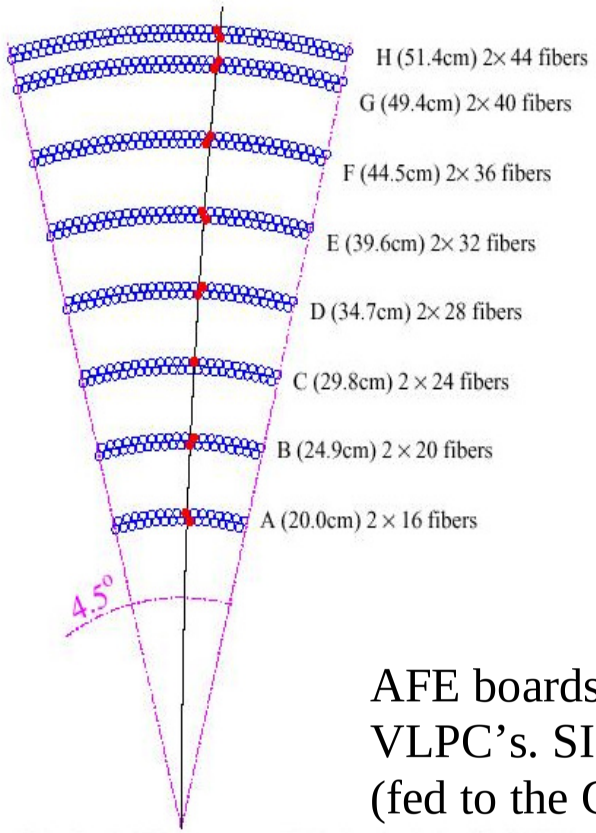
First Look at Real Data with the Track Trigger Simulation

Kyle Stevenson

INDIANA UNIVERSITY

The D0 Fibre Tracker System at Run IIa



8 Layers of doublets in the CFT axial (no stereo for L1−CTT).

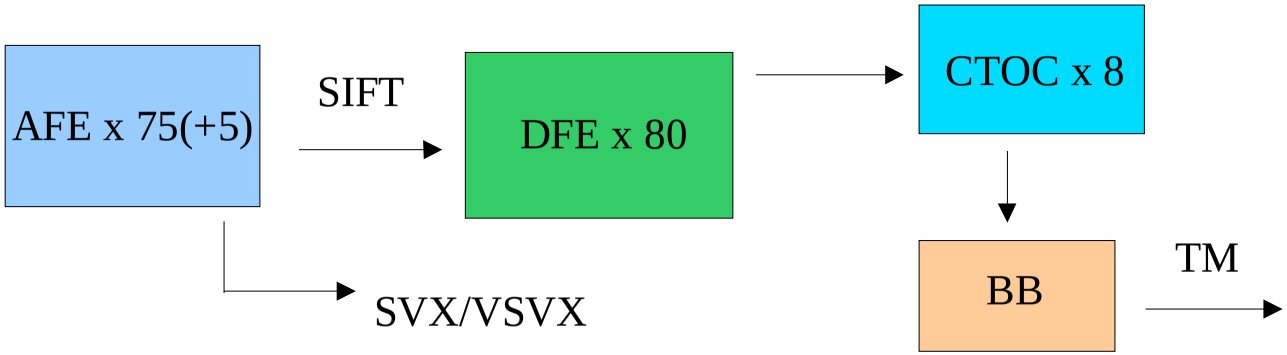
CFT is broken up into 80 trigger sectors (one shown).

38,400 polystyrene scintillating fibres. Readout by VLPC's , with QE ~ 60−75 %, Gain of ~ 40−50k.

AFE boards integrate the charge from the VLPC's. SIFT supplys a discriminator bit (fed to the CTT) & SVX II gives adc count for L3 & offline.

How the Track Trigger Operates

SIFT discriminator signals sent to 80 DFE Boards. These bits are then compared to preset equation lists within the boards FPGA's.



