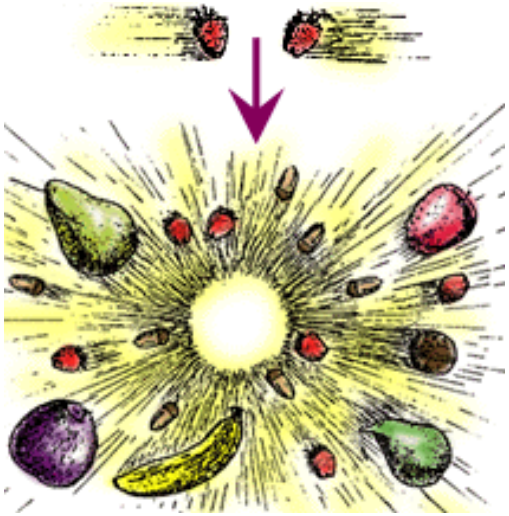
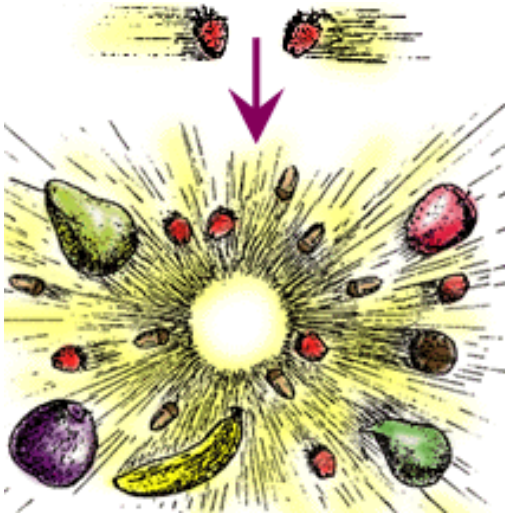
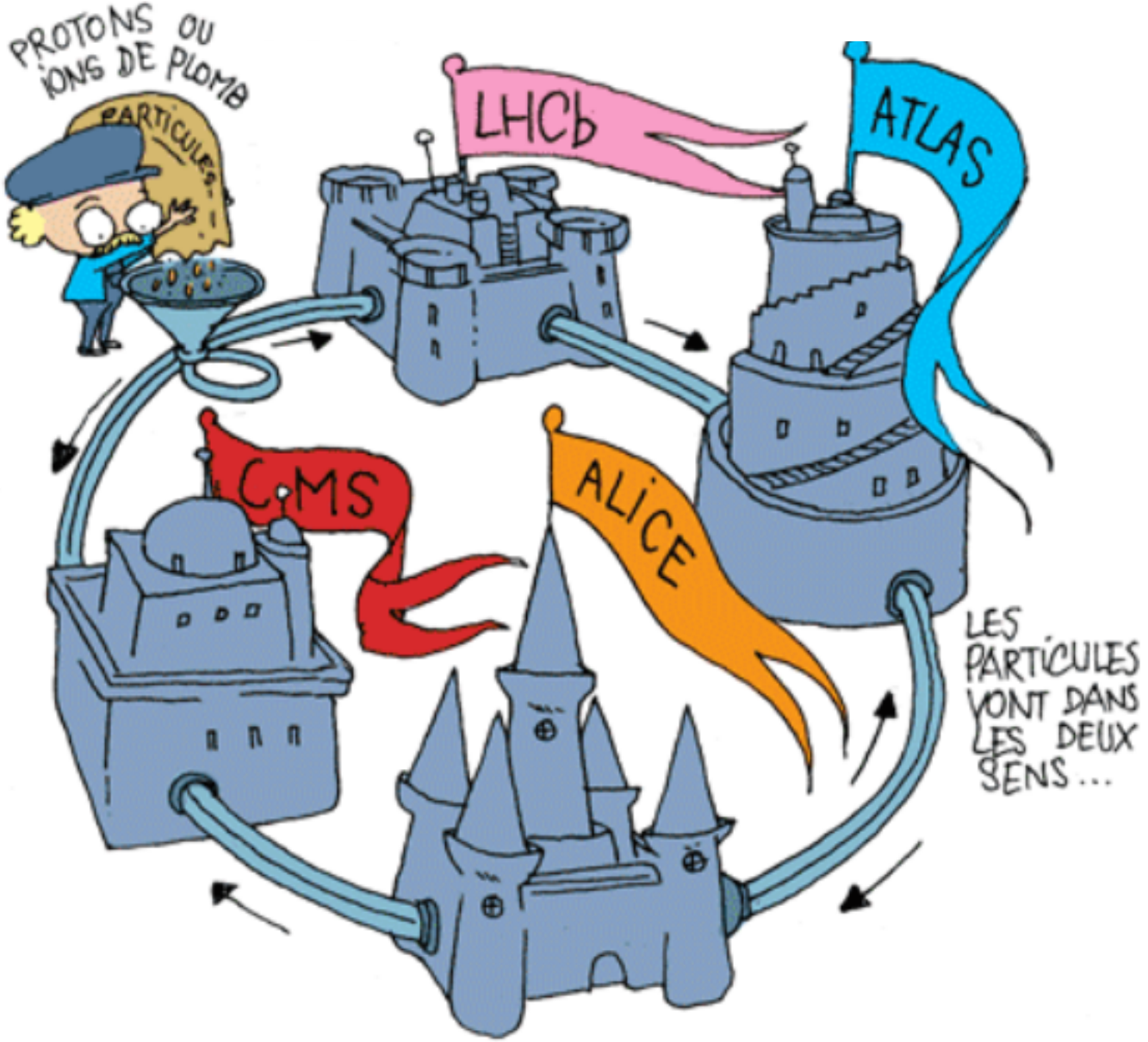


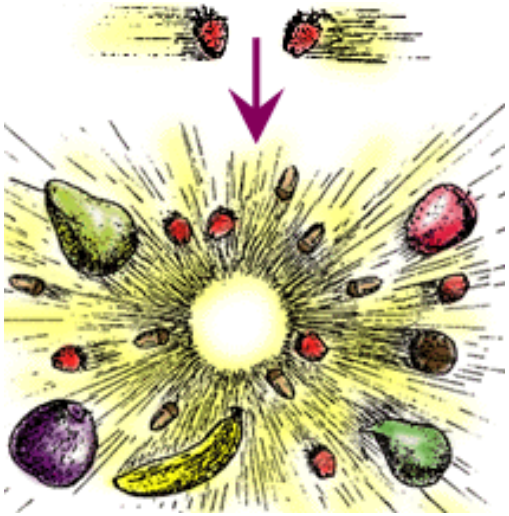
Accélérateur

Large Hadron Collider : LHC,CERN(CH)

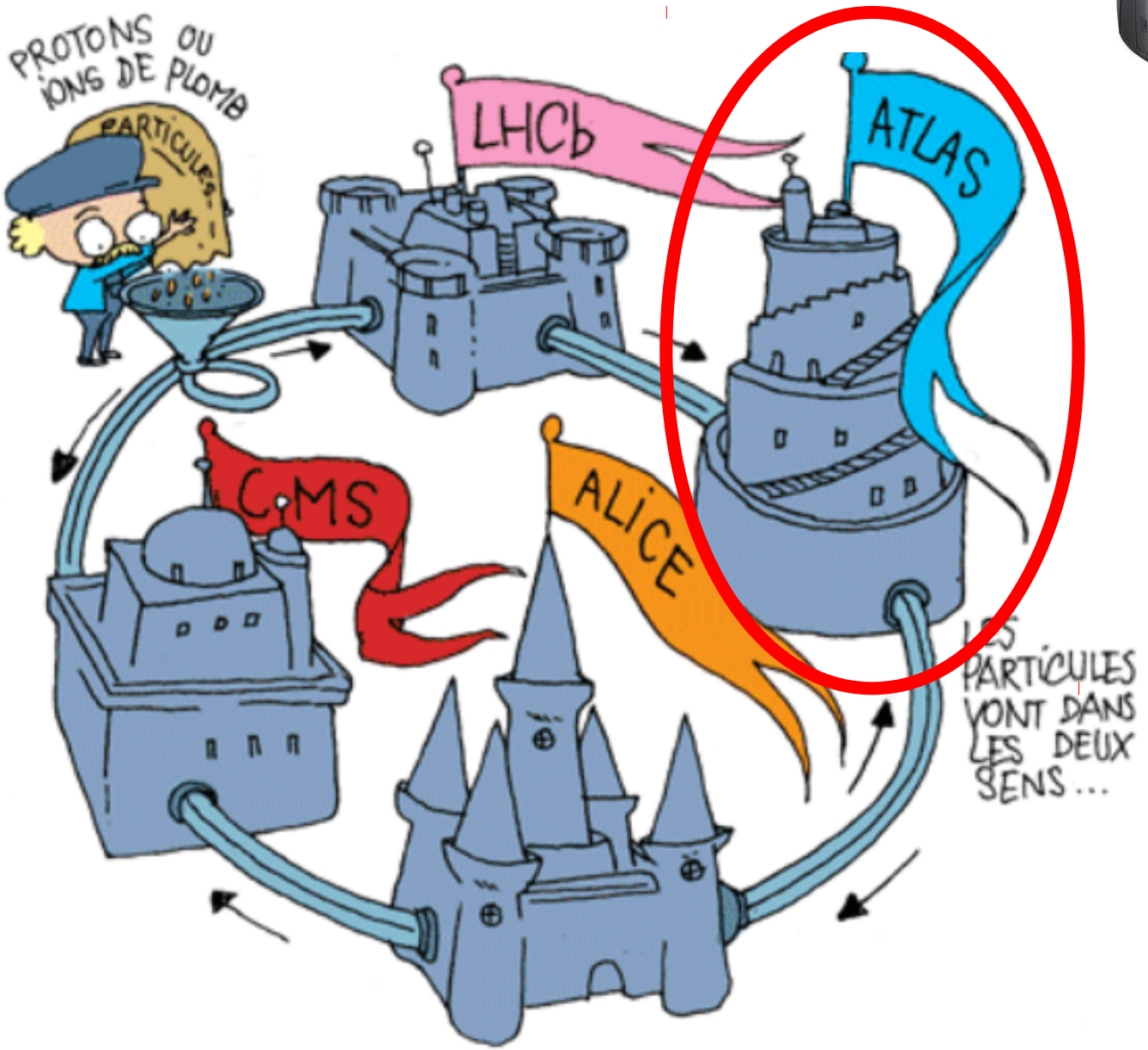


Détecteur(s)

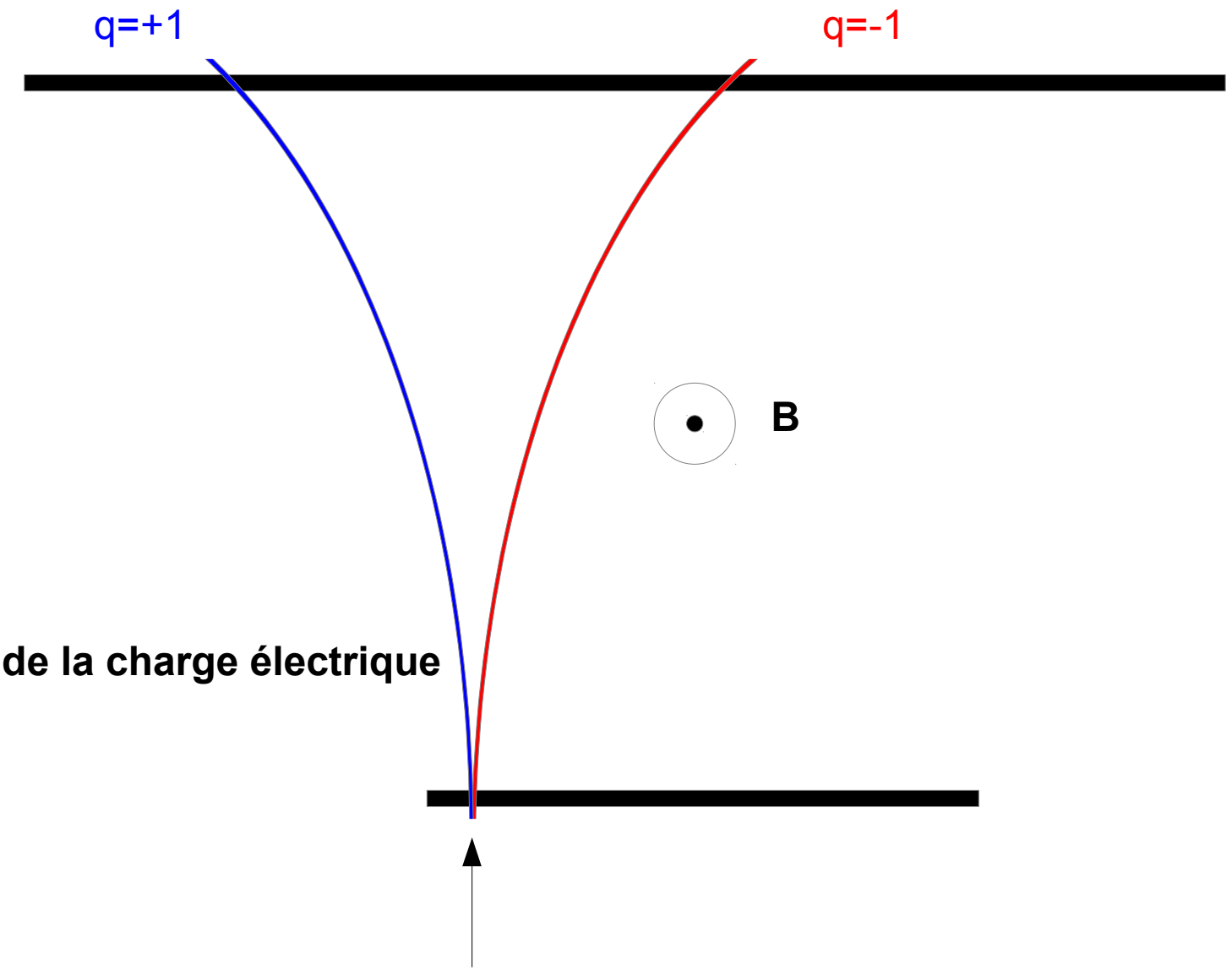

PROTONS OU IONS DE PLOMB
PARTICULES
LHCb
ATLAS
CMS
ALICE
LES PARTICULES VONT DANS LES DEUX SENS...



