IFR Full simulation status

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Outline

Full Simulation

The importance of full simulation

A Full simulation is important for:

- background simulation,
- detector optimization
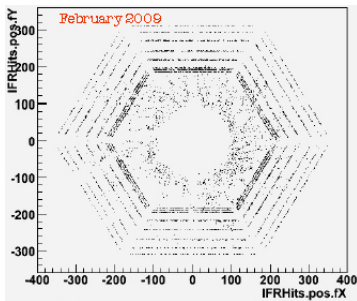- extracting parameters for fast simulation
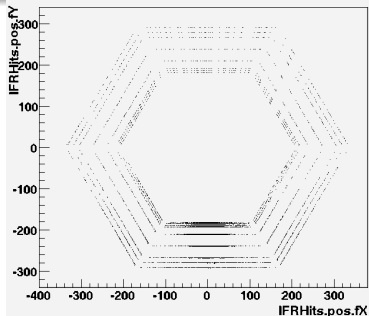

Figure: IFR BaBar-like

Figure: IFR CDR-like

IFR @ Orsay vs IFR @ Perugia

The IFR configuration at Orsay was like BaBar with some layers filled with iron. Now we have improved this configuration and we have one CDR-like.

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

Figure: IFR CDR-like

Digitization

Outline
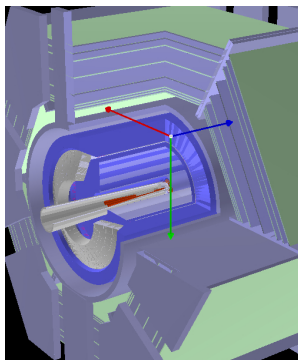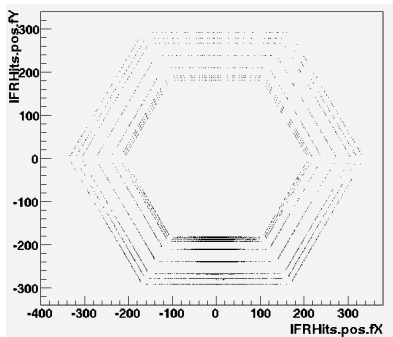**Digitization**
Clusterization
Conclusions

Introduction to digitization
Previous setup
New setup

Introduction to digitization

1. The main idea of digitization for IFR is to collect hits of same track in one layer,

2. With digitization we can decrease the dimension of hits collection,

3. In the preliminary version of digitization we checked of an GHit: trackID, layer and position [Orsay].

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Old digitization setup I

In the first version of digitizer we follow these rules:

- first GHit of an event memorized $\rightarrow$ one hit memorized;
- one GHit compared to hits memorized:

IF

$$Layer_{ghit} = Layer_{hit} \text{ e } Sxt_{ghit} = sxt_{hit} \text{ e } TrackID_{ghit} = TrackID_{hit}$$
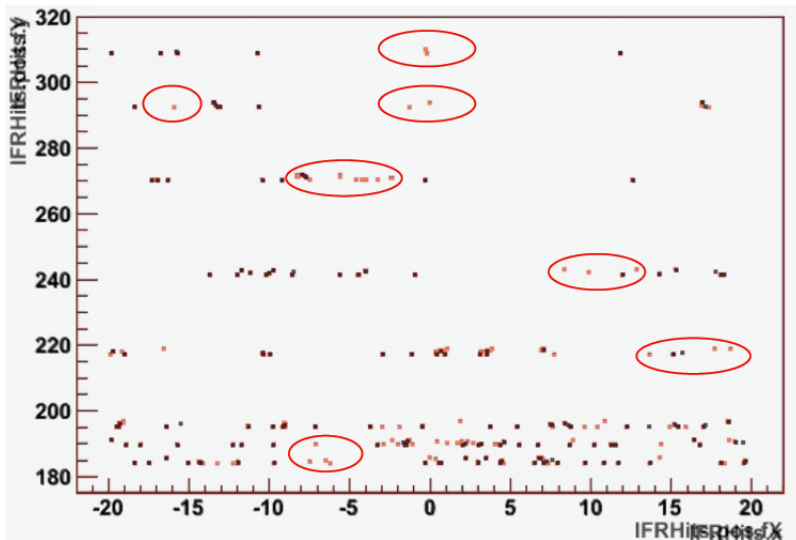
SO

$$x_{hit} = \frac{x_{hit} + x_{ghit}}{n}, y_{hit} = \frac{y_{hit} + y_{ghit}}{n}, z_{hit} = \frac{z_{hit} + z_{ghit}}{n}, e_{hit} = e_{hit} + e_{ghit}$$
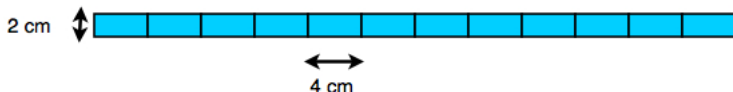
n is the number of hits satisfie conditions;

