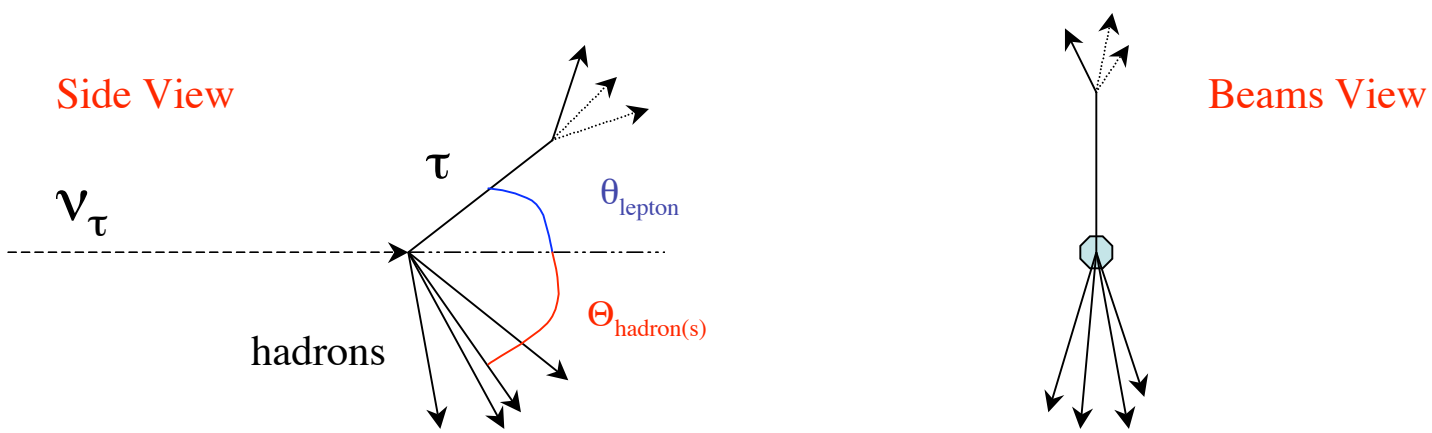
Estimate of Tau Lepton Energy in ν_τ CC Interactions (Update)

-The idea is to use the P_T of the hadronic part of the interaction to estimate the momentum of the tau lepton. This can also be used to estimate the total energy of the event. (In general we know the direction of the τ well.) EM clusters (E > 1.5 GeV)not associated with charged tracks are also used.

-The P_T of the hadronic part is obtained using the emulsion angle of the tracks + the MS estimate for the momentum of the tracks.



Estimate of Tau Lepton Energy …cont.

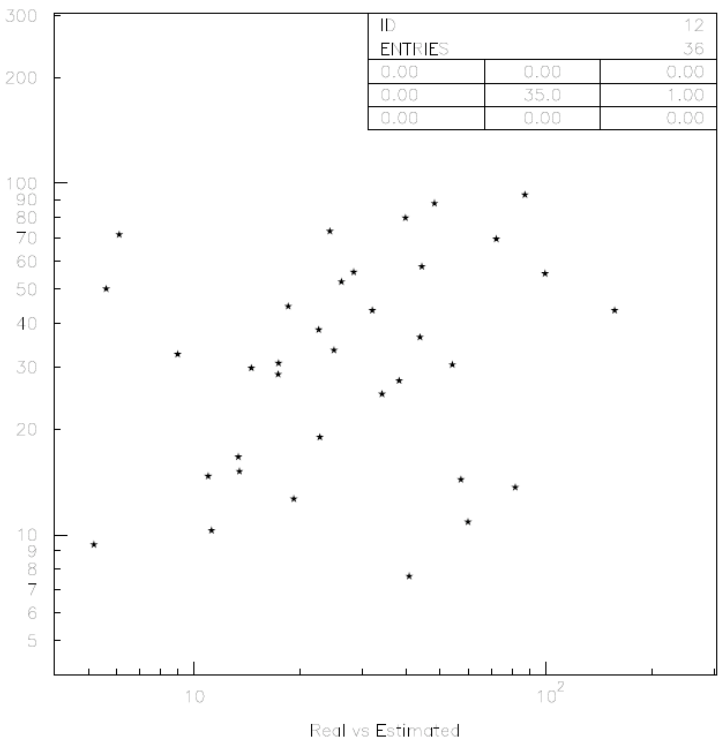
- As a check of this method I will use the located ν_μ CC sample.

