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Rainer Schwemmer, CERN-PH / 3 July 2013

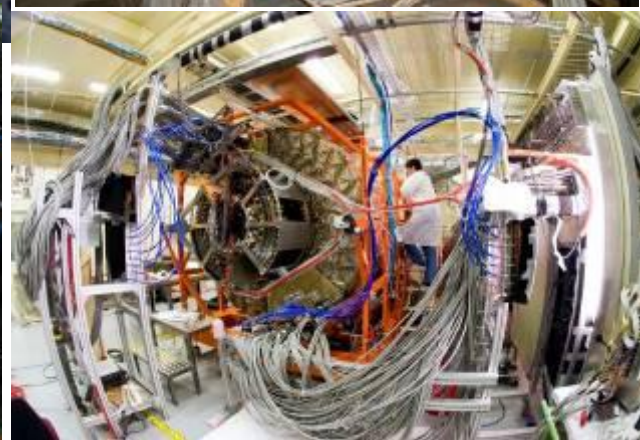
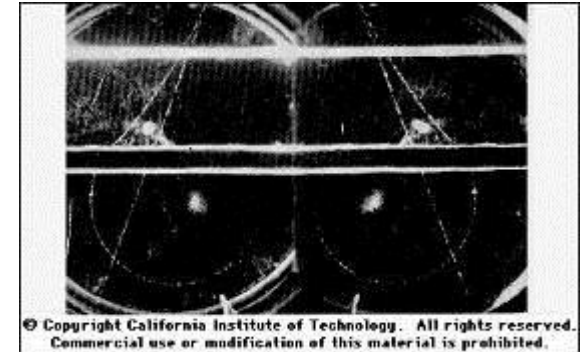
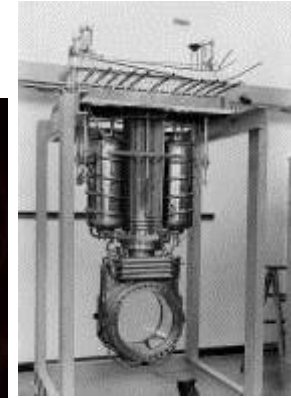
A short introduction to the  
**2013  
Summer  
Student  
Hardware  
Labs**





# The Summer Student Hardware Labs

(even in software and physics!)



With the size of the experimental tools in high energy physics getting larger and more complicated, it is very hard in some short summer months to get a feeling of the different aspects of an experiment.

We would therefore like to invite you into some of our labs and try to show you in a few hours what we are doing there and why we are doing it.



Who are "we" :



Bertrand Bellenot  
Enrico Bonaccorsi  
Thomas Blake  
Carmelo D'Ambrosio  
Marcos Fernandez Garcia  
Benjamin Fuks  
Markus Gabrysch  
Vladimir Gligorov  
Thierry Gys  
Christophe Haen  
Andreas Hoecker  
Sune Jakobsen  
Christian Joram  
Beat Jost

Michael Moll  
Axel Naumann  
Niko Neufeld  
Frederic Rikkert  
Rainer Schwemmer  
Tim Stelzer  
Mick Storr

*As a Menu, we can offer:*

Accelerator Technology

Cloud Chambers

Inorganic Scintillator Detectors

Organic Scintillator Detectors

Gas detectors

Silicon Detectors

Vacuum Photon Detectors

Data Acquisition

Analysis Techniques

High Energy Physics Monte-Carlo Techniques

Root

## Very fast signal detection for TOF experiments

Contact person: [Thierry Gys](#)

