Super Bfactory Workshop
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IFR fast simulation

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General stuffs

- ***Physics output:***
  - *IFR reconstructed quantity that can be given as input to the Standard (or simplified) PID selectors*
  - *Users should be able to access the IFR through the usual lines of code:*
    - `BtaCandidate* B;`
    - `BtaIfrQual* IfrQual=B->getMicroAdapter()->getIfrQual();`
    - `Float mIntLenght=IfrQual->measuredInteractionLengths();`
  - *List of muons with different selection criteria will be provided to analysts*

Muon selection

Muon cut based selctor

Selection Variables	Very Tight	Tight
E_{cal}	[0.4, 0.5]	[0.4, 0.5]
No. of Layers (N_L)	> 1	> 2
Meas. Lambda (λ_{meas})	> 2.2	> 2.2
Delta Lambda $(\triangle\lambda)$	< 0.8	< 1
Track Fit Chisq. (χ^2_{fit})	< 3	< 3
Track Match Chisq. (χ^2_{mat})	< 5	< 5
Track Continuity (T_C)	< 0.34	< 0.3
Average Strip Mult. $(\bar{m})$	< 8	< 8
Sigma Strip Mult. (σ_m)	< 4	< 4

These variables are strongly correlated.

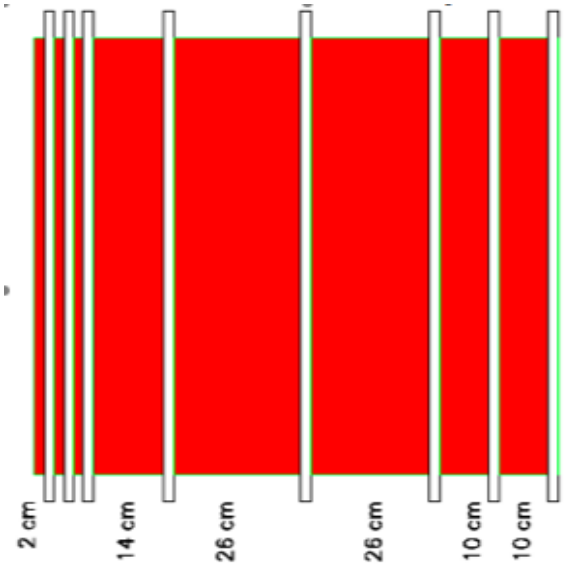
- *To simulate the response of the IFR a realistic parameterization of the hadronic showers is important for the e/mu separation and the Klong identification.*

Possible Approaches for a IfrFastSim

- ***(1) Parameterize the final reconstructed quantities**:*
  - *Start using the existing BaBar data*
  - *Generate for each track the IFR reponse randomly in bins of p, theta, phi, LundID.*
- ***(2) Parameterize the basic IFR ouput (strip multiplicity per layer, etc.)***
  - *Reconstruct the relevant quantity*

Approach (1)

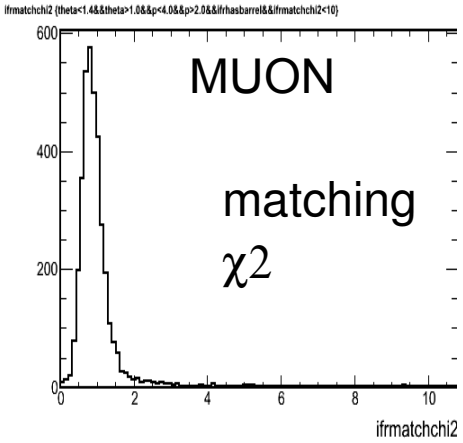
- ***Parameterize the final reconstructed quantities in bins of (p, theta, phi, LundID):***
  - *IFR geometry will be very similar to the SuperIFR: material before the IFR will be ~the same*
- *Advantages:*
  - *PDFs from the BaBar data*
  - *output is -realistic-: hadronic (pions, Kaons) interactions within the IFR and before the IFR are parameterized*
  - *Effect of the DCH-IFR matching are taken into account*

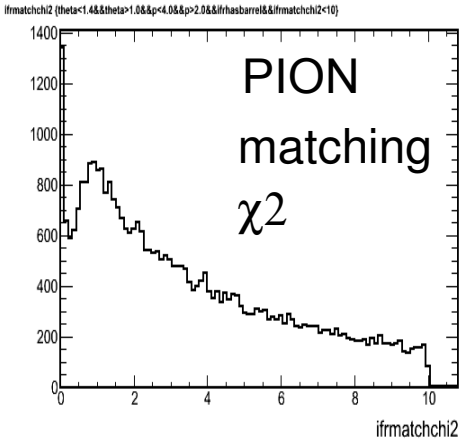


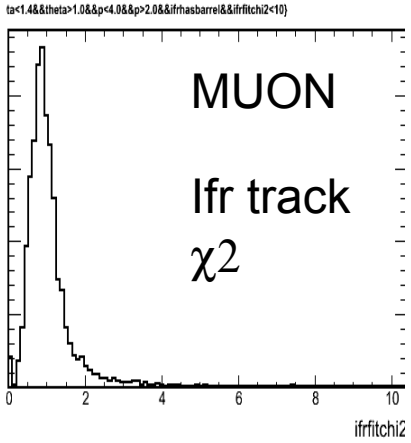
- *Disantvantages:*
  - *parameterization needs to be changed according to the design optimization (full simulation) of the Super B detector*
  - *Correlations between the reco-quantities are difficult to account and are important for the mu-ID*