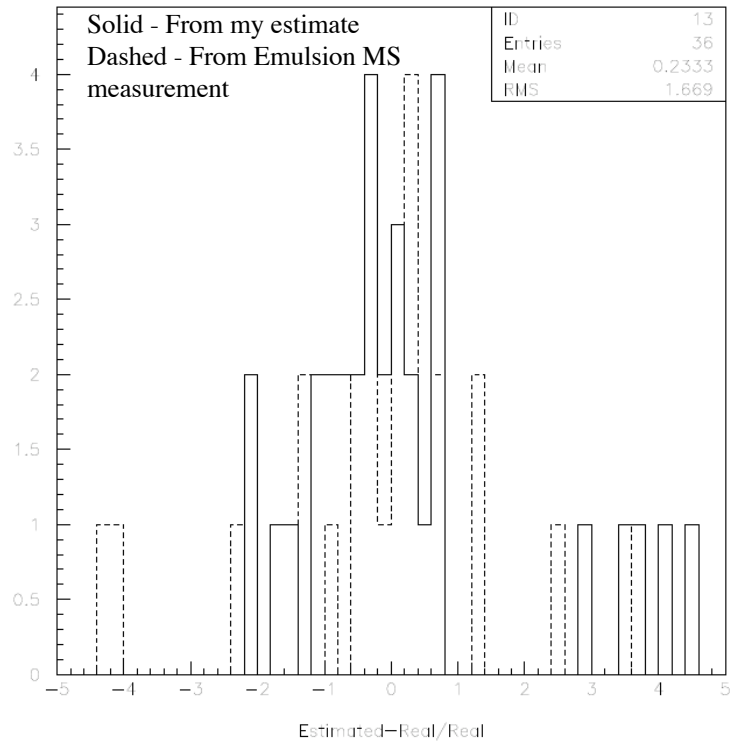
->The muon momentum for these events are generally well known.

1)	Total number of events:	867
2)	Located	583
3)	With reconstructed muon and located	220
4)	Muon momentum < 120 GeV/c and MS file exists	151
5)	With good MS momentum measurement for hadron tracks: # segments >2 and (number charged tracks in event - "Bad tracks") >=2	58
6)	P_T of hadronic recoil > 250 MeV/c in U or V, μ angle > 5mr w.r.t. beam.	46
7)	Hadron P_T direction opposite to muon direction in U or V	36

Estimate of Tau Lepton Energy …cont.

(Real - Muon Momentum measured in spectrometer)





Events that passed all cuts (*i.e.* up to 7)

Example using Tau Event: 3334_19920

ν Direction - U: 0.0024 V: -0.0038 Decay Length(DL)=8.9mm

From MCSMOM file:

```
Parent: 3334 19920 1008 482 4654 0.0064 -0.0401 8 0 0.00 0.00 0.00 0.000 0 0.00 0.00
Daughters: 3334 19920 1 442 1004690  0.0198 -0.0501 1 1 11.6  -3.0    5.9
           3334 19920 1 441 1004946 -0.0015 -0.0485 1 1 15.7  -5.6   17.2
           3334 19920 1 442 1005052  0.0023 -0.0302 1 1  3.2  -0.7    1.1

3334 19920 4001 361 1173 -0.0069 0.0705 1 11 19.48 -8.02 31.92 0.462 0 0.00 45.23
3334 19920 4002 361 1202 -0.0058 0.0178 1 17 5.06 -1.07 1.76 0.231 0 0.00 65.03
3334 19920 4003 361 1680 -0.0309 0.0754 1 9 0.28 -0.06 0.10 0.226 0 0.00 4.13
3334 19920 4004 361 1693 -0.0188 0.0817 1 9 0.94 -0.19 0.31 0.222 0 0.00 9.62
3334 19920 4005 361 1226 -0.0317 0.0875 1 8 15.21 -5.46 16.63 0.428 0 0.00 21.76
3334 19920 4006 361 1376  0.0312 0.0970 1 7 3.78 -0.95 1.76 0.274 0 0.00 14.01
3334 19920 4007 361 1164 -0.0957 -0.2354 1 2 1.26 -0.20 0.30 0.167 0 0.00 1.73
3334 19920 4009 361 1171  0.0015 0.0657 1 11 22.21 -9.14 36.39 0.566 0 0.00 34.20
```

Using my method I get: 116 GeV/c for the momentum of the τ

Compare this value to that using the average impact parameters: 144 GeV/c