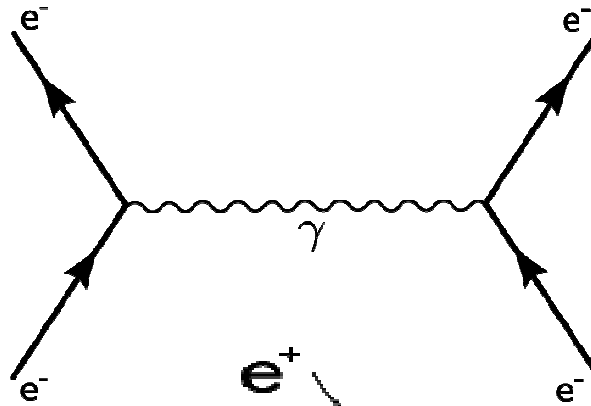


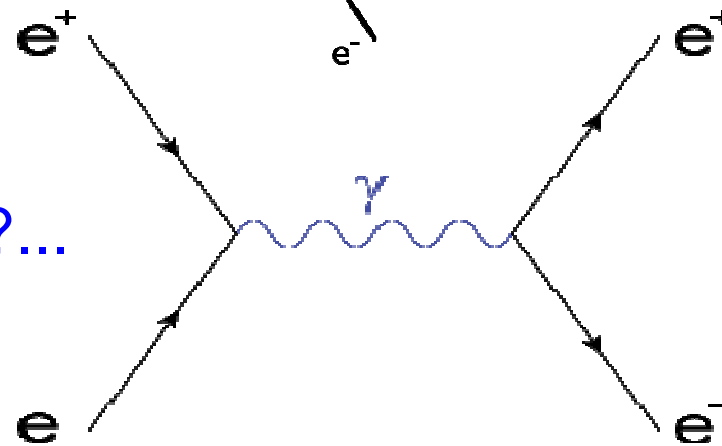
# An Introduction to Particle Physics

I - Some theoretical views...

... very basic (?)...

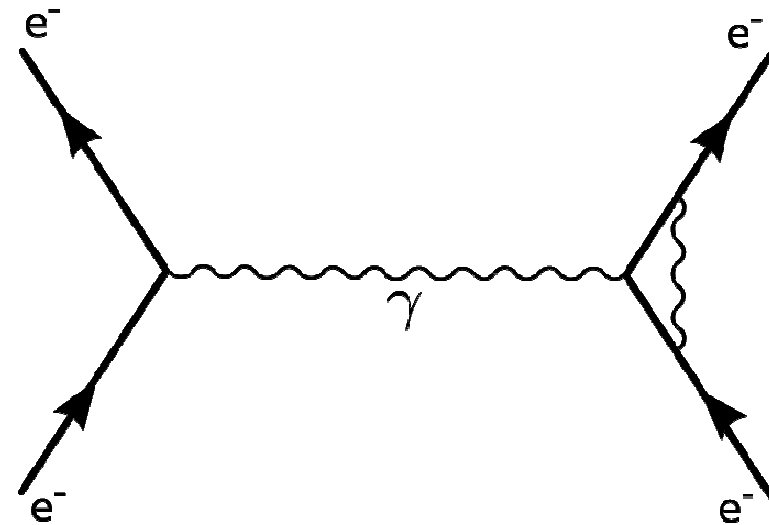
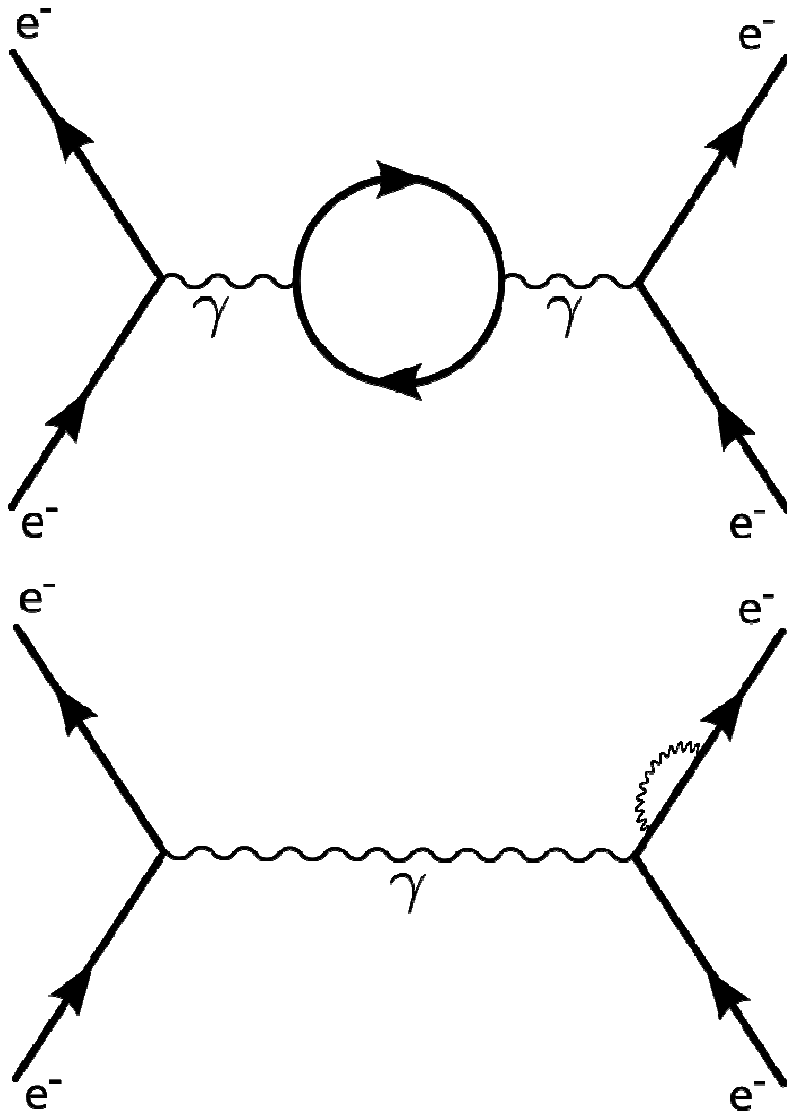


