LA SCOPERTA DEL BOSONE DI HIGGS

Giovanni Organtini
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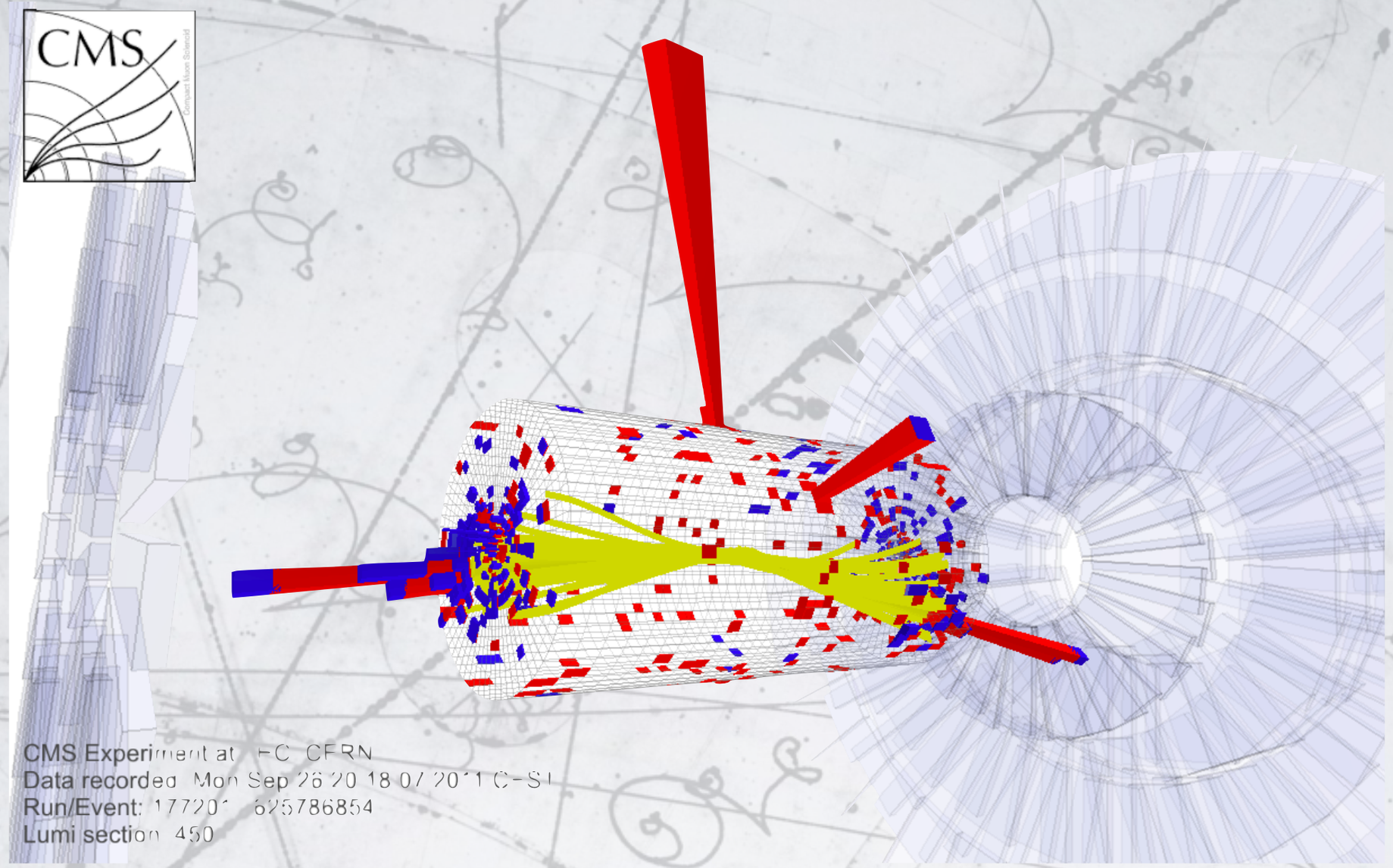

COS'È UN BOSONE DI HIGGS?

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- ▸ François Englert
- ▸ Peter Higgs

All Nobel Prizes in Physics
All Nobel Prizes in 2013

The Nobel Prize in Physics 2013
François Englert, Peter Higgs

The Nobel Prize in Physics 2013

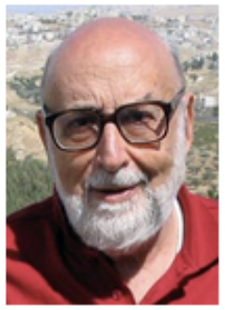

Photo: Pnicolet via Wikimedia Commons
François Englert

Photo: G-M Greuel via Wikimedia Commons
Peter W. Higgs

The Nobel Prize in Physics 2013 was awarded jointly to François Englert and Peter W. Higgs *"for the theoretical discovery of a mechanism that contributes to our understanding of the origin of mass of subatomic particles, and which recently was confirmed through the discovery of the predicted fundamental particle, by the ATLAS and CMS experiments at CERN's Large Hadron Collider"*

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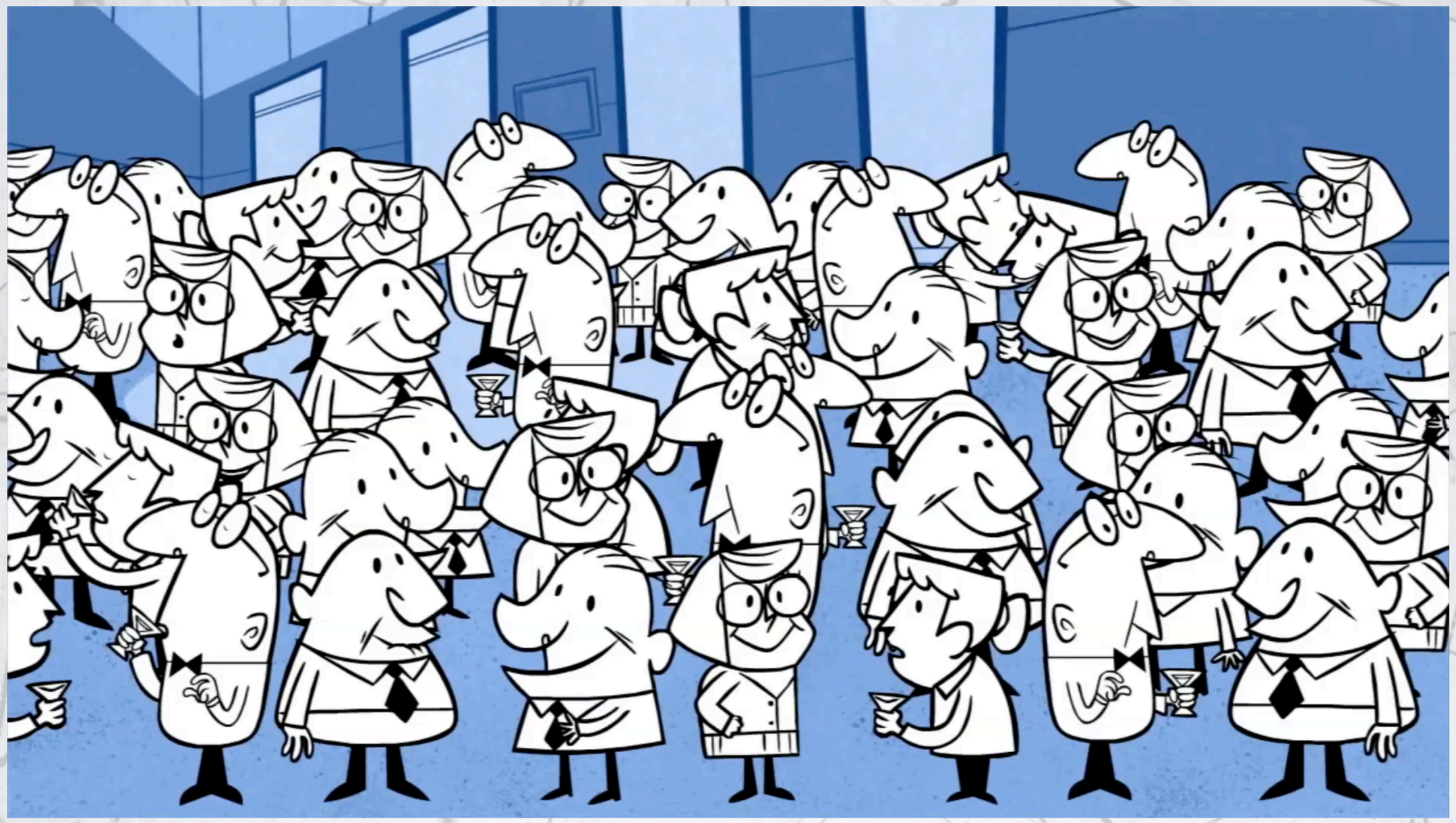
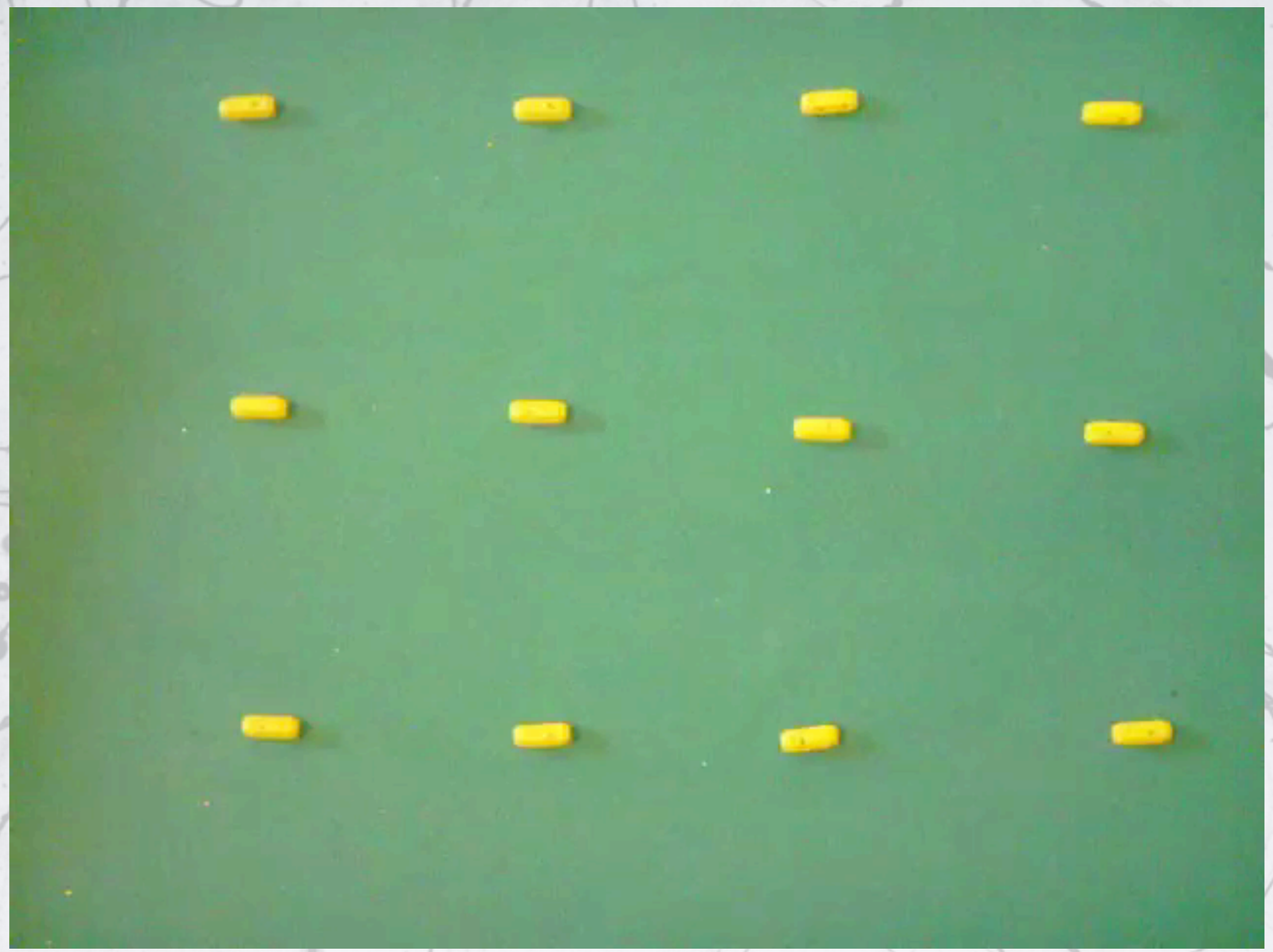
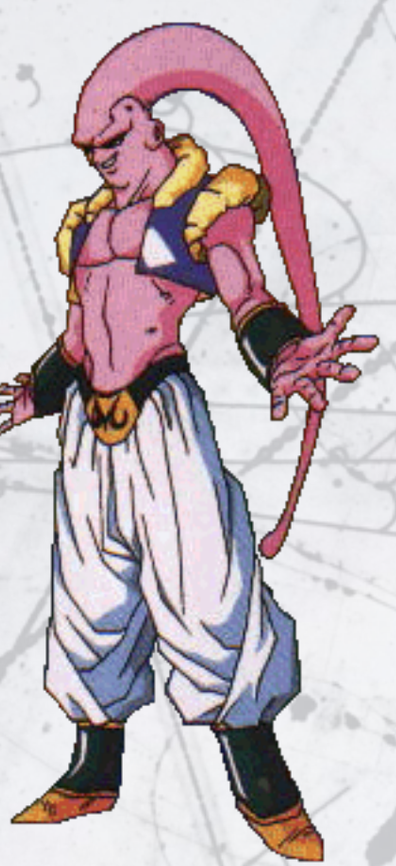
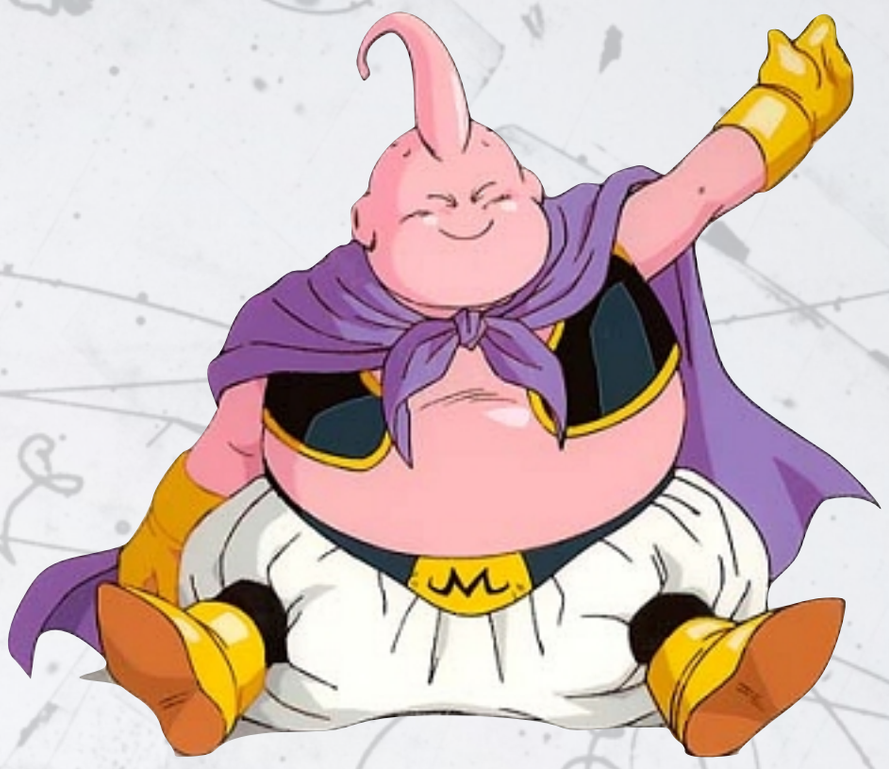


