# How many colors does a quark come in?

- we learned how to calculate the R-value and to deduce the number of quark colors.

$$R = \frac{N(\text{light quarks})}{\frac{1}{2} \cdot [N(\text{muons}) + N(\text{taus})]} = N_C \cdot \frac{10}{9}$$
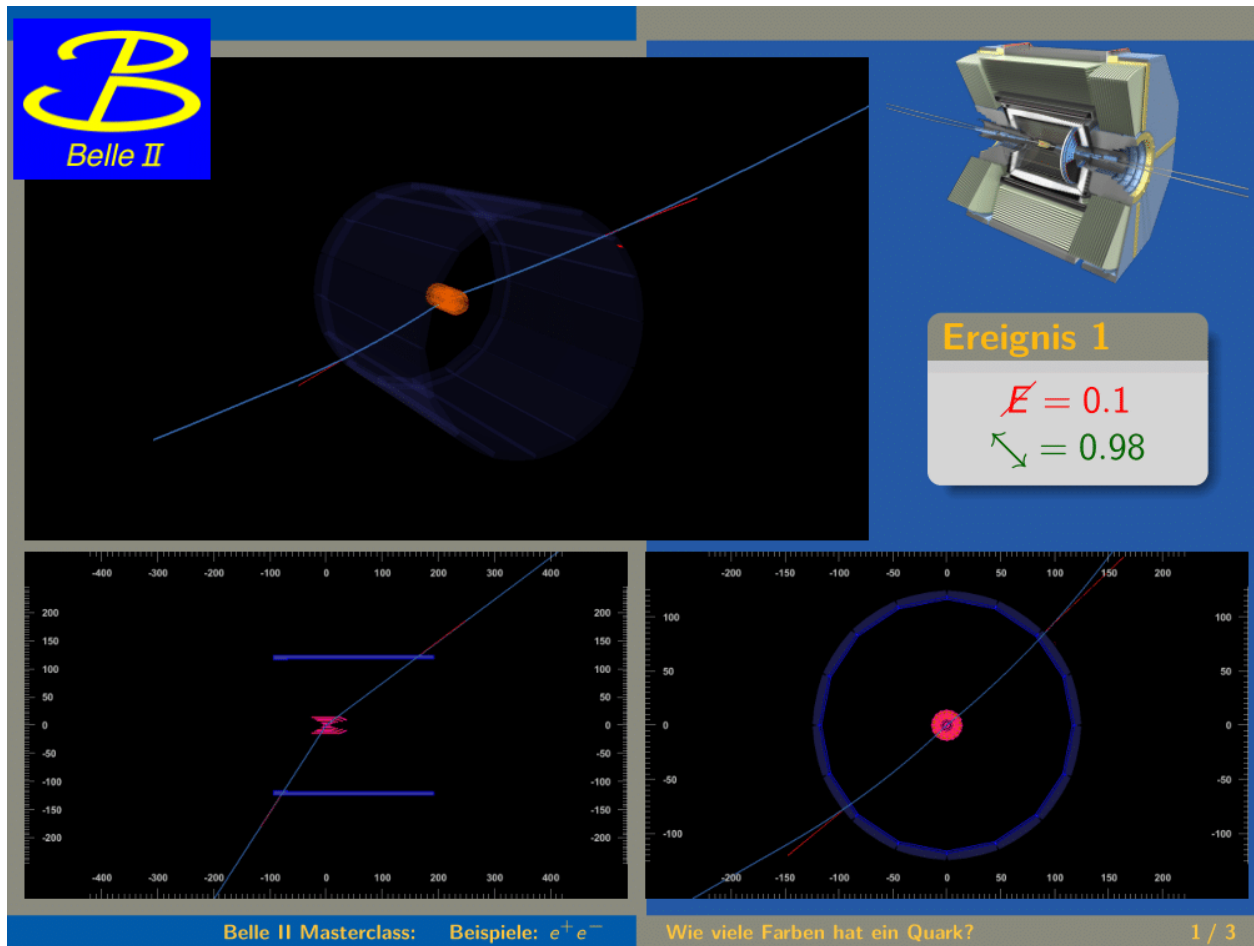
