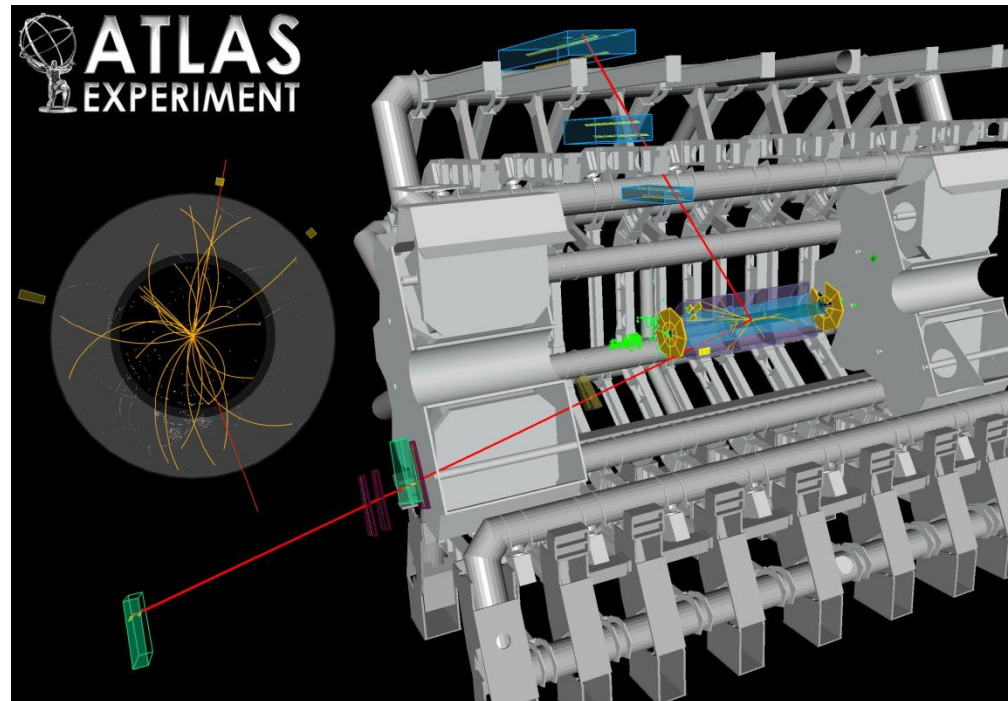
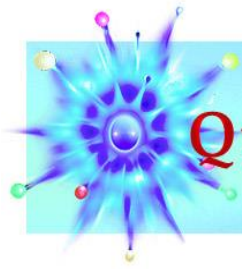