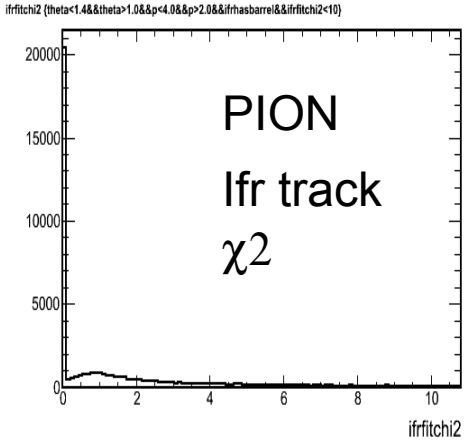
Some examples

- *Use clean samples of muons ($\mu\mu\gamma$) and pions ($\tau\tau$): select a particular bin, for ex. (barrel): θ(57°-80°), p(2.0-4.0 GeV)*

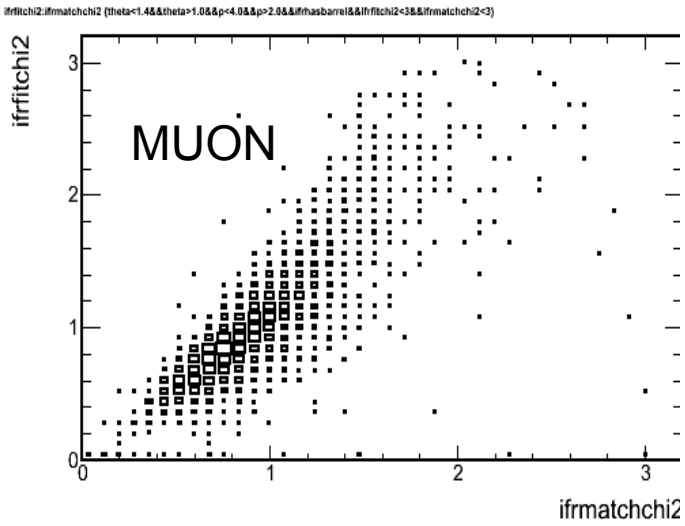


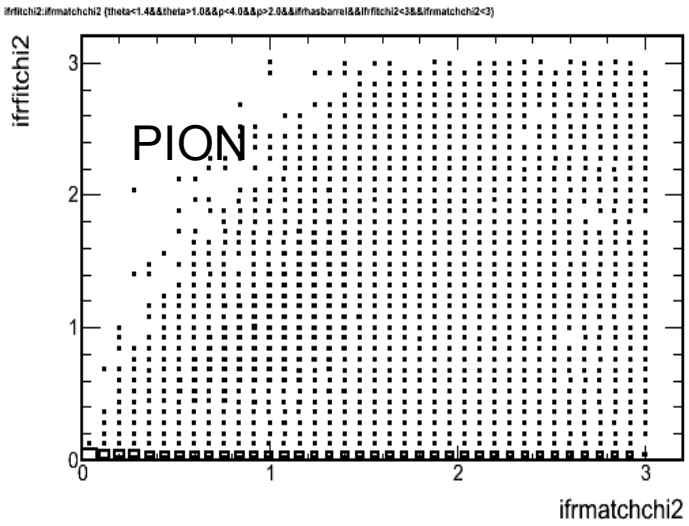






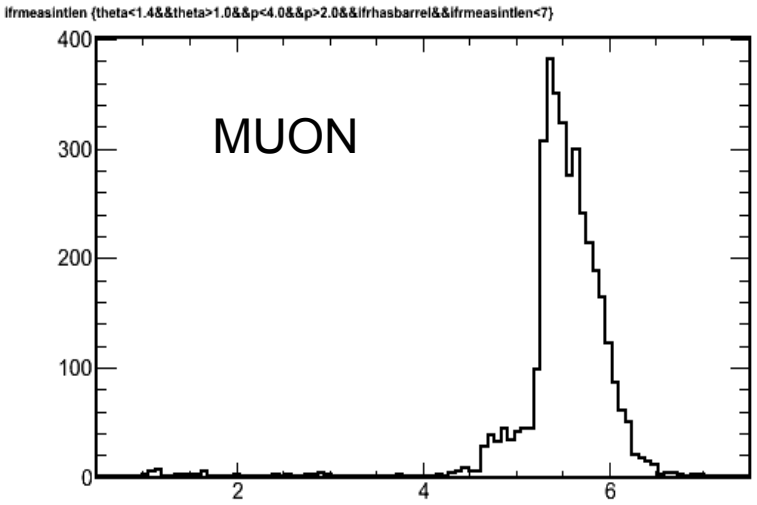
Need to take into account the correlations...