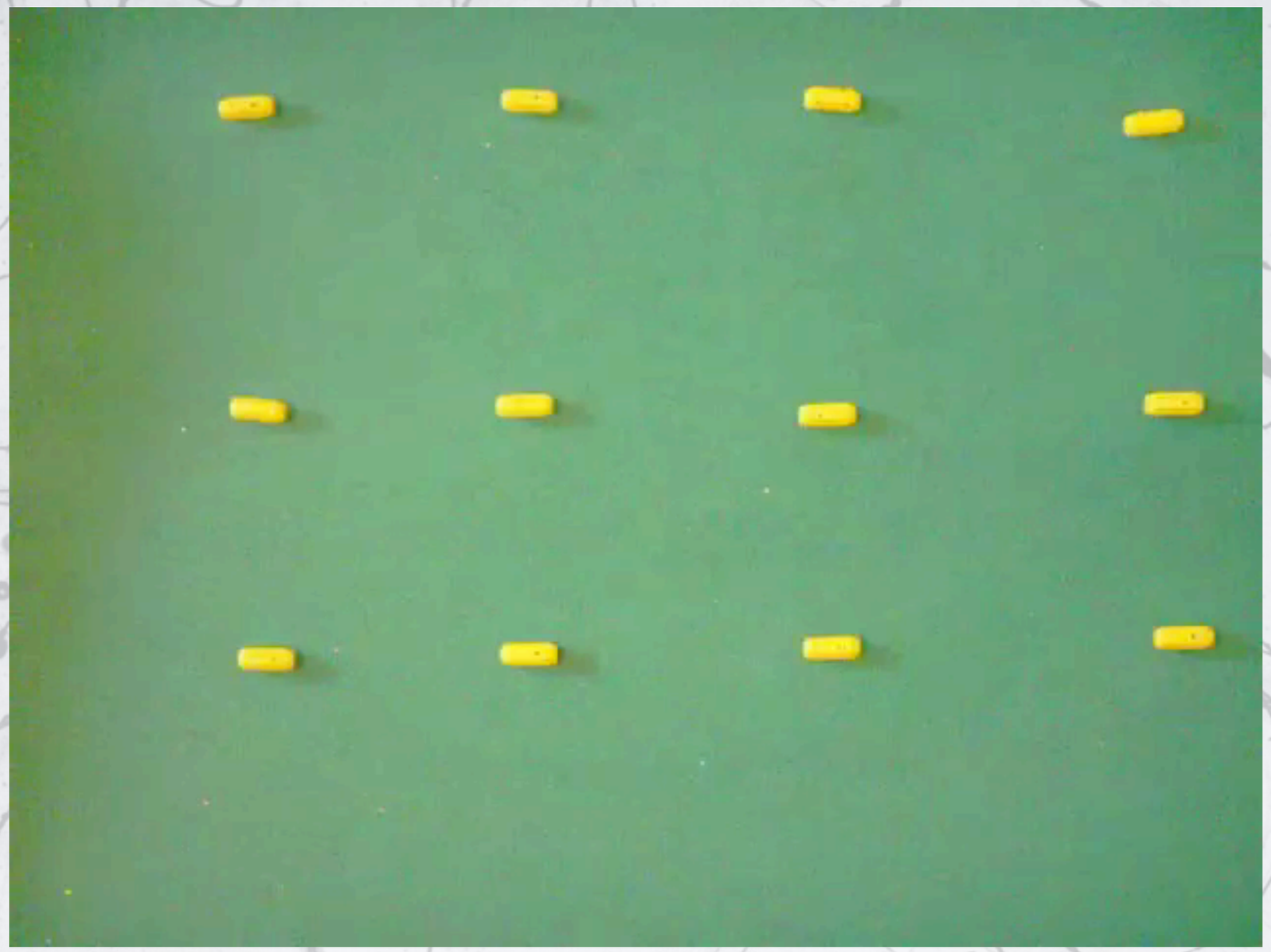


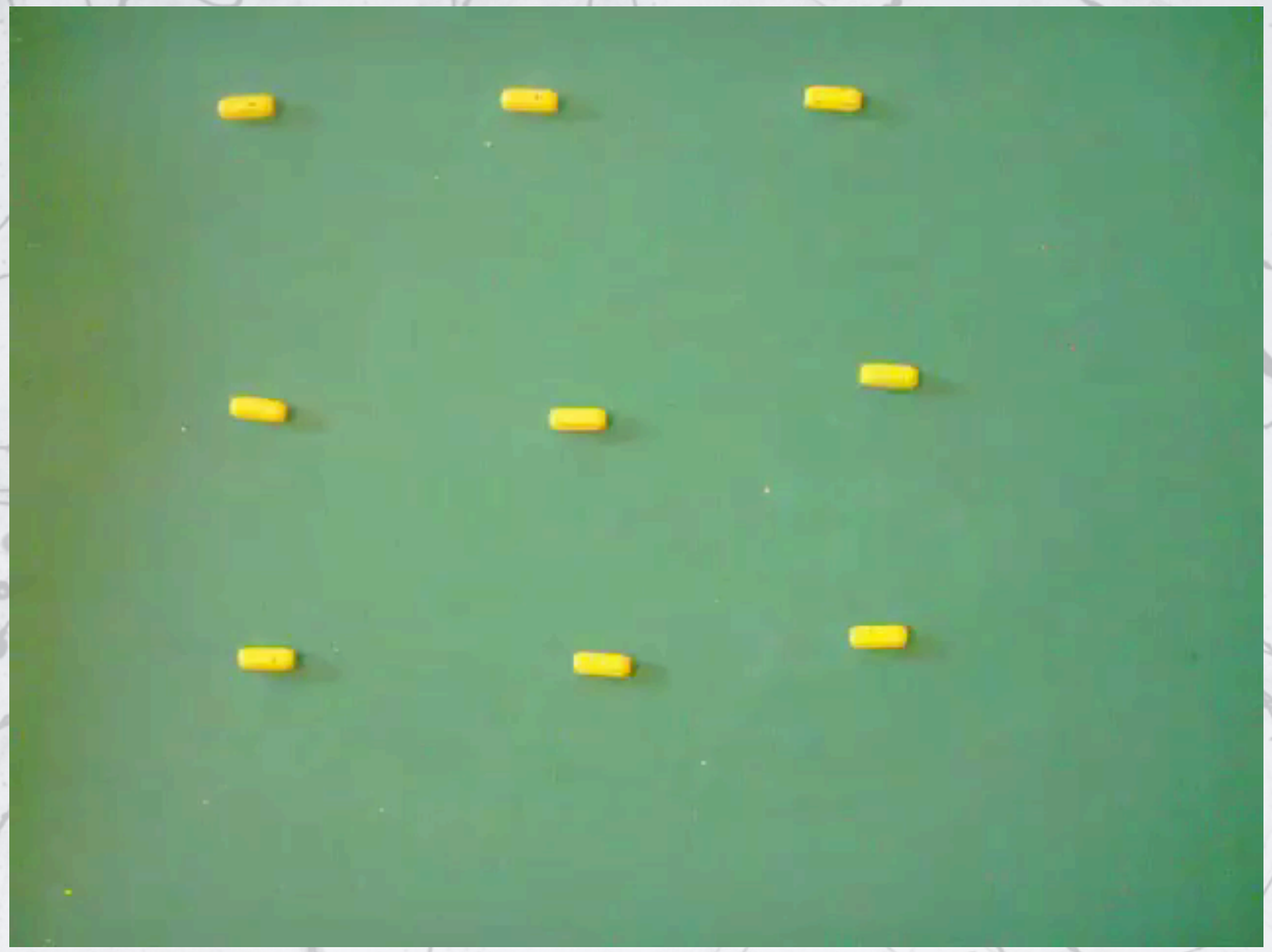


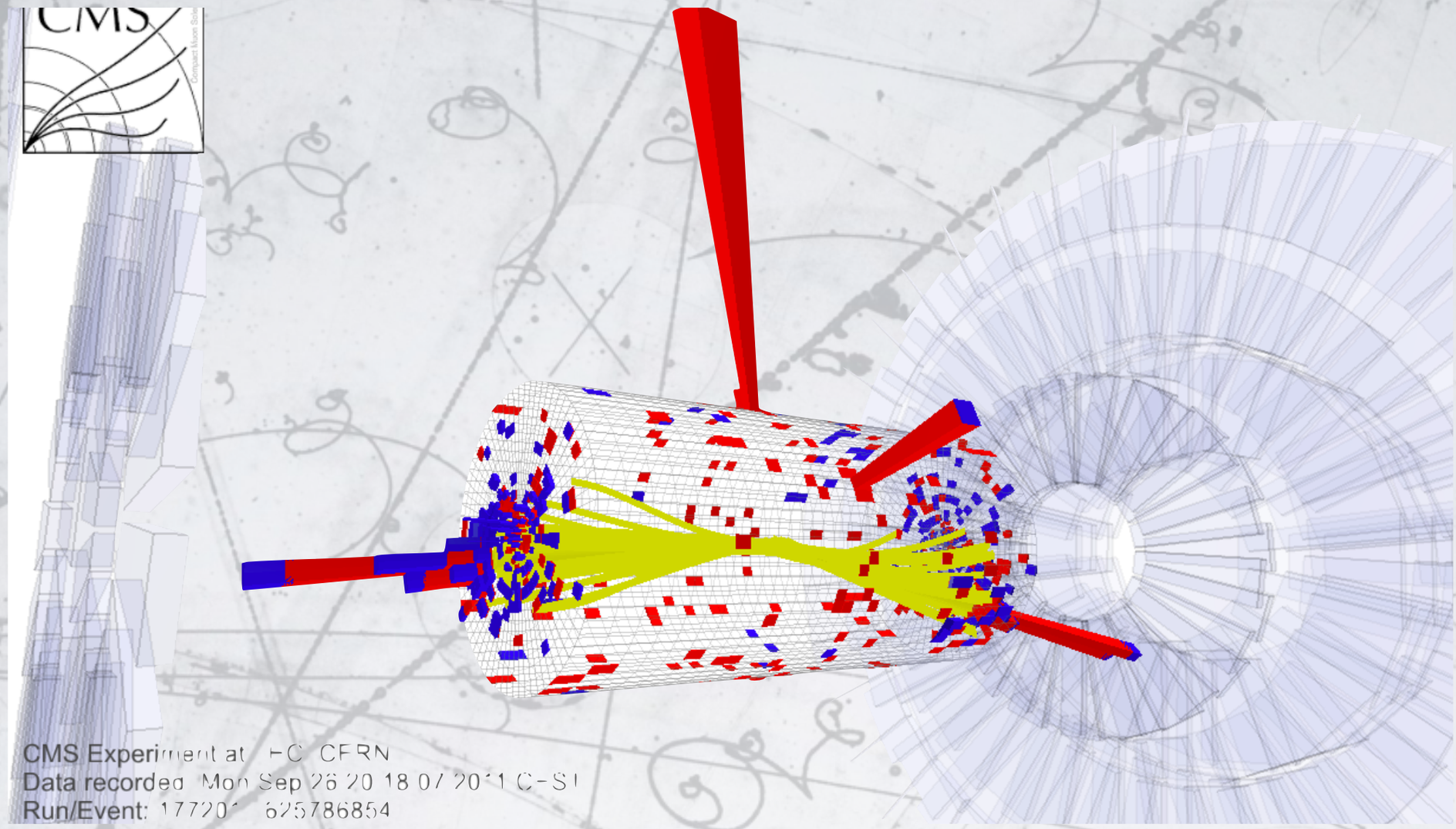
elettrone



muone

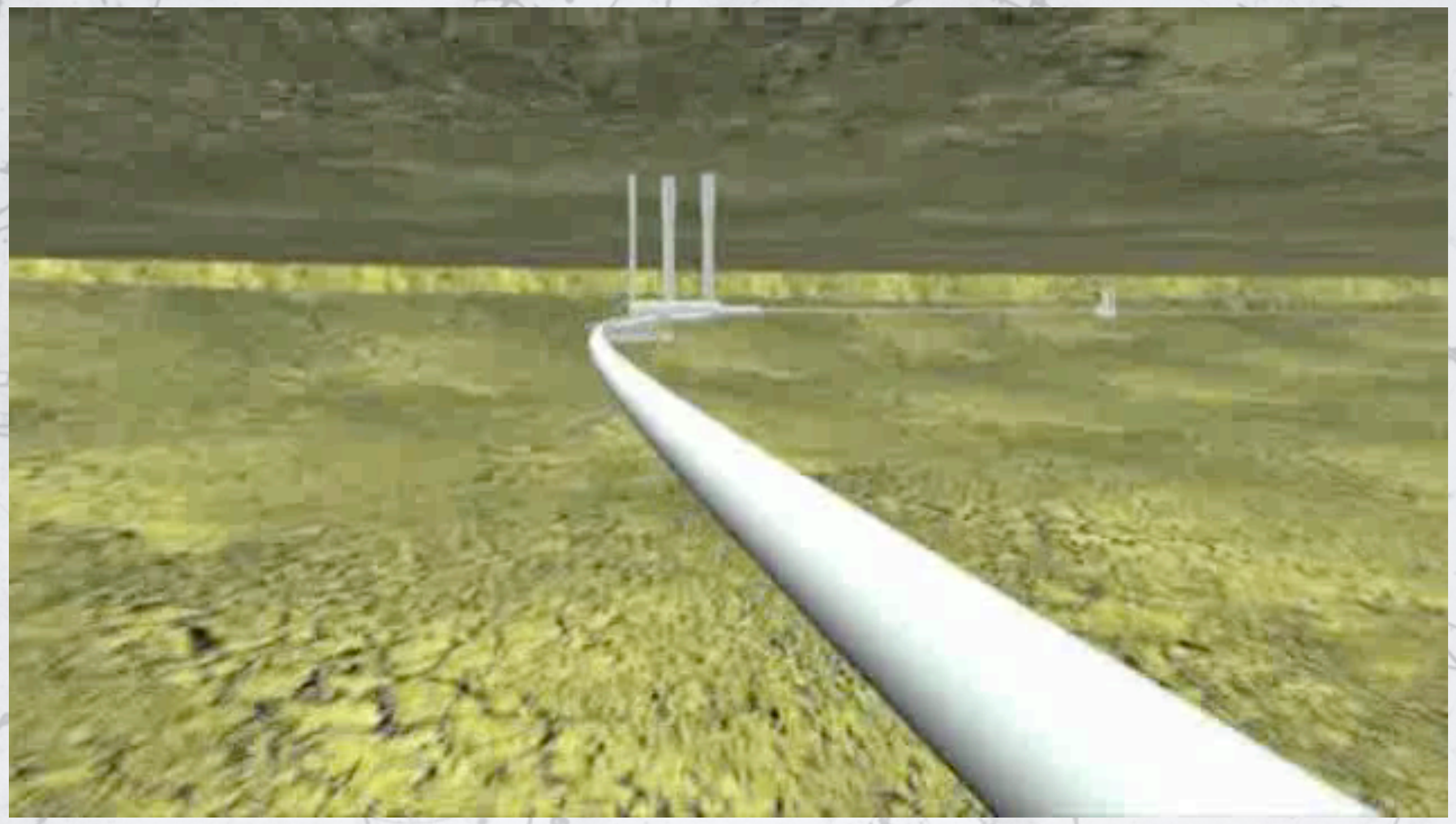


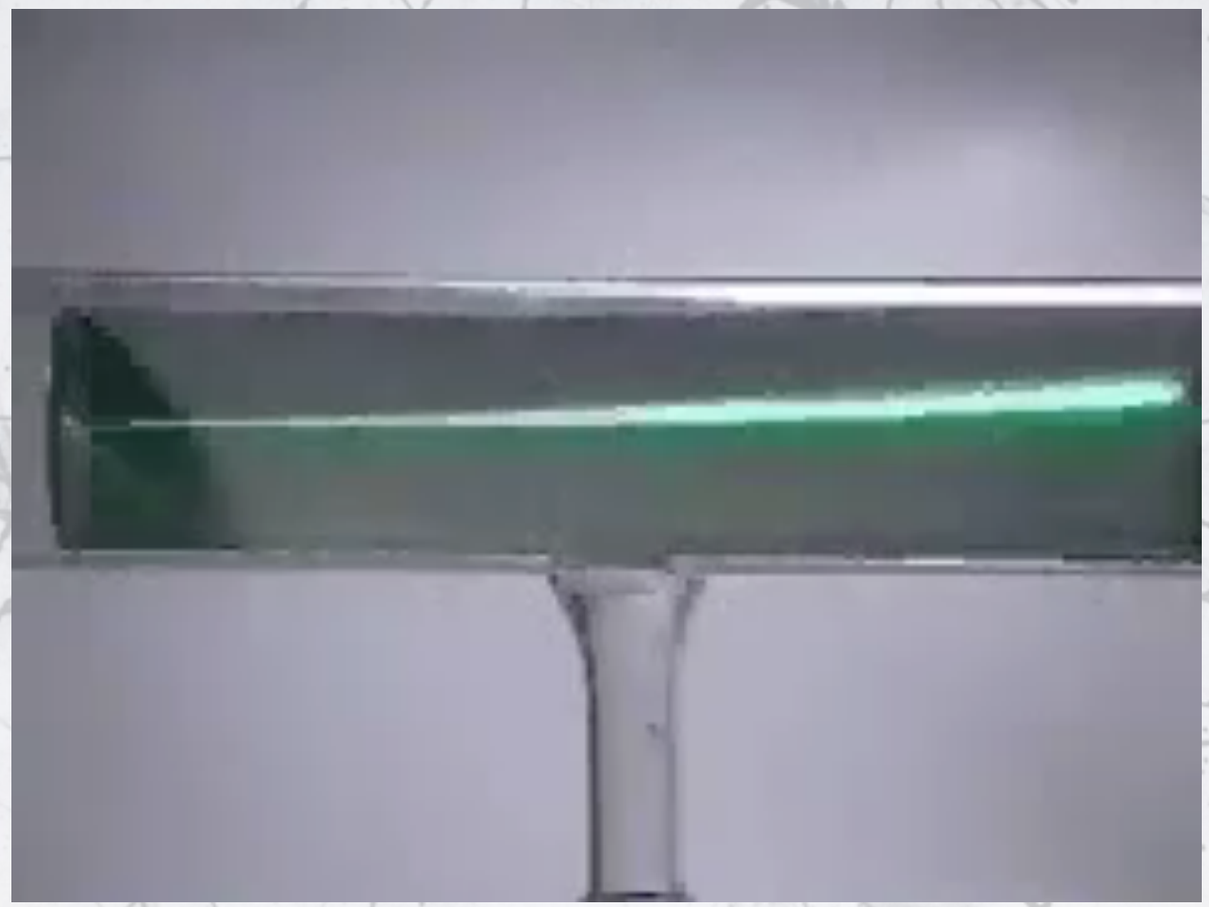




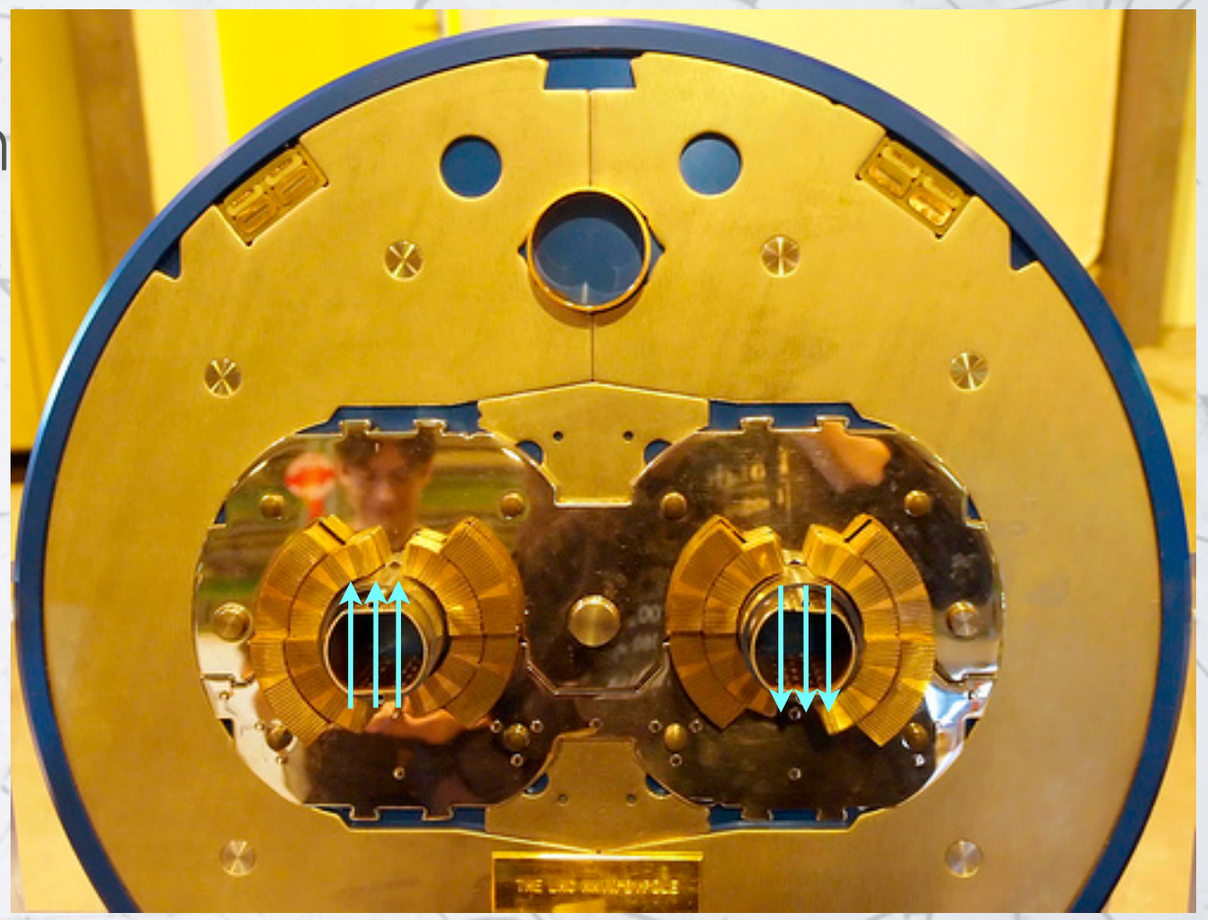
COME SI PRODUCE UN BOSONE DI HIGGS?

