IFR Full simulation status

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Outline

Introduction

Why full simulation

A Full simulation is important for:

- background simulation;
- detector optimization ;
- useful for studying adronic showers (not possible in fast simulation).
- extracting parameters for fast simulation;

Figure: Stratigraphy of IFR CDR-like

Status of IFR @ Perugia

We had two geometry configuration: one as BaBar(787 mm of iron) and one as CDR (920 mm of iron)

Number of gap	Material	thickness
1	scintillator air iron	2cm 0.5cm 2 cm
2	scintillator air iron	2cm 0.5cm 2cm
3	scintillator air iron	2cm 0.5cm 16cm
4	scintillator air iron	2cm 0.5cm 26cm
5	scintillator air iron	2cm 0.5cm 26cm
6	scintillator air iron	2cm 0.5cm 10cm
7	scintillator air iron	2cm 0.5cm 10cm
8	scintillator	2cm

Stratigraphy of IFR CDR-like

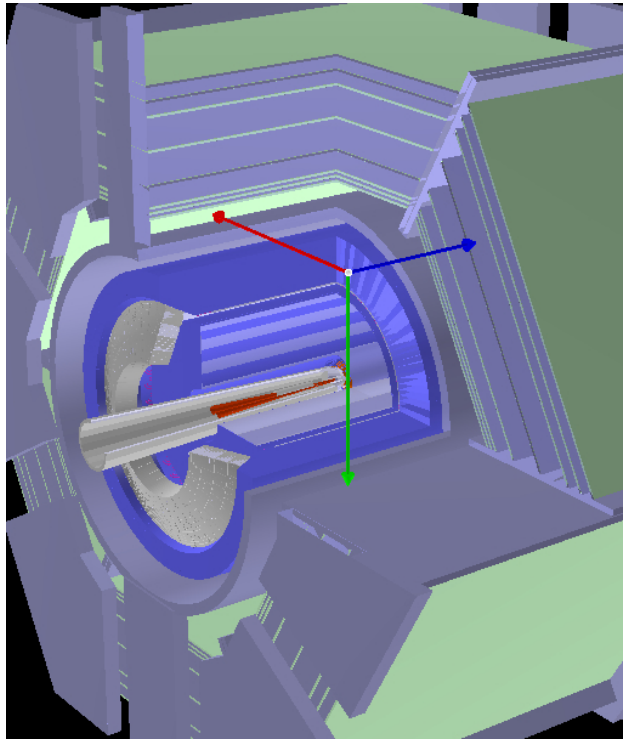


Figure: IFR CDR-like

Code developed @ Perugia

At Perugia we had a first version of digitization and clusterization.

