

# Optimization for $B \rightarrow K$ emu

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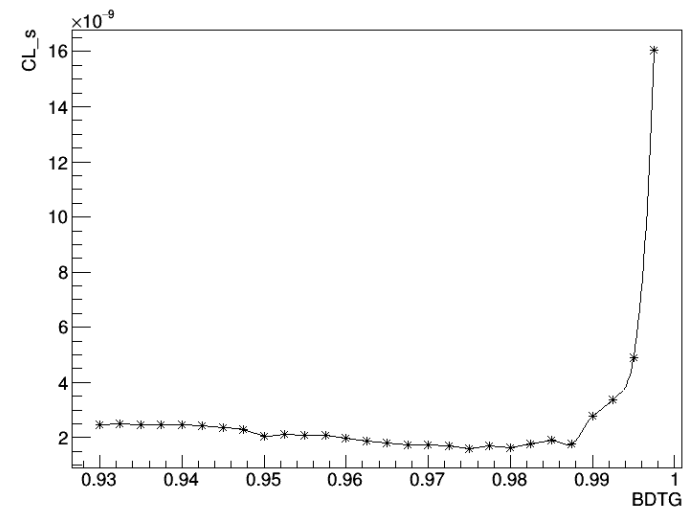
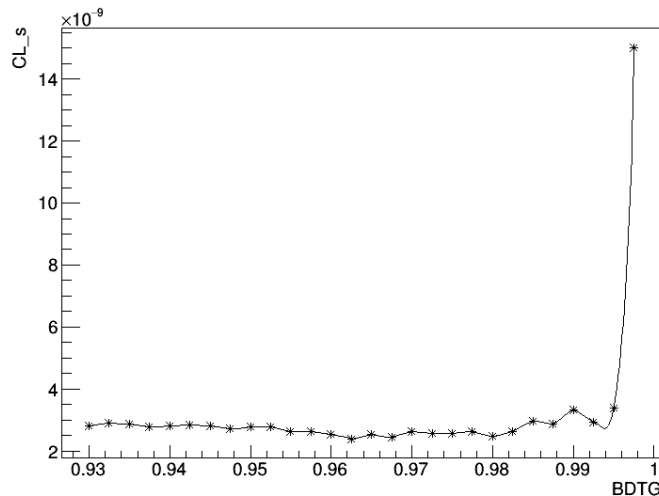
IFJ PAN

# Introduction

- We have now 3 ProbNNs and 2 BDTs that will be used in the final selection.
- One needs to find optimum cuts for both of them.
- 5-dim space is a non easy beast to optimize :(
- Attempt to optimize the parameters space....
- We are doing a swap in data sets: optimizing on  $K_{mu}(K_e)$  and applying to  $K_e(K_{mu})$ .

# Combinatorial background BDT

- We are trying to reduce the dimension optimization by optimizing the combinatorial background BDT as it's a separate sample. We use the upper sideband for it.

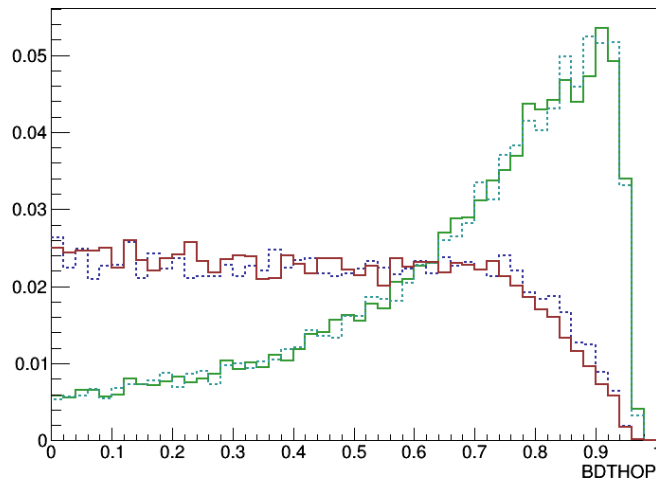


- The UL is rather flat and stable. We propose to have a cut of 0.97 for both samples.

# “Leftovers” ;)

- We are left with 4-dim space:  $\text{Probnn}(e,k,\mu)$  and BDTHOP.
- Here are the distribution of variables:

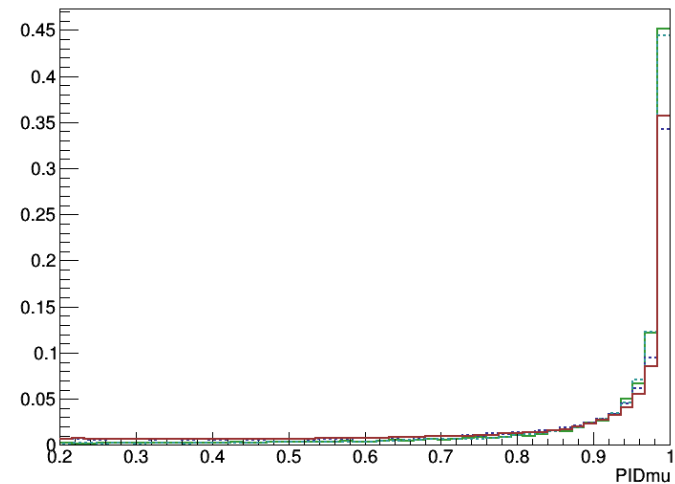
BDTG\_HOP ((Kplus\_ID+muplus\_ID==308 || Kplus\_ID+muplus\_ID ==-308))



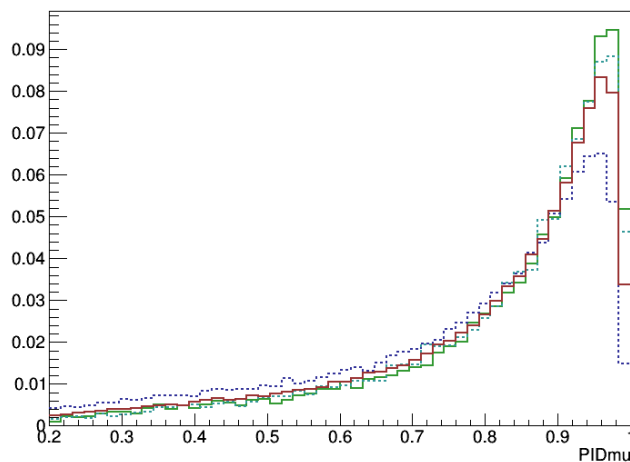
Only the BDTHOP Shows difference between the signal and background.