If we have a match then tracks are formed which are then summed by octant boards (CTOC's). These are then sent to the Broadcast board for L1 which forms the trigger bits used in the L1 trigger.

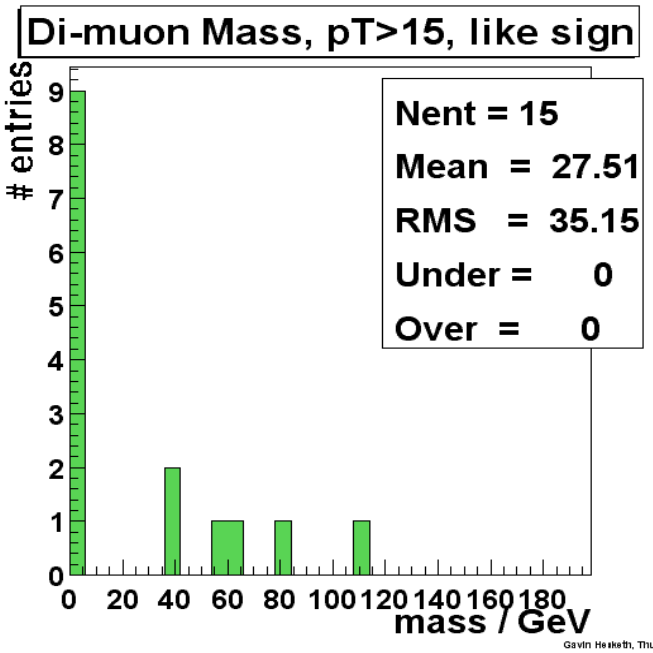
Simulating the Behaviour of the Track Trigger

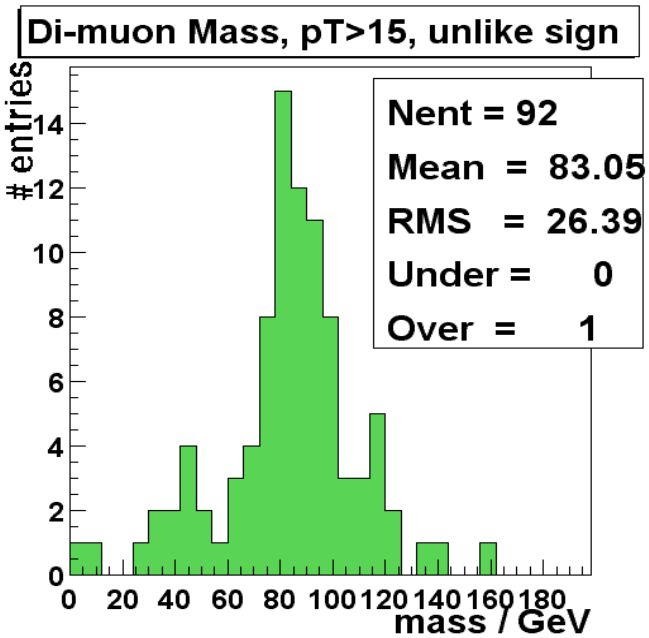
In preparation for running with the real CTT we are proceding to study what happens to data passed through the L1−CTT portion of trigsim (written by Vivek Jain, Kin Yip & Bruno Thooris).

We can use this to investigate physics triggering (offline Z sample) & expected background rates (from min_bias samples).