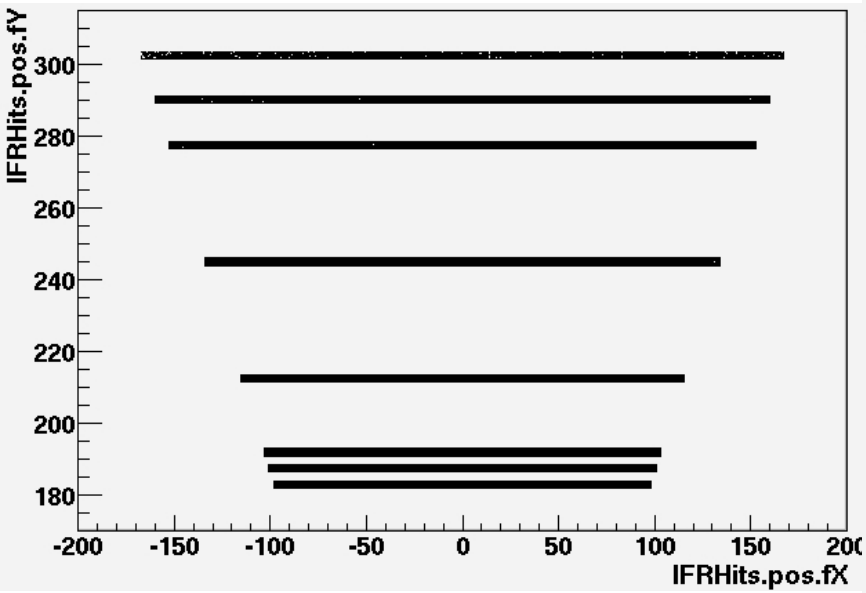


Figure: SXT 1 not digitized

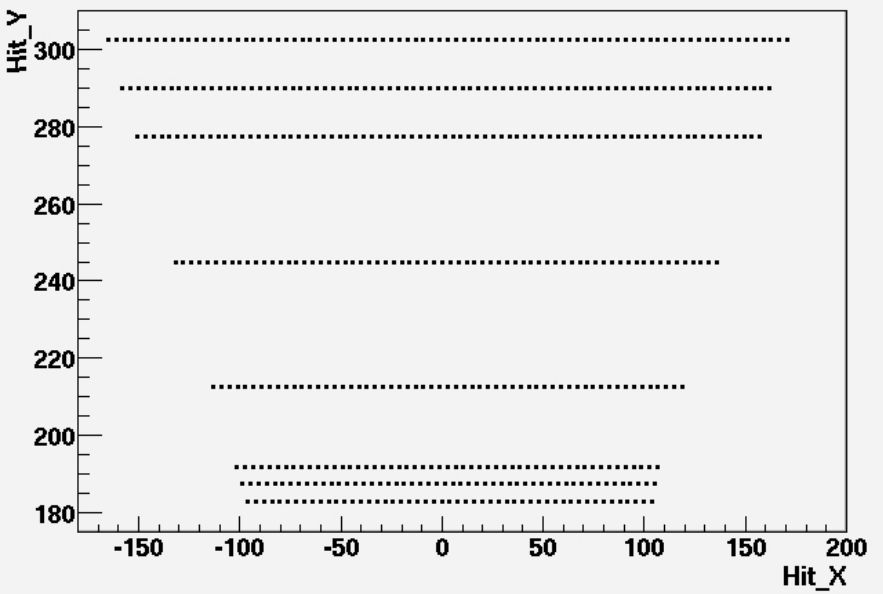


Figure: SXT 1 digitized

Example of clusterization

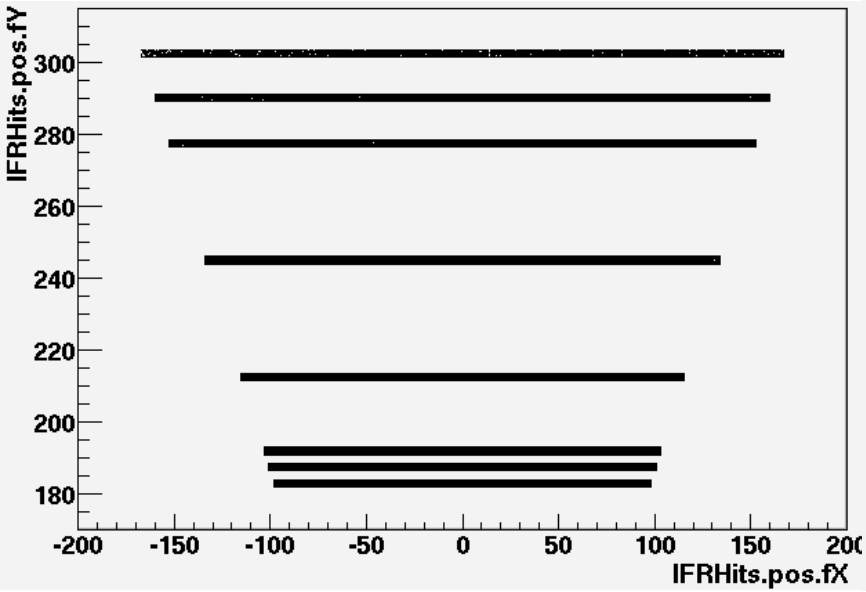


Figure: SXT 1 not digitized

