Panda Computing Week
23-27th July 2012
Torino

Forward Tracking

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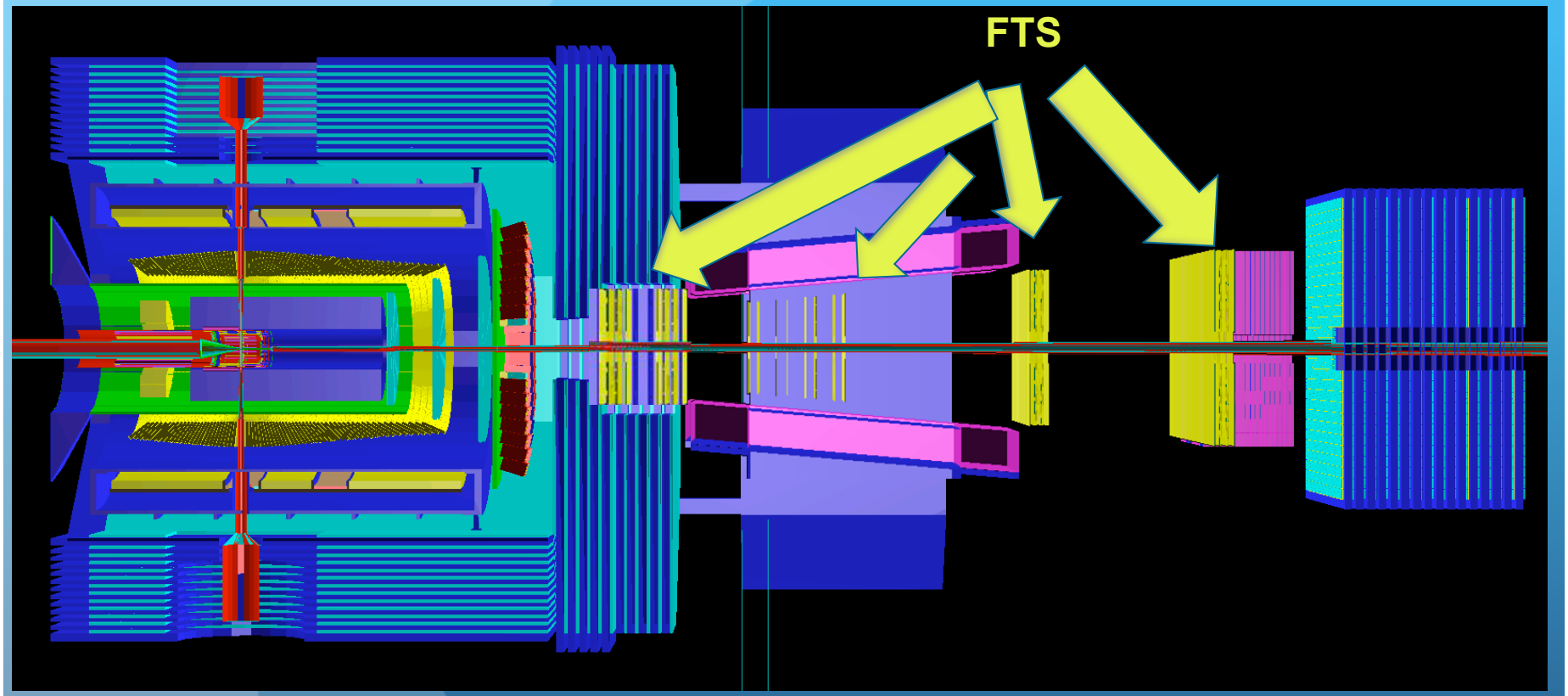
Outline