Time : afternoon, 14:00 - 17:30

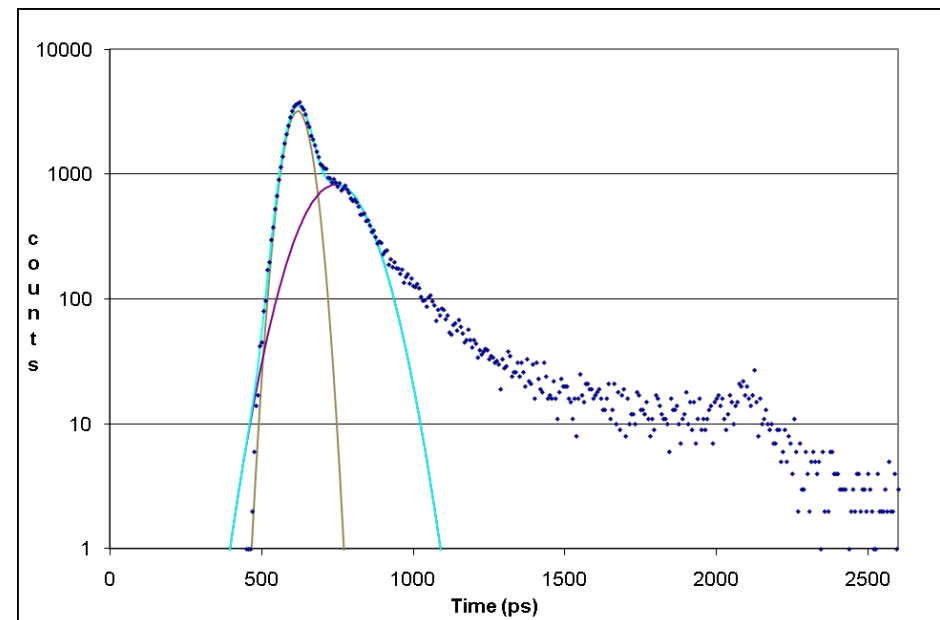
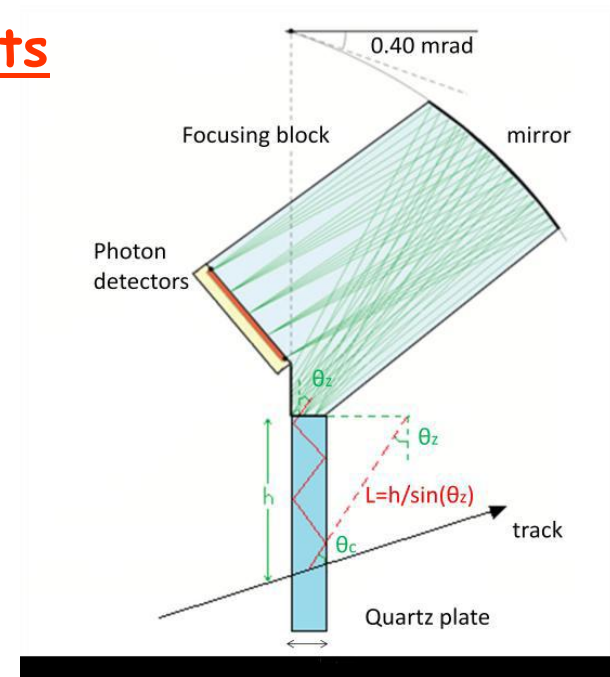
3 groups of 3 students

Dates : 15,16,17 July

Place : 16-1-047

Please note that high voltages are present on the set-up.

To allow Time-Of-Flight experiments to measure in the  $GeV/c$  momentum range, over  $\sim 10$  metres distances, the time resolutions of such detectors have to exceed the  $\sim 10$  ps barrier per measured track. You will be able to detect with a vacuum photo-detector, containing a Micro-Channel-Plate, time resolutions of the order of 50 ps per photon!