Une masterclass ATLAS légère



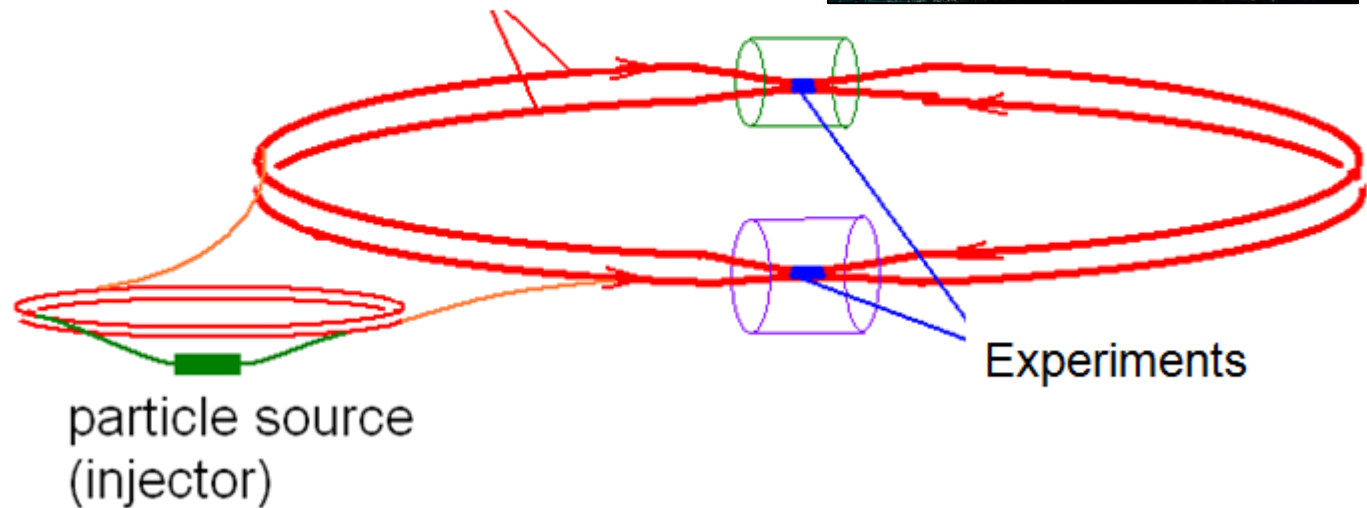


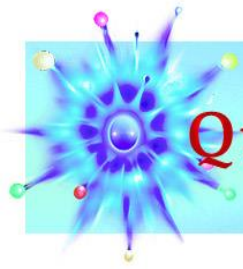
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The LHC and New Physics

Le LHC est enterré à environ
~100 m sous la surface, près
de la frontière franco-suisse.

beams accelerated in large rings
(27 km circumference at CERN)





Conception Générique

Cylinders wrapped around the beam pipe

From inner to outer . . .