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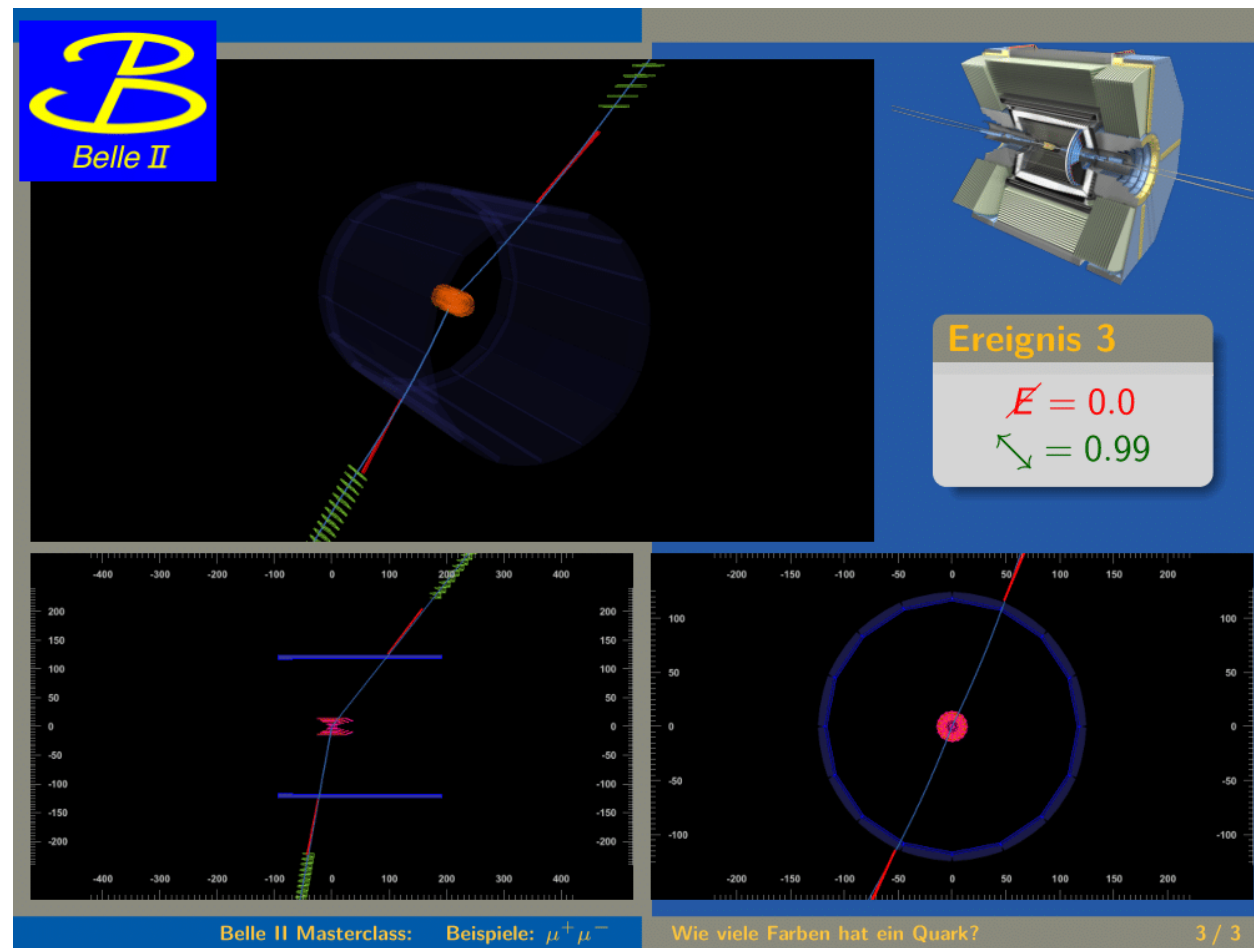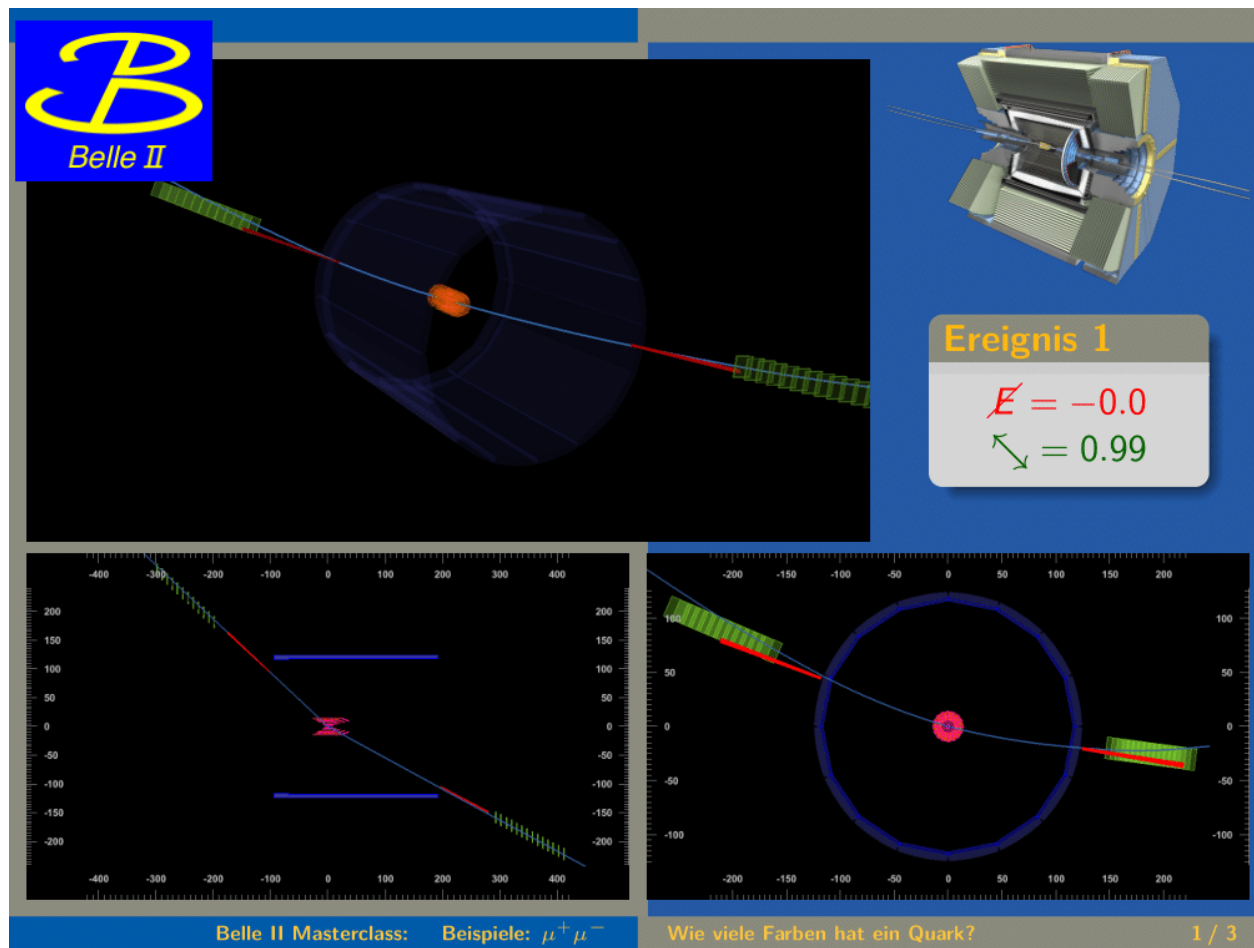
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➢ To measure the number of colors, we have to count the number of different processes

