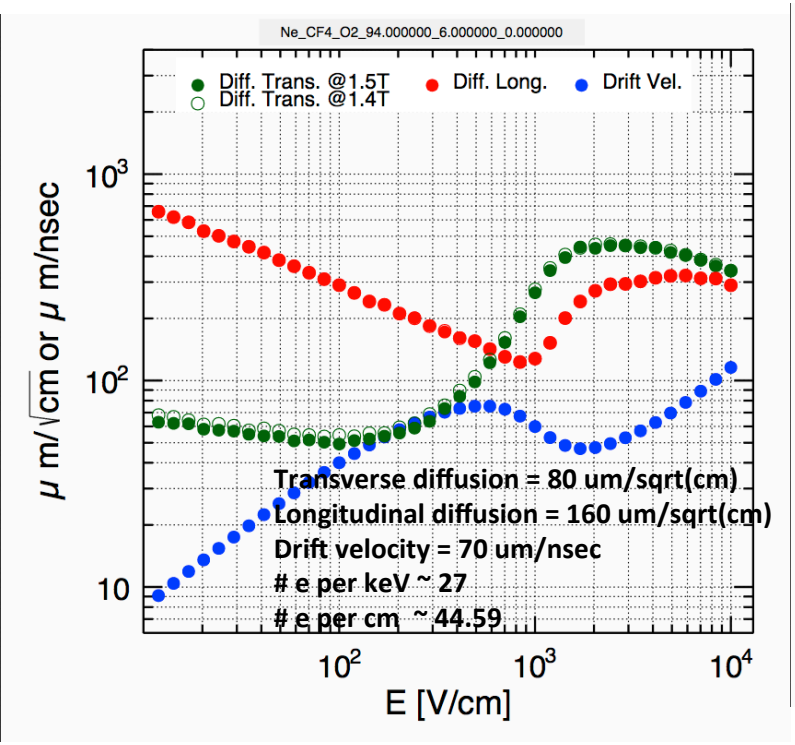
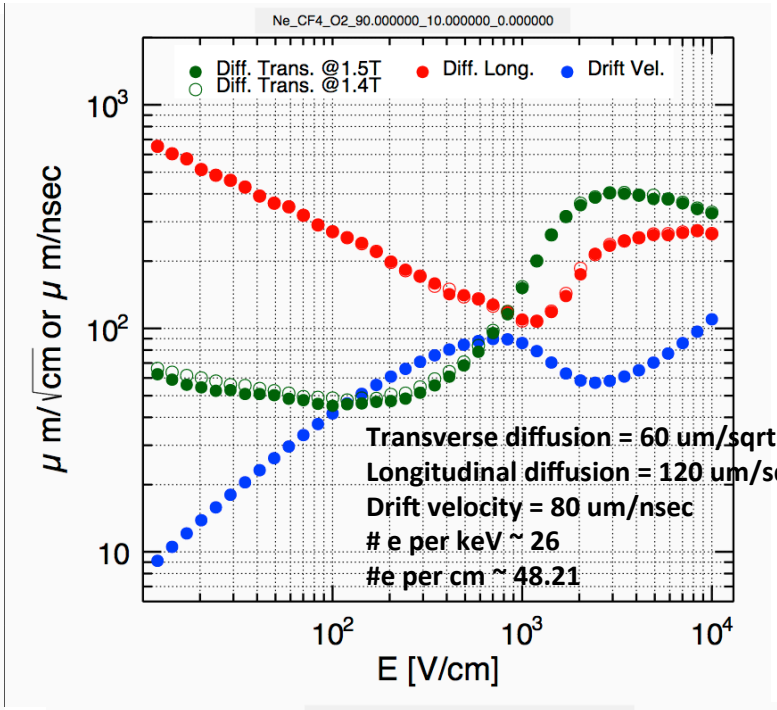
