Liverpool BTH Meeting

$H \rightarrow ZZ^* \rightarrow 4\mu$ & Cosmic Muon Studies

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Current Status of H→ ZZ* → 4μ Analysis

LiverpoolAnalysis code now in place to run through full analysis chain.

Need to include systematic effects.

Misalignment effects still need to be studied in *HiggsToFourLeptons* group.

Already presented effects of ID misalignments.

MC production jobs for samples with MS and ID-MS misalignments currently running on grid.

Next step…..

Include systematic effects and reproduce results presented in the *HiggsToFourLeptons* CSC note.

See if H→ ZZ* → 4μ analysis could be performed using ID only.

Cosmic Muon Studies

Now studying cosmic data whilst H→ ZZ* → 4μ MC samples run on the grid.

Particularly interested in using cosmics to look for ID-MS misalignments.
(not many people looking at this at the moment).

Data Sample Details

Looking at **80k** events (RPC stream) from **run 91900** (October 2008).

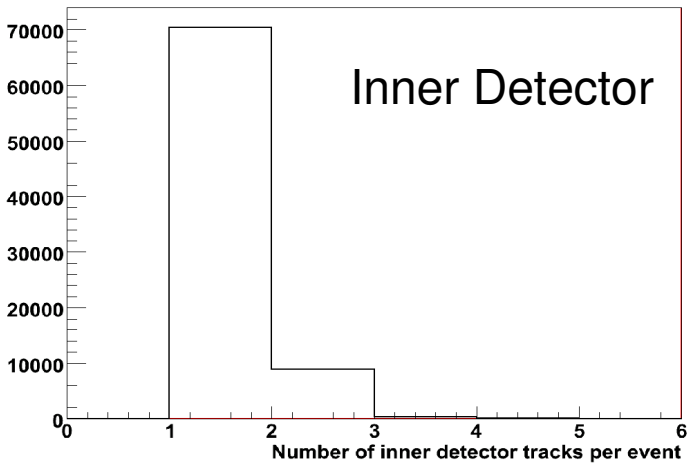
/hepstore/store2/wiglesworth/CosmicData/data08_cosmag.00091900.physics_IDCosmic.recon.ESD_FILTERED.o4_f73/ (~200k Events)

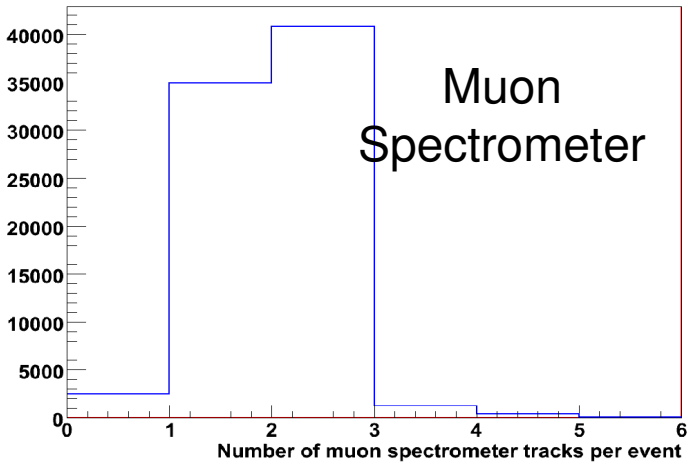
All magnets on at full current. *Almost* all parts of subdetectors fully functional.

