

## CMS DETECTOR

Total weight : 14,000 tonnes  
Overall diameter : 15.0 m  
Overall length : 28.7 m  
Magnetic field : 3.8 T

STEEL RETURN YOKE  
12,500 tonnes

SILICON TRACKERS  
Pixel ( $100 \times 150 \mu\text{m}$ )  $\sim 16\text{m}^2 \sim 66\text{M}$  channels  
Microstrips ( $80 \times 180 \mu\text{m}$ )  $\sim 200\text{m}^2 \sim 9.6\text{M}$  channels

SUPERCONDUCTING SOLENOID  
Niobium titanium coil carrying  $\sim 18,000\text{A}$

MUON CHAMBERS  
Barrel: 250 Drift Tube, 480 Resistive Plate Chambers  
Endcaps: 468 Cathode Strip, 432 Resistive Plate Chambers

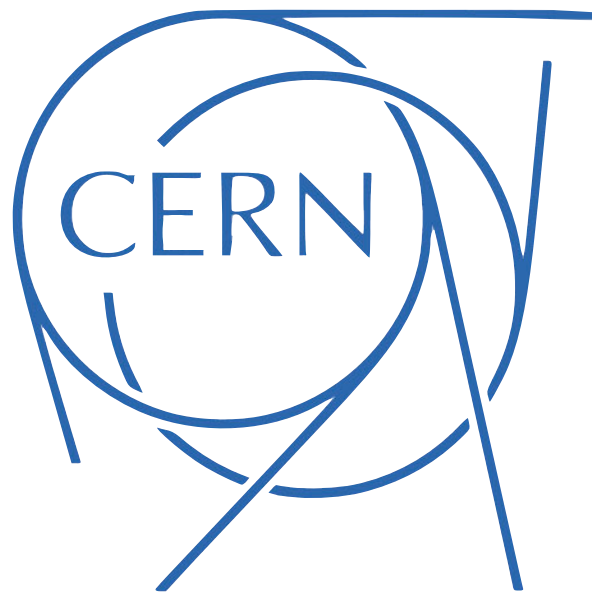
PRESHOWER  
Silicon strips  $\sim 16\text{m}^2 \sim 137,000$  channels

FORWARD CALORIMETER  
Steel + Quartz fibres  $\sim 2,000$  Channels

CRYSTAL  
ELECTROMAGNETIC  
CALORIMETER (ECAL)  
 $\sim 76,000$  scintillating  $\text{PbWO}_4$  crystals

HADRON CALORIMETER (HCAL)  
Brass + Plastic scintillator  $\sim 7,000$  channels

Activities for the classroom -  
Masterclasses with real  
CMS data



# Activities for the classroom - Masterclasses with real CMS data

Konrad Jende, Welsh Teacher Programme 2015

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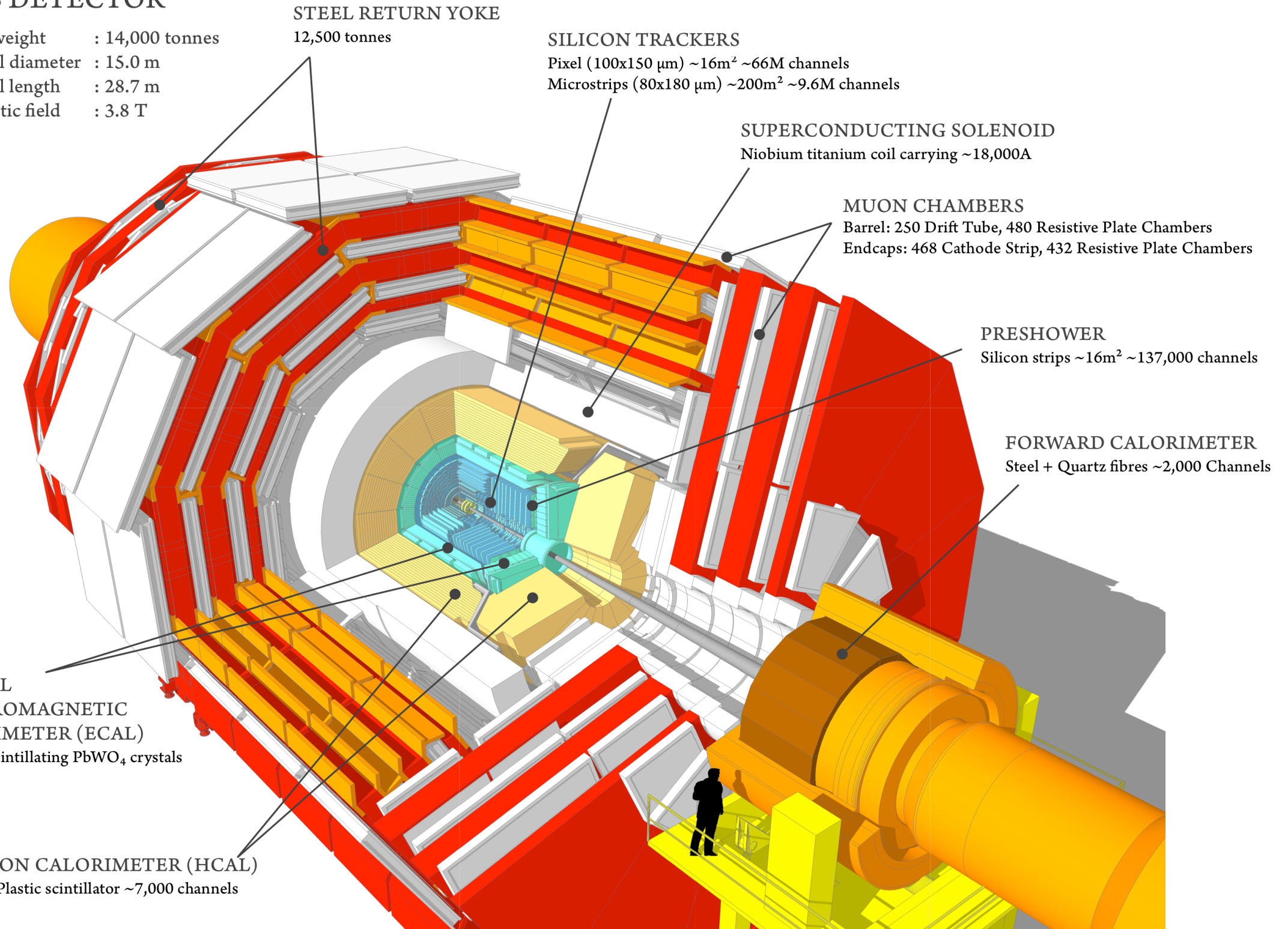