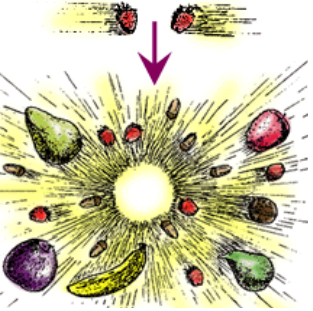
Détecteur(s)


PROTONS OU IONS DE PLOMB
PARTICULES
LHCb
ATLAS
CMS
ALICE
LES PARTICULES VONT DANS LES DEUX SENS...

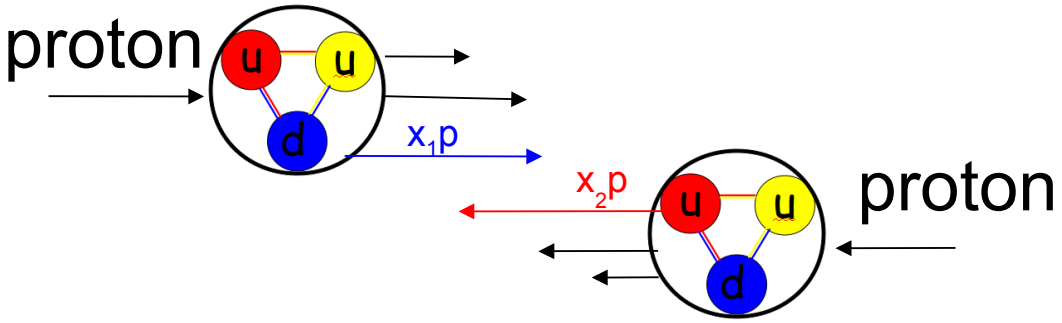
$$\vec{F} = q\vec{v} \times \vec{B}$$



Conservation de la charge électrique

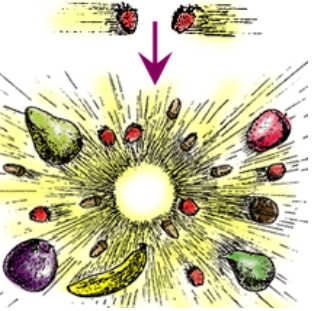


Large Hadron Collider (LHC)
CERN

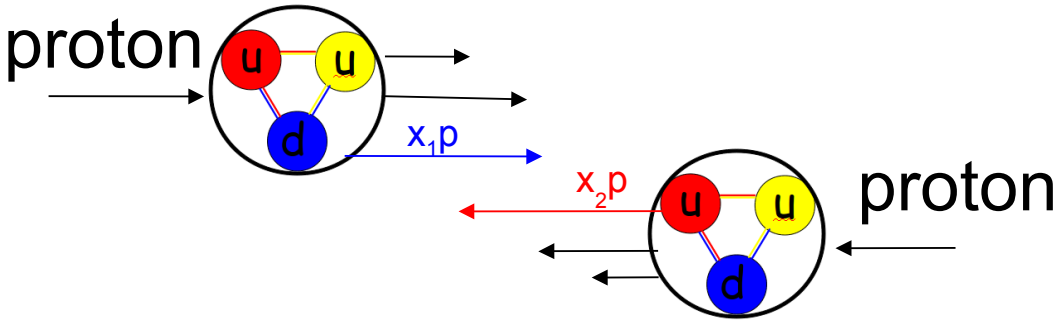


$$e=mc^2$$

matière (proton) → Énergie → matière (W^+ ou W^-)



Large Hadron Collider (LHC)
CERN



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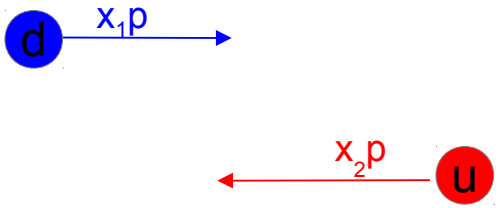
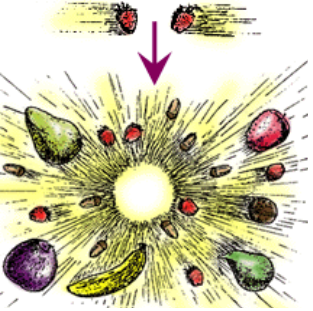
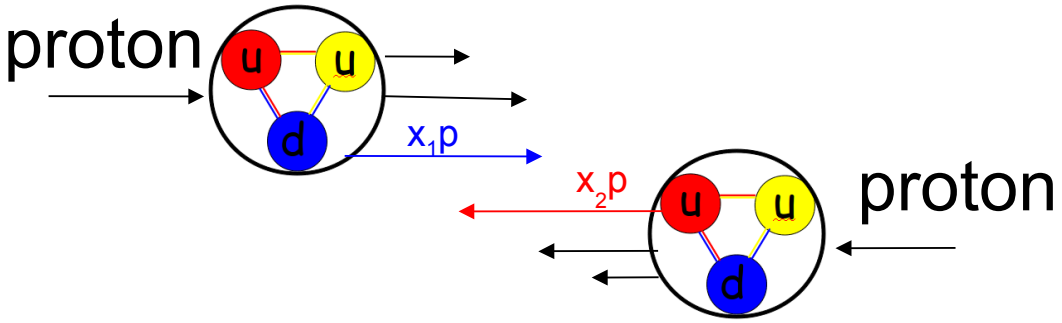


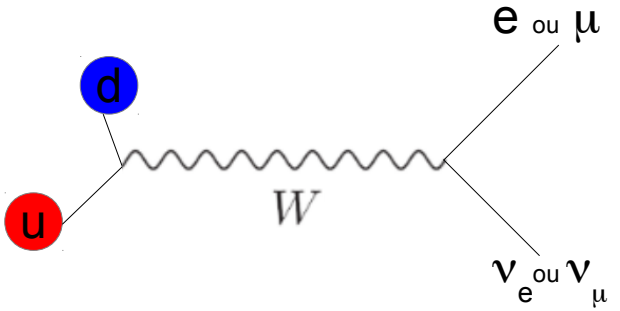


Large Hadron Collider (LHC)
CERN

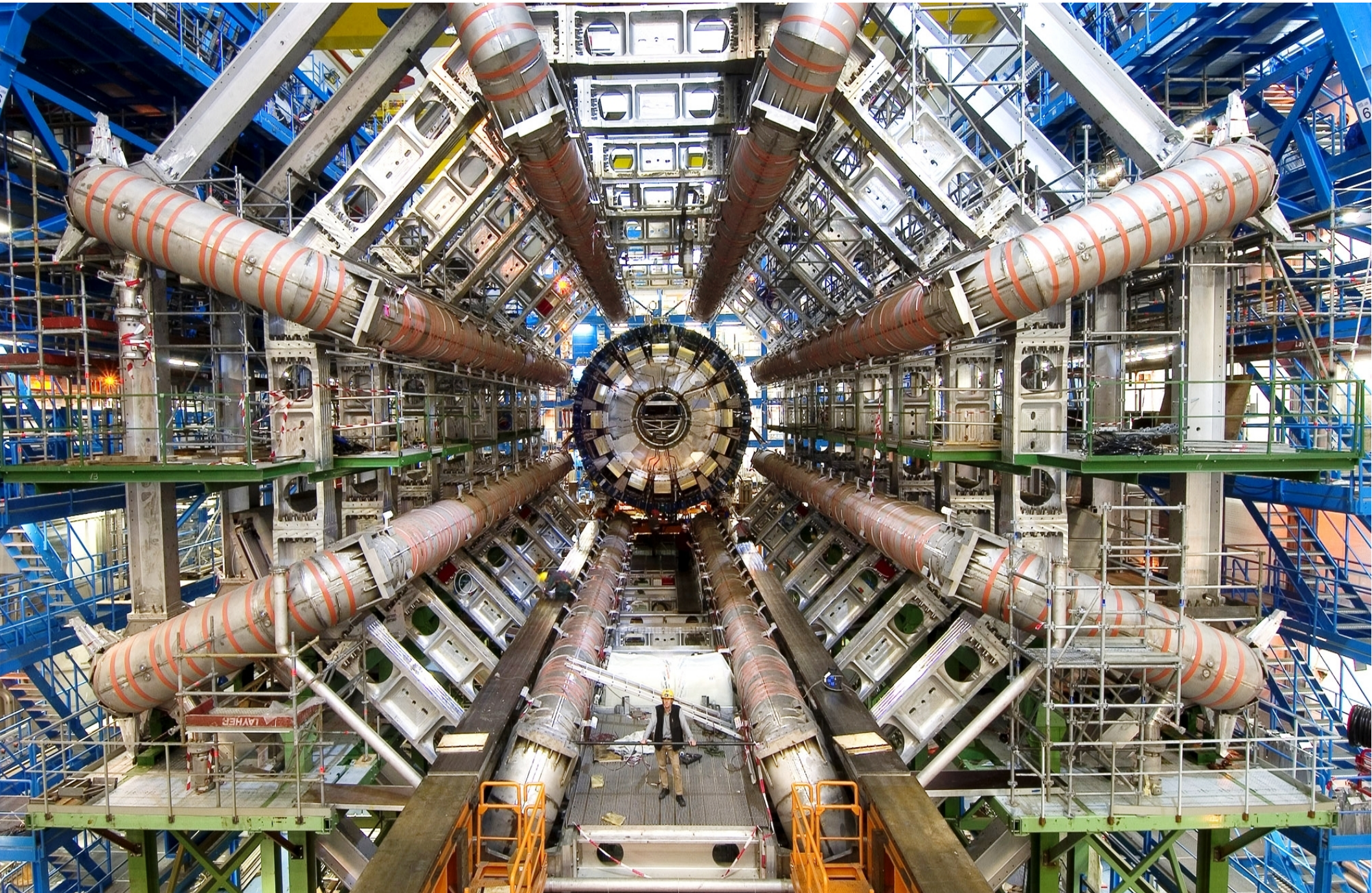


$$e=mc^2$$

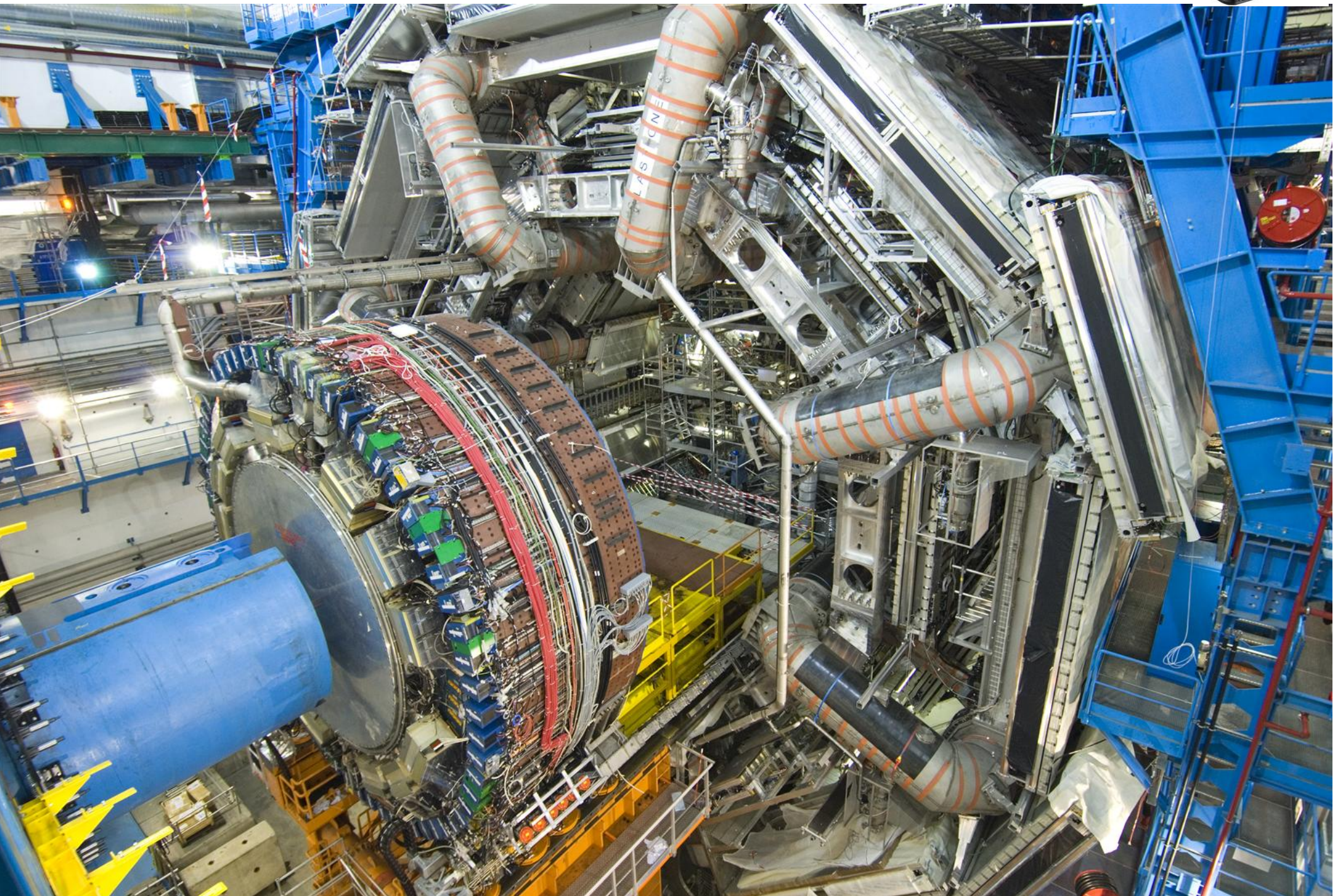
matière (proton) → Énergie → matière (W^+ ou W^-)