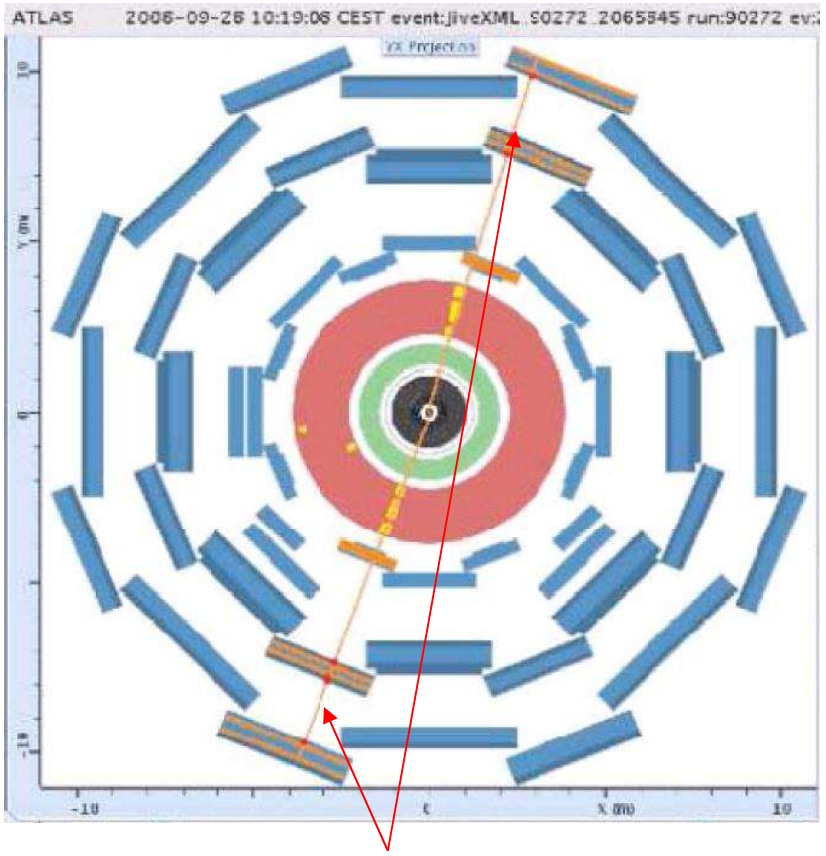
Tracks in the muon spectrometer are reconstructed by *MOORE* algorithm.
(*MOORE* does not extrapolate tracks to the interaction point).

Analysis performed on ESDs using *LiverpoolAnalysis* code.

Reconstruction of ID and MS Tracks

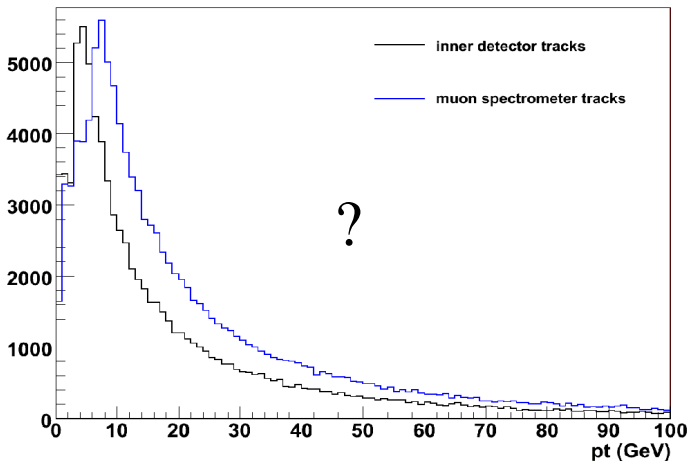


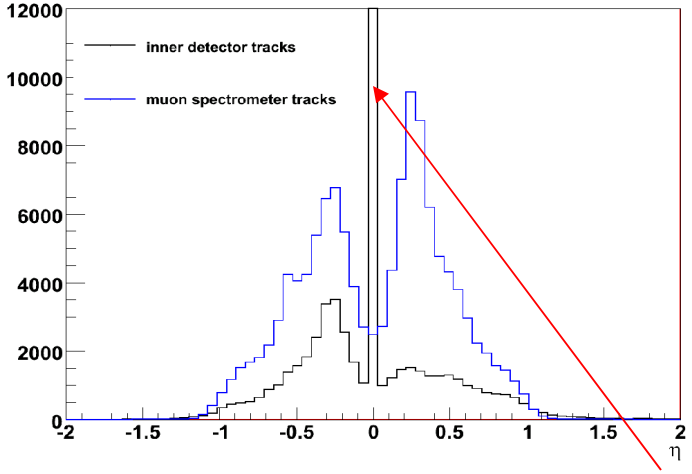




In the muon spectrometer the cosmic tracks traversing the top and bottom are reconstructed as 2 separate tracks