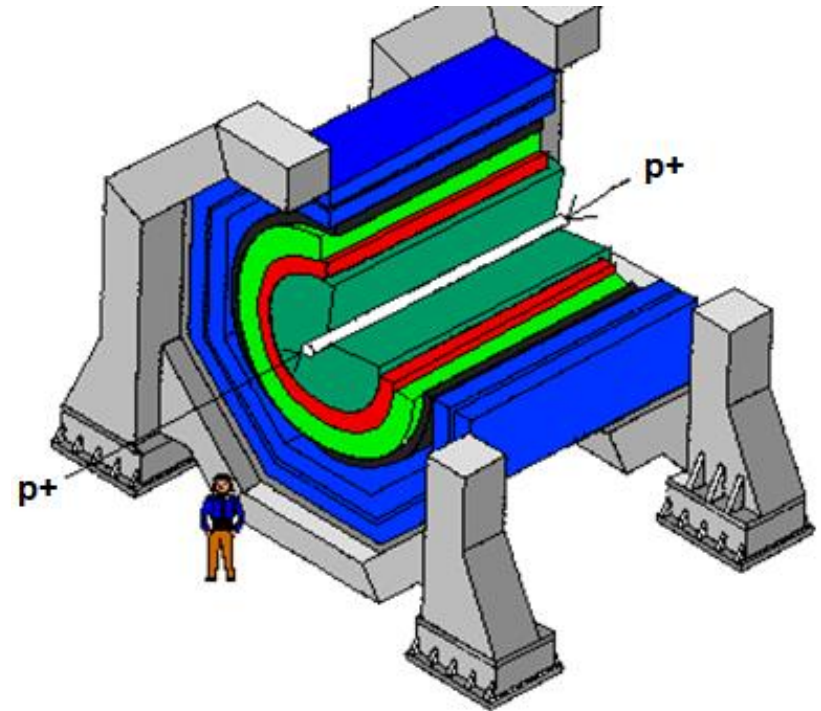
Tracking

Electromagnetic calorimeter

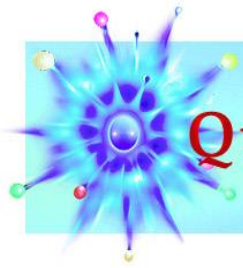
Hadronic calorimeter

Magnet*

Muon chamber



* *Location of magnet depends on specific detector design.*

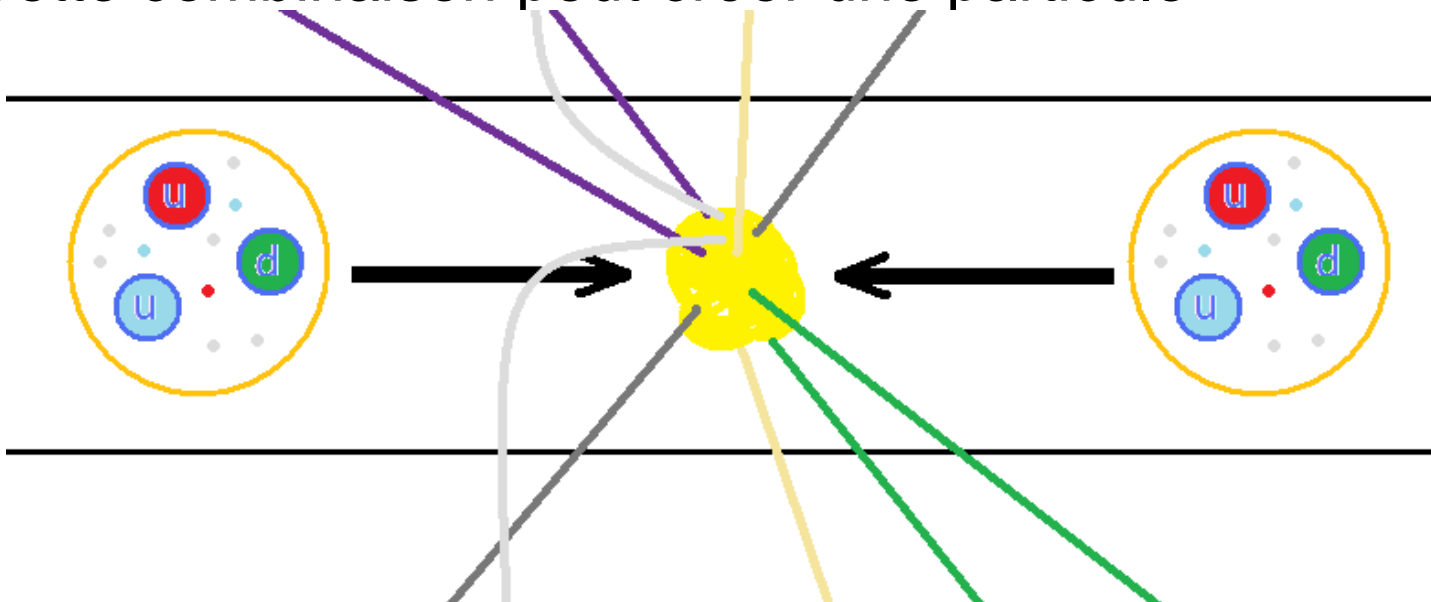


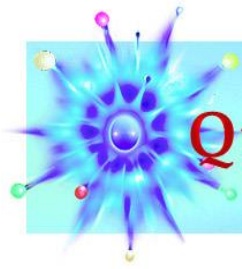
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Interactions Protoniques

Si chaque faisceau a une énergie de 4 TeV...

- L'énergie totale de collision est de $2 \times 4 \text{ TeV} = 8 \text{ TeV}$.
- Mais chaque particule dans le proton partage seulement une partie
- Cette combinaison peut créer une particule



