

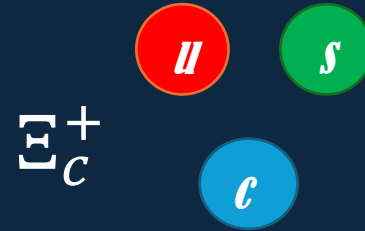
MUSI@CPPM

How was the month ?
What did I learn and discover

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Supervisor : Vitalii Lisovskyi

My internship

The objective was to calculate:

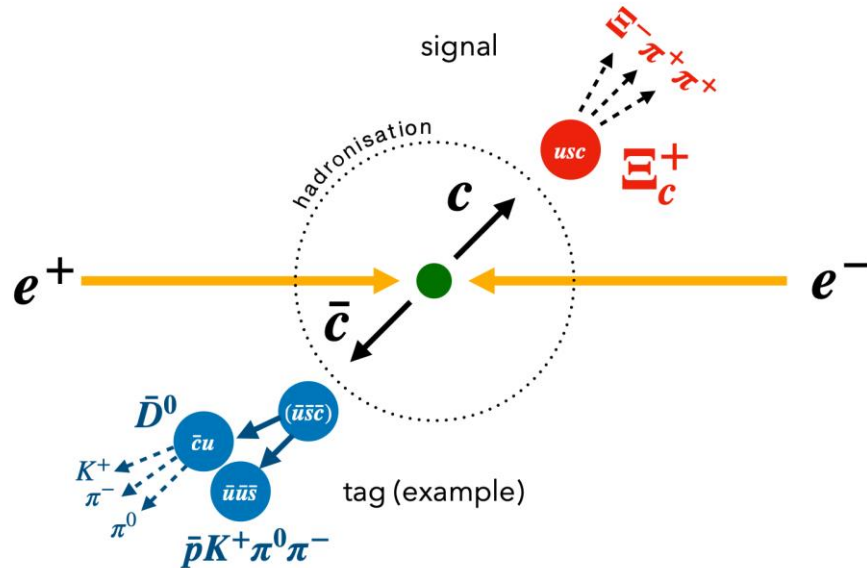


$$BR(\Xi_c^+ \rightarrow \Xi^- \pi^+ \pi^+) = \frac{N(\Xi_c^+ \rightarrow \Xi^- \pi^+ \pi^+)}{N(\Xi_c^+)} , \text{ the probability for } \Xi_c^+ \text{ to decay in the mode } \Xi^- \pi^+ \pi^+$$

PDG : $BR(\Xi_c^+ \rightarrow \Xi^- \pi^+ \pi^+) = 2.9 \pm 1.3\% \Rightarrow 45\% \text{ of uncertainty}$
 $\Rightarrow$ we want to reduce it

Finally, we get : $BR(\Xi_c^+ \rightarrow \Xi^- \pi^+ \pi^+) = 4.5 \pm 0.5\%$
 $\Rightarrow 11\% \text{ of uncertainty, much better !}$

How to proceed ?



The SuperKEKB accelerator is an e^-e^+ collider, this collision gives a $c\bar{c}$ pair.

What we call the *tag* is the result of the $\bar{c}$ hadronisation.

The study of the tag will help us to know what is signal and what is background thanks to **conservation laws** !

