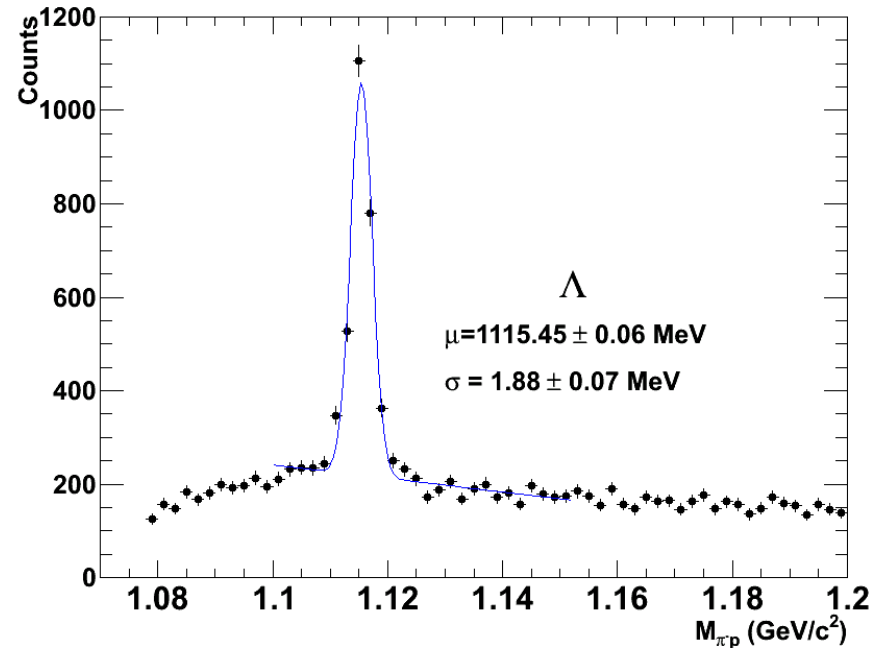
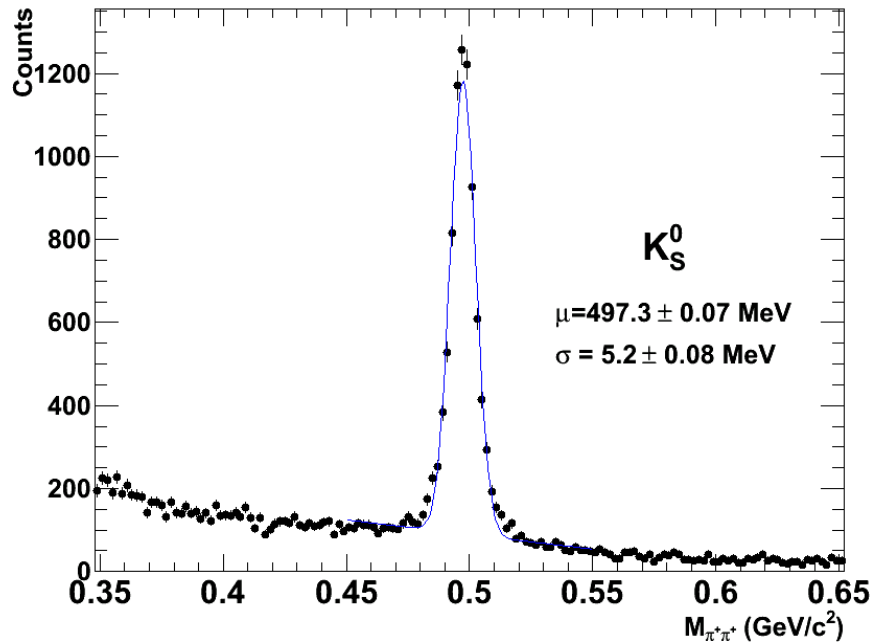


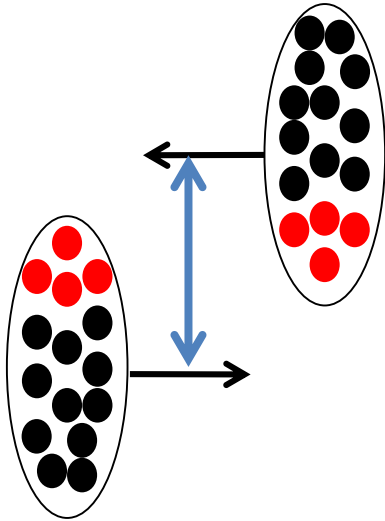
# Strangeness enhancement in lead-lead collisions