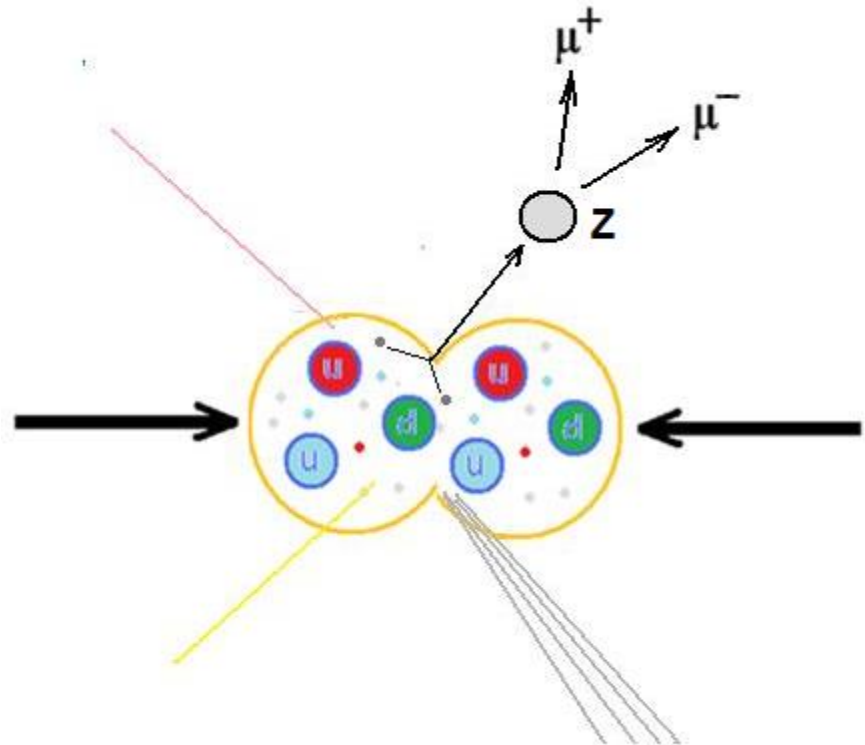


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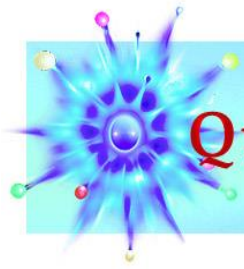
Particle Decays

Nous recherchons le boson Z, une particule sans charge qui se désintègre en deux muons.*

Quelle est la charge électrique du Z ?



**The Z has other decays . . . but these are not what we are looking for.*

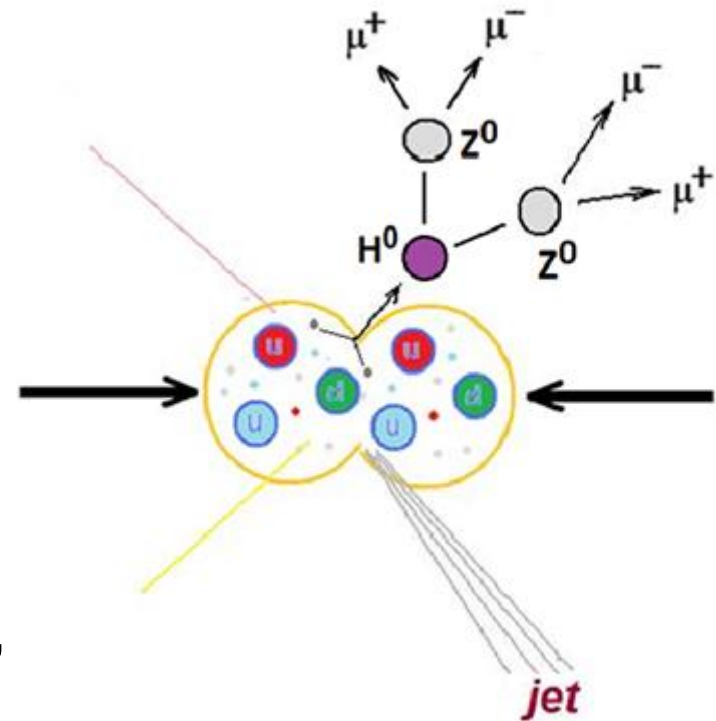


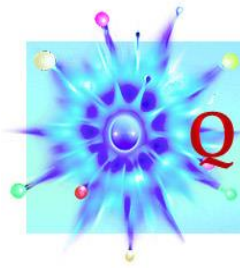
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Particle Decays

The Higgs boson was discovered by CMS and ATLAS and announced on July 4, 2012.