## X- and Gamma- rays detection with a Hybrid Photon Detector

Contact person: Carmelo D'Ambrosio

Requirements: dosimeter

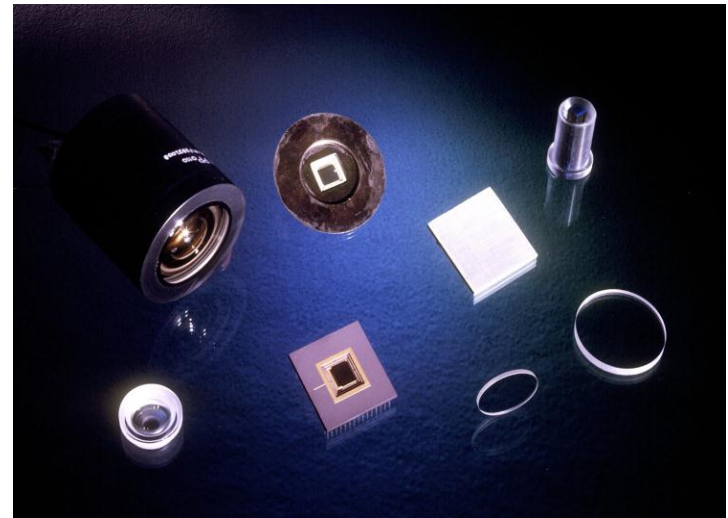
Time : afternoon, 14:00 - 17:30

3 groups of 3 students

Dates : 6, 7 and 8 August

Place : 29-1-021

Please note that gamma sources and high voltages are present on the set-up.



New Scintillating Crystals are being developed for bio-medical applications, which were first developed for high energy physics or material science. With a new generation of photodetectors being made available for the same applications (HPDs, APDs, SDCs, etc.), these gamma detectors (crystal + photodetector) represent an important contribution in the evolution of instrumentation for physics and non-physics applications.



## Characterization of a particle detector using cosmic particles

(it is the 101<sup>st</sup> anniversary of cosmic detection)

Contact Persons :

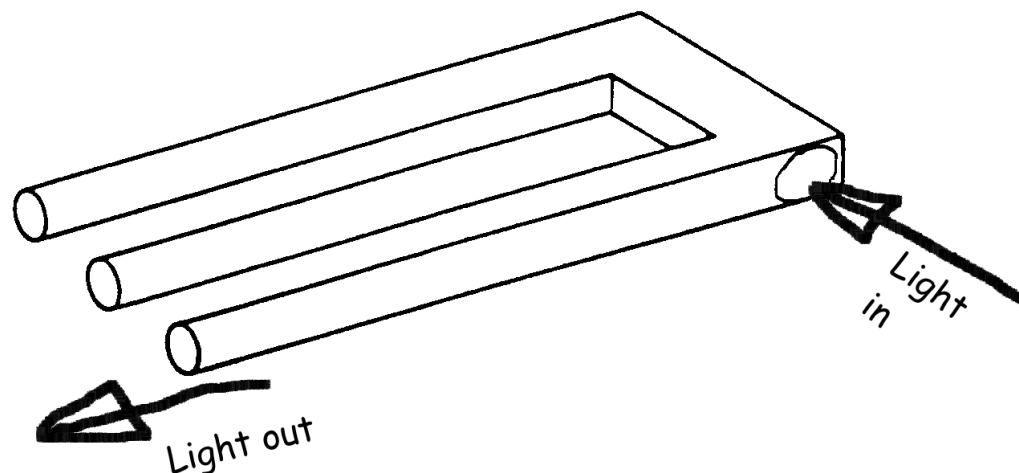
Sune Jakobsen and Christian Joram

3 afternoons with 3 students.

When: To be announced

Where: Meeting room: 3-R-020.

What: Hands-on experience with photomultipliers, oscilloscopes, scintillators, light guides, wavelength shifters and monochromators.



CERN photo CERN-EX-9201043

End part of the scintillating fibre detector of the CHORUS experiment. There are 1 million fibres and each fibre has a diameter of 500 .micron.m.