Reduce the background

Compare the signal to the background

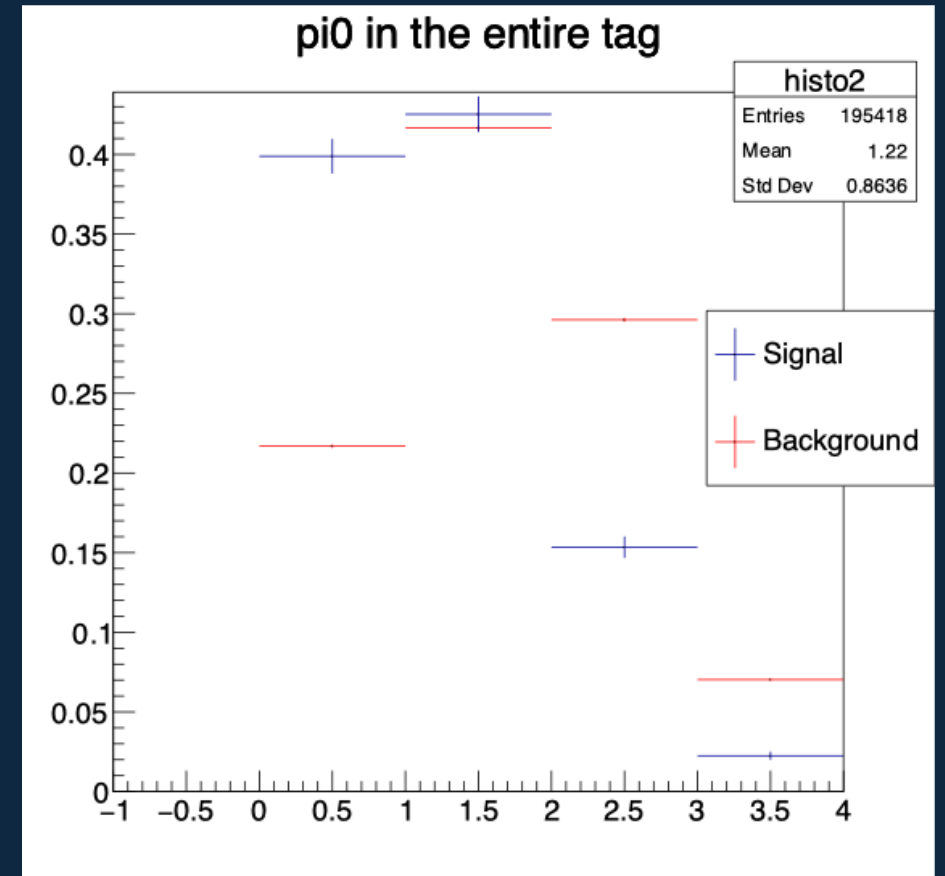
An example with the number of π^0 in the tag:

We see that up to 2, there is more signal than background.

So afterward, we will put a constraint on this variable (≤ 2) to keep as much signal as possible while reducing the background !

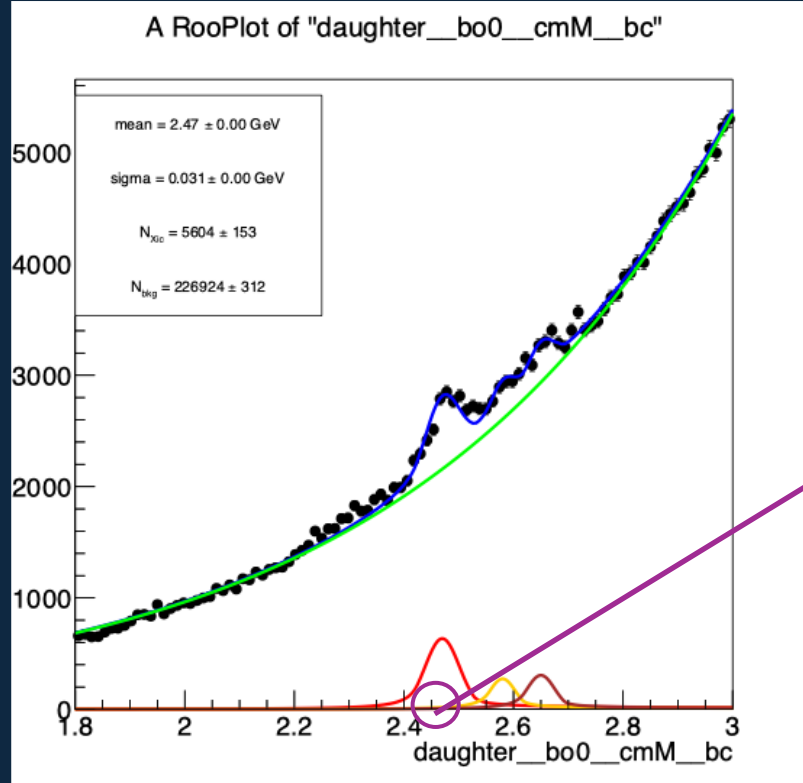
In the case of this example, how can we explain the origin of the background ?

- $\pi^0 \rightarrow \gamma\gamma$
- The detector detects a lot of γ
- γ can come from everywhere
- It's easy to combine photons badly, and therefore to misidentify π^0
- So less π^0 , less background !



