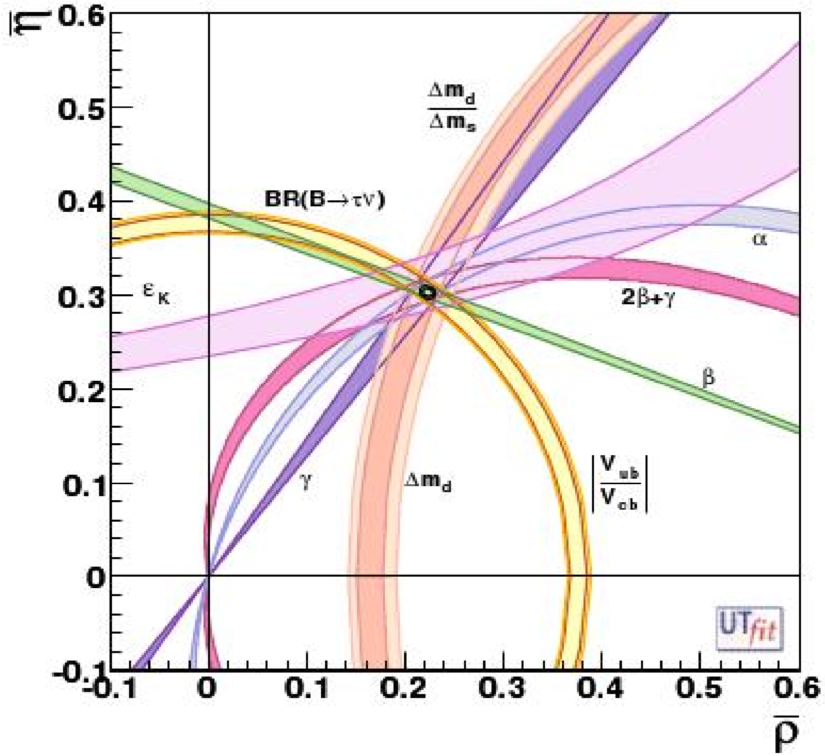
XII SuperB General Meeting, Annecy, 17/03/2010

Simulation and Detector Optimization



G.Cibinetto, N.Gagliardi, M.Munerato and M.Rotondo

Outline

- **IFR configurations;**
- **DBT inputs;**
- **Efficiencies and Mis-ID distributions (as function of p);**
- **DBT procedure tuned in 4 p-bins;**
- **Noise and real detector efficiency;**
- **Forward and Barrel regions from events coming from $B \to Dl\nu$ decays**
- **Conclusions.**

Different IFR configurations

```
|=|=|========|============|============|=======|=====|
|2|2|   16   |     24     |     24     |  14   | 10  |
```
$C_2' \sim 920$mm

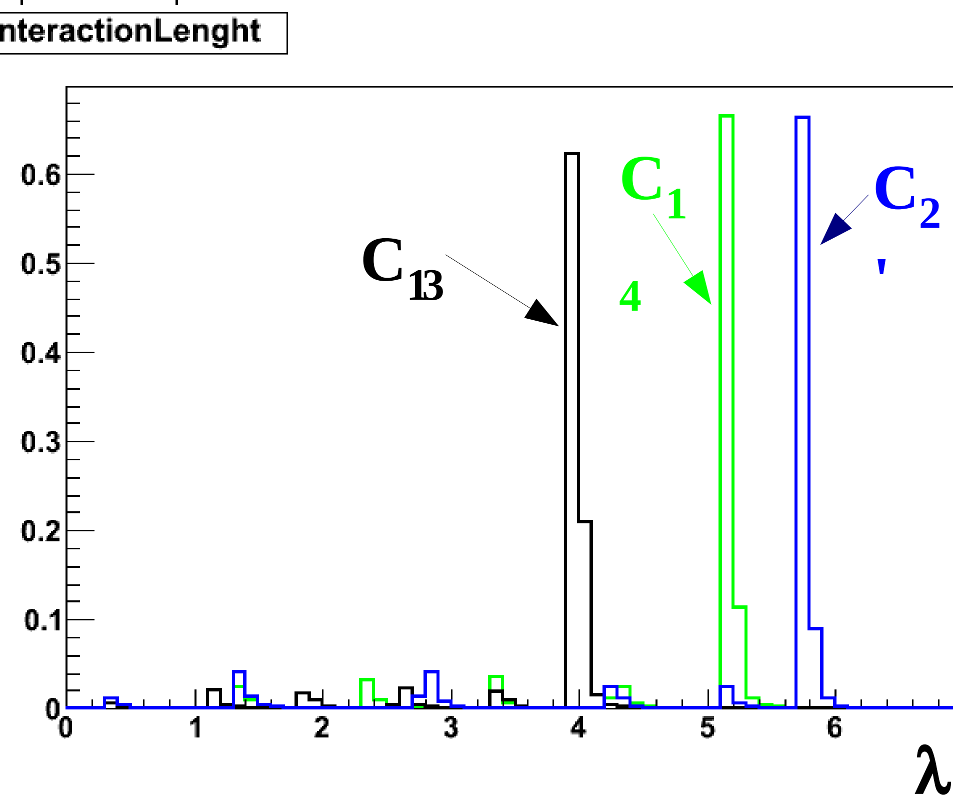
```
|=|=|========|========|========|========|=======|
|2|2|   16   |   16   |   16   |   16   |  14   |
```
$C_{13} \sim 820$mm

```
|=|=|======|======|======|======|=====|
|2|2|  12  |  12  |  12  |  12  | 10  |
```
$C_{14} \sim 620$mm

- Simulated 500k of muons and pions (momentum range from 0 to 5 GeV/c) in the top-sextant of the barrel
- How to compare these configurations:

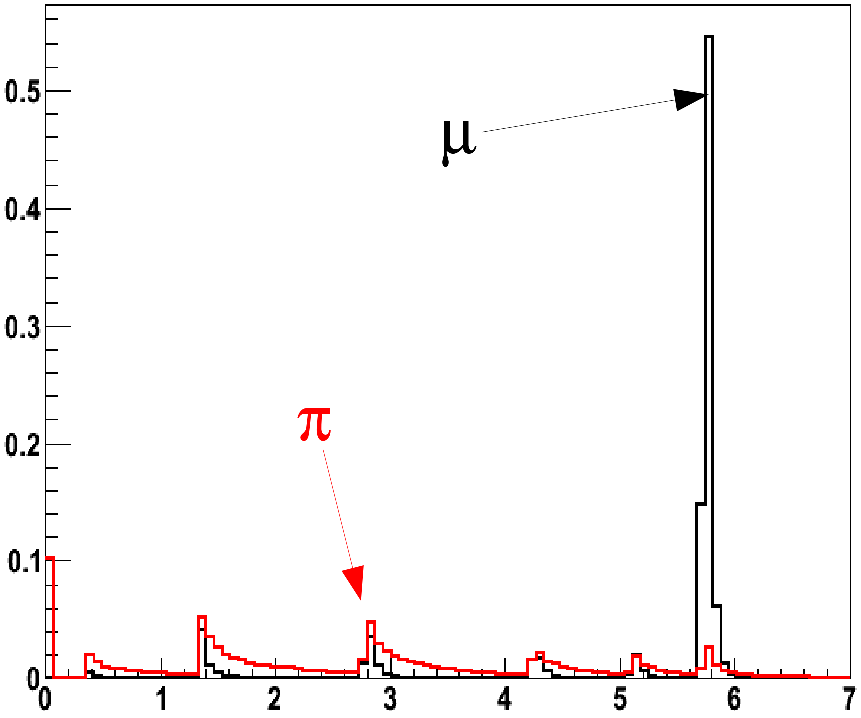
↓

DBT

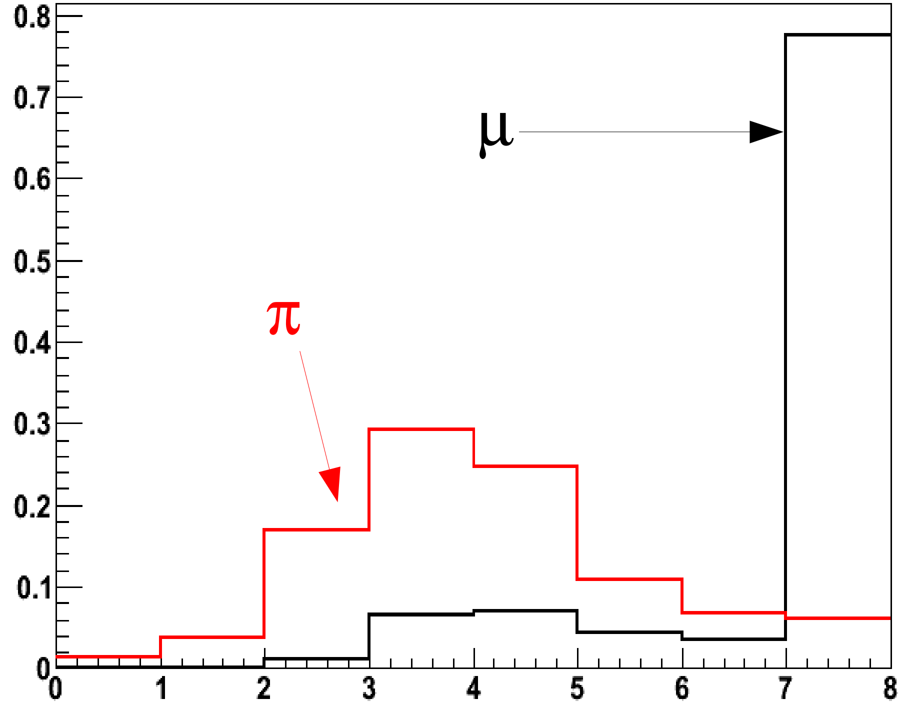


Boost Decision Tree Inputs I

We use 9 discriminating variables to separate signal from background

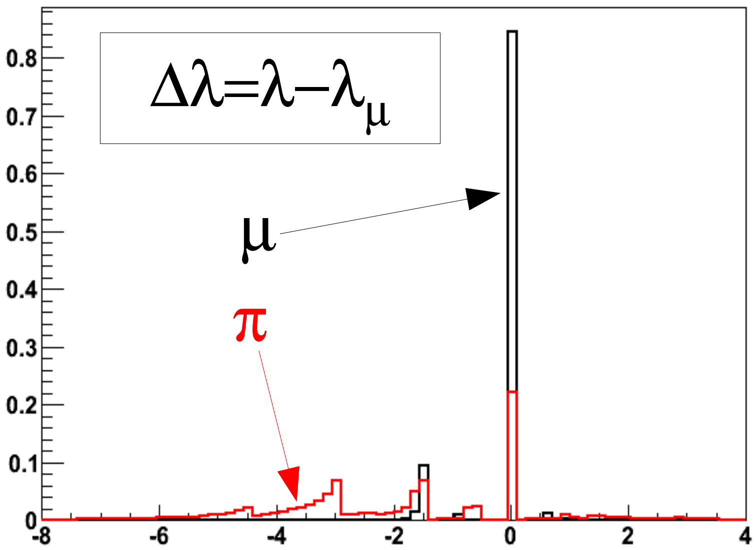


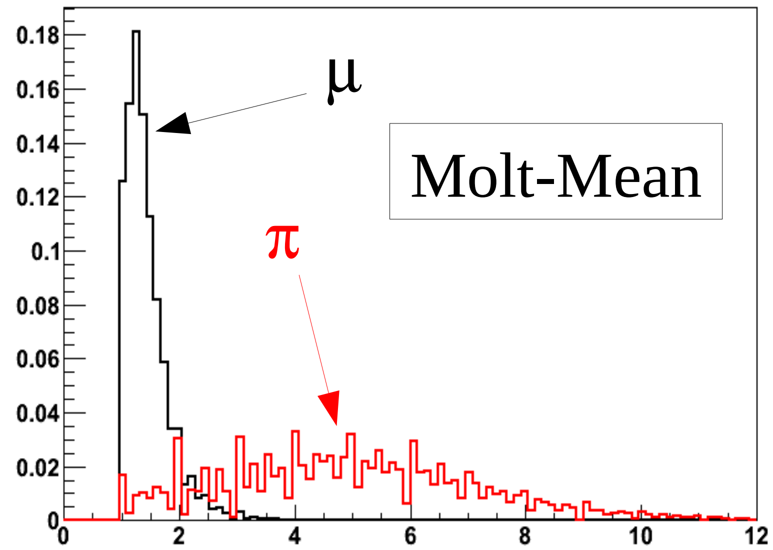
InteractionLenght

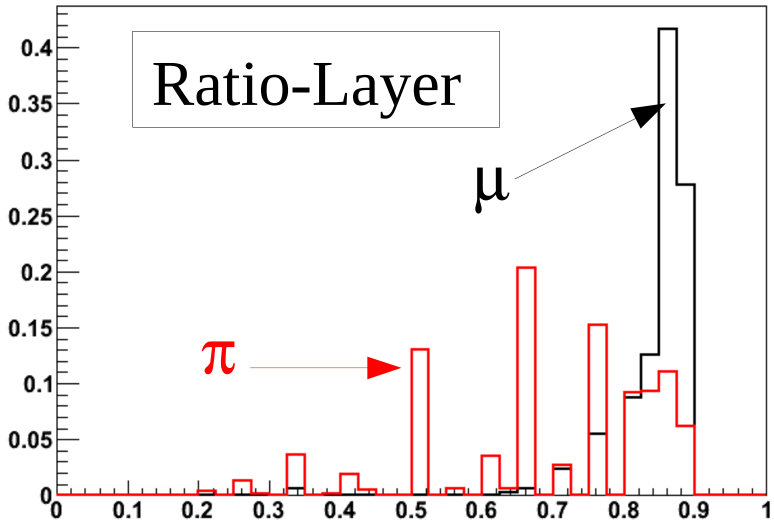


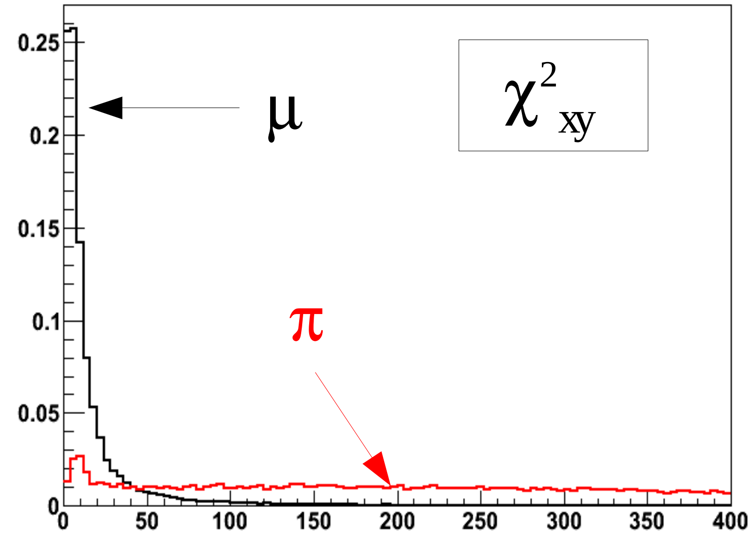