... is there a link?...



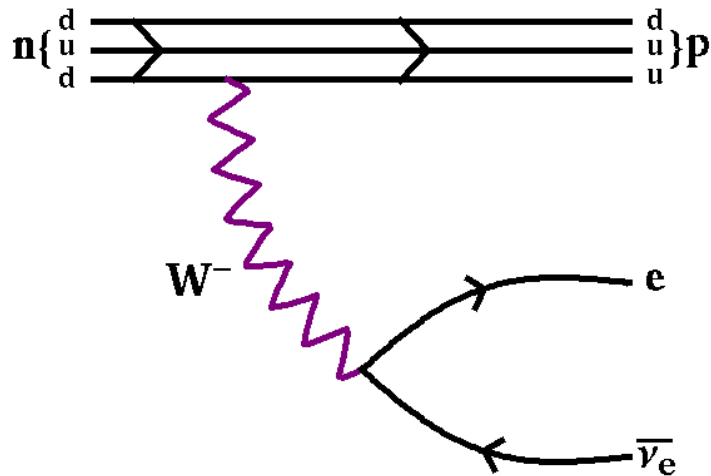
# Some theoretical views (cont'd)

... not so evident (2<sup>nd</sup> order)...

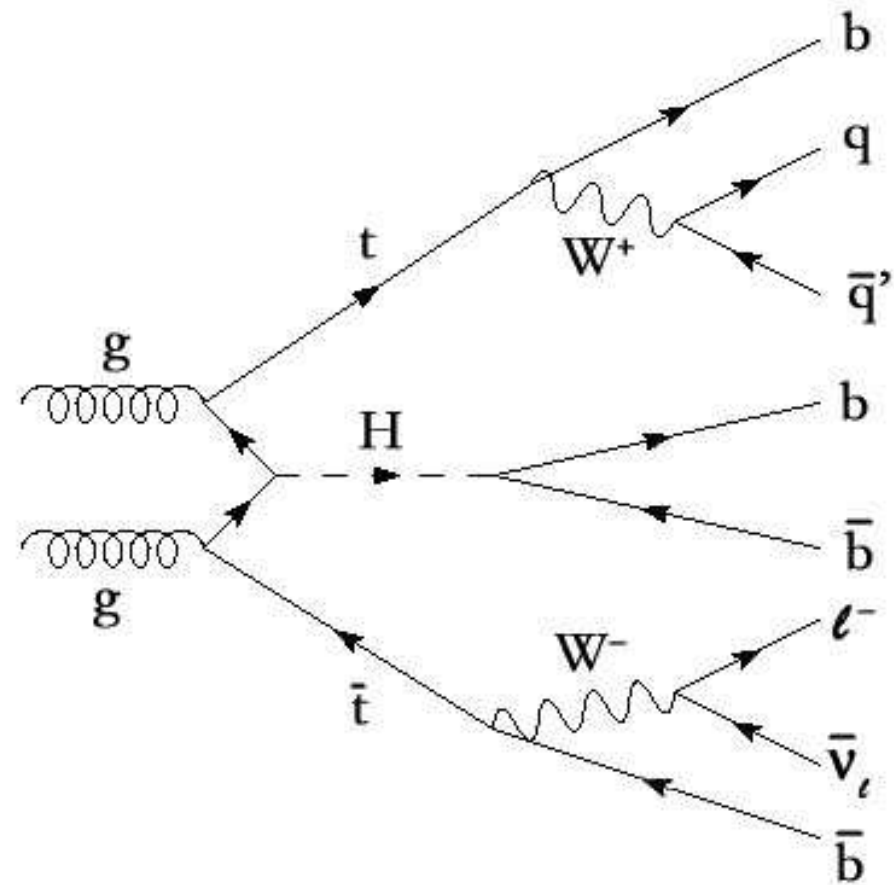


## Some theoretical views (cont'd)

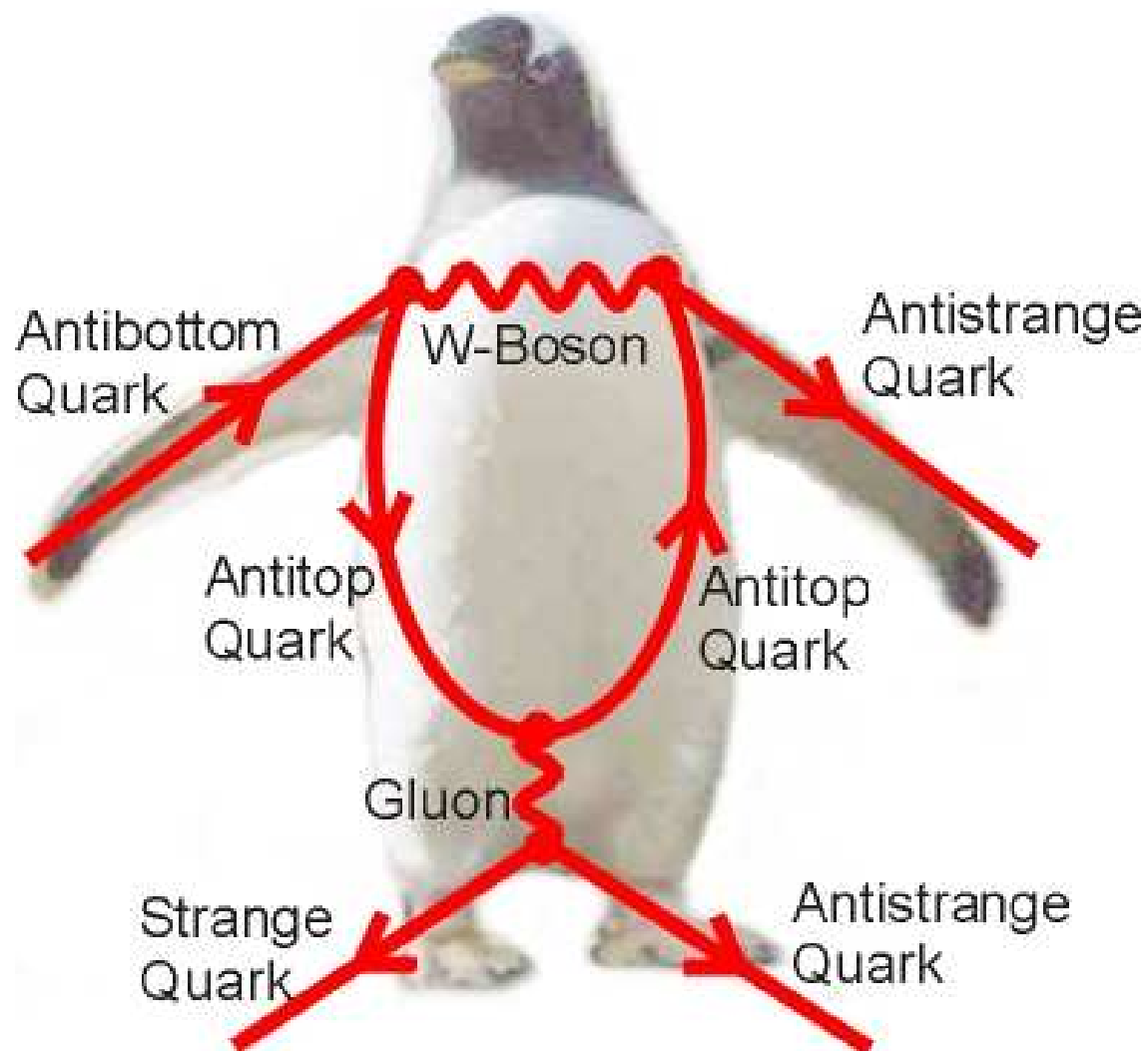
... not evident at all (weak interactions)...