- Therefore:

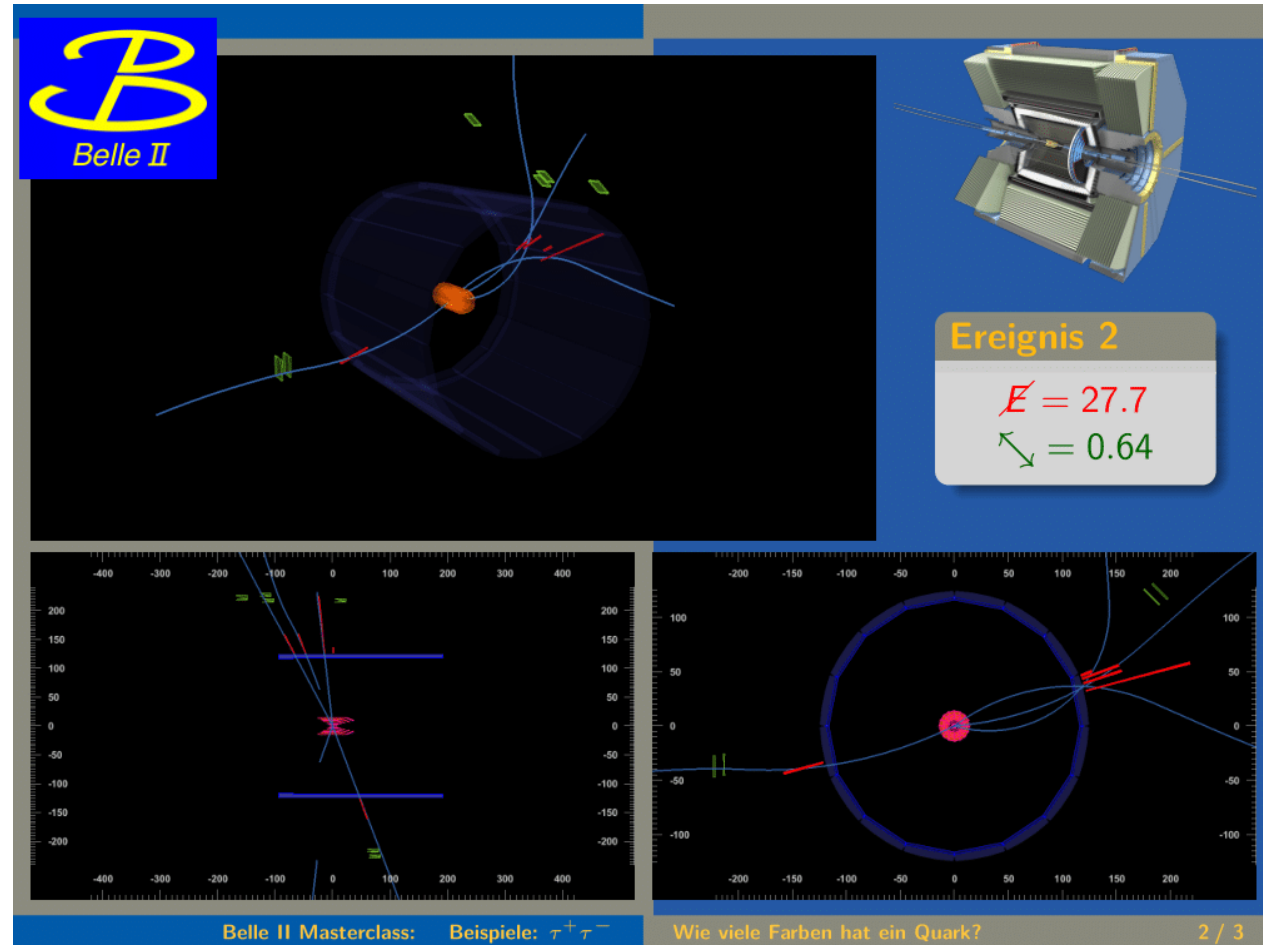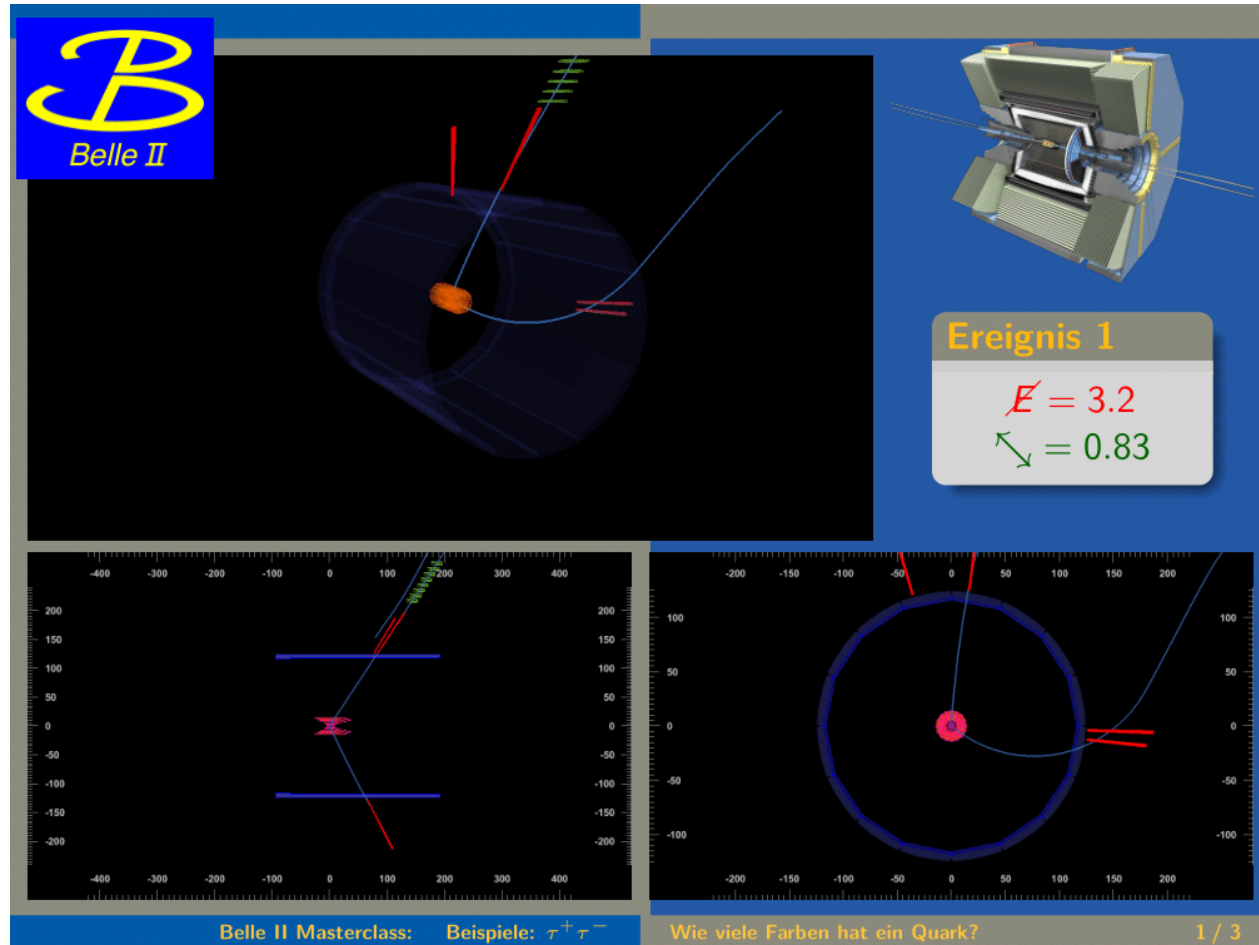➢ We want to learn