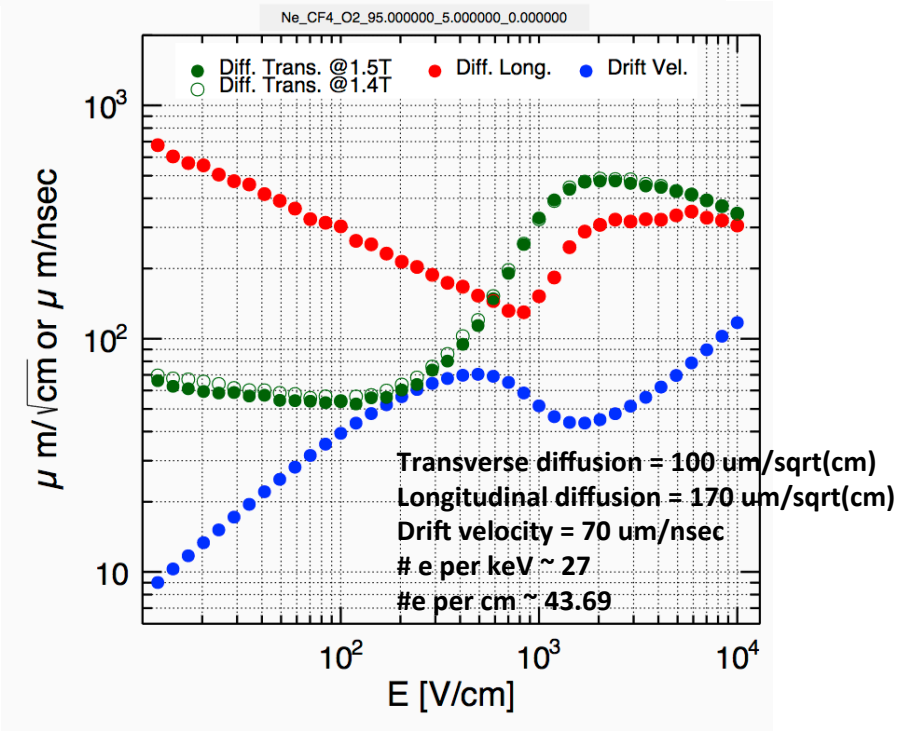
sPHENIX TPC software meeting
9th March 2017