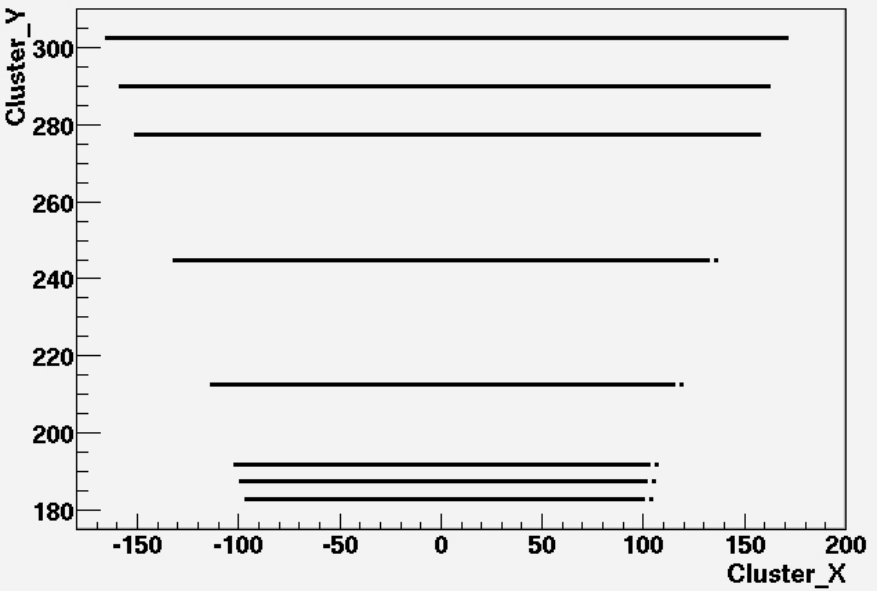


Figure: SXT 1 clusterized

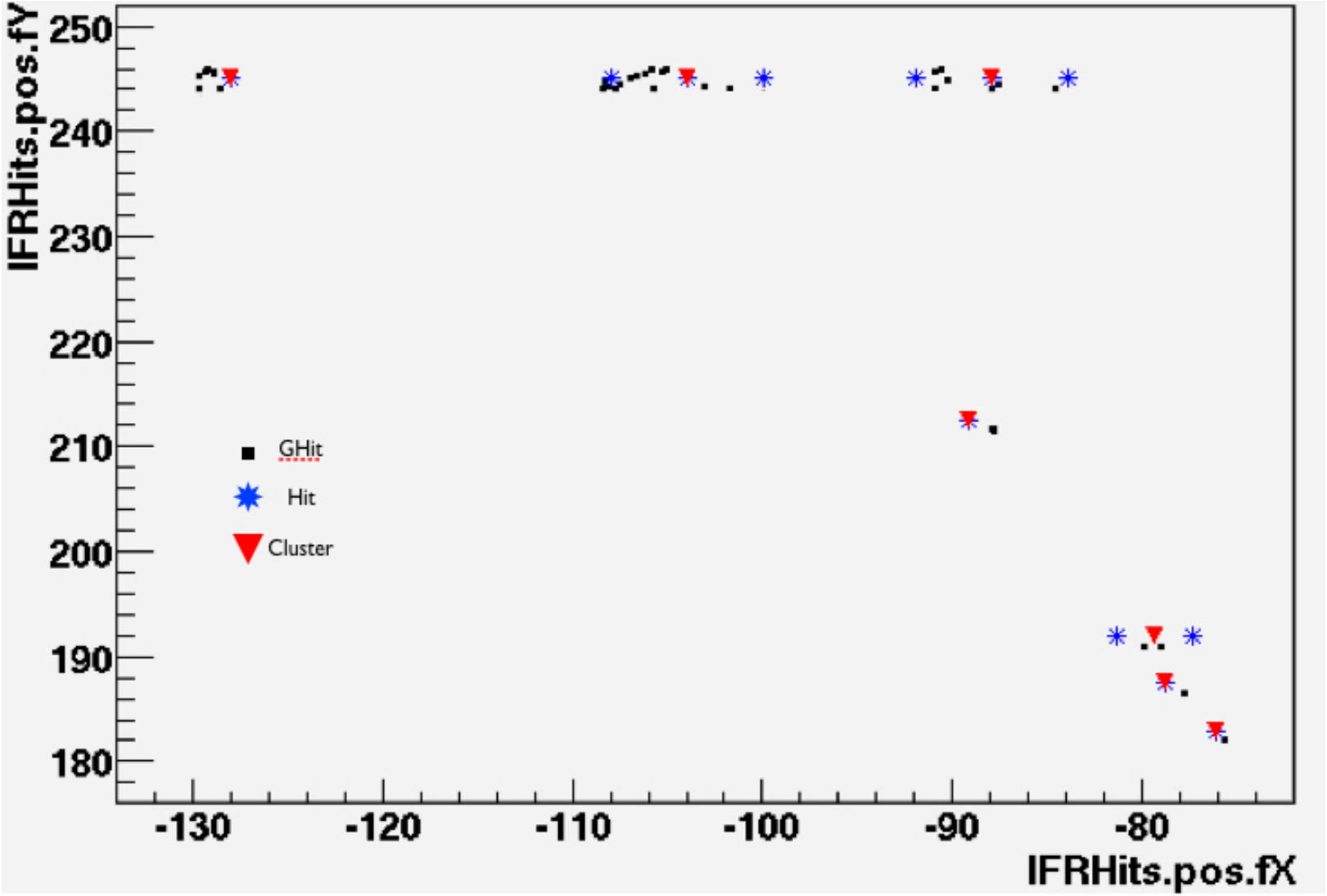


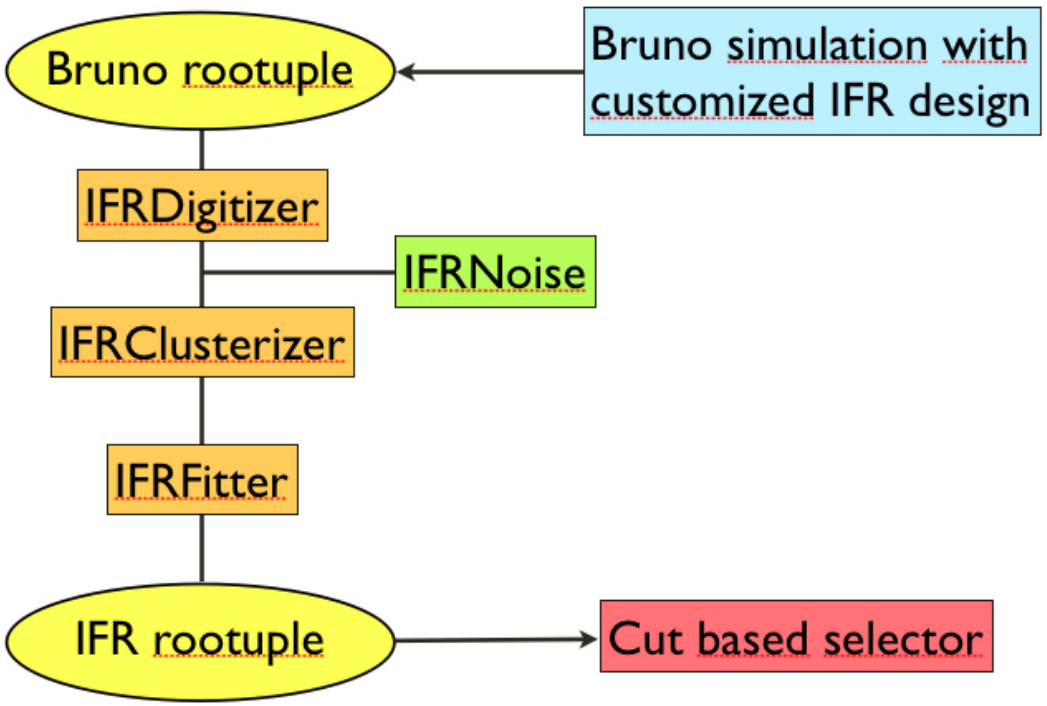
Figure: View of one event not digitized, digitized and clustered.

Code developments

Structure of IfrRootCode

The package of reconstruction IfrRootCode, starting from rootples produced by Bruno, has been developed! (G. Cibinetto, R. Ferrara, M. Munerato, Marcello Rotondo, V. Santoro).