how to distinguish the different processes from each other in the detector
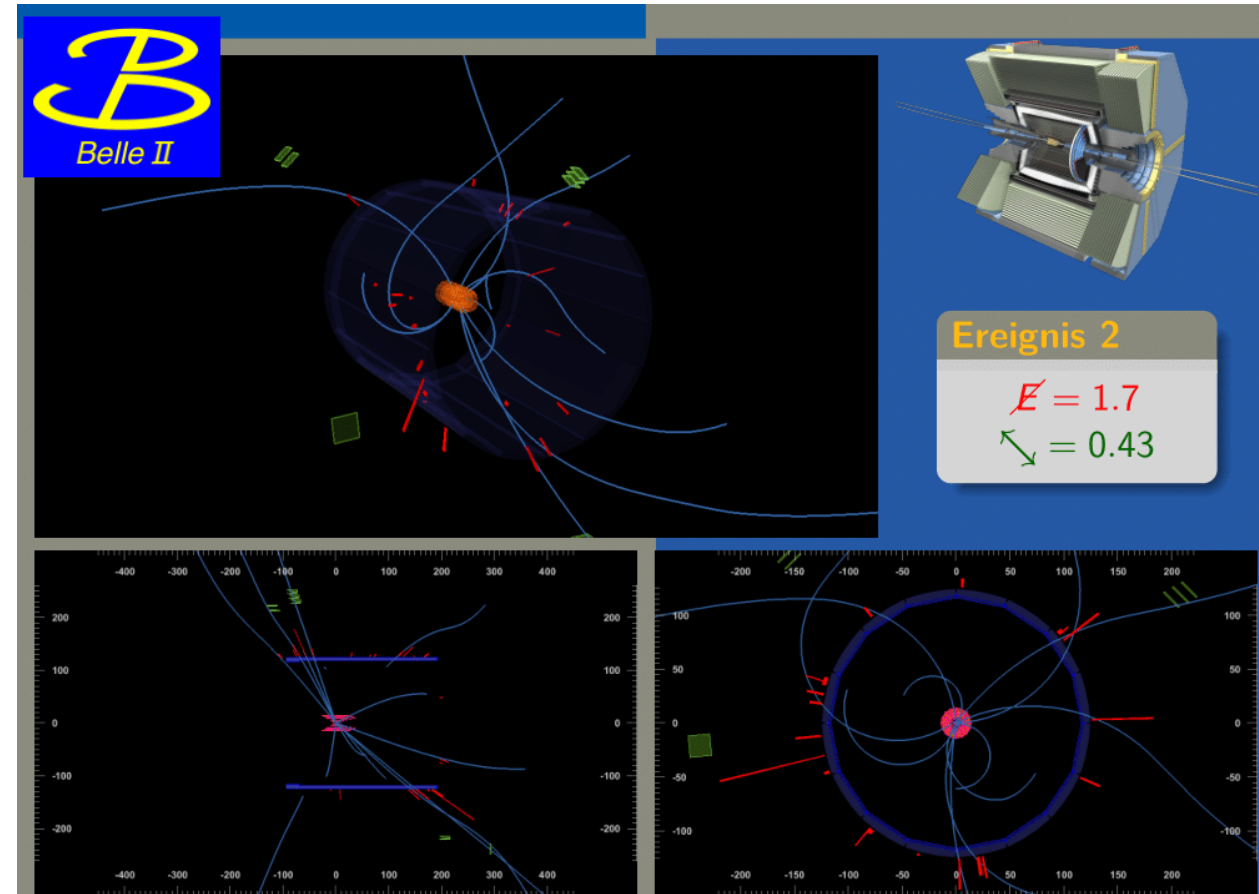