Last-Layer

Boost Decision Tree Inputs II

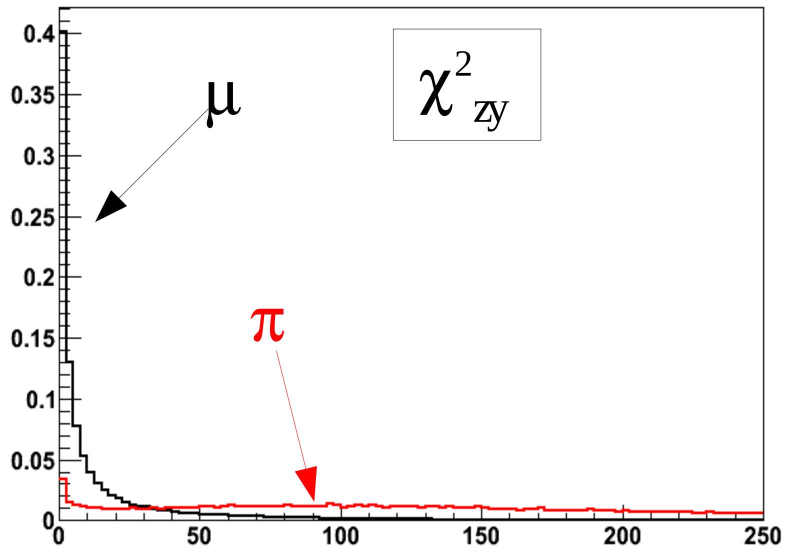


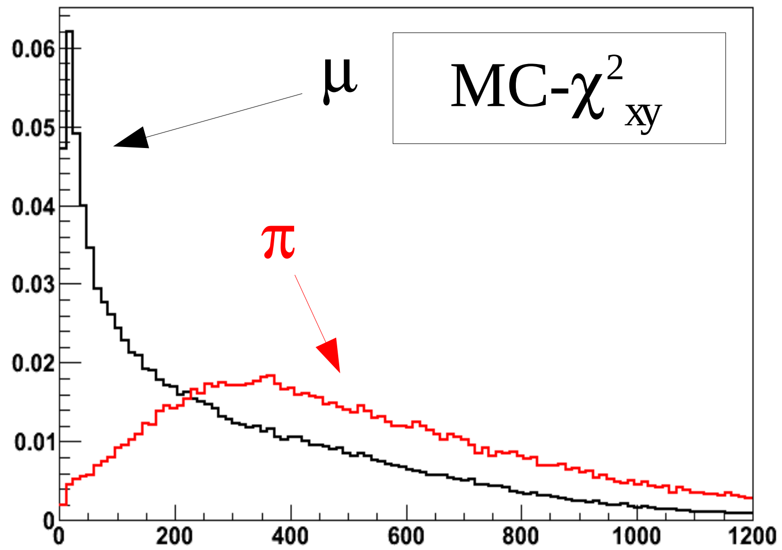


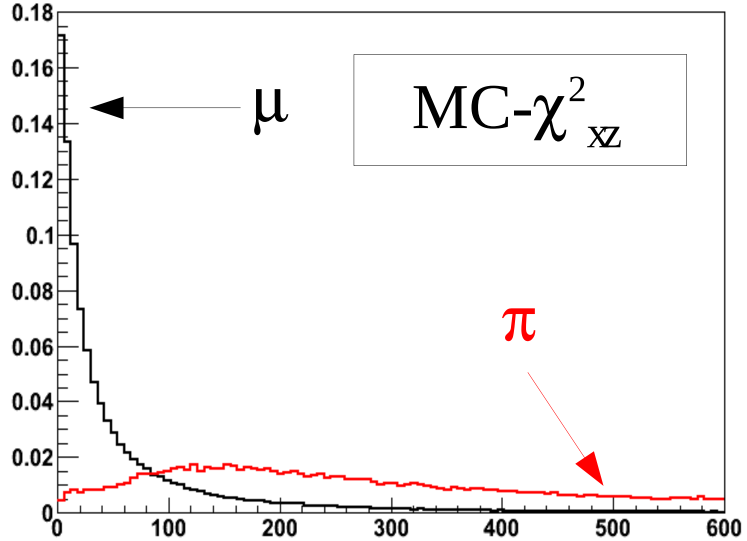




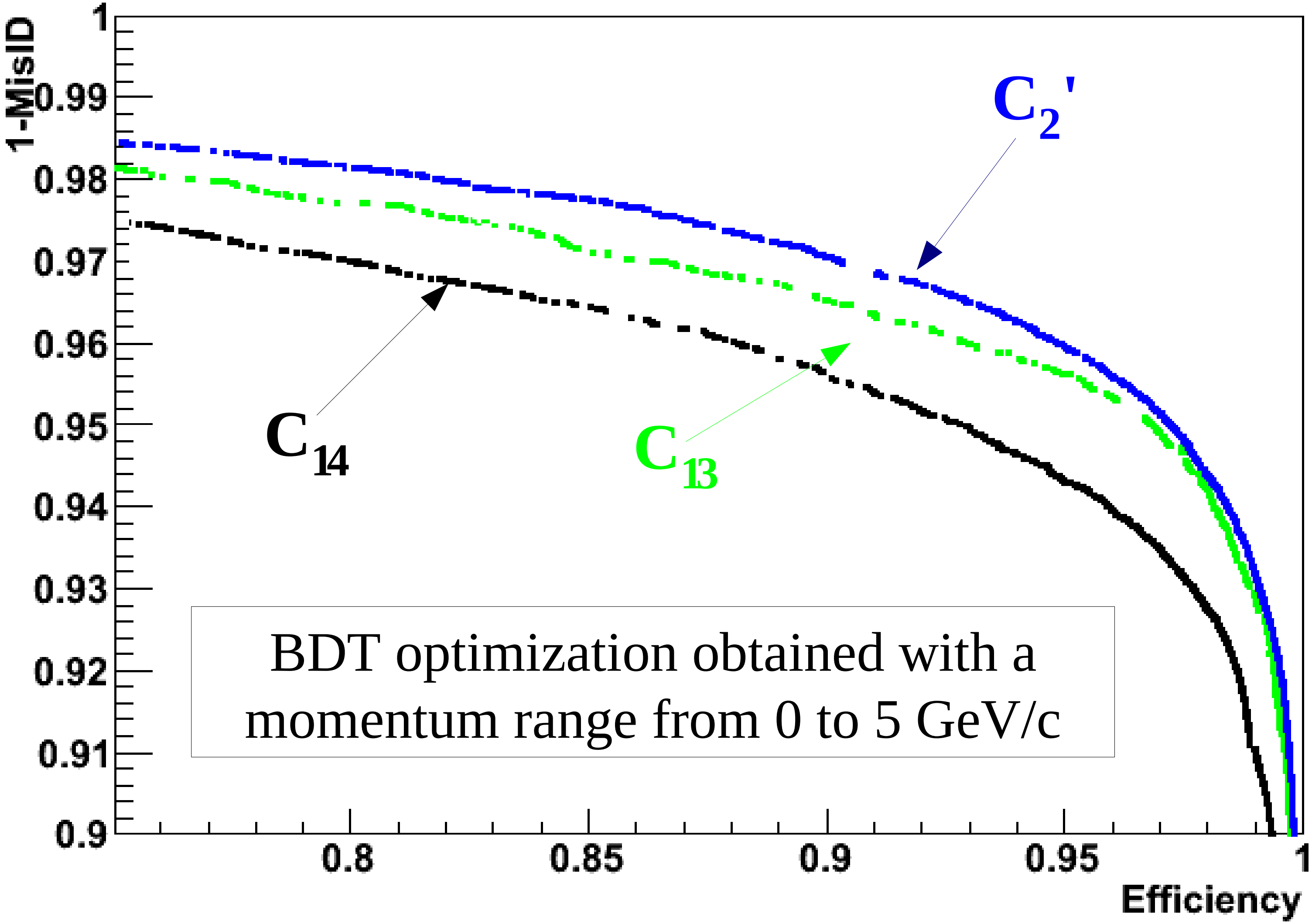
Boost Decision Tree Inputs III





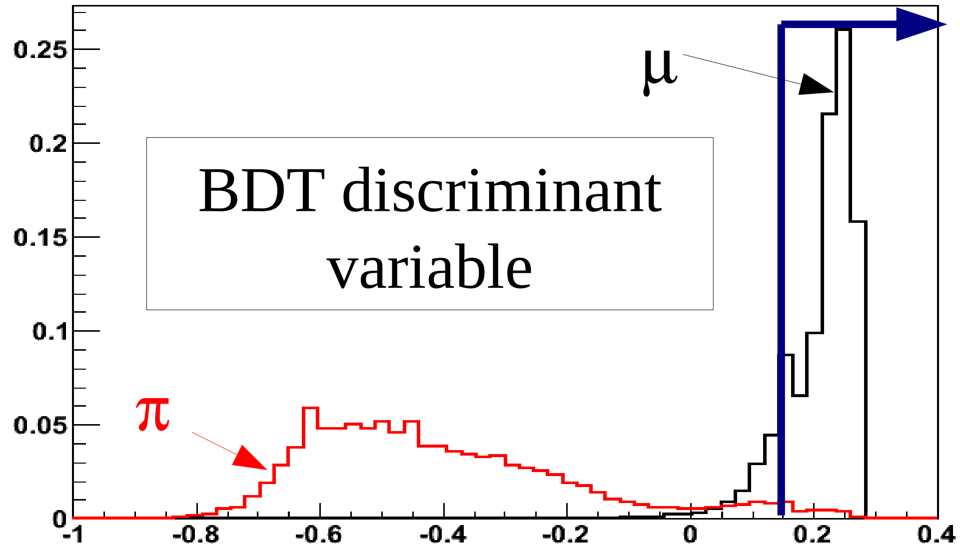


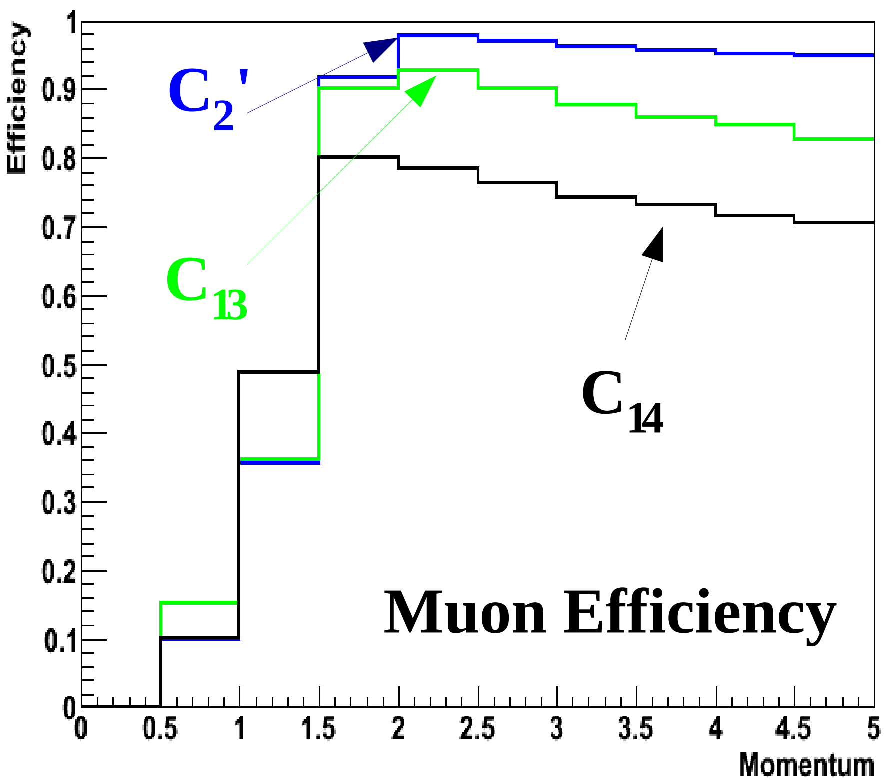
BDT output