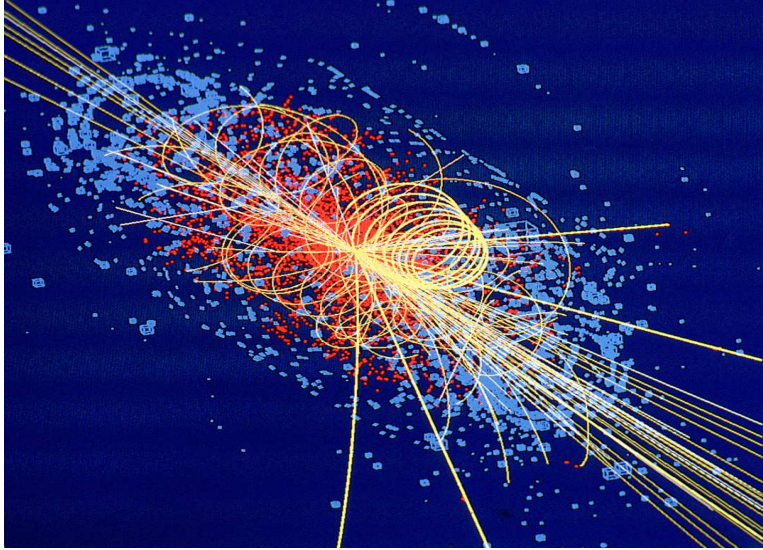
... frankly hostile  
(QCD inside)...



... and exotic...