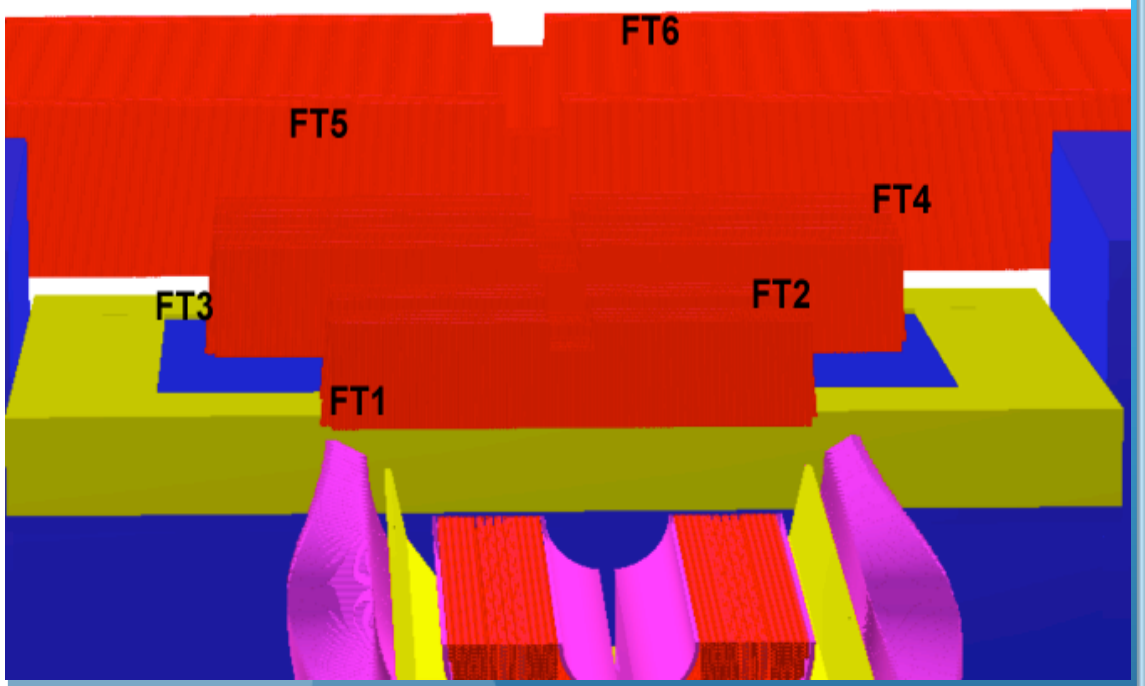
- ✓ Geometry
- ✓ Simulation
- ✓ Pattern recognition