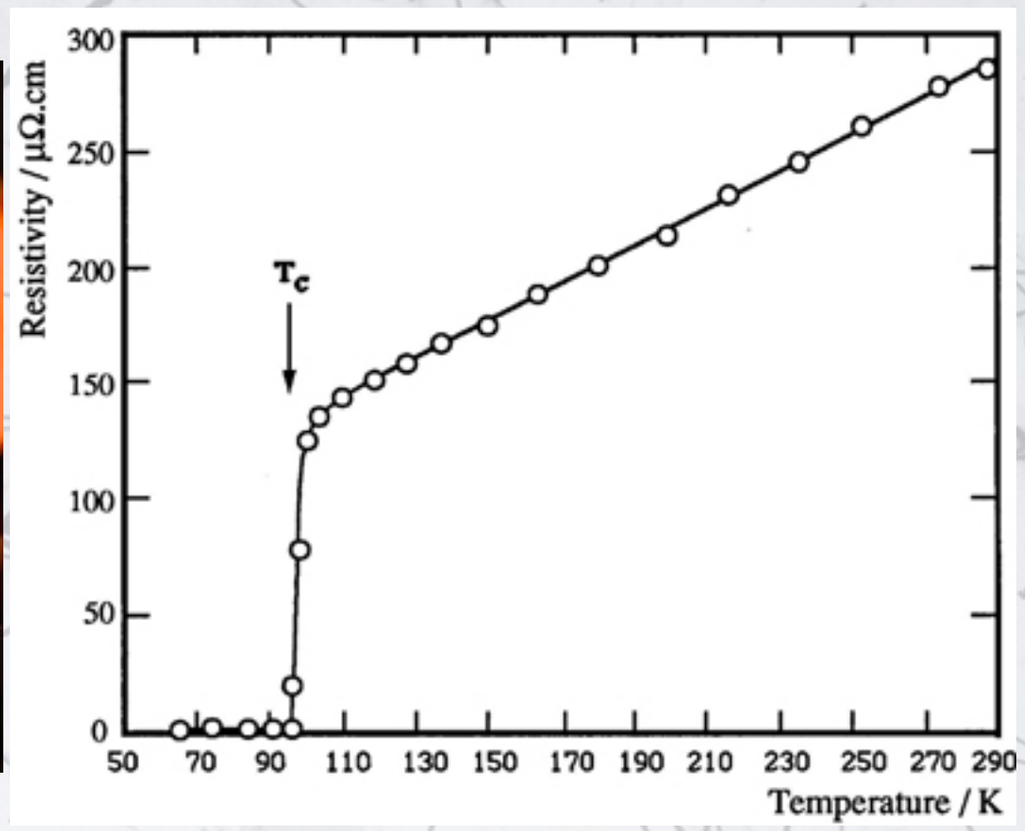
$E=mc^2$



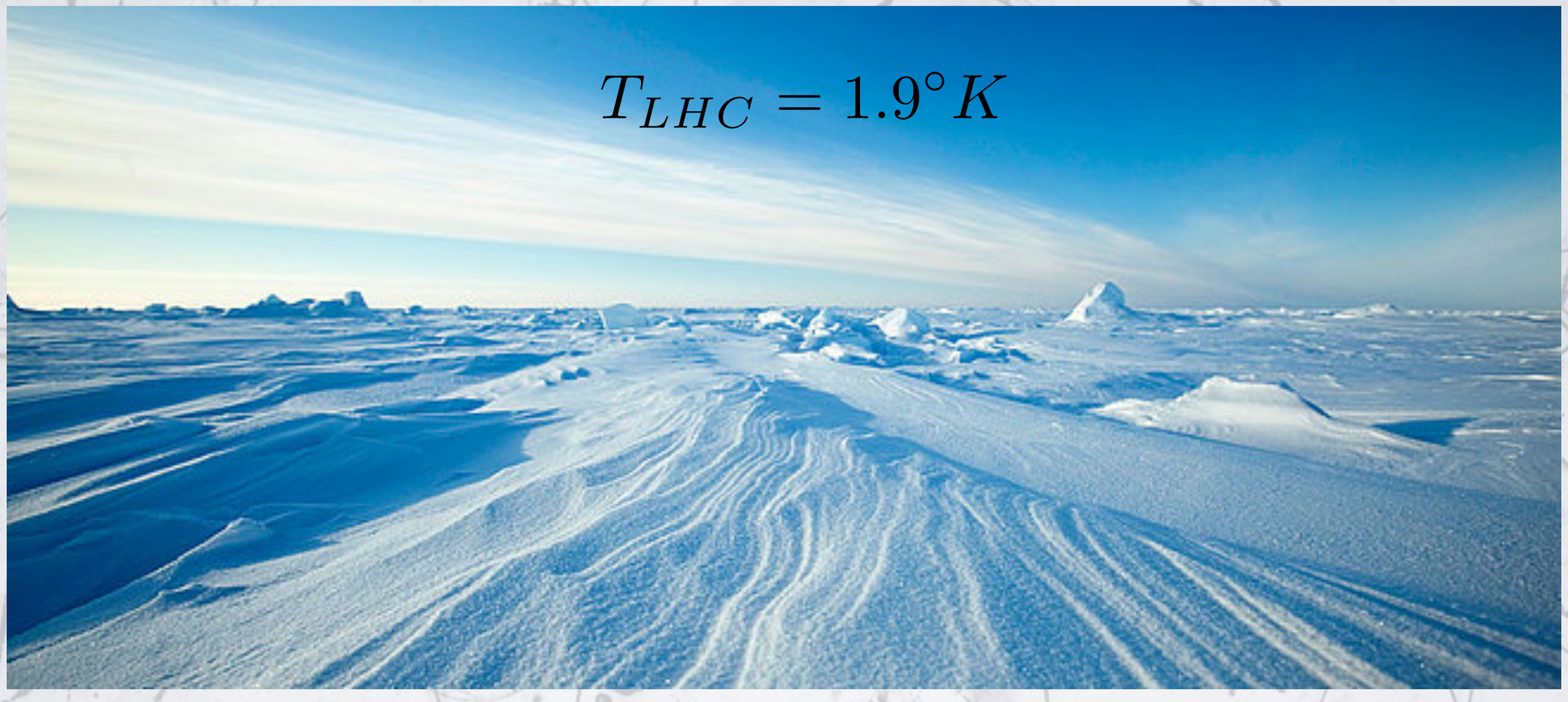


- 1232 dipoli magnetici
  - B = 8.33 T (100.000 volte più intenso di quello terrestre)
  - I = 12000 A (utenze domestiche: ~13 A)
  - lunghezza del dipolo:14.3 m
  - 1 miliardo di km di cavo

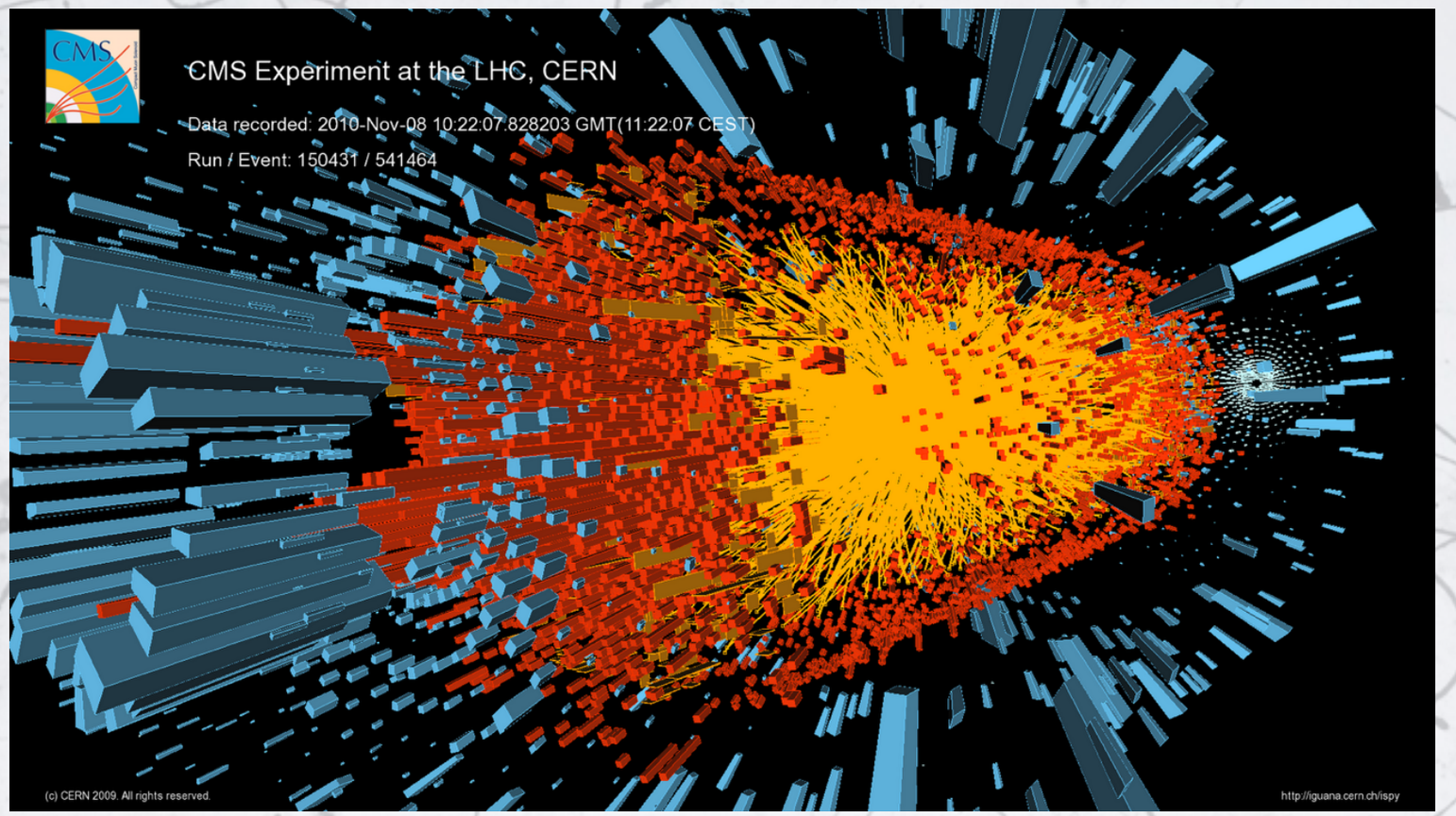



Resistivity / μΩ.cm
300
250
200
150
100
50
0
T_c
50
70
90
110
130
150
170
190
210
230
250
270
290
Temperature / K

$$T_{LHC} = 1.9^{\circ} K$$



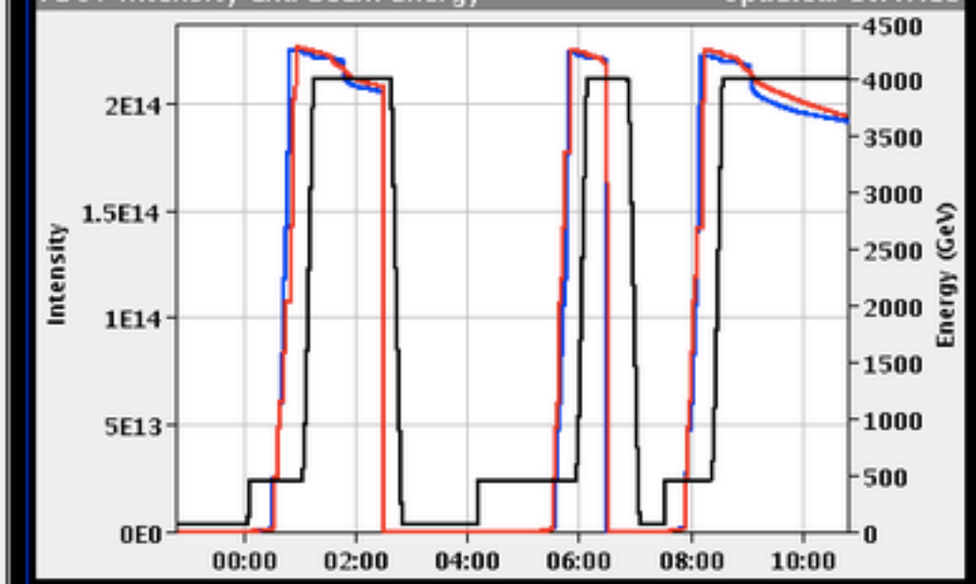
$T_{Coll} > 100000\ T_{Sun}$

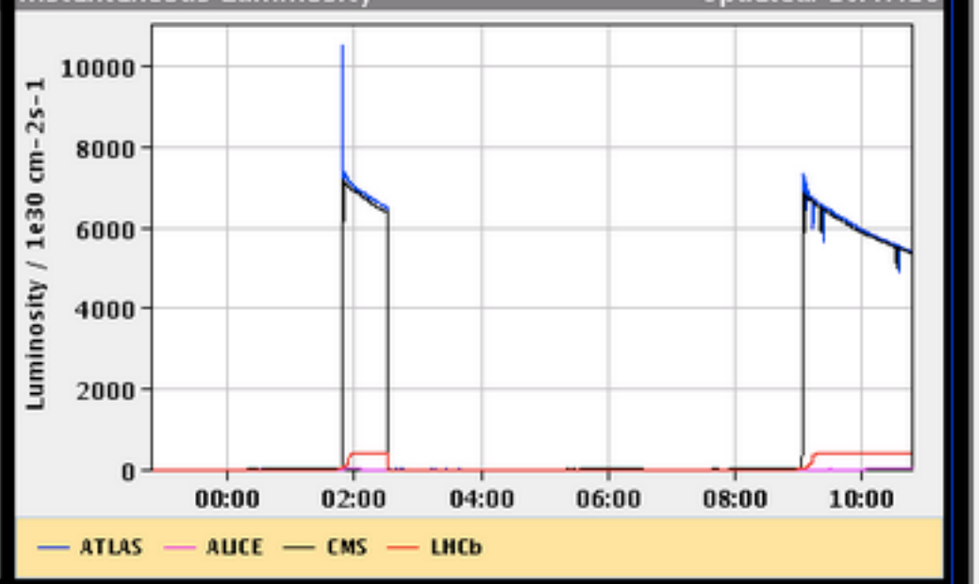


LHC Page1 | Fill: 3005 | E: 4000 GeV | t(SB): 01:42:50 | 26-08-12 10:47:18

PROTON PHYSICS: STABLE BEAMS

Energy:	4000 GeV	I(B1):	1.95e+14	I(B2):	1.96e+14



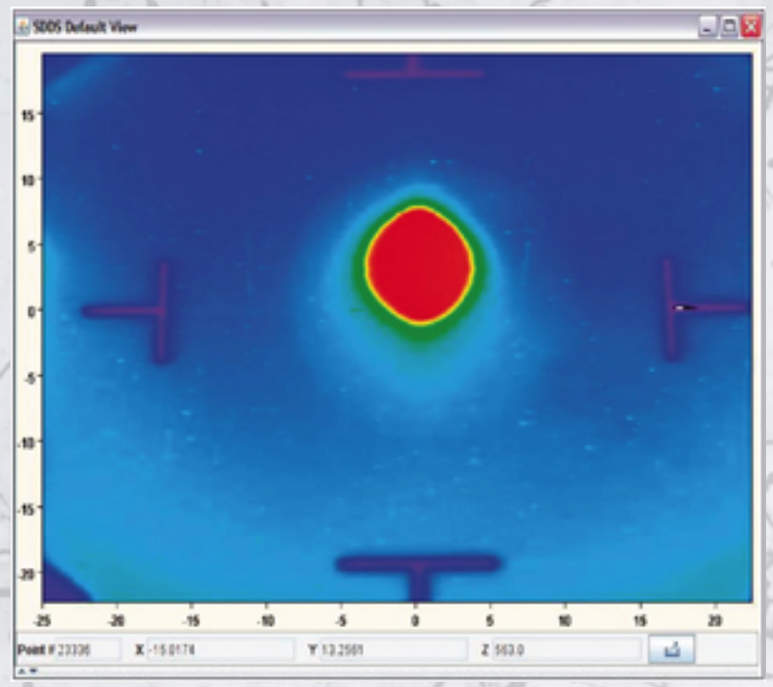


Comments 26-08-2012 07:39:54 :

Filling for physics

BIS status and SMP flags	B1	B2
Link Status of Beam Permits	true	true
Global Beam Permit	true	true
Setup Beam	false	false
Beam Presence	true	true
Moveable Devices Allowed In	true	true
Stable Beams	true	true