Fig. 1: Sectional view of the CMS detector



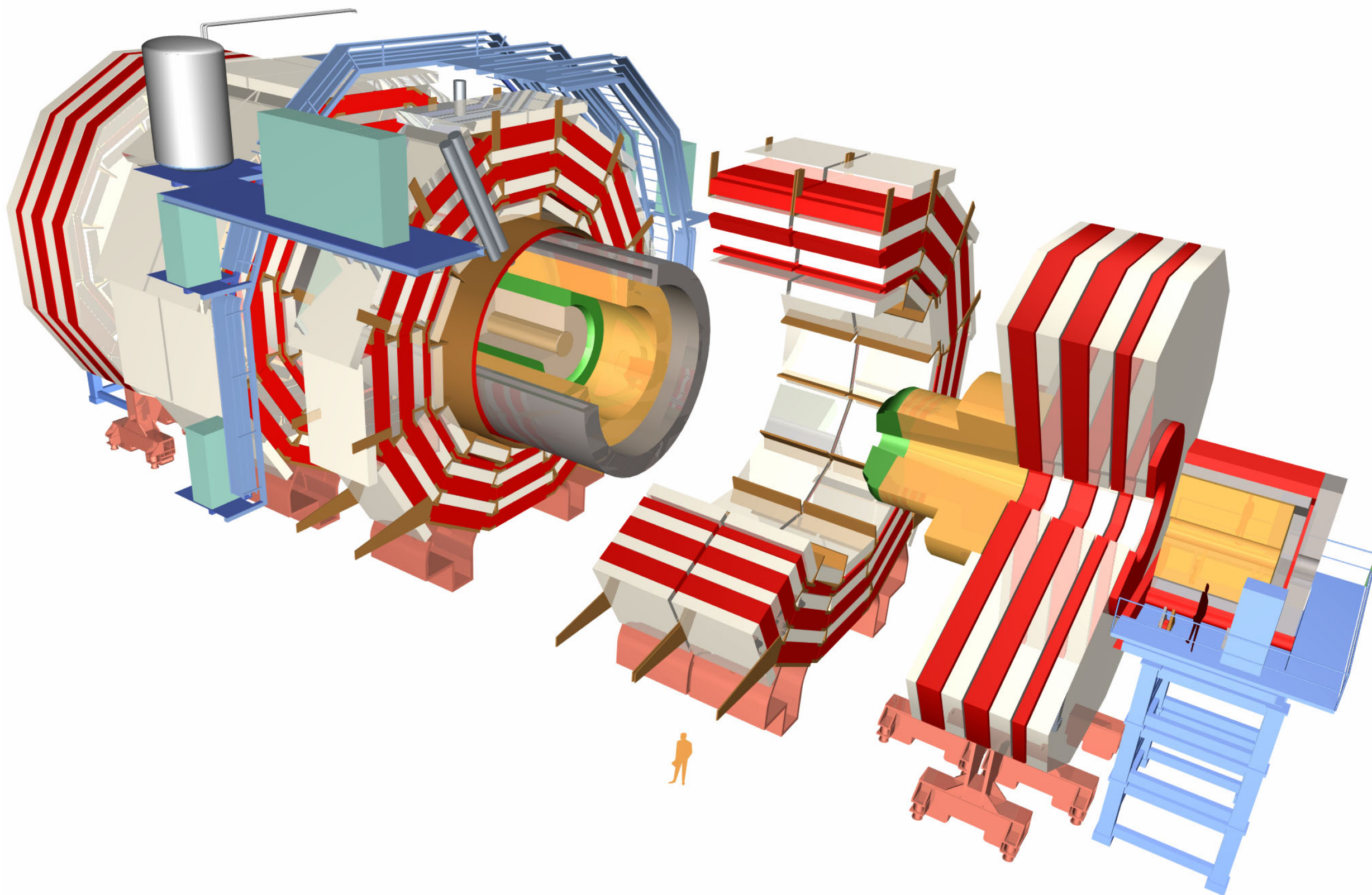


Fig. 2: Modular construction of CMS

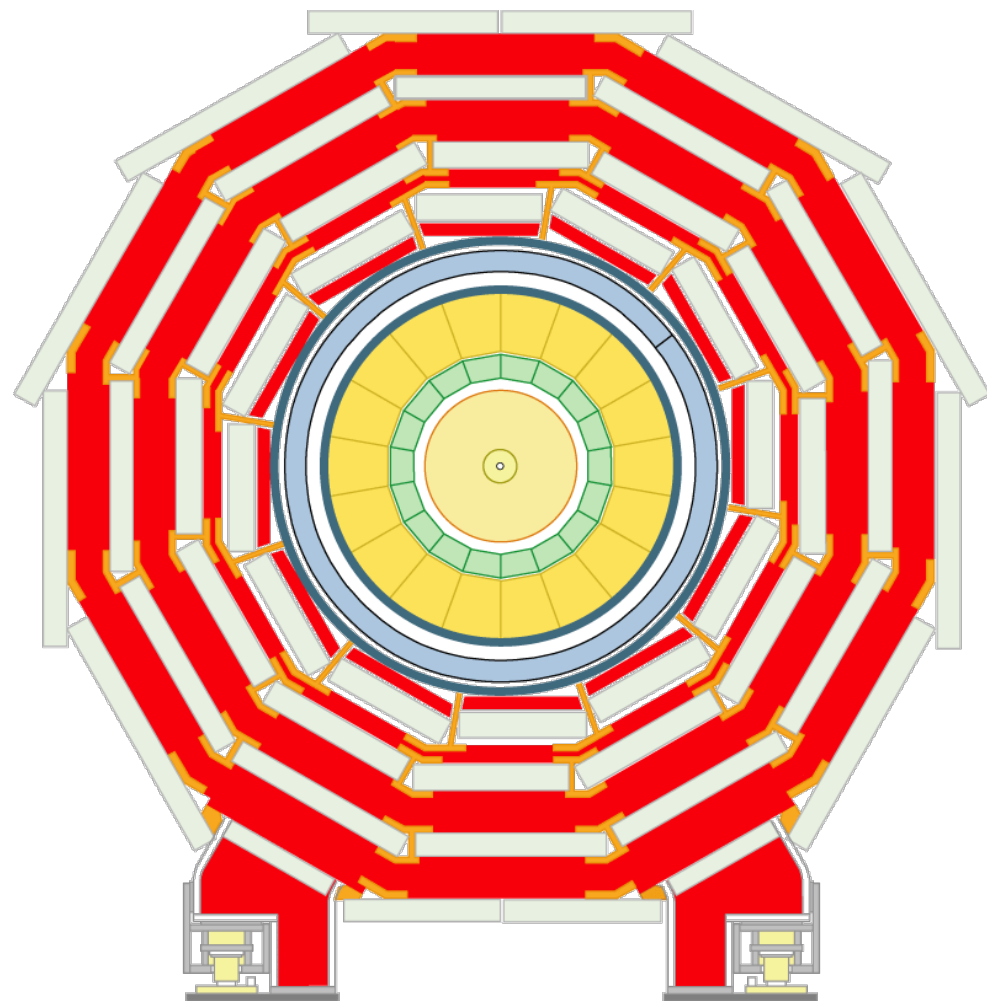


Fig. 3: Cross-sectional view of CMS

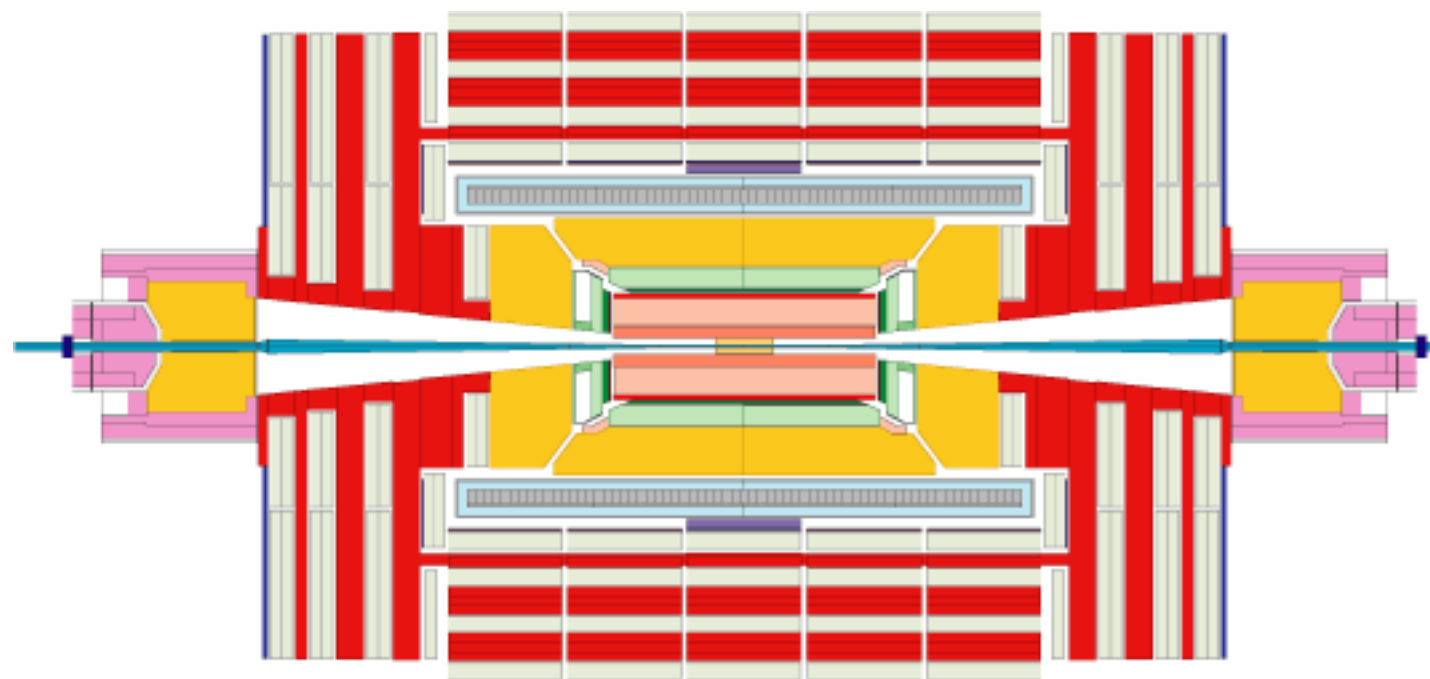


Fig. 4: side-view of CMS

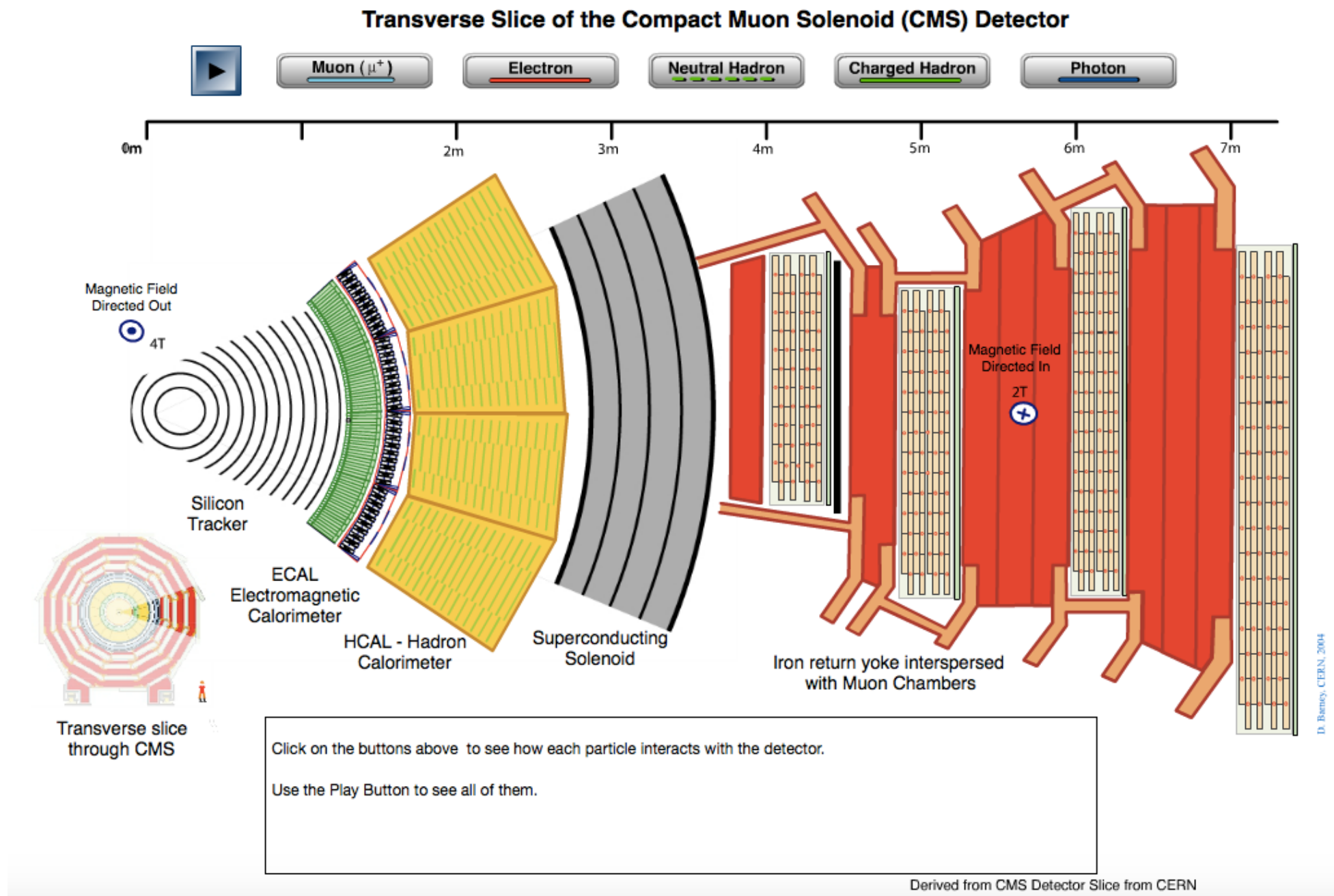


Fig.6: Interactive applet how CMS detects particles




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[J/Ψ PATH](#)
[WZH PATH](#)
[EVENTS](#)


## CMS International Masterclasses

Join us on a journey to study the smallest building blocks of matter! Data samples from the CMS Experiment at CERN's Large Hadron Collider (LHC) are ready. Make your own data analysis. Follow the menu buttons above: the J/Ψ measurement from Masterclass 2011 and the current W/Z measurement. Students will find information in these web pages and videos. Explore...and then let's do some 21st century particle physics!