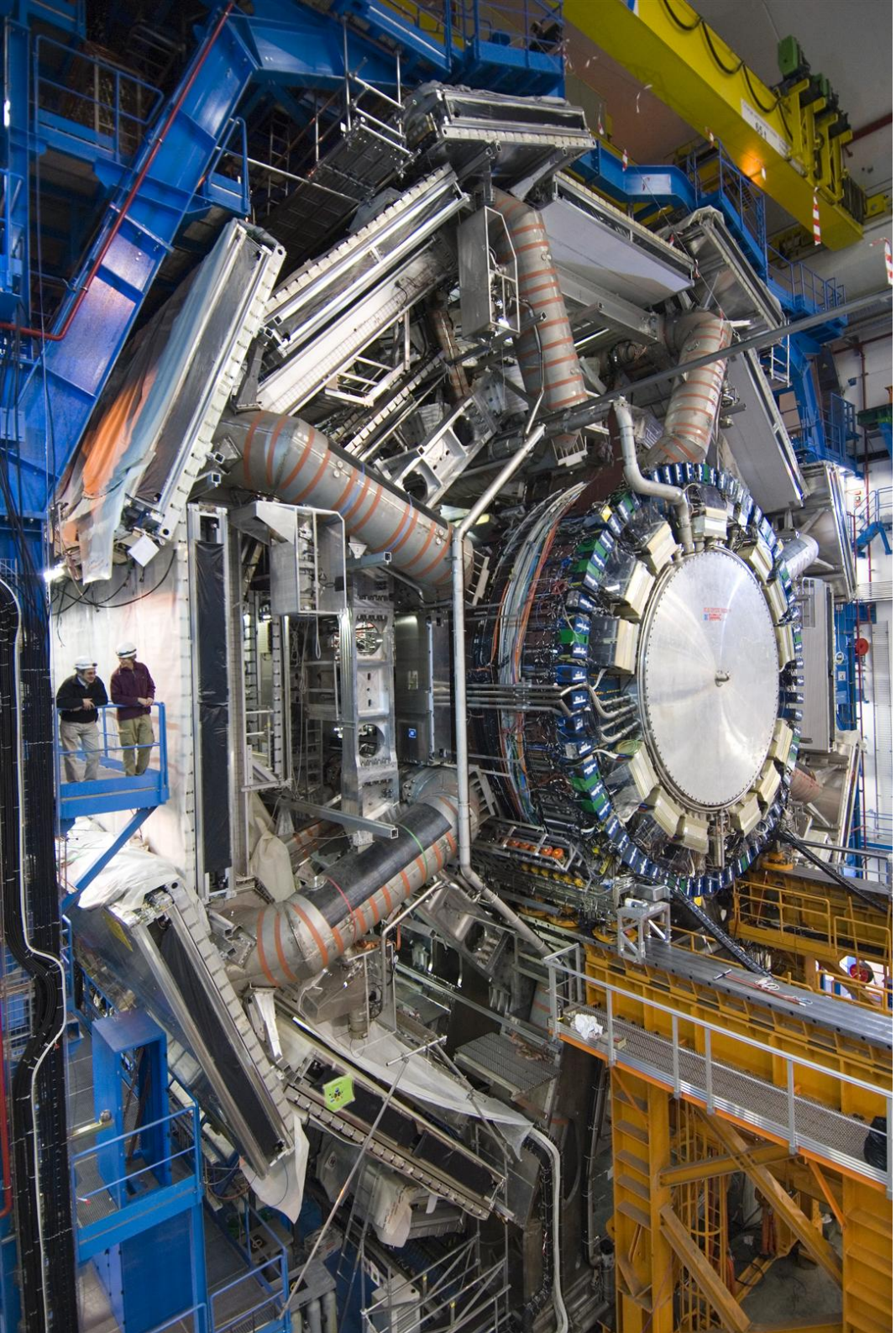


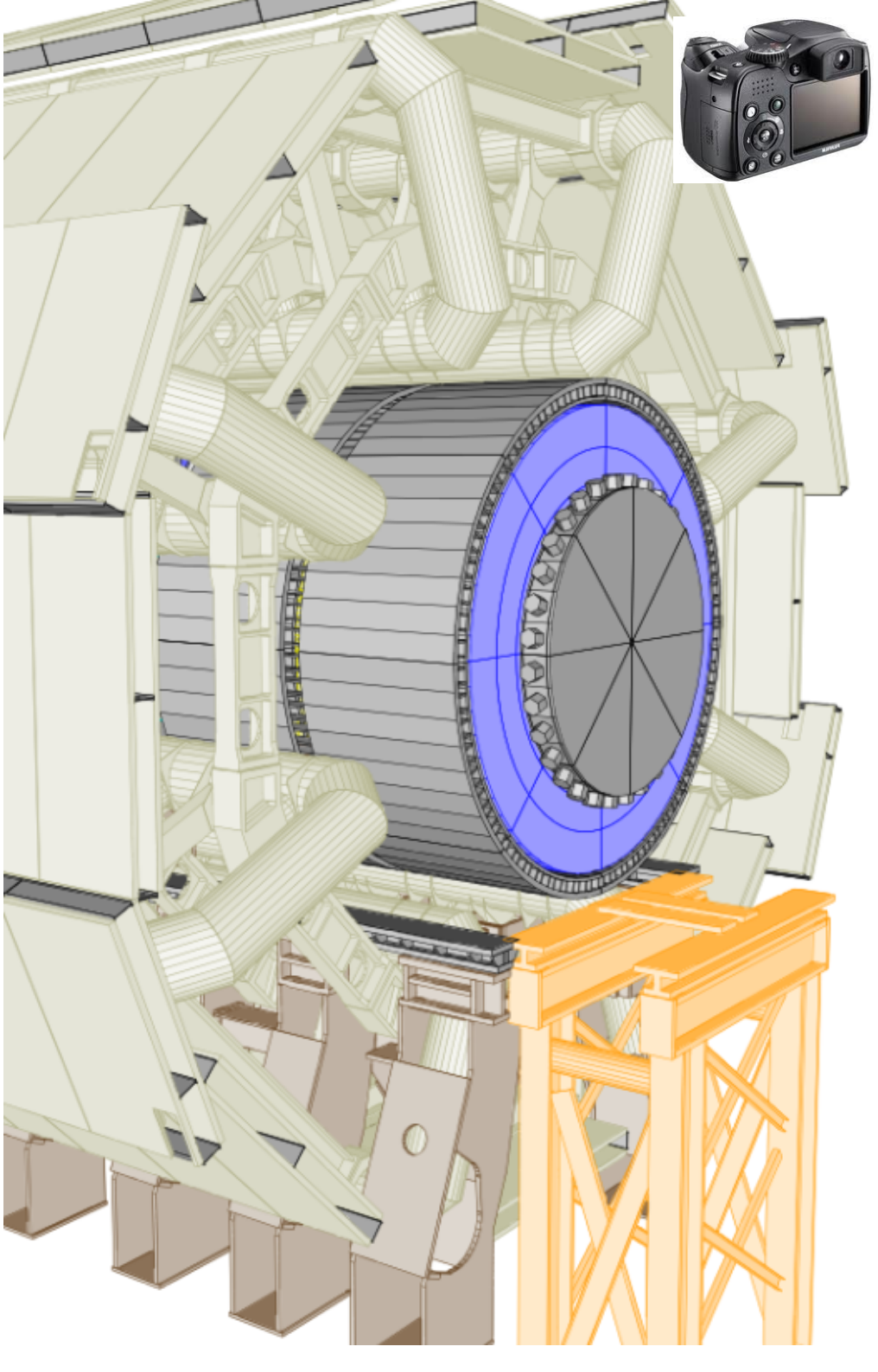
Détecteur ATLAS



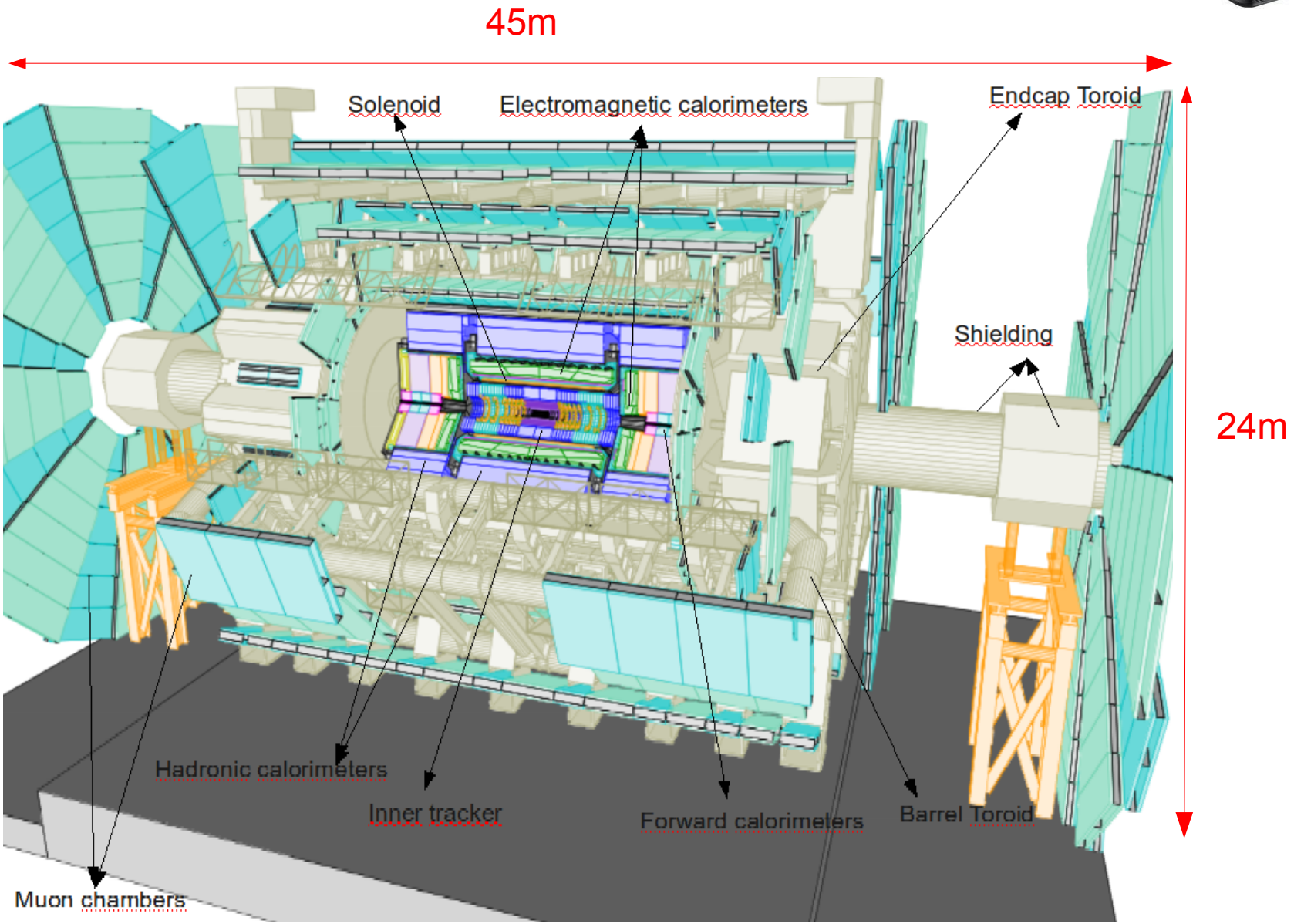
Principe d'un détecteur

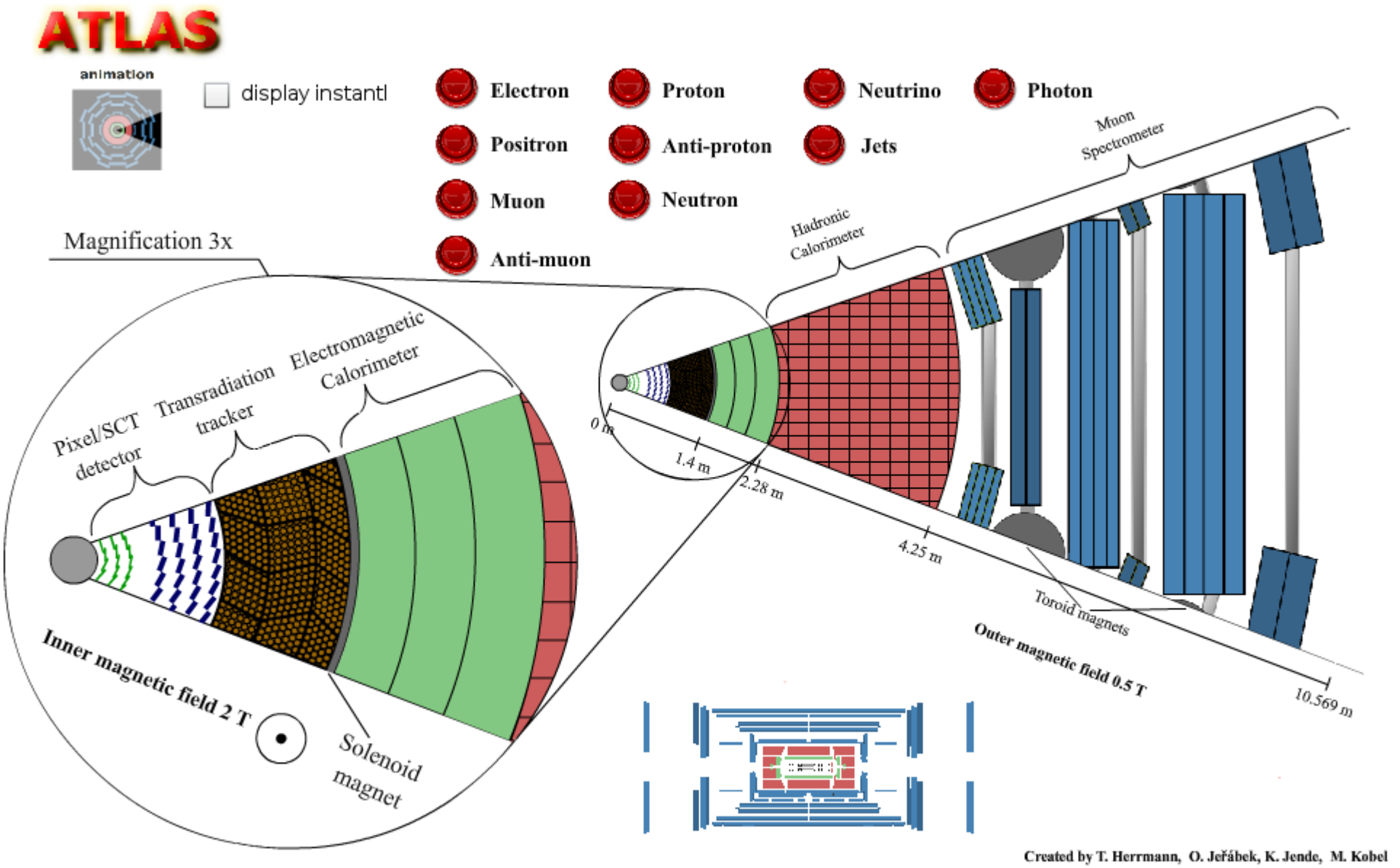




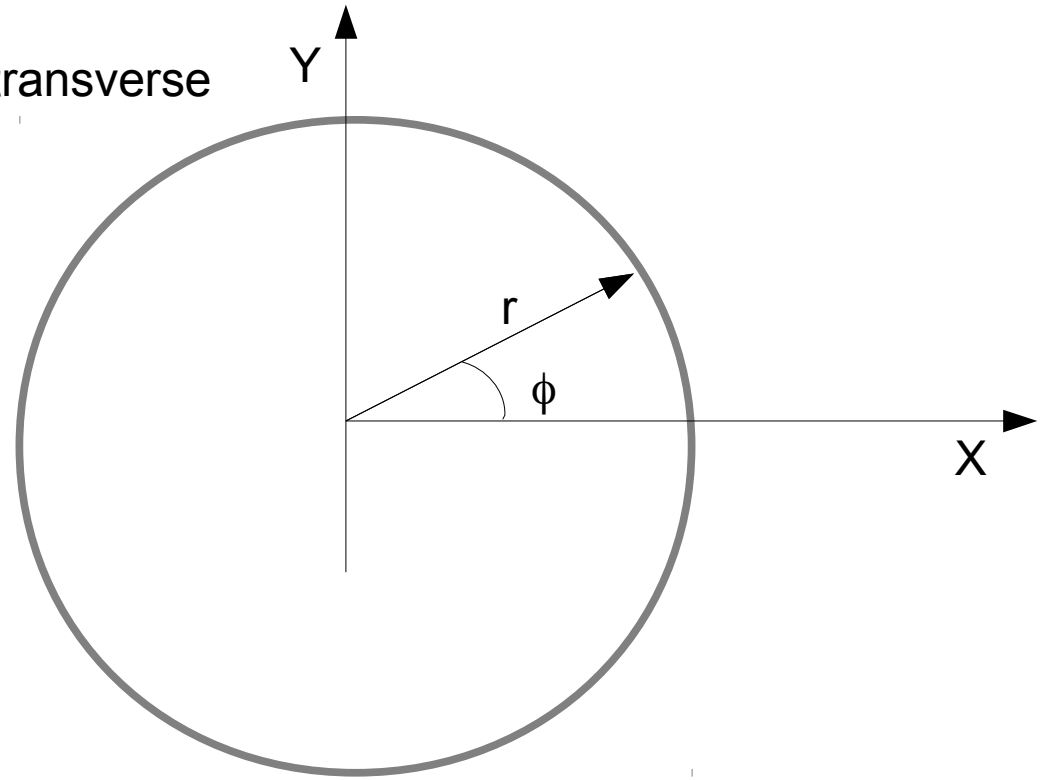


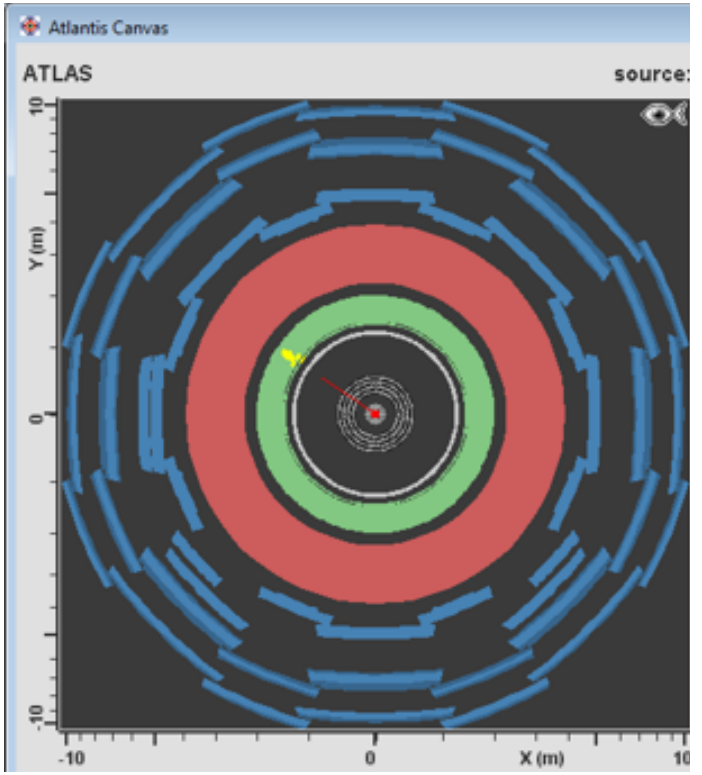
~90 000 000 pixels



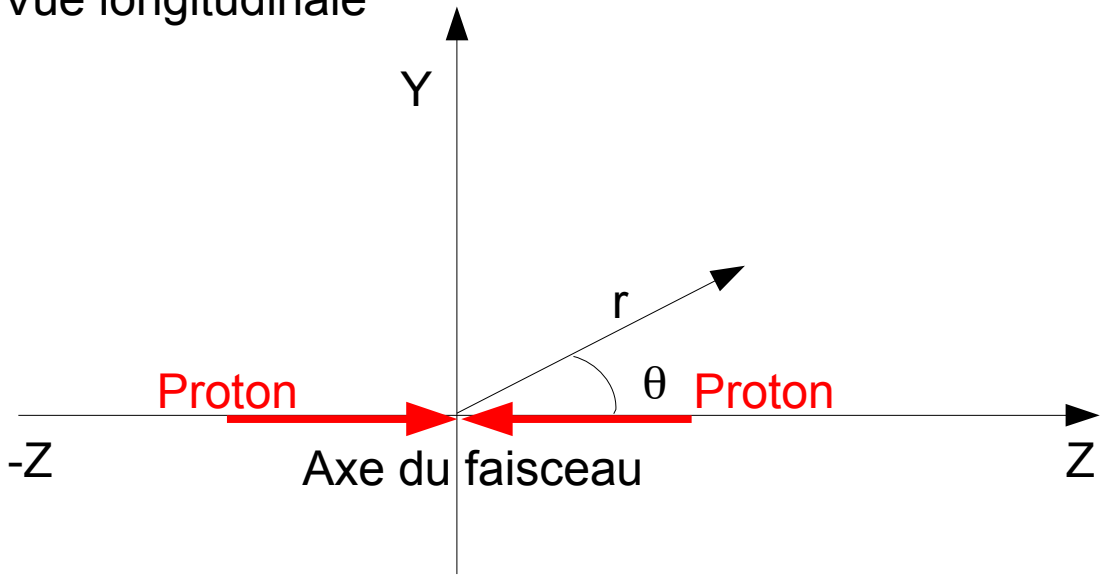

ATLAS
animation
display instantl
Electron
Proton
Neutrino
Photon
Positron
Anti-proton
Jets
Muon
Neutron
Anti-muon
Magnification 3x
Pixel/SCT detector
Transradiation tracker
Electromagnetic Calorimeter
Hadronic Calorimeter
Muon Spectrometer
0 m
1.4 m
2.28 m
4.25 m
10.569 m
Toroid magnets
Inner magnetic field 2 T
Solenoid magnet
Outer magnetic field 0.5 T
Created by T. Herrmann, O. Jeřábek, K. Jende, M. Kobel