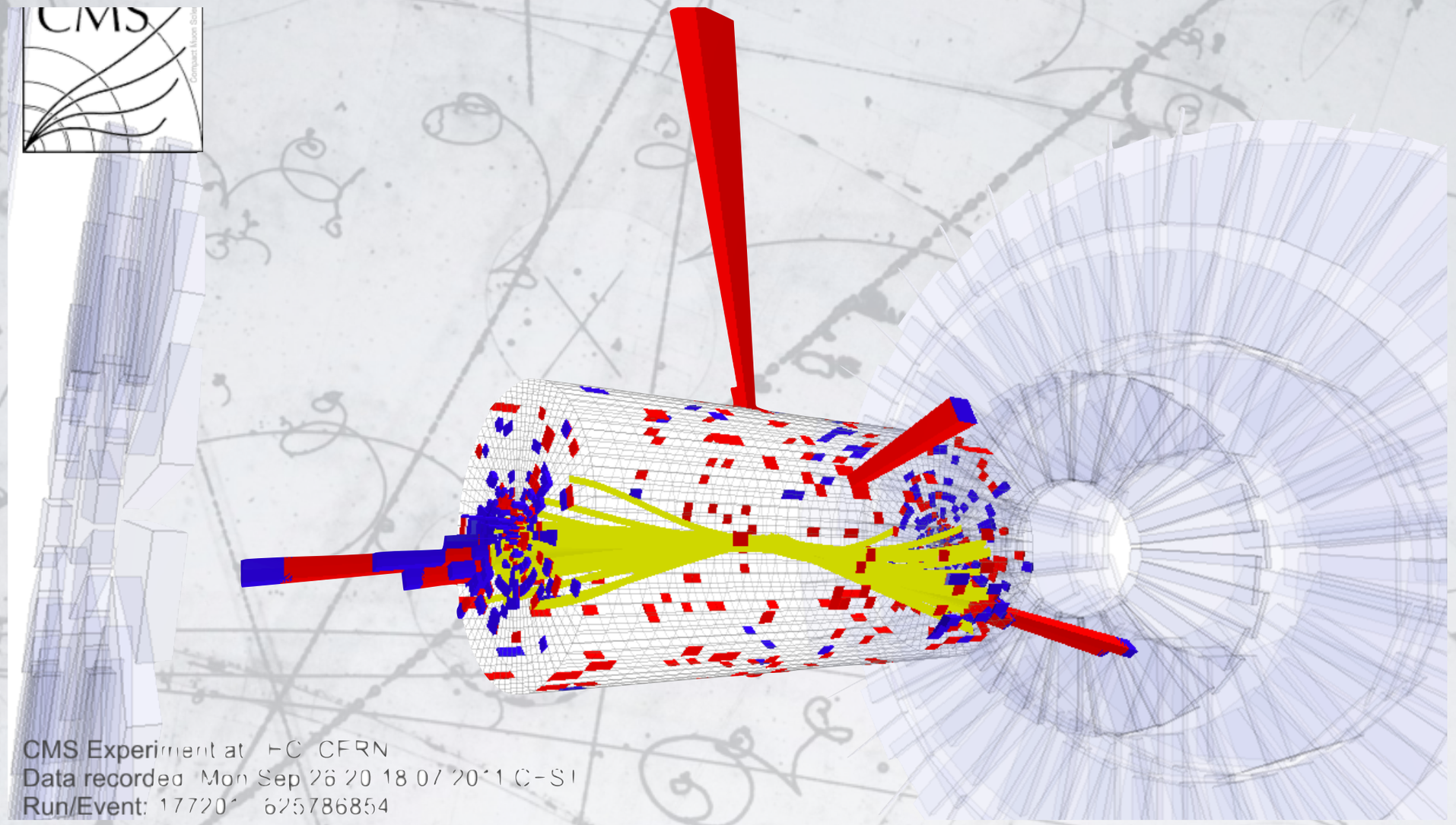
AFS: 50ns_1374_1368_0_1262_144bpi12inj | PM Status B1: ENABLED | PM Status B2: ENABLED



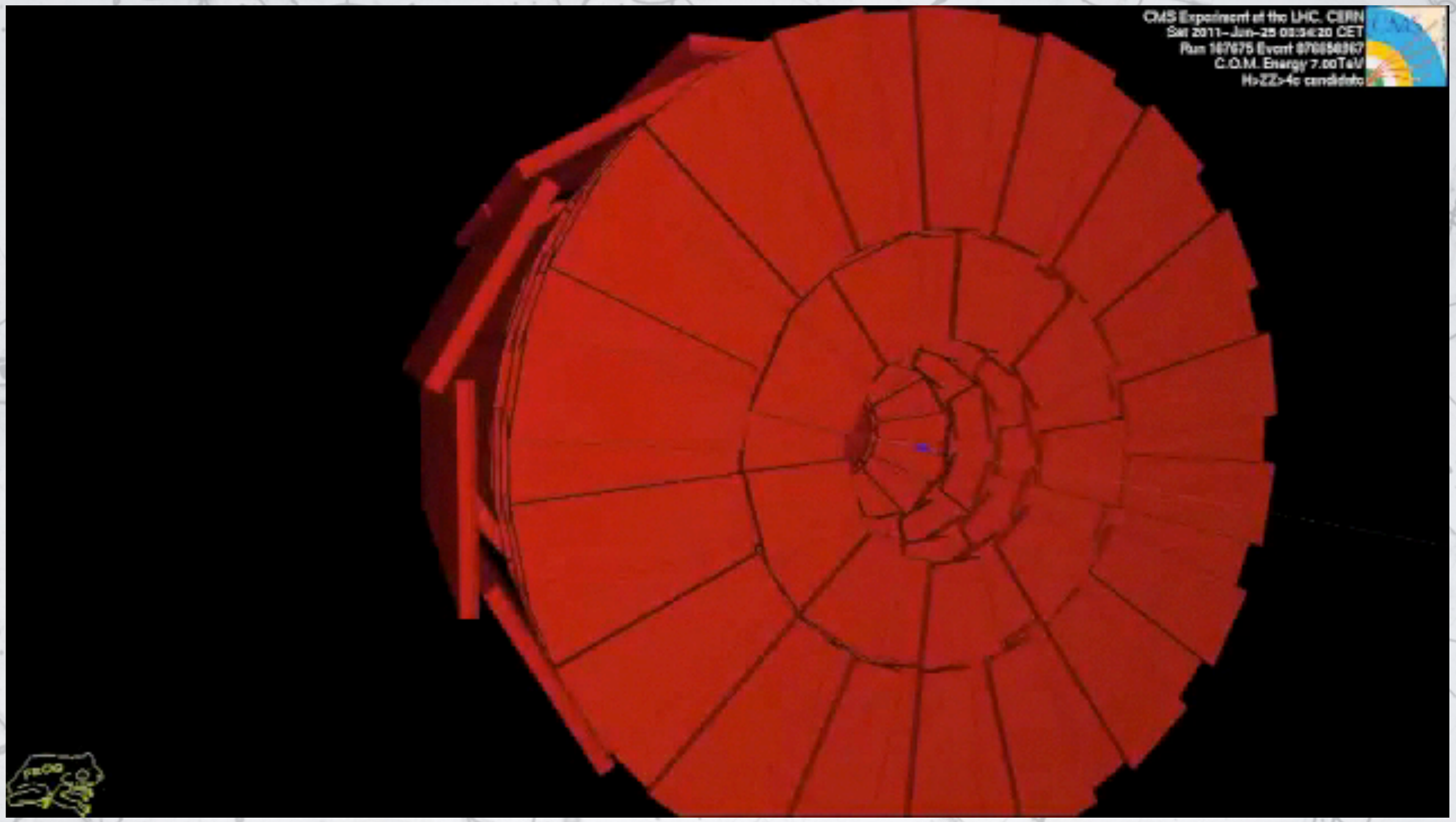
E_{LHC}=360 MJ

E_{FR}=900 MJ

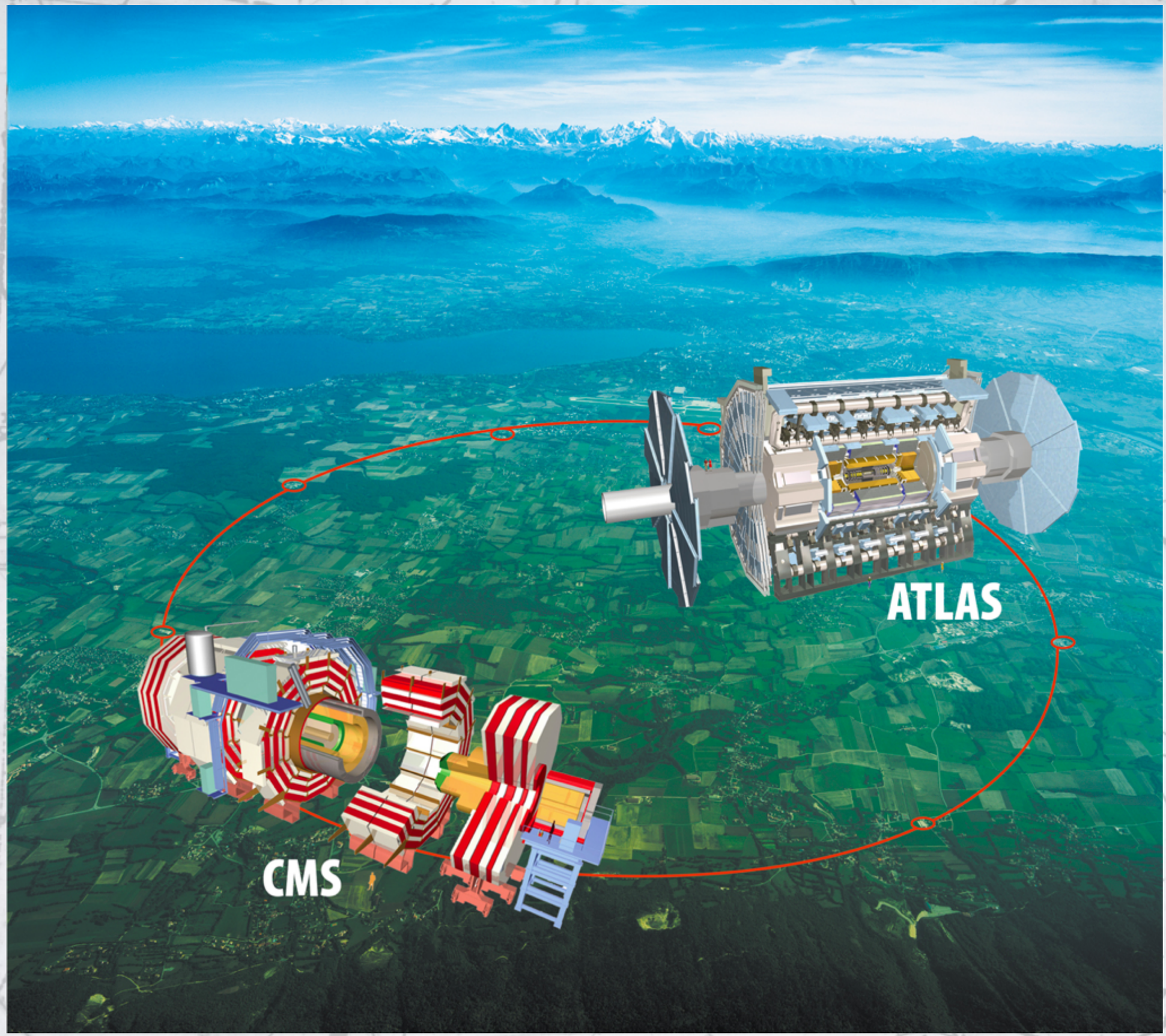
2 motrici + 11 carrozze @ 200 km/h



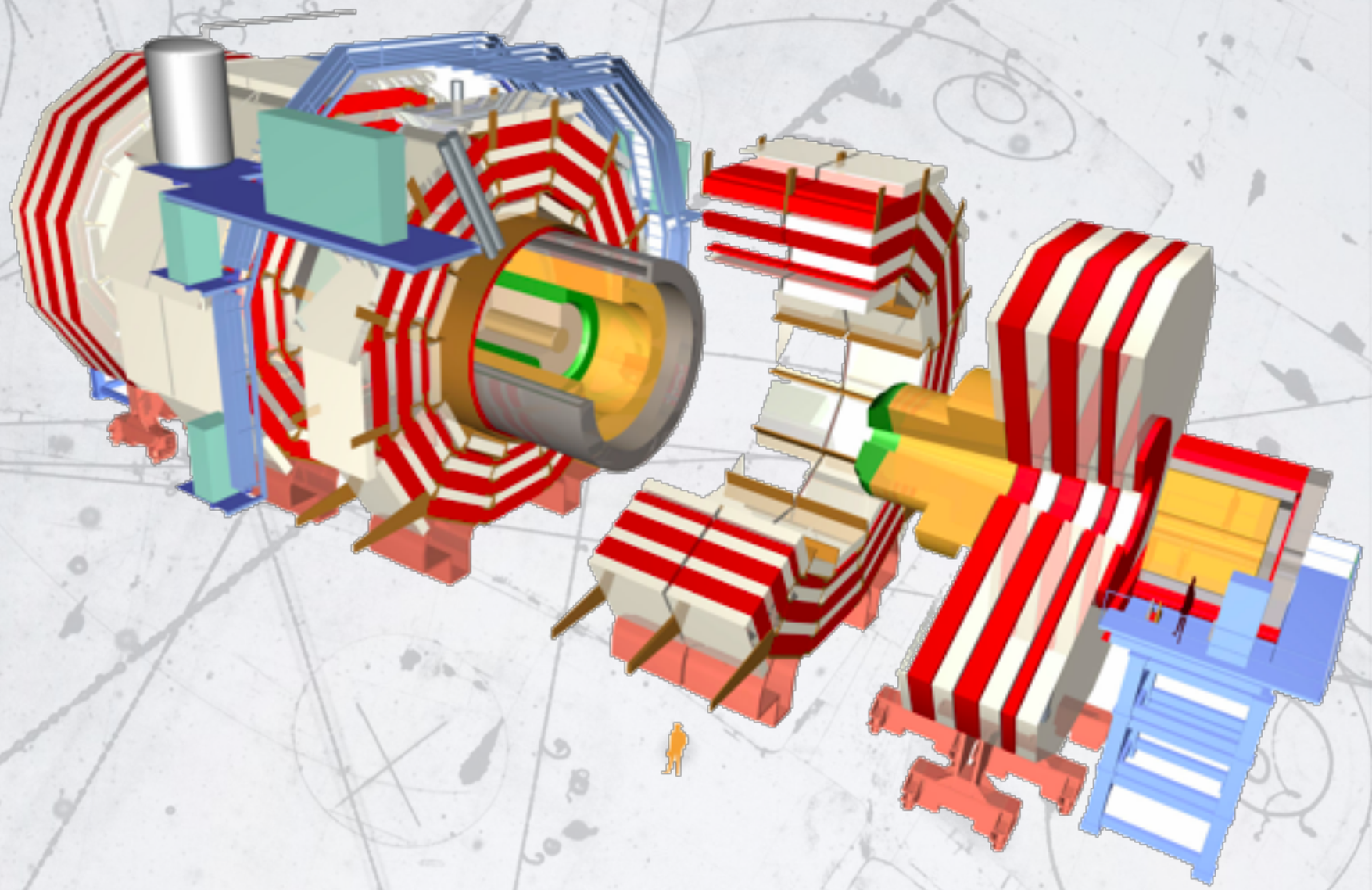
COME SI OSSERVA UN BOSONE DI HIGGS?


CMS Experiment at the LHC, CERN
Sat 2011-Jun-25 03:34:20 CET
Run 167675 Event 870858867
C.O.M. Energy 7.00TeV
H->ZZ->4e candidate