Comparison of ID and MS Track Parameters

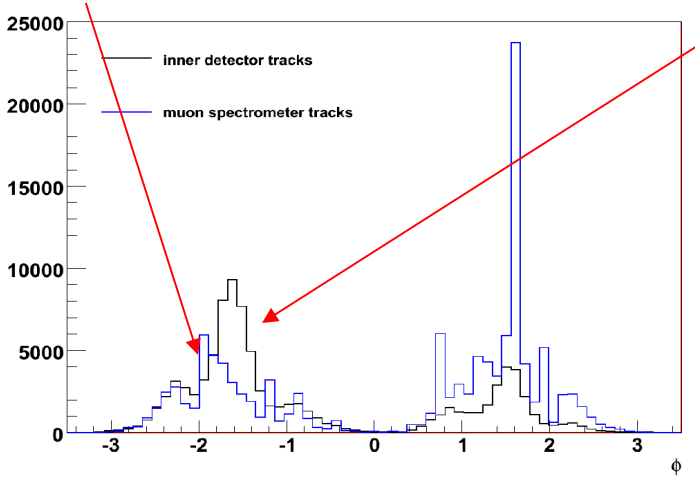


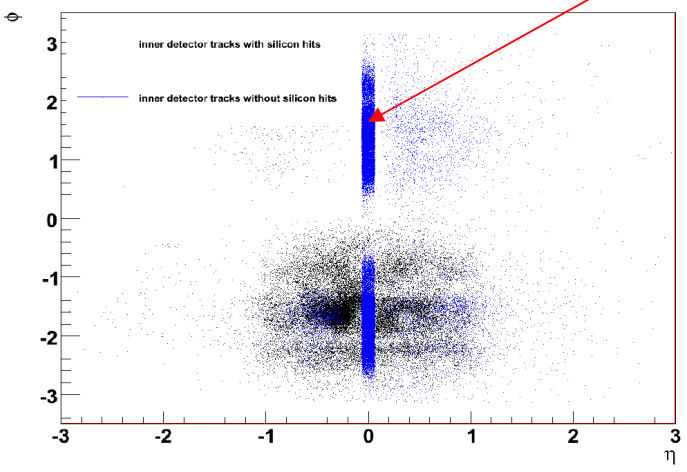


Some μ lost in lower hemisphere

More ϕ<0 tracks in ID

TRT only tracks



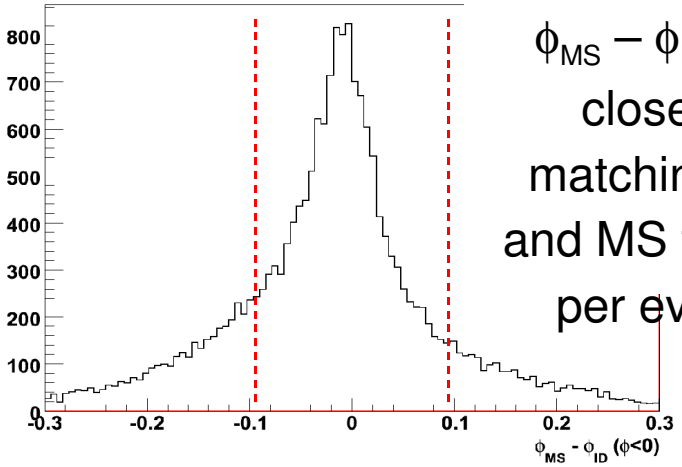


Correlation Between ID and MS Tracks

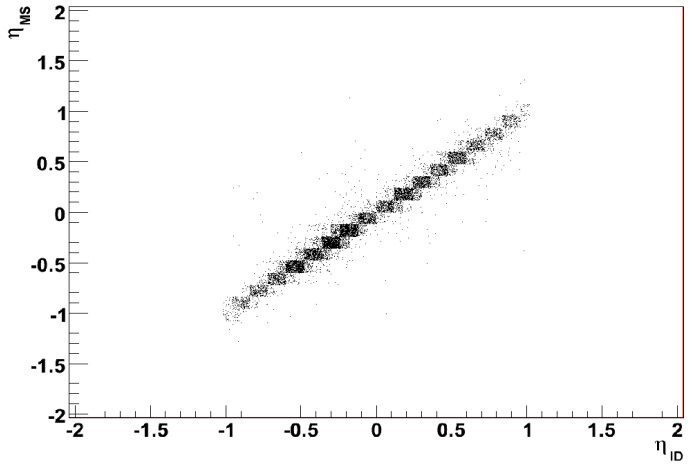
Select ID and MS tracks in barrel region $|\eta|<1$