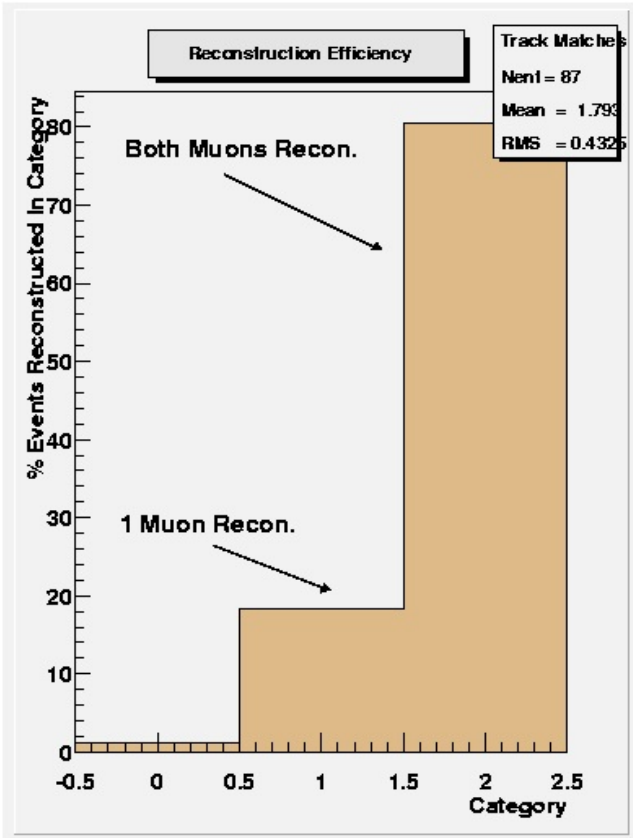
L1CTT tracks come in four flavours , 1.5−3 GeV/c, 3−5, 5−10, 10+ and the phi graining is 80 sectors. Chosen so 1.5 GeV/c track can't drift over more than one neighbouring sector.

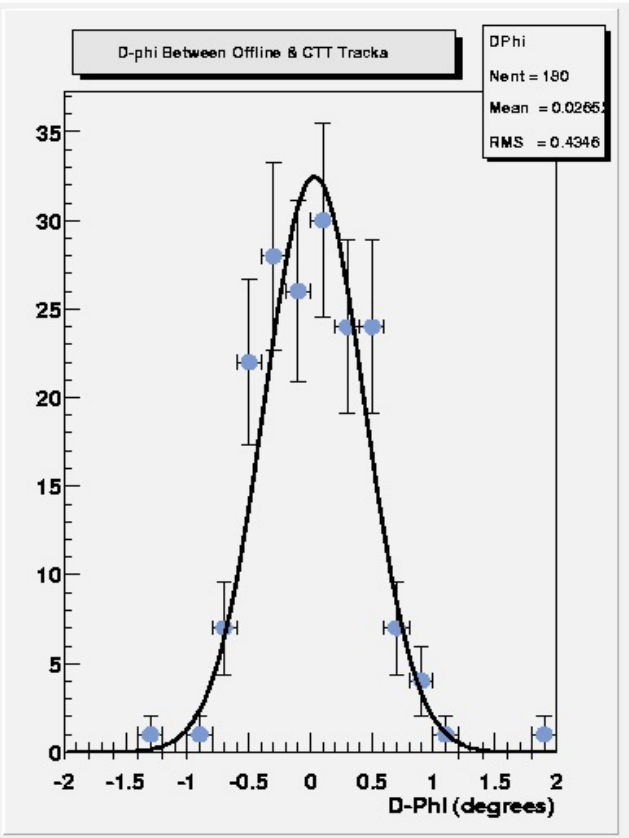
Results from running over the p10.15.00 EW− Group $Z \rightarrow \mu\mu$ Sample