This long-sought particle is part of the “Higgs mechanism” that accounts for other particle having mass.





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Helping Develop America's Technological Workforce

HYPATIA Event Display

Hybrid pupils' analysis tool for interactions in ATLAS - version 6.0 - Invariant Mass Window

File View Histograms Preferences Help

File Name	ETMis [GeV]	Track	P [GeV]	+/-	Pt [GeV]	ϕ	η	M(Zij) [GeV]	M(4l) [GeV]	e/ μ
00036_JiveXML_166964_987982.xml	19.626	Tracks 3	112.6	+	49.4	1.441	-1.464	95.325		μ
		Tracks 69	96.8	-	45.9	-1.720	-1.378			μ

Canvas Window - File: 00036_JiveXML_166964_987982.xml Run: 166964 Event: ...

ATLAS 2010-10-18 04:39:34 CEST run:166964 ev:987982 HYPATIA

HYPATIA - Track Momenta Window

File Previous Event Next Event Insert Electron Insert Muon Delete Track Reset Canvas

ETMis: 20.808 GeV ϕ : -2.415 rad Collection: MET RefFinal

C:\installers\HYPATIA\groupAI\00036_JiveXML_166964_987982.xml

Reconstructed Tracks

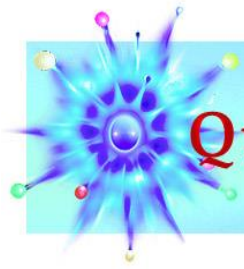
Track	+/-	P [GeV]	Pt [GeV]	ϕ	θ
Tracks 3	+	112.57	49.42	1.441	2.687
Tracks 69	-	96.83	45.88	-1.720	2.648
Tracks 127	-	37.93	30.81	1.803	0.948
Tracks 128	+	25.73	12.70	0.303	2.625
Tracks 134	+	121.30	89.22	-0.597	2.315
Tracks 136	-	34.18	8.63	-3.123	0.255
Tracks 154	+	14.19	8.35	-2.346	2.513
Tracks 176	-	13.53	12.74	0.259	1.915