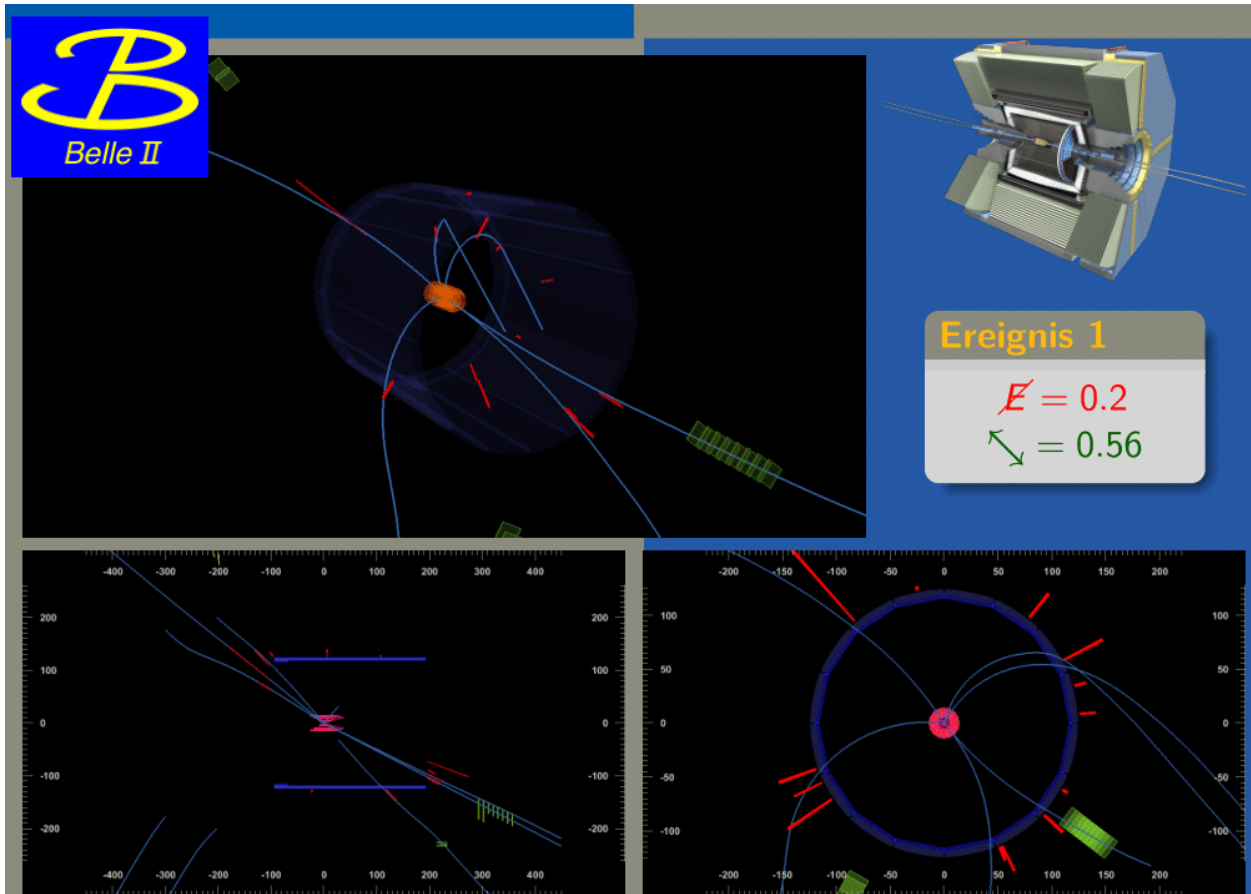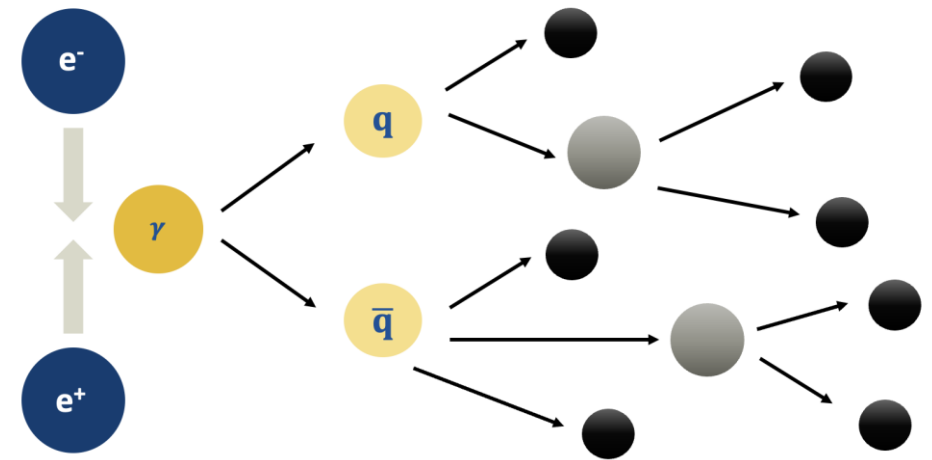
Electron/Positron events