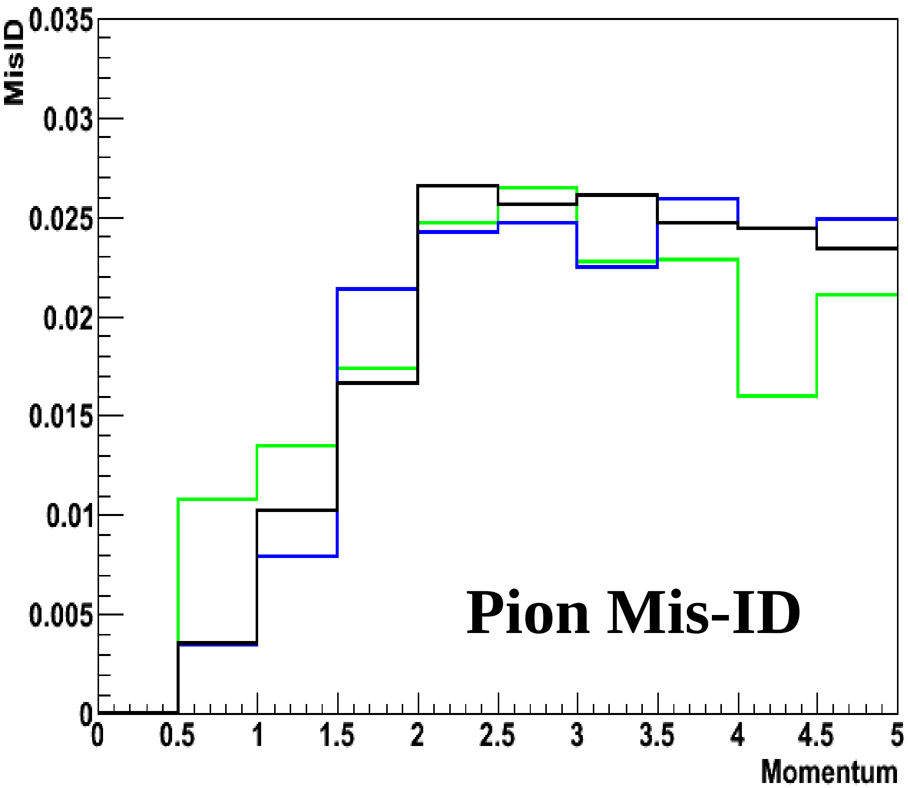


1-MisID
1
0.99
0.98
0.97
0.96
0.95
0.94
0.93
0.92
0.91
0.9
0.8
0.85
0.9
0.95
1
Efficiency
C2'
C14
C13
BDT optimization obtained with a momentum range from 0 to 5 GeV/c

- Cut on BDT requiring an average Mis-ID of 2%
- We extract the efficiency and mid-ID as function of the μ/π momentum
- C_2' configuration seems to be the best

