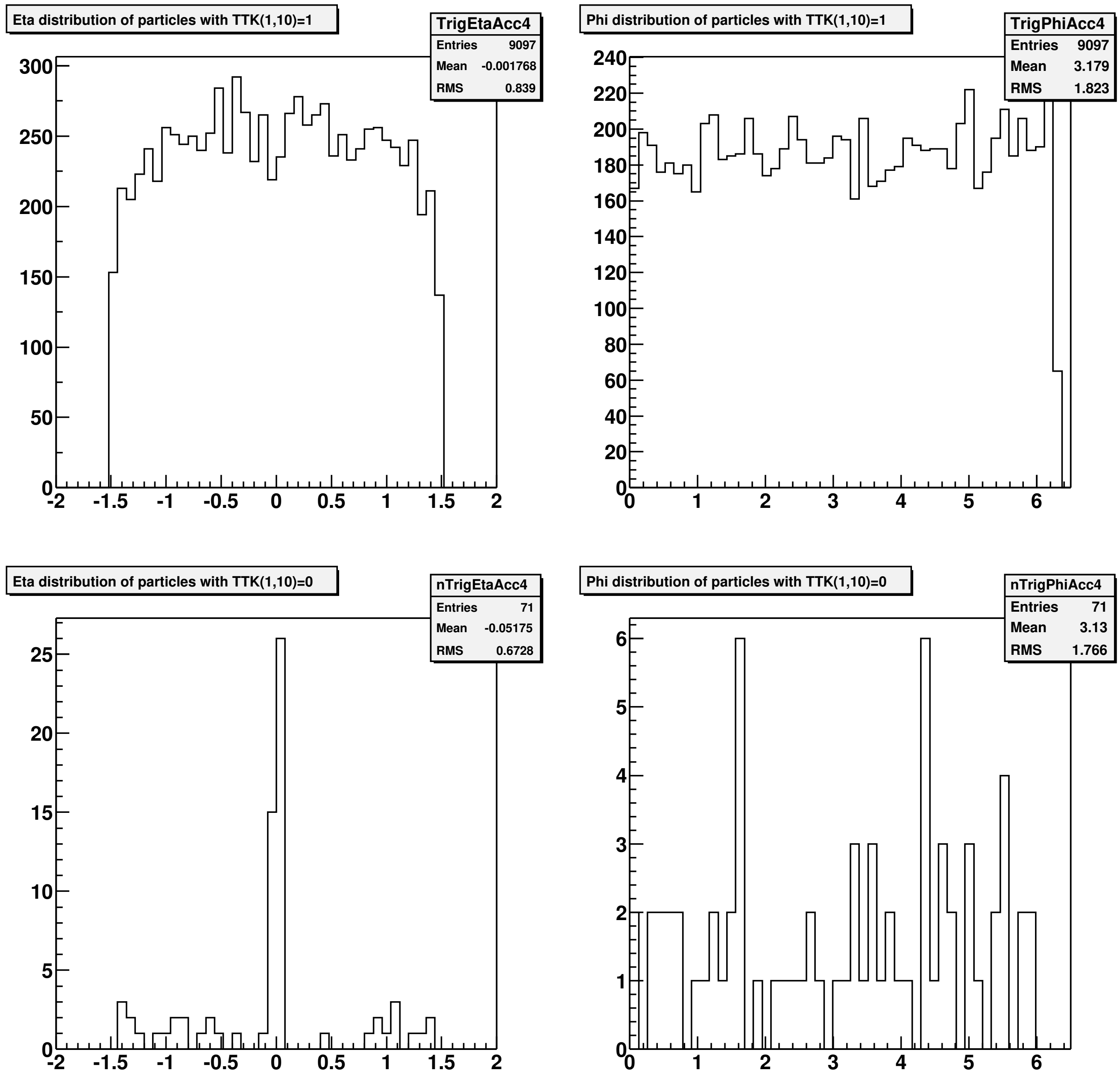
	Single muons			
	2 GeV		15 GeV	
	All Events	Within CFT	All Events	Within CFT
Number of events	10000	9150	10000	9168
TTK(1,1.5)	0.925 ± 0.010	0.976 ± 0.015	0.945 ± 0.010	0.992 ± 0.015
TTK(1,3)	0.0	0.0	0.945 ± 0.010	0.992 ± 0.015
TTK(1,5)	0.0	0.0	0.945 ± 0.010	0.992 ± 0.015
TTK(1,10)	0.0	0.0	0.945 ± 0.010	0.992 ± 0.015
TTK(2,1.5)	0.006 ± 0.001	0.006 ± 0.001	0.009 ± 0.001	0.009 ± 0.001
TTK(2,3)	0.0	0.0	0.009 ± 0.001	0.009 ± 0.001
TTK(2,5)	0.0	0.0	0.009 ± 0.001	0.009 ± 0.001
TTK(2,10)	0.0	0.0	0.009 ± 0.001	0.009 ± 0.001