Sourav Tarafdar
Vanderbilt University



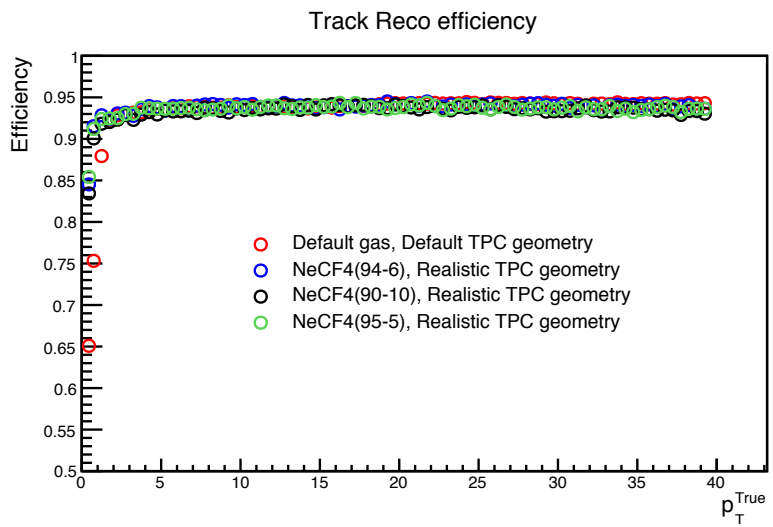


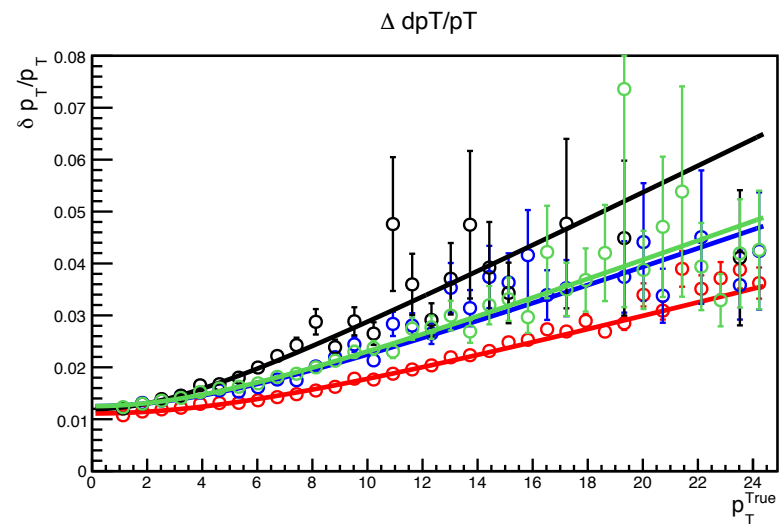
- Operating voltage of TPC = 400 V/cm
- Magnetic field = 1.4 T
- Note that in sPHENIX G4 code the number e per keV is being used and NOT e per cm.

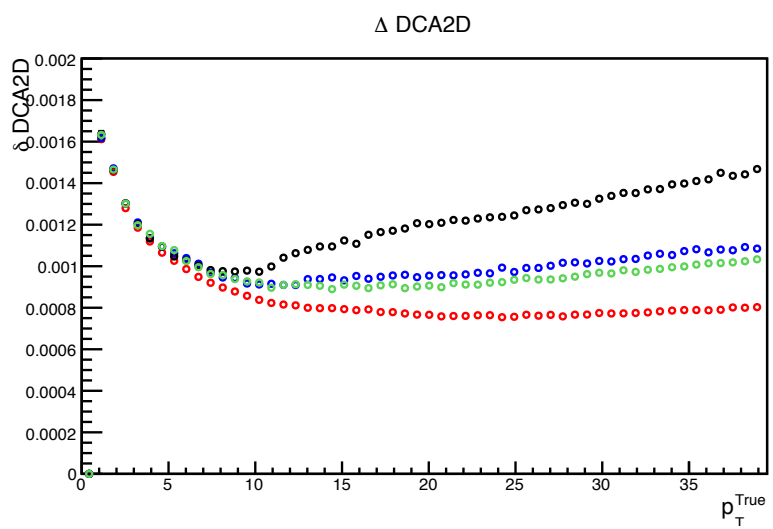


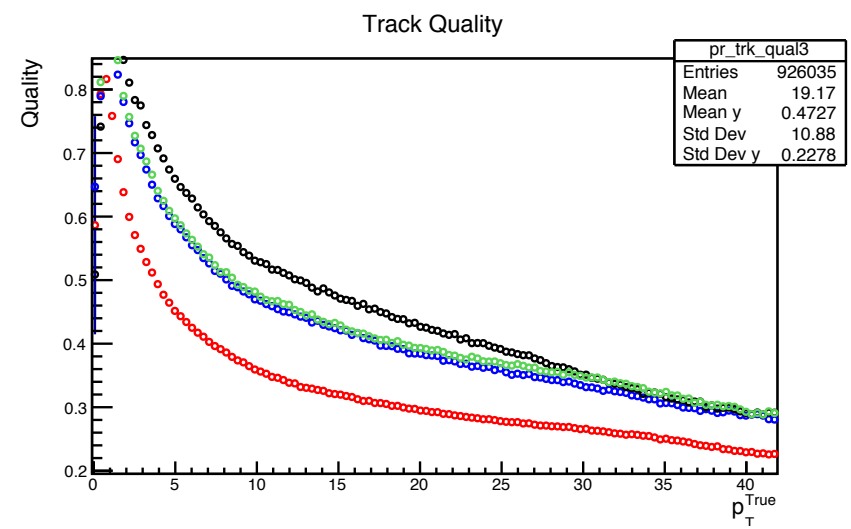
Default TPC geometry : 60 layers , 20 < R < 78 cm , fixed cell size
Realistic TPC geometry : 40 layers, 20 < R < 75 cm, realistic cell size , sPHENIX Github clusterizer