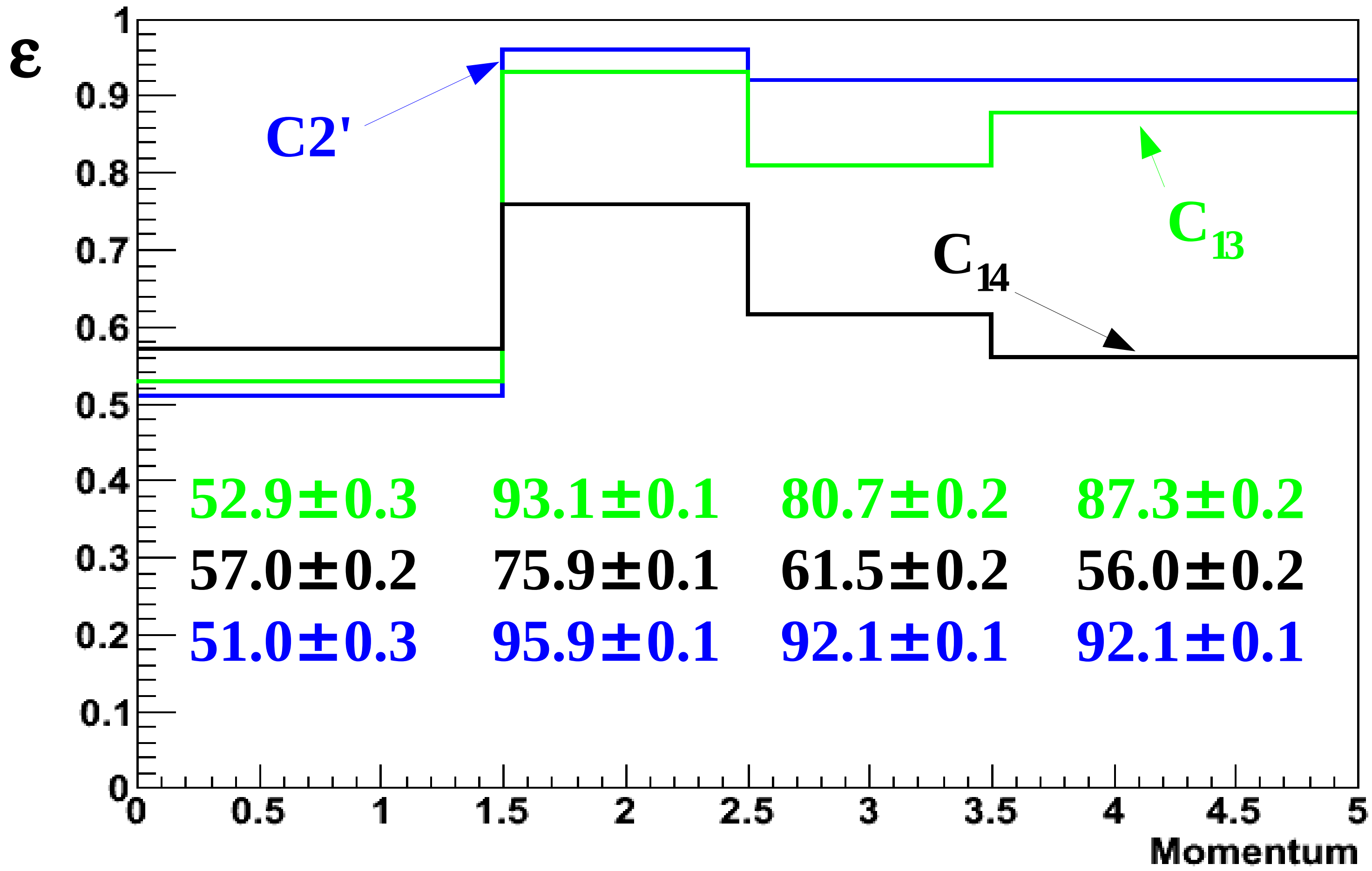






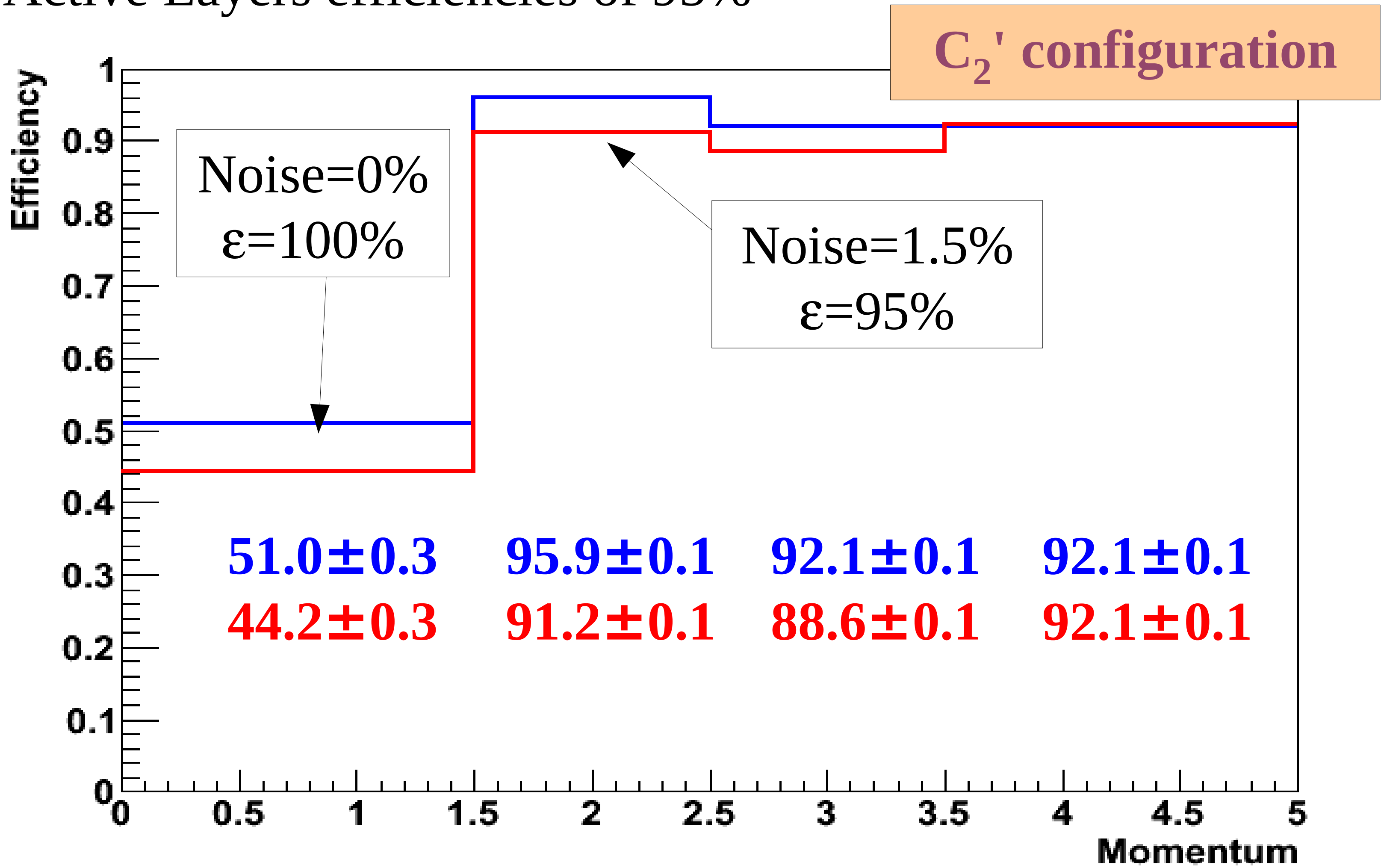
BDT optimization

- BDT technique optimized in 4 bins of the μ/π momentum
- Extracted the muon efficiency for each momentum bin requiring a pion MisID of 2%

