How to analysis Muon?

--Muon software

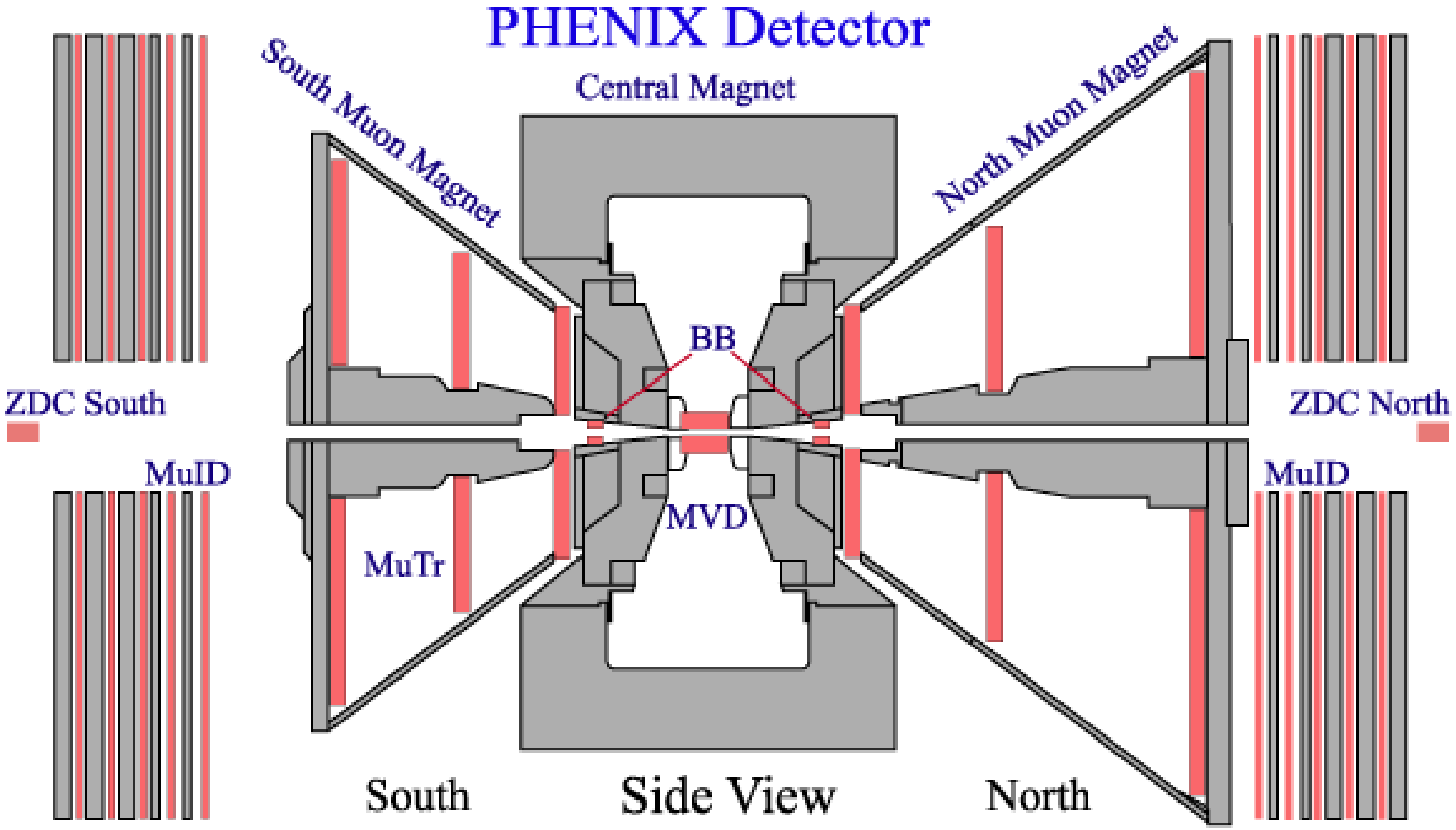
All credit to Muon software developer

Hugo, Melynda, David, Jamie, et al……

outline

- Muon arms overview
- Muon software tutorail
- Real data analysis
  - What do we get from production?
  - How to extract muons from Muon Nanodst?
  - What is in Muon picodsts?
    - Dimuons
    - Sngmuons
- Muon simulations

