

# Outreach Activities in Switzerland

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**G. Dissertori**

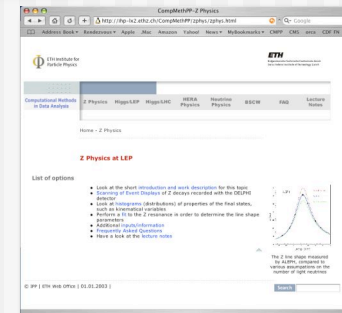
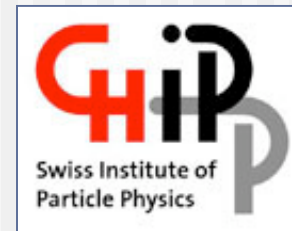
ETH Zürich



**EPOG meeting,**  
Valencia, April 2005

# Contents

- CHIPP
- Activities
  - General list
- The project IPEP at ETH
- School visits at ETH
- SJF-activity in 2005



# Presentation of CHIPP

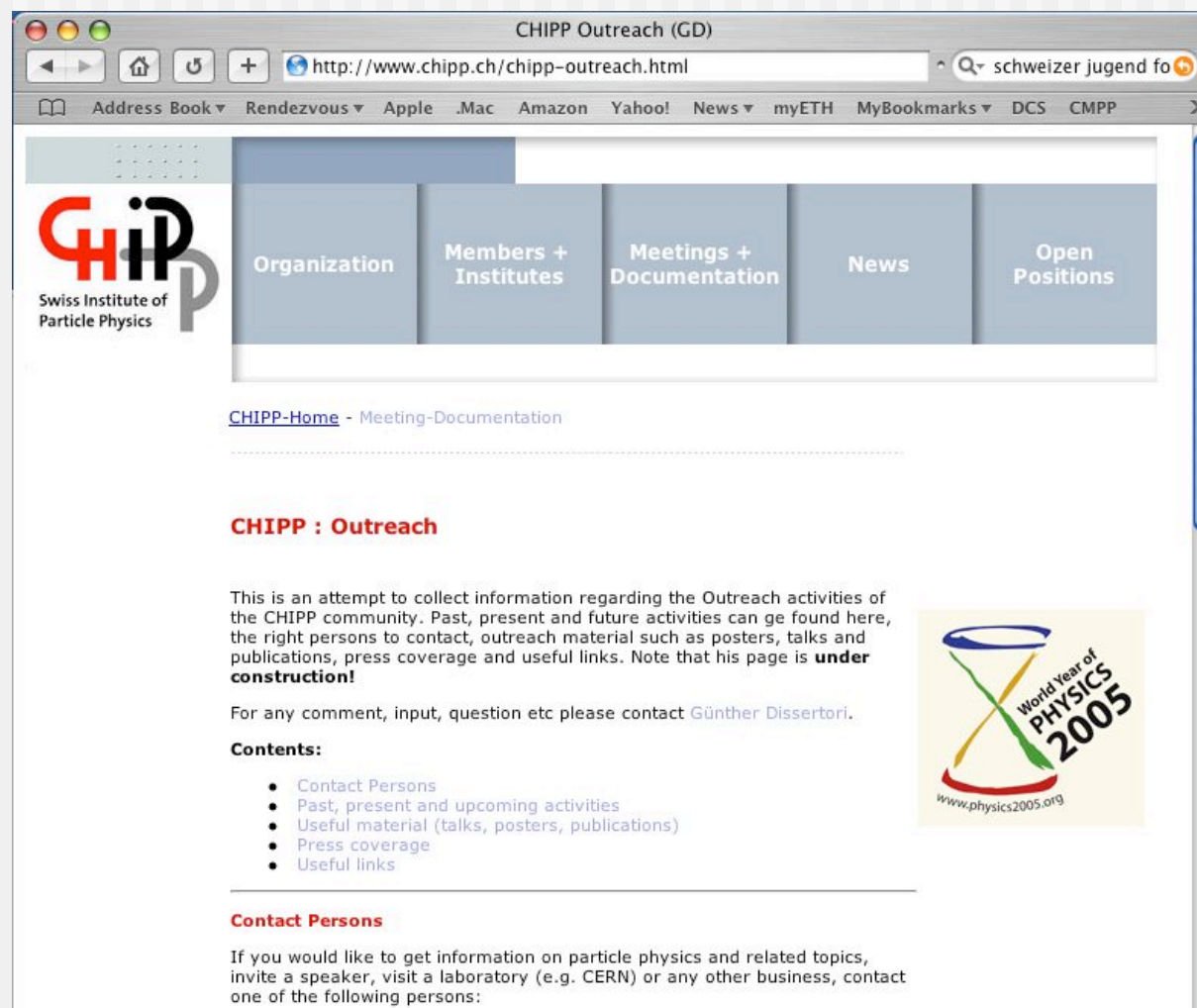
- CHIPP is the **Swiss Institute of Particle Physics**
  - Coordinates activities of Swiss Institutes in Particle, Astroparticle and Nuclear Physics research and teaching
  - Recognized link between these communities and federal, cantonal and academic authorities



[www.chipp.ch](http://www.chipp.ch)

# CHIPP - Outreach

- Recently appointed coordinator : G. Dissertori
- Web page under construct.