### LANGUAGES

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### LINKS



#### WHAT ARE CERN AND THE LHC?



#### WHAT IS CMS?



Fig.7: CMS Masterclasses website

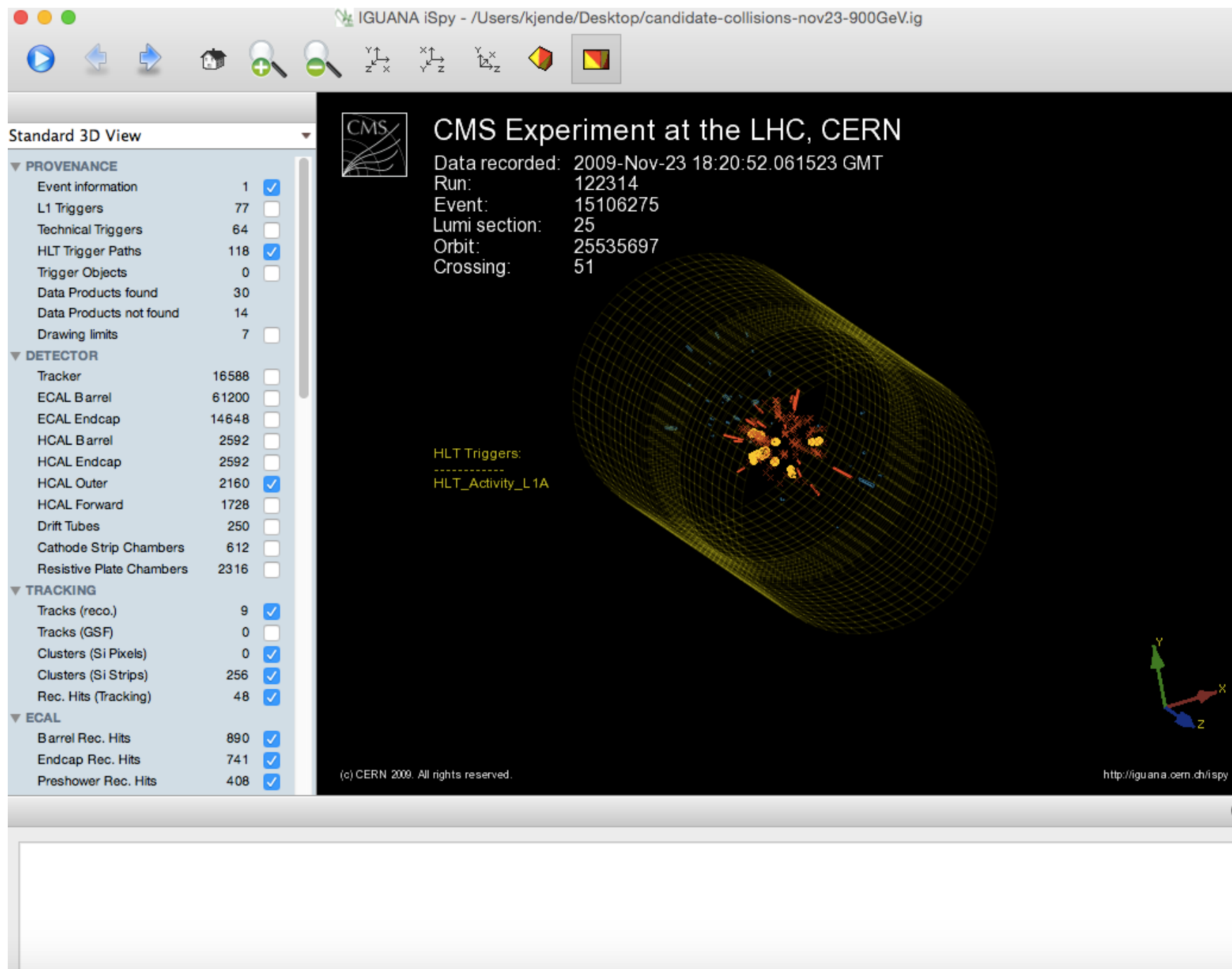


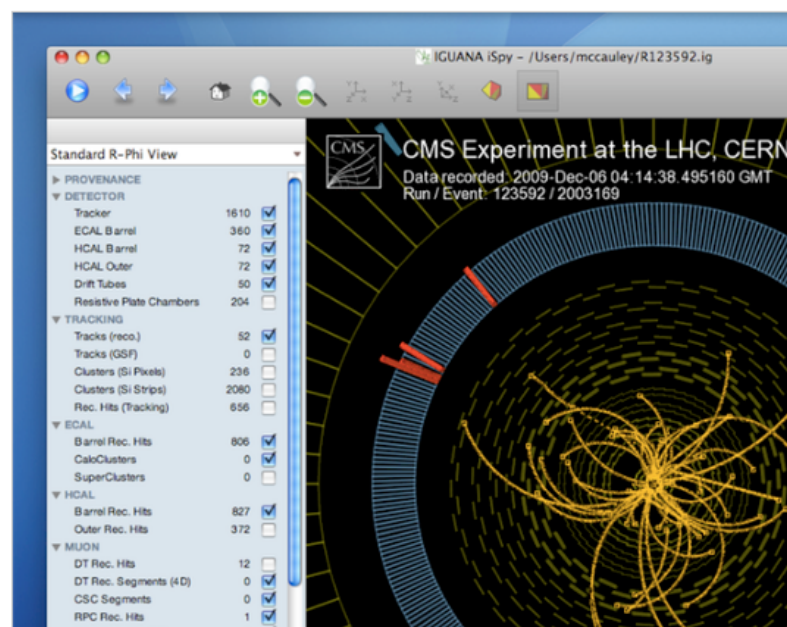
Fig.8: CMS Event Display Programme iSpy





**iSpy** a powerful *and* lightweight CMS event display

Download **iSpy** from this page then double-click to start viewing real or simulated CMS events served from the Web



Features

Download iSpy

Linux (32bit) (Supported...)  
Download version 1.4.5

Linux (64bit) (Supported...)  
Download version 1.4.5

Mac (10.4/10.5/10.6)  
Download version 1.4.5

Windows (XP or Vista)  
Coming soon ...

