

# EUROPEAN RESEARCHERS' NIGHT STUDENTS ON SHIFT AT CMS



The project is supported by the European Commission and co-ordinated by Frascati Scienza in partnership with the Erasmus MC and CERN

Dave Barney

At the DQM they guys make sure that the data collected is useful and is not trash!

...and they are all working to make this world so that it'll give us a better understanding of how our world works!

# Students in the Control Room

- 24<sup>th</sup> September 2010, from 6pm-1am
- 21 high school students aged between 13 and 17, mostly from local schools, spent two hours each at the CMS Control Room at Cessy, France
  - Very short introduction to CERN, CMS etc. (~15 minutes) – deliberately did not give them much information
  - ~45 minutes “on shift”, shadowing a shifter to ask questions → enquiry-based learning!
    - They were equipped with cameras, video cameras, notepads etc.

# CMS at CERN isn't the



guys make sure that the data collected is useful and is not trash!

all working to make this world so that it'll give us a better understanding of how our world works

Daniel Malby

## 2<sup>nd</sup> activity

- ~1 hour activity
  - Small number of students so \*we\* (CMS) wanted to get something out of this!
    - Produce a poster showing what they had learned
    - Produce content for a special Facebook page  
<http://www.facebook.com/pages/Researchers-Night-at-CMS/162366320442697>
  - Majority of students wished to make posters – even the older ones
  - Produced seven posters, all on display in building 40 at CERN
  - Special edition of CMS Times:  
[http://cms.web.cern.ch/cms/Media/Publications/CMS-times/2010/10\\_04/index.html](http://cms.web.cern.ch/cms/Media/Publications/CMS-times/2010/10_04/index.html)

CMS at CERN isn't the



place  
er if  
mistake  
t is  
d ye  
ver



LHC  
made  
plast  
at C  
the fi  
ronal



Daniel Malynik

guys make sure that the data collected is usable and is not trash!

all working to make this world so that it'll give us a better understanding of how our world works

CMS at CERN isn't the cold scientific place that I would have expected and neither it is the all-accounted for control room; mistakes are made, team work is crucial, it is amazing - a journey into the unknown - and yet people are as friendly as ever!



↑ Noemi track how the CMS sector works



The 27-km LHC is complex, made of steel and plastic and yet those at CMS and other sites fill it with personality!



... and they are all working to make this better work so that it will give us a better understanding of how our world works!

At the DQM these guys make sure that the data collected is usable and is not trash!



Zoltan makes sure everything is safe. Don't Mess With The Zoltan!

Daniel Malynuk



# THE C.M.S



CMS

By: Taliker Weston & Tomohito SHIBATA  
International School of Geneva  
Campus La Châtaignerie

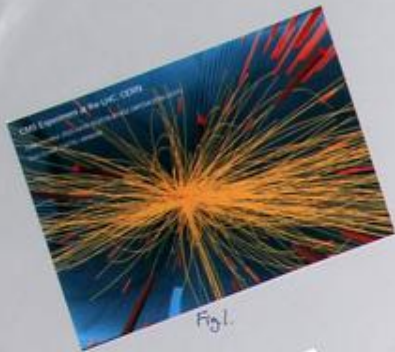
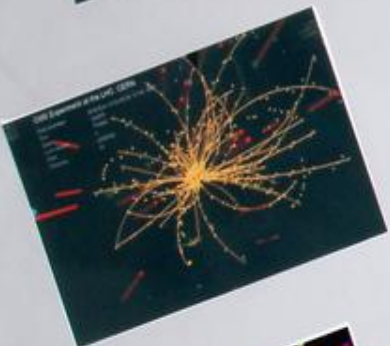
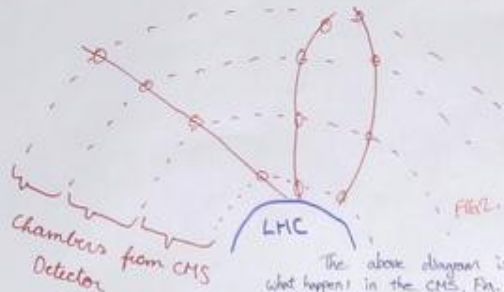


Fig.1



C  
E  
R  
N



The above diagram is a simple illustration of what happens in the CMS. Fig.1 shows the 3D version. Each line represents a particle motion.

Equation in Use

$$r = \frac{P}{0.3B}$$

$P = \text{momentum}$

$B = \text{Magnetic Field Strength}$

$[B \approx 3.8]$

## COMPACT MUON SOLENOID



WHAT IS A MUON? A muon is a heavy version of an electron. Its charge is the same as an electron (-1).

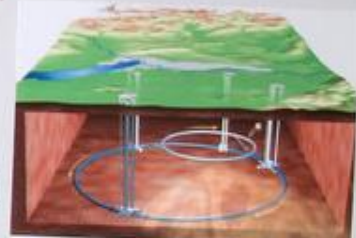
WHAT IS A DAQ? Records all of the data and collects it to a relevant computer. Its real name is "Data acquisition".

## Large Hadron Collider:

Ionized Hydrogen particles (protons) speed along the 27km LHC circuit at 99.9% the speed of light, 11,000 times a second to collide at CMS.

As they collide they split and produce energy and particles which fly into the CMS chamber to be identified by their trajectory (Fig 1 & Fig 2) and the amount they penetrate the CMS chambers. Any unidentified ones can be matched to theories as "new discoveries".

Data storage:  
All CERN's data is stored in a massive warehouse on magnetic tape (as it is cheap + efficient) and all over the world at different sites where it can be analysed.



LHC; Switzerland / France



CMS: what it looks like.



# Summary

- A really excellent night
  - All students were extremely motivated after their 2 hours “on shift”
  - Something simple – the production of posters – was useful on many levels:
    - Overall goal achieved: students more interested in the field of science after their visit
    - The act of writing things down really put the information into the students
    - CMS got some great output – posters, Facebook page, special edition of CMS Times and a YouTube video interview
- <http://www.youtube.com/watch?v=VRnr3BJQyWQ>