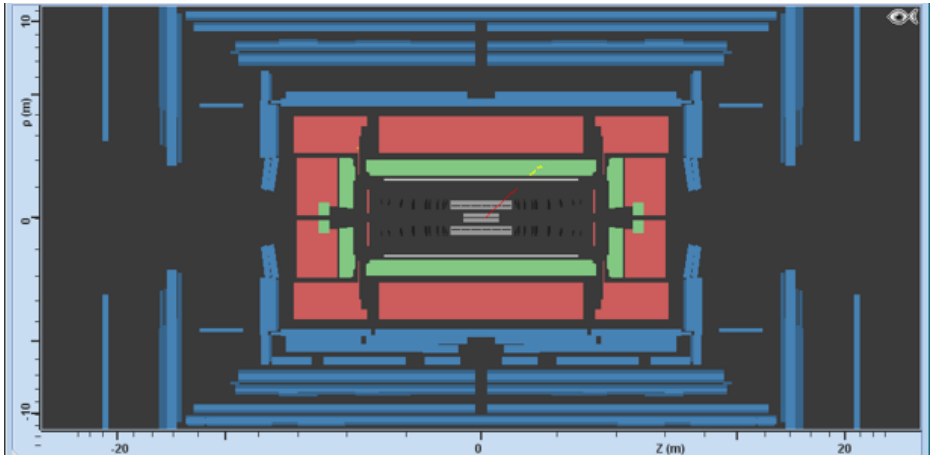
Vue transverse





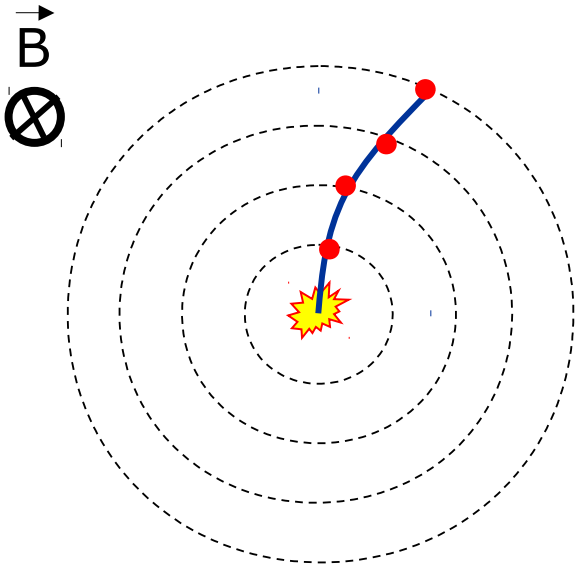
Vue longitudinale



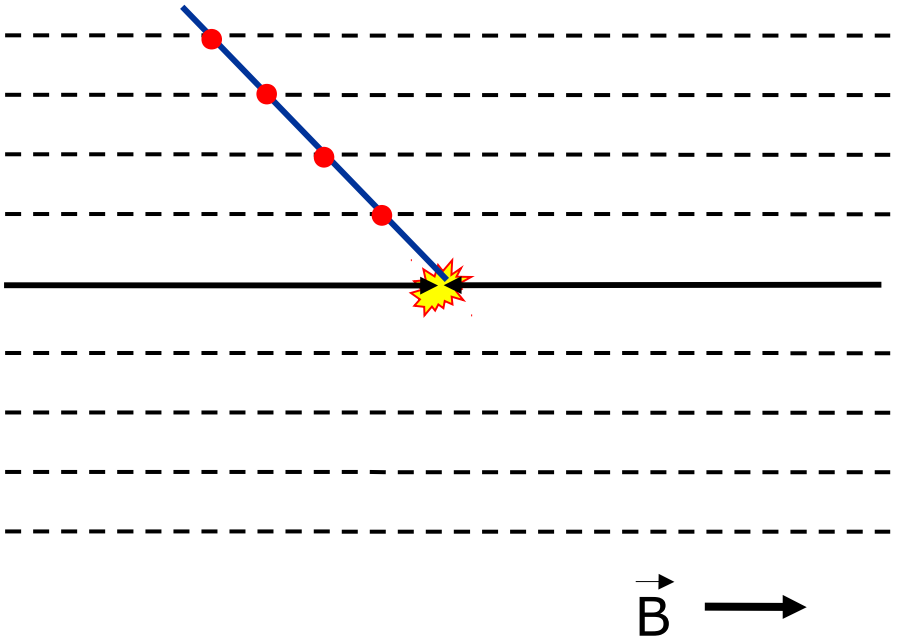


Vue transverse

Vue longitudinale

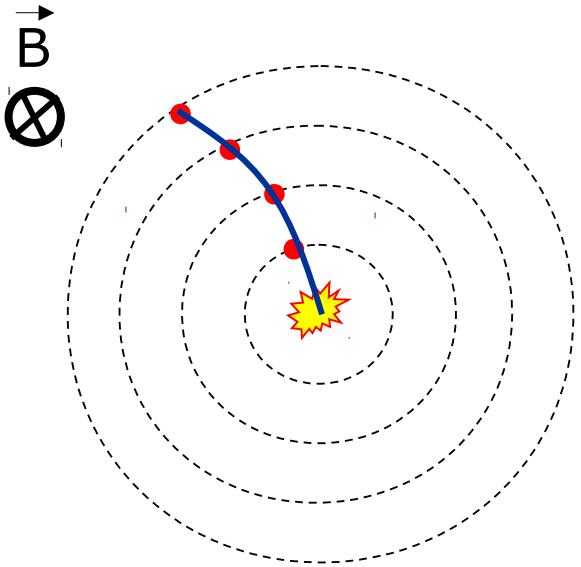


Un électron

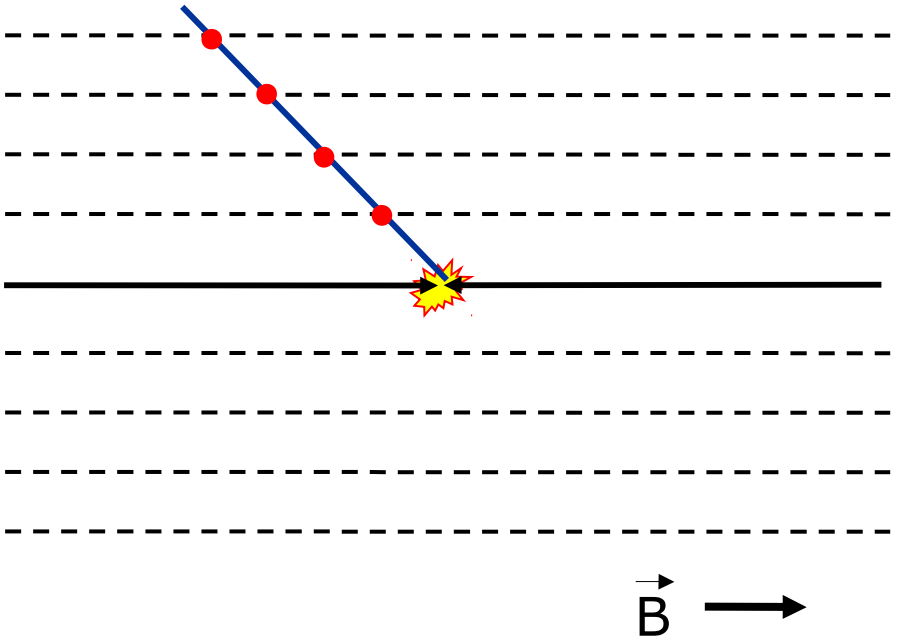


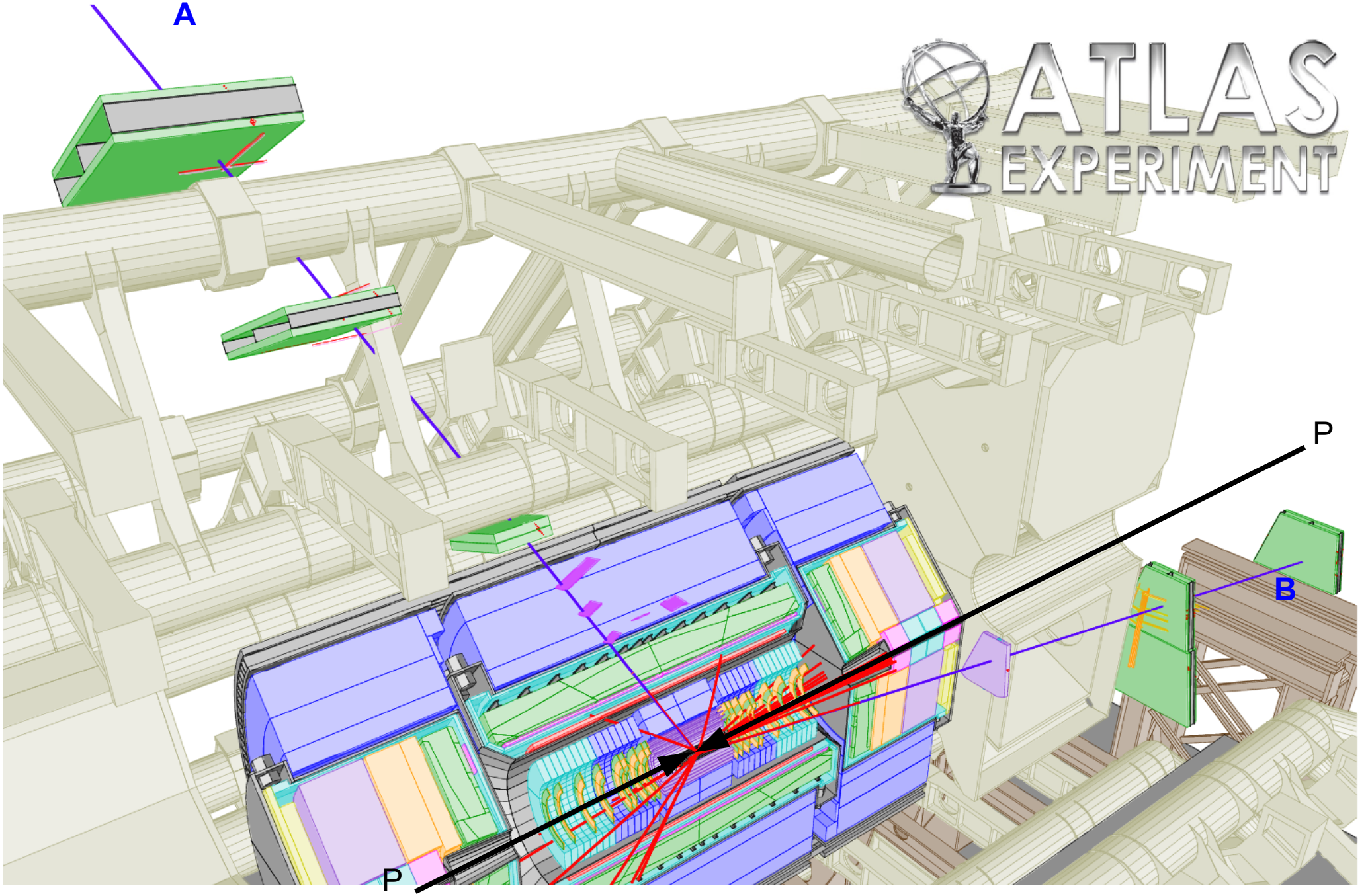
Vue transverse

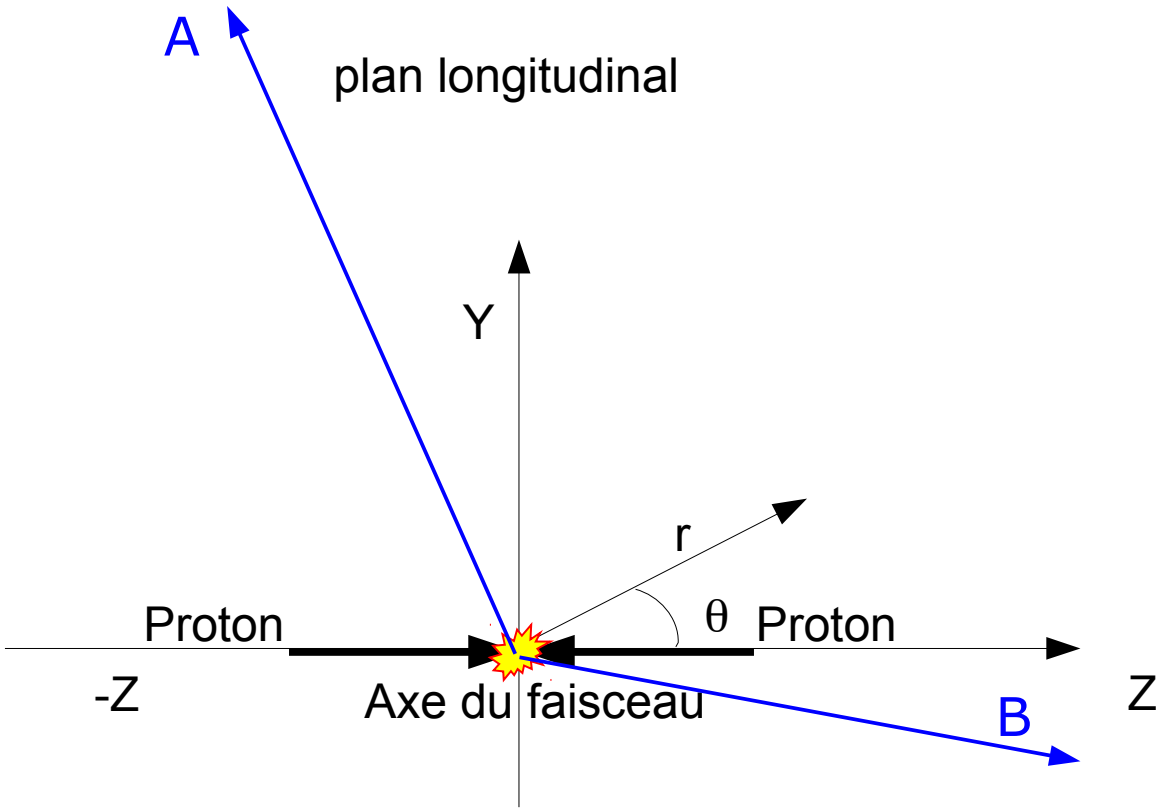
Vue longitudinale



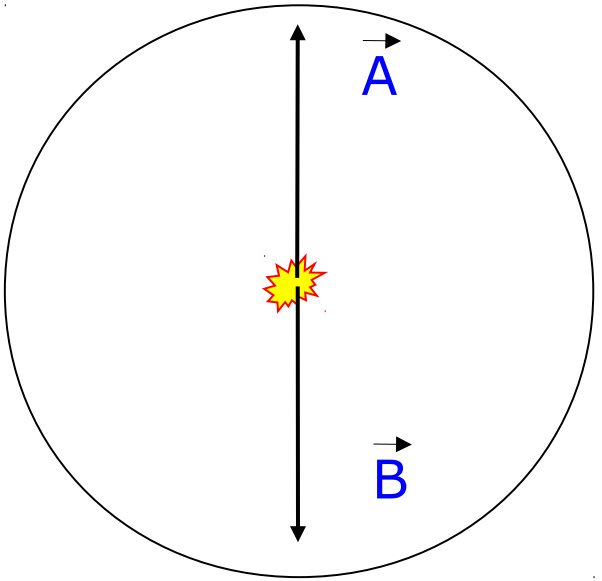
Un positon




A
ATLAS
EXPERIMENT
P
B
P



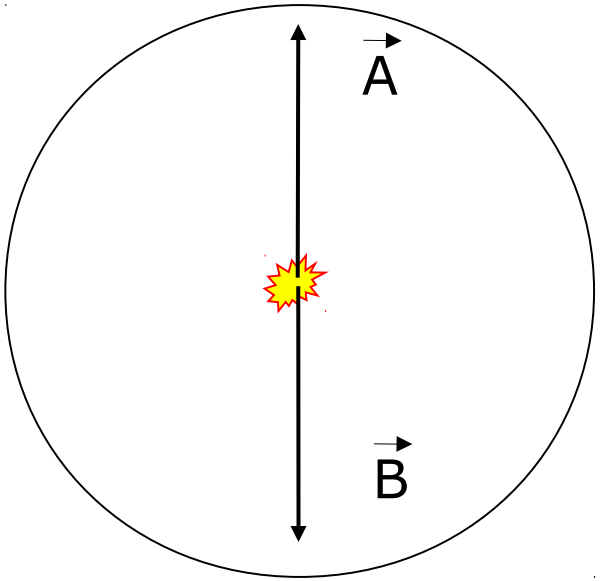
plan transverse



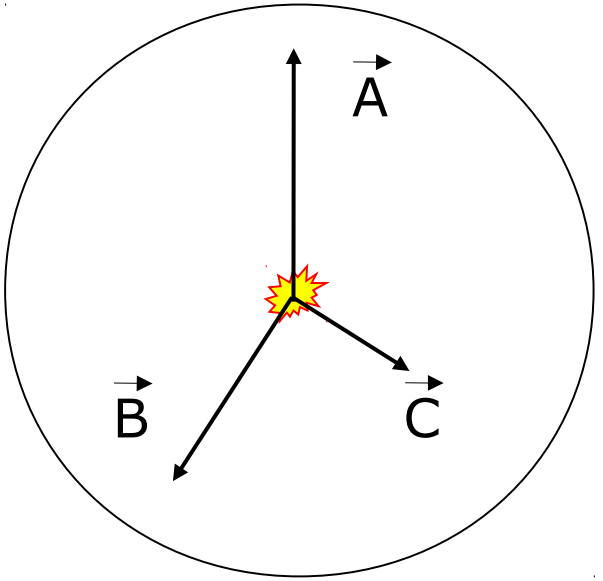
$\vec{A}+\vec{B}=\vec{0}$

Quantité de mouvement (p=mv) = impulsion

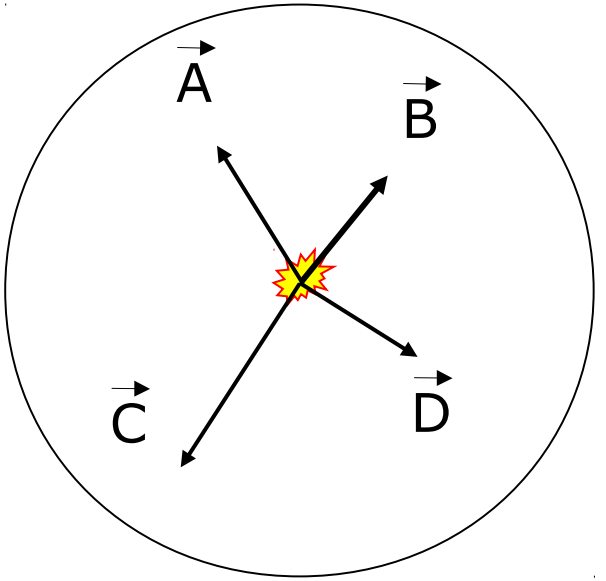
Conservation de l'impulsion dans le plan transverse au faisceau



