Direct
Reco Upgrade progress

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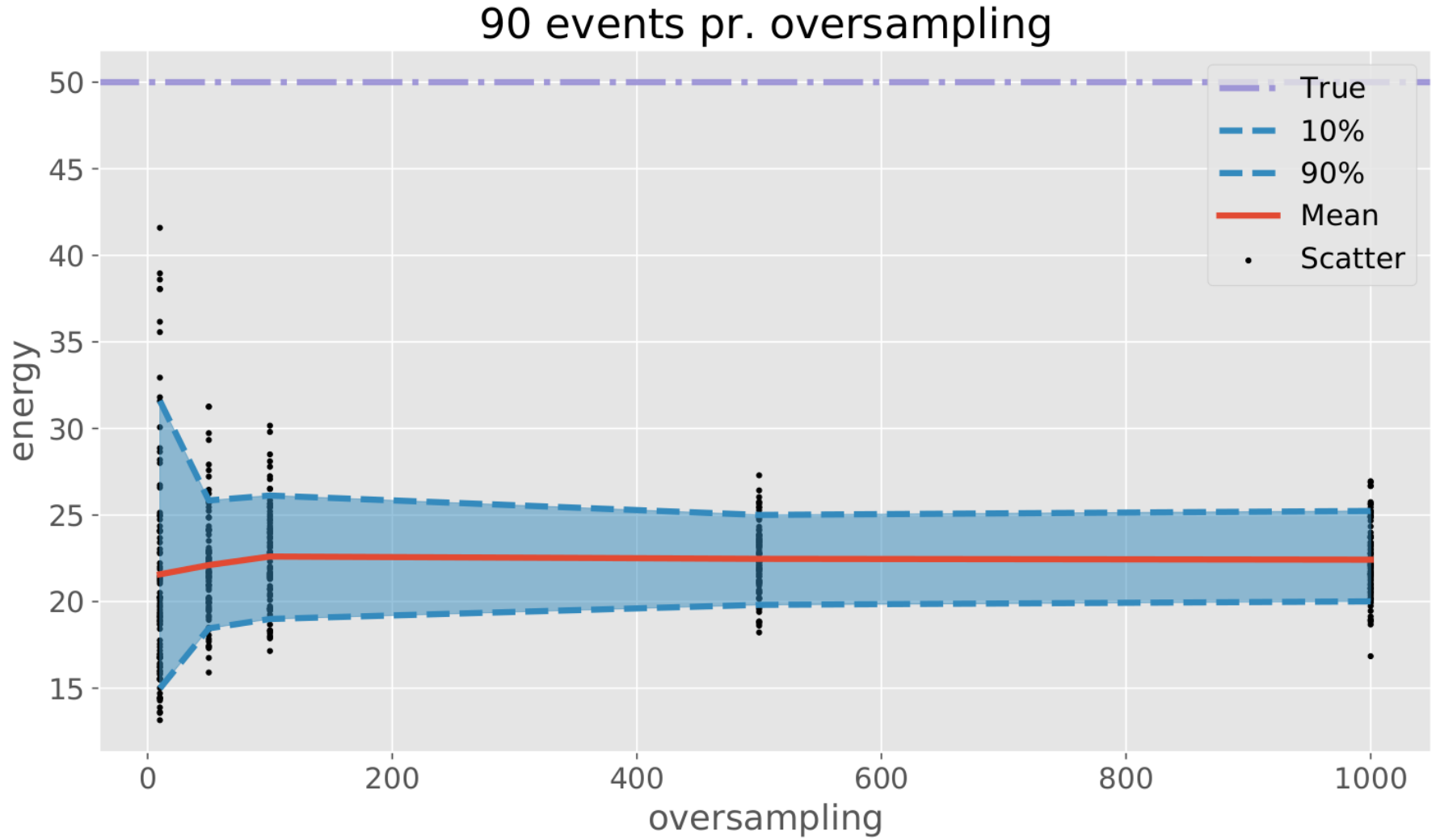
Intro

- The factor of 2
  - We saw a factor of 2 in difference in the amplitudes in the MC data and direct reco data