- Analysis of large event samples from lead collisions
- Find number of  $K_s$ ,  $\Lambda$ , anti- $\Lambda$
- Calculate particle yields
- Calculate strangeness enhancement taking into account particle yields in proton collisions

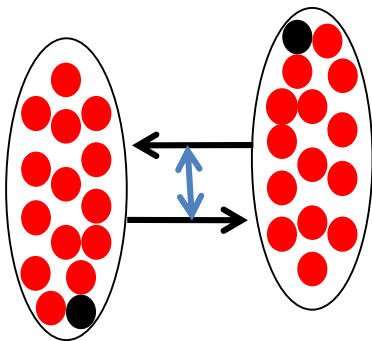


- Continuum : irreducible background due to random combinations of  $\pi^+\pi^-$  or  $\pi\pi$
- Fit curves to background (2<sup>nd</sup> degree polynomial) and peak (gaussian)
- Find number of  $K_S$ ,  $\Lambda$ , anti- $\Lambda$  after background subtraction

# Geometry of a Pb-Pb collision



- Peripheral collision
  - Large **distance** between the centres of the nuclei
  - Small number of **participants**
  - Few charged particles produced (low multiplicity)



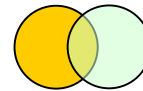
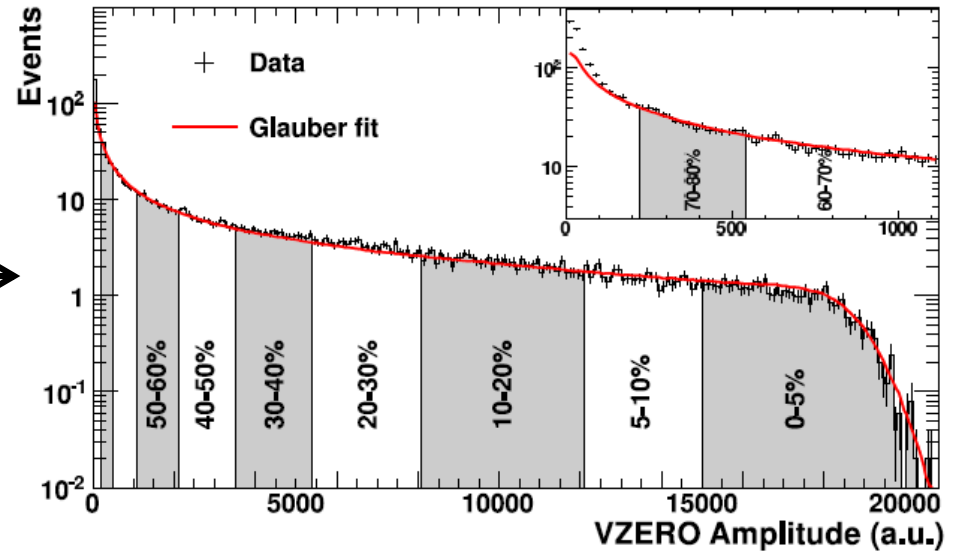
- Central collision
  - Small **distance** between the centres of the nuclei
  - Large number of **participants**
  - Many charged particles produced (high multiplicity)

# Centrality of Pb-Pb collisions

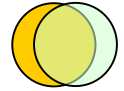
Distribution of the signal amplitude of V0 (plastic scintillators)  
 red line : described by model (Glauber)