Geometry



6 chambers:
two before, two inside and two after the dipole magnet

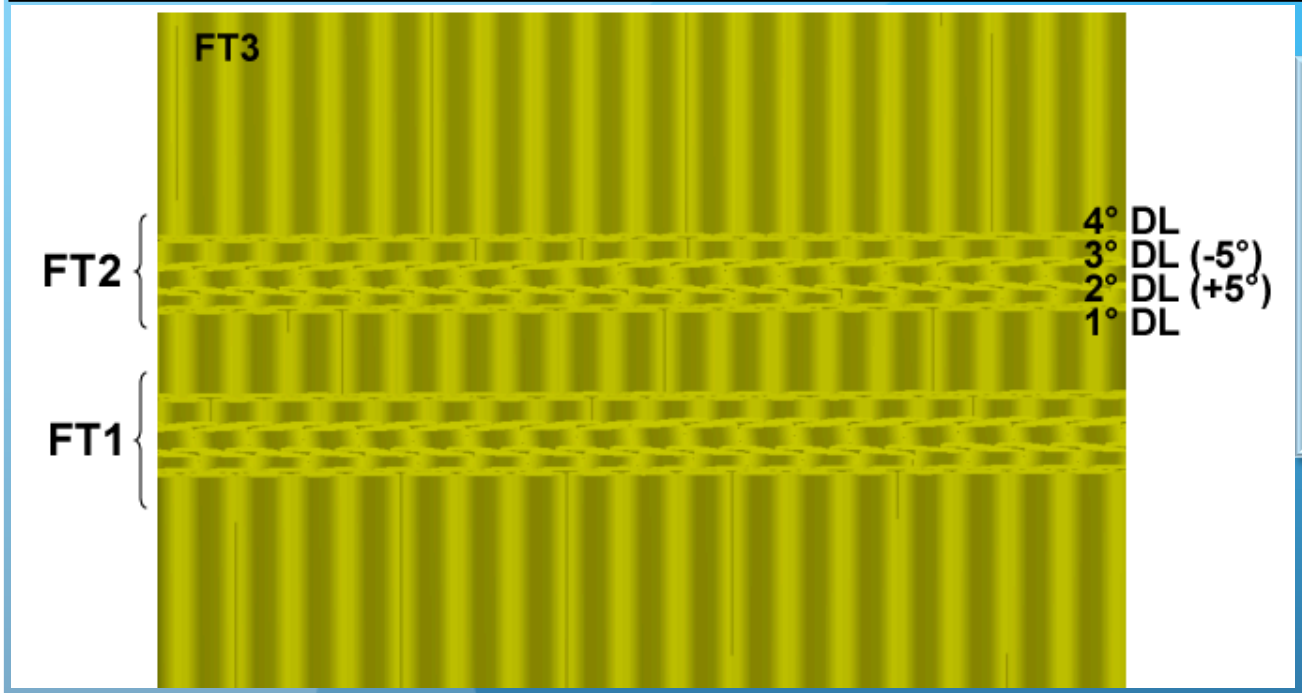
Geometry



- 4 double layers for each chamber → 24 double layers.
- For each double layers there are two planes. The double layers have different dimensions and distances.
- The second and the third double layers are inclined of ±5° (the central planes of each chambers).

- The hole for the beam pipe is squared, inclined and different for each double layers;

Geometry



The second and the third double layers are inclined of ±5° (the central planes of each chambers).

Properties of straws:

Straw diameter: 10.1 mm
Tube wall: 0.03 mm Mylar
Sense wire diameter: 0.02 mm (W)
Gas filling: 90% Ar + 10% CO_2 at 2 bar

Geometry

Tracking station	Double layer	Straw inclination	Number of modules (straws)	*z*-coordinate [mm]	Active area	
					w [mm]	*h* [mm]
FT1	1	0º	8 (2x128)	2954	1297.9	640
	2	+5º	8 (2x128)	3004	1358.8	640
	3	-5º	8 (2x128)	3054	1358.8	640
	4	0º	8 (2x128)	3104	1297.9	640
FT2	1	0º	8 (2x128)	3274	1297.9	640
	2	+5º	8 (2x128)	3324	1358.8	640
	3	-5º	8 (2x128)	3374	1358.8	640
	4	0º	8 (2x128)	3424	1297.9	640
FT3	1	0º	12 (2x192)	3945	1944.3	690.3
	2	+5º	12 (2x192)	4019.75	2013.2	703.4
	3	-5º	12 (2x192)	4165	2015.4	728.8
	4	0º	12 (2x192)	4239.75	1944.3	741.9
FT4	1	0º	12 (2x192)	4385	1944.3	767.3
	2	+5º	12 (2x192)	4459.75	2020.0	780.4
	3	-5º	12 (2x192)	4605	2022.2	805.8
	4	0º	12 (2x192)	4679.75	1944.3	818.9
FT5	1	0º	25 (2x400)	6075	4045.1	1180.0
	2	+5º	25 (2x400)	6125	4163.7	1180.0
	3	-5º	25 (2x400)	6175	4163.7	1180.0
	4	0º	25 (2x400)	6225	4045.1	1180.0
FT6	1	0º	37 (2x592)	7475	5984.3	1480.0
	2	+5º	37 (2x592)	7525	6136.6	1480.0
	3	-5º	37 (2x592)	7575	6136.6	1480.0
	4	0º	37 (2x592)	7625	5984.3	1480.0

- All the dimensions and distances were decided on December 2009.

