

IFR OPTIMIZATION

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ON BEHALF OF THE IFR GROUP

SUPER B WORKSHOP - PERUGIA 16-19 JUN 2009

OUTLINE

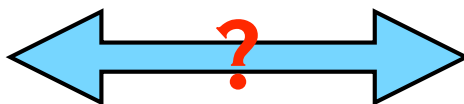
- IFR optimization: what, how, when, who
- Work in progress

THE IFR BASELINE DESIGN

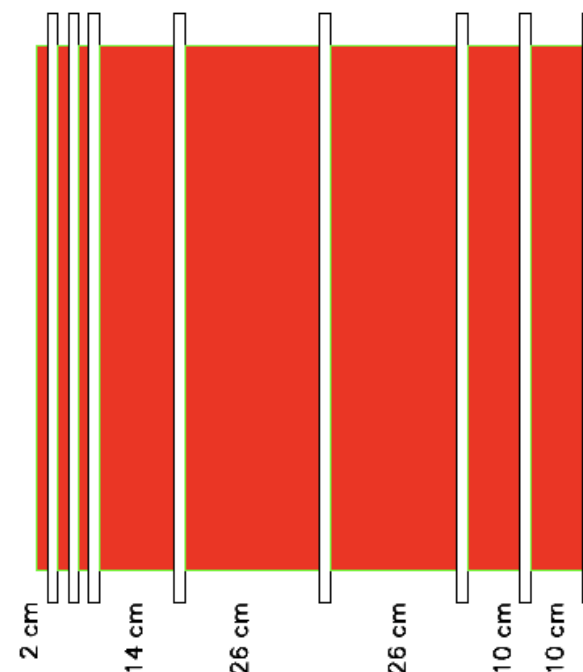
- The **muon** and K_L detector is build in the magnet flux return.
- It will be composed by one hexagonal **barrel** and 2 **endcaps** like in Babar.
- Plan to reuse BaBar iron structure
- **Add iron** to BaBar stack to improve μ ID:

→ 7-8 detection layers should be enough

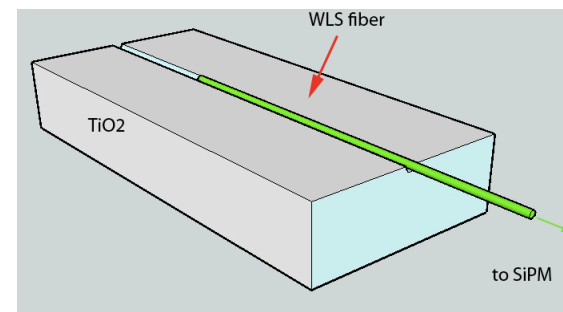
- **Keep longitudinal segmentation** in front of stack to retain K_L ID capability.