IfrRootCode is useful for extracting relevant informations from GHits



Main code developed

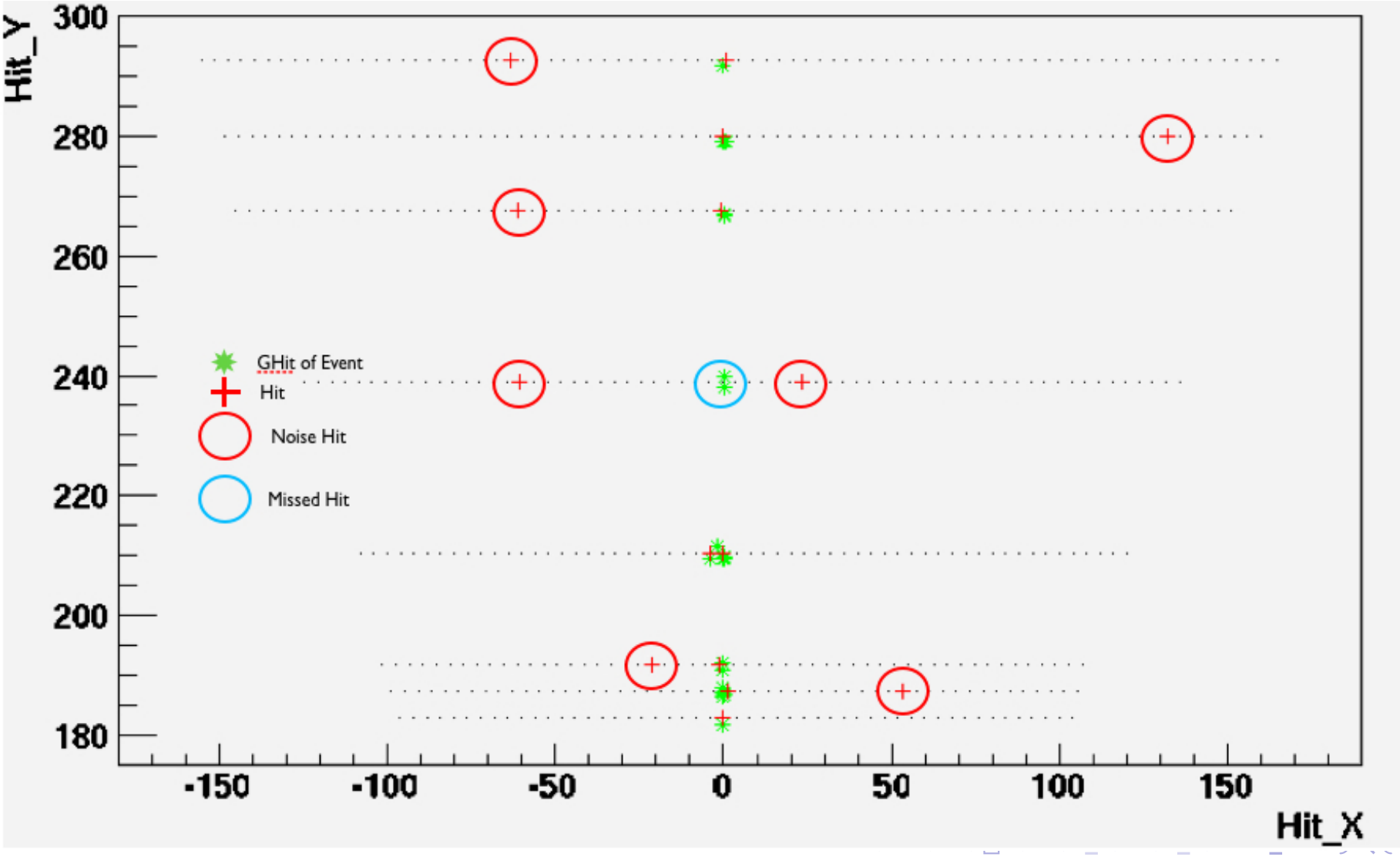
We simulate with Bruno 10K muons and pions with momentum 0.5GeV $< p <$ 4 GeV, without magnetic field and with geometry configuration of CDR.