- Simulation of all the tubes: 13056

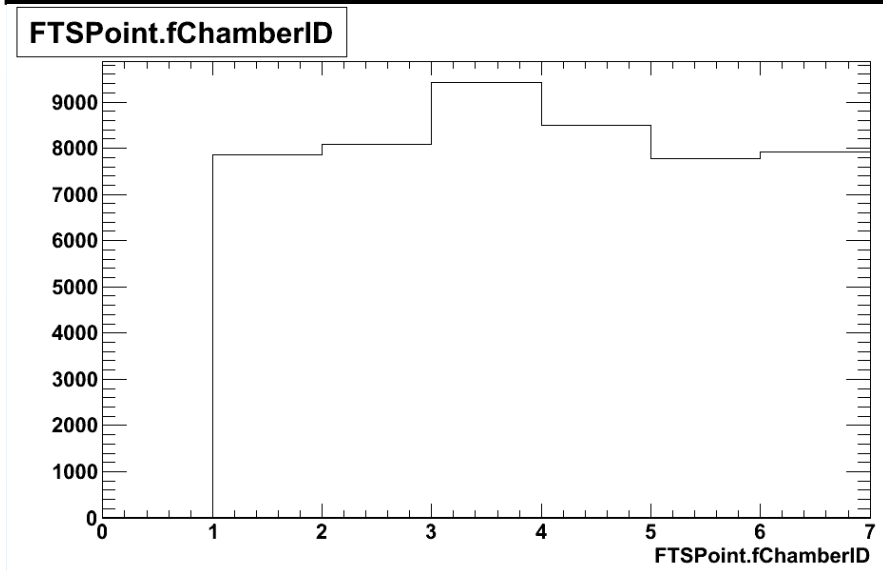
Simulation (run_sim.C)

Detector identification: chamberID, layerID, tubeID

Simulation parameters:

- 1000 muons events simulated with BoxGenerator
- p = 1 GeV/c
- ϕ range: [0°- 360°]
- Uniform distribution in cosθ
- θ range: [1°- 5°]
- Beam momentum: 15 GeV/c

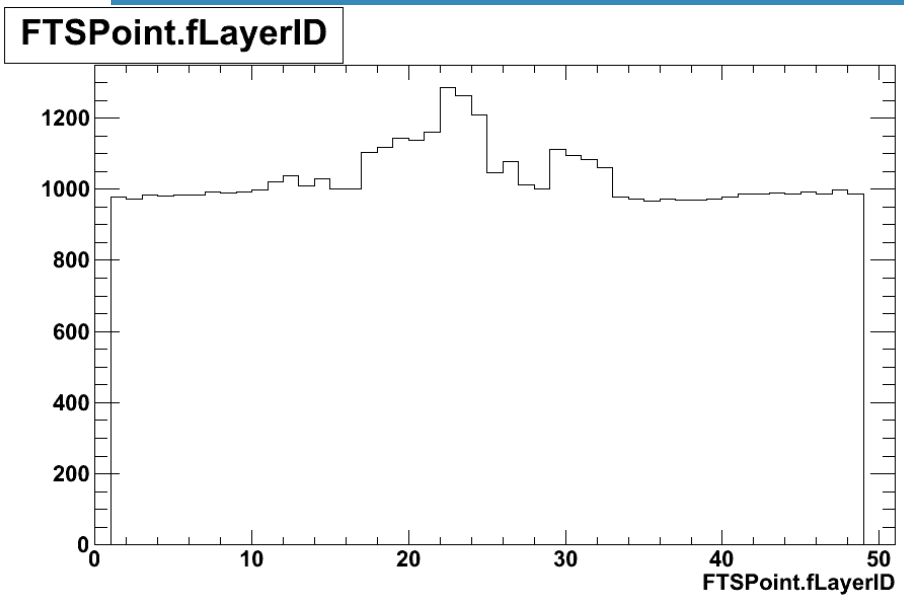
Simulation (run_sim.C)