- if previous conditions aren't satisfied $\rightarrow$ new hit memorized;
- To be compared other ghits with hits memorized.

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New digitization setup I

$\Rightarrow$ For digitizing we subdivide the layer into strip of 4x2cm.

$\Rightarrow$ We check in what strip is the Ghit considered.

$\Rightarrow$ We compare the Ghit considered with other hits memorized.

$\Rightarrow$ Hit memorized will be in the middle of bar (x:y view) but the z position will be the average (see next slide).

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New digitization setup II

We follow these rules for digitizing:

- first GHit of an event memorized $\rightarrow$ one hit memorized;
- one GHit compared to hits memorized:

IF

$$Layer_{ghit} = Layer_{hit} \text{ e } Sxt_{ghit} = sxt_{hit} \text{ e}$$

$$\|z_{hit} - z_{ghit}\| < 20cm(\approx 1ns) \text{ e } \|x_{hit} - x_{ghit}\| \leq 2cm(\text{same strip})$$

SO

$$x_{hit} = x_{strip}, y_{hit} = y_{layer}, z_{hit} = \frac{z_{hit} + z_{ghit}}{n}, e_{hit} = e_{hit} + e_{ghit}$$

n is the number of hits satisfie conditions;

- if previous conditions aren't satisfied $\rightarrow$ new hit memorized;
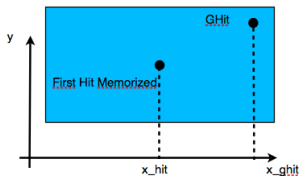- To be compared other ghits with hits memorized.

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Figure: Technics for digitizing
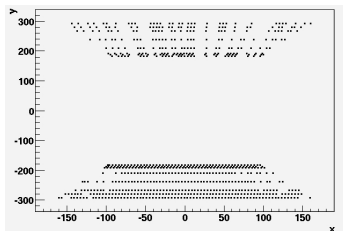
Figure: Sextants 1-4 digitized.

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New digitization setup IV
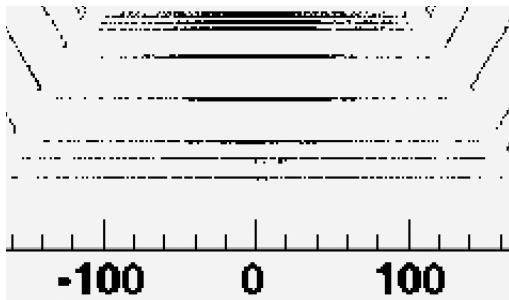
Figure: IFR SXT 4 without digitization.

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New digitization setup VI
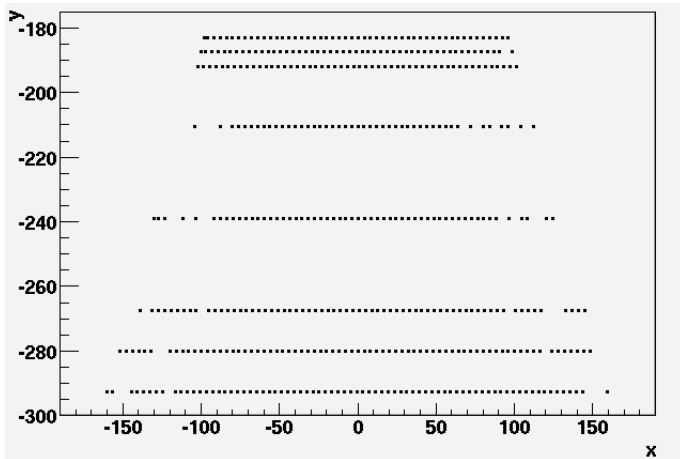
Figure: IFR SXT 4 with digitization - XY view.

