



A short introduction to the

2018 Summer Student Labs

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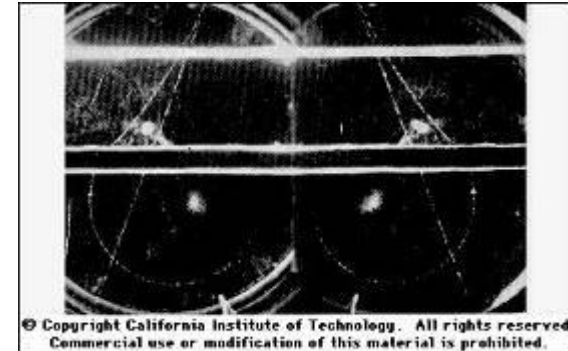
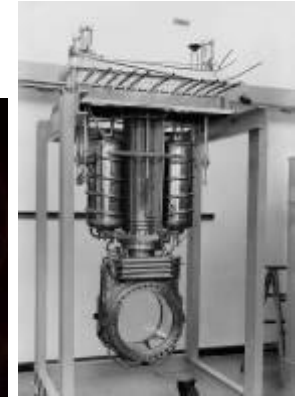
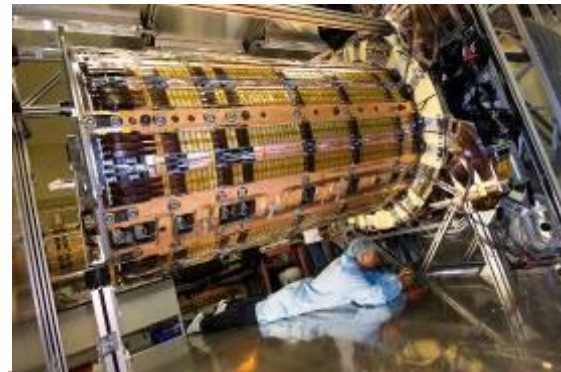


Rainer Schwemmer, CERN-EP/ 26 June 2018

Rainer Schwemmer, EP
Department - Summerstudent
Labs 2018



The Summer Student (Hardware) Labs



Rainer Schwemmer, EP Department - Summerstudent Labs 2018

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.



As a Menu, we can offer:

ROOT

Working with a beam—line in the North Area (“make your own Higgs and save a bundle”)

Cloud chamber

CERN Box – the CERN sync and share cloud storage

Data Acquisition and Trigger

Characterisation of scintillating fibres

Characterization of a simple particle detector using cosmic particles

MadGraph

Silicon Sensors

Characterization of Silicon Photomultipliers

Web-application security

<http://hr-dep.web.cern.ch/content/summer-students-workshops>

Root

Contact Persons: Danilo Piparo

28/6 5/7 14:00-17:00 Room 593-R-10/ 11



Root version 6.06/04 (in case you want to bring your own install)

You must bring your own laptop!

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

Contact persons:

Tommaso Colombo, Flavio Pisani, Niko Neufeld

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

4 sessions with 4 students

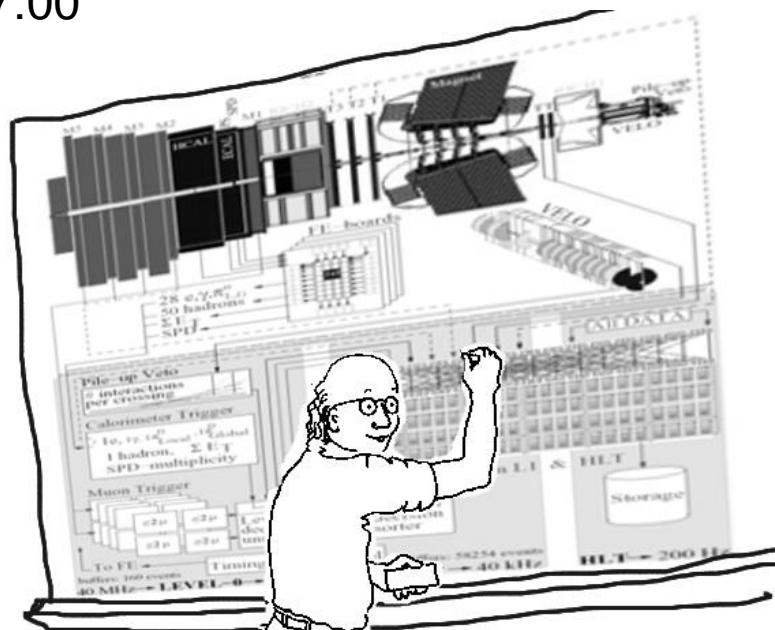
Time : one afternoon, 13:45 – 17:00

Dates : 25, 26, 27, 28 July

Place : Point 8

Meeting at 13:45 in 2-R-002

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.