Muon track + muon identifier



South Muon arm : $-1.2 > \eta > -2.0$

North Muon arm : $2.4 > \eta > 1.2$

Measure charged particle tracks

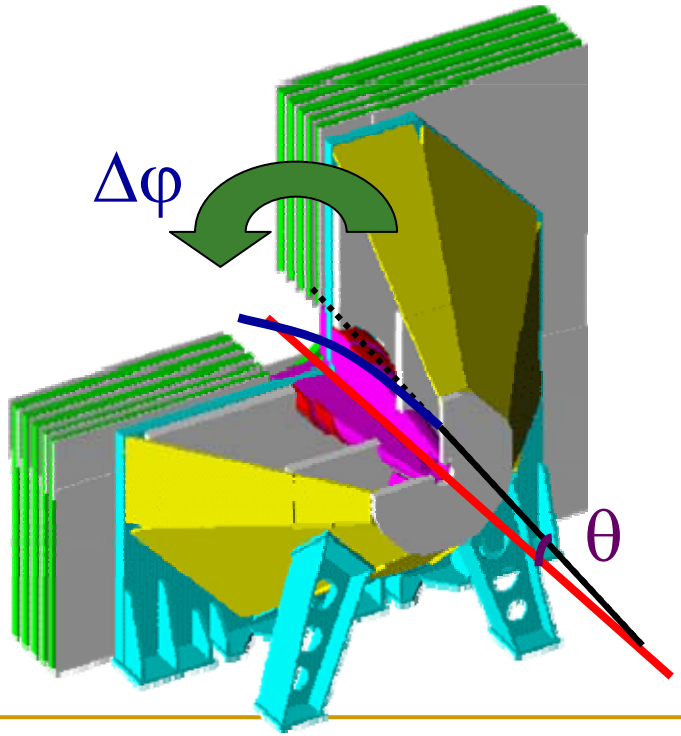
Charged particle bend

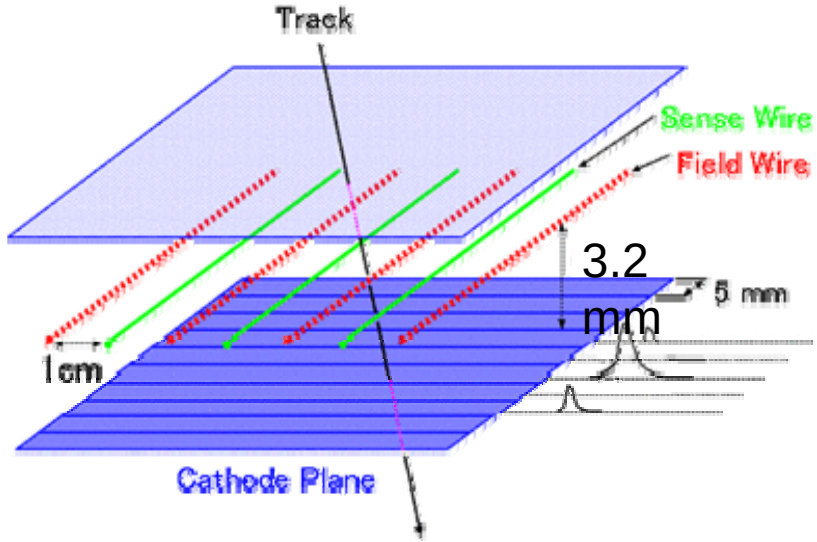
$\Delta\varphi$ (~P_L)

$\Delta\varphi$ & θ: particle momentum

Particles passing through a gap

- Ionization in the gas
- Strips collect induced signal





More detail: vi-nham's run4 mutr focus talk

Useful PHENIX fucus talks

- Run4 Vi-Nham Tram: hadware

http://www.phenix.bnl.gov/WWW/run/04/focus/index_run4

- Run5: Physics analysis

http://www.phenix.bnl.gov/WWW/run/05/focus/index_run5

  - Walt Sondheim: how to design muon arm
  - David silvermy: Jpsi and dimuons
  - Xiaorong Wang: single muons
  - Anuj Purwar: hadron

Muon software tutorial (doxygen)

mutoo + muioo + rpcoo + fvtxoo + …

Class library

https://www.phenix.bnl.gov/WWW/p/draft/hpereira/doc/mutoo/html/

https://www.phenix.bnl.gov/WWW/p/draft/hpereira/doc/muioo/html/

Analysis modules: fun4all modules

https://www.phenix.bnl.gov/WWW/p/draft/hpereira/doc/mutoo_subsysreco/html/

Real data analysis:

- MWG_Minbias
- MWG_Muon: triggered
  - Single muon trigger

MUIDLL1_N1D&BBCLL1 0x00004000
MUIDLL1_S1D&BBCLL1 0x00008000
MUIDLL1_N1S&BBCLL1 0x00010000
MUIDLL1_S1S&BBCLL1 0x00020000

  - Dimuons trigger (lvl2 filtered)

MUIDLL1_N1D1S&BBCLL1 0x00040000
MUIDLL1_S1D1S&BBCLL1 0x00080000
MUIDLL1_N1D&S1D&BBCLL1 0x00100000 (back to back dimuon trigger(run6)
(MUIDLL1_N2D||S2D)&BBCLL1 0x00200000

See Kenichi's SpinFest EmCal talk, to see how to extract trigger information.

