Studies of Muons Crossing a DOM in water

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Muons crossing DOMs in a water tank

- Purpose: to study the signal of muons crossing DOMs in water
- Previous studies have been done of muons crossing DOMs in air, showing a peak in the charge distribution ~70 PE
- No such peak is seen in ice (peak seen previously was mishandled saturated hits)
- A DOM in water is closer to a DOM in ice than a DOM in air

Using the DOM "Glutta" in the water tank at Chamberlin

Muons are tagged by scintillator paddles provided by U. Alabama, PMTs attached to paddles are read out by mainboards for timing/coincidence only





All charge shown is on Glutta Keeping paddles fixed and rotating Glutta

0 Degrees: PMT faces upward







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90 Degrees: PMT faces sideways, away from the upper paddle



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DOM 180 Degrees (Downward Facing PMT)

180 Degrees: PMT faces downward, same as in IceCube



Triple Coincidence Hits



We see a charge peak when PMT faces upwards, but not when facing downward

Both scintillator paddles directly above Glutta



Test of charge with paddles in and out of alignment – Glutta PMT faces downward



The hits are all triple coincidence, meaning that the paddles are tagging muons, and therefore the signal in Glutta in the "not aligned" runs is just noise/random hits

Aligned runs, where the muon is going through both paddles and through/near Glutta, have higher charge

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Sanity check: test of muon crossing DOM in air

- To compare to previous measurements and test our setup, we did another measurement with a DOM in a box, "Wind_Shear"
- Again, triple coincidence hits with the two paddles are shown, charge is from Wind_Shear only

Both paddles above Wind Shear



One paddle above, one below Wind Shear



Comparison to previous measurements of DOM crossing muon in air