*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!*

Characterization of a particle detector using cosmic particles

Contact Persons :

Sune Jakobsen

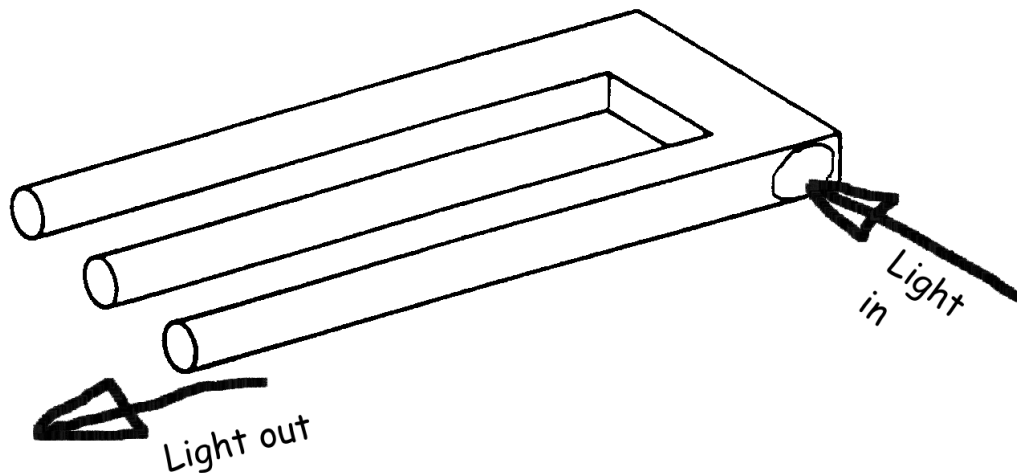
3 afternoons with 3 students.

When: TBC – check the web-site / watch out for mail

Where: Meeting room: 3-R-022.

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

- measure the photodetection efficiency (PDE) of a silicon photomultiplier (SiPM)



CERN photo CERN-EX-9201043

End part of the scintillating fibre detector of the CHORUS experiment. There are 1 million 7 fibres and each fibre has a diameter of 500 .micron.m.

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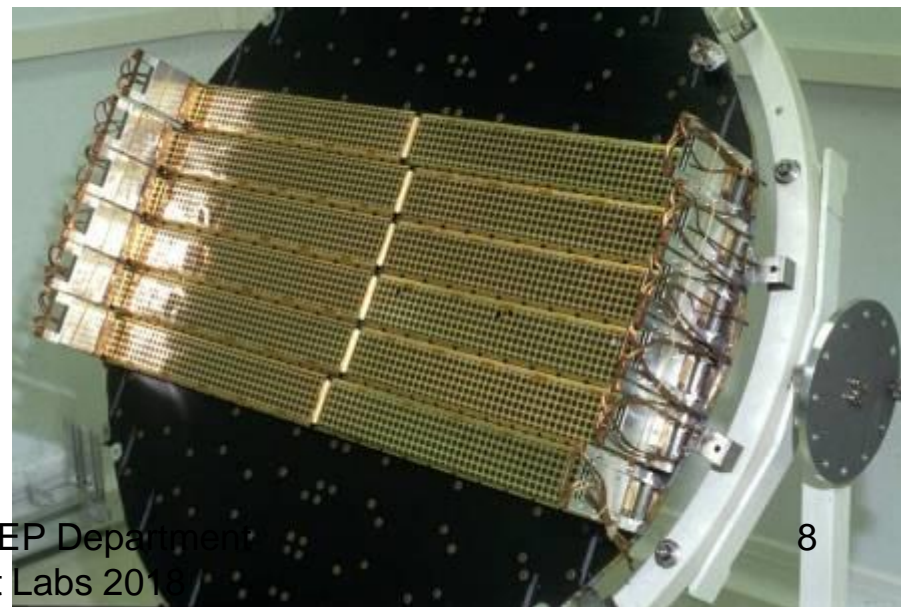
Characterization of silicon sensors.