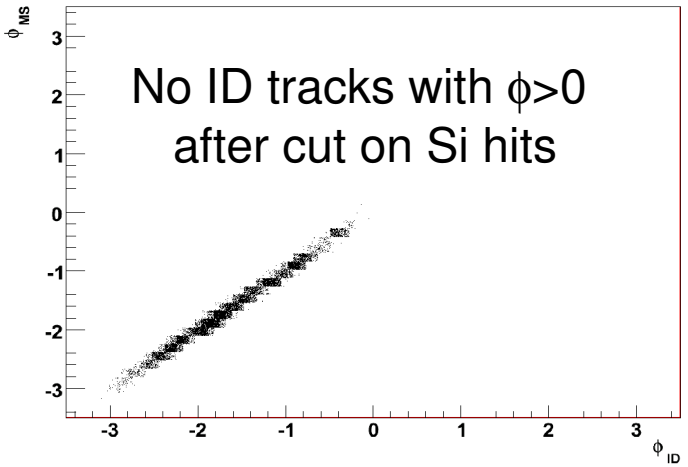
Select ID tracks with at least 1 silicon hit (ie. Exclude TRT only tracks).

Good correlation between ID and MS track parameters



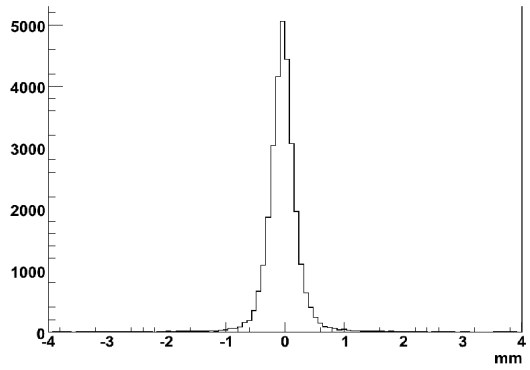
$\phi_{MS} - \phi_{ID}$ for closest matching ID and MS tracks per event



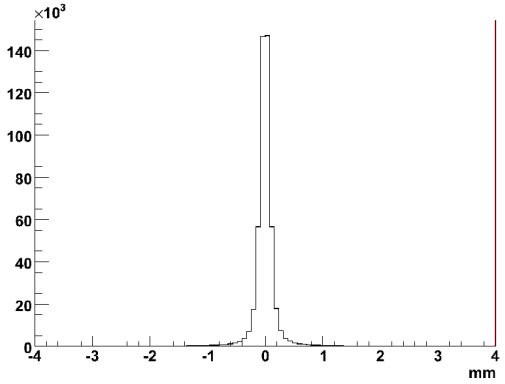


No ID tracks with ϕ>0 after cut on Si hits

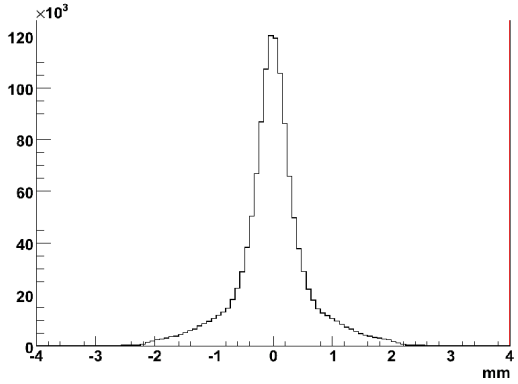
ID and MS Track Residuals



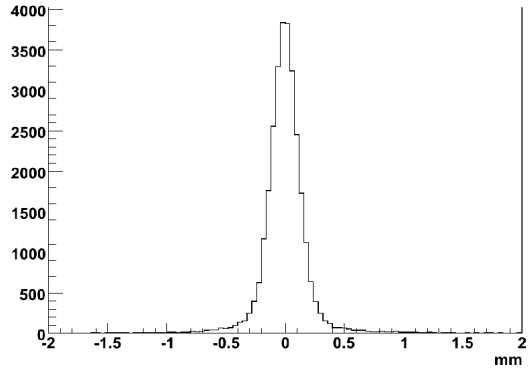
Pixel



SCT



TRT

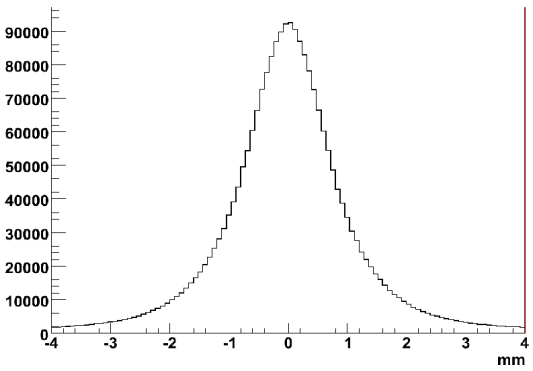


Pixel

Check calculations of track residuals.