MAPS + IT +TPC :Pure pions









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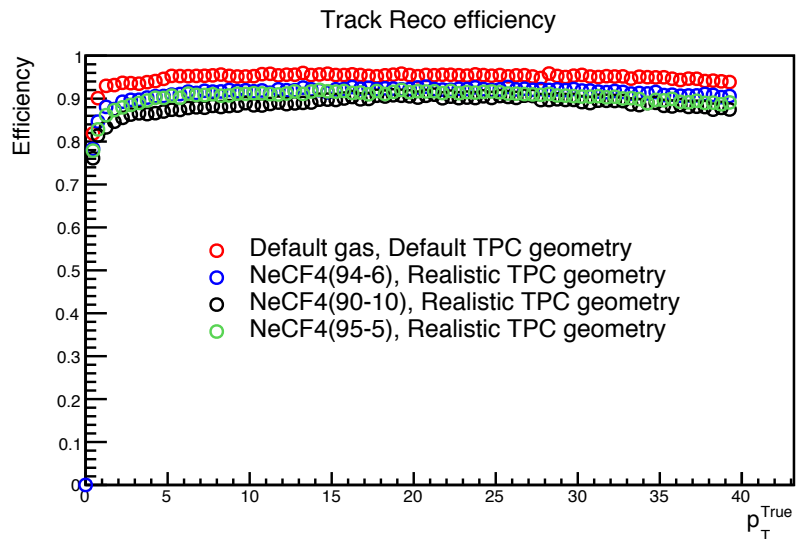
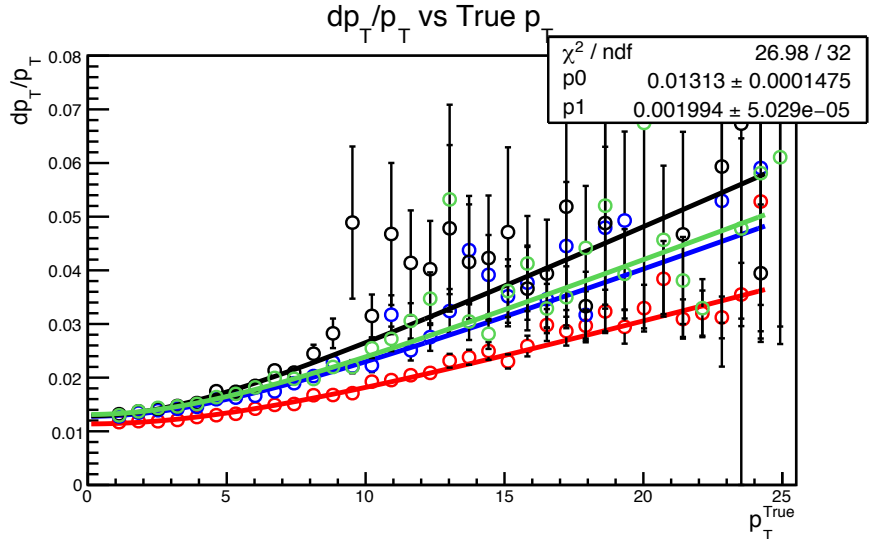
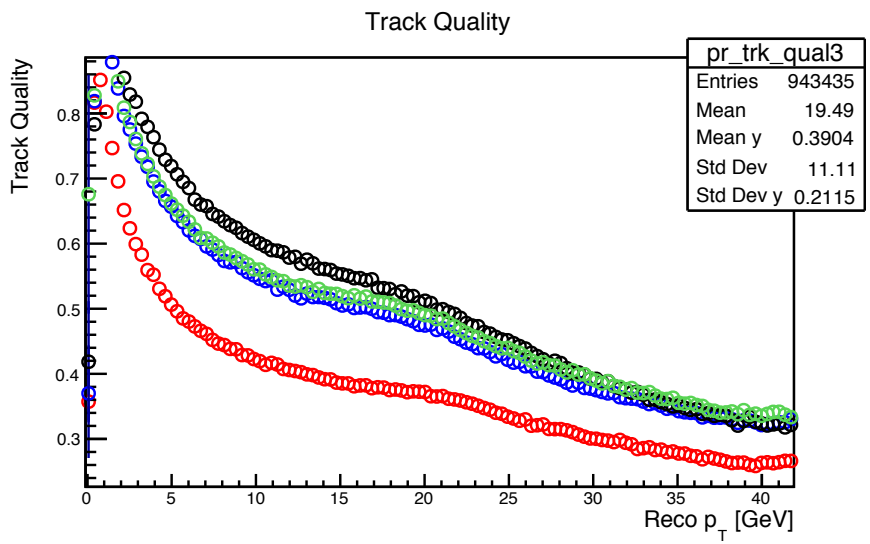
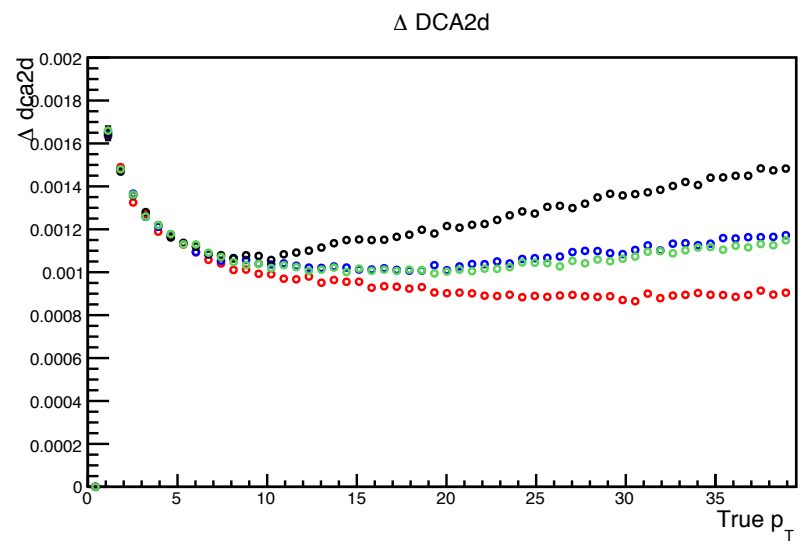
Hijing embedded pions : MAPS(cyl) + ITT(cyl) + TPC









Both NeCF4(94:6) and NeCF4(95:5) can be considered as better candidate than NeCF4 (90:10)

Feasibility of particle identification using TPC

- Very simplistic back of envelope achievable dE/dx resolution for sPHENIX TPC.
- Based on number of primary ionizations and is basically scaling the STAR TPC dE/dx by so called “Figure of merit (FOM)”.
- FOM = sqrt(path length/ionization energy)
- STAR TPC mostly uses Argon with ionization energy of 16 eV while sPHENIX TPC will be mostly Neon based gas with ionization energy of 21.5 eV (Few % of other gas mixture won’t affect much of this ionization energy).
- STAR TPC active volume is 120 cm while for sPHENIX TPC it is 45 cm in R.
- FOM (STAR) = 2.7 , FOM (sPHENIX) = 1.5
- So sPHENIX optimum resolution is about 1.8 times larger than STAR optimum resolution. STAR currently achieves dE/dx resolution of 6-7% , so for sPHENIX TPC we expect dE/dx resolution of ~ 10-11%.
- Point to note that first stage GEM gain will worsen the expected sPHENIX TPC dE/dx resolution.
- Full G4 simulation will provide us more insight into the feasibility of dE/dx using sPHENIX TPC.