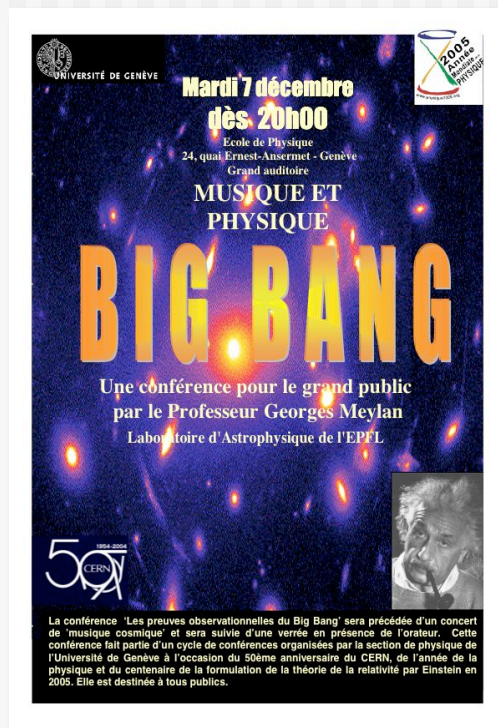
# Activities - General

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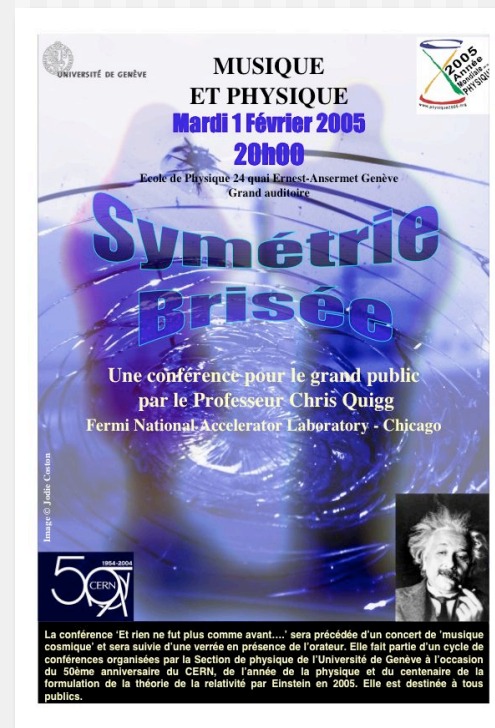
- Seminars for general public
- Radio interviews
- TV coverage : eg. reports on the Swiss Science programme MTW
- Newspaper articles
- Contacts to / Workshops with teachers
- School visits
  - at the Universities or at CERN

# Activities - Geneva Univ.

- Recently started : series of “Conferences grands publics” (evening seminars, open to general public)
- <http://www.unige.ch/sciences/physique/index.cgi?http://www.unige.ch/sciences/physique/conferences.html>