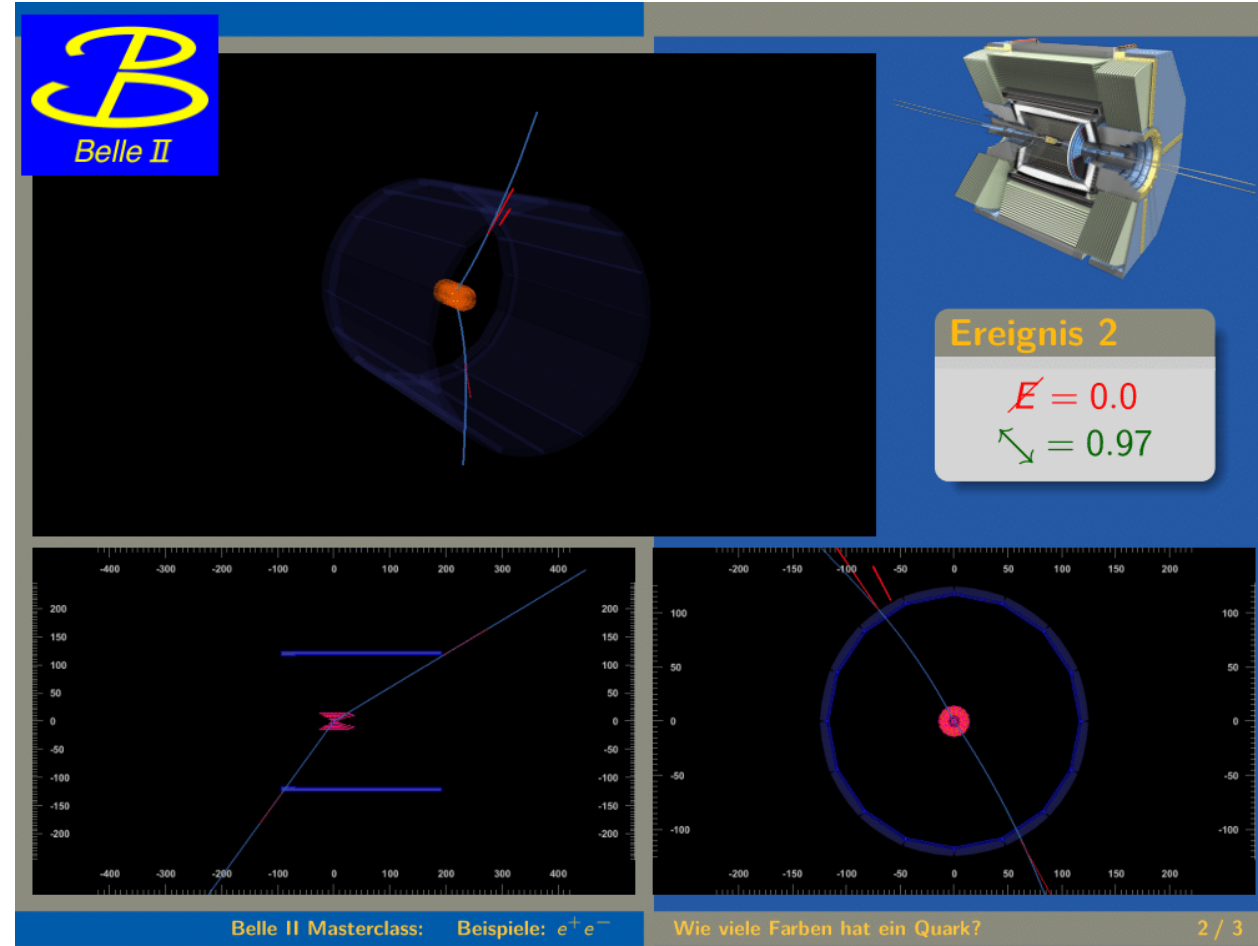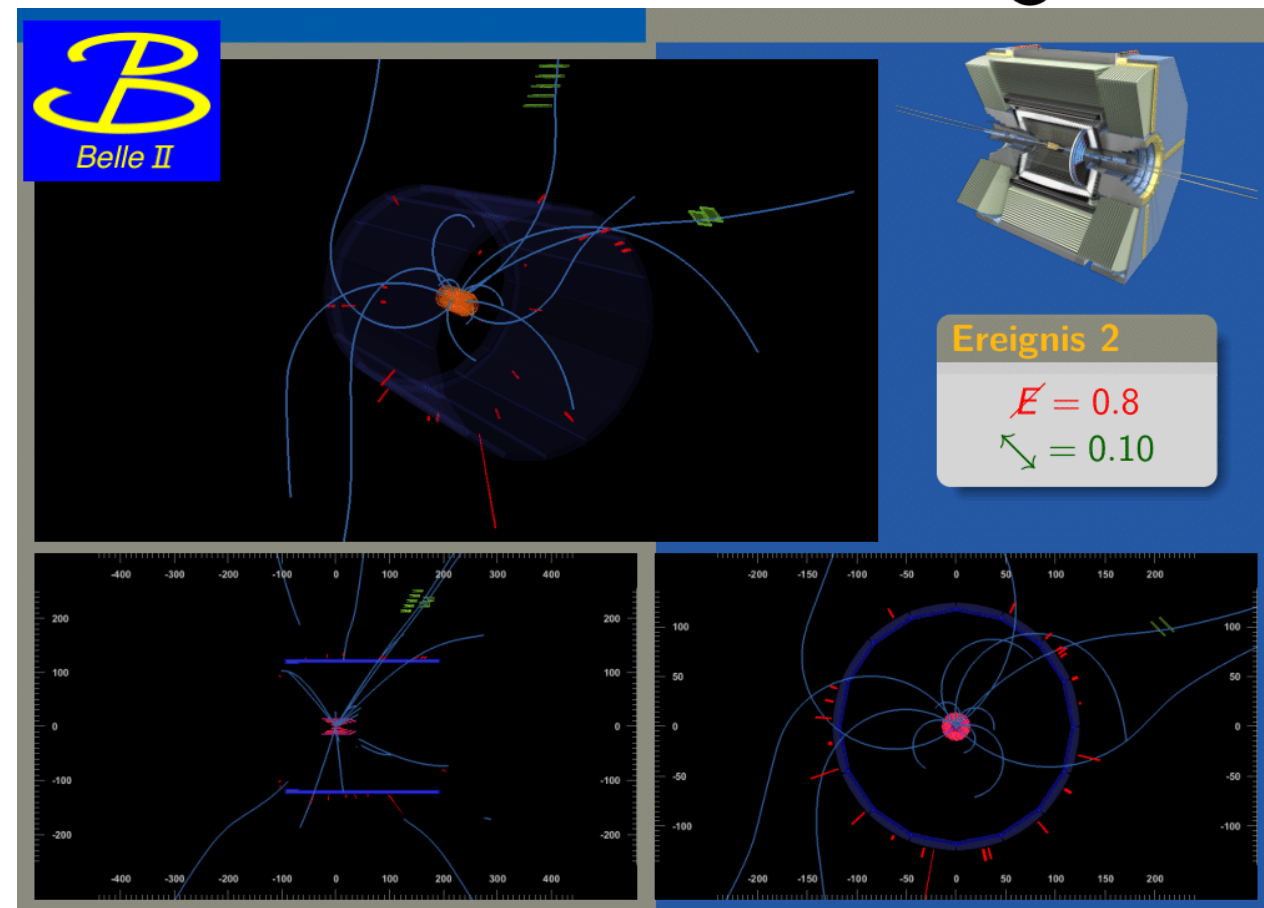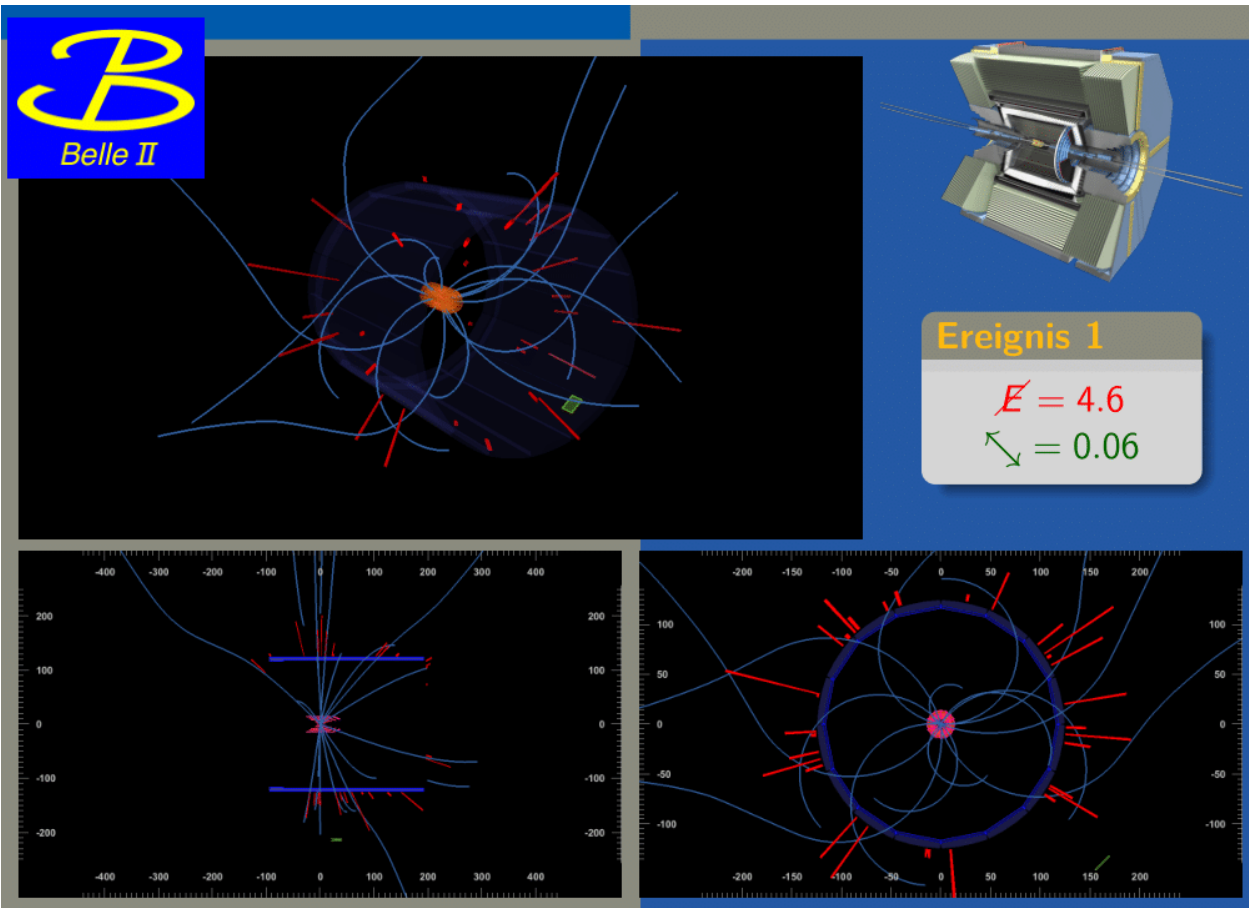