HYPATIA - Control Window

Parameter Control Interaction and Window Control Output Display

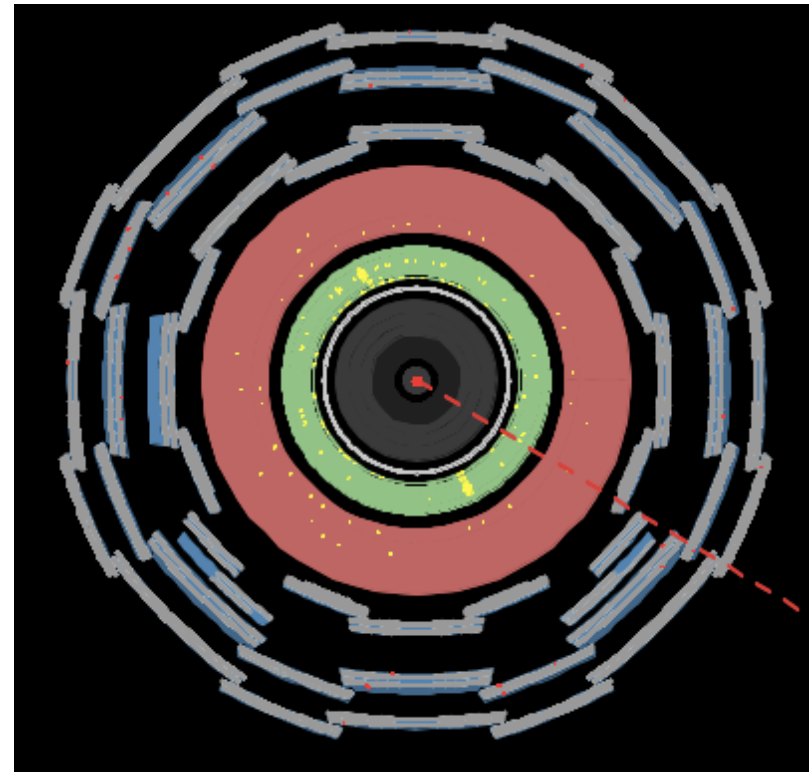
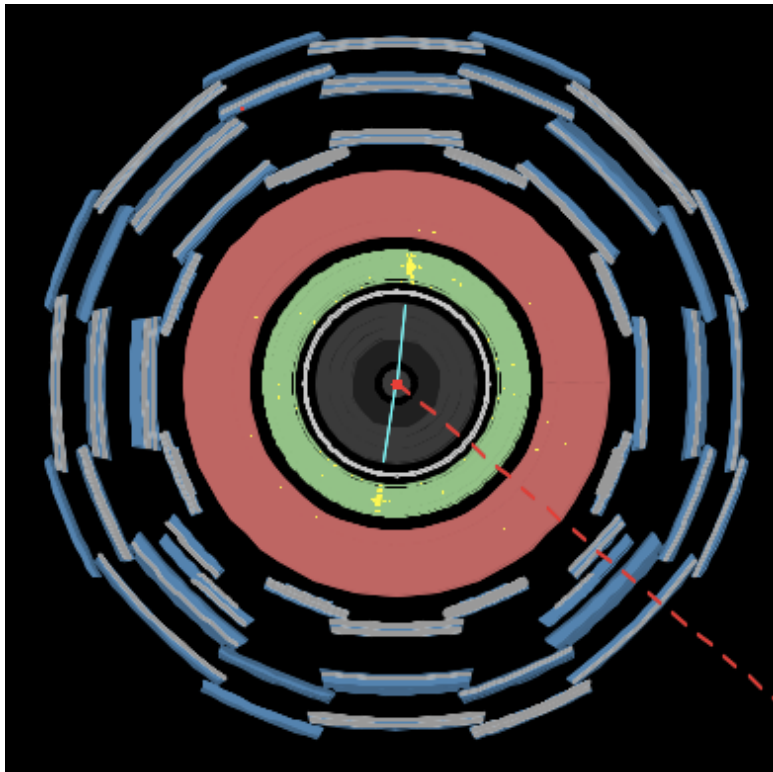
Projection Data Cuts InDet Calo MuonDet Objects Geometry

InDet	Name	Value
Calo	<input checked="" type="checkbox"/> Pt	> 5.0 GeV
MuonDet	<input type="checkbox"/> d0	< 2.5 mm
Objects	<input type="checkbox"/> z0	< 20.0 cm
ATLAS	<input type="checkbox"/> d0 Loose	< 2.0 cm
	<input type="checkbox"/> z0-zvtx	< 2.5 mm