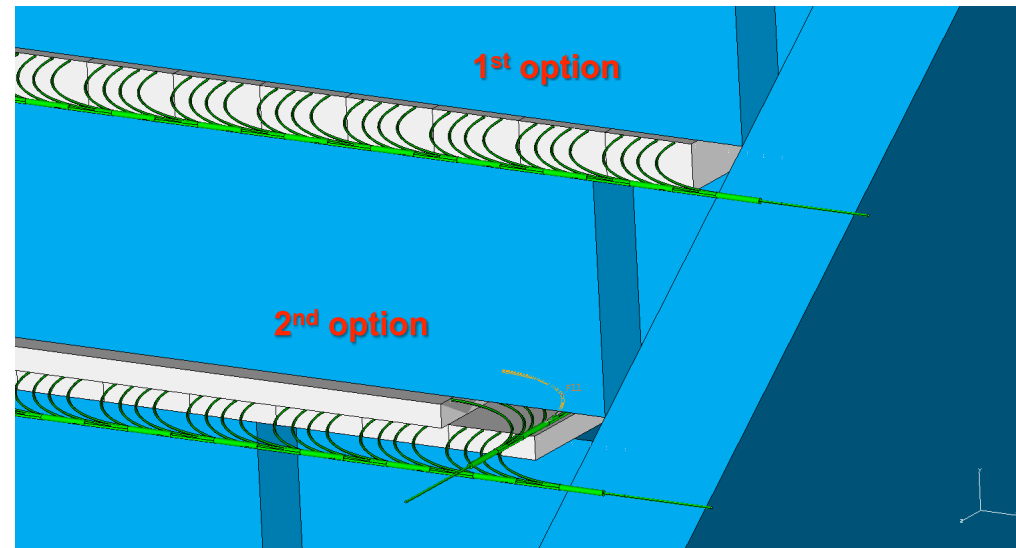
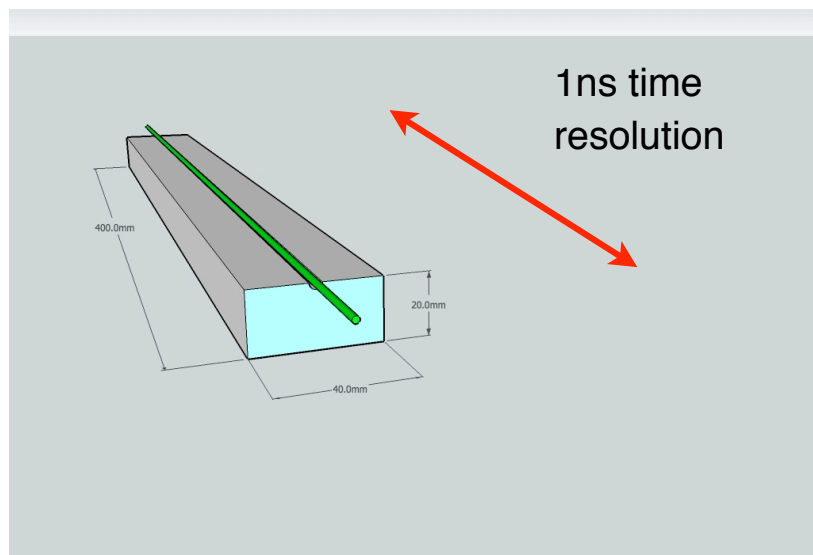
A possible (not optimized) configuration



MINOS like scintillators as active material



READOUT OPTIONS



- Baseline option: read one coordinate with the bar position and the other with the time.
- Need a time resolution $\sim 1\text{ns}$ to have $\sim 20\text{cm}$

- As 2-nd option we are considering also the "double coord layout": orthogonal scintillator bars, 1cm thick (mechanically rather complicated for the barrel, may be a good option for the endcaps)

IFR detector optimization

- Parameters to optimize
 - Number of active layers
 - Amount of absorber
 - Width of the scintillator bars
 - Evaluate the worst allowed time resolution
- Quantities to evaluate: muon ID, pion rejection, detection efficiency.
- What is needed: a full superB simulation + reconstruction code and tools.
- The plan is to generate single particle events (muons, pions and then also KI) and events + background with Bruno and then write some reconstruction and what's needed to optimize the detector.