G. Dissertori



EPOG, Valencia, April 2005



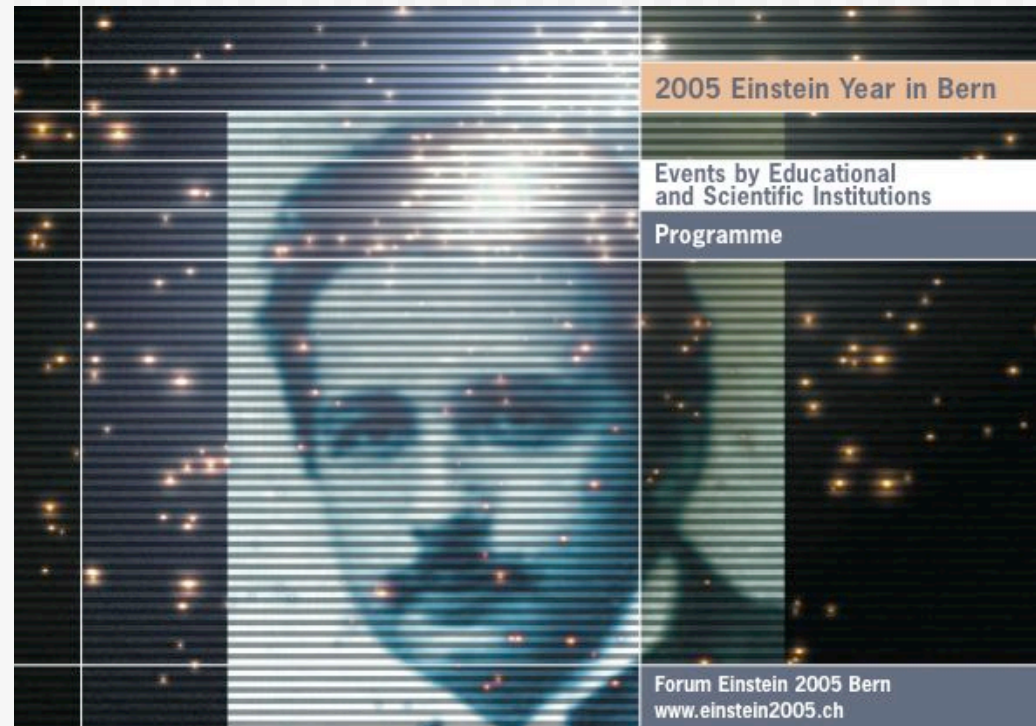
# Activities - Geneva ....

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- **This fall : University of children**
  - 150 school children (10-12), one week at the University
  - Lectures on physics (at their level), have to prepare the scientific file (and some gadgets!) for Jules Verne (who died 100 years ago in 1905!) to write his next novel.
  
- One day for **high school teachers** per year
  - In the context of 'formation continue'
  - Jan 2006 : Cosmology, organized by N. Gisin.

# Activities - Bern Univ.

- Many activities in Bern this year, because of annus mirabilis
- Symposia, EPS meeting, SPS meeting, exhibitions, ....
- See [www.einstein2005.ch](http://www.einstein2005.ch)





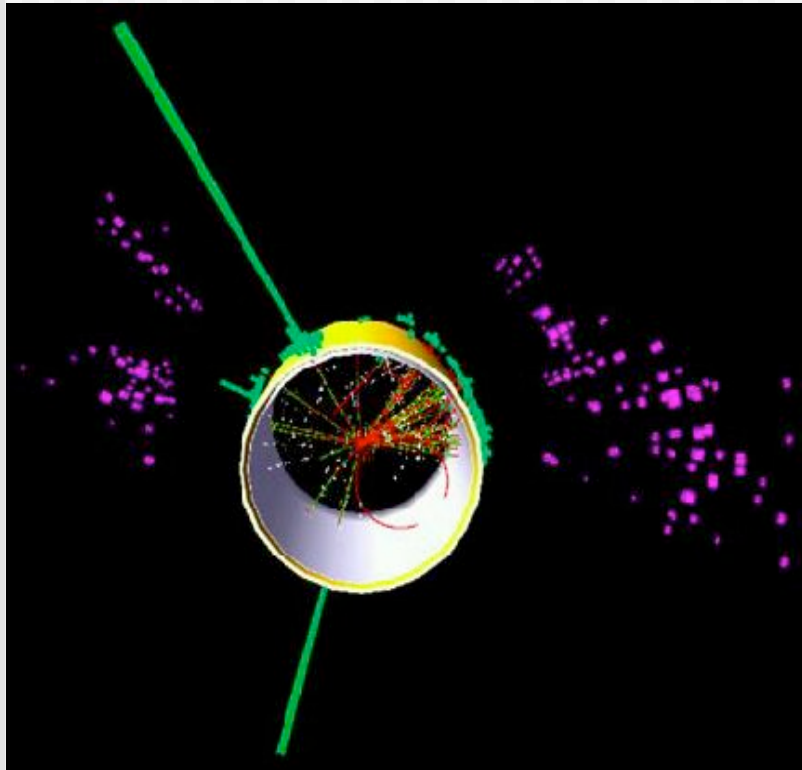
# Activities at ETH Zurich

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- Institute for Particle Physics
  - IPEP :  
Interactive Physics and Education Project
  - Recent Visits of **School children**
  - **ETH en route** : Cosmic ray detector **CORACU**
  - **150 Years** of ETH Zurich:  
Professors downtown...