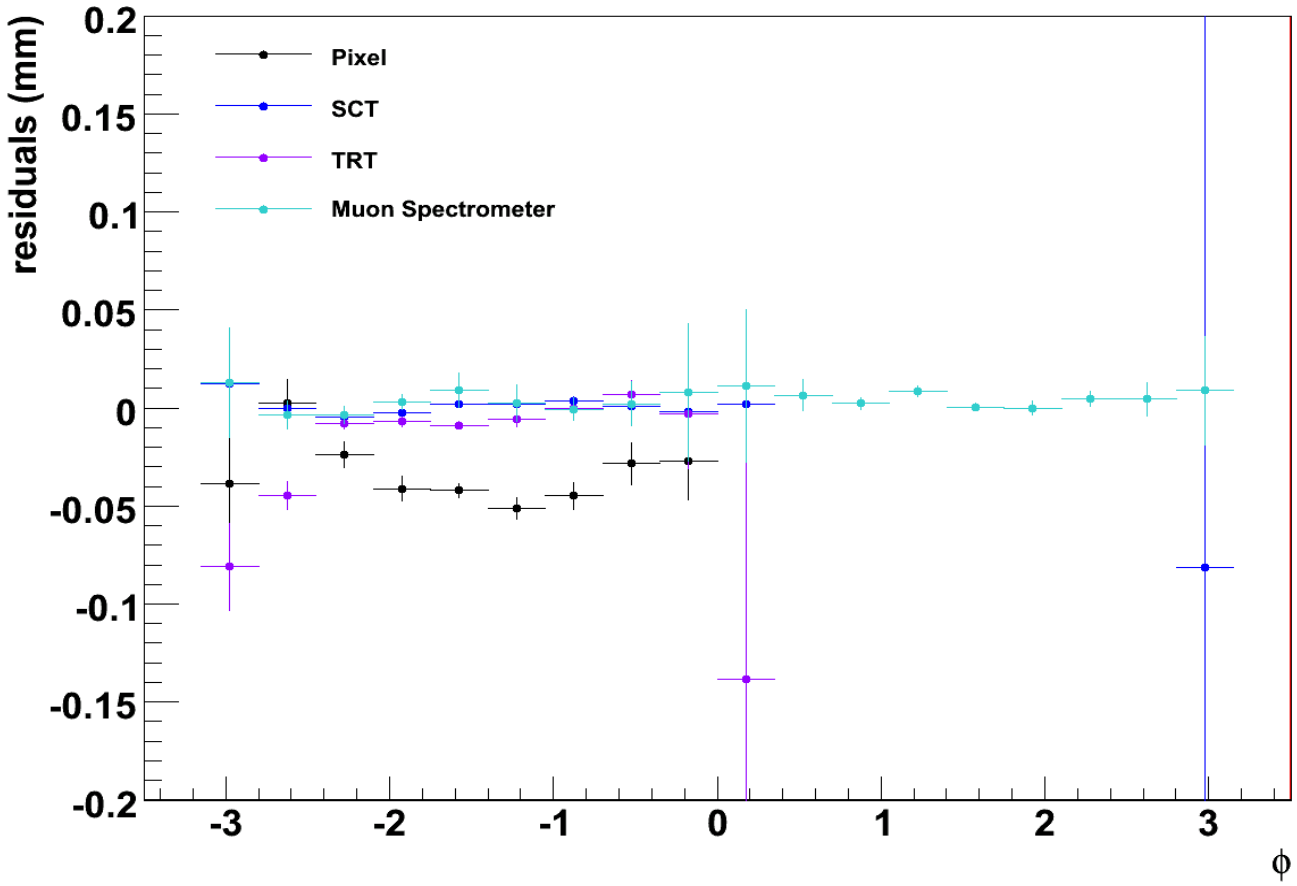
Can then calculate residuals of ID tracks extrapolated to the hits in MS when B=0.

This could be used to look for ID-MS misalignments.



Muon Spectrometer

ID and MS Track Residuals



ID and MS track residuals vs ϕ.

(Would need to apply the same method to the extrapolated ID tracks).