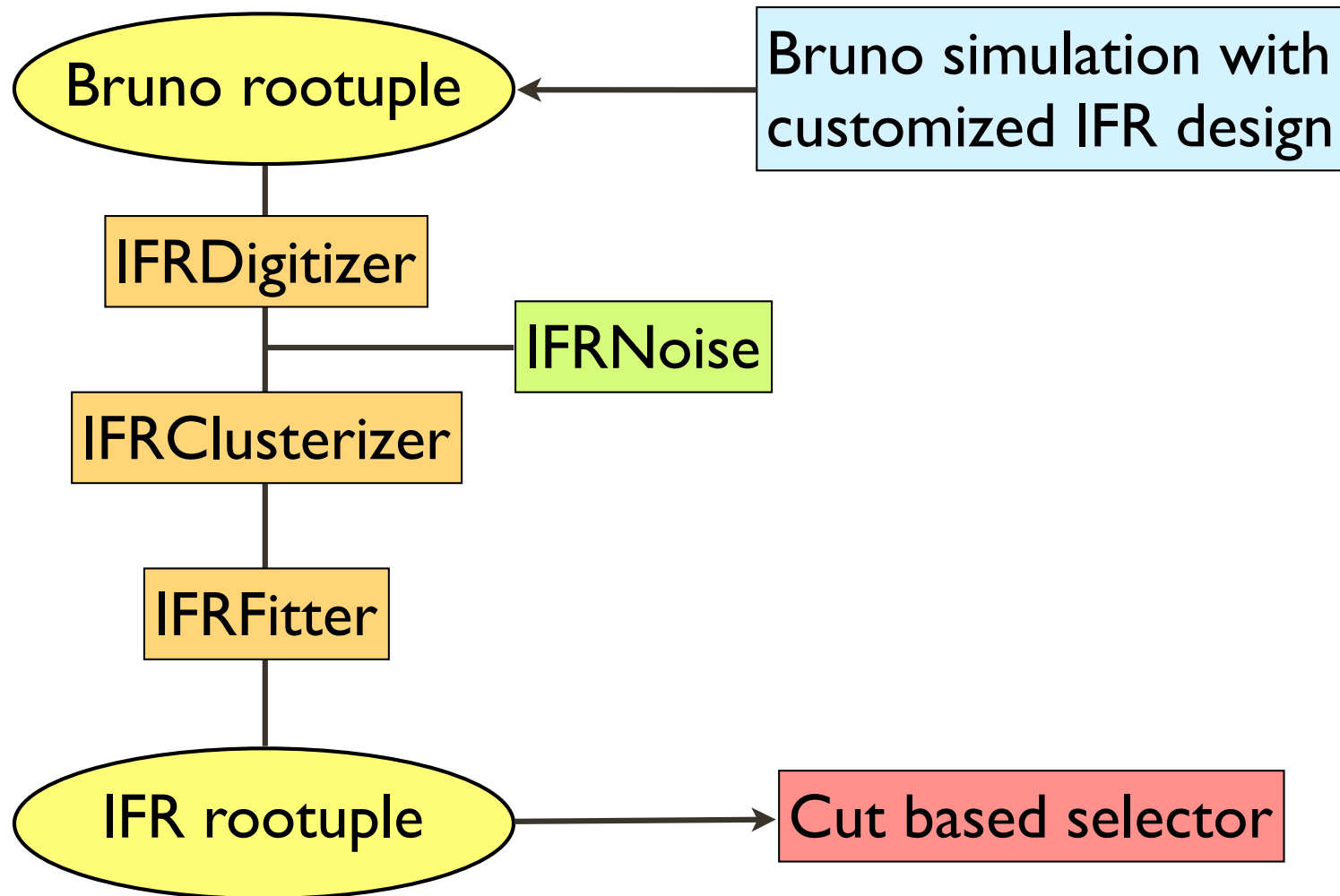
Time scale

- The IFR group has a tight time constraint: need to place the order for scintillators and iron for the prototype **before the end of September** - not all the results are needed by that time -
- In any case the IFR optimization does not affect the other subdetectors: the inner dimensions are fixed.
- Nobody working full time on this, currently: Mauro Munerato and Valentina Santoro (Ferrara) and Roberto Ferrara (a student from Padova) are helping writing the code.
- No results were expected by the Perugia meeting, we are in the middle of the development phase.
- Code developments for the Fast Simulation will continue in parallel and will eventually take advantage of the optimization results.

To do list

- Write more GDML description of the IFR: 2 configurations already done (CDR like and BaBar like).
- Write digitization and clusterization
- Write a track fitter and extract relevant information.
- Write a cut-based muon selector similar to the first one used in BaBar.
- Test different configurations (BaBar like, CDR like, some hybrid).
- Make a proposal