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Introduction to digitization
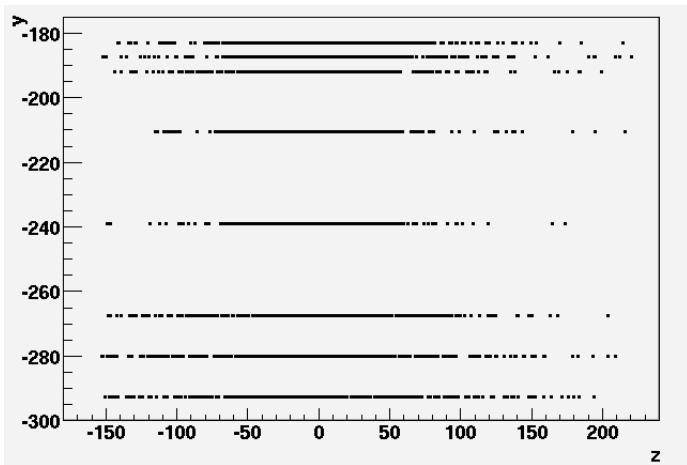Previous setup
New setup

New digitization setup V

Figure: IFR with digitization - YZ view.

Clusterization

Clusterization I

⇒For clusterizing it loops on hits memorized (this is done for every event) and we memorize a cluster when one or more hits are in strip neighbour.
⇒We impose $\|z_{cluster} - z_{hit}\| \leq 20cm$
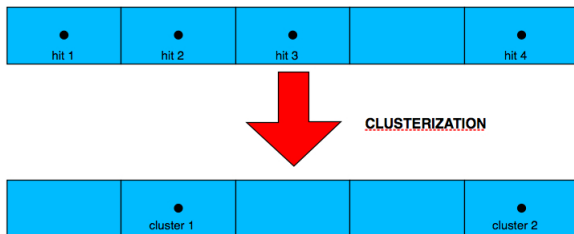

Figure: Technics for clusterizing

Clusterization II
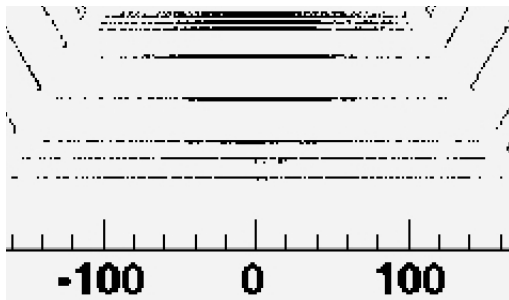

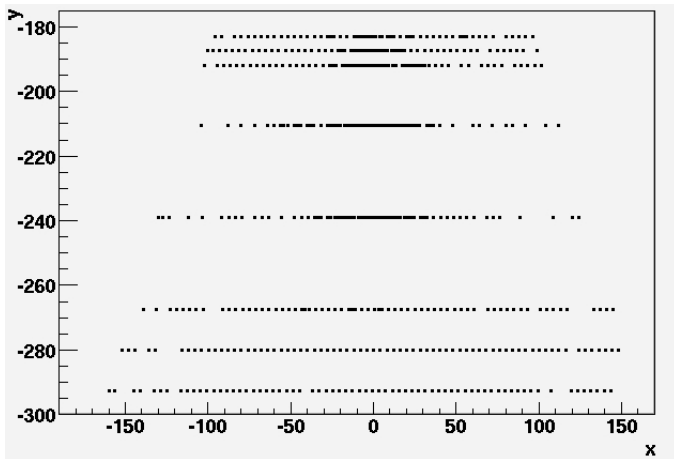Figure: IFR SXT 4 not clustered

Clusterization III

Figure: IFR SXT 4 clustered

Conclusions

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Work in progress
Conclusions

Work in progress

Padua & Ferrara are working for creating an IFR full simulation package:

- Creation of IFRTracker (Roberto Ferrara & Marcello Rotondo from Padua)
- Improvement of IFRDigitizer & IFRCluster (Mauro Munerato from Ferrara)
- Creation of environment for integrating IFRDigitizer, IFRCluster, IFRTracker (Valentina Santoro from Ferrara)

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Work in progress
Conclusions

Conclusion

- New geometry version of IFR CDR-like;
- new version of digitization based on fact layers are subdivided into strip of 4X2 cm and time resolution is 1ns;
- production of code are in progress and the main idea is to product a IFR Full simulation package;
- IFRDigitizer & IFRCluster works but to be implemented;