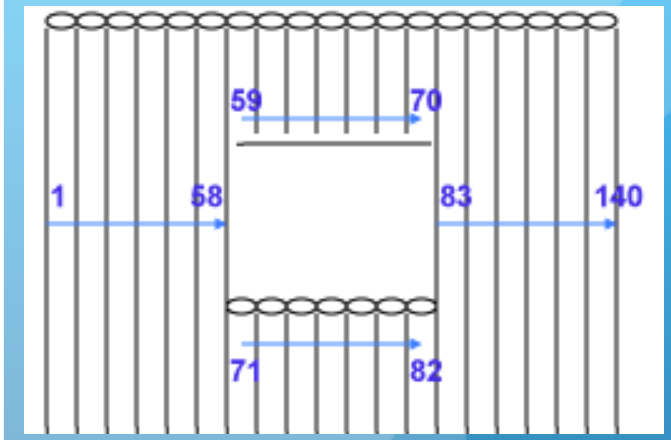
ChamberID: 1-6

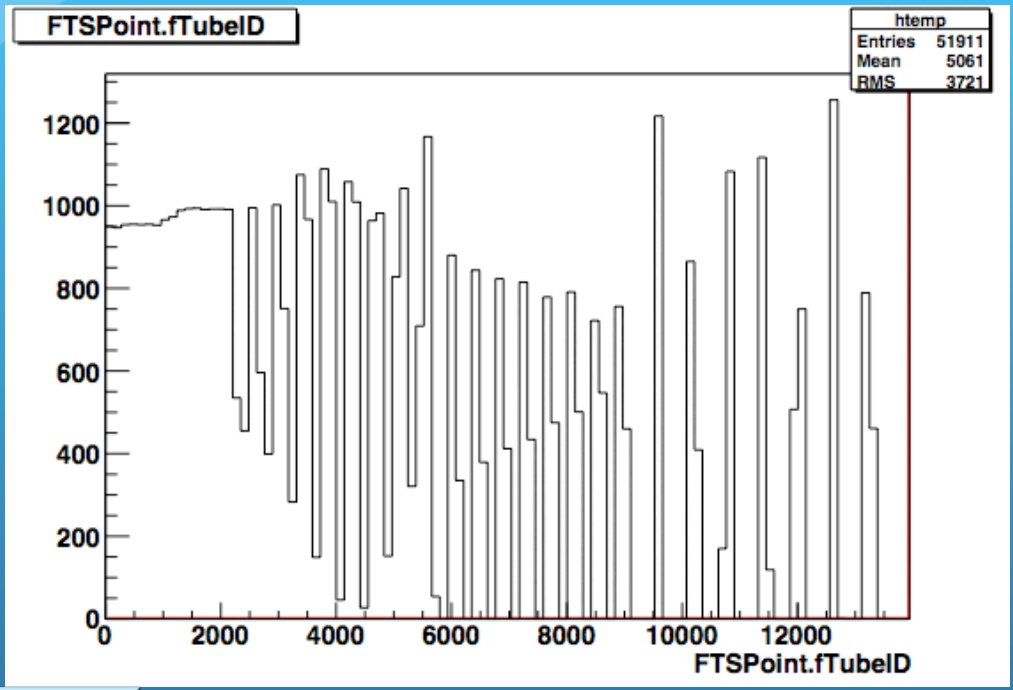
LayerID: 1-48

Chamber 1: layers 1-8
Chamber 2: layers 9-16
Chamber 3: layers 17-24
Chamber 4: layers 25-32
Chamber 5: layers 33-40
Chamber 6: layers 41-48



Simulation (run_sim.C)