$\vec{A}+\vec{B}=\vec{0}$

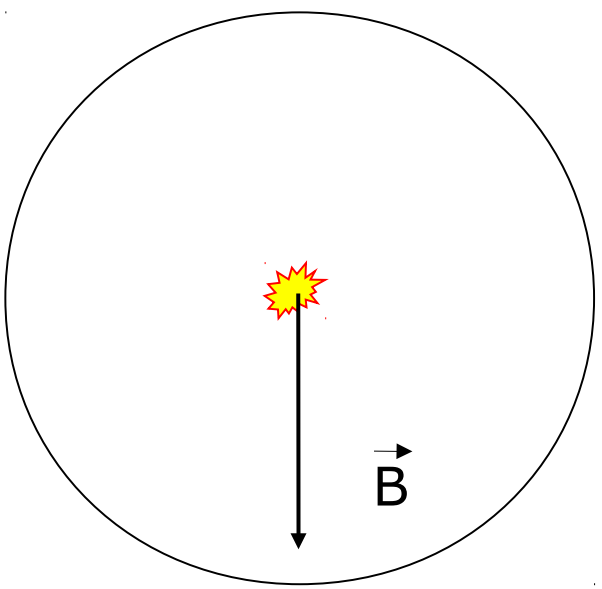


$\vec{A}+\vec{B}+\vec{C}=\vec{0}$

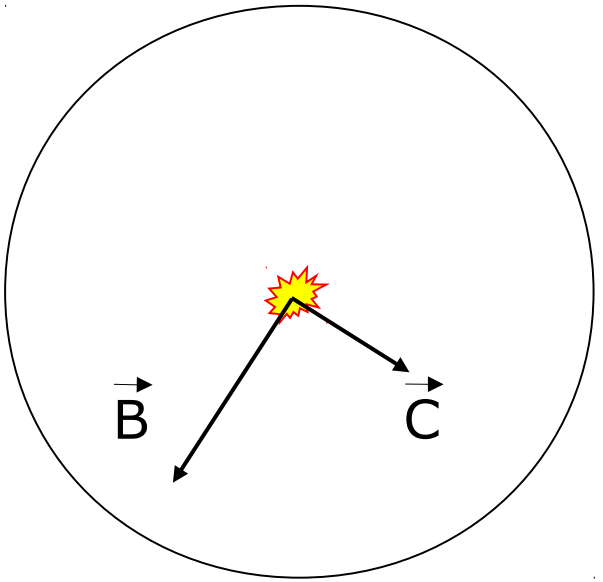


$\vec{A}+\vec{B}+\vec{C}+\vec{D}=\vec{0}$

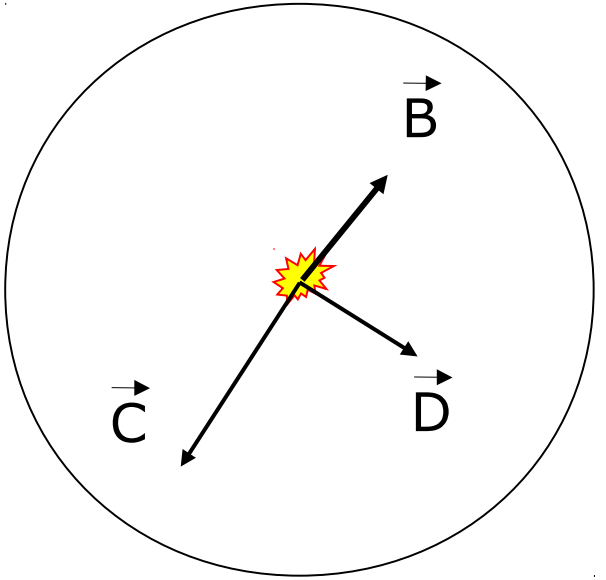
Énergie Manquante (MET)



$\vec{B} \neq 0$



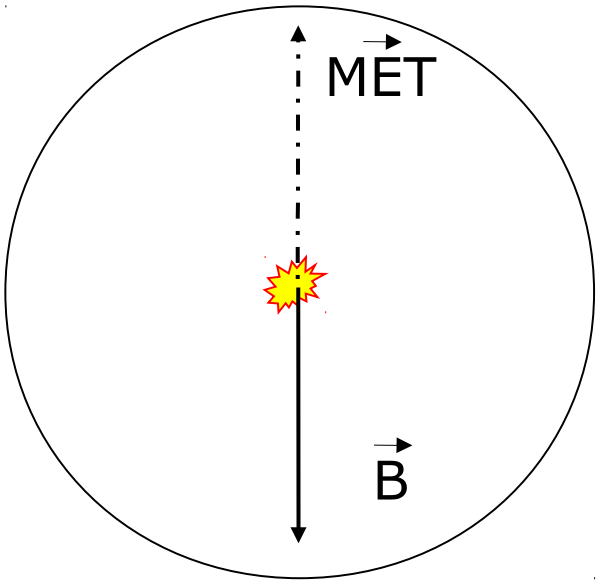
$\vec{B}+\vec{C}\neq 0$



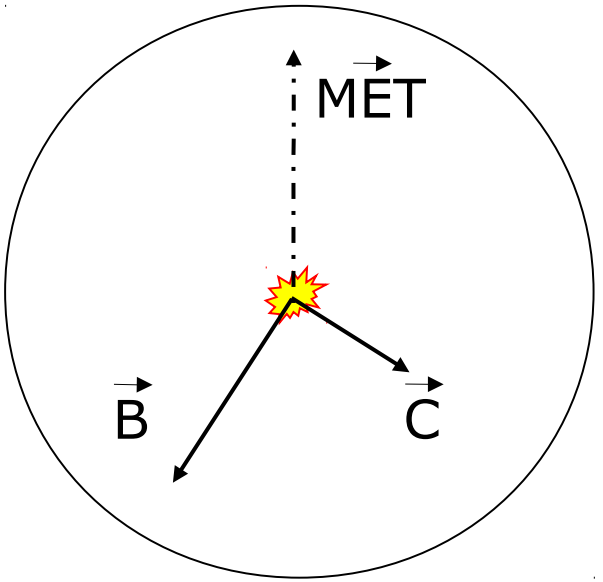
$\vec{B}+\vec{C}+\vec{D}\neq 0$

Le neutrino ne laisse pas de trace dans le détecteur interne (neutre) et ne dépose pas d'énergie dans le calorimètre (interagit très faiblement avec la matière)

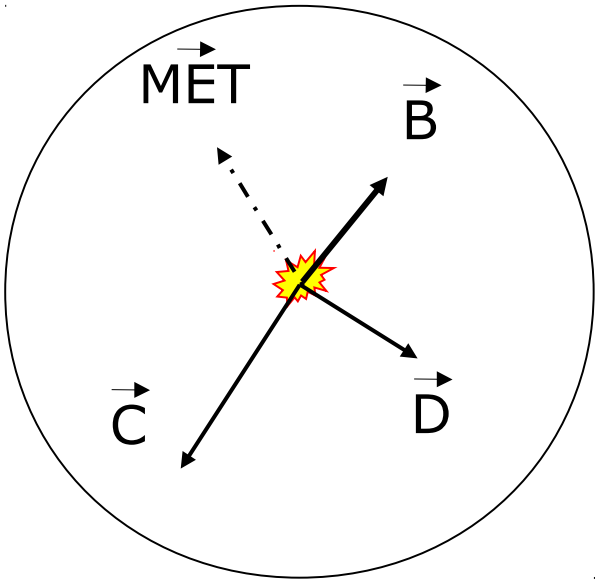
Si la particule A est un neutrino l'impulsion dans le plan transverse au faisceau ne semble plus être conservée