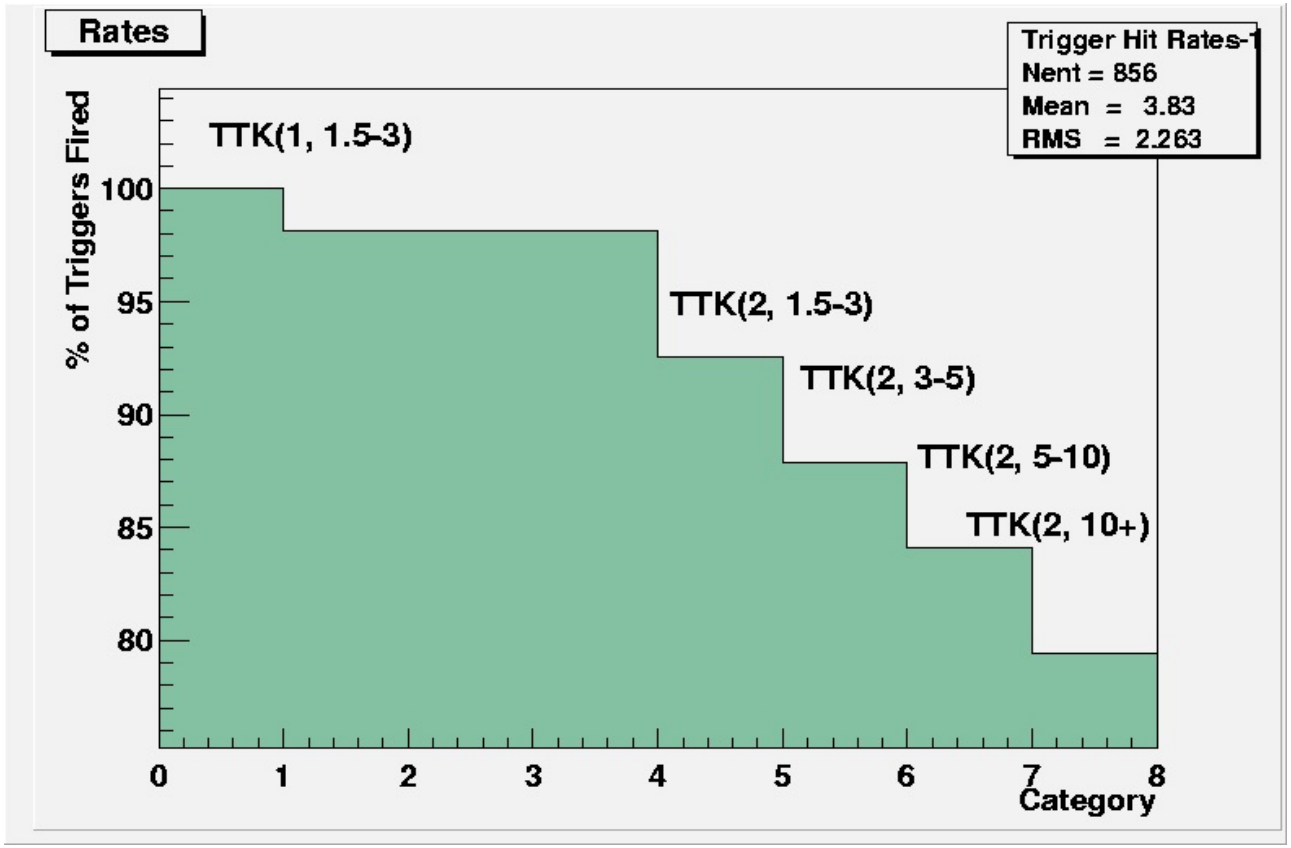
What the CTT finds in the Z Sample





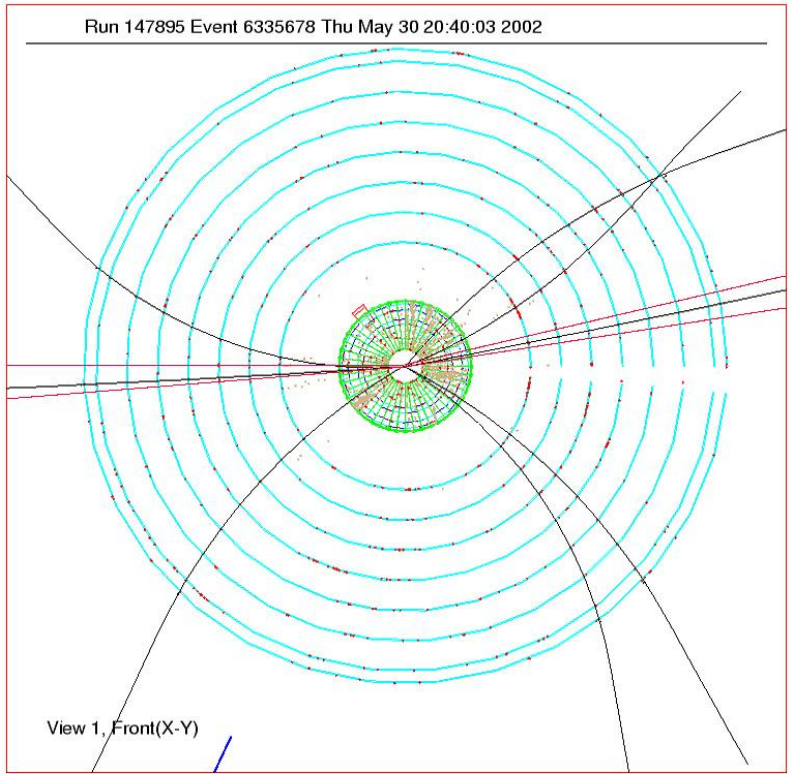
Preliminary studies indicate we have even now good triggering