IFRNoise: Turn on random strips with a fixed occupancy.

IFREfficiency: Simulate the detection efficiency.

IFRFitter: We do a linear fit to the track, evaluating the χ^2(in xy and zy plane) and the residual distribution of hits. We also calculate the χ^2 respect to the generated track using MC Truth information.

Example of simulated noise and efficiency



Output of IfrRootCode: some plots

The output of IfrRootCode is a rootple with all the important informations: interaction length, first layer shouted, numbers of layers shouted and so on.

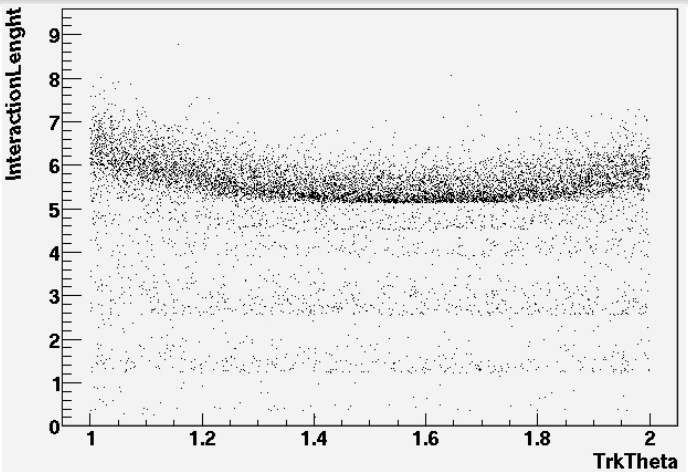


Figure: Interaction length vs θ for muons

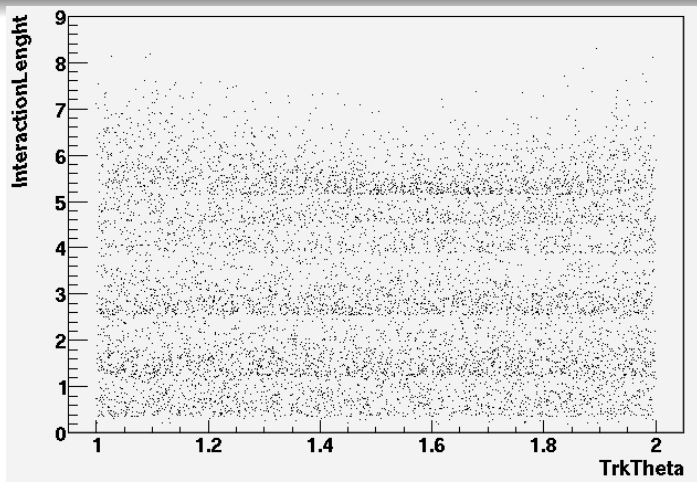


Figure: Interaction length vs θ for pions

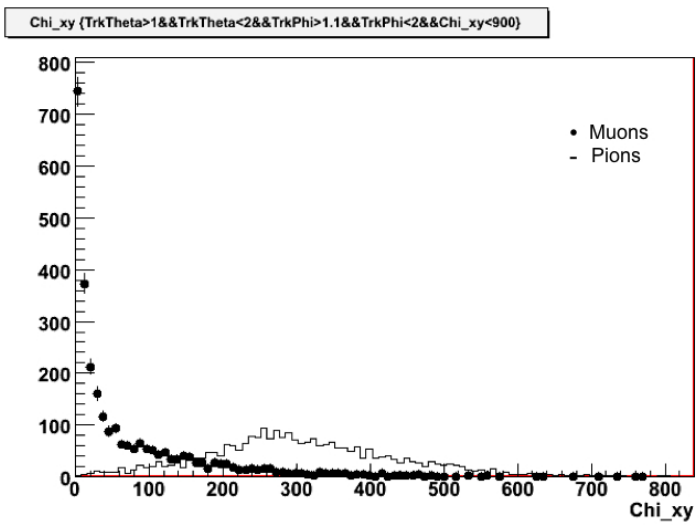


Figure: Distribution of χ^2 for pions and muons.

