Status of the IFR optimization

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IFR detector optimization

- Parameters to optimize
  - Amount of absorber
  - Width of the scintillator bars
  - Evaluate the worst allowed time resolution

- Quantities to evaluate: muon ID, pion rejection.

- What is needed: superB full simulation (for hadron showers) + reconstruction code.

- The plan is to generate single particle events (muons, pions and then also KI) and events + background with the Full Sim and write some reconstruction and what's needed to optimize the detector.

To do list (in Perugia)

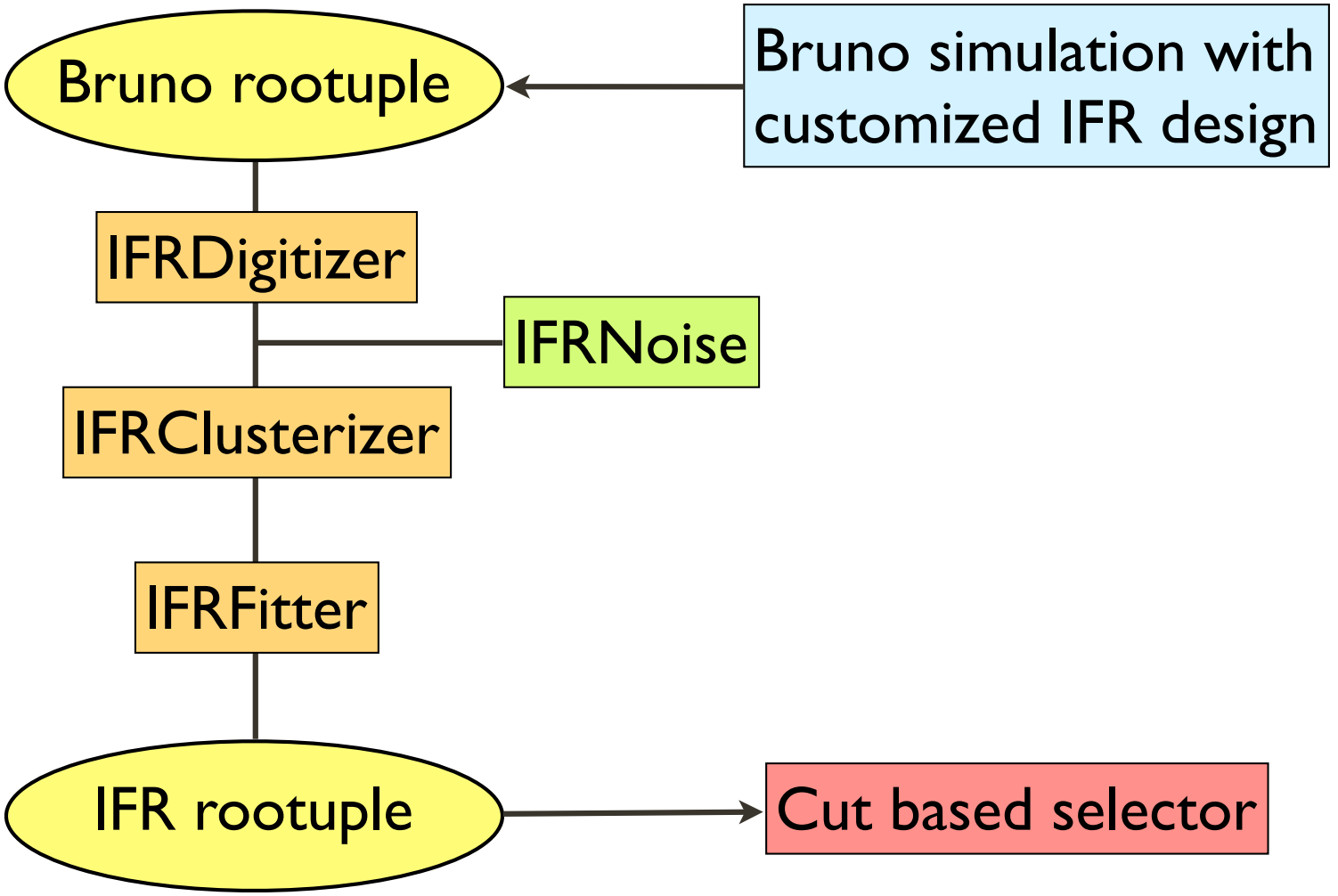
- Write more GDML description of the IFR: 2 configurations already done (CDR like and BaBar like).
- Write digitization and clusterization
- Write a track fitter and extract relevant information.
- Write a cut-based muon selector similar to the first one used in BaBar.
- Test different configurations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

What has been done

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

preliminary results expected for the SLAC meeting

Code structure



From detector R&D

- Use the proper time resolution.
- Simulate the detection efficiency.
- Add electronics noise to the single particle events.