capability with the CTT matched to muons. Looking good !

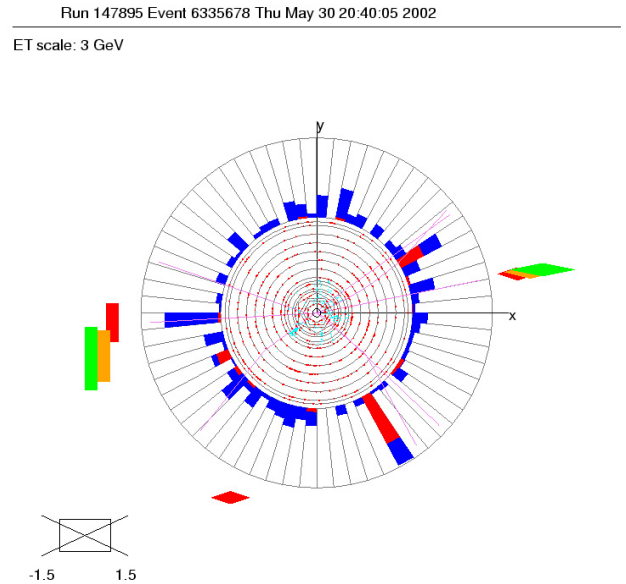
What the CTT finds in the Z Sample



The trigger rates look fine for this study.