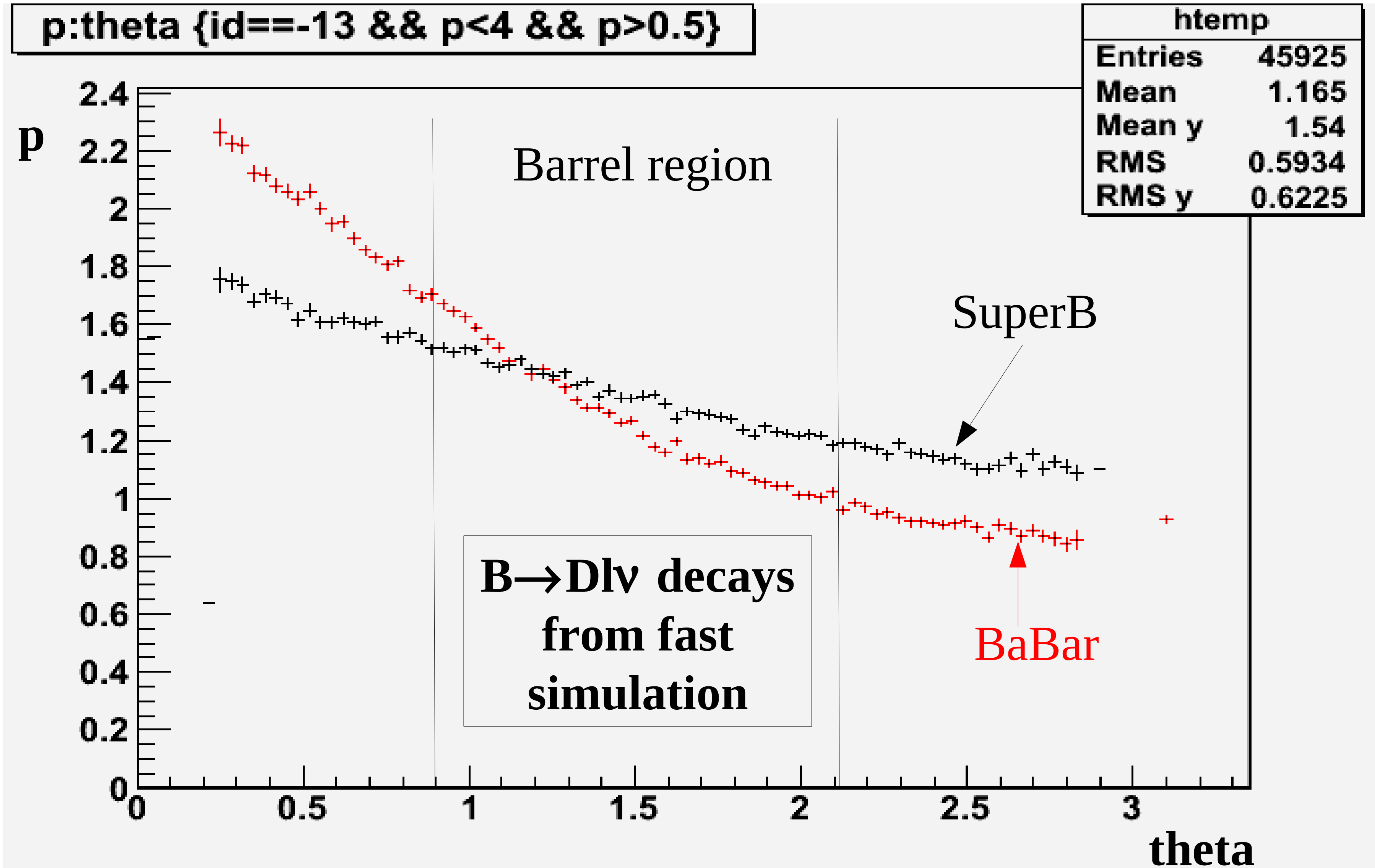


Noise and real detector efficiency

- Add 1.5% of uniform noise
- Active Layers efficiencies of 95%



Forward and Barrel regions from events coming from B→Dlν decays

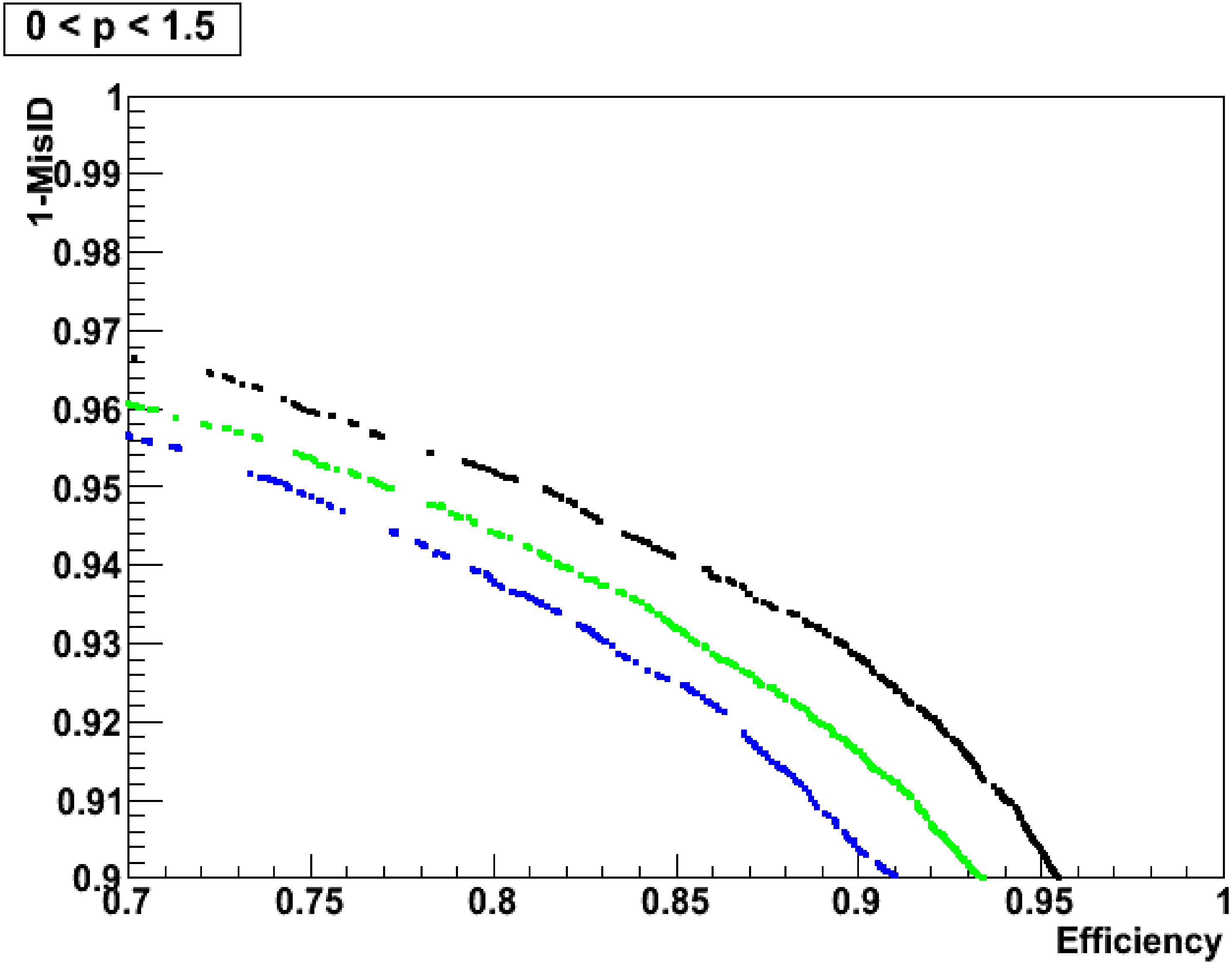