For nominal geometry (as in MC), tsim_l1ft works well

Here the track equations were generated by Kin

Brigitte ran the simulator on single particle MC events - e,μ, π

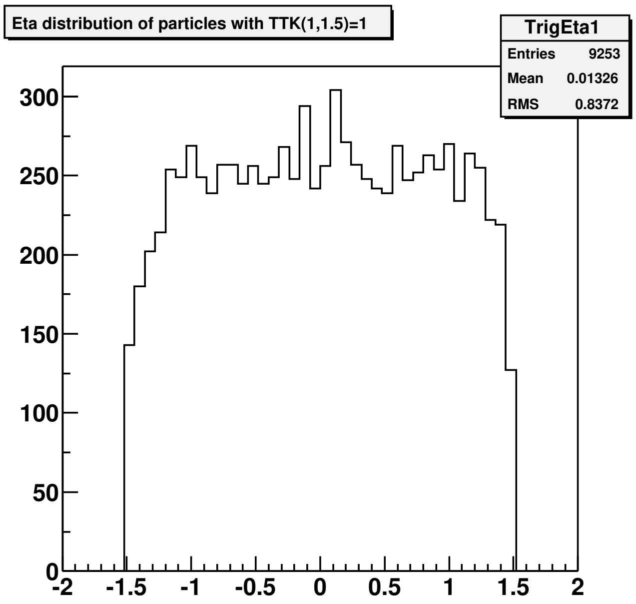
Foll. plot for muon - pT $=$ 15 GeV, within CFT acceptance

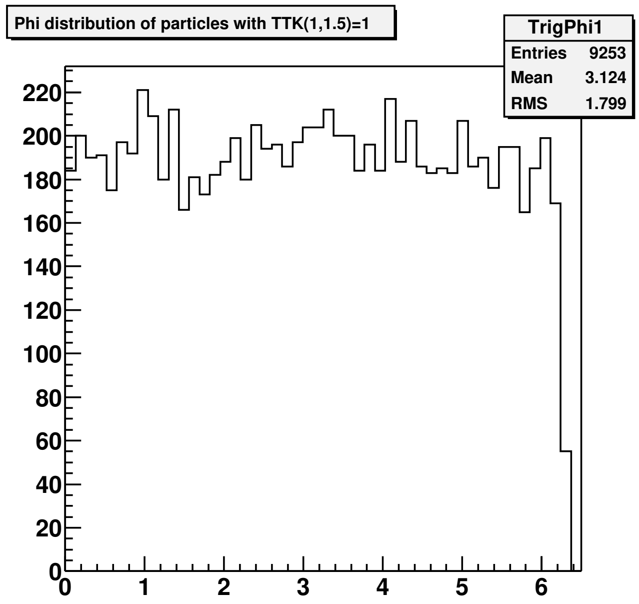


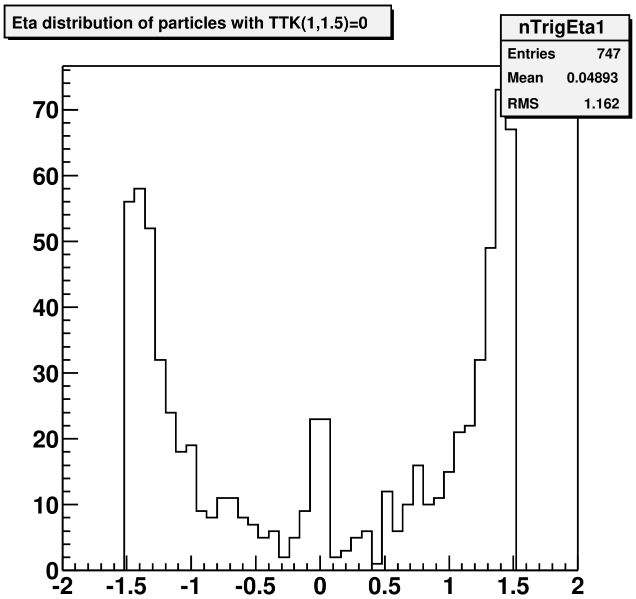
Weird peak at $\eta = 0$. Brigitte/I will investigate