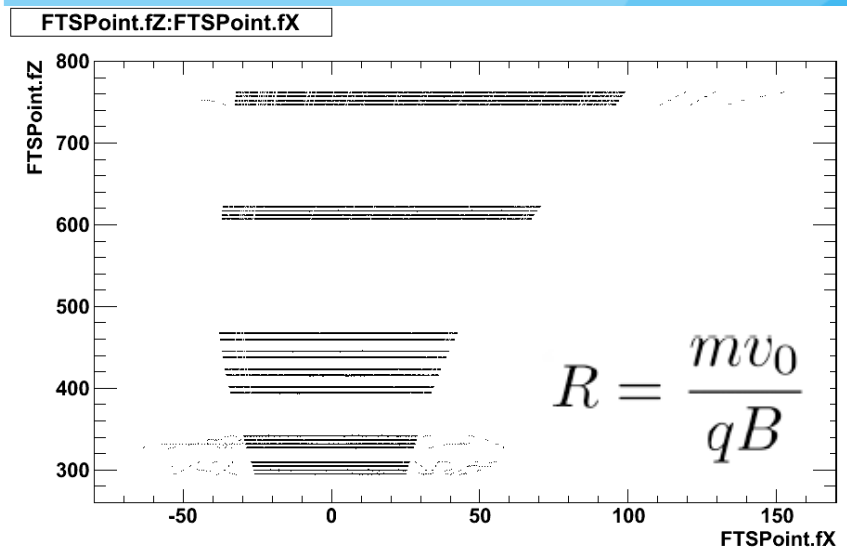




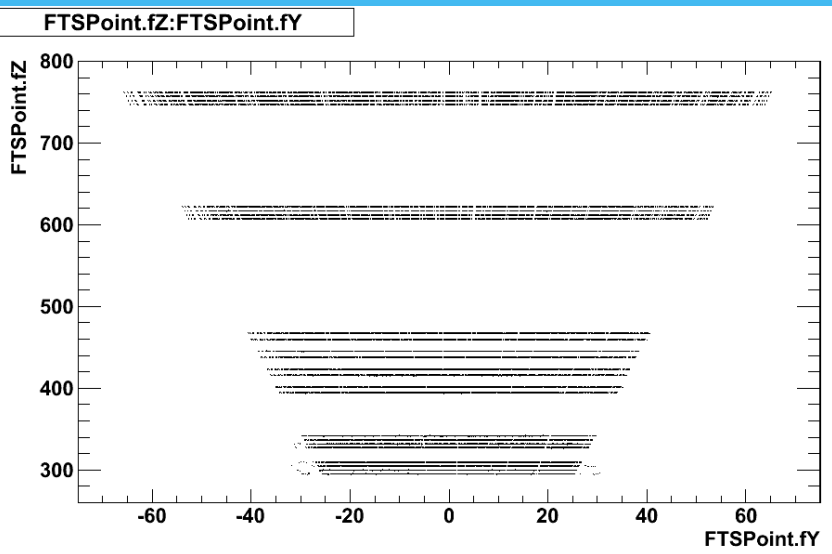
tubeID: 1-13728

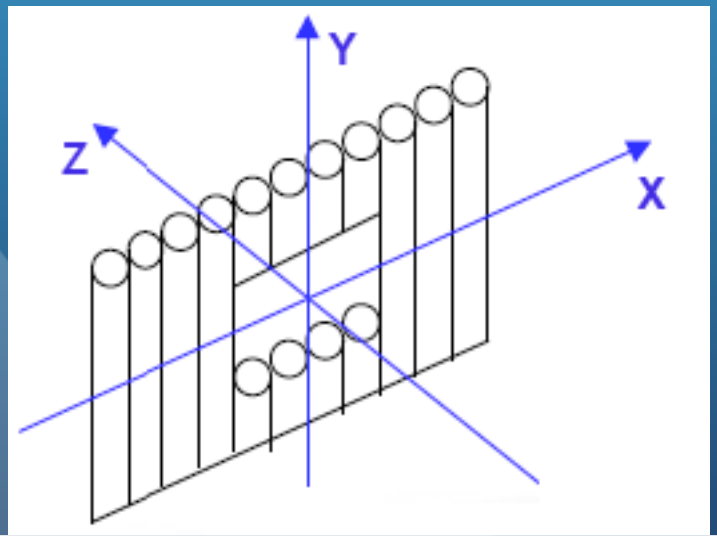
- Chamber 1: Tube ID 1-1120
- Chamber 2: Tube ID 1121-2240
- Chamber 3: Tube ID 2241-3872
- Chamber 4: Tube ID 3873-5504
- Chamber 5: Tube ID 5505-8848
- Chamber 6: Tube ID 8849-13728

Simulation (run_sim.C)