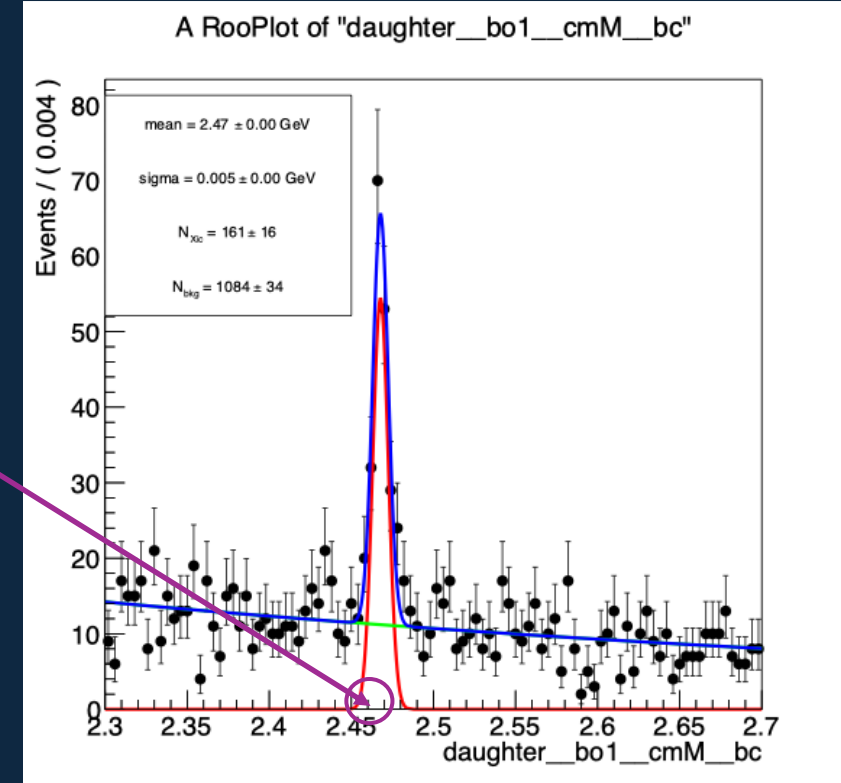
Gaussian and exponential model

After setting the constraints on our variables and making a mass fit,



Mass calculated from the tag

$$N(\Xi_c^+) = 5604 \pm 153$$



Mass calculated from the decay product

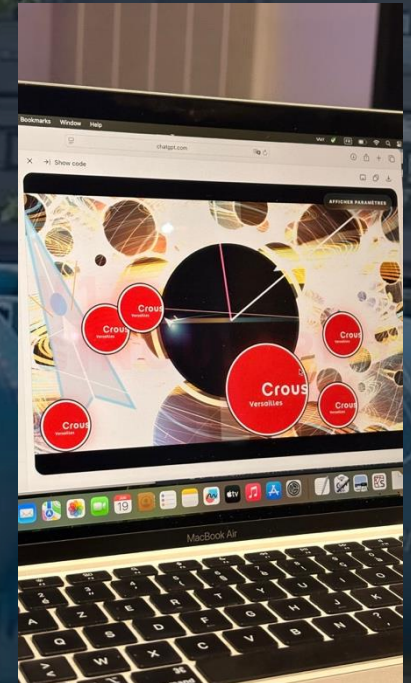
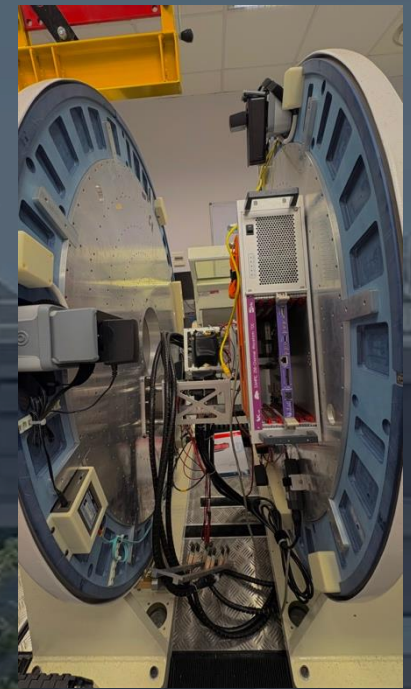
$$N(\Xi_c^+ \rightarrow \Xi^- \pi^+ \pi^+) = 161 \pm 16$$

The MUSI program

First of all, a *very beautiful experience* !

- The diversity of discovery lectures
- « *La fresque des deux infinis* »
- « *Scientific research and environmental transition* »
- CERN trip was amazing
- FCC debate

★ **THANK YOU VERY MUCH** ★
! ★



Accélérateur de science



Vive Clermont !