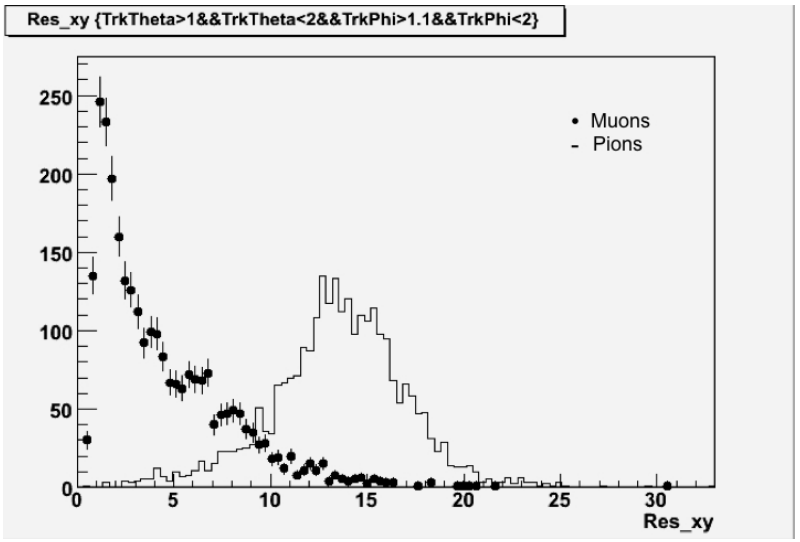


Figure: Distribution of residues for pions and muons

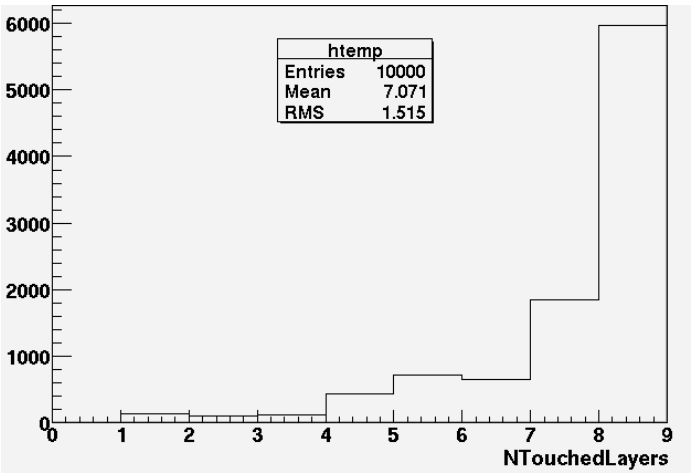


Figure: Number of touched layers for muons

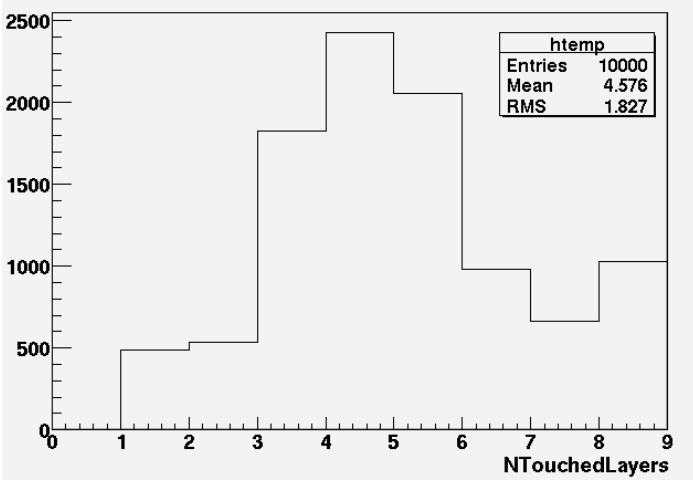


Figure: Number of touched layers for pions

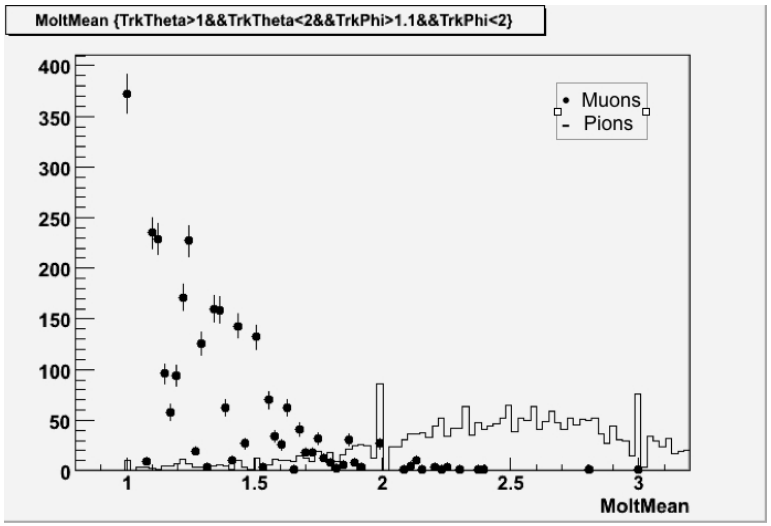


Figure: Mean multiplicity of muons and pions

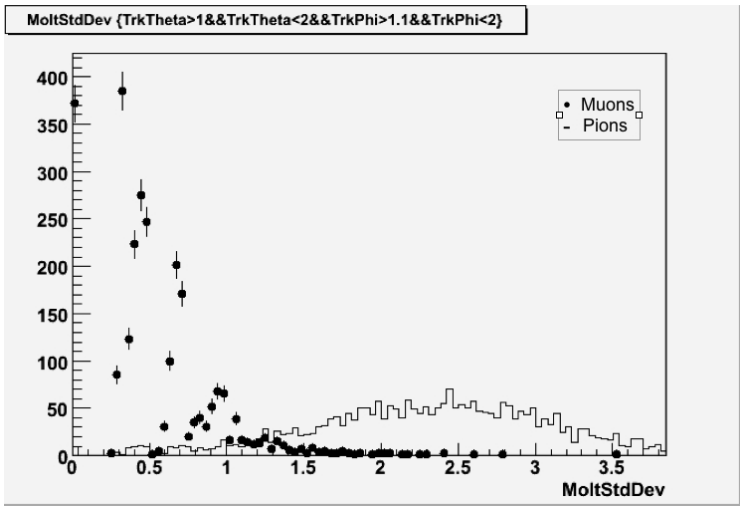


Figure: Standard deviation of mean multiplicity for muons and pions.

Status of IFR Now

Starting from CDR geometry configuration(called C2), now we have another two configurations: one with 10cm of iron added(C6=C2+10cm) and one with 10cm removed(C5=C2-10cm).

Number of gap	Material	thickness C5	thickness C2	thickness C6
1	scintillator	2cm	2cm	2cm
	air	0.5cm	0.5cm	0.5cm
	iron	2 cm	2 cm	2 cm
2	scintillator	2cm	2 cm	2 cm
	air	0.5cm	0.5cm	0.5cm
	iron	2cm	2 cm	2 cm
3	scintillator	2cm	2cm	2cm
	air	0.5cm	0.5cm	0.5cm
	iron	14cm	16cm	18cm
4	scintillator	2cm	2cm	2cm
	air	0.5cm	0.5cm	0.5cm
	iron	22cm	26cm	30cm
5	scintillator	2cm	2cm	2cm
	air	0.5cm	0.5cm	0.5cm
	iron	22cm	26cm	30cm
6	scintillator	2cm	2cm	2cm
	air	0.5cm	0.5cm	0.5cm
	iron	10cm	10cm	10cm
7	scintillator	2cm	2cm	2cm
	air	0.5cm	0.5cm	0.5cm
	iron	10cm	10cm	10cm
8	scintillator	2cm	2cm	2cm

We have generated some single particle events of muon and pion and preliminary results will be showed by G.Cibinetto.

Future plans

Future plans

Starting from rootples produced by IfrRootCode we want:

- add the dependence of resolution from theta-angle;
- study machine background and add it to the single particle events;
- maybe make a larger production (50K events);
- use the feedback from optimization studies to improve the code;
- add some minor code refinements.