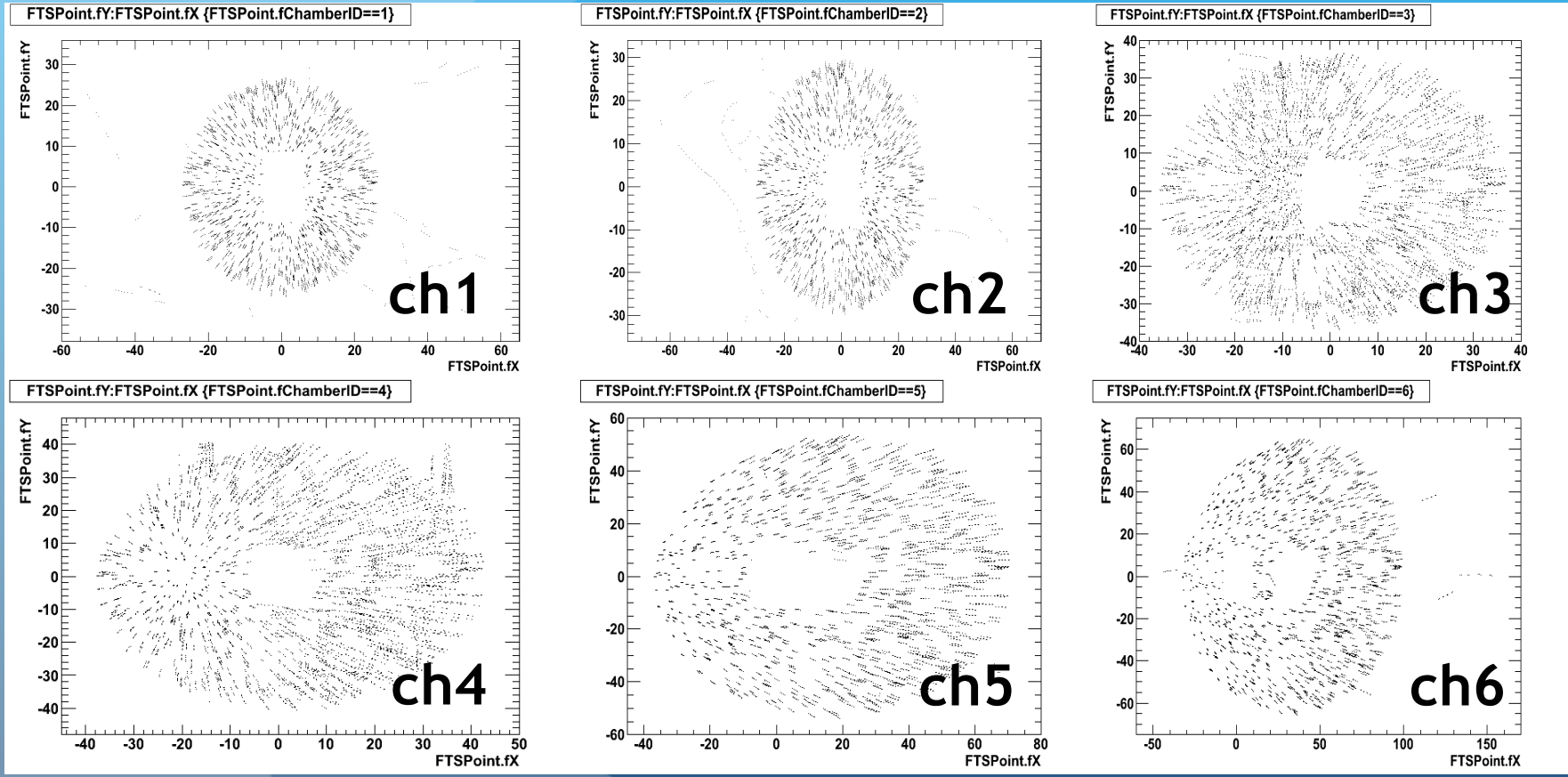
$$R = \frac{mv_0}{qB}$$





Simulation (run_sim.C)

Y vs X for each chamber



Pattern recognition (macro/pid/run_reco_sttcombi.C)

```
PndFtsTrackerIdeal* trackFts = new PndFtsTrackerIdeal();
trackFts->SetRelativeMomentumSmearing(0.05);
trackFts->SetVertexSmearing(0.05, 0.05, 0.05);
trackFts->SetTrackingEfficiency(1.);
trackFts->SetTrackOutput("FtsIdealTrack");
fRun->AddTask(trackFts);
```

Possibility to set:

- Momentum smearing
- Vertex smearing
- Tracking efficiency

Ideal Tracking:
FTS+MVD+GEM

R. Kliemt

Pattern recognition (macro/pid/run_reco_sttcombi.C)

```
PndRecoKalmanTask* recoKalmanFwd = new PndRecoKalmanTask();
recoKalmanFwd->SetTrackInBranchName("FtsIdealTrack");
recoKalmanFwd->SetTrackOutBranchName("FtsIdealGenTrack");
recoKalmanFwd->SetBusyCut(50);
fRun->AddTask(recoKalmanFwd);
```