# IPEP

(Interactive Physics and Education Project)



## ■ Objectives:

Students shall get their first hands-on experience with modern analysis methods using real data from particle physics experiments

**Key word:**

**Research-Oriented Teaching**

Project proposed by Prof. F. Pauss

Project realized by Prof. G. Dissertori, Dr. Ch. Grab, Dr. A. Holzner

# General Problem

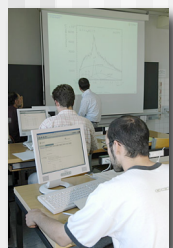
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- data from different experiments
- which use different analysis tools/software
- don't want the students to learn all this software (too time consuming)
- they should concentrate on physics content



Need generic interface

# The IPEP Web-Tool



- <http://ihp-ix2.ethz.ch/CompMethPP>

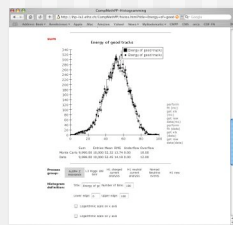
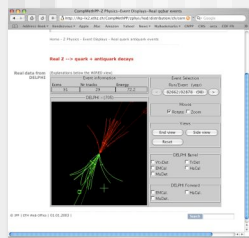
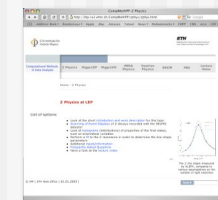
- **Web-Site:** Introductions, instructions, links

- **Event Displays**

- Study visually/graphically outcome of particle reactions
- Gain a feeling for later analysis strategies

- **Histogram Tool**

- Generate and analyse/interpret statistical distributions of observables



CompMethPP-Histogramming

http://ihp-ix2.ethz.ch/CompMethPP/histos.html

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## Histogramming

Make your selection of what to plot

With the Web form below, you can:

- Choose a physics topic to be studied
- Choose a variable to be histogrammed
- Make an SQL query, i.e. apply selection criteria
- Get the histogram from one or more databases, for example, from data and Monte Carlo, or several different Monte Carlo files

Look at the following [info](#):

- Examples of SQL queries
- Further Information on
  - Z Physics
  - Higgs/LEP
  - Higgs/LHC
  - HERA Physics
  - Neutrino Physics

**Example** of dealing with Web form (overview)

**Process group:**

ALEPH Z resonance	L3 Higgs 189 GeV	H1 charged current analysis	H1 neutral current analysis	Nomad Neutrino events	H1 new
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**Histogram definition:**

Title:  Number of Bins:

Lower edge:  Upper edge:

Logarithmic scale on x axis

Logarithmic scale on y axis

**Expression to plot:**  [Help on expression syntax](#)

**Cut:**  [Help on cut syntax](#)

[Show / Edit my aliases](#) [Help on aliases](#)