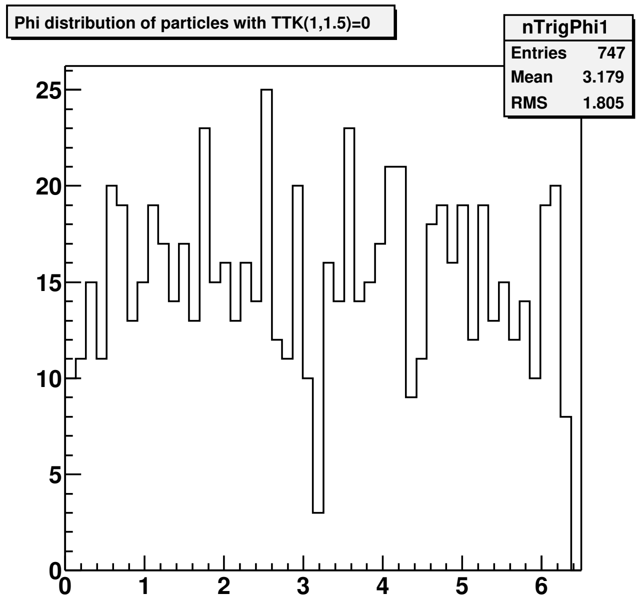
Is it a problem with the MC or with the simulator.

Foll. plot for muon - pT = 2 GeV, no cut on CFT acceptance









- On next slide is a comparison of tsim_l1ft and firmware performance
- For run 170243 ,
  both tsim_l1ft and firmware use the same track equations.
  (Ignore information for all other runs!)
- Track eqns. generated by Graham Wilson
- The different rows are for TTK(1,1.5),TTK(1,3.0),TTK(1,5.0),TTK(1,10.0) TTK(2,1.5),TTK(2,3.0),TTK(2,5.0),TTK(2,10.0)
- The agreement is encouraging!

MinBias events

	Fraction of events									Corrected Ratio		
	TrigSim			Data			Ratio			(for the 2 missing Octan		
169894	0.227	+/-	0.006	0.128	+/-	0.005	1.77	+/-	0.08	1.33	+/-	0.06
169988	0.246	+/-	0.010	0.146	+/-	0.008	1.68	+/-	0.11	1.26	+/-	0.09
170014	0.246	+/-	0.029	0.134	+/-	0.020	1.84	+/-	0.35	1.38	+/-	0.26
170243	0.321	+/-	0.013	0.187	+/-	0.010	1.72	+/-	0.12	1.29	+/-	0.09
169894	0.036	+/-	0.002	0.014	+/-	0.001	2.57	+/-	0.23	1.93	+/-	0.17
169988	0.041	+/-	0.004	0.018	+/-	0.003	2.28	+/-	0.44	1.71	+/-	0.33
170014	0.051	+/-	0.012	0.029	+/-	0.009	1.76	+/-	0.68	1.32	+/-	0.51
170243	0.047	+/-	0.005	0.021	+/-	0.003	2.24	+/-	0.40	1.68	+/-	0.30
169894	0.005	+/-	0.001	0.003	+/-	0.001	1.67	+/-	0.65	1.25	+/-	0.49
169988	0.005	+/-	0.001	0.004	+/-	0.001	1.25	+/-	0.40	0.94	+/-	0.30
170014	0.011	+/-	0.005	0.011	+/-	0.005	1.00	+/-	0.64	0.75	+/-	0.48
170243	0.010	+/-	0.002	0.005	+/-	0.002	2.00	+/-	0.89	1.50	+/-	0.67
169894	0.000	+/-	0.000	0.000	+/-	0.000						
169988	0.000	+/-	0.000	0.001	+/-	0.001						
170014	0.005	+/-	0.004	0.005	+/-	0.004						
170243	0.002	+/-	0.001	0.002	+/-	0.001						
169894	0.081	+/-	0.004	0.026	+/-	0.002	3.12	+/-	0.28	2.34	+/-	0.21
169988	0.097	+/-	0.006	0.043	+/-	0.004	2.26	+/-	0.25	1.69	+/-	0.19
170014	0.094	+/-	0.017	0.043	+/-	0.011	2.19	+/-	0.68	1.64	+/-	0.51
170243	0.153	+/-	0.009	0.048	+/-	0.005	3.19	+/-	0.38	2.39	+/-	0.29

What needs to be done

- Some issues re: singlet/doublet calculation in tsim_l1ft vs. what is assumed when generating track equations
- Ensure that algorithms are the same in the firmware and simulator
  Meeting next week to address these issues
- tsim_l1ft geometry is rotated relative to reality by 36°
  CPS is not rotated, so one has to be careful