A FIRST LOOK AT THE DATA

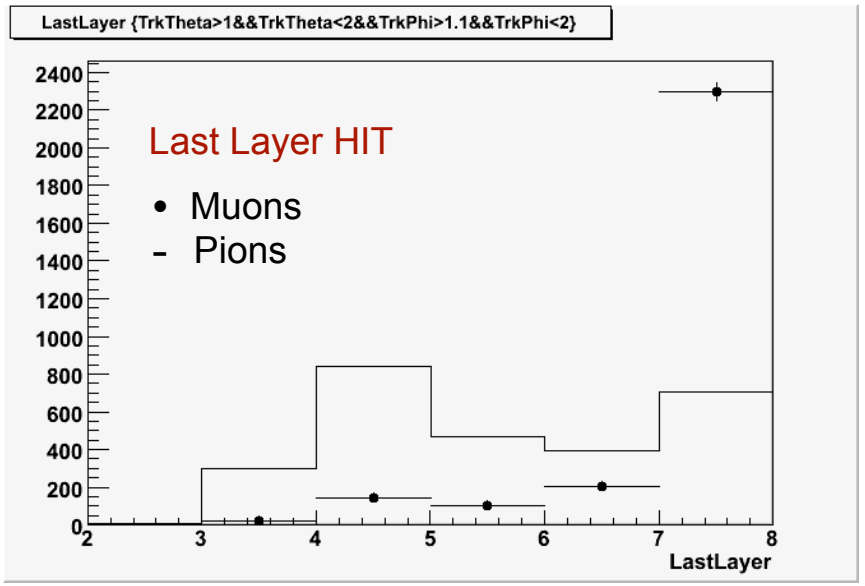
We simulated with Bruno 10000 muons and 10000 pions with momentum 0.5GeV < p < 4GeV.

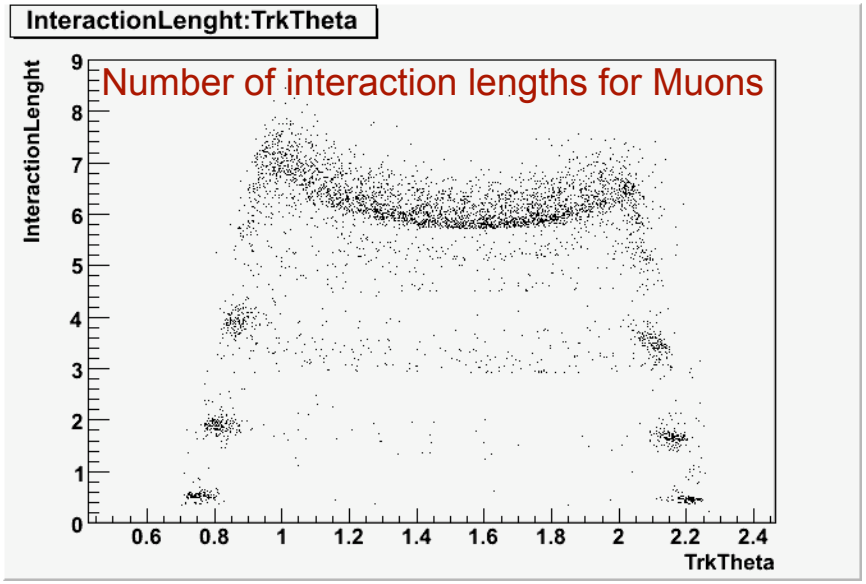
First we use the CDR like configuration of the IFR

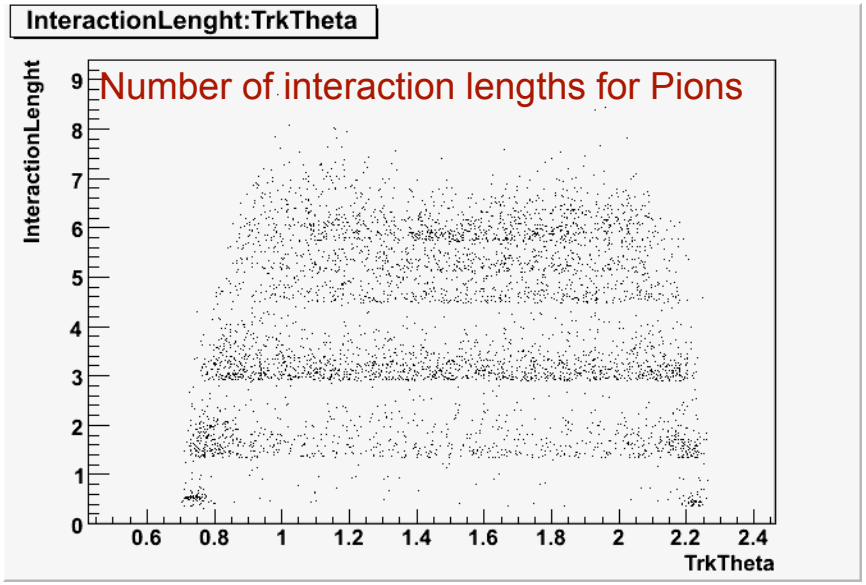
Magnetic field switched OFF - no inner detector (for debug purpose)