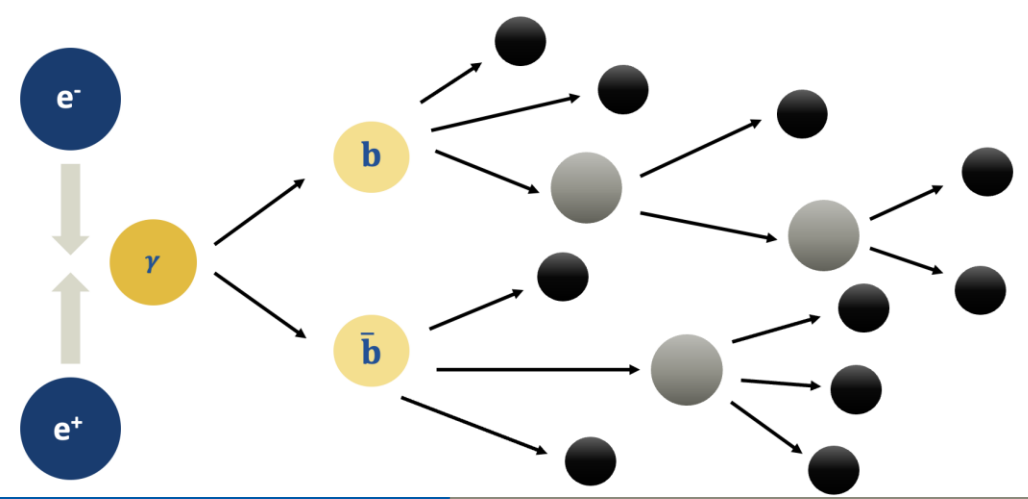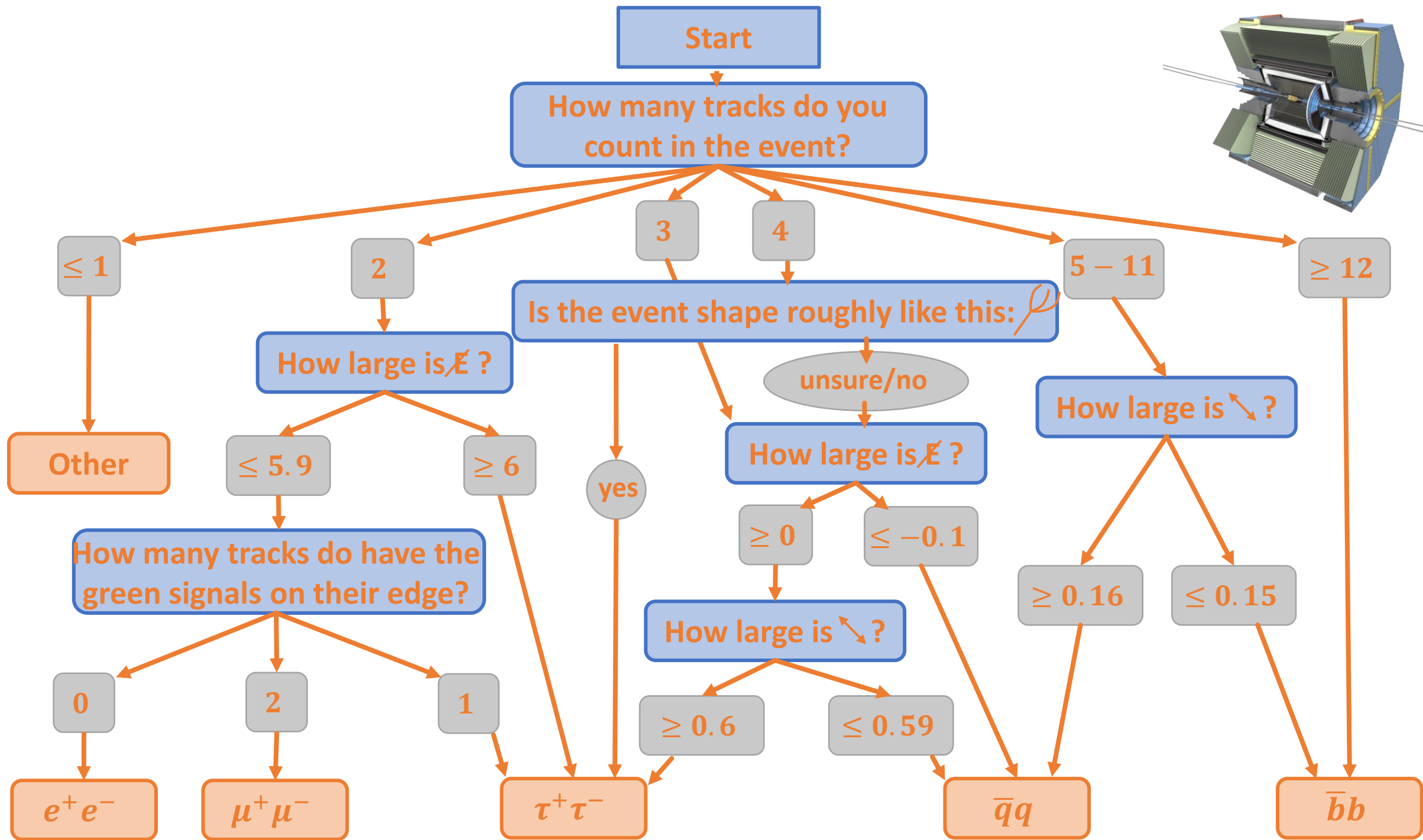
Muon/AntiMuon events