$\vec{B} = -\vec{MET}$



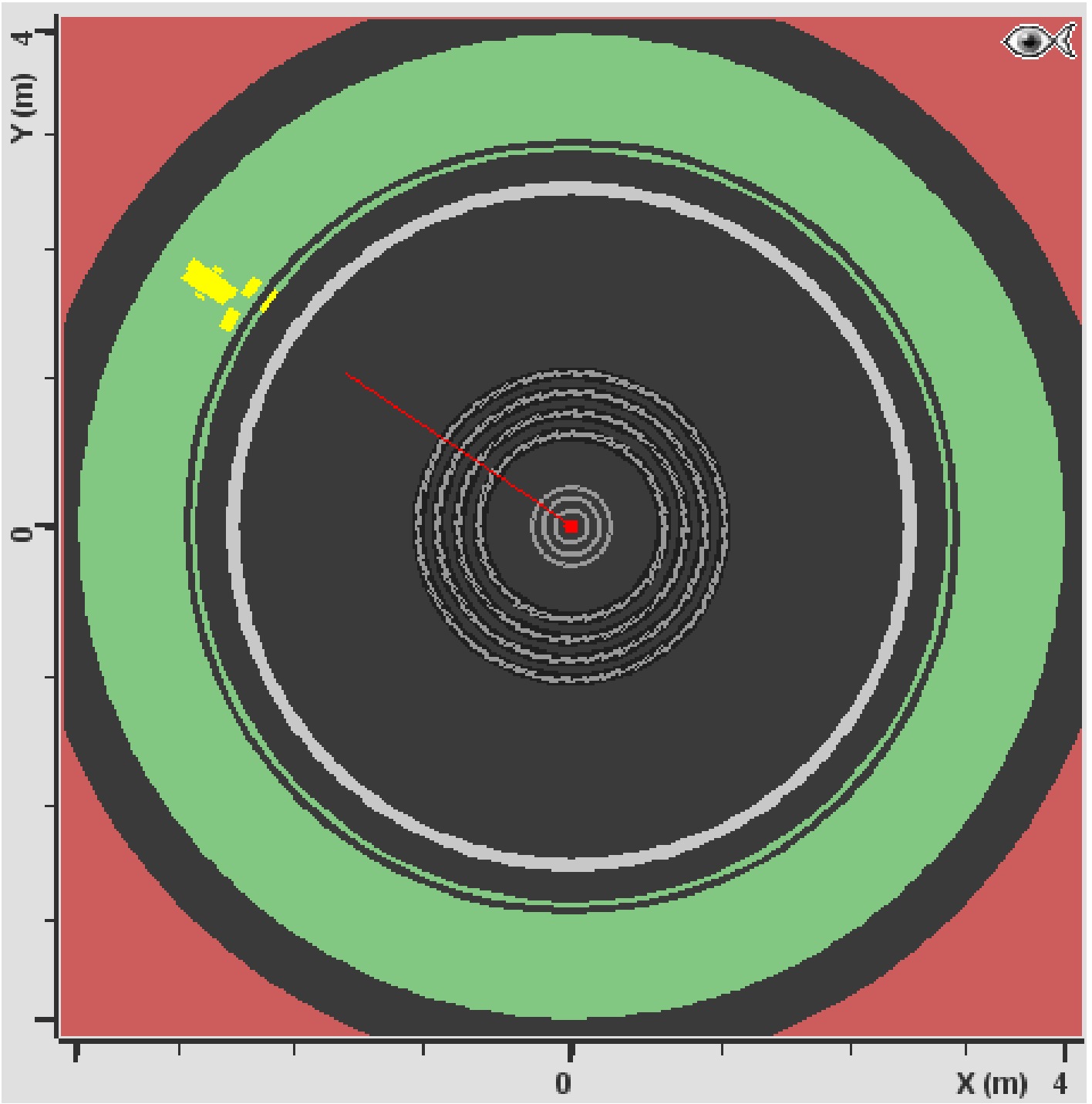
$\vec{B} + \vec{C} = -\vec{MET}$

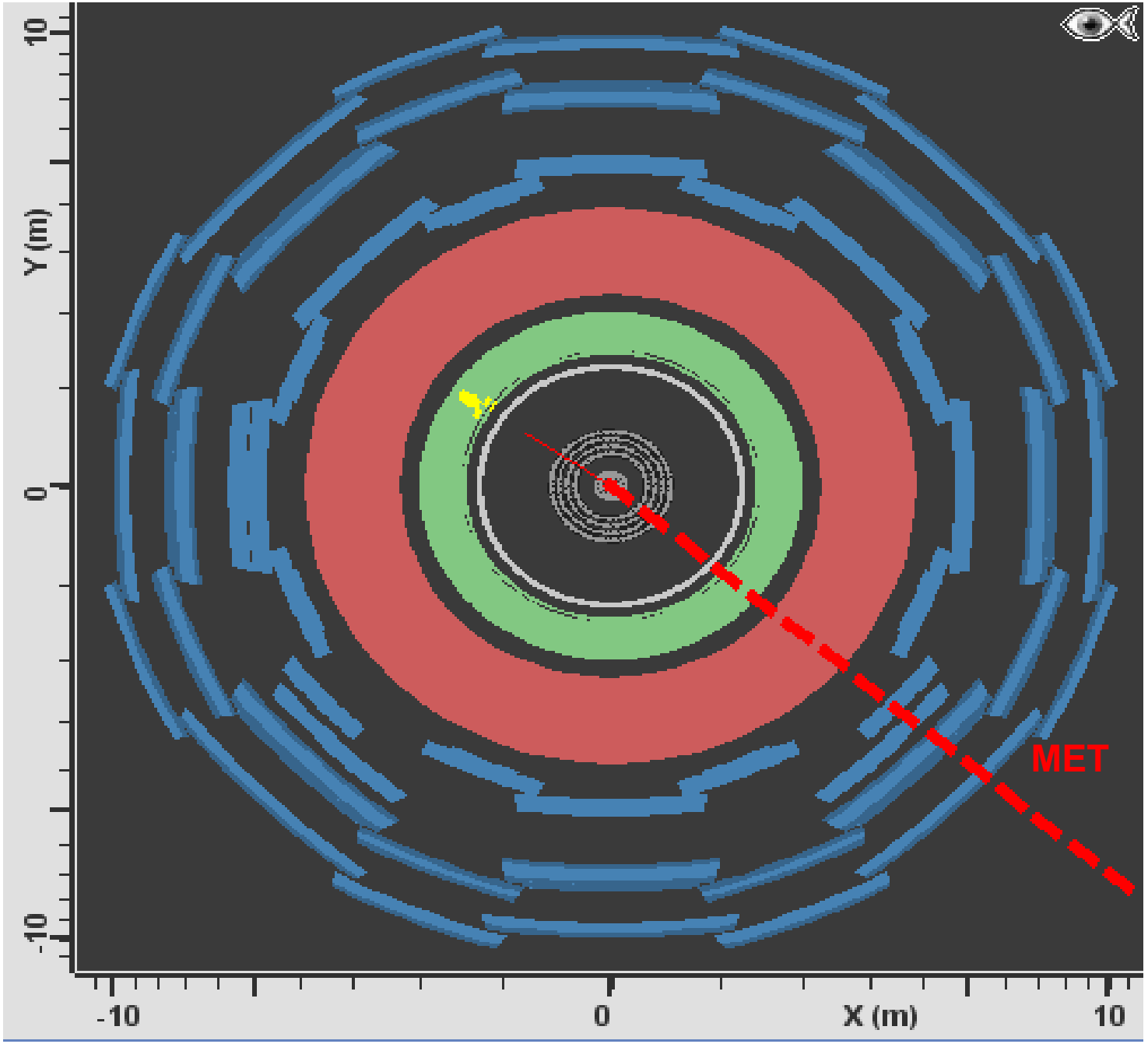


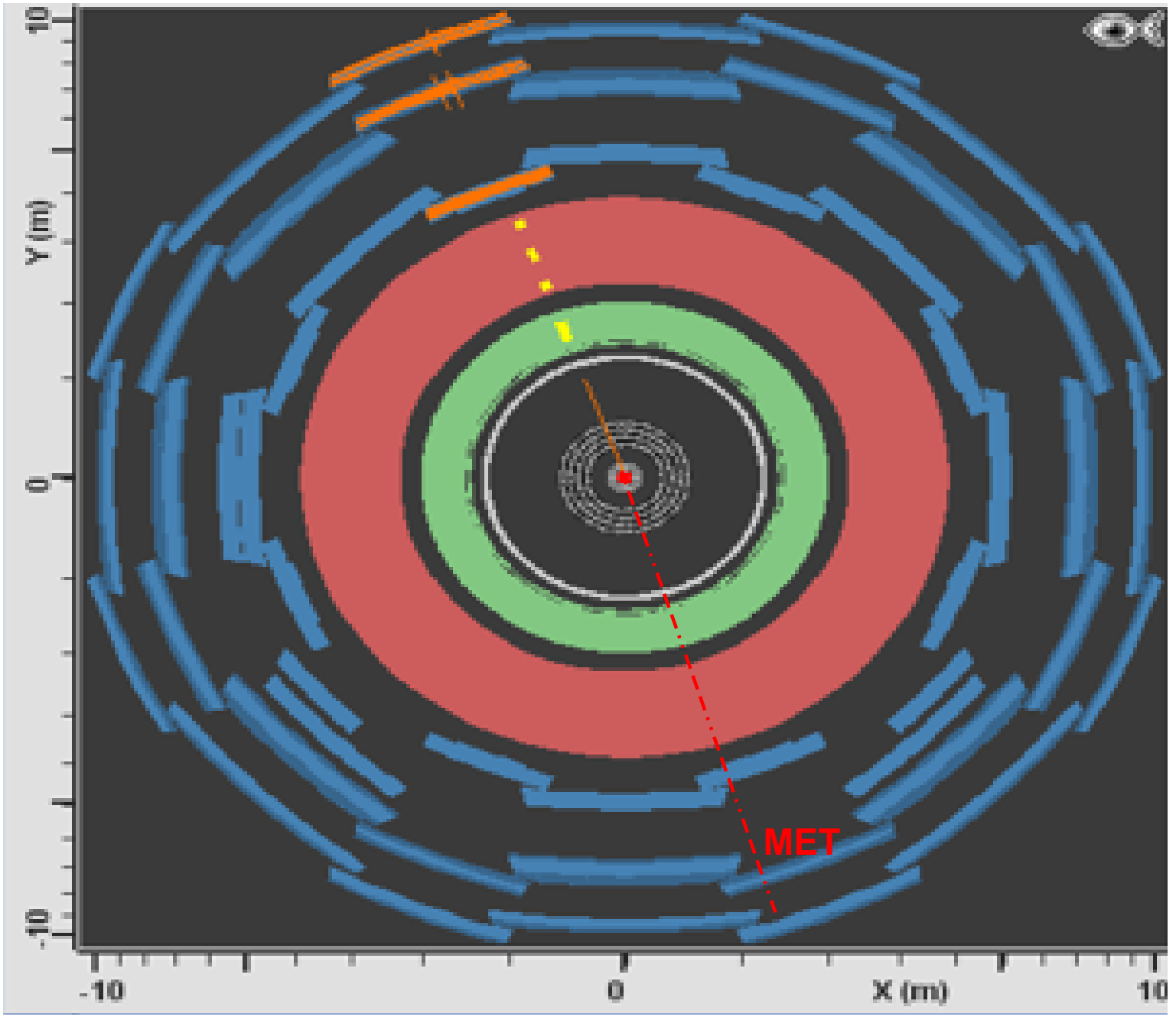
$\vec{B} + \vec{C} + \vec{D} = -\vec{MET}$

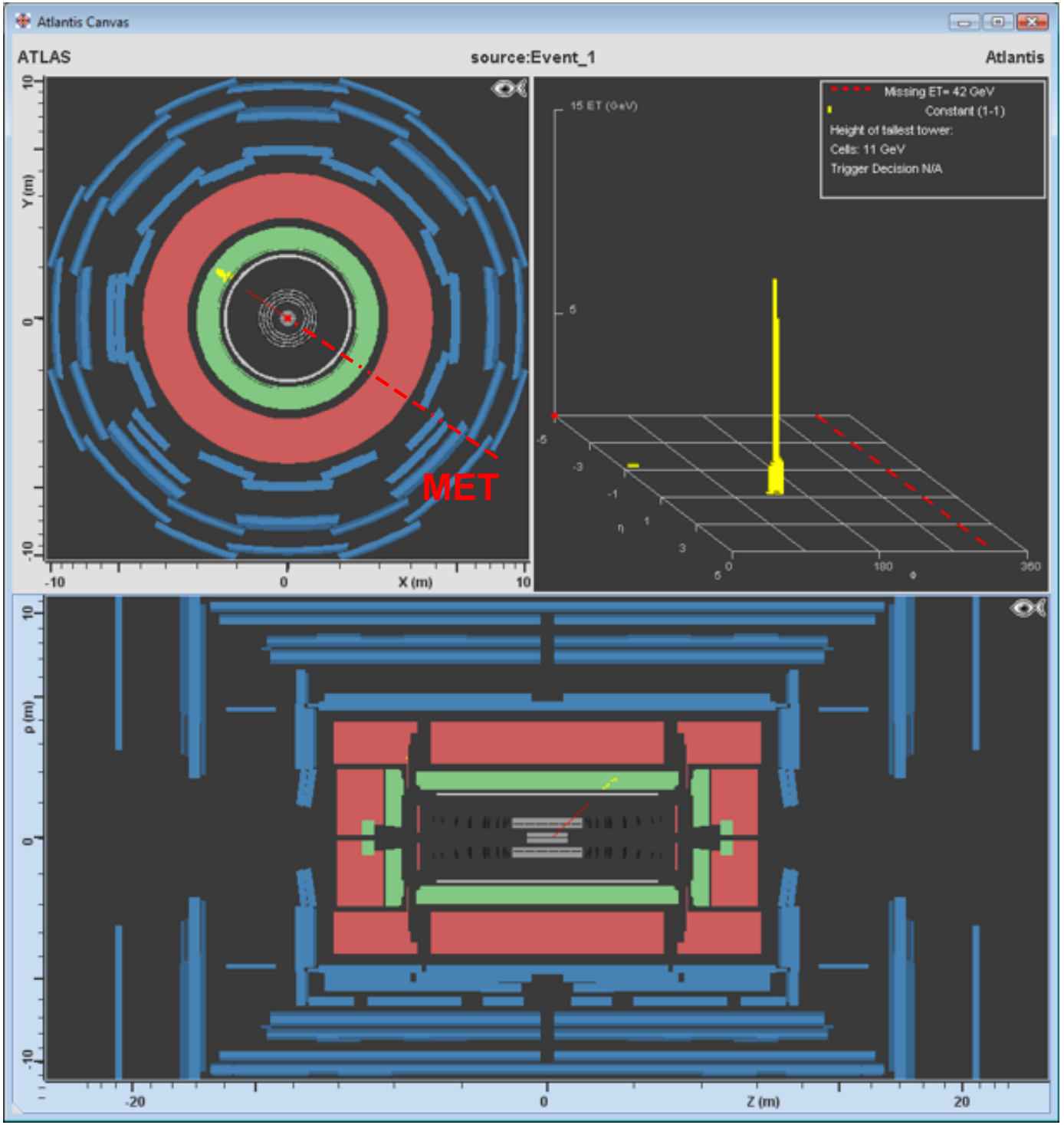
La non-conservation de l'impulsion dans le plan transverse au faisceau est une indication de la presence d'un neutrino