Conclusions

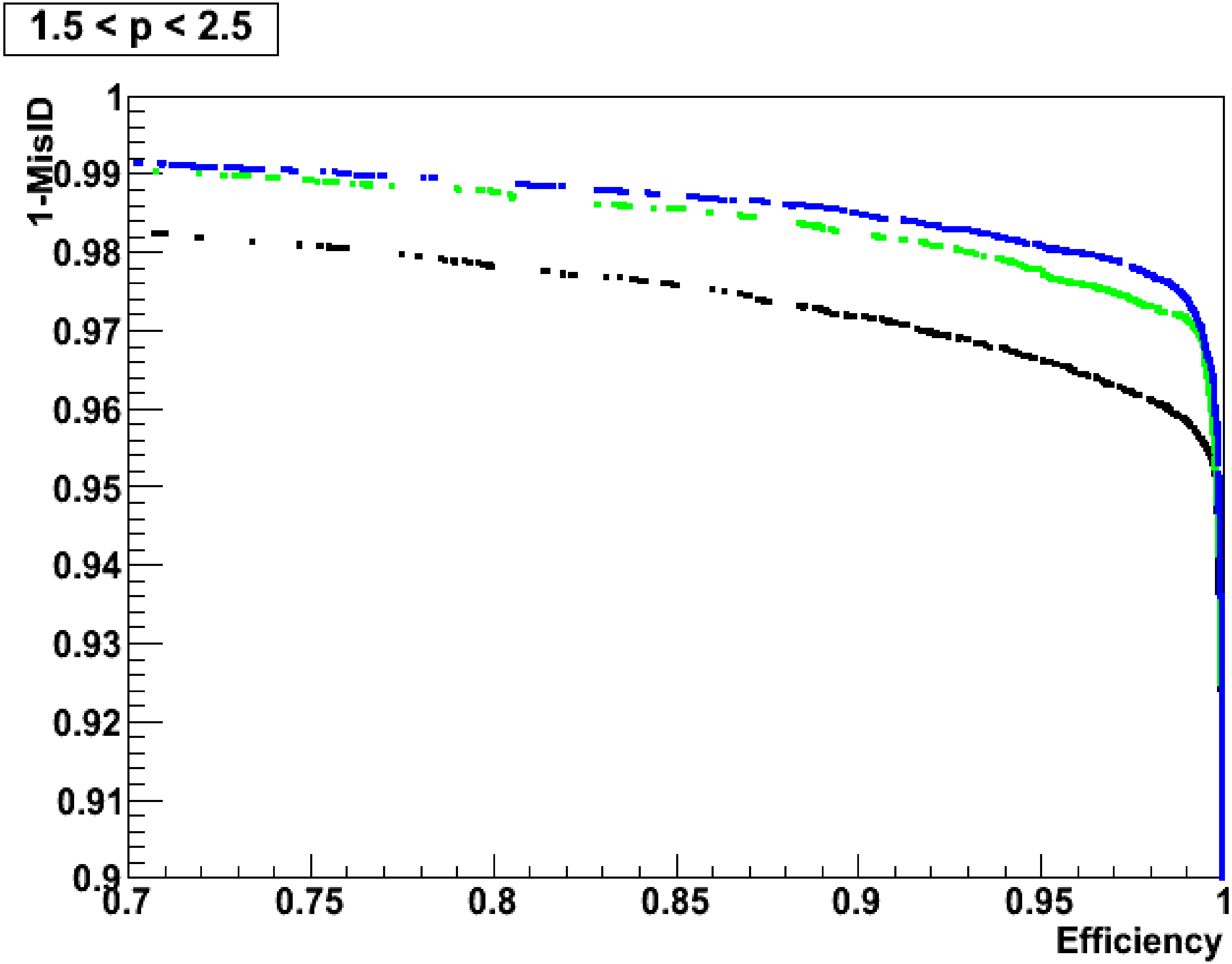
- BDT is an useful tool to discriminate the different IFR configurations
- The study performed show C_2' is the best option
- We need background simulation with more realistic distributions
- K_L ID