**Number of events to plot:**

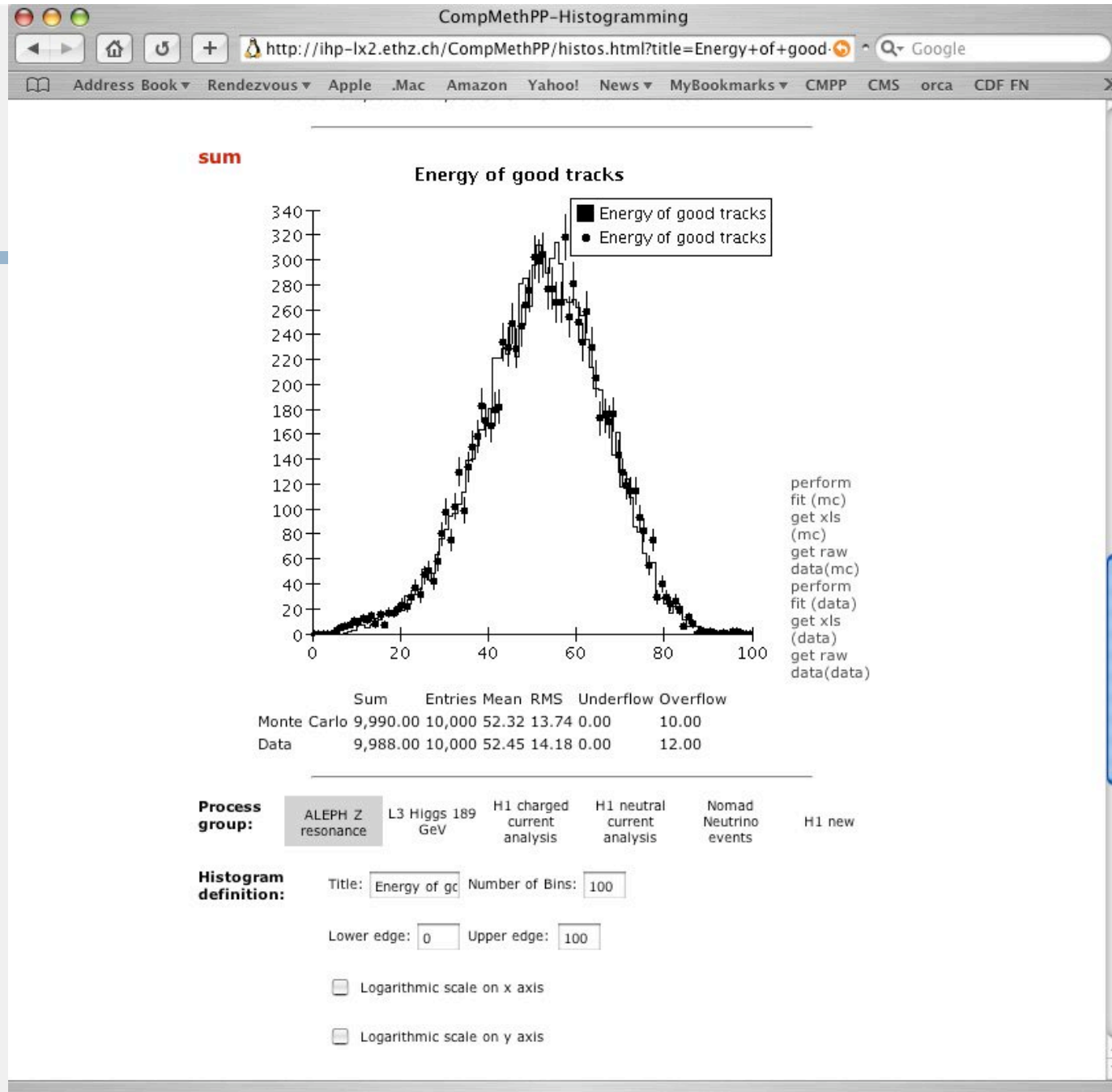
**Description of Variable:**

[Show selection history](#)

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**Process list**

<b>Process 1</b>	<input type="text" value="data 91.2 GeV"/>	event weight: <input type="text"/>	<input type="checkbox"/> hide
<b>Process 2</b>	<input type="text" value="e+e-"/>	event weight: <input type="text"/>	<input type="checkbox"/> hide



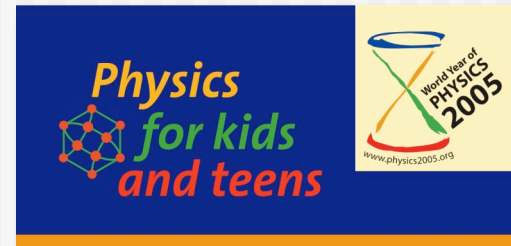
# Project Status

- Web-tool used in **course**
  - In the fourth year now
  - Very successful
  - Will continue, incorporating further physics topics
  - Requests/interests from other Universities (Pisa, Florence)
  
- Use at **high schools** (adapted content/didactics)
  - <http://ihp-ix2.ethz.ch/CompMethPP/outreach>
    - For teachers and/or students
    - Got first experience
      - Workshops with teachers, one “Matura-Arbeit”
      - Successful first test-run with High School students
      - Interest expressed by teachers’ programme at CERN
  
- **Outreach** : adapt to the larger public
  - No experience yet...



# Visits of school children at ETH Zurich

- Mid-March
- Age : 7 - 12



- Among many others, prepared two particle physics specific activities:
  - “scattering experiment” : a game
  - “Rain detector” : experience basic functional principles of a particle detector