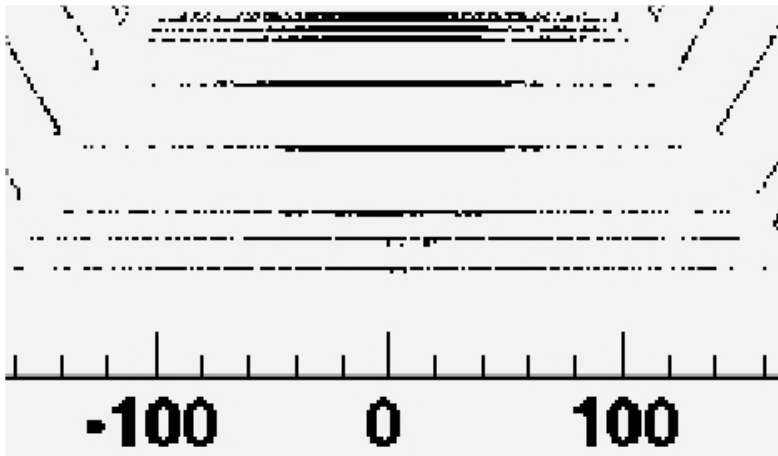
CODE STRUCTURE



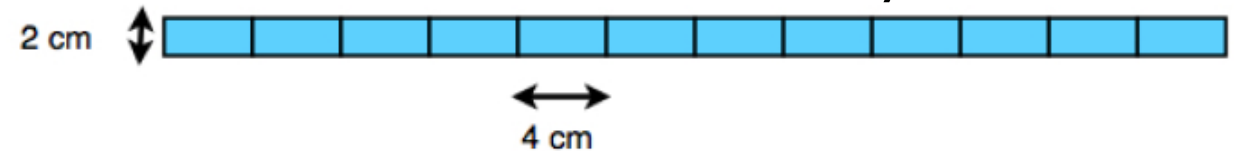


DIGITIZATION

front view (xy) no digitization

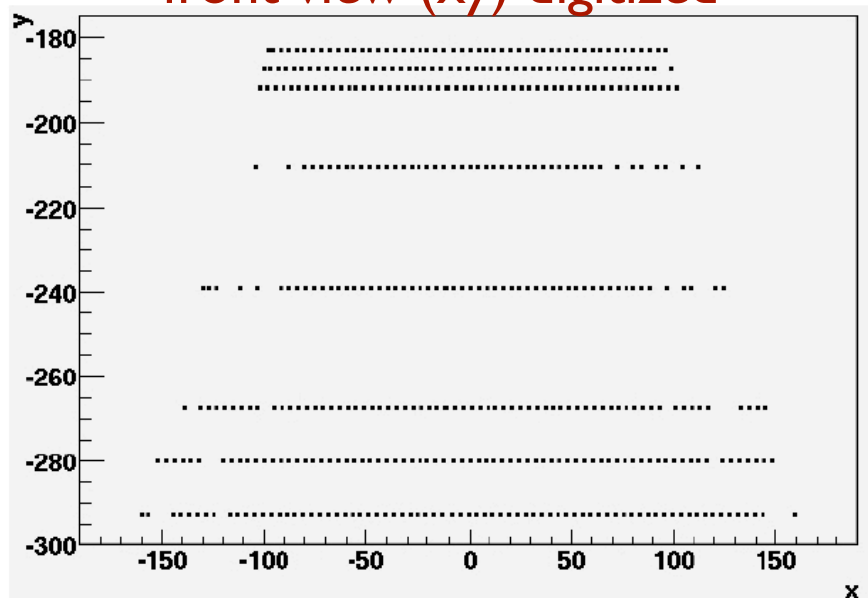


front view of a barrel layer

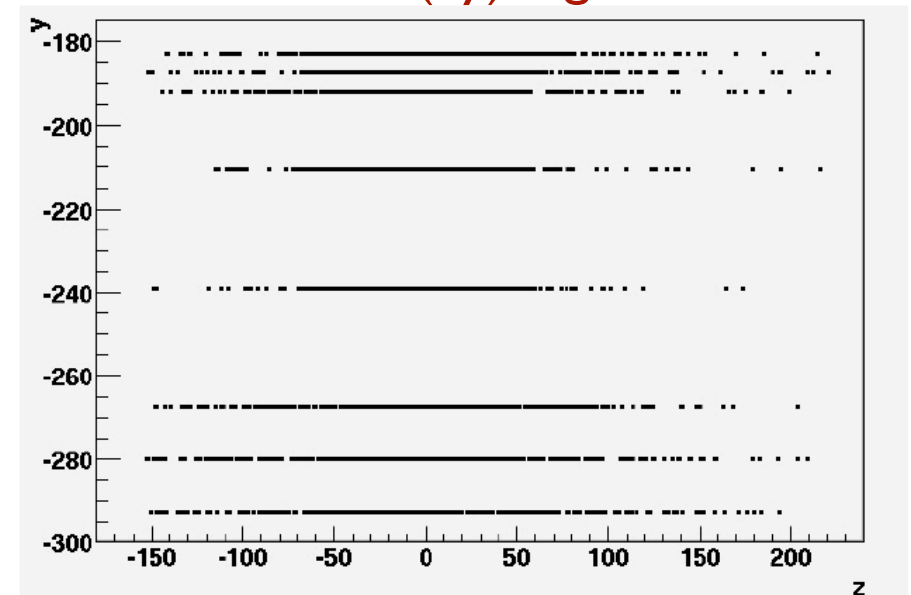


- ⇒ For digitizing we subdivide the layer into strip of 4x2cm.
- ⇒ We check in what strip is the Ghit considered.
- ⇒ We compare the Ghit considered with other hits memorized.

front view (xy) digitized



side view (xy) digitized





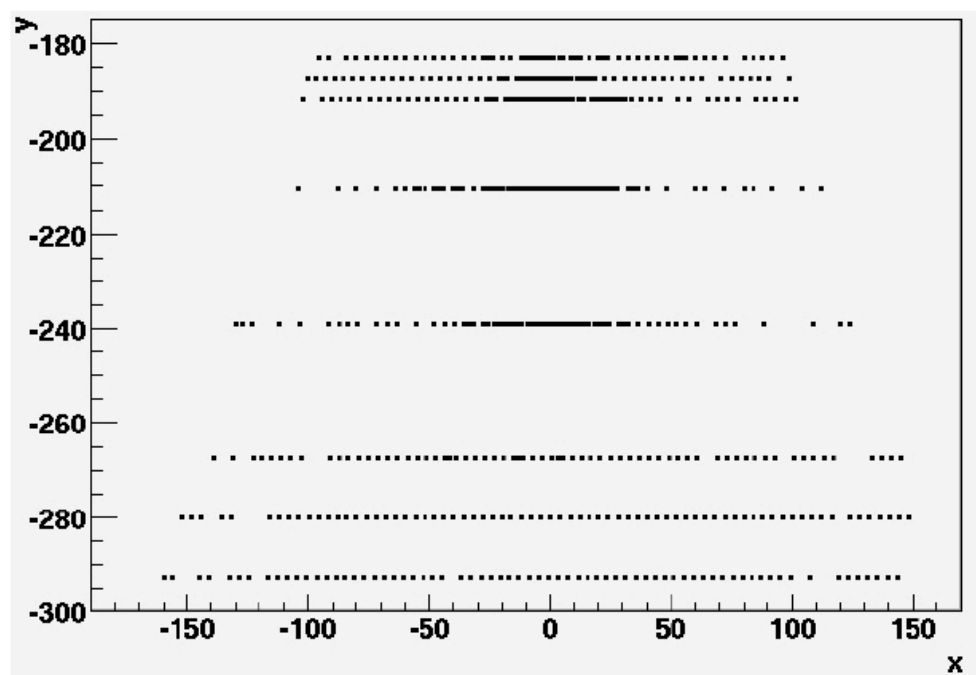
CLUSTERIZATION



CLUSTERIZATION



front view (xy) clusterized





TRACK FITTER

- No magnetic filed will be considered at this stage
- A simple single track fitter is being developed
- A preliminary version running on the ghits is ready

THEN...

- Integrate everything together
- Include the right (from R&D) time resolution for the z coordinate
- Apply energy cuts to the hits to have only the ones that can be really detected
- Add detection efficiency
- Add electronics noise to the single particle events.

CONCLUSIONS

- Preliminary version of the reconstruction code is almost ready.
- Need improvements, refinements and integration.
- The amount of work is big, but we are on track.