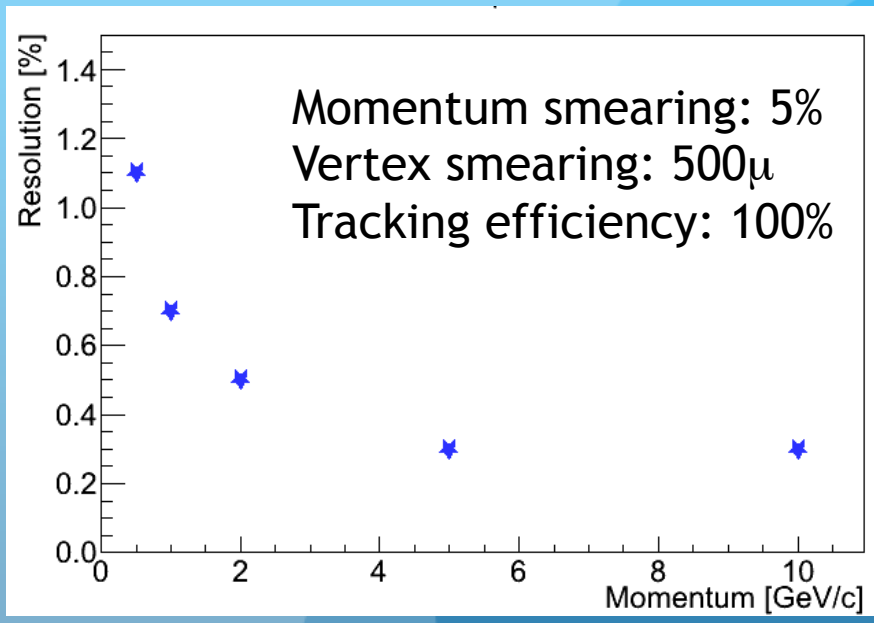
Kalman Filter

```
PndMCTrackAssociator* trackMC = new PndMCTrackAssociator();
trackMC->SetTrackInBranchName("FtsIdealGenTrack");
trackMC->SetTrackOutBranchName("FtsIdealGenTrackID");
fRun->AddTask(trackMC);
```

MC Truth

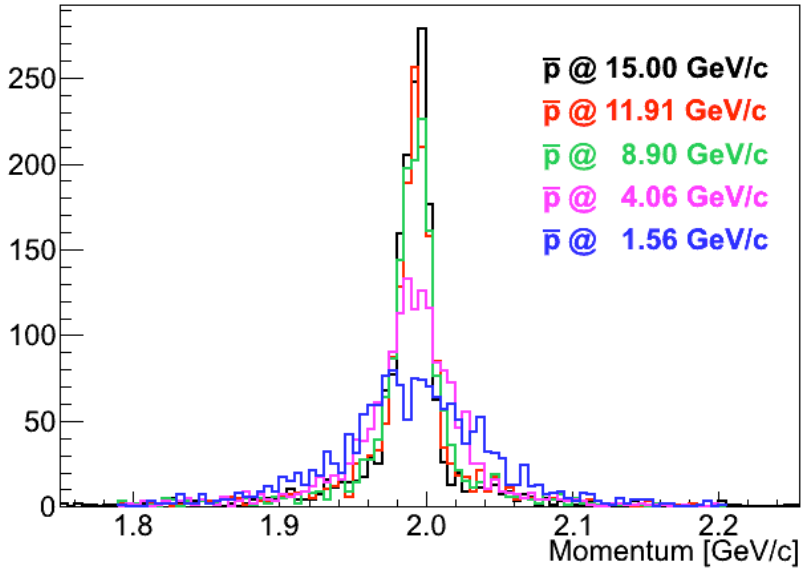
S. Spataro

Pattern recognition (macro/pid/run_reco_sttcombi.C)



Ideal Pattern Recognition
Kalman Filter

Maximum Dipole Field



S. Spataro

Pattern recognition (macro/pid/run_reco_sttcombi.C)

- ✓ Geometry implemented and working
- ✓ Ideal Pattern recognition available
- ✓ Kalman Filter is working
- ✓ Analysis with FTS is possible
- ✓ Tasks are assigned in the EVO meeting of 15th June