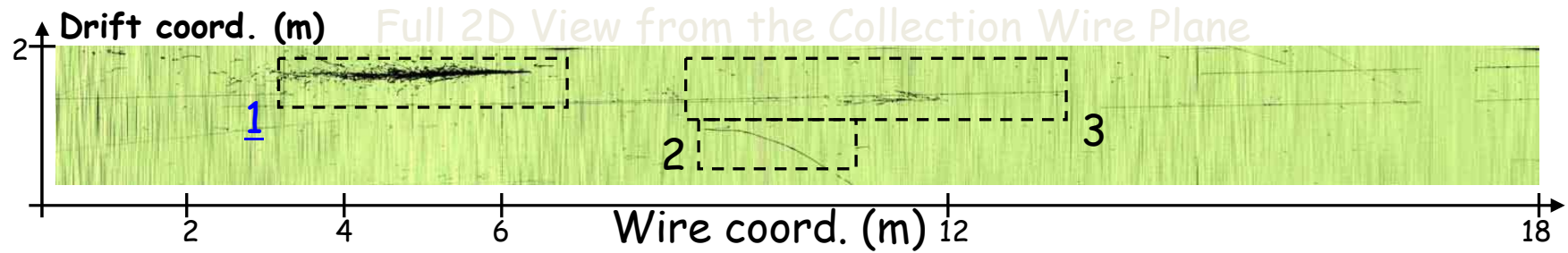


## II - Some experimental views



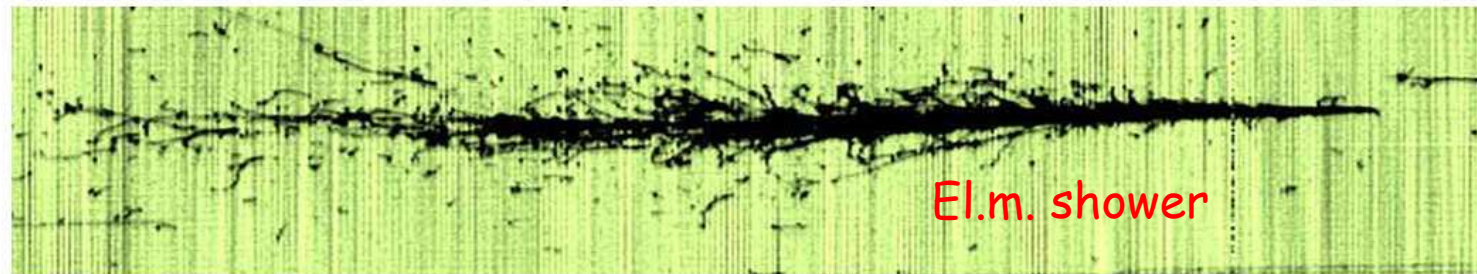
... simulated event

... real events...