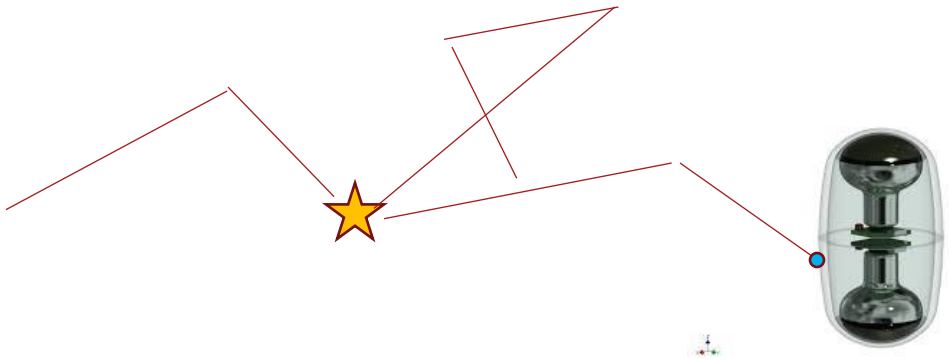
- Directo reco's ability to reconstruct a 50 GeV electron

The factor of 2 in DEggs



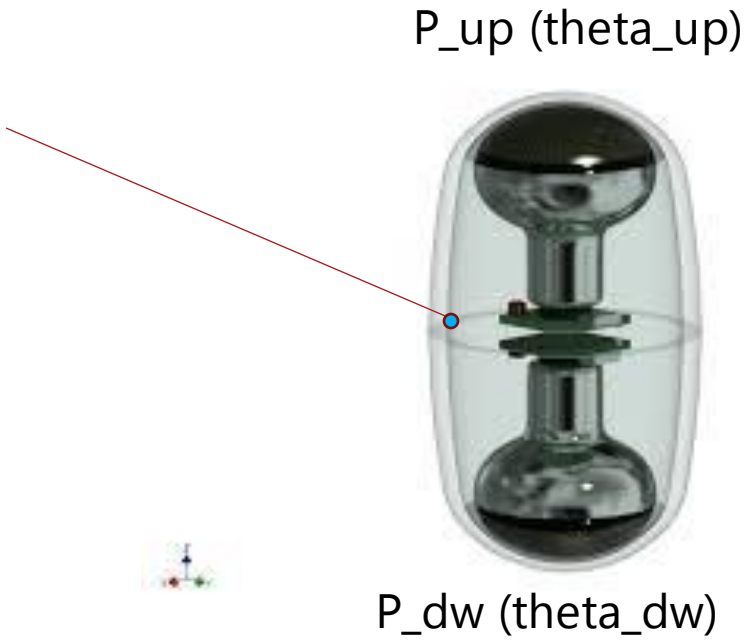
The factor of 2 in DEggs

- The simulation steps:
  1. Event is created. 50 GeV electron in (x,y,z)=(0,0,0), traveling upwards.
  2. Photons are propagated and if they hit a module it is recorded
  3. Recorded photons are set to hit either pmt up or pmt down (this methods differs in MC and direct reco)



The factor of 2 in DEggs

- From the angle of the photon to the pmt normal an angular acceptance is found for both pmt up and down.
- These are the probabilities of hitting either pmt up or down
- MC method:
  1. Draw random number between 0 and 1: r = [0,1]
  2. Check whether photons misses both.
     If (r > **P_up + P_dw): miss**
  3. If it does not miss, check if it hits pmt up
     else if (r< **P_up): add 1 to pmt up**
  4. If it does not hit up and does not miss, it hits down
     else: add 1 to **pmt down**
- Direct Reco method
  1. We just add the probability of hitting up divided by oversampling into pmt up and the same into pmt down
     add P_up/oversampling to pmt up
     add P_dw/oversampling to pmt down
  2. Resimulate same event "oversampling amount of times and do (1) each time



The factor of 2 in DEggs

- Notes
  - This does not happen if the same setup is run with regular DOMs
  - If the method as MC simulation is used in Direct Reco there is no factor of 2

- **For the next slides, the factor of 2 is factored in so Direct Reco matches MC data**