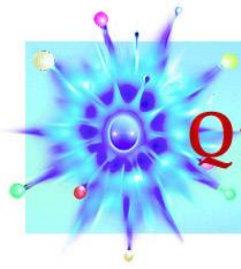


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HYPATIA Event Display

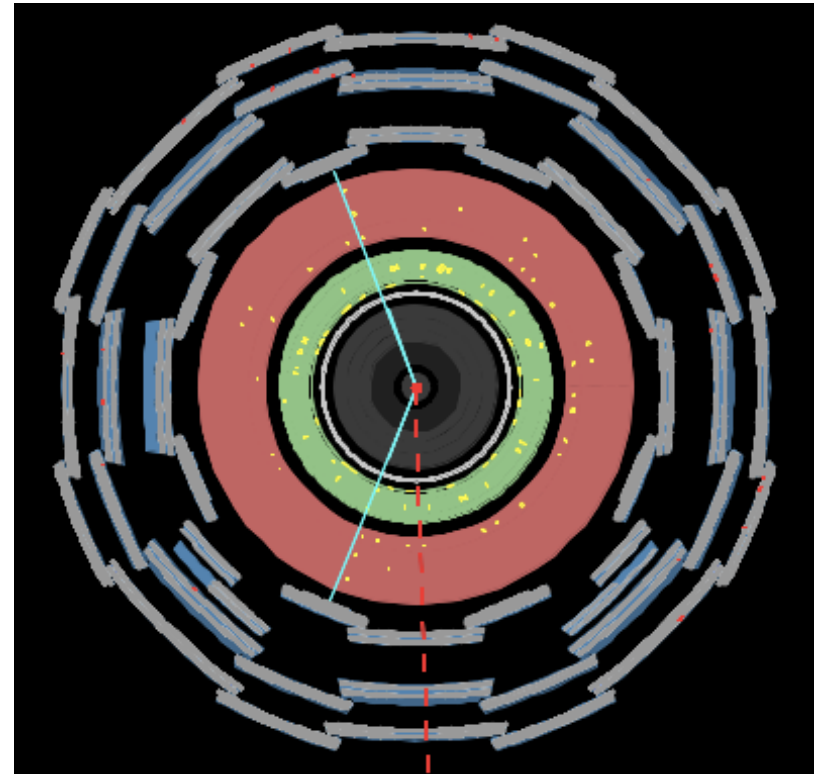
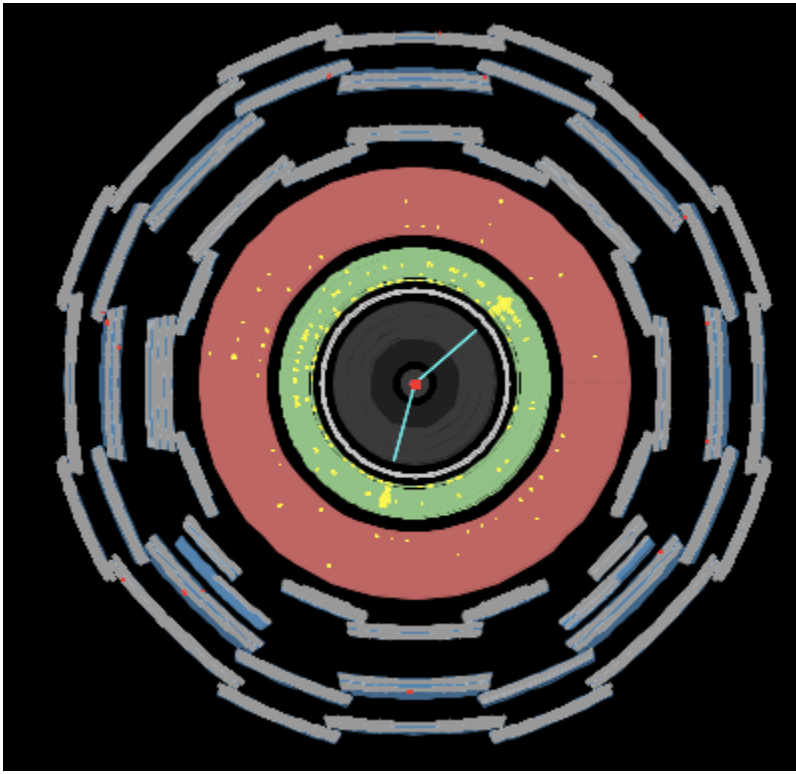


How are these events similar? Different? Why?