## Characterization of irradiated silicon sensors.

Contacts: [Michael Moll](#), [Markus Gabrysch](#), [Marcos Fernandez Garcia](#)

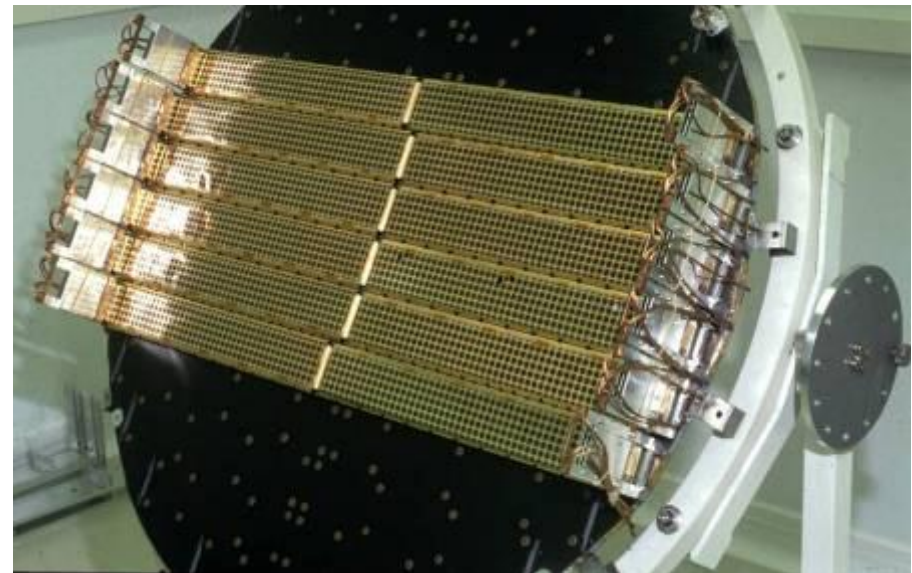
3 afternoons with 3 students.

When: 31 Jul. 7, 14 Aug. at 14:00

+ common visit to the Si facility, 21<sup>st</sup> of August  
contact: Alan Honma, Ian McGill

Where: Meeting room: 28-2-017

What: We will investigate how radiation damage is influencing the silicon tracking detectors in the LHC experiments. The following properties of irradiated and non-irradiated silicon detectors will be measured: Reverse current, detector capacitance, depletion voltage and charge collection efficiency. This will give you an impression on how much detectors in the LHC will suffer from radiation damage. In a concluding discussion we will look at some possibilities on how to make detectors radiation harder.





## Data Acquisition (and fun with bits lost and found).

Contact persons:

Niko Neufeld, Enrico Bonaccorsi, Christophe Haen

Requirements: Some basic programming experiences would be good - but that should not deter anyone.