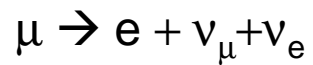


*Zoom details*

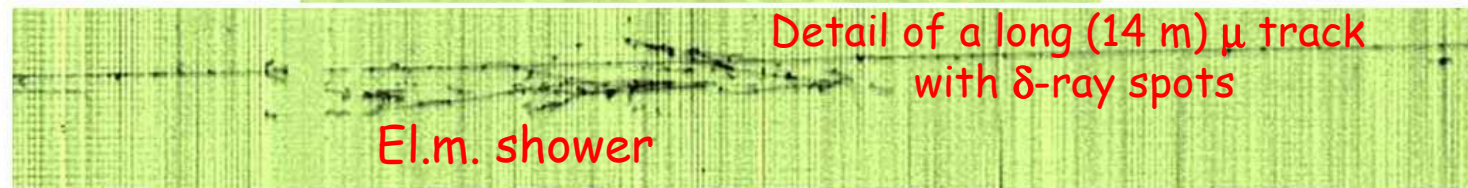
1



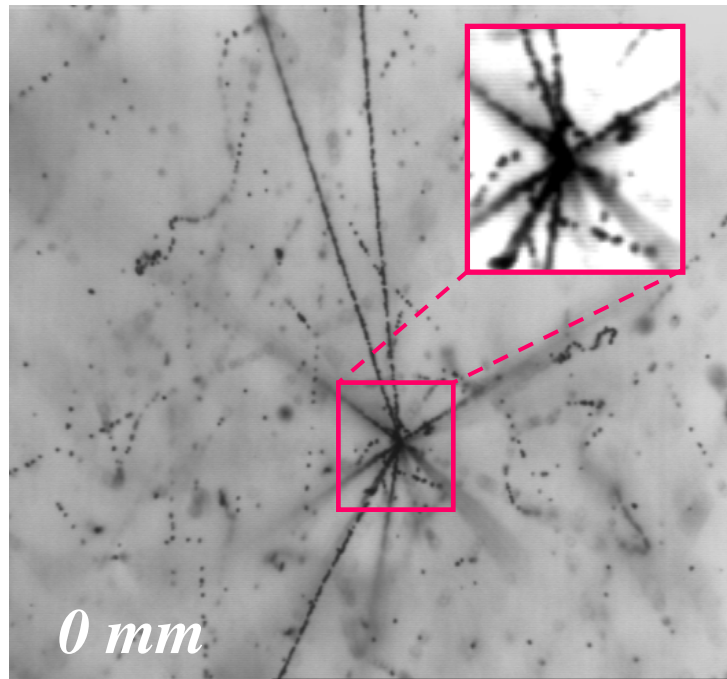
2



3

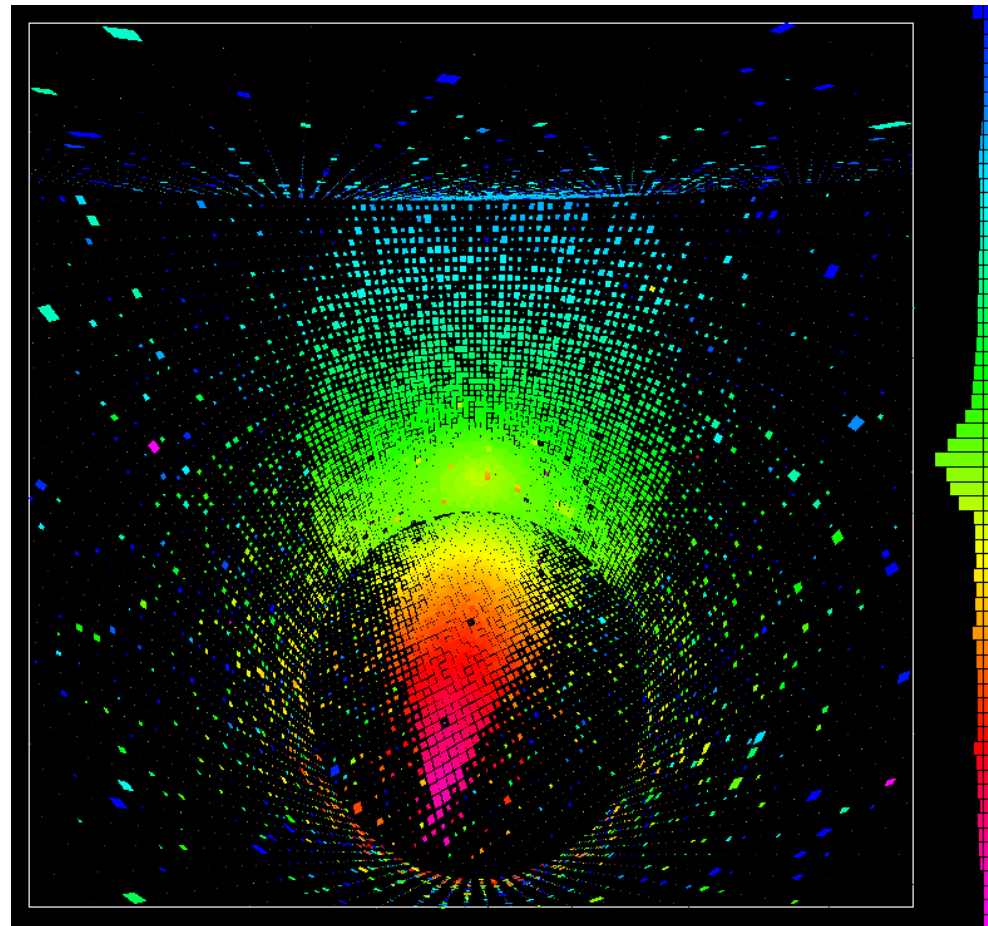


... real events but different techniques...