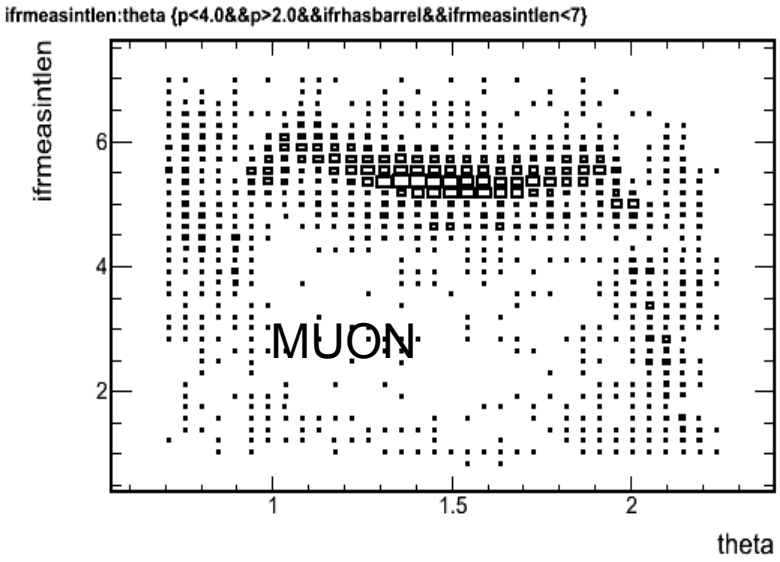




Measured IntLenght

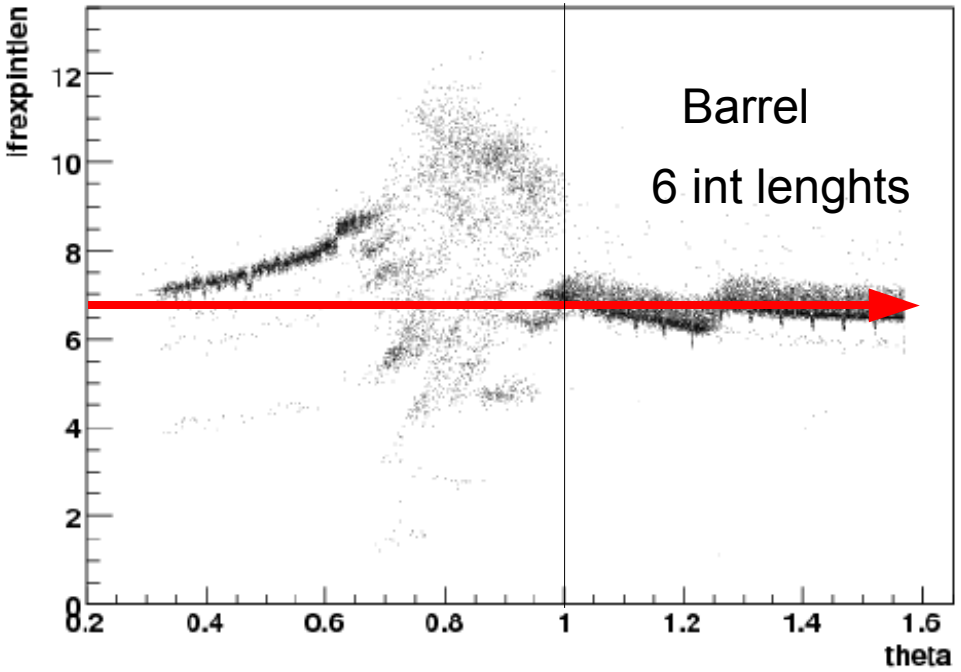
bin: θ(57°-80°), p(2.0-4.0 GeV)





PDFs needs to be changed according to the Detector design and optimization

IFR baseline in the CDR



Approach (2)

- ***For each track generate the multiplicity, spread of the hits per layers:***

- *Advantages:*
  - *PDFs can still be obtained from the BaBar data*
  - *output is -realistic-: hadronic (pions, Kaons) interactions within the IFR and before the IFR are parameterized*
  - *Correlations are easily accounted*
  - *Parameterizations can be changed according to the detector design: number of layers, hit multiplicity, amount of iron*

- *Disantvantages:*
  - *A layer of code to reconstruct the Ifr reco-objects is needed (reuse the BaBar code?)*
  - *We need to simulate the effect of the DCH-IFR matching,*

Summary

- *We evaluated different approaches*
- *Originally the preferred design*
  - *was to use the approach (1), just using a subset of the reconstructed variables*
- *We will use the approach (2), more stable and easy to update with the*
- *We are in time to provide a first IFR output by the end of June*

- *People involved in the project:*
  - *G. Castelli, M. Rotondo (Padova University and INFN)*