Tau/AntiTau events

Light Quark/Antiquark events

- Decay into a large variety of final states

b/Anti-b Quark events

Start

How many tracks do you count in the event?

≤ 1 2   3   4 $5-11$ ≥ 12

How large is $\not{E}$?

Is the event shape roughly like this: ✎

unsure/no

How large is $\searrow$?

Other

≤ 5.9 ≥ 6

yes

How large is $\not{E}$?

≥ 0 ≤ -0.1

≥ 0.16 ≤ 0.15

How many tracks do have the green signals on their edge?

How large is $\searrow$?

0   2   1

≥ 0.6 ≤ 0.59

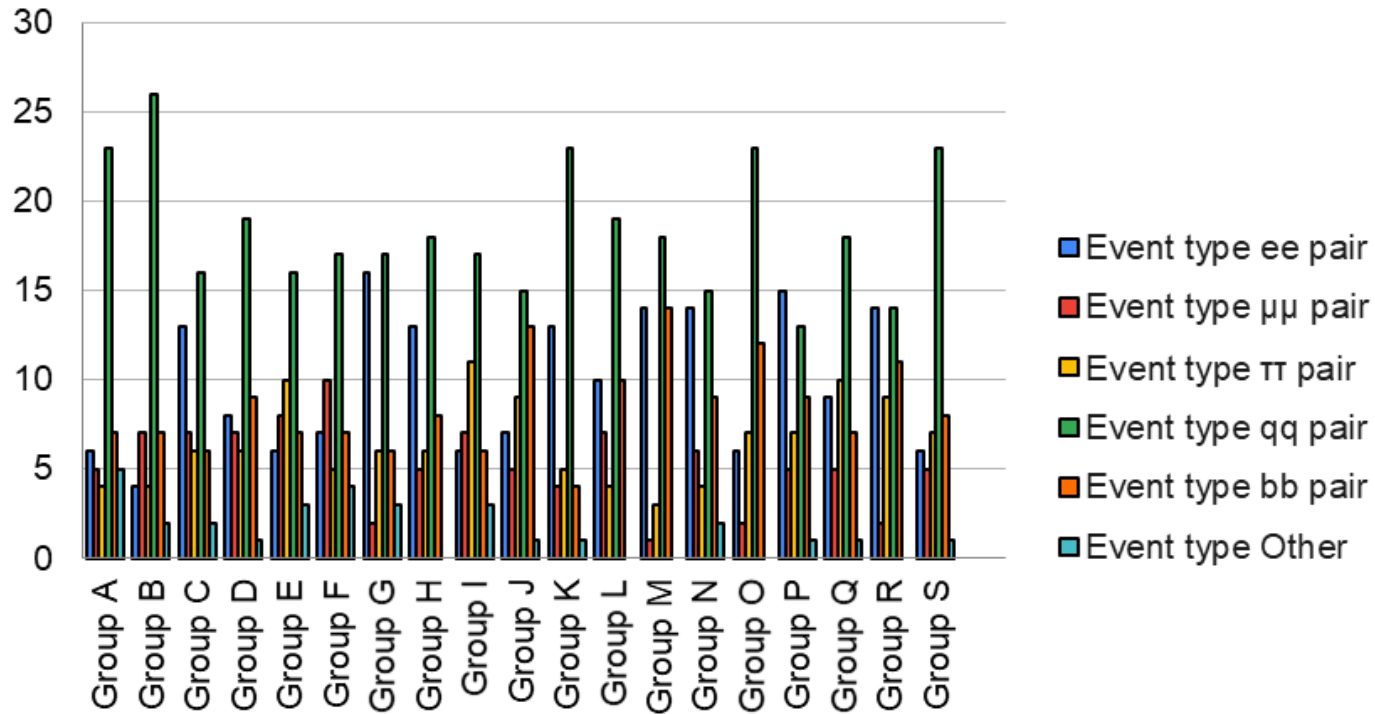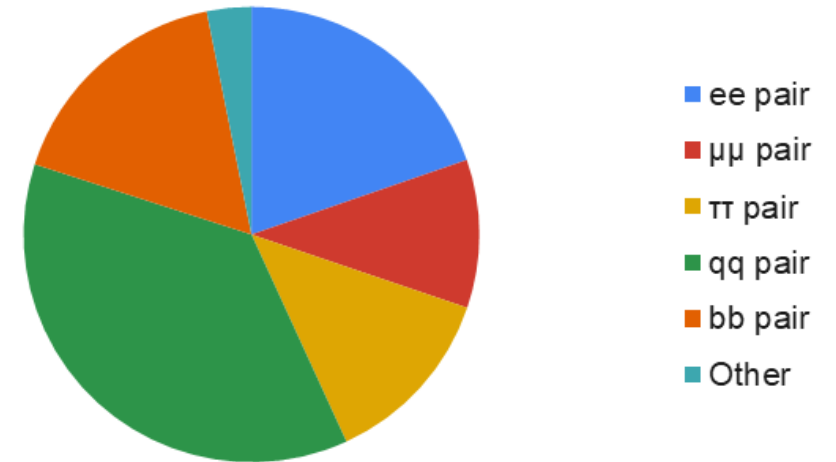$e^+ e^-$ $\mu^+ \mu^-$ $\tau^+ \tau^-$ $\overline{q}q$ $\overline{b}b$
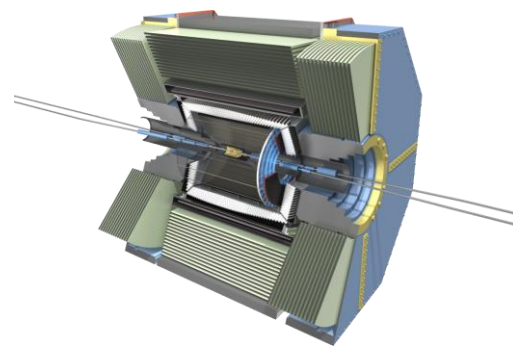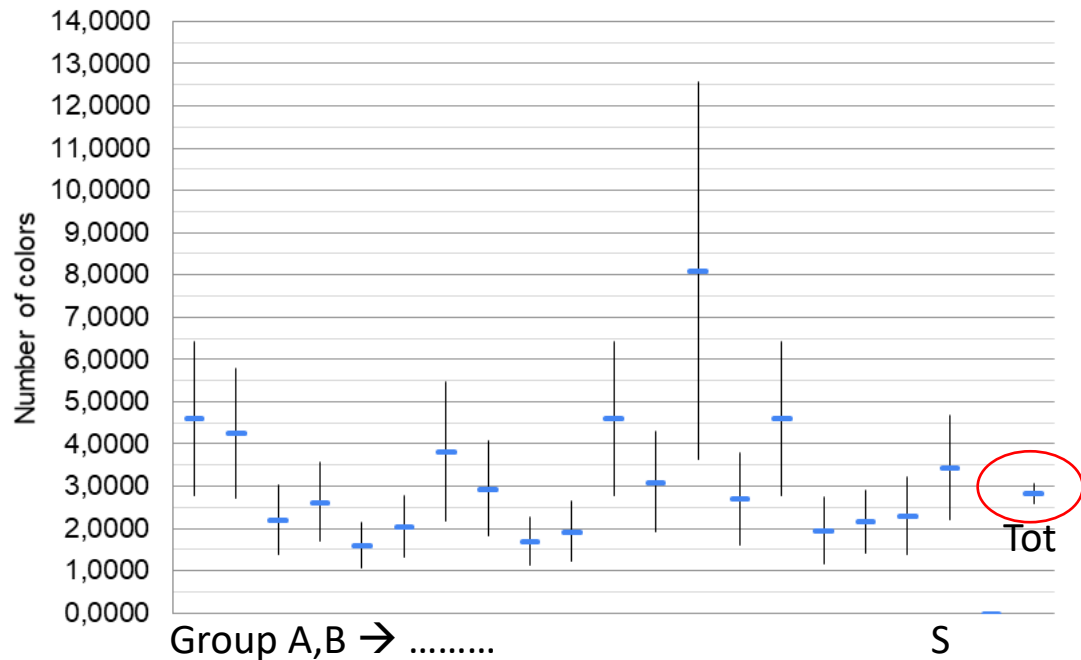
Results

19 students, 50 events each: 950 events in total

Number of events per group

Total number of events:

Measured number of different quark colors

Measured number of colors

R = 3.139 ± 0.269

N_{color} = 2.825
N_{color} - 1 σ = 2.583
N_{color} + 1 σ = 3.067