Release Notes

iSpy will replace the Iguana "classic" event display once the required functionality has been migrated

Support

More about iSpy (FAQ)

hn-cms-visualization@cern.ch

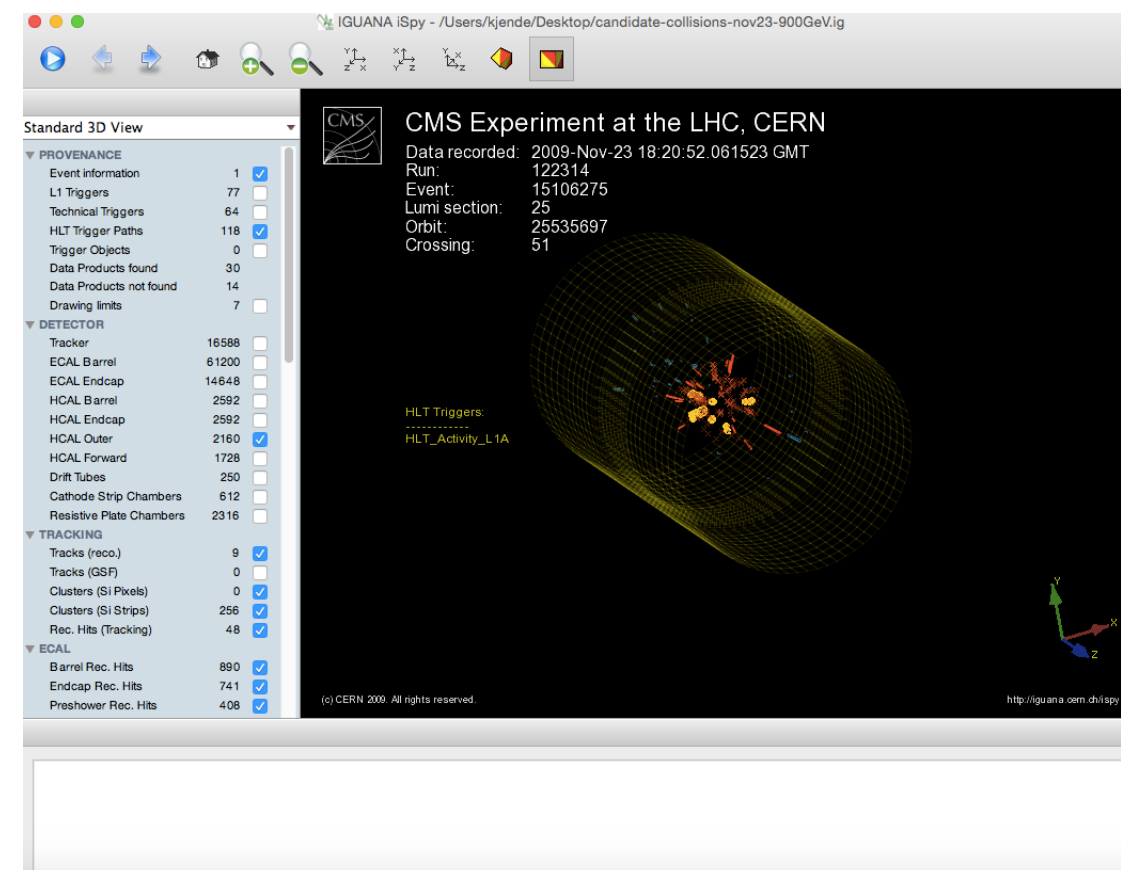


Fig.9: CMS Event Display Programme iSpy

Fig.10: CMS Event Display Programme iSpy