Contacts: [Michael Moll](#), Christian Gallrap, Hannes Neugebauer, [Marcos Fernandez Garcia](#)

3 afternoons with 3 students.

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.



Web application security penetration testing

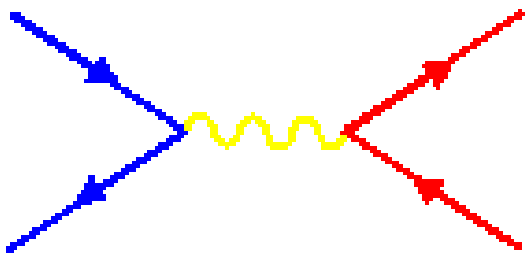


Become a White Hat hacker 😊

Where: 513-1-024
When: July 18 and August 1
Who: Sebastian Lopienski

Bring your own laptop!!





MadGraph

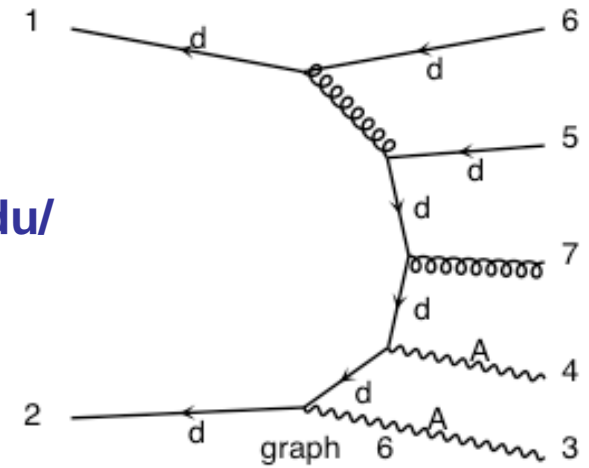
<http://madgraph.hep.uiuc.edu/>

Contact Persons: F. Maltoni, Olivier Mattelaer

3 afternoons with up to 18 students each time.

Where: TBC

When: TBC – watch out for mail



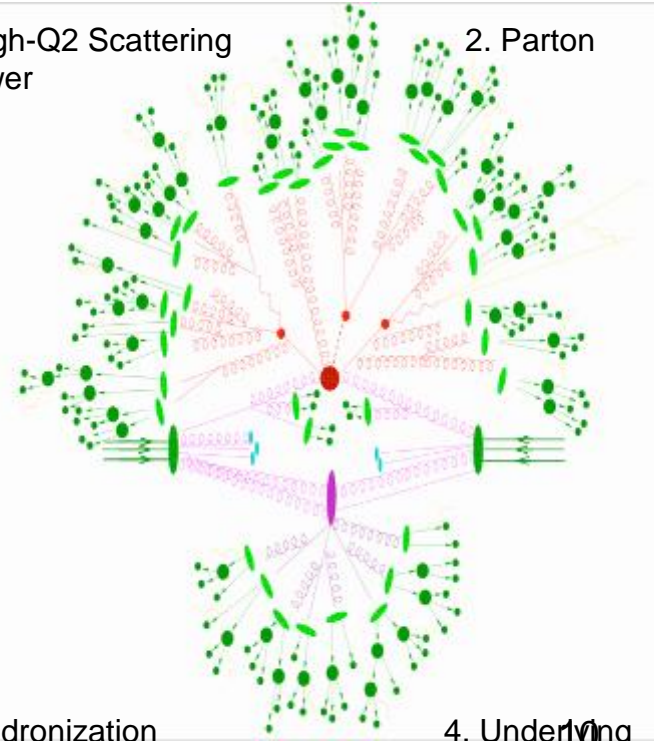
In this workshop we will

- 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.