Backup slides

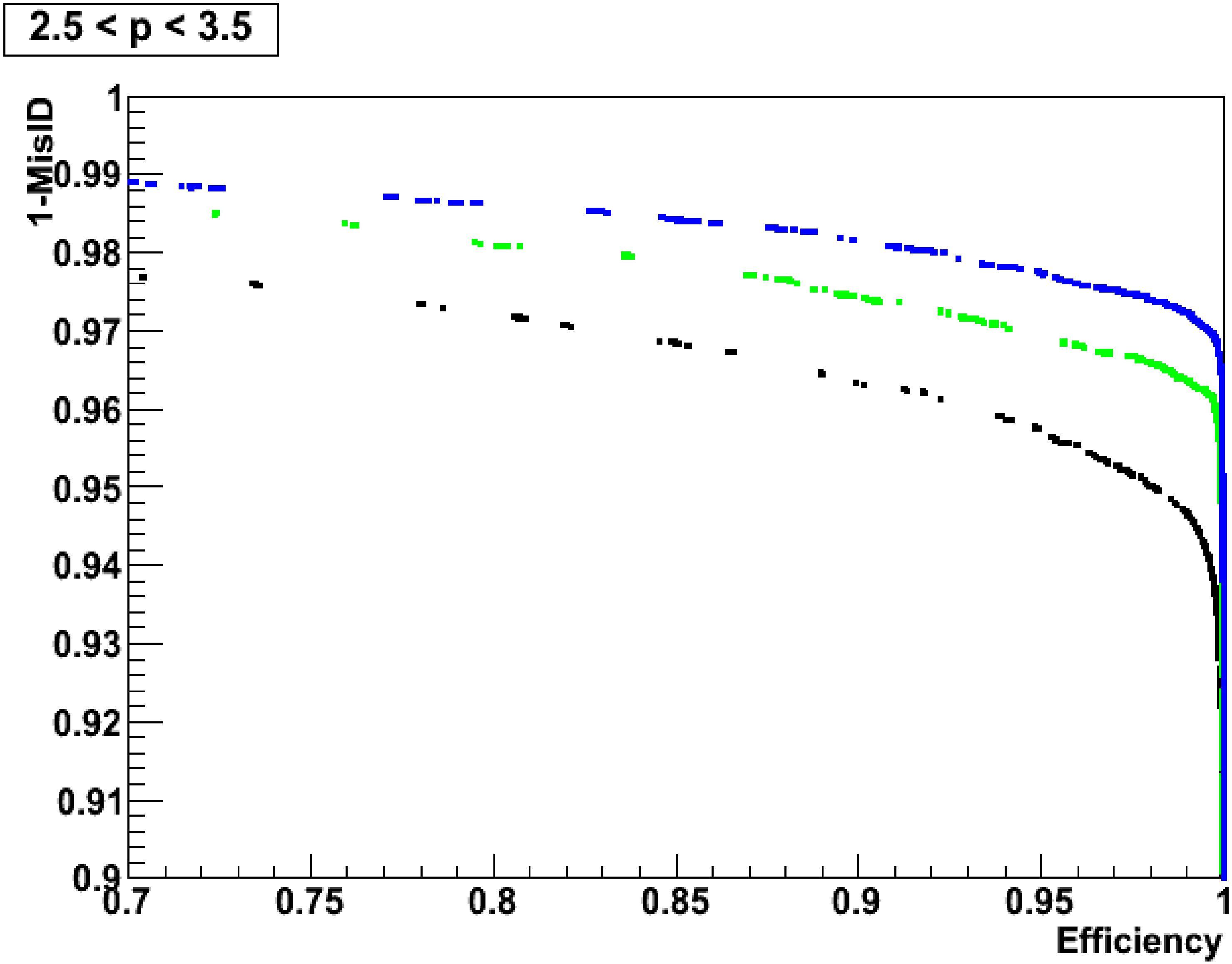
BDT optimization: 0 < p < 1.5 GeV/c



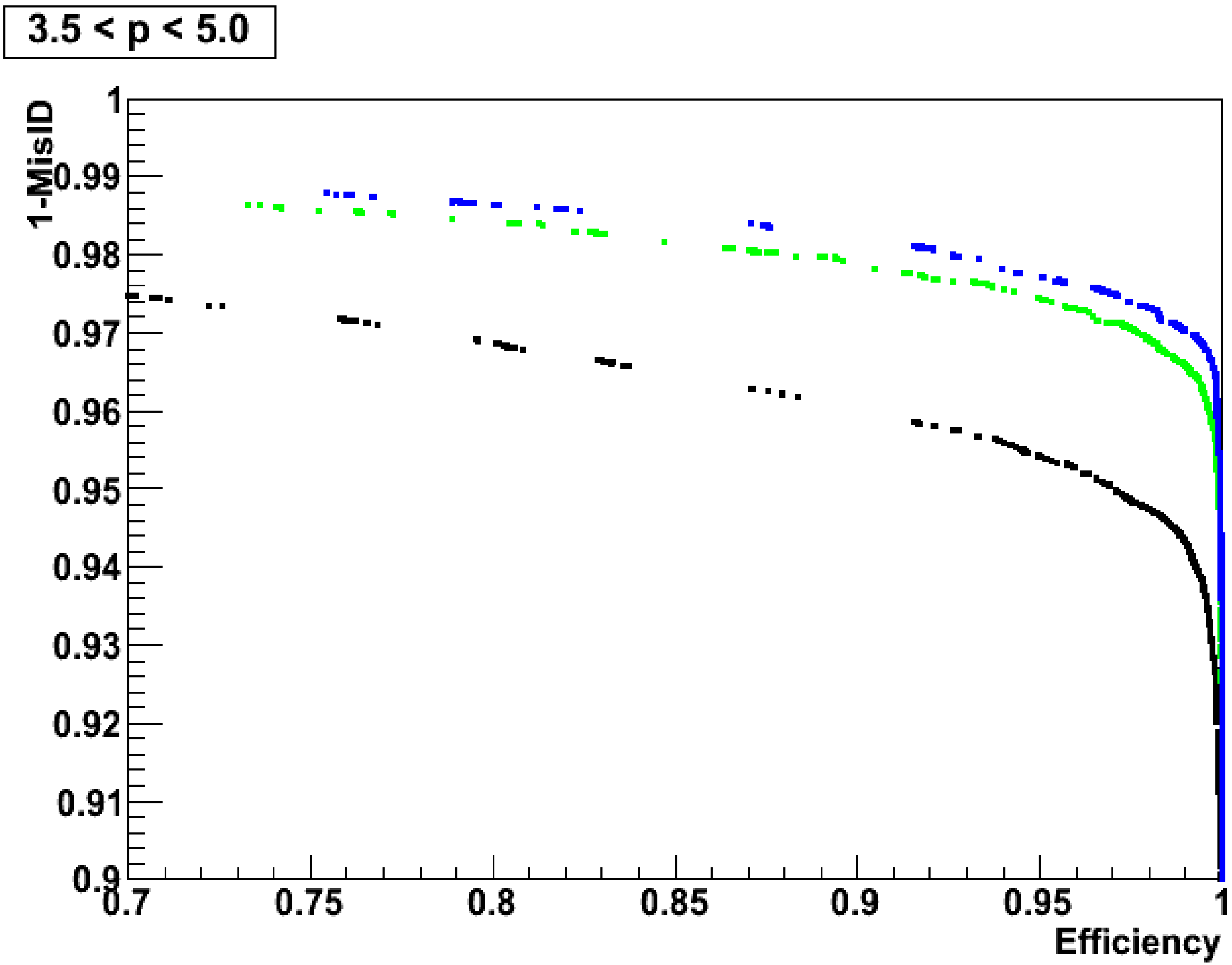
BDT optimization: 1.5 < p < 2.5 GeV/c



BDT optimization: 2.5 < p < 3.5 GeV/c



BDT optimization: 3.5 < p < 5.0 GeV/c



Noise and real Detector Efficiency