4 sessions with 4 students

Time : one afternoon, 14:00 – 17:00

Dates : 22, 23, 25, 26 July

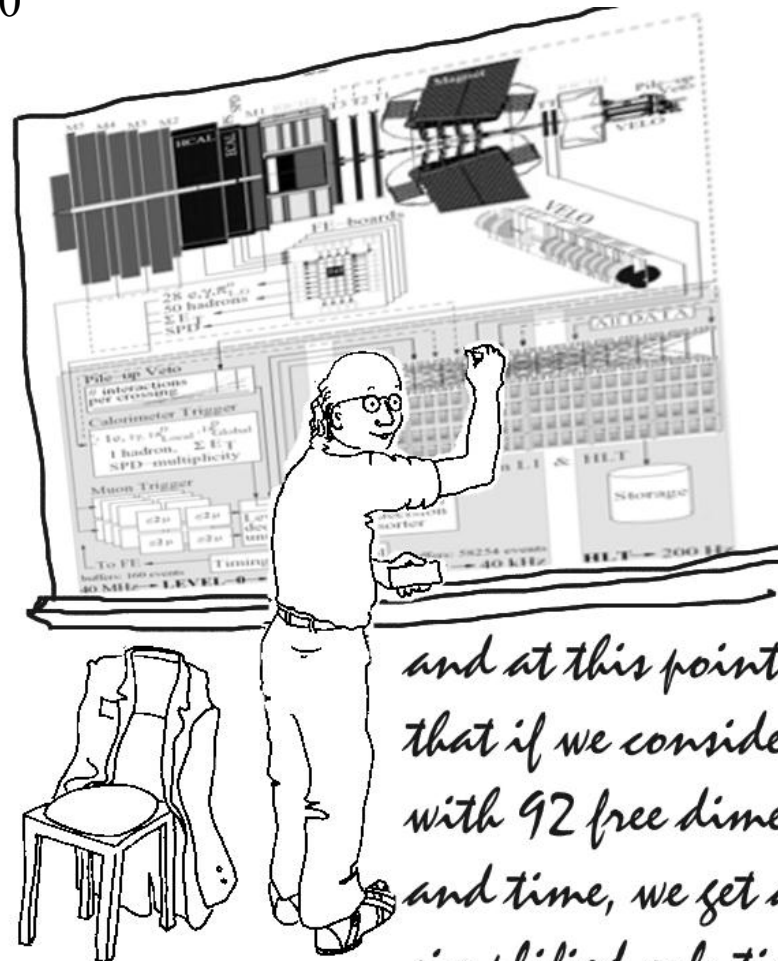
Place : Point 8

**Meeting at 13:45 in 2-R-022**

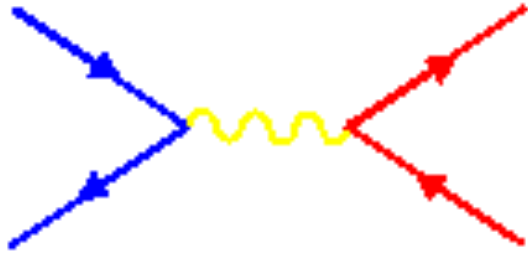
(transport arranged via email to Niko)

Real data acquisition at 1 MHz.  
Follow the data through LHCb  
and try not to lose a single bit!  
From the front-end  
electronics, through the  
readout boards, the network,  
the farm to tape - and not  
back.

Includes a tour of the LHCb Experiment



*and at this point we notice  
that if we consider the trigger  
with 92 free dimensions in space  
and time, we get a beautifully  
simplified solution!*



# MadGraph

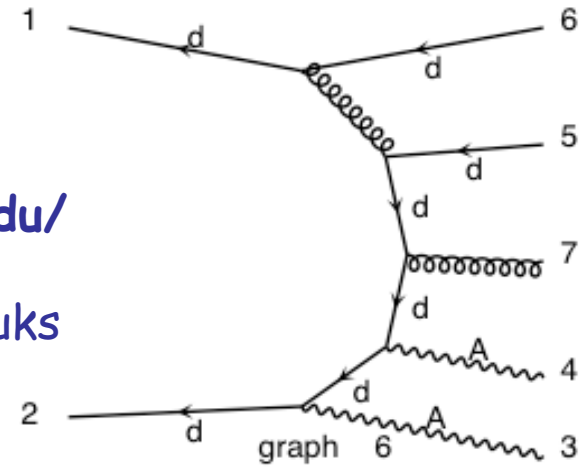
<http://madgraph.hep.uiuc.edu/>

Contact Persons: Frederix Rikkert, Benjamin Fuks

3 afternoons with up to 18 students each time.

Training Centre (bgs. 572), rooms 24 and 25, at 14:00.

29, 30 and 31 July.