$|\vec{MET}| \neq 0 \quad \Rightarrow$ Presence d'un neutrino

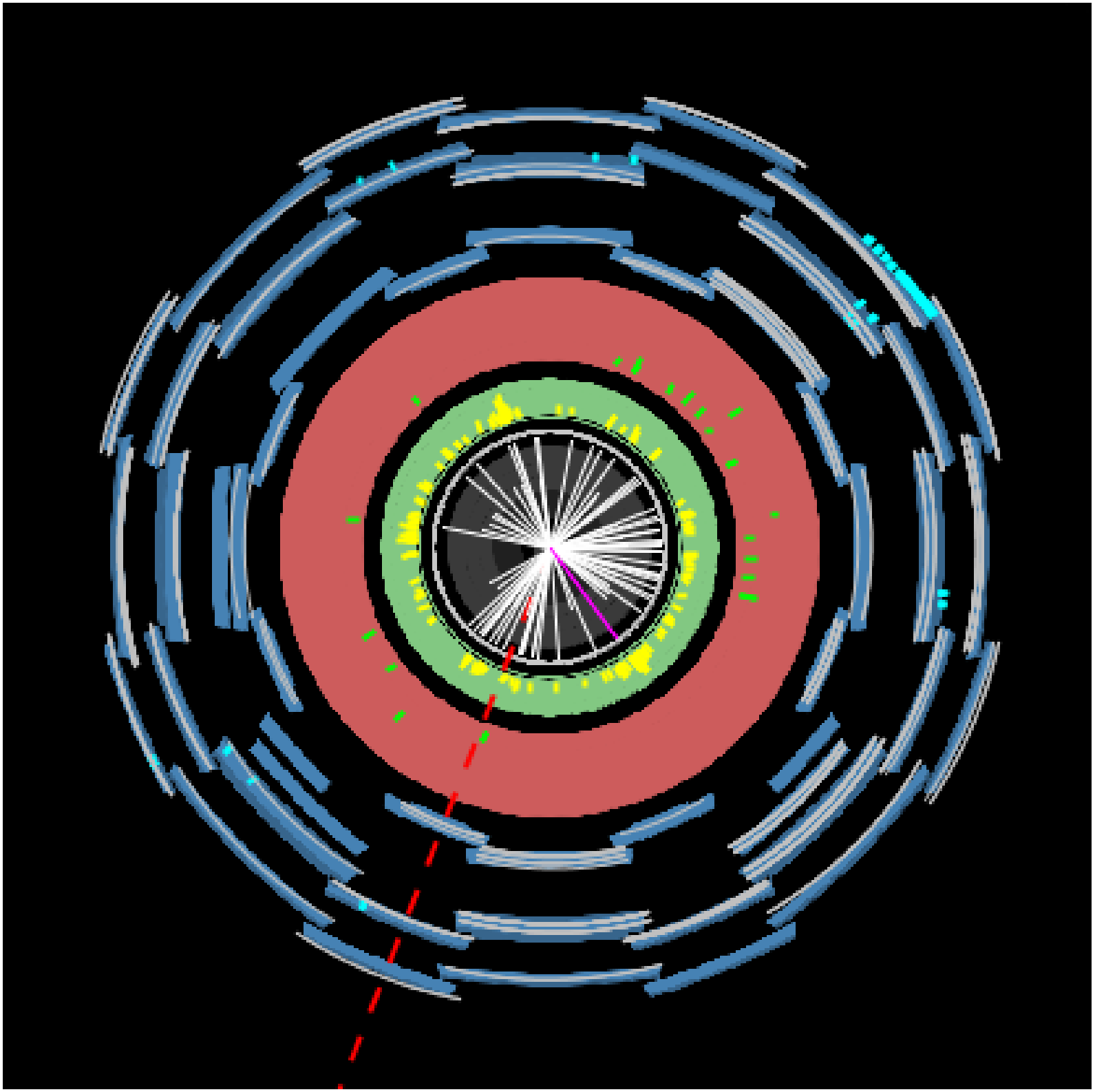

Y (m)
4
0
0
X (m)
4


10
Y (m)
0
-10
-10
0
X (m)
10
MET

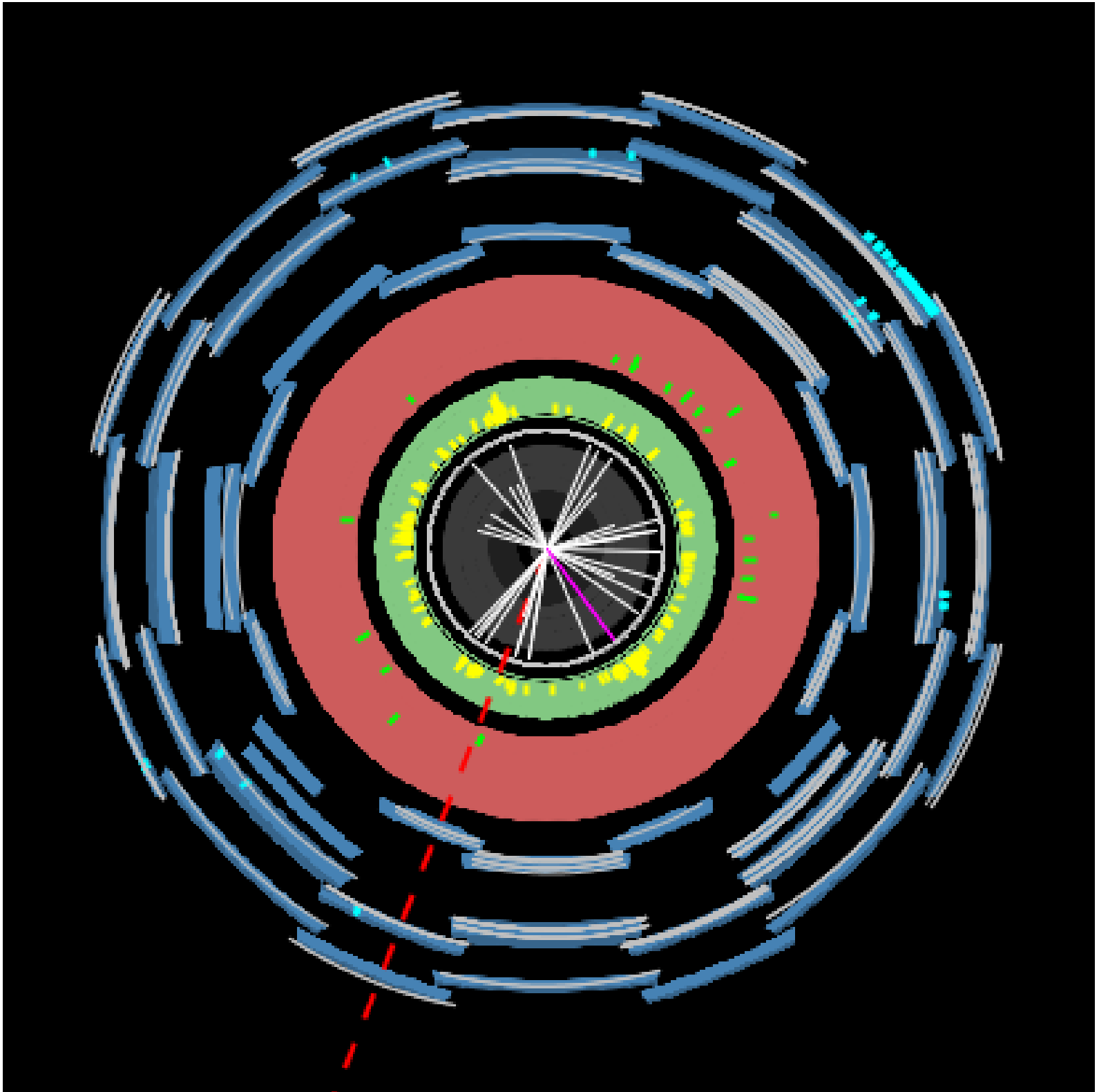

Y (m)
10
0
-10
-10
0
X (m)
10
MET


Atlantis Canvas
ATLAS
source:Event_1
Atlantis
MET
Missing ET= 42 GeV
Constant (1-1)
Height of tallest tower:
Cells: 11 GeV
Trigger Decision N/A
15 ET (GeV)
Y (m)
X (m)
ρ (m)
Z (m)
η
φ

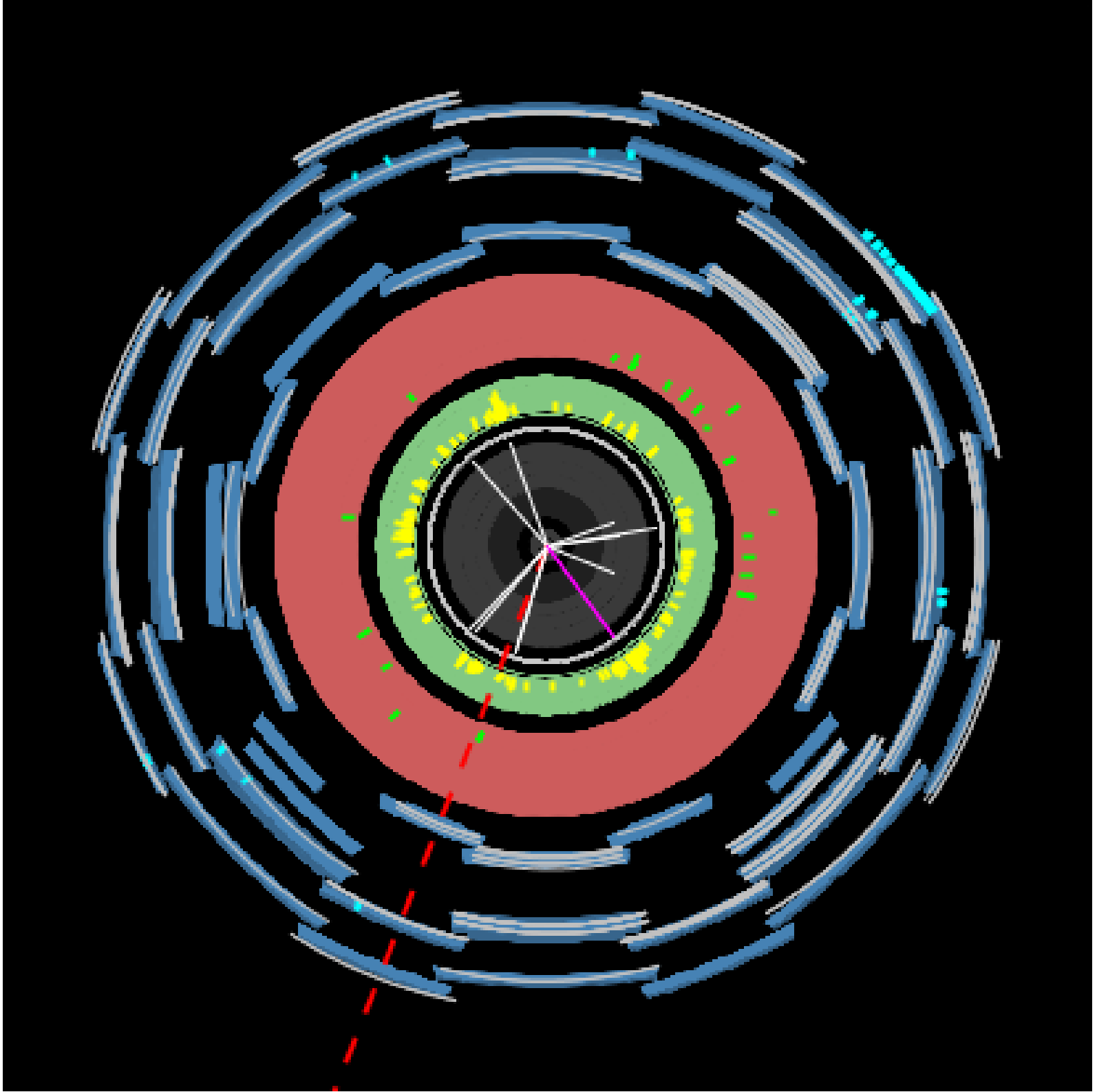
Pt>1GeV



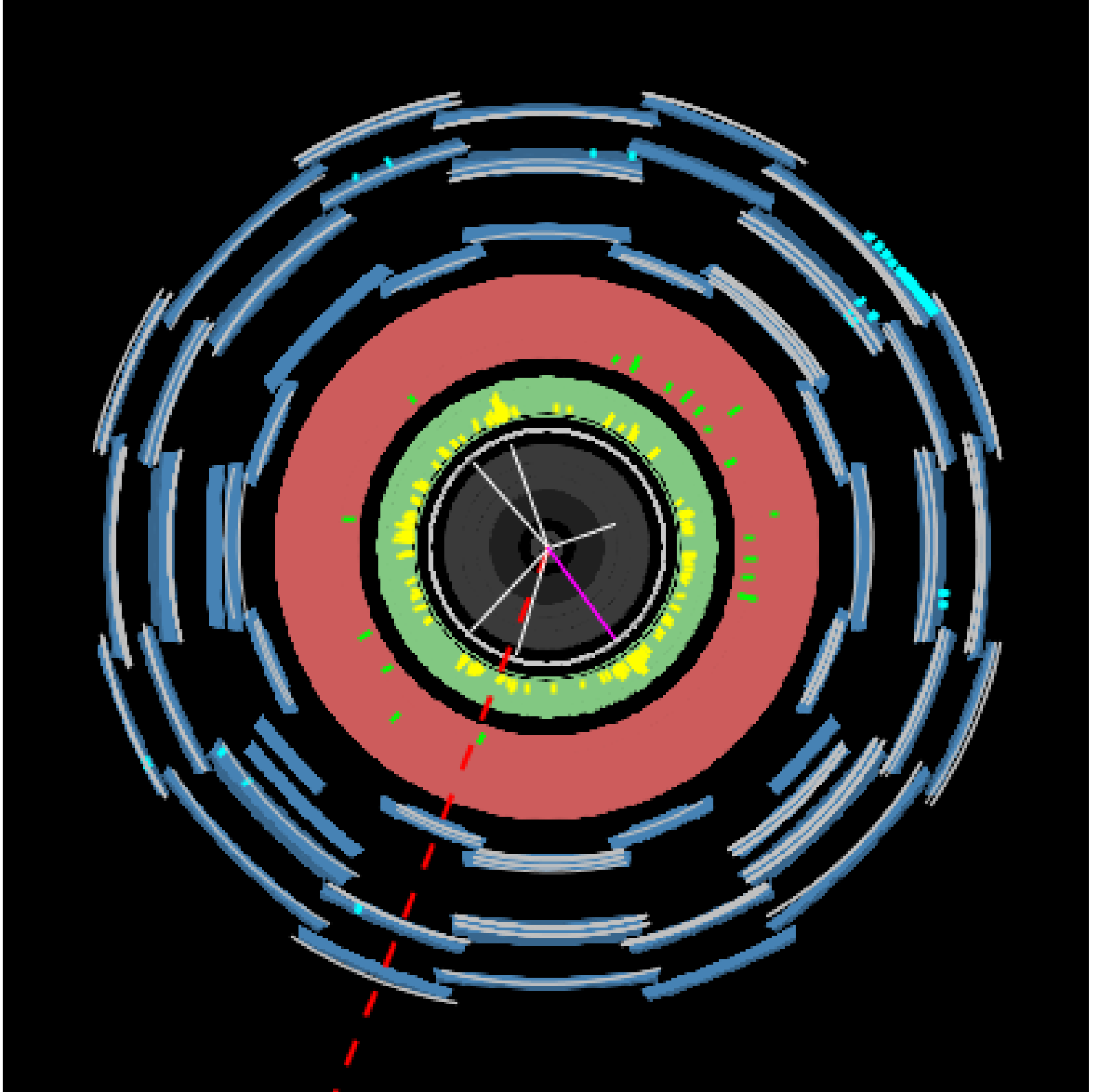
Pt>2GeV

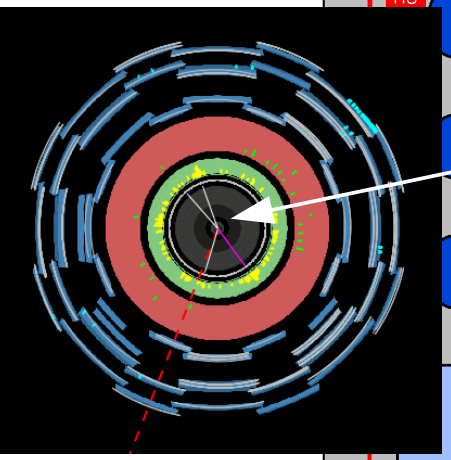


Pt>5GeV



Pt>10GeV





load event and go through every step of the following flowchart
in order to find out what kind of event it is

no

MET ≥ 20 GeV

yes

track(s) with transverse momentum $p_T \geq 10$ GeV

yes

matching entries in the electromagnetic calorimeter (e^+, e^-)
or muon chambers (μ^+, μ^-)

yes

number of those tracks originating from one vertex (zoom in) is:

exactly 1 | exactly 2 | > 2

yes

no

$p_T \geq 20$ GeV

no

$p_T(l_1) \geq 20$ GeV
$p_T(l_2) \geq 10$ GeV

yes

no

isolated?

no

both isolated?

yes

determine electric charge:

+1 W^+ candidate

W^- candidate -1

determine type of lepton:

e^+ μ^+ e^- μ^-

yes

opposite electric charge

no

yes

for leptons originating from the same family:
MET ≥ 40 GeV

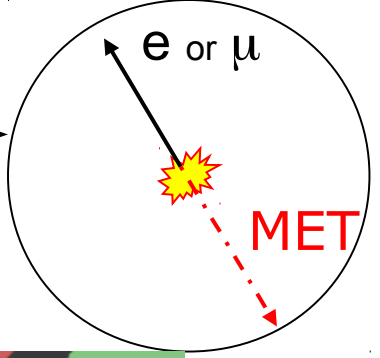
no

yes

measure angle between leptons in transverse plane

WW candidate

background



e^+/e^-

μ^+/μ^-