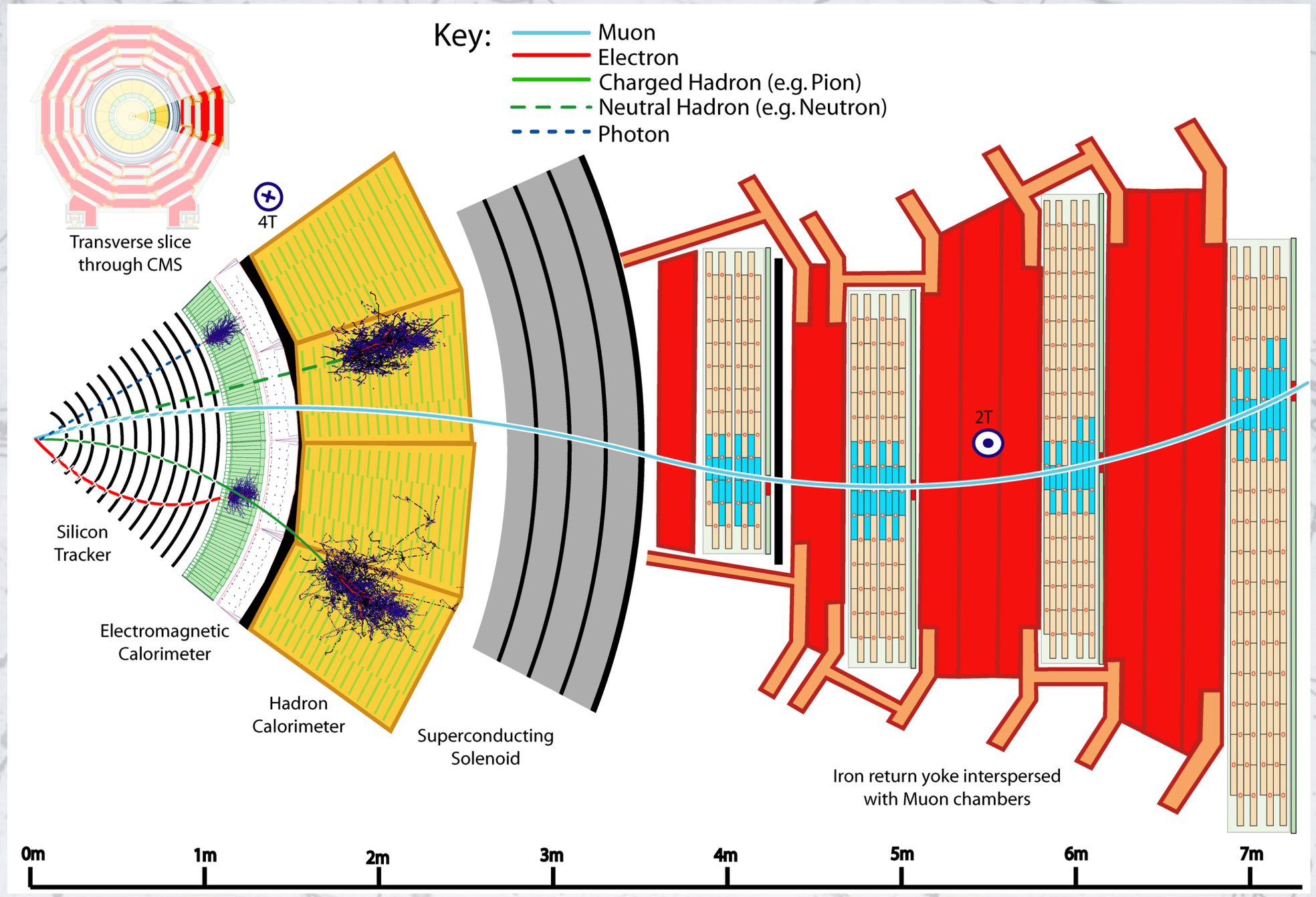
SULLE TRACCE DELLE PARTICELLE


ATLAS
CMS

UN RIVELATORE



UN RIVELATORE DI PARTICELLE



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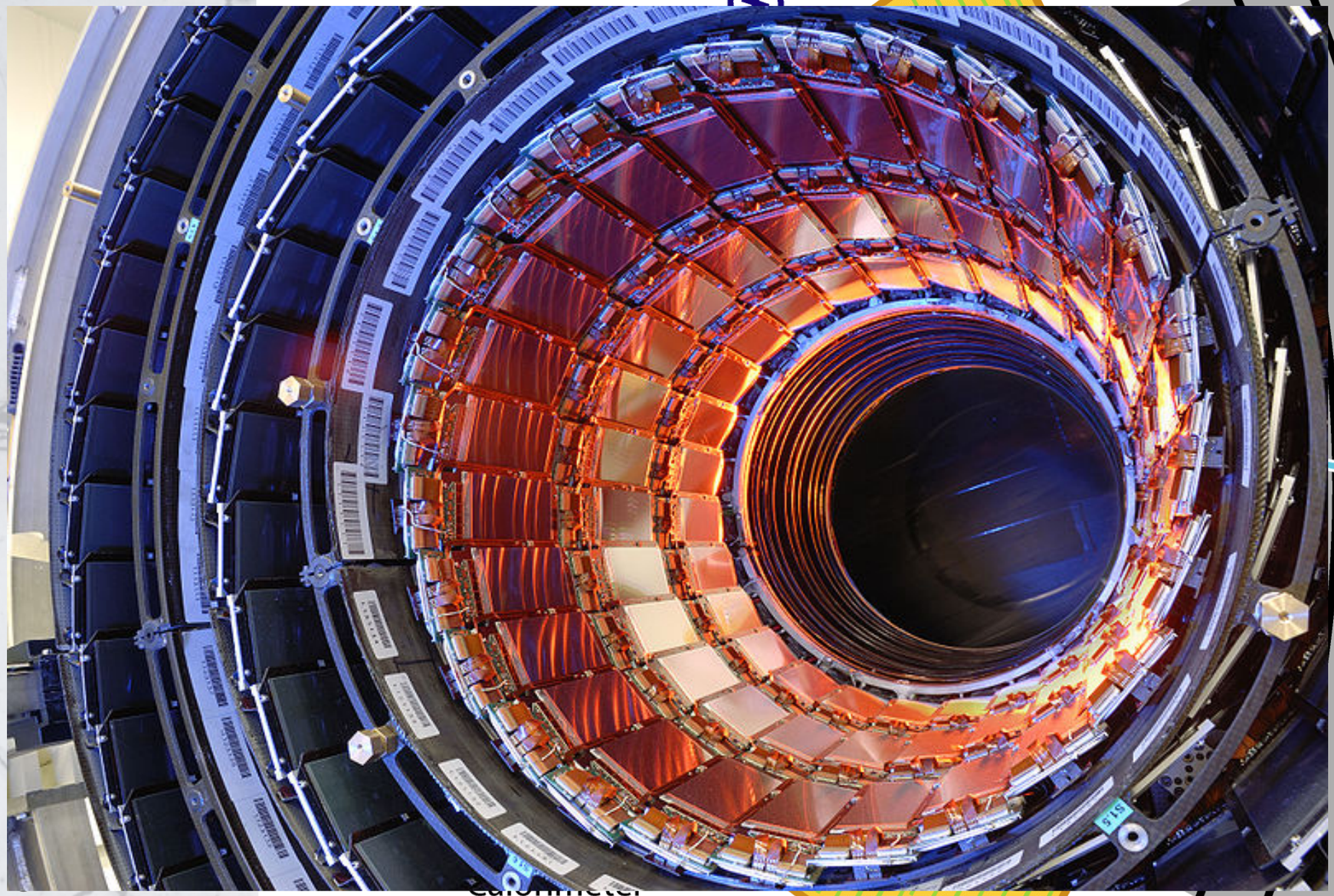
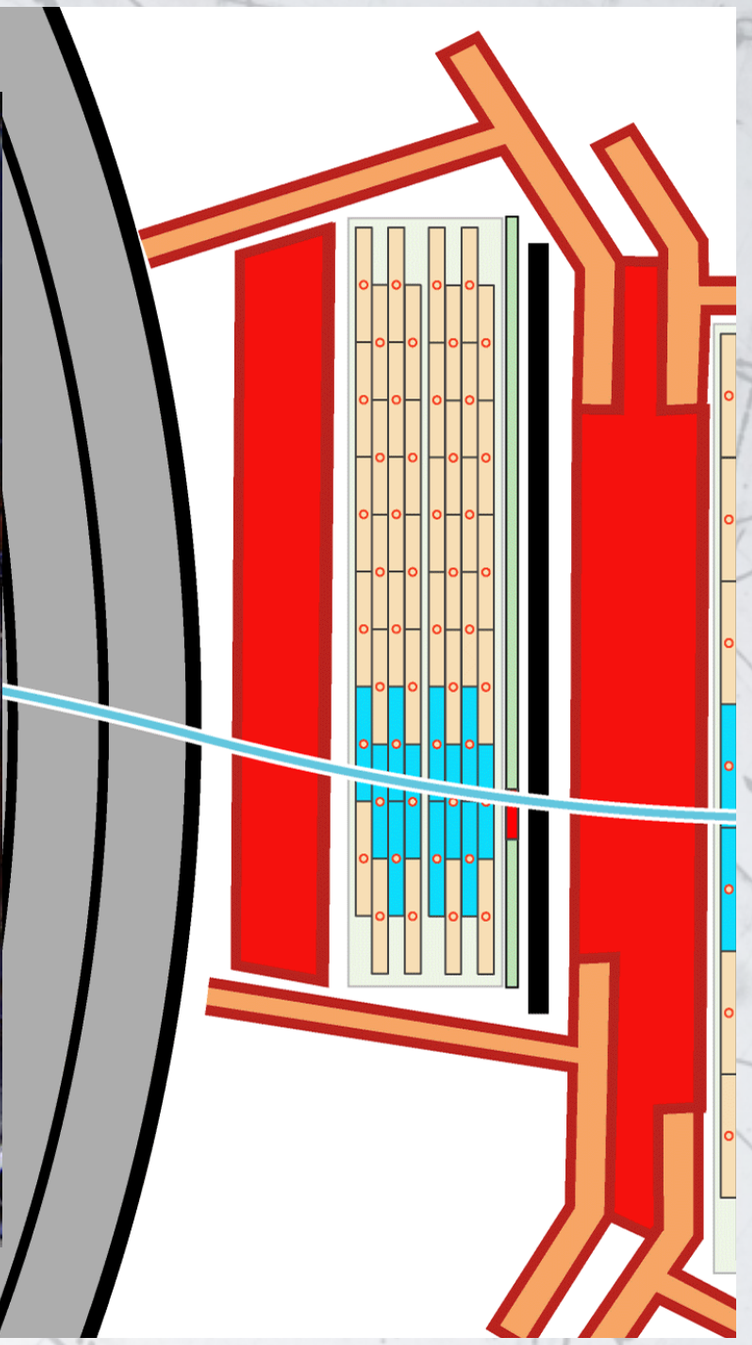
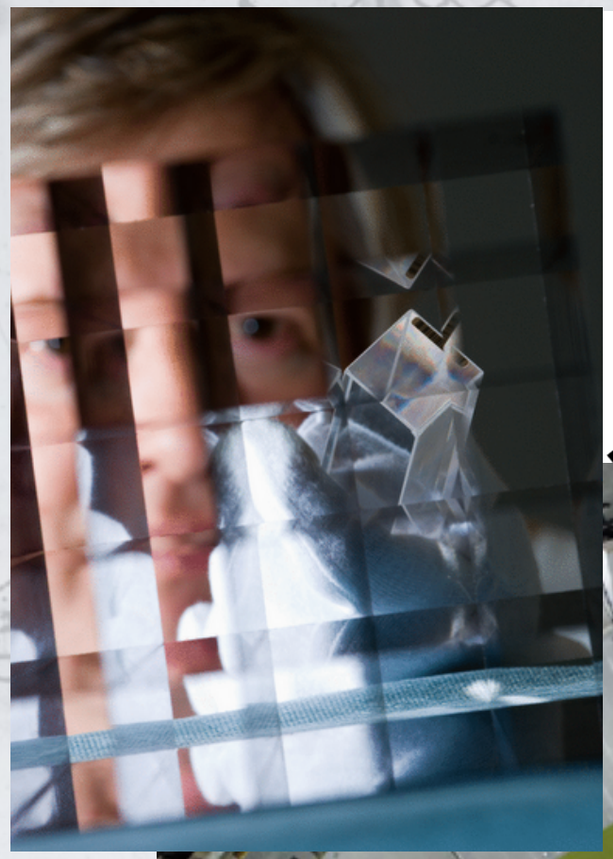
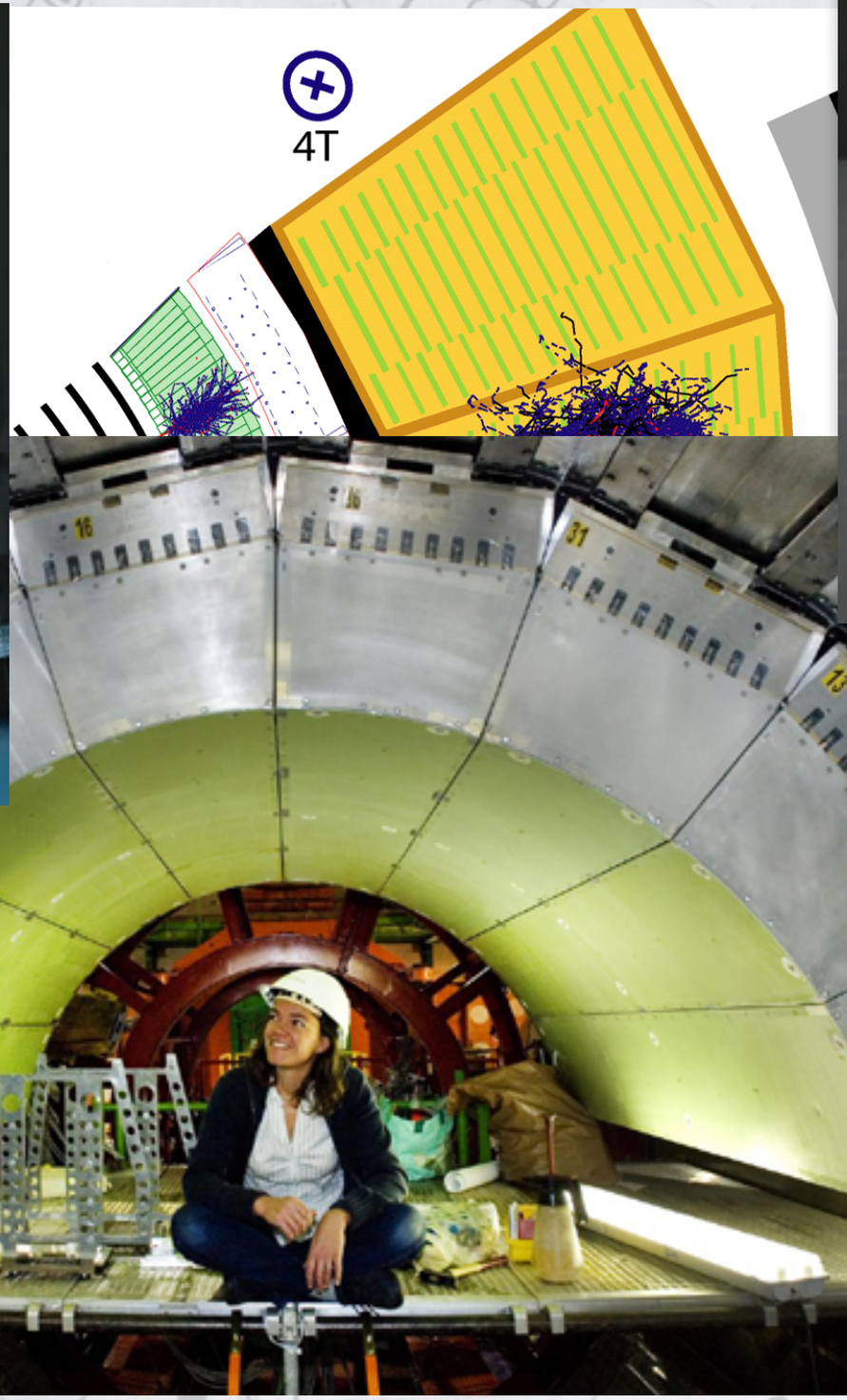
UN RIVELATORE DI PARTICELLE