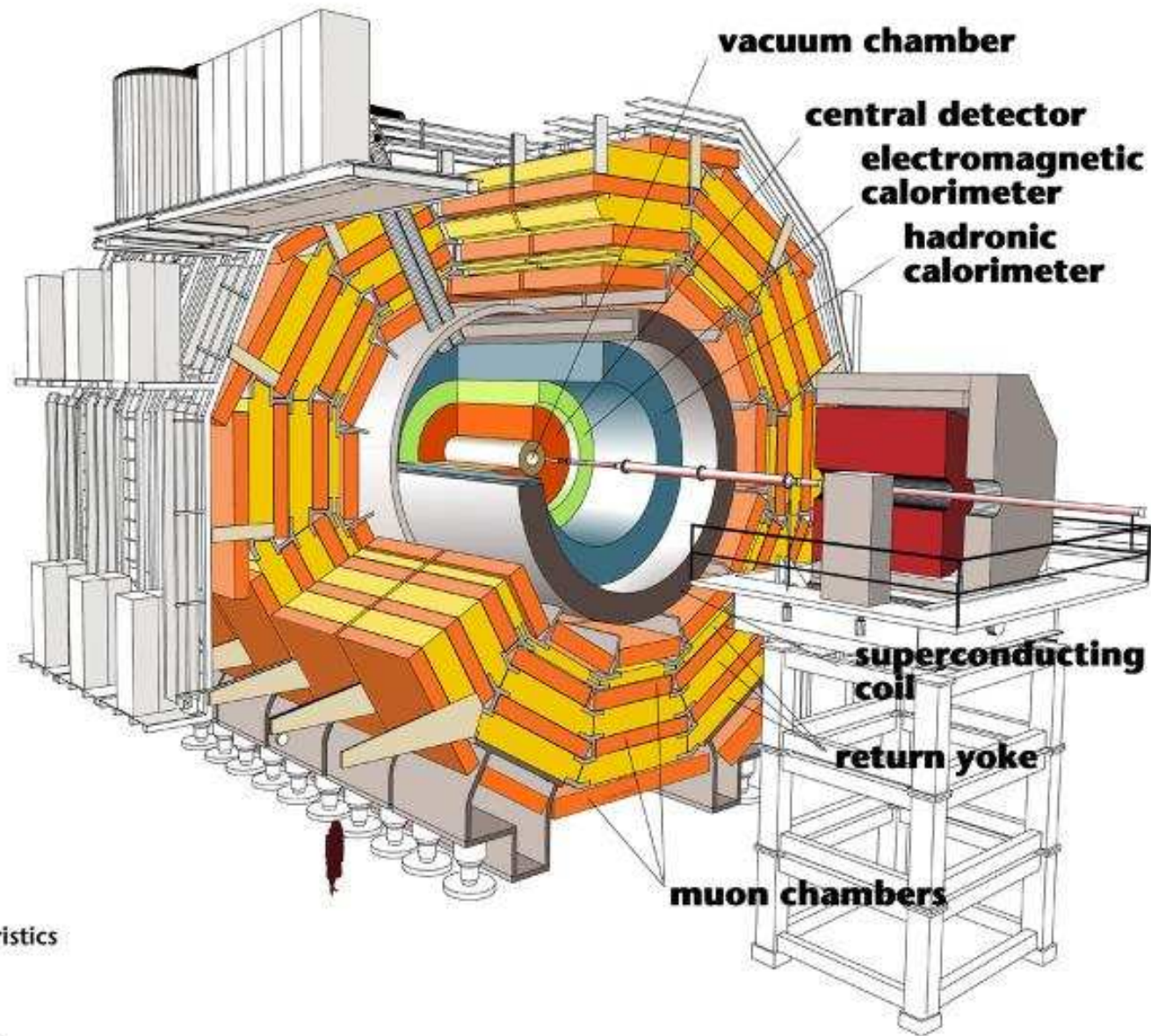
Vertex seen in  
nuclear emulsions

Cerenkov light ring





## II bis - Some experimental challenges



### Detector characteristics

Width: 22m  
Diameter: 15m  
Weight: 14'500t



## II bis - Some experimental challenges

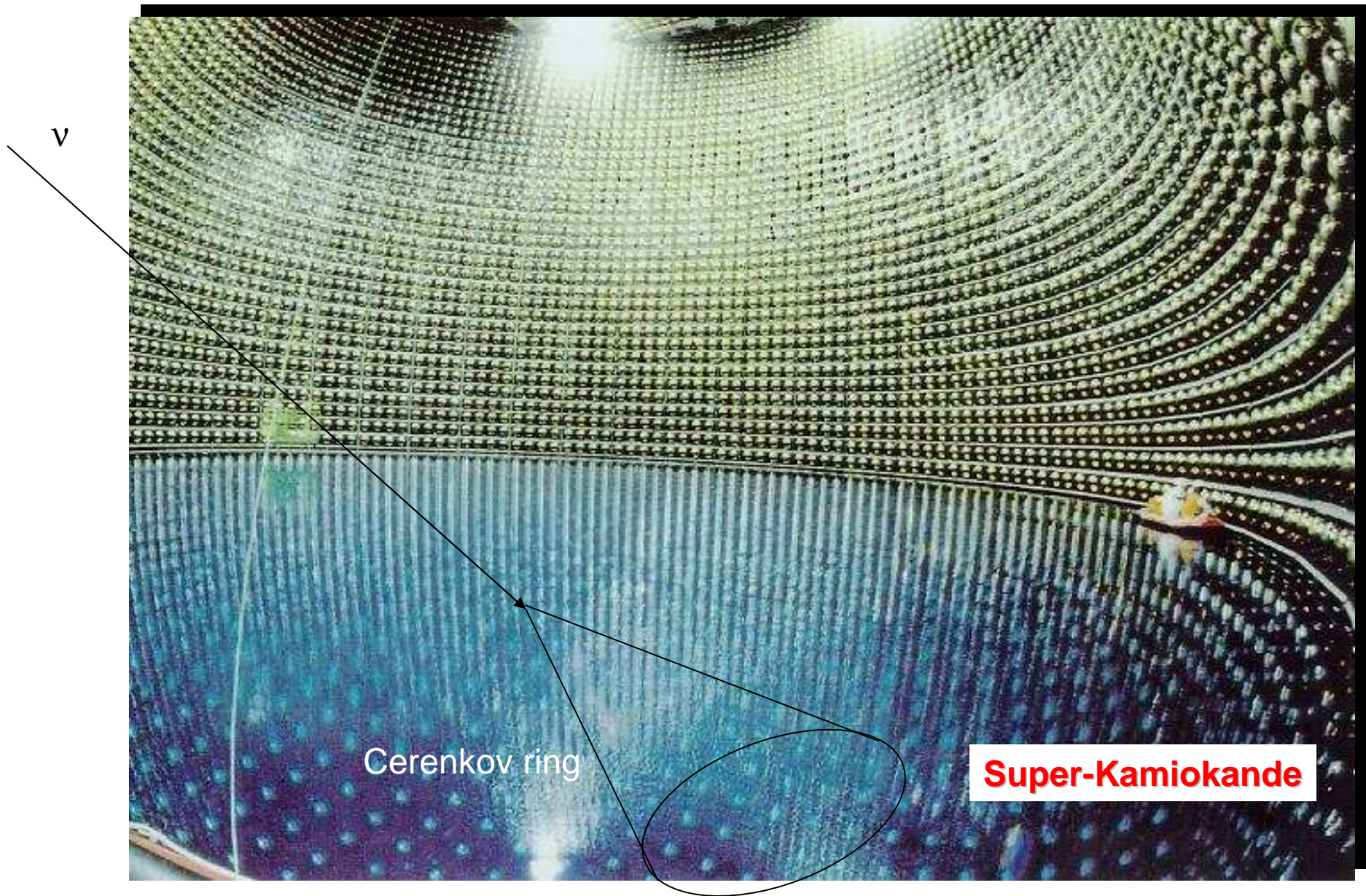






**ALEPH @ CERN**





# Outline/Plan

## 1/ Particle phenomenology :

quarks & leptons;  
Strong, electro-weak interactions;  
Some actual problems :  
Higgs boson search,  
matter-antimatter asymmetry,  
grand unification theories...

## 2/ Experimental facts :

Particle-matter interactions;  
Some detection techniques;  
Particles production.

## 3/ The free theory :

Particles spin description;  
Propagation equations, propagators;  
Lagrangian description.

## 4/ Interacting theory :

Feynman diagrams;  
Cross sections;  
Electro-weak theory: QED, Fermi theory.

## 5/ Symmetries :

C, P, CP, CPT and their non-conservation...;  
Neutrino oscillations;  
Internal symmetries.

## 1/ Phénoménologie des particules et de leurs interactions :

quarks & leptons;  
interactions électro-faible & forte;  
quelques problèmes actuels :  
recherche du boson de Higgs,  
brisure matière-antimatière,  
théories de grande unification...

## 2/ Aspects expérimentaux :

interaction particules-matière;  
quelques techniques de détection;  
production de particules: les grands accélérateurs.

## 3/ La théorie libre :

description spinorielle des particules;  
équations de propagation, propagateurs;  
formulation Lagrangienne de la théorie.

## 4/ La théorie en interaction :

diagrammes de Feynman;  
sections efficaces;  
théorie électro-faible: calculs de QED, théorie de Fermi.

## 5/ Rôle des symétries :

C, P, CP, CPT et de leur non-conservation éventuelle...;  
oscillations de neutrinos;  
rôle des symétries internes: nombres leptonique, baryonique.