Direct Reco Upgrade Progress – Seeding

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Goals and recap

- Goals:
 - Produce a reconstruction with good statistics (events~1000) will take atleast a week per. Direct Reco master student (2 of those)
 - That is 2 weeks (14 days).
 We have 20 days left before handing in
 - We need to start the reconstruction very soon (during this week in case problems arise)

Realistic seeding

- We use Center of Gravity (COG) for seeding (x,y,z)
- We use SPE Fit for direction (zenith, azimuth)
- Time = 0 for time
- Energy? This presentation!

How we have seeded energy so far (tailored seeding)

- Take the total charge of all events and find the mean of it.
- Use this mean charge to compute a "charge to energy factor":
 - K = Mean_charge/(50 GeV)
- Use this to seed the energy
 - E_seed = total_charge_in_event * K
- Problems?
 - It is specifically tailored to our setup and electron parameters, so it will be extremely good
 - Not realistic!
 - And Direct Reco will not be able to do better

nu_e energy seeding (nu_e seeding)

- Plots for the expected amount of charge measured per energy for nu_e
- Plan:
 - Fit the line
 - Seed the energy by finding the total charge in an event and use this line to get the energy guess
- Problems:
 - There is going to be a loss of energy in hadronic cascade, so we expect an offset in energy



nu_e energy seeding - test

- Tested on the MC data we have for an 50 GeV electron
- Can Direct Reco do better?
 - We expect Direct Reco to be able to improve this by fixing the offset
 - The width is around ~0.2, maybe Direct Reco will improve the width as well
- Problems?
 - Using the Regular IceCube plot, Kasper got insane results of energies ~10⁴
 - Is this really a realistic seed? We know there will be an offset, can we do better?



Find the charge with random parameters (Single E seeding)

- Tried to find a more realistic seeding
- Doing MC sim of an electron with 50 GeV but random (x,y,z,zen,azi)
- Find median of charge (Npulses) and use it to find a "charge to energy factor" similar to "Tailored seeding"



Single E seeding - test

- Tested on the specific MC data that we have previously been recoing on
- Can Direct Reco do better?
 - I expect Direct Reco to fix the offset for this specific setup by some amount
 - The width is very good with ~0.1, not sure Direct Reco can do better than that
- Problems?
 - Maybe still not realistic, since we have fixed energy at 50 GeV when finding the energy, and we would not expect to know that normally



Line energy seeding

- Similar to nu_e, find charge for different energies
- Still using random parameters in DeepCore and Upgrade as before (except energy and time)



Line E seeding - test

- Seeding looks almost the same as previous test (Single E seeding)
- Similar conclusions as before





Line E seeding – Recoing [60 events, 0.8-2.8 hours/event]

- Energy still has problems... Does improve though
- All other parameters improve as well (except X for some reason)



Next steps?

- Choose a energy seeding
 - Either one of the four or something better
- Start the high statistics recoing
- Should try reco of electrons at 10-12 GeV as well