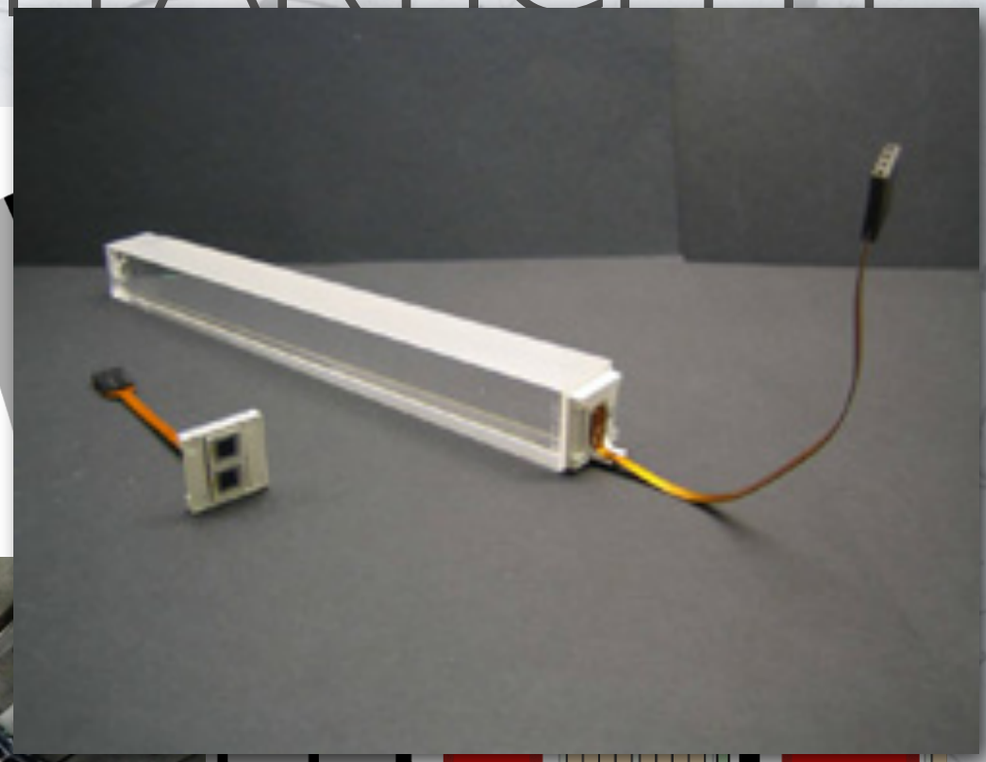


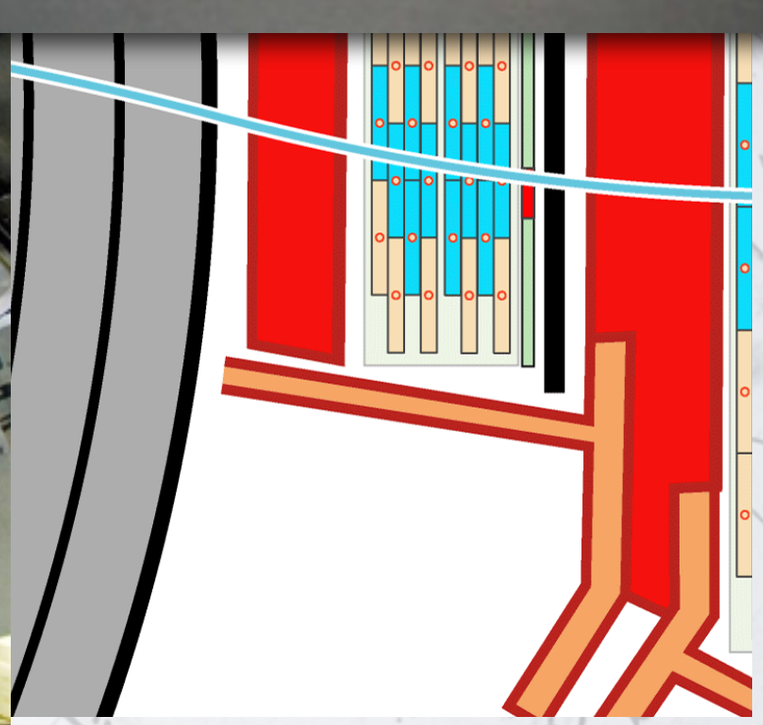


UN RIVELATORE DI PARTICELLE









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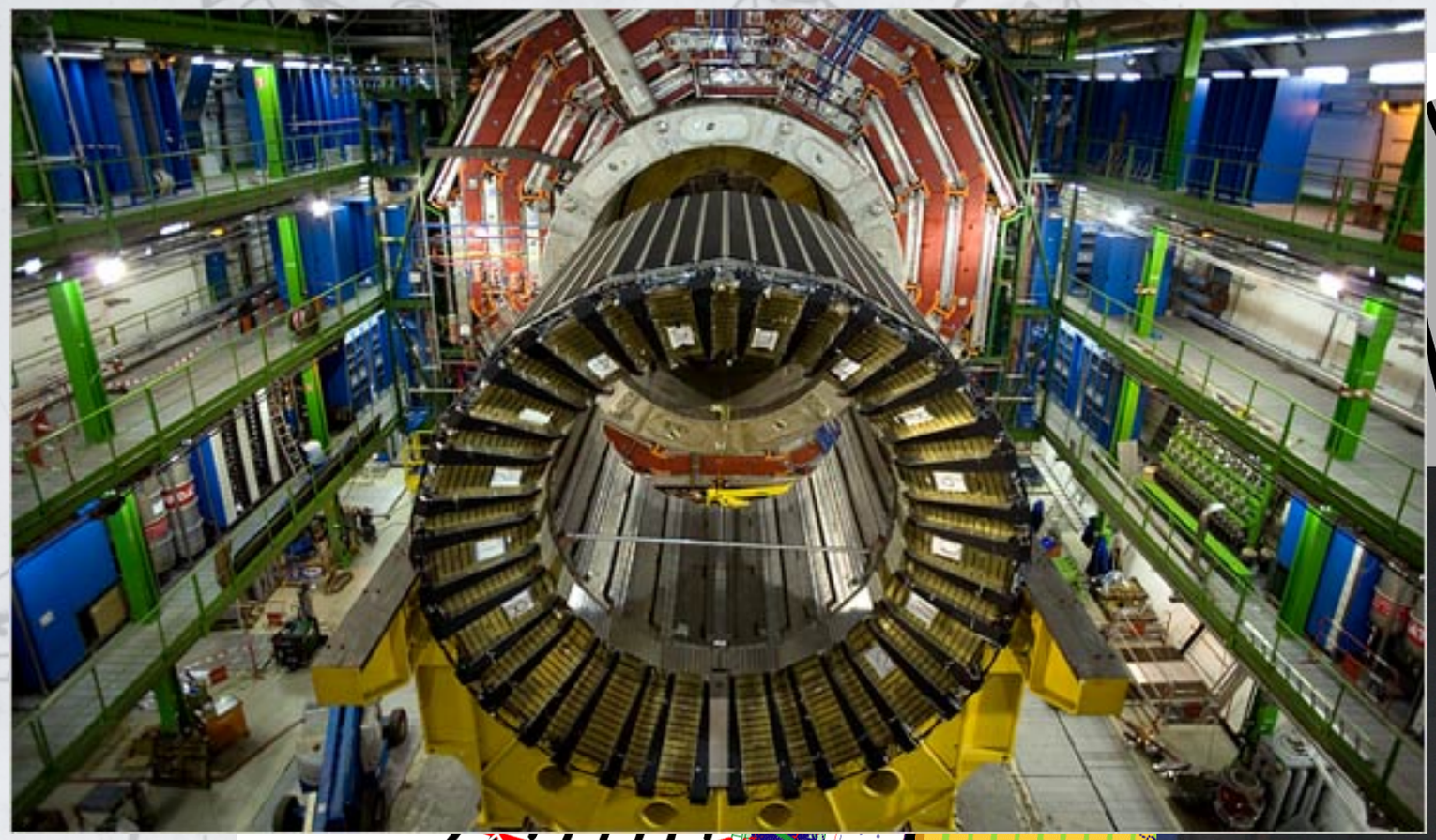
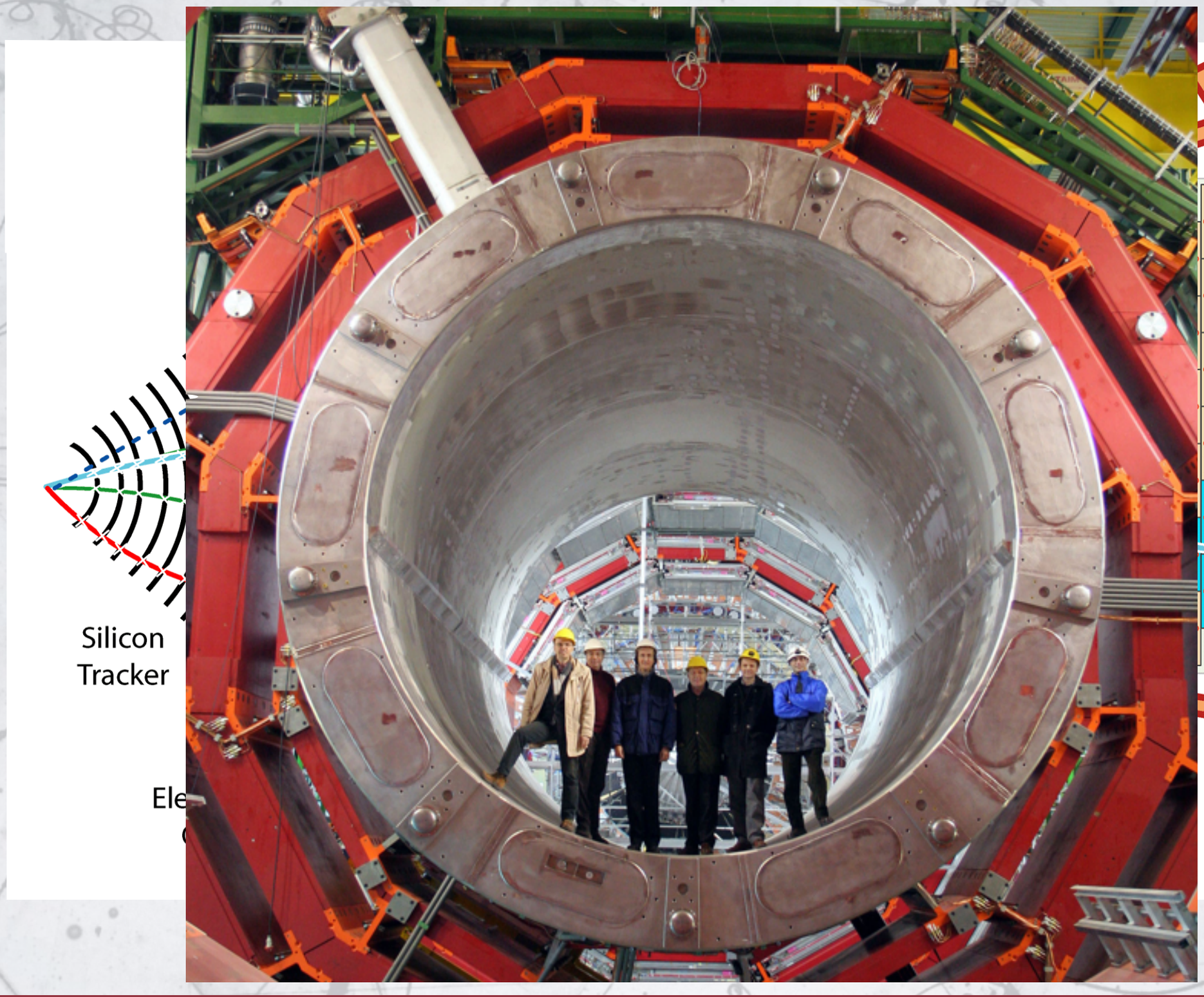
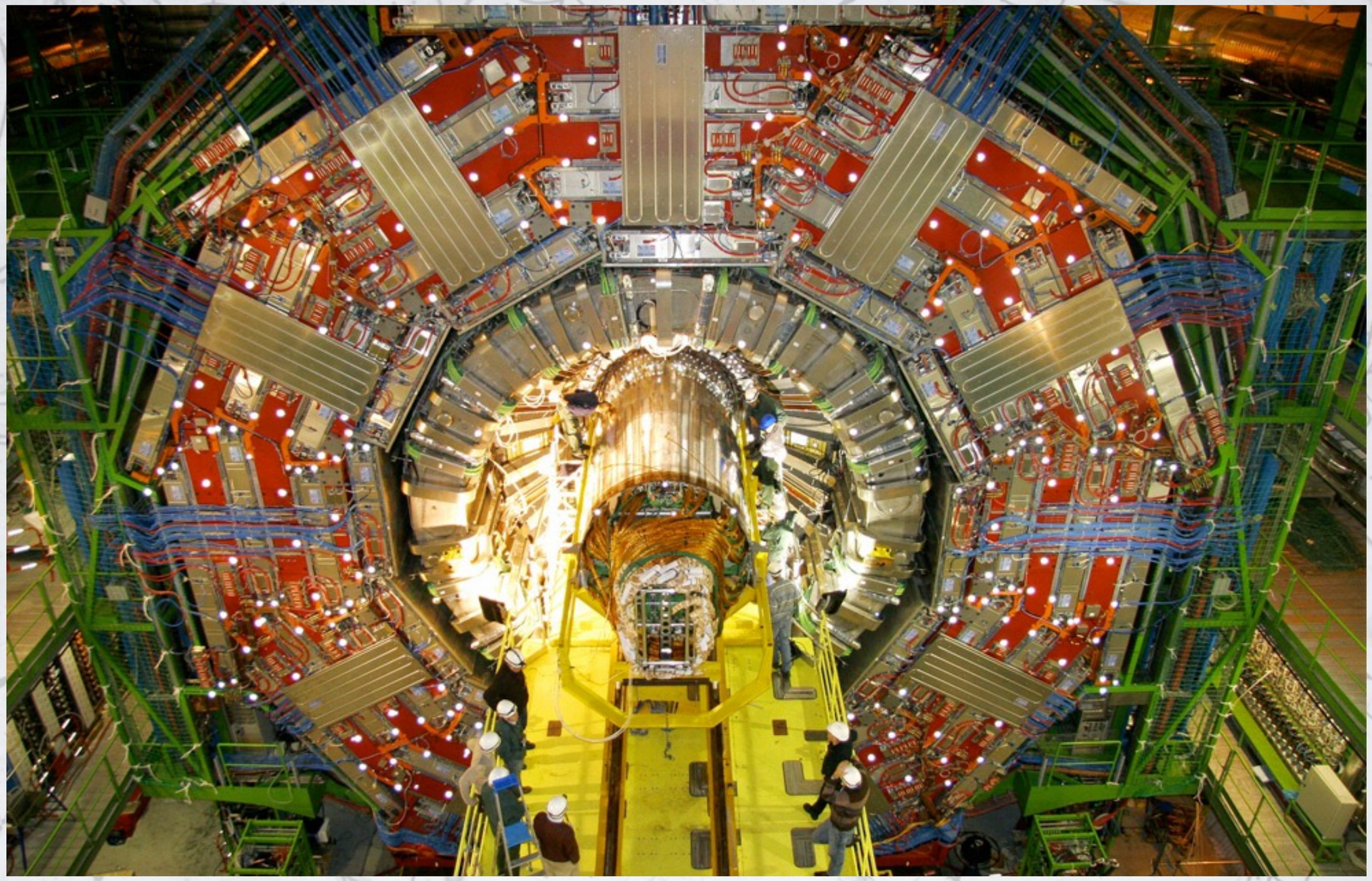
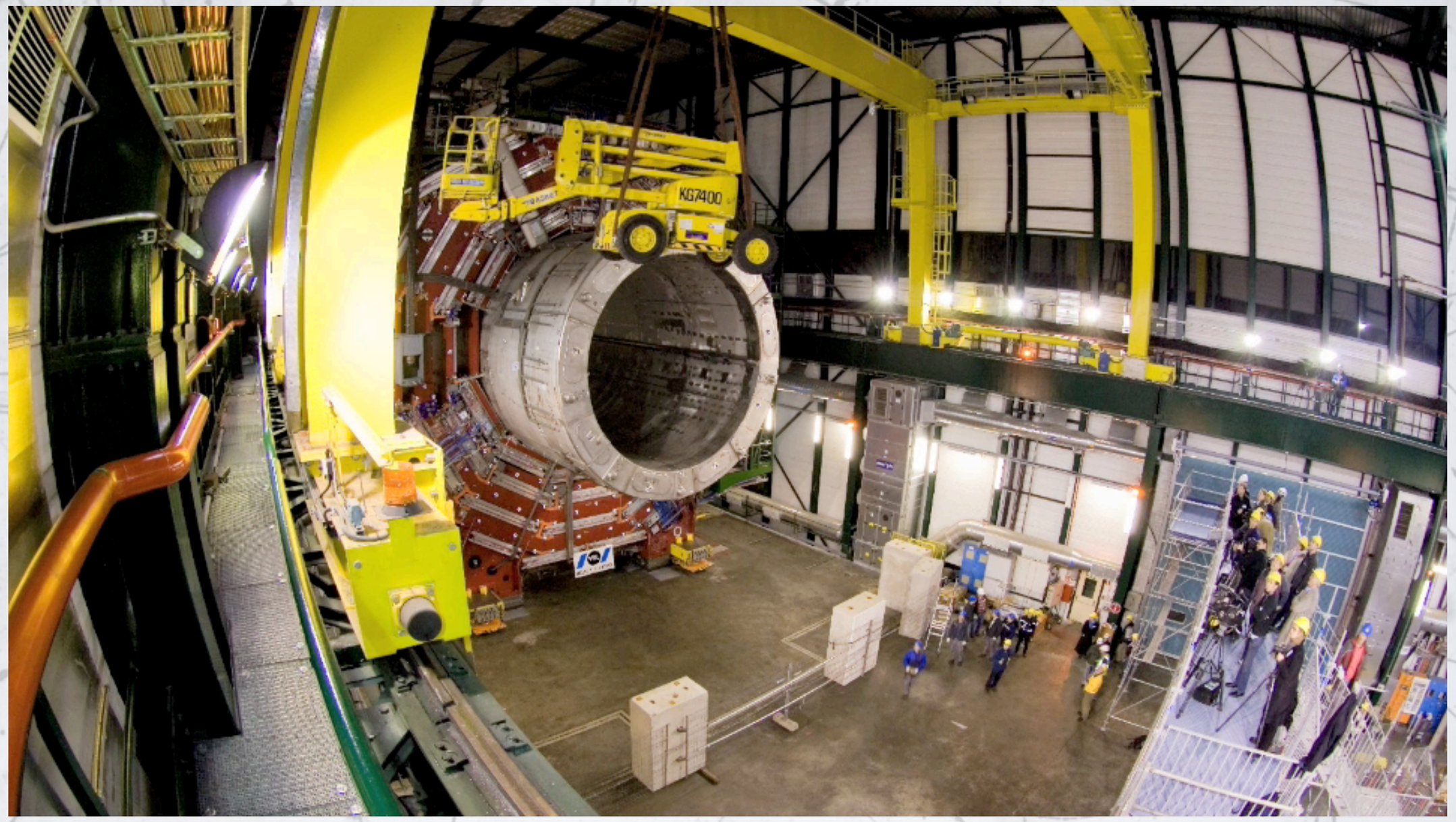
UN RIVELATORE DI PARTICELLE