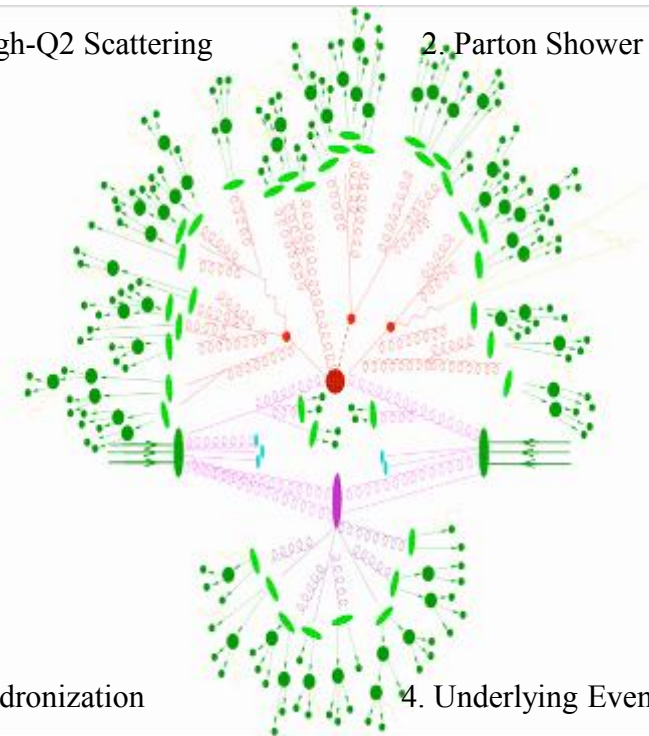


In this workshop we will

- 1) Discuss the various aspects of a hard-hadronic collision using a FLASH simulation.
- 2) Develop cutting edge Monte Carlo techniques necessary for simulating these collisions.
- 3) Use MadEvent's new web-based capabilities to produce event simulations for processes important to LHC physics.

1. High-Q<sup>2</sup> Scattering

2. Parton Shower



3. Hadronization

4. Underlying Event

# Root

Contact Persons: Axel Naumann and Bertrand Bellenot

2 afternoons with up to 60 students each time.

Building 513/1-024, at 14:00.

9, 10 and 11 July.

You must bring your own laptop! You should install ROOT 4.34/08 from:  
<http://root.cern.ch/drupal/content/development-version-52704>)

# Cloud Chamber

Contact Persons:

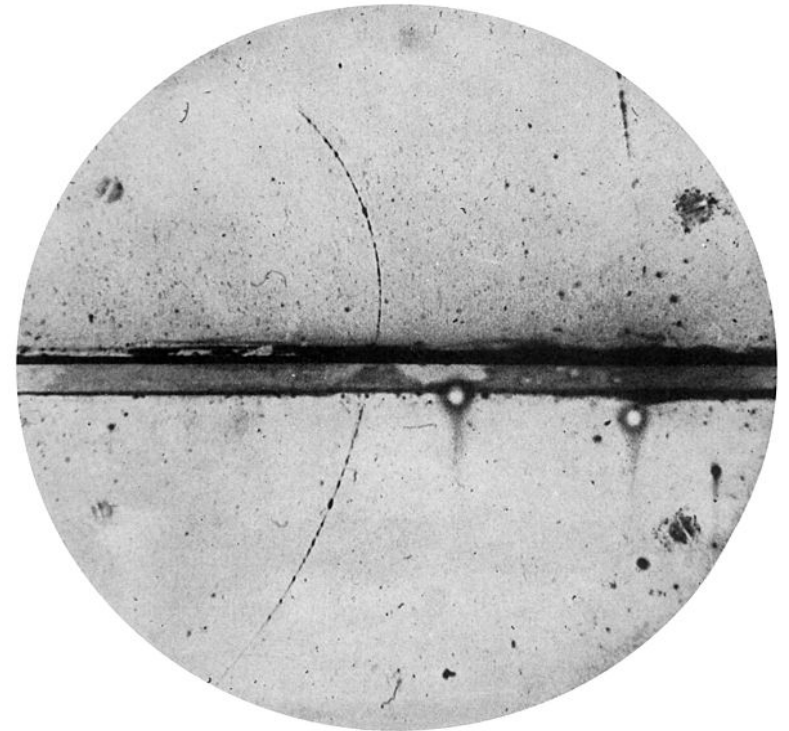
Mike Storr

8 groups of 24 students

Building 6

30. Jul, 6, 15, 20 August

14:00 and 16:00



# LHCb Master Classes

Contact Persons:

Vladimir Gligorov, Thomas Blake

3 afternoons with 20 students each time.

Location: TBA

6, 7 and 8 August 13:30 – 17:00

Measurement of the  $D^0$  meson lifetime using data collected by the LHCb detector.

You will learn how to separate signal from background, how to extract signal distributions using background subtraction, and how to test for systematic uncertainties.

# What you have to do:

**T/** Do what **Sharon and Eva** will tell you to do by e-mail and, remember, **dates** are not completely fixed!



Try not to forget your **rendez-vous...**



**Have fun!**

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