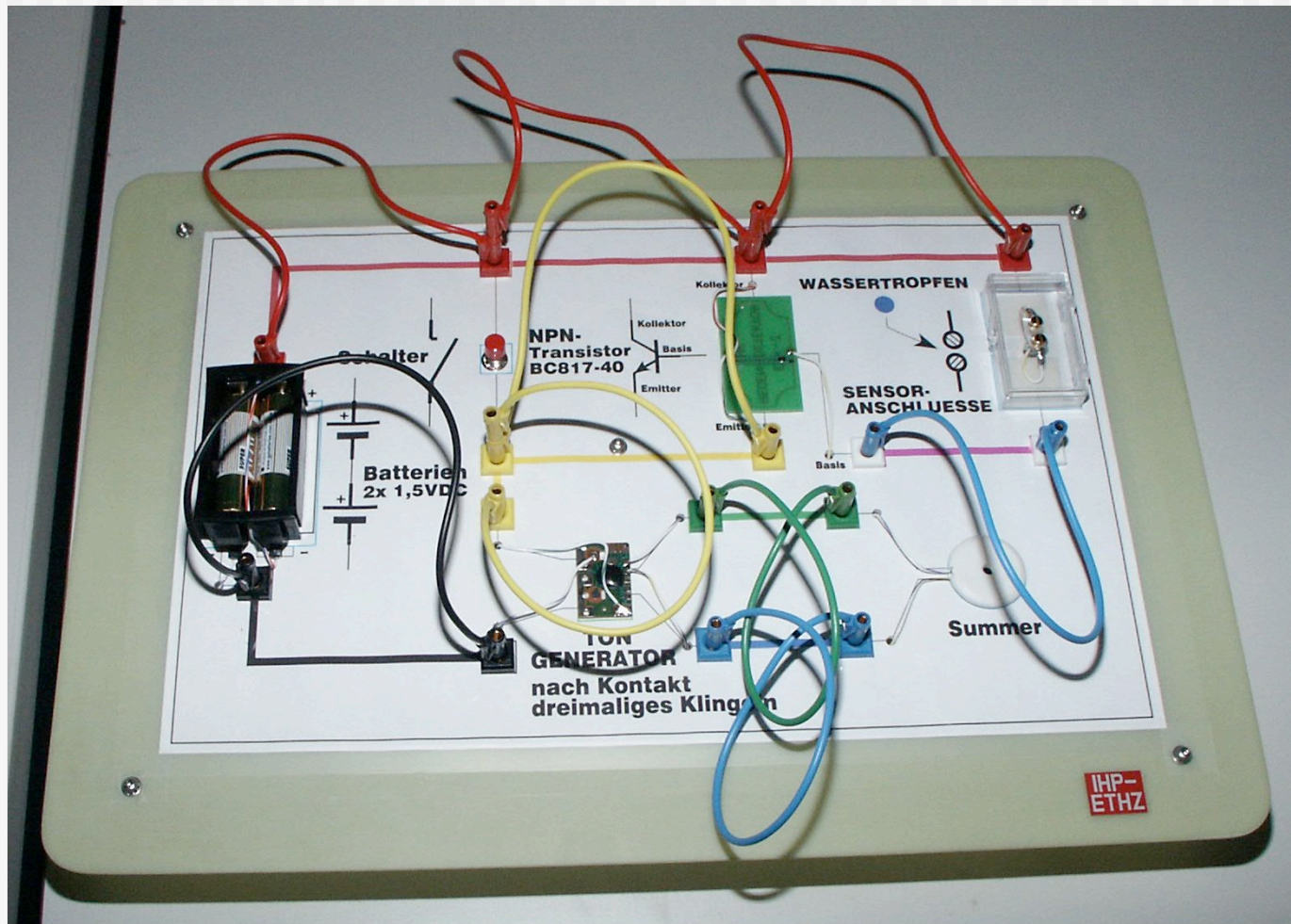
# The scattering experiment



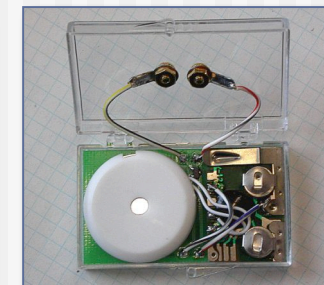
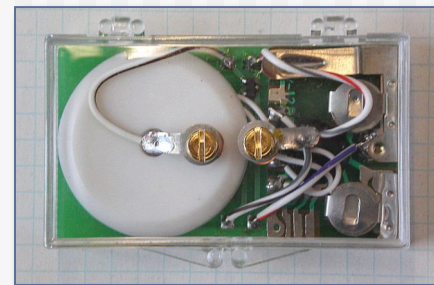
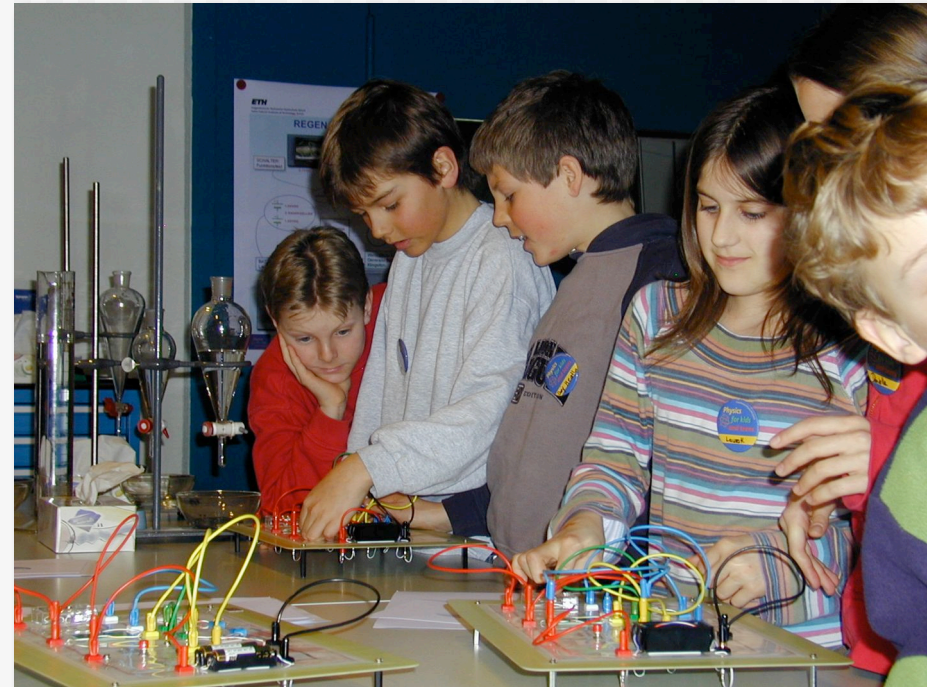
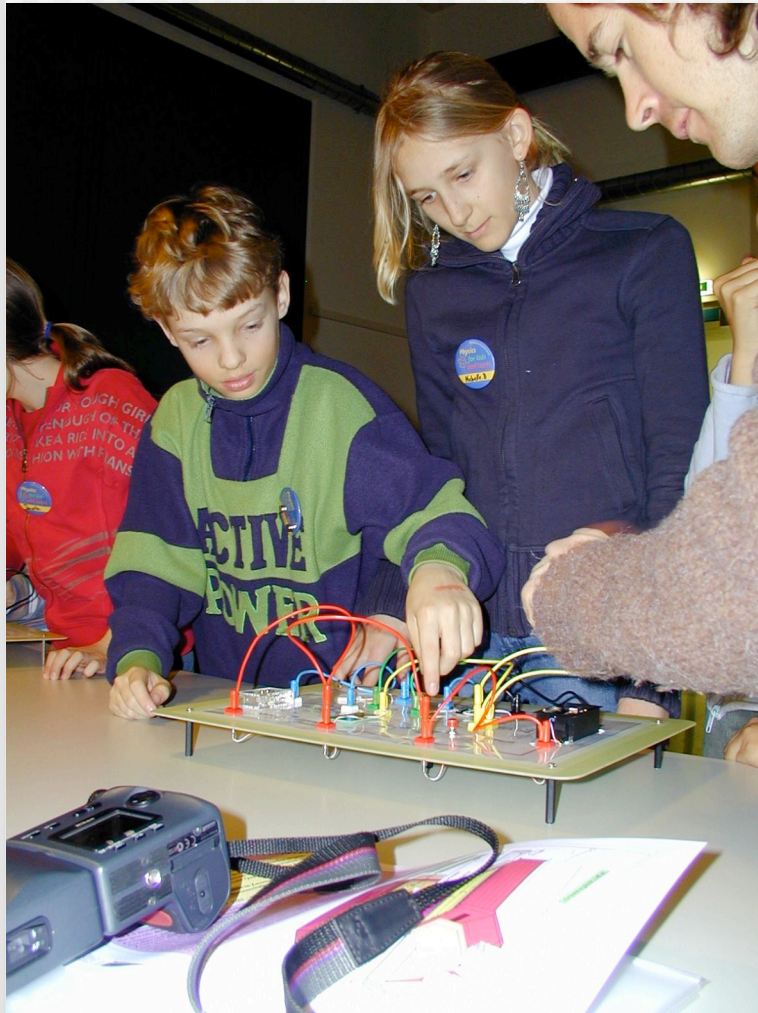
# The scattering experiment...



# The “rain detector”



# The “rain detector” ...



G. Dissertori

EPOG, Valencia, April 2005

# ETH en route

- The ETH truck
- Among many other experiments:  
The **Cosmic Ray Cube (CORACU)**



121 plastic scintillators (NE 102 A) + APDs

# Schweizer Jugend Forscht

- Special activity in the Einstein year
- Groups of students will work on small science projects for one week, at several Swiss Institutes
- Also at CERN : Activity coordinated by ETH Zurich / G. Dissertori
  - Studies of Cosmic rays
  - Analysis of scintillating crystal properties
  - Simulations of particle interactions in crystals



# Open days (in 2005)

- At PSI - Villingen
  - 30. October : **Physics Day**
  - Note also : [www.psiforum.ch](http://www.psiforum.ch)
  
- At ETH Zurich
  - 17. June : **Night of Physics**
  - We will exhibit a spark chamber, and again the game “scattering experiment”



# Conclusions



- **CHIPP:**
  - Swiss Institute for Particle Physics
    - Try to coordinate also Swiss outreach activities in the future
    - **Many individual activities so far**
  
- Recent interesting experiences
  - Very large audiences in evening lectures
  - Particle Physics and School children
  - Data Analysis by teachers and high school students