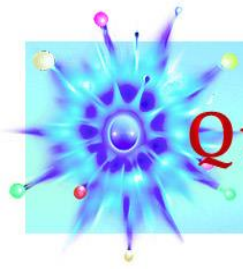


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HYPATIA Event Display

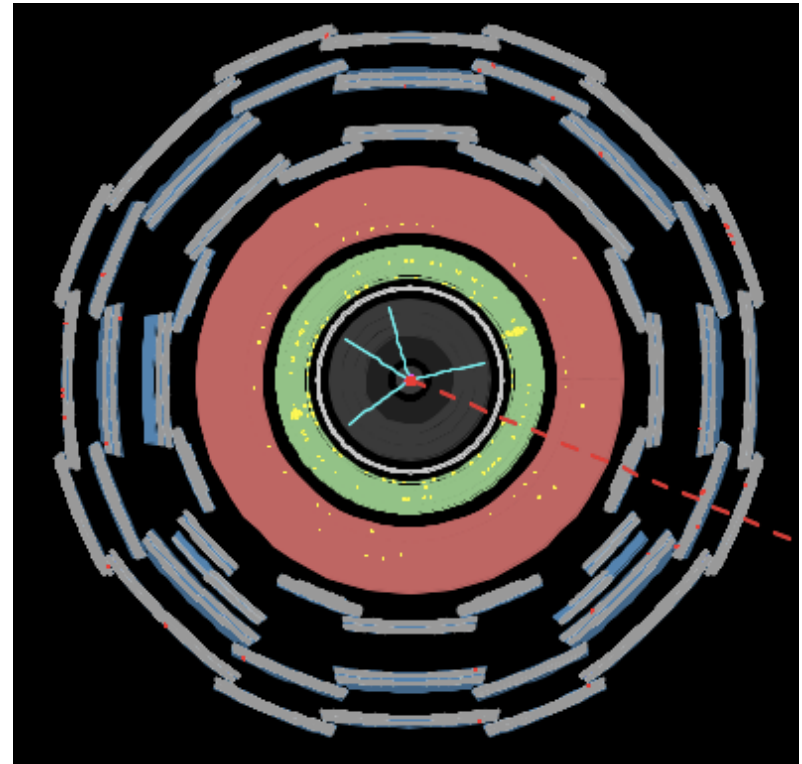
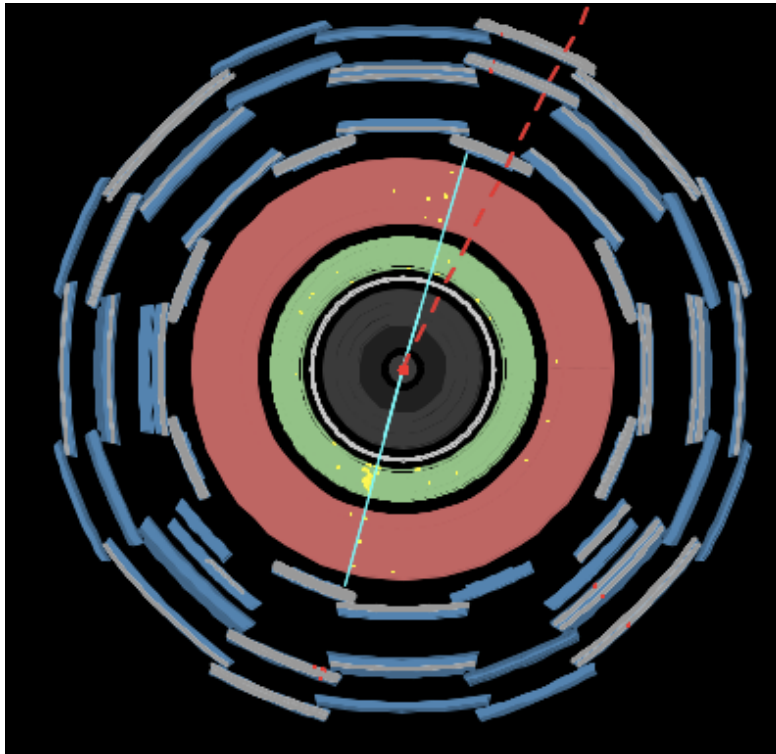


How are these events similar? Different? Why?



QuarkNet

HYPATIA Event Display



How are these events similar? Different? Why?