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1. High-Q² Scattering
Shower

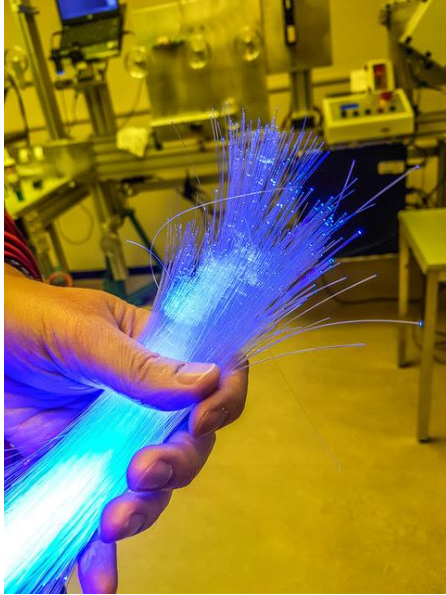
2. Parton
Shower



3. Hadronization
Event

4. Underlying
Event

Characterisation of scintillating fibres



- Measure the attenuation length of a scintillating fibre
- Measure emission spectrum of a scintillating fibre and the wavelength dependence of the attenuation length
- Demonstration of Scintillation Light Yield measurement with a SiPM
- Visit of scanner for fibre diameter and cladding quality

Contact: Lukas Gruber

Date and time:

Total students: 9 students – 3 groups of 3 students

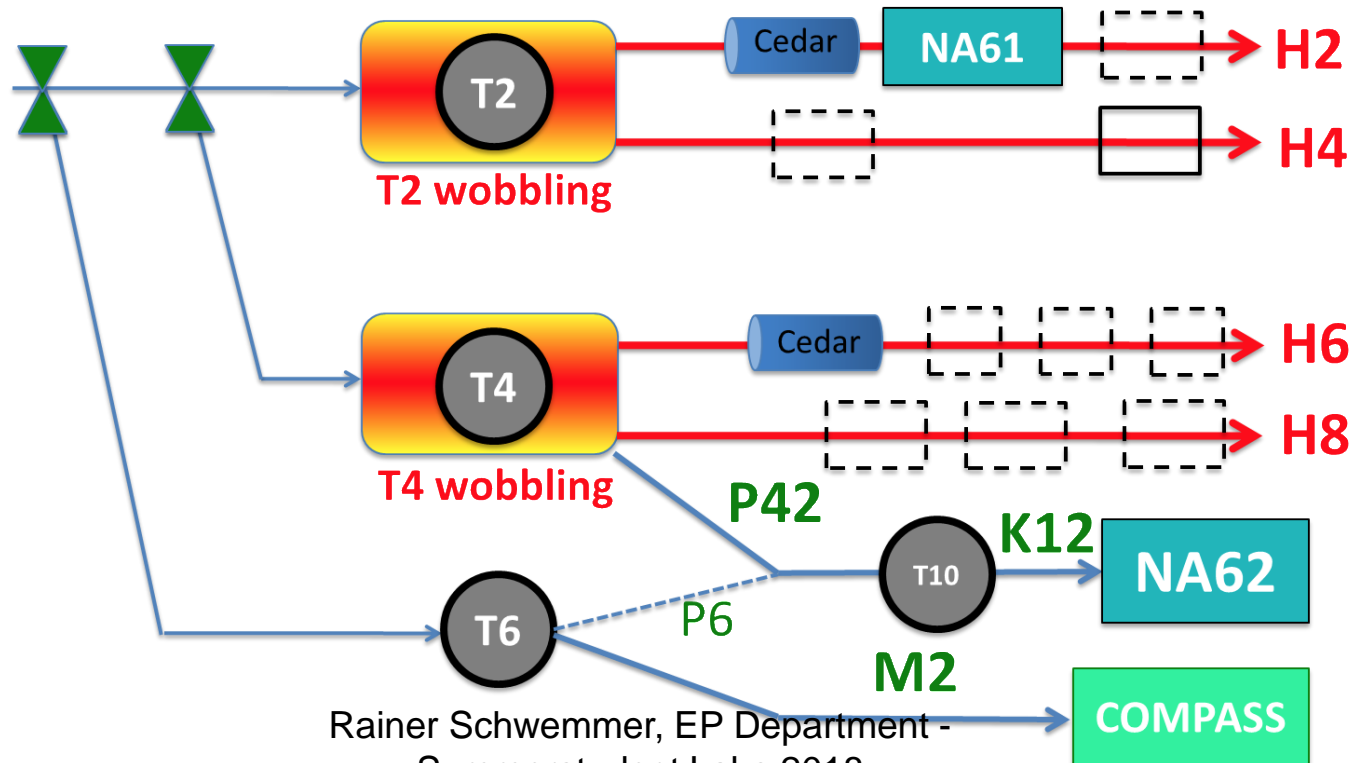
Location: 304/1-004



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Working with a beam line in the North Area