Only one sextant of the barrel.

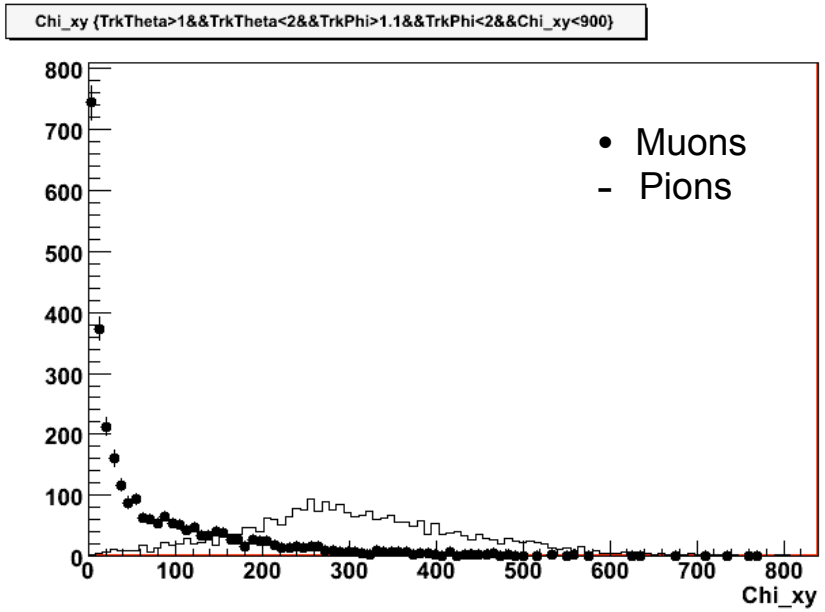
Added random noise corresponding to 1.5% occupancy







Track reconstruction



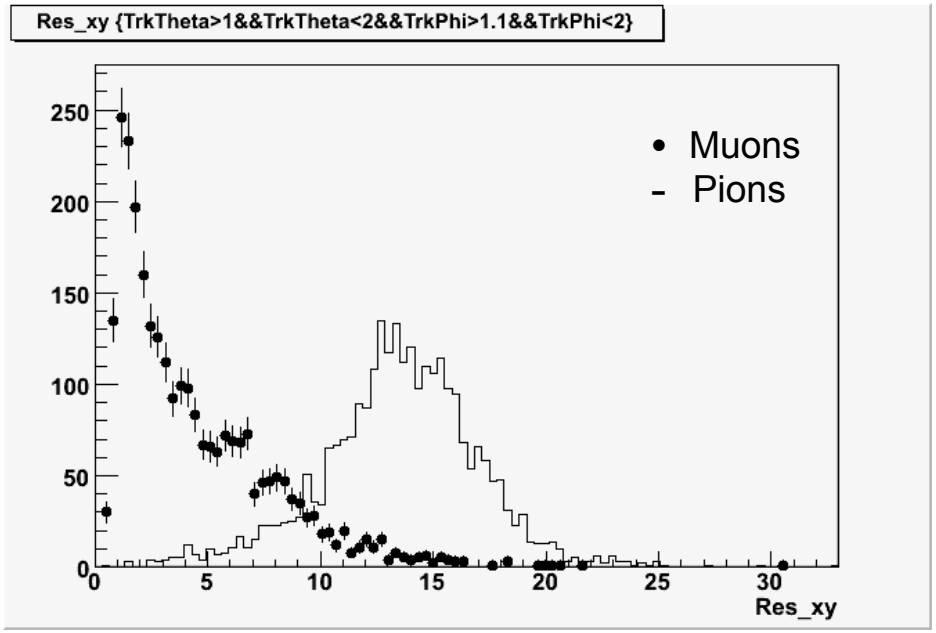
χ^2 distribution of the linear fit to the cluster for muons and pions

We do a linear fit to the track and evaluate the χ^2 and the residual distribution of the hits