Reconstruction using a const seed

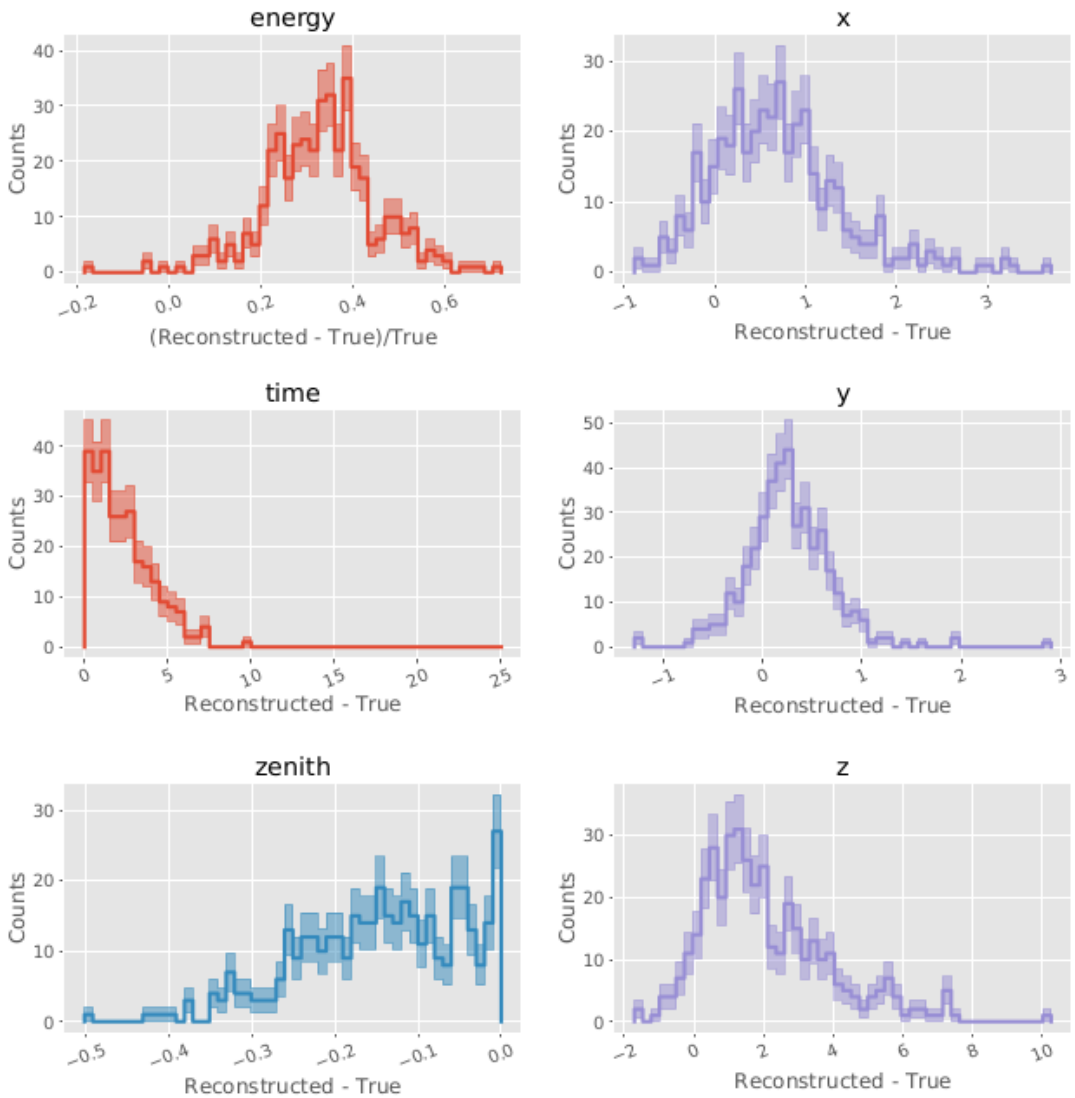
- Kasper showed promising results using a smearing of the seed from the truth particle

- I have now used the same seed for all events, which is not equal the true particle:

Parameter	True particle	Seed	Difference
Energy	50 GeV	60 GeV	10 GeV
Time	9904.68ns	9914.68 ns	10 ns
Position (x,y,z)	(0,0,0)	(5,5,5)	(5,5,5)
Azimuth	0	0	0
Zenith	3.14159....	3.14159...	0

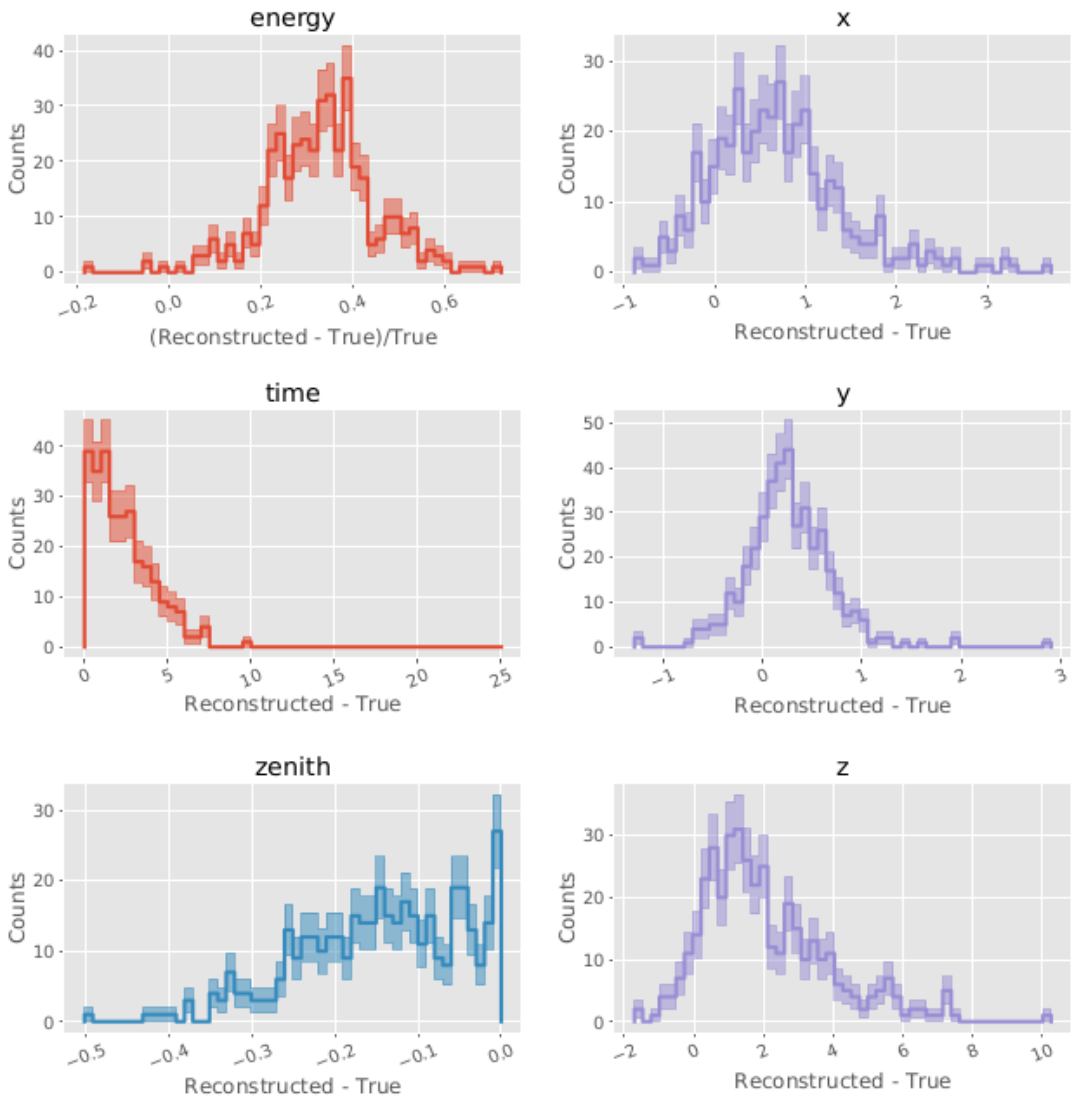
Reconstruction using a const seed

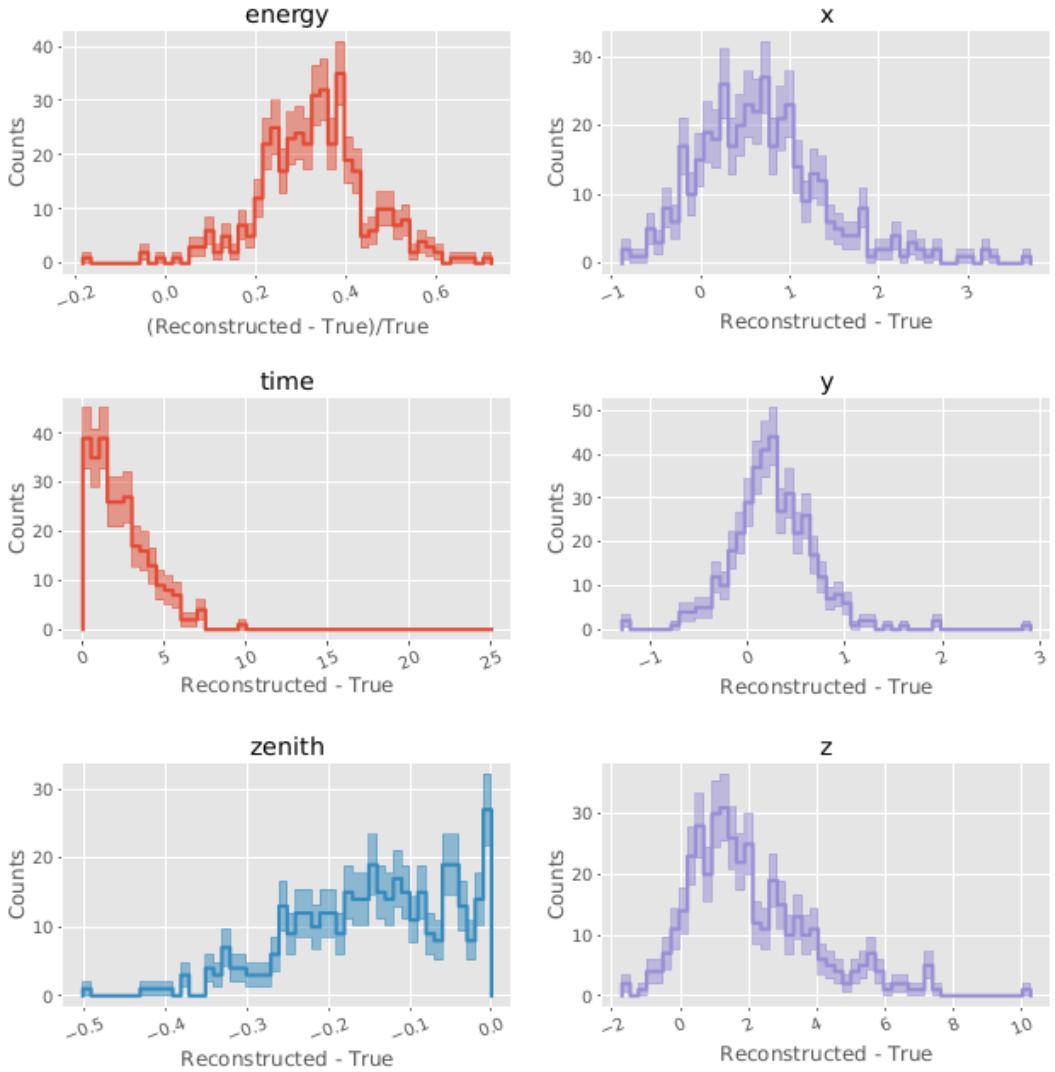
- Based on 400 events with an oversampling of 100



Reconstruction using a const seed

- Based on 400 events with an oversampling of 100
- Doing this with regular DOMs showed similar bad results.





Reconstruction using a const seed

- Increasing the oversampling does not improve the result either

- Kasper is also running now with a constant seed to see if he sees the same bad results