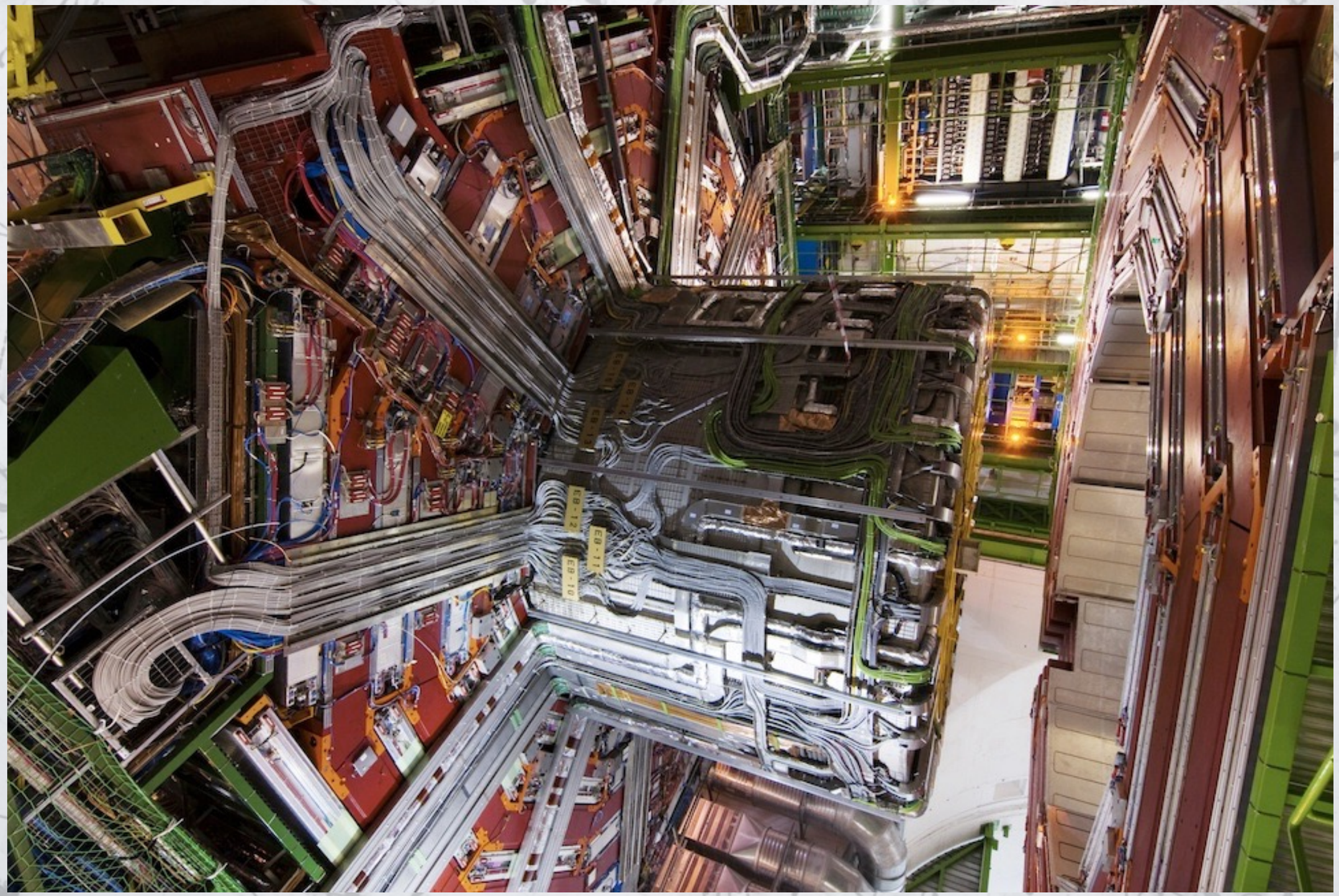


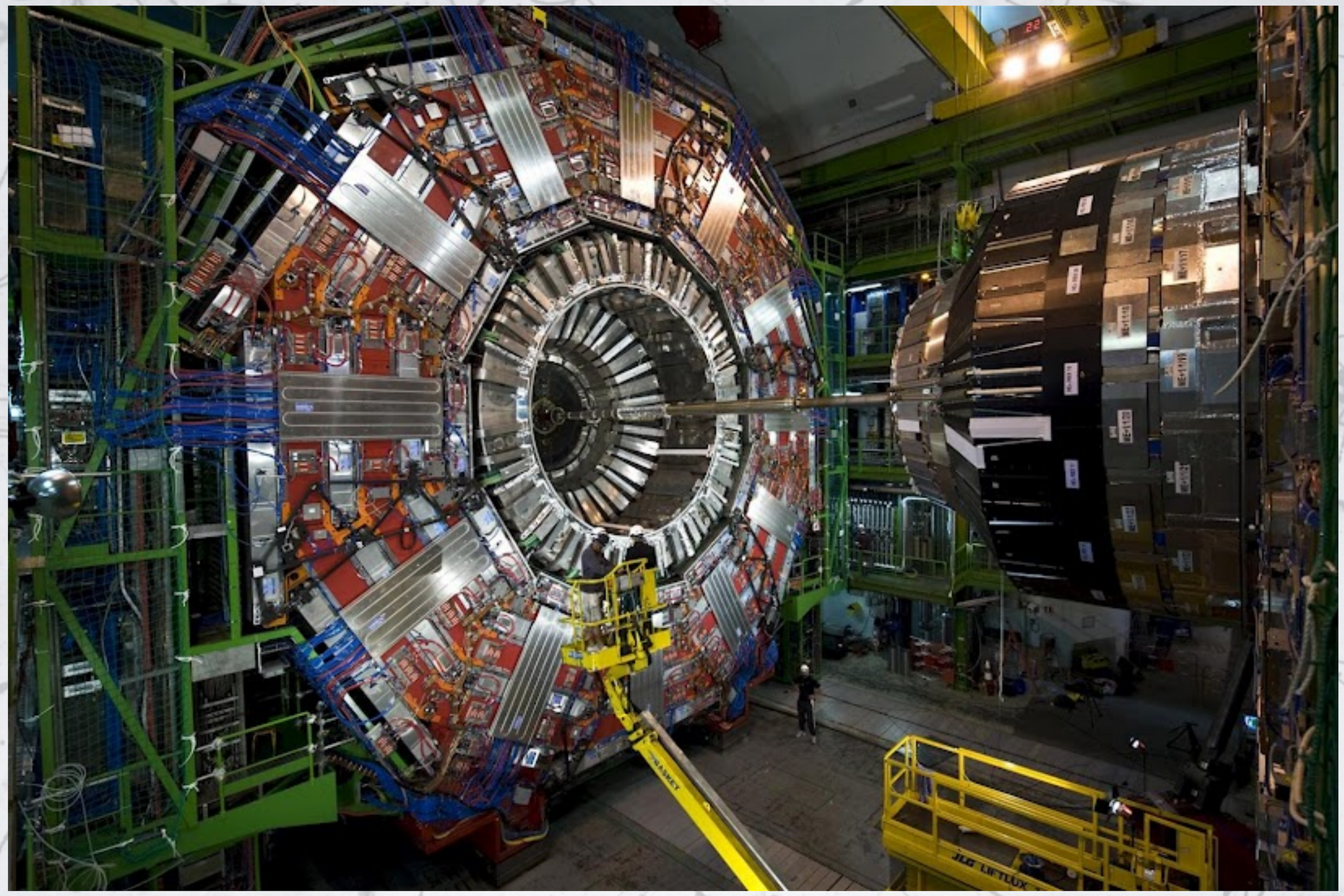
UN RIVELATORE DI PARTICELLE

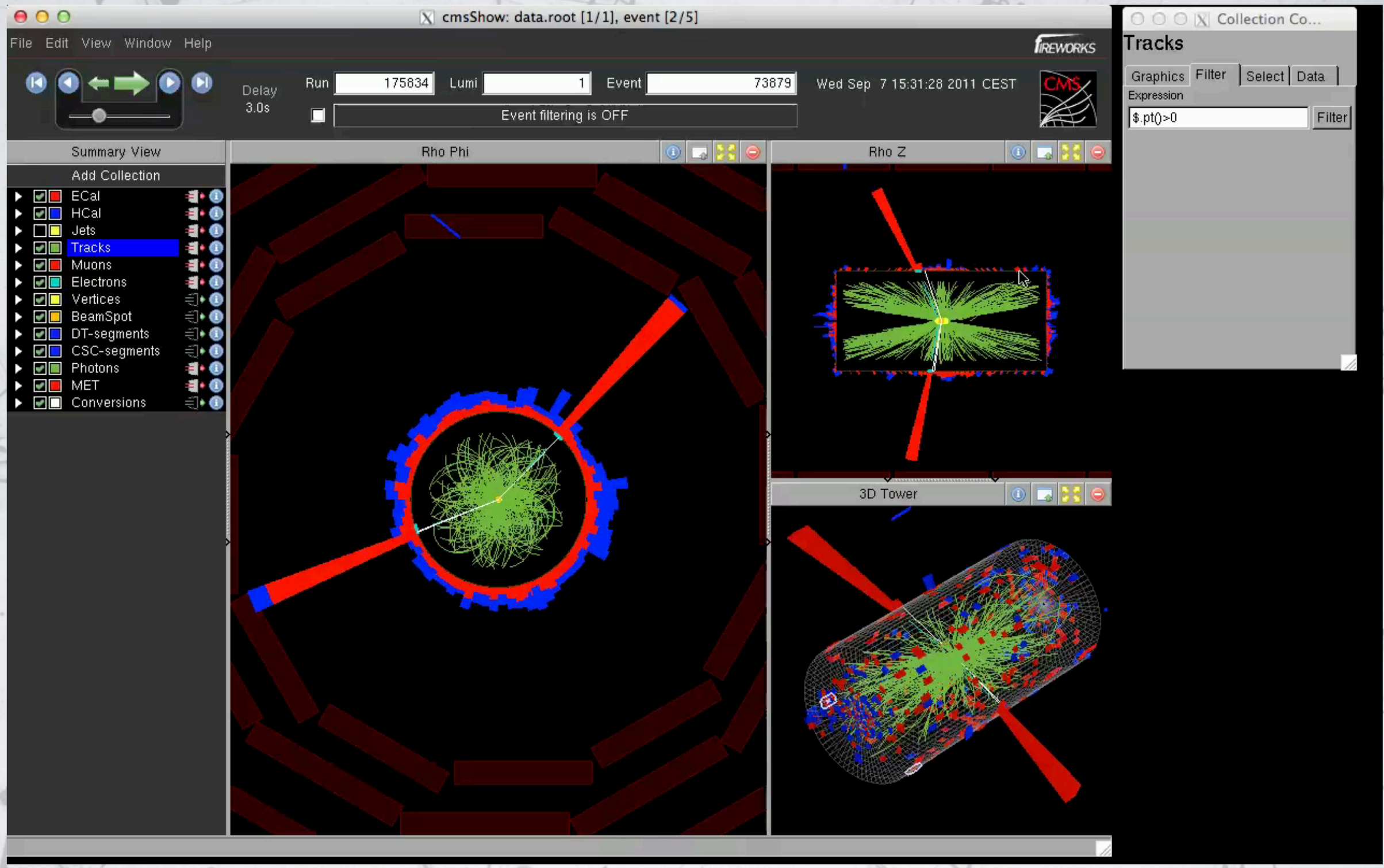


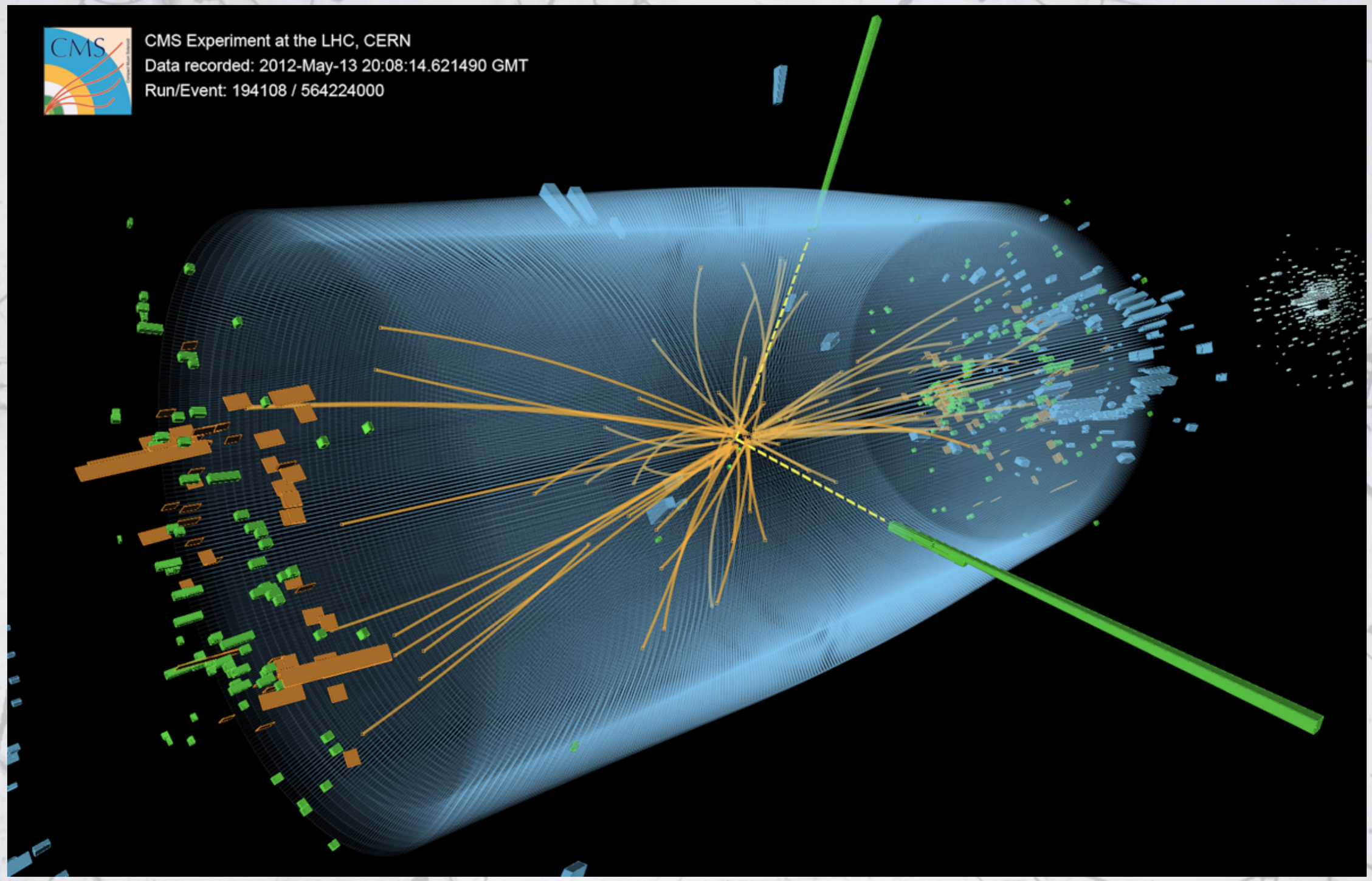


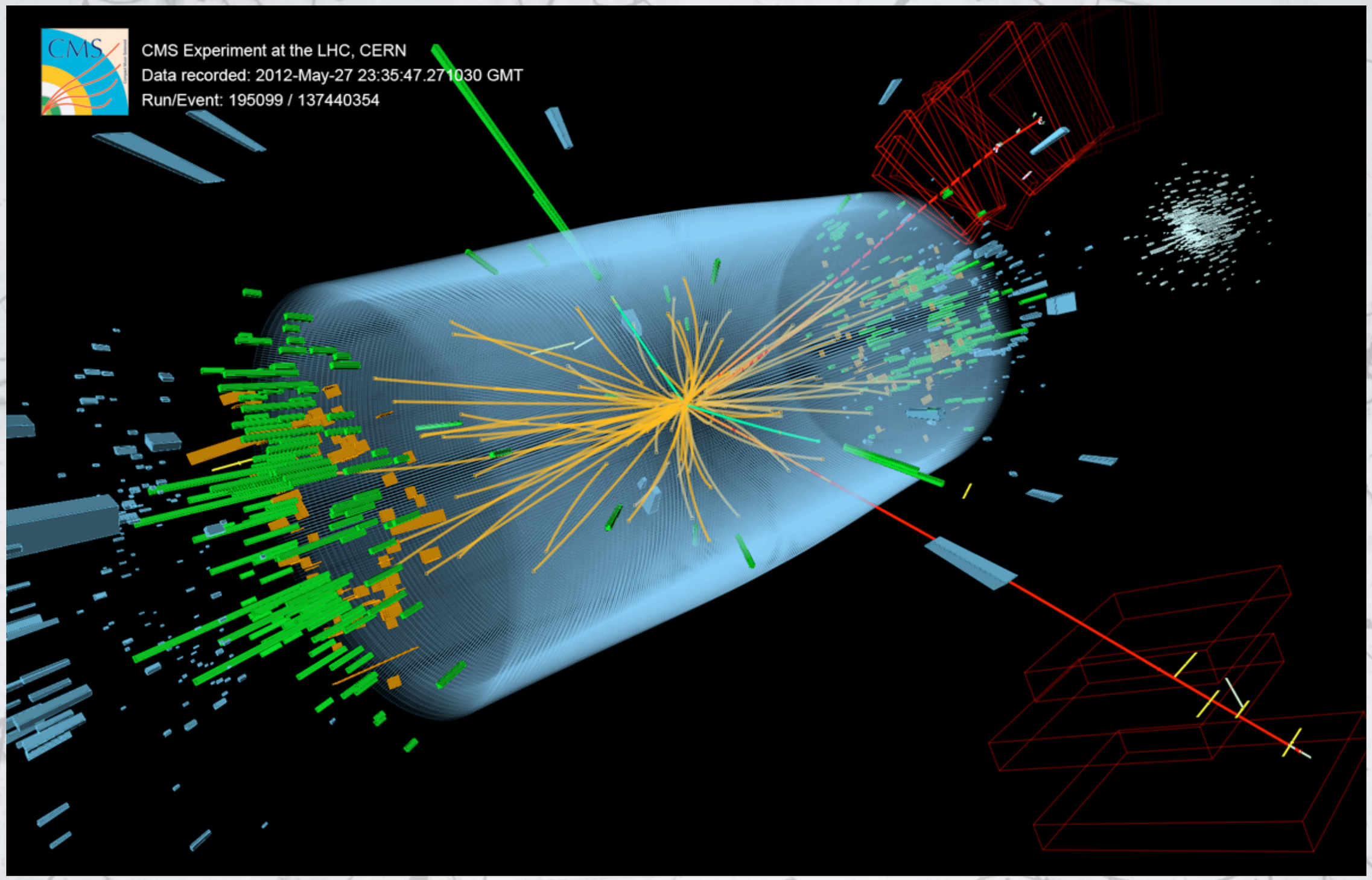

KG7400

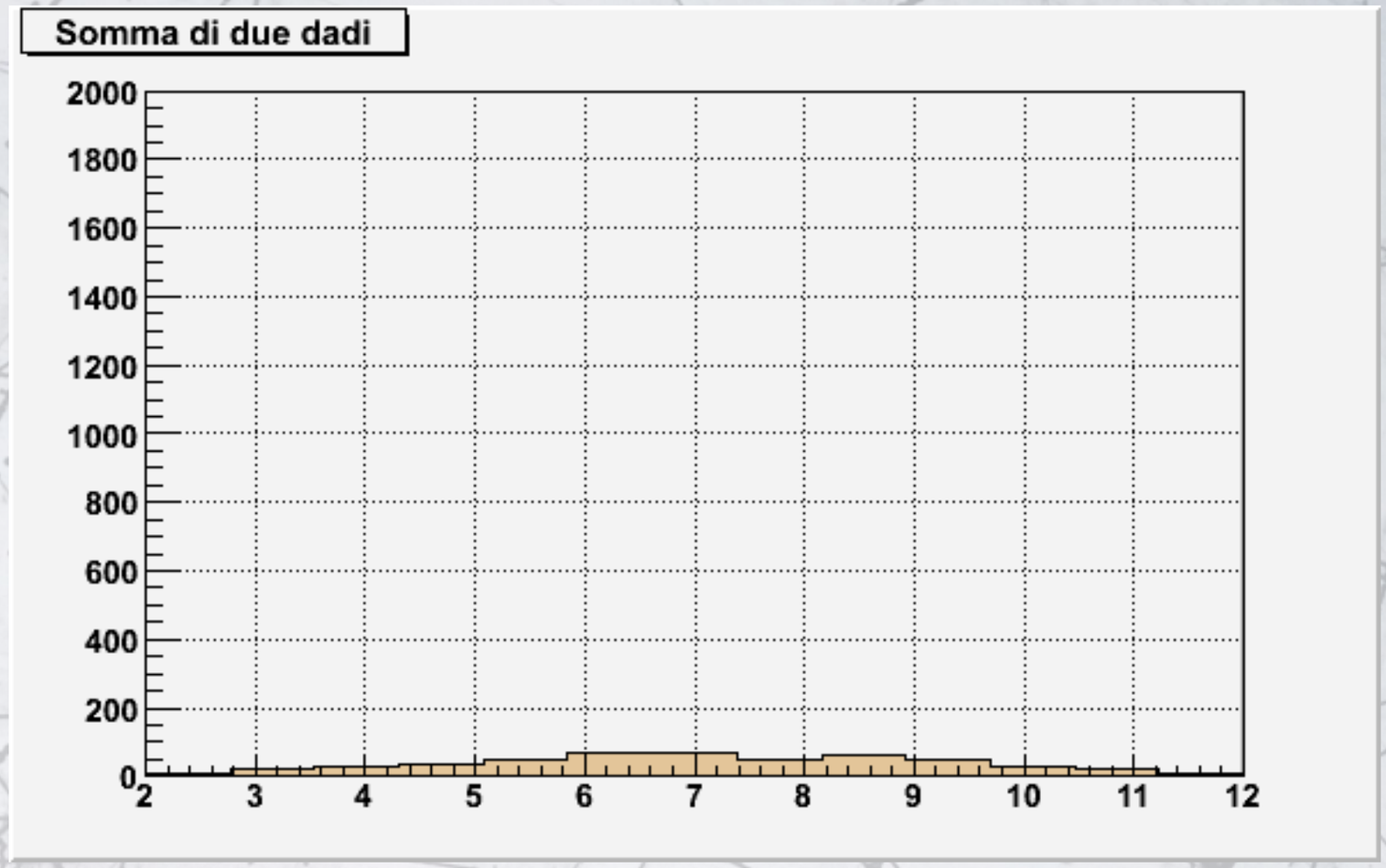

EB-12
EB-11
EB-10

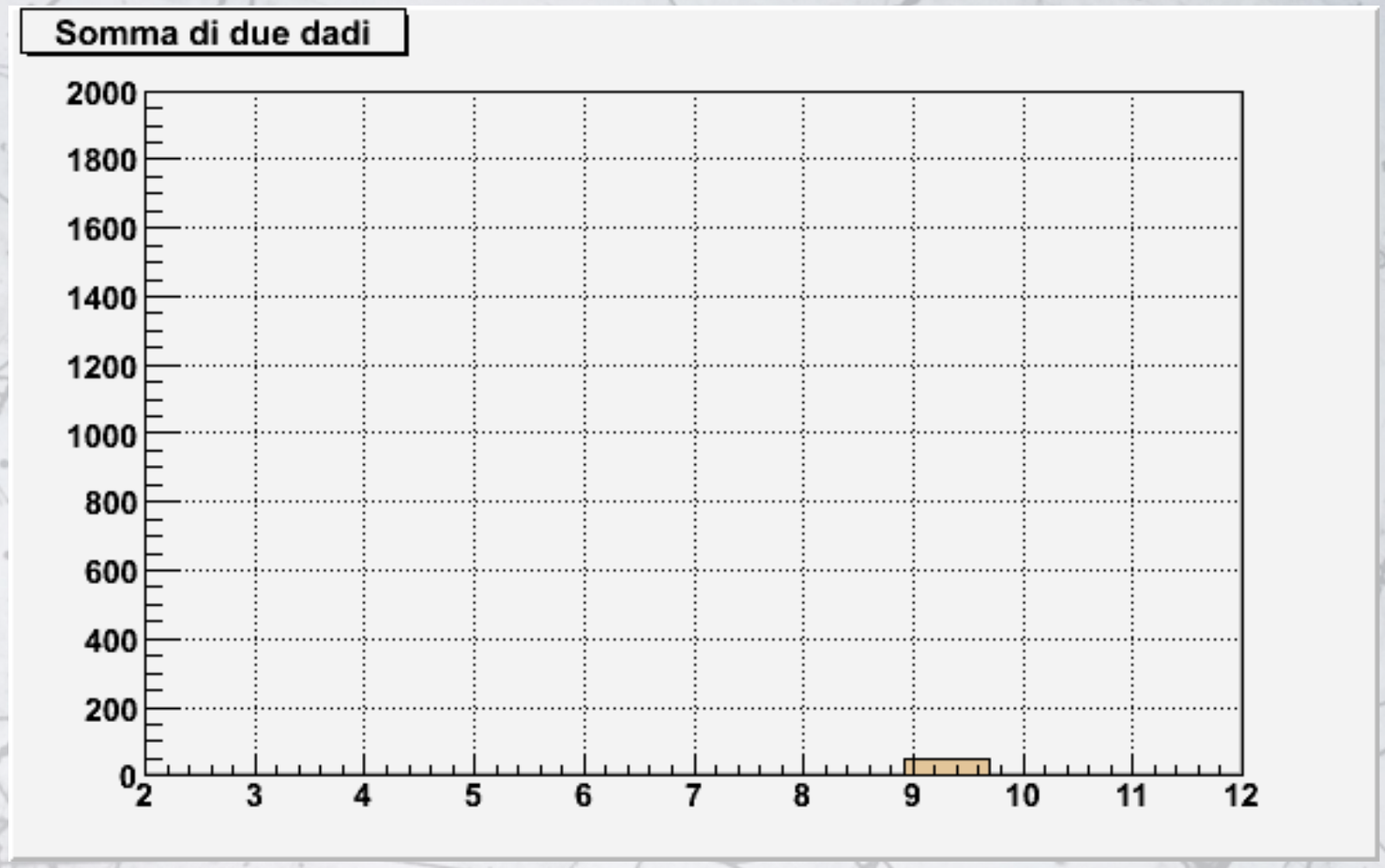

JLG LIFTLUX

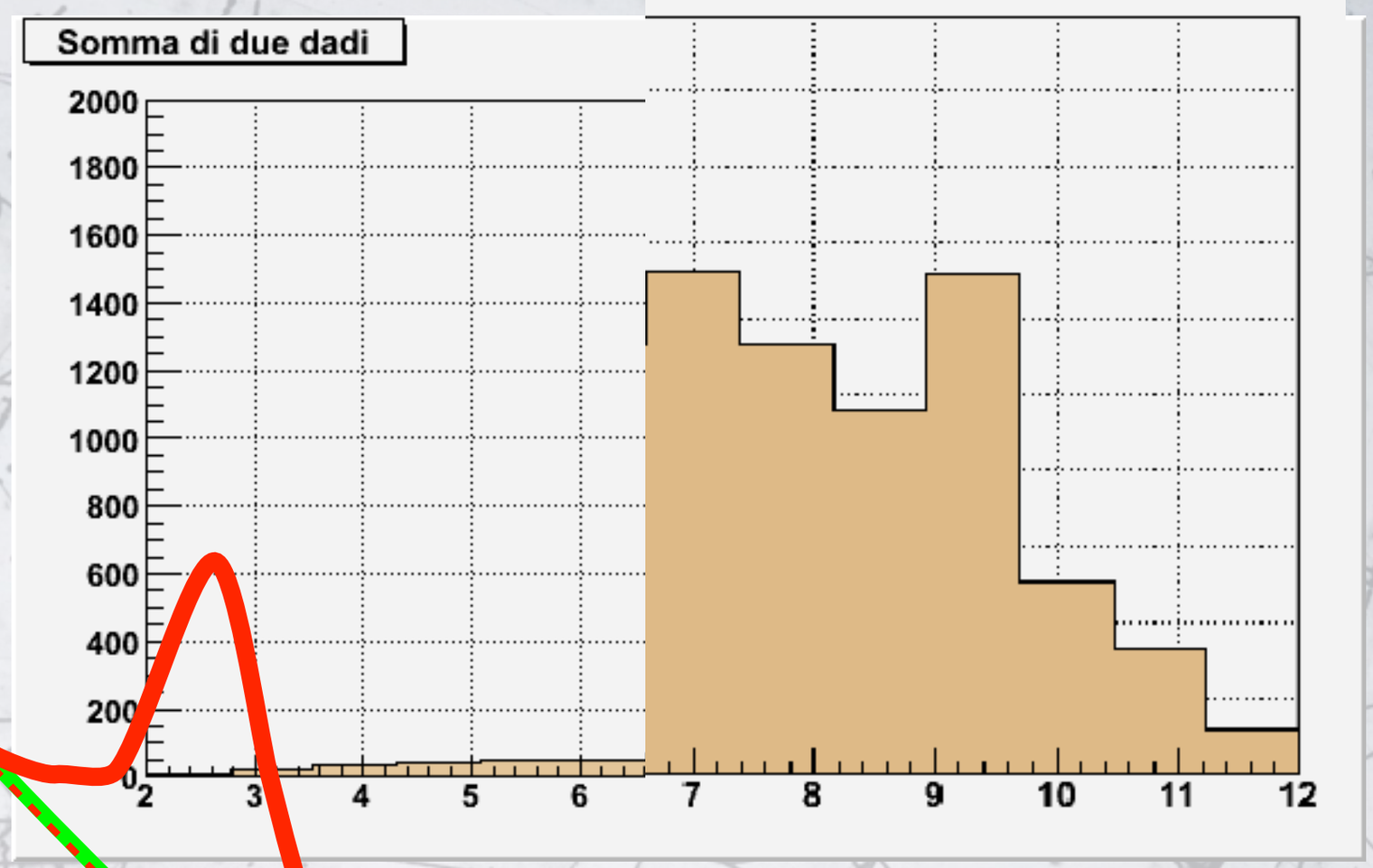

cmsShow: data.root [1/1], event [2/5]
File Edit View Window Help
FIREWORKS
Delay 3.0s
Run 175834
Lumi 1
Event 73879
Wed Sep 7 15:31:28 2011 CEST
CMS
Event filtering is OFF
Summary View
Add Collection
ECal
HCal
Jets
Tracks
Muons
Electrons
Vertices
BeamSpot
DT-segments
CSC-segments
Photons
MET
Conversions
Rho Phi
Rho Z
3D Tower
Collection Co...
Tracks
Graphics
Filter
Select
Data
Expression
$.pt()>0
Filter

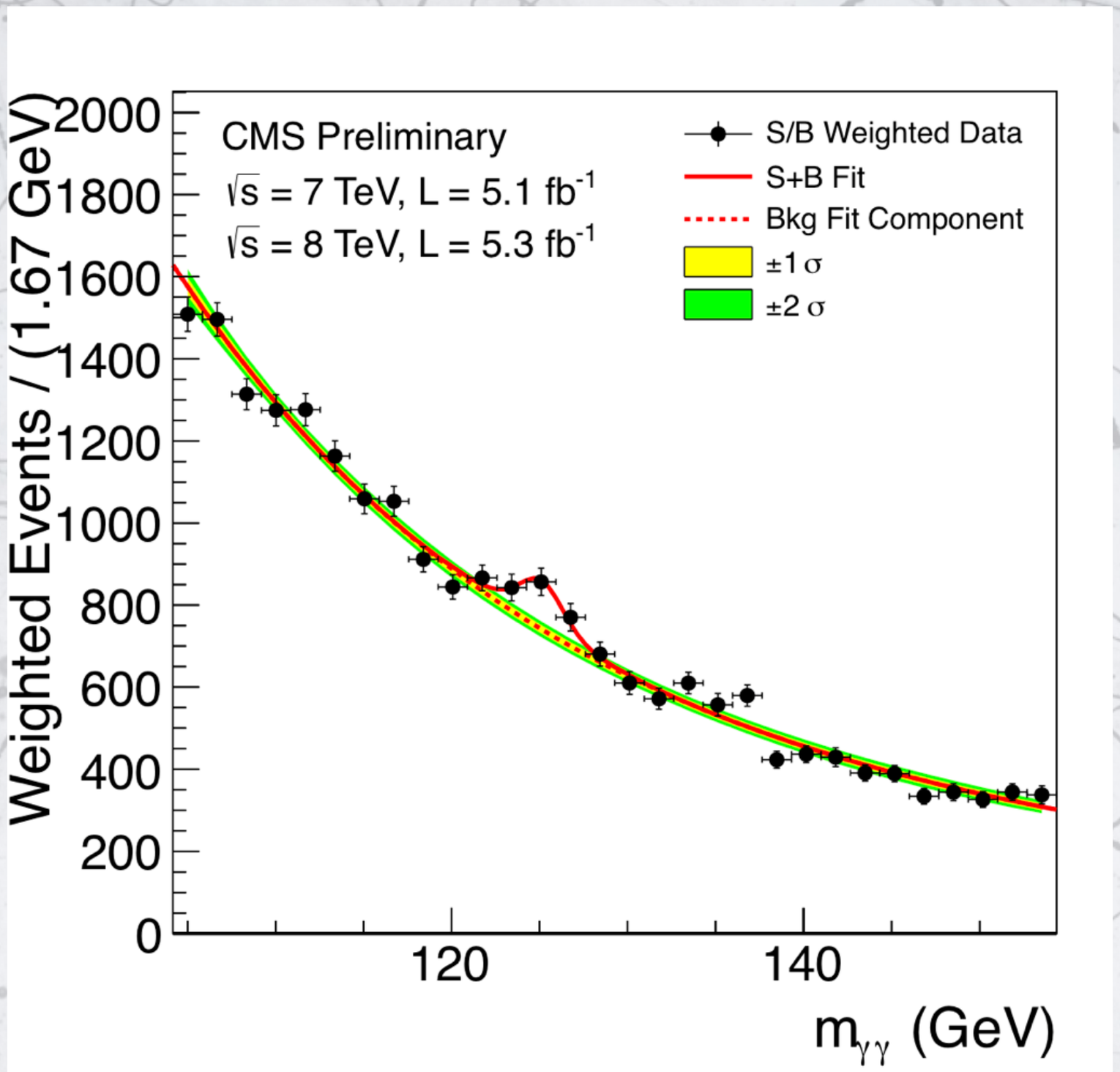

CMS Experiment at the LHC, CERN
Data recorded: 2012-May-13 20:08:14.621490 GMT
Run/Event: 194108 / 564224000

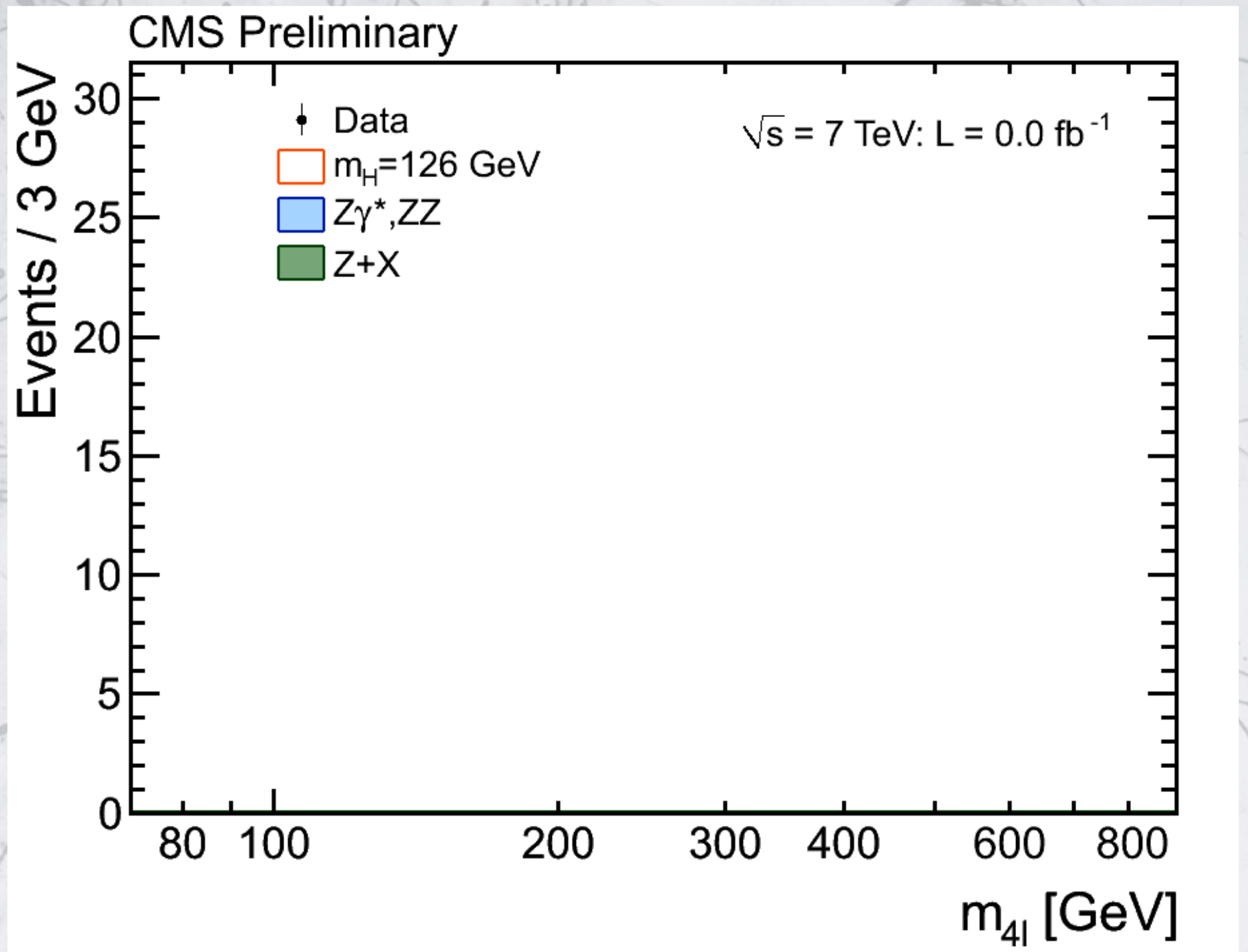