Any attempt on the optimising the 4-dim space has failed with unstability.

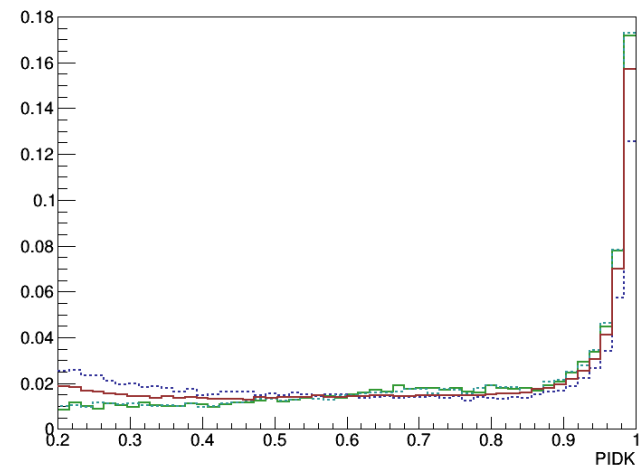
emius\_V3ProbNNe\_Untrafo\_corrected ((Kplus\_ID+muplus\_ID==308 || Kplus\_ID+muplus\_ID ==-308))



muplus\_V2ProbNNmu\_Untrafo\_corrected ((Kplus\_ID+muplus\_ID==308 || Kplus\_ID+muplus\_ID ==-308))



Kplus\_V2ProbNNk\_Untrafo\_corrected ((Kplus\_ID+muplus\_ID==308 || Kplus\_ID+muplus\_ID ==-308))



# PID Cus

- Since the optimization did not work, we have decided to place a hard cut on the PID variables:
- ProbNNmu > 0.7
- ProbNNe > 0.65
- ProbNNk > 0.6

And do an optimiation of BDTHOP.

# BDTHOP optimization

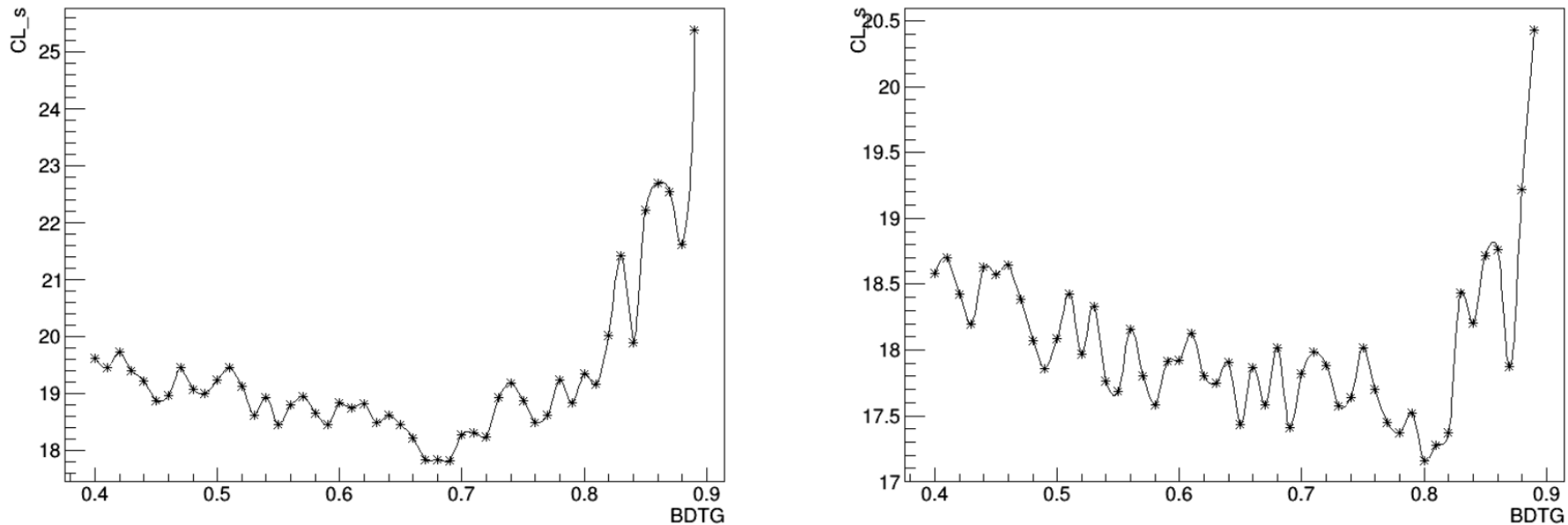


Figure 27: Results of the BDTHOP optimization. Left the KeSS sample, right the KmuSS sample.

- As can be seen the cut  $> 0.75$  is ok for both samples.

# Expected UL

- Taken the new alphas from Gośka we can calculate the expected UL:
- $B(B^+ \rightarrow K^+ \mu^+ e^-) < 1.5e-08$
- $B(B^+ \rightarrow K^+ \mu^- e^+) < 1.2e-08$