Centrality	$dN_{ch}/d\eta$	$\langle N_{part} \rangle$	$(dN_{ch}/d\eta)/(\langle N_{part} \rangle/2)$
0%–5%	$1601 \pm 60$	$382.8 \pm 3.1$	$8.4 \pm 0.3$
5%–10%	$1294 \pm 49$	$329.7 \pm 4.6$	$7.9 \pm 0.3$
10%–20%	$966 \pm 37$	$260.5 \pm 4.4$	$7.4 \pm 0.3$
20%–30%	$649 \pm 23$	$186.4 \pm 3.9$	$7.0 \pm 0.3$
30%–40%	$426 \pm 15$	$128.9 \pm 3.3$	$6.6 \pm 0.3$
40%–50%	$261 \pm 9$	$85.0 \pm 2.6$	$6.1 \pm 0.3$
50%–60%	$149 \pm 6$	$52.8 \pm 2.0$	$5.7 \pm 0.3$
60%–70%	$76 \pm 4$	$30.0 \pm 1.3$	$5.1 \pm 0.3$
70%–80%	$35 \pm 2$	$15.8 \pm 0.6$	$4.4 \pm 0.4$



peripheral collisions



central collisions

# Strangeness enhancement calculation

**Yield** : number of particles produced per interaction =  $N_{\text{particles(produced)}}/N_{\text{events}}$

**Efficiency** =  $N_{\text{particles(measured)}}/N_{\text{particles(produced)}}$ \*

**Yield** =  $N_{\text{particles(measured)}}/(\text{efficiency} \times N_{\text{events}})$

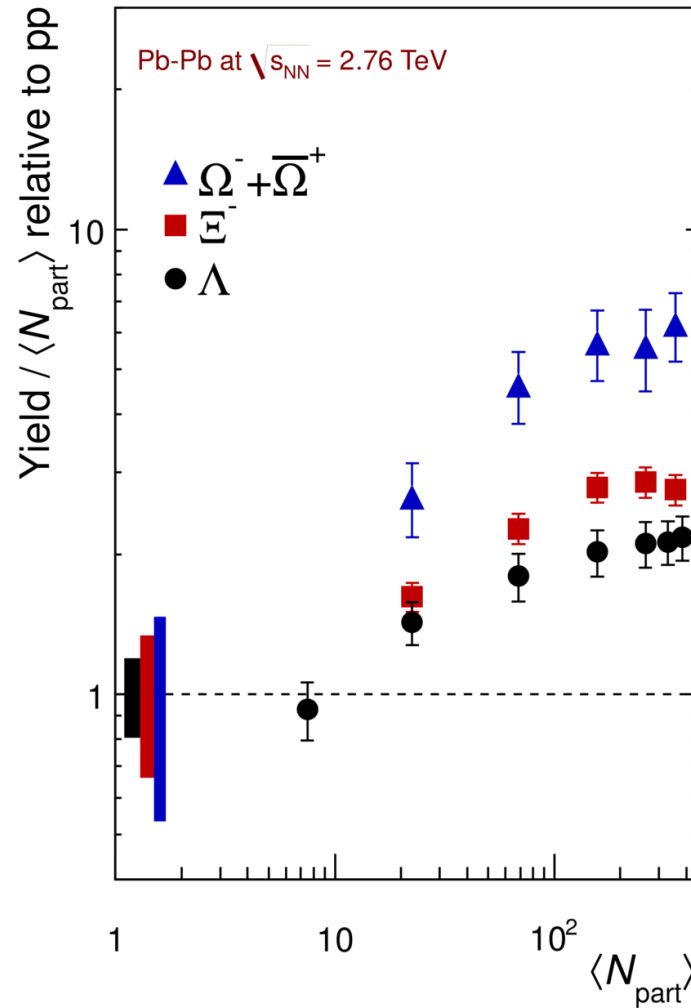
$K_s$ -Yield (pp) = 0.25 /interaction ;  $\Lambda$ -Yield(pp) = 0.0617 /interaction ;  $\langle N_{\text{part}} \rangle = 2$  for pp

**Strangeness enhancement**: the particle yield normalised by the number of participating nucleons in the collision, and divided by the yield in proton-proton collisions\*\*

\*assumption on efficiency values : to match yields in Analysis Note  
Measurement of  $K_s$  and  $\Lambda$  spectra and yields in Pb–Pb collisions at  $\sqrt{s_{NN}}=2.76$  TeV with the ALICE experiment

\*pp yields at 2.76 TeV from interpolation between 900 GeV and 7 TeV  
Analysis Note “ $K_s$ ,  $\Lambda$  and anti $\Lambda$  production in pp collisions at 7 TeV”

# Strangeness enhancement : one of the first signals of QGP



ALI-DER-80680

Enhancement increases with number of strange quarks in the hadron ( $\Omega$  has 3,  $\Xi$  has 2,  $\Lambda$  has 1)