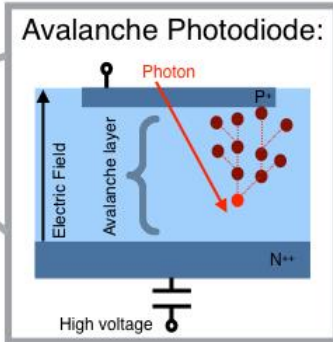
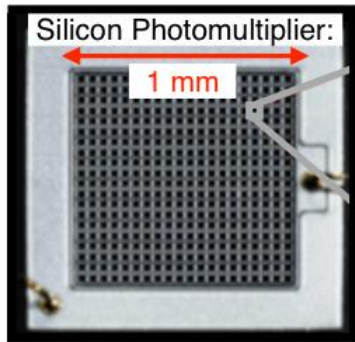
- When: TBC
- Where: CCC Preveessin
- Contact person: Lau Gatignon



Silicon Photon Multipliers

Characterisation of Silicon Photomultipliers

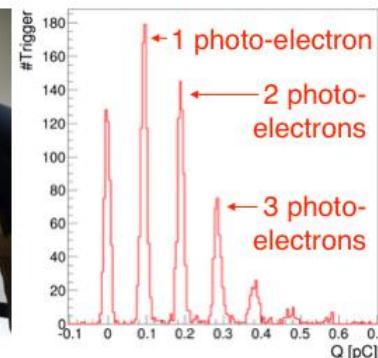
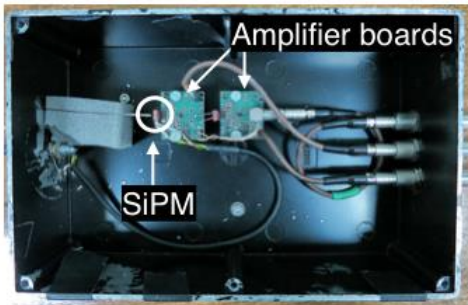
Silicon Photomultipliers (SiPMs) are in parallel connected Avalanche Photodiodes (APDs):



- Photon absorbed in the high-field layer of an APD creates avalanche:
 - Very high gain of $\sim 10^5$
 - Can measure single photons
- Readout signal of APD array proportional to number of incident photons:
 - Can use device to measure energy in a sandwich calorimeter

Where: 21-1-065
When: TBC
Contact: Dominik Dannheim
3 x 4 students

High gain of SiPMs allows to measure discrete photo-electron spectrum (quantum effect) with this macroscopic device:



Students get the opportunity to understand & measure the basic properties of SiPMs such as the gain, using the single photoelectron spectrum

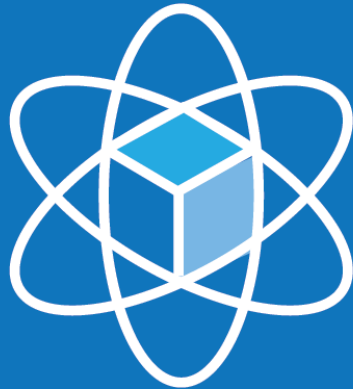
Running Cloud services at large scale: the CERNbox

Where: IT Auditorium

When: 13/7 10/8

Who: Luca Mascetti and team

Bring your own laptop!!



CERNBox

What you have to do:

① Check and decide which are interesting for you:
<http://hr-dep.web.cern.ch/content/summer-students-workshops>

- 1) You will get by email the link for registration - **first come first served!**
- 2) If you were able to register successfully you will also receive a confirmation email from the Summer Student Team

③

Have fun!

②

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