Typical Event Tagged from the Sample

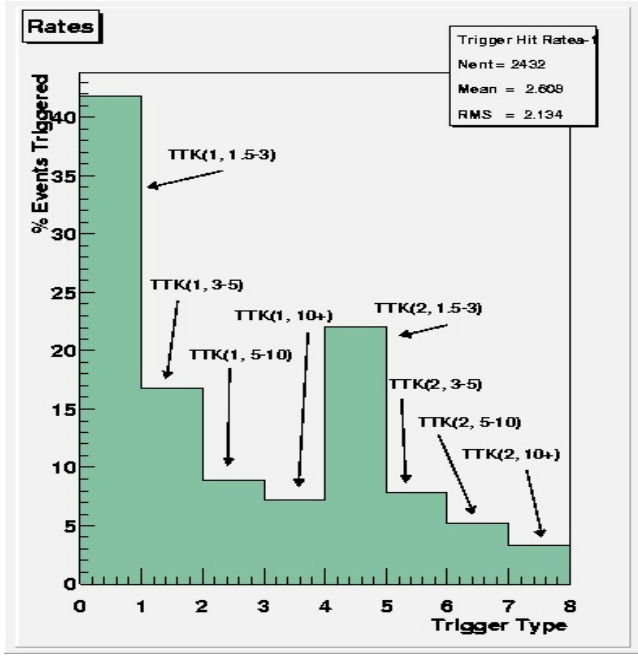


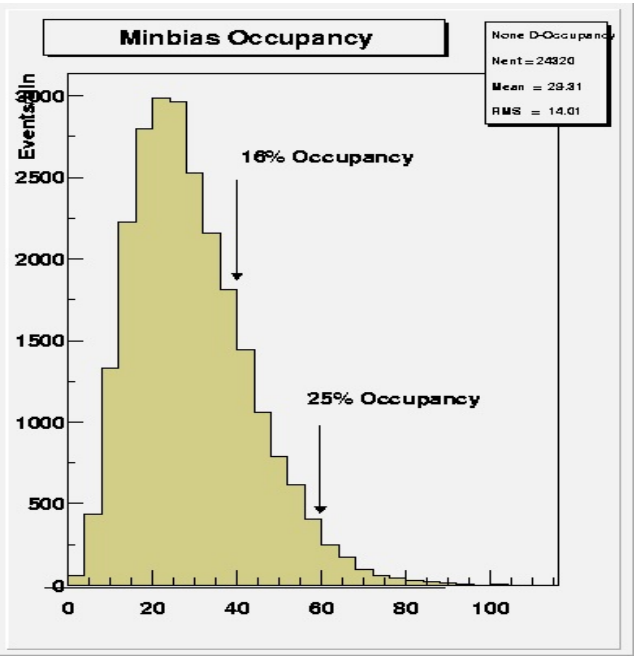


Both high Pt muons are found by the CTT here. This is typical of the events tagged.

What Sort of Background Rate are we Looking at ?

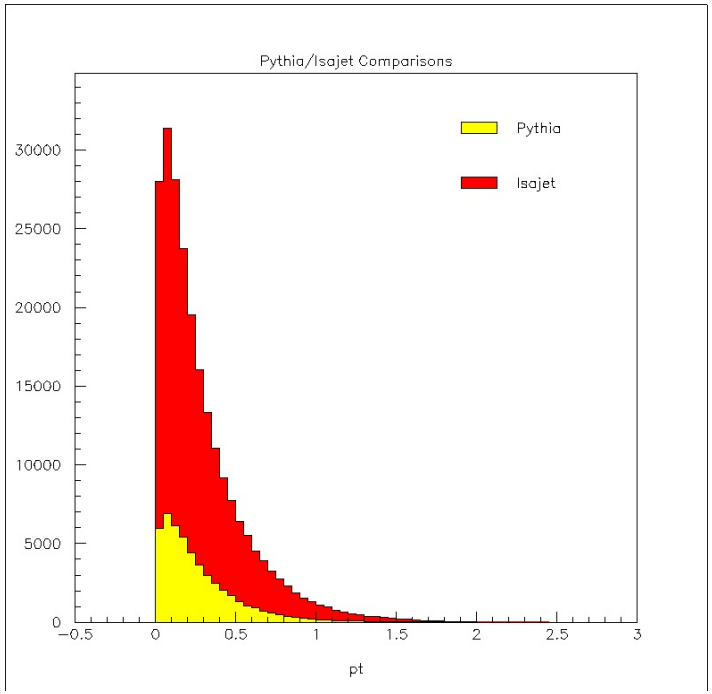
The bad news is the CFT is too noisy to work standalone at the present time (though this is likely to improve rapidly as our understanding of the CFT improves).