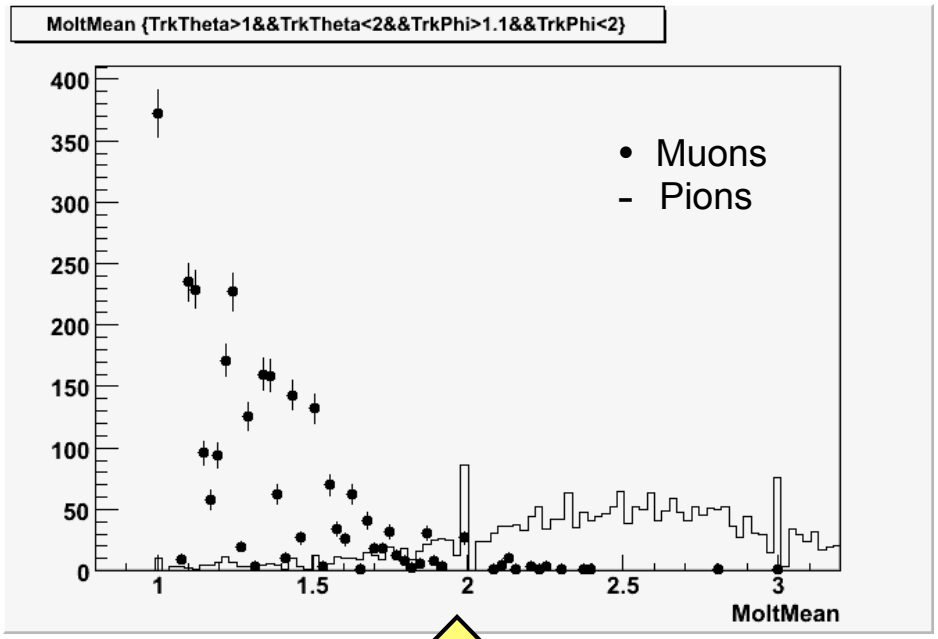
In order to fully reconstruct the track we performed 2 fits, one in the xy plane the other in the zy plane.

We also calculated the χ^2 with respect to the generated track using the MC truth information.

residual distribution for muons and pions



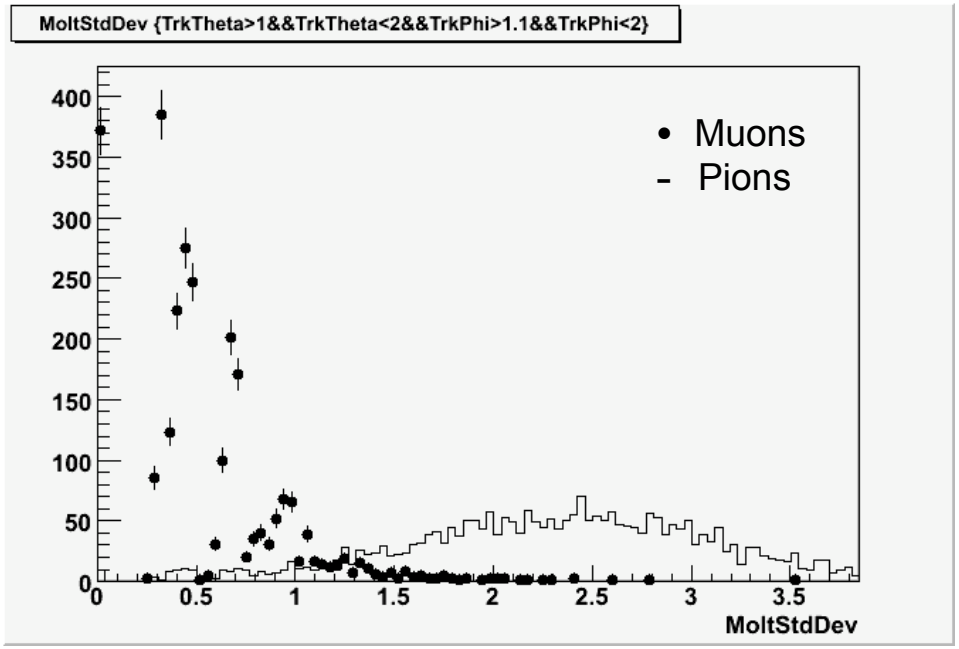
Shower size



To have an idea of the transverse development of the shower we evaluate the average multiplicity.

Average multiplicity of hit strips per cluster for muons and pions

... and its standard deviation



What's next

- Debug/improve our code
- Finalize a cut-based muon selector
- Study its performances with different
  - iron configurations
  - occupancies
  - spatial resolutions
- Optimization strongly depends on the momentum: use the Fast Sim to know the momentum distributions of the muons in superB for the most interesting physics channels.
- The same for the KI