How to extract muon from Nanodsts

DST node: PHMuoTracksOO (PHIODataNode)

Get Node:

```
muoo = findNode::getClass<PHMuoTracksOut>(top_node,"PHMuoTracksOO");
if (first && !muoo) cout << "MWGpico::GetNodes - PHMuoTracksOO (new framework) not in Node Tree" << endl;
```

Library: offline/packages/MWGpico/MWGpico.C

/singlemuons

/dimuons

Macros:/direct/phenix+u/xrwang/spinFestTutorial/data_macros

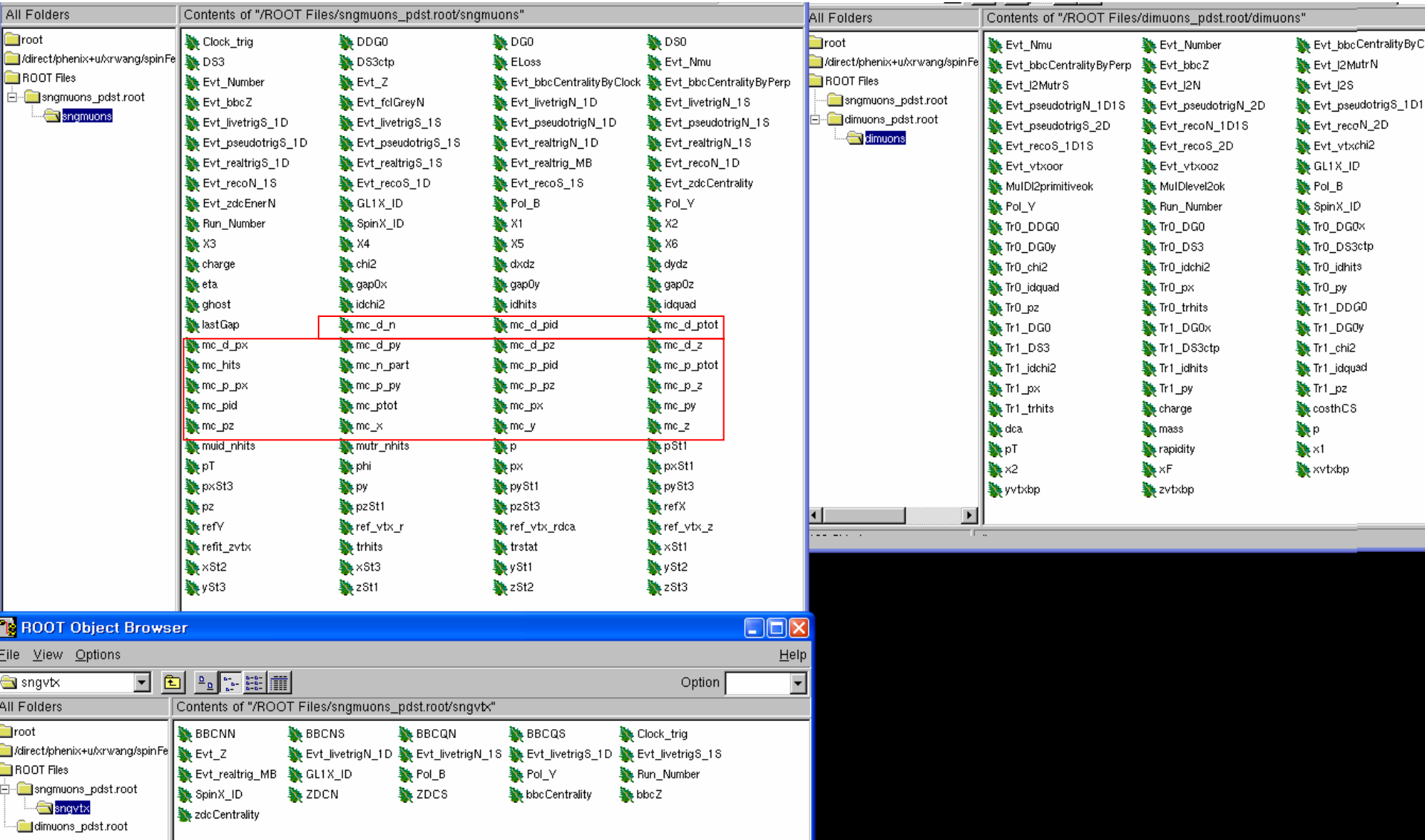
Fun4Muons_RecoNDST.C

```
MWGpico *picoDST = new MWGpico(choice,"RCF");
picoDST->set_nano_file( inputfile );
picoDST->MakePico("dimuonsOO", outputfile_dimuons );
picoDST->MakePico("sngmuons", outputfile_sngmuons );
```

Output: sngmuons_pdst.root and dimuons_pdst.root

Inside sngmuons_pdst.root and dimuons.root

- Dimuons_pdst.root: dimuons,
- Sngmuons_pdst.root : Sngmuons, Sngvtx



Simulations

/direct/phenix+u/xrwang/spinFestTutorial/sim_macros

Fun4Muons_Pisa.C:

from PISAEvent.root to sim_dst.root

SubsysReco *Muon_pisa = new MuonUnpackPisa();

***Making modifications**

***Changing the Muid efficiency in the response, HV map applied here**

Fun4Muons_RecoDST_sim.C:

from sim_dst.root to nanodst or picodst