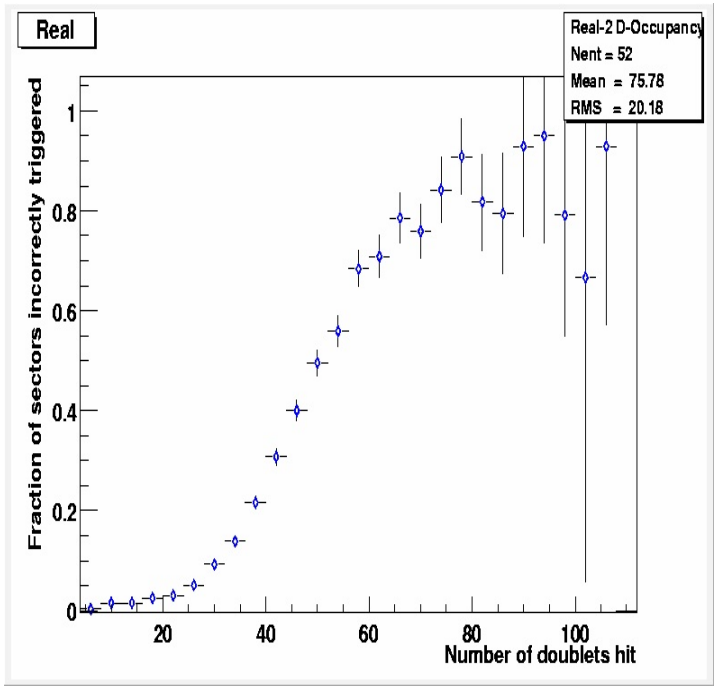




The reason :−Minbias has a huge cross−section (~50 mbarns) & unfortunately likes to fire the CTT as well.

How Many are Really Fake ?

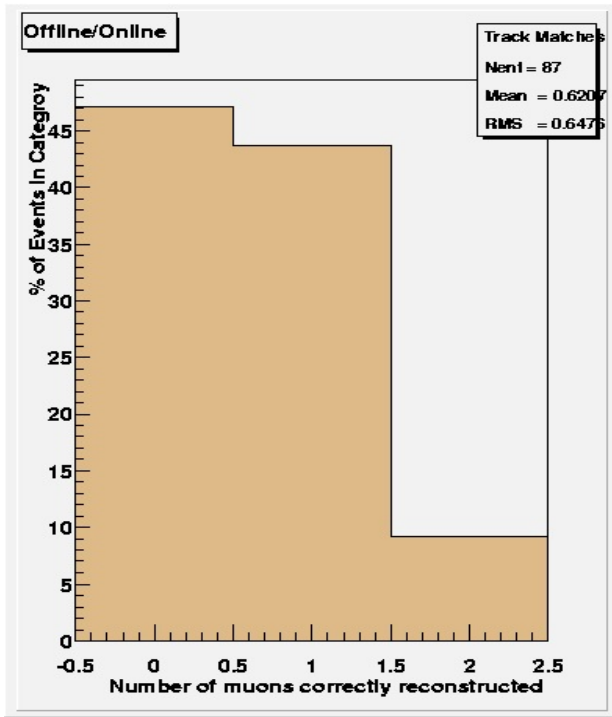


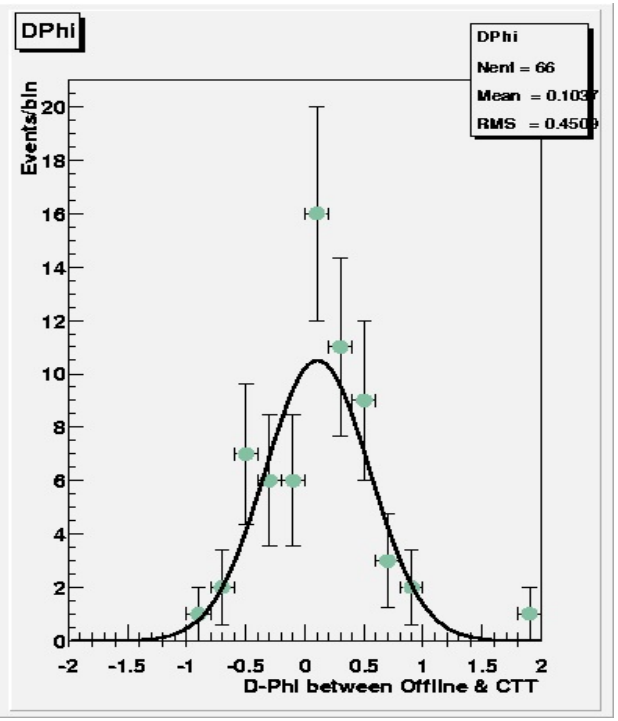


Unfortunately almost all, if the detector gets too noisy the CTT suffers.