CMS Experiment at the LHC, CERN
Data recorded: 2012-May-27 23:35:47.271030 GMT
Run/Event: 195099 / 137440354

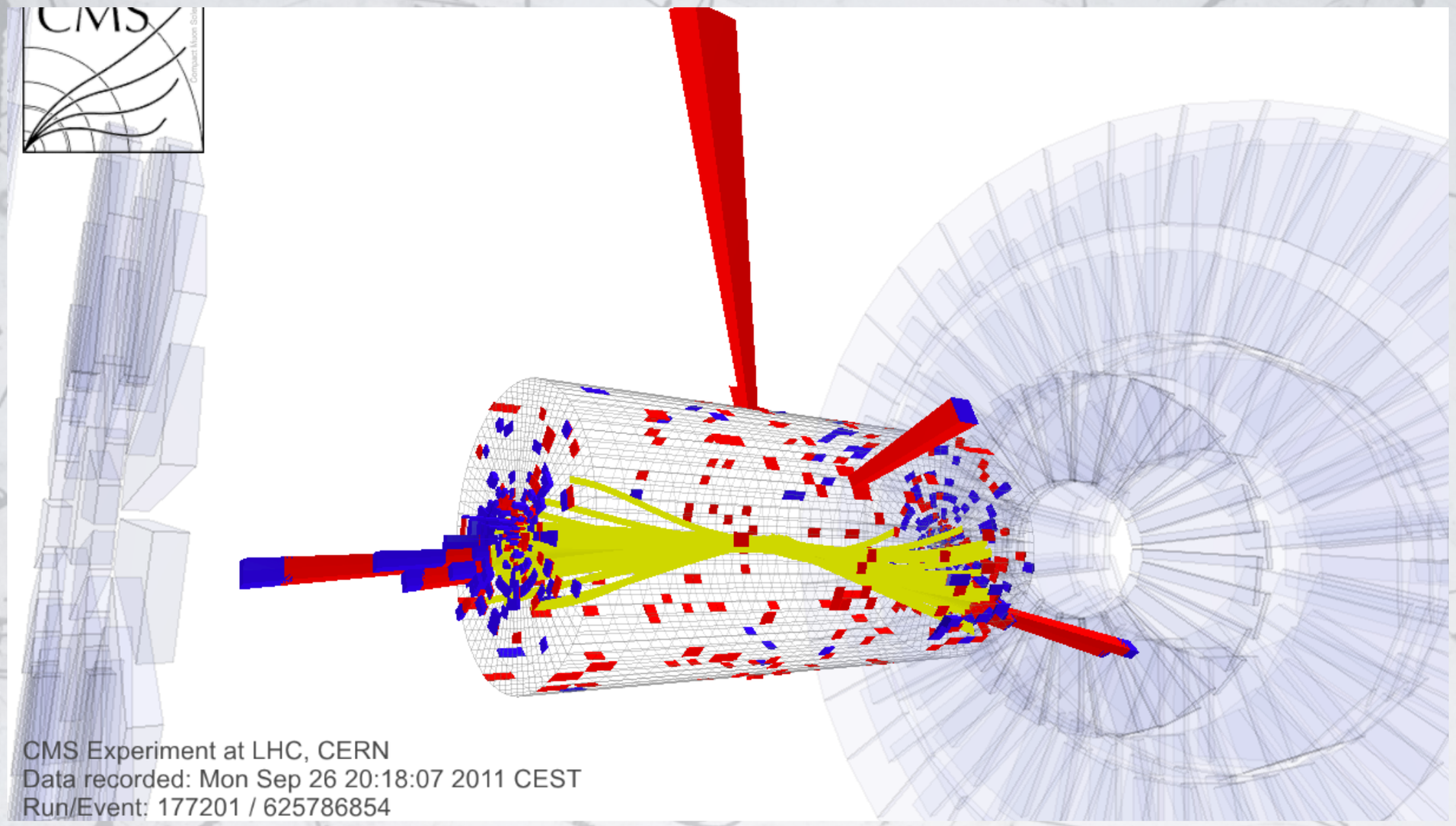

Somma di due dadi
2000
1800
1600
1400
1200
1000
800
600
400
200
0
2
3
4
5
6
7
8
9
10
11
12


Somma di due dadi
2000
1800
1600
1400
1200
1000
800
600
400
200
0
2
3
4
5
6
7
8
9
10
11
12


Somma di due dadi
2000
1800
1600
1400
1200
1000
800
600
400
200
0
2
3
4
5
6
7
8
9
10
11
12


CMS Preliminary
√s = 7 TeV, L = 5.1 fb-1
√s = 8 TeV, L = 5.3 fb-1
S/B Weighted Data
S+B Fit
Bkg Fit Component
±1 σ
±2 σ
Weighted Events / (1.67 GeV)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
120
140
mγγ (GeV)


CMS Preliminary
Data
m_H=126 GeV
Zγ*,ZZ
Z+X
$\sqrt{s}$ = 7 TeV: L = 0.0 fb^{-1}
Events / 3 GeV
0
5
10
15
20
25
30
80
100
200
300
400
600
800
m_{4l} [GeV]



CERCARE L'AGO NEL PAGLIAIO

40 milioni di collisioni/s
20 urti pp per collisione
200 giorni/anno

14 milioni di miliardi di eventi/anno
5 miliardi di eventi/anno selez.

400 $H \rightarrow \gamma\gamma$

THE GRID

CONCLUSIONE