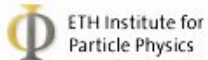





CompMethPP-Z Physics

http://ihp-lx2.ethz.ch/CompMethPP/zphys/zphys.html

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 ETH Institute for Particle Physics


  
 Eidgenössische Technische Hochschule Zürich  
 Swiss Federal Institute of Technology Zurich

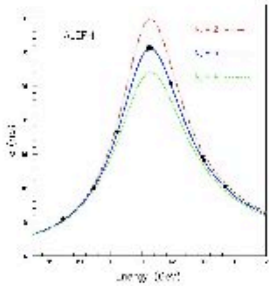
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[Z Physics](#)
[Higgs/LEP](#)
[Higgs/LHC](#)
[HERA Physics](#)
[Neutrino Physics](#)
[BSCW](#)
[FAQ](#)
[Lecture Notes](#)

Home - Z Physics

**Z Physics at LEP**

List of options

- Look at the short [introduction and work description](#) for this topic
- [Scanning of Event Displays](#) of Z decays recorded with the DELPHI detector
- Look at [histograms](#) (distributions) of properties of the final states, such as kinematical variables
- Perform a [fit](#) to the Z resonance in order to determine the line shape parameters
- Additional [inputs/information](#)
- [Frequently Asked Questions](#)
- Have a look at the [lecture notes](#)


  
 The Z line shape measured by ALEPH, compared to various assumptions on the number of light neutrinos

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Search

CompMethPP-Z Physics-Event Displays-Real qqbar events

<http://ihp-lx2.ethz.ch/CompMethPP/zphys/hod/distribution/ch/cern>

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Home - Z Physics - Event Displays - Real quark antiquark events

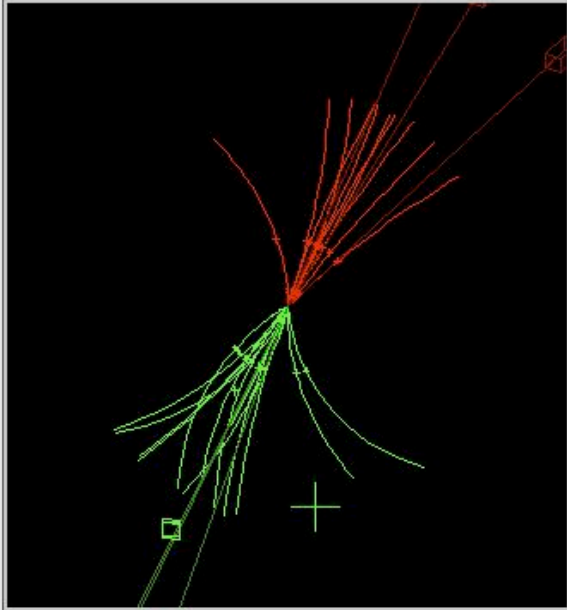
**Real Z --> quark + antiquark decays**

Real data from DELPHI

(Explanations below the WIRED view)

Event information		
Ecms	Nr tracks	Energy
91	29	72.2

DELPHI - (705)



Event Selection

Run/Event (year)

< 82662/02878 (98) >

Mouse

Rotate  Zoom

Views

End view Side view

Reset

DELPHI Barrel

VtxDet  TrDet  
 EMCal  HaCal  
 MuDet

DELPHI Forward

EMCal.  HaCal.  
 MuDet.

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Search

# Technical Solution

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- **SQL Database** (compressed data set)
  - Contains simple high-level variables of several different experiments, no detailed detector-related data
- **Web-Interface** for interactive queries
  - Choice of variable to plot (=histogram)
  - Definition of **selection criteria**
  - Choice of different data sets/simulations
  - Submission of the query
- **Application** in background on central server
  - Takes query, scrutinizes database, generates graphics
  - Sends graphics (=plot) back to Web-Interface

# Why at high schools?

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- Students obtain insight into the **fascinating** modern research in particle physics
  - Research methods as they are really applied
  - Access to **real data**
- **Personal experience**, by doing a simple analysis:
  - First with detailed instructions, then on their own
  - Experience with methods of “**data mining**”, used also in other areas. Statistical methods.
  - Get to know / hear about **simulations**
- All this **via Web-interface** <http://ihp-lx2.ethz.ch/CompMethPP/outreach>
  - Remotely (from schools) accessible

# Didactical Advantages

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- Students have **access to real data** from different experiments (at different accelerators)
- **No time-loss** due to learning of experiment-specific software and tools
- Student's independent **hands-on experience** with real data gives them a taste of later scientific work
- Students learn to **present their scientific results** with modern tools (eg. Power Point)
- Have to use **original scientific literature. English.**