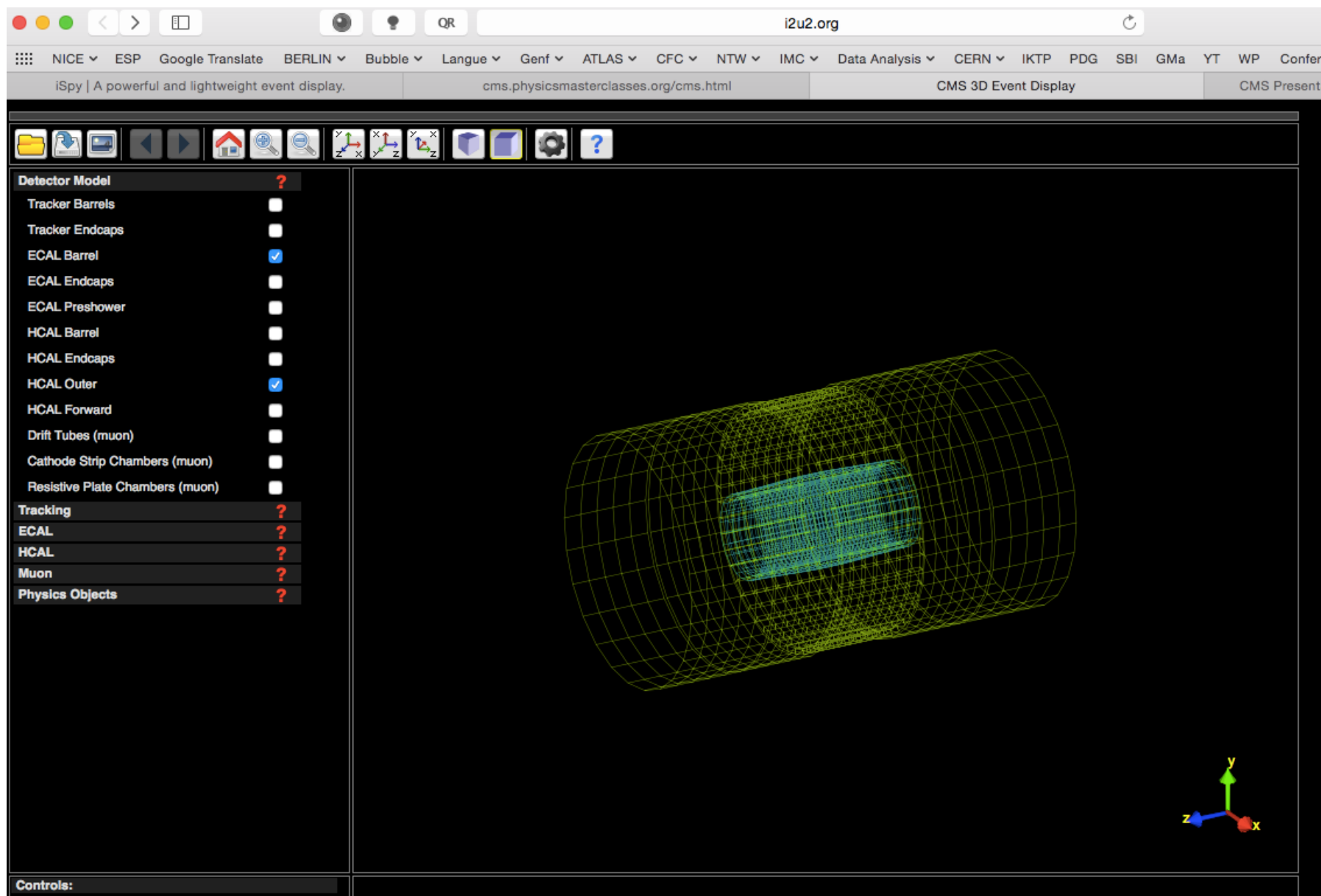


Fig.11: browser-based version of iSpy

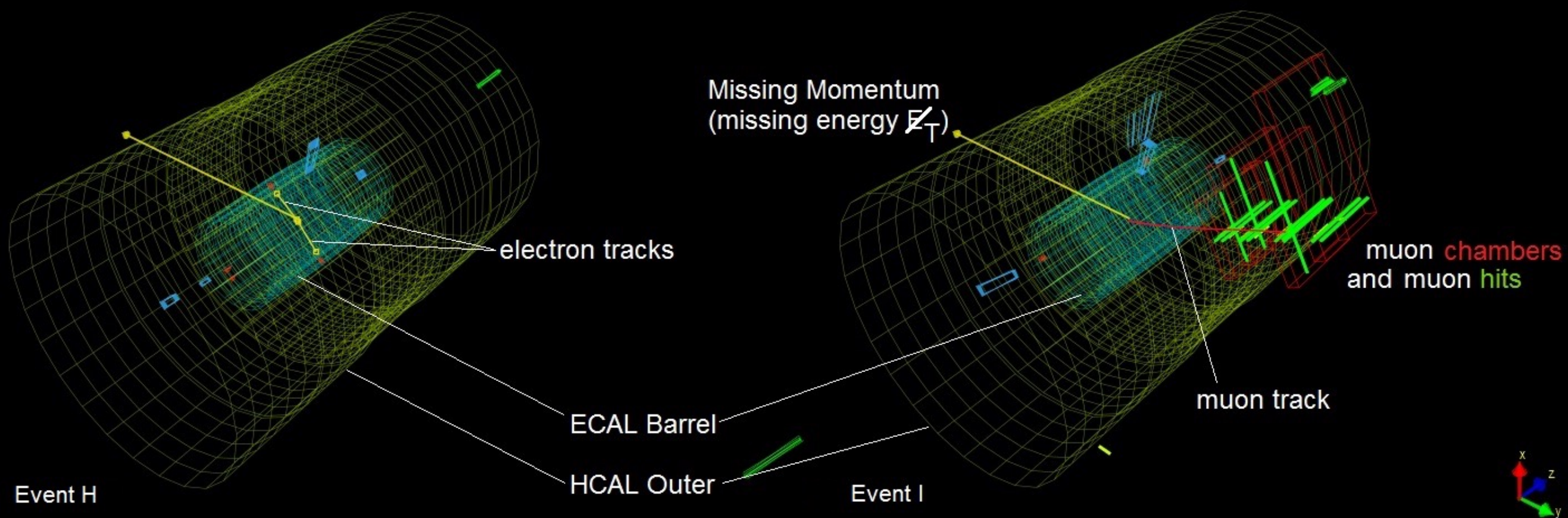


Fig.12: What you can see with iSpy



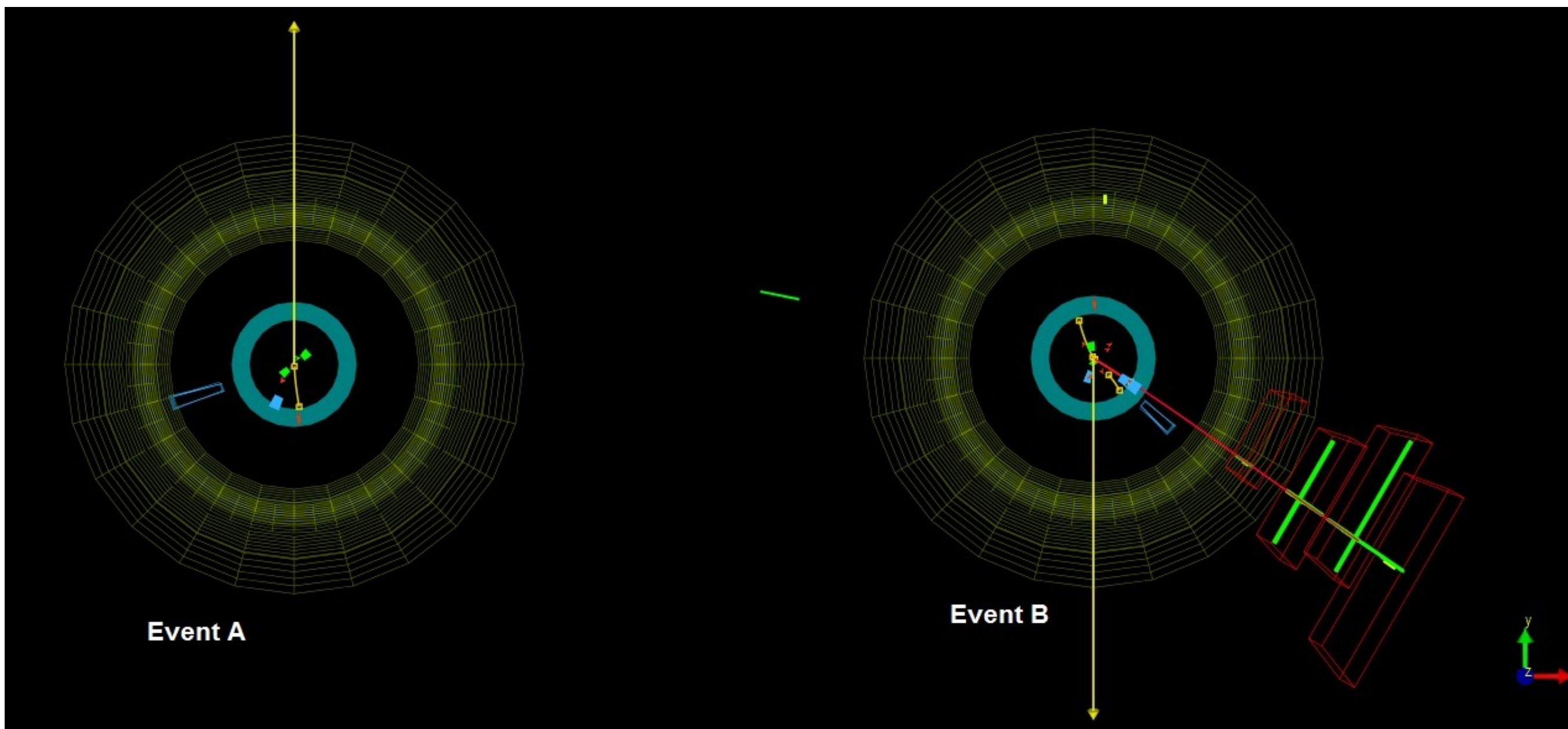


Fig.13: neutrino detection and W particles

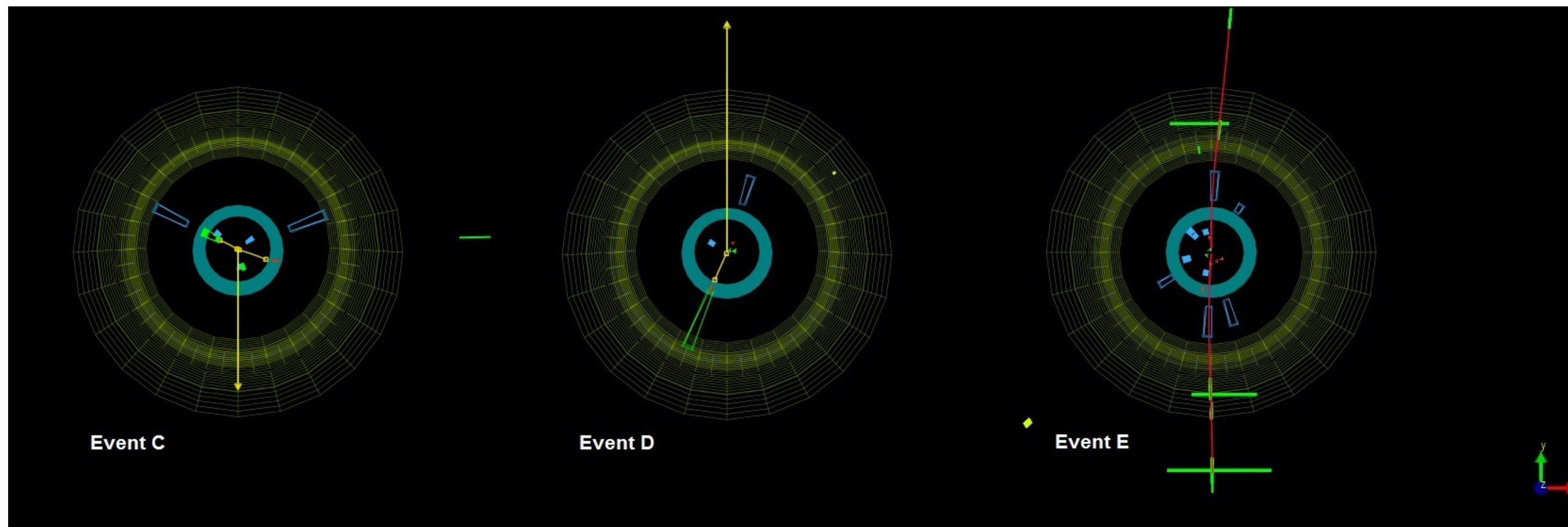


Fig.14: Which event shows the production and decay of a Z boson into a pair of a muon and anti-muon?

1. Start the online event display iSpy
2. Make yourself familiar with the programme
3. Load events
4. Look for particles (electrons, positrons, muons and anti-muons, neutrinos)
5. Look for W, Z and Higgs events