The Real Thing (using the VSVX signals)

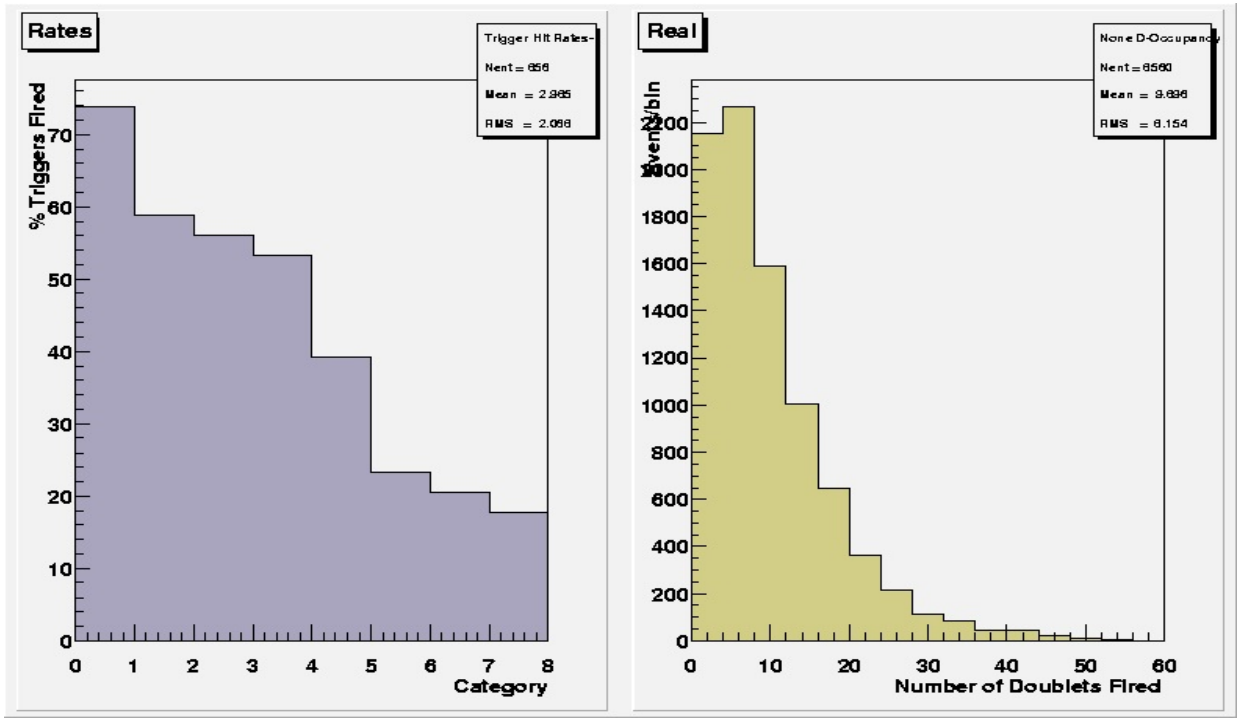
Currently we have the thresholds raised on the SIFT...
but tracks near the adc threshold make it through & fire the discriminator.





The Real Thing (using the VSVX signals)

We still find tracks firing the track trigger. Looks like the SIFT's are producing reasonable output.



Summary & Conclusion

The preliminary studies show it is theoretically possible to form tracks using the track trigger (with VSVX hits).

The CTT will provide a powerful tool to trigger on physics events even on its own.

We expect to turn the SIFT threshold down soon which will give a better idea of how we can expect the trigger to perform. The AFE group has been working hard to eliminate issues in the SVX/ VSVX signals.