

# *IPPOG - bringing particle physics into classrooms*



*Ivan Melo on behalf of IPPOG network  
University of Žilina, Slovakia*

*Global Language Monitor (GLM) makes statistical analysis of language usage in the worldwide print and electronic media, the Internet, and the blogosphere, as well as social media*

### Top Names

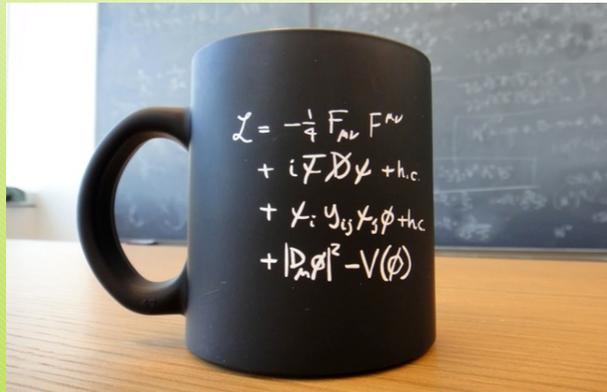
2012
Newtown and Malala Yousafzai (tie)
Xi Jinping
Kate Middleton
President Obama
Mitt Romney
London Olympics
Higgs boson
Europe (EU/Eurogeddon)
Felix Baumgartner
Senkaku Islands

### Top Phrases

2012
Gangnam Style
Global warming/climate change
Fiscal cliff
The Deficit
God particle
Rogue nukes
Near-Earth Asteroid
Binders full of women
Arab Spring
solar max

### Words of the Year

2009
twitter
Obama-
H1N1
stimulus
vampire
2.0
deficit
hadron
healthcare
transparency



Complexity  
of physics



Beauty of physics

IPPOG

Interest of public

# *IPPOG - International Particle Physics Outreach Group*

*Network of scientists, informal science educators and communication specialists active in outreach and informal education in particle physics*

*"Fundamental physics impacts both scientific and philosophical thinking, influencing the way we perceive the universe and our role in it.*

*It is an integral part of particle physics research to share the wonders of our discoveries with the public and the youth in particular.*

*Outreach should be implemented with adequate resources from the start of any major project*

*Personal engagement of scientists in outreach and communication must be recognised with equal importance as scientific research as such"*

*The 2006 and 2013 European Strategy for Particle Physics*

- *Who do we serve?*

*Anyone who wants to know more about particle physics, especially **educators and students** (from school to university).*

- *What is our aim?*

*To raise standards of global outreach and informal science education efforts of particle physics and to communicate its results and findings to the public.*

- *Our vision for the future?*

*Understanding and enthusiastic support of particle physics and related sciences from all audiences.*



# IPPOG membership



*1997: IPPOG started under joint auspices of ECFA and European Physical Society*

*2011: European → International*

*CERN member states (20)*

*+ Ireland, Romania and the United States*

*+ five major experiments at CERN's Large Hadron Collider*

*+ CERN, DESY, ...*



Foto: Bartolomej Cisár

*Initially a discussion forum with information exchange,  
IPPOG has become proactive organizing its own outreach projects*

*Three examples:*

*International Particle Physics Masterclasses*

*IPPOG resources database*

*Cascade projects competition*



# *Working groups*

*IPPOG identity and membership*

*IPPOG @ conferences*

*Social media*

*Masterclasses*

*Higgs boson and Higgs mechanism*



# *Particle Physics Masterclasses:*

*Started in Great Britain 17 years ago*

*Expanded by IPPOG to International Masterclasses in 2005*



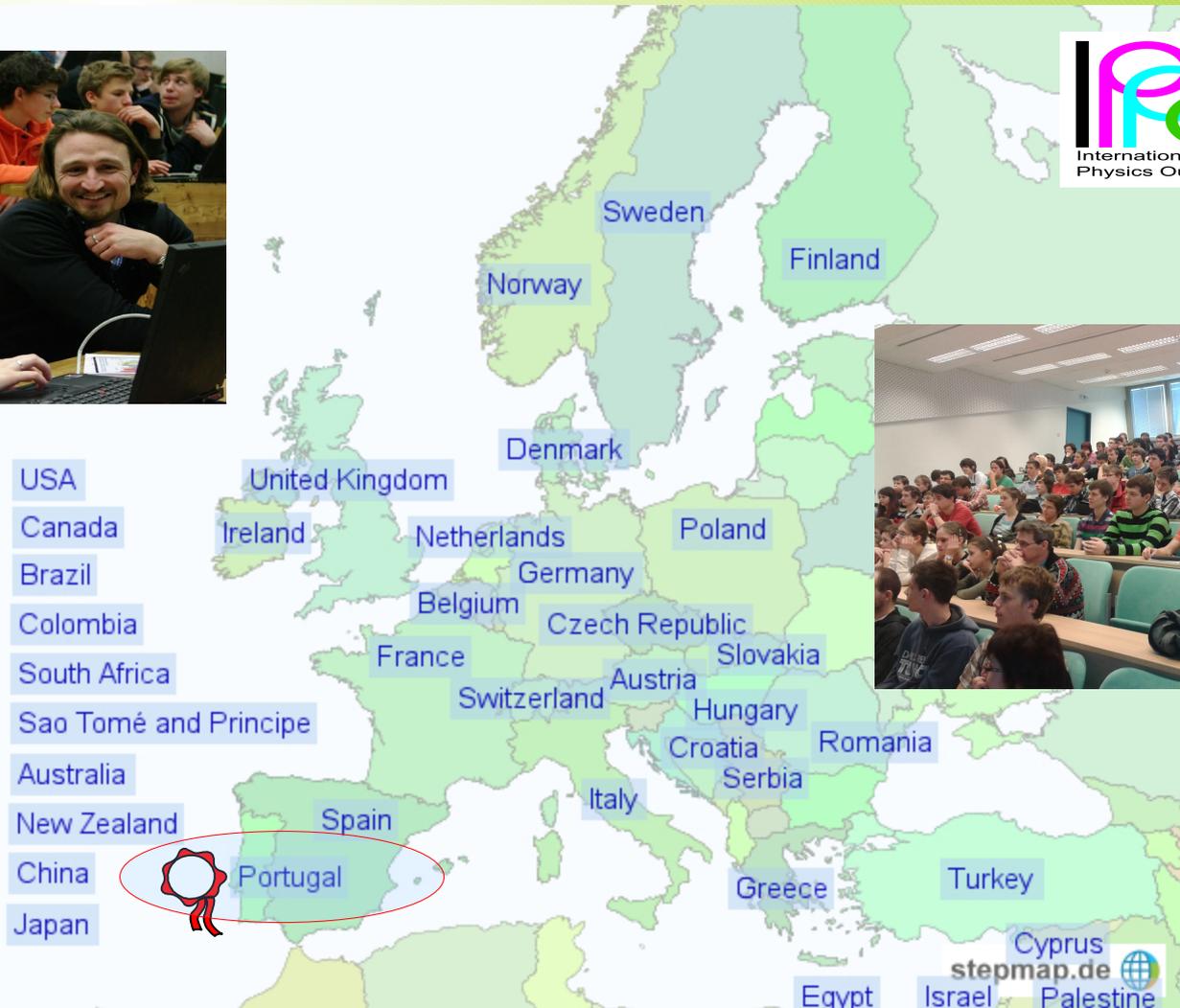
*Universities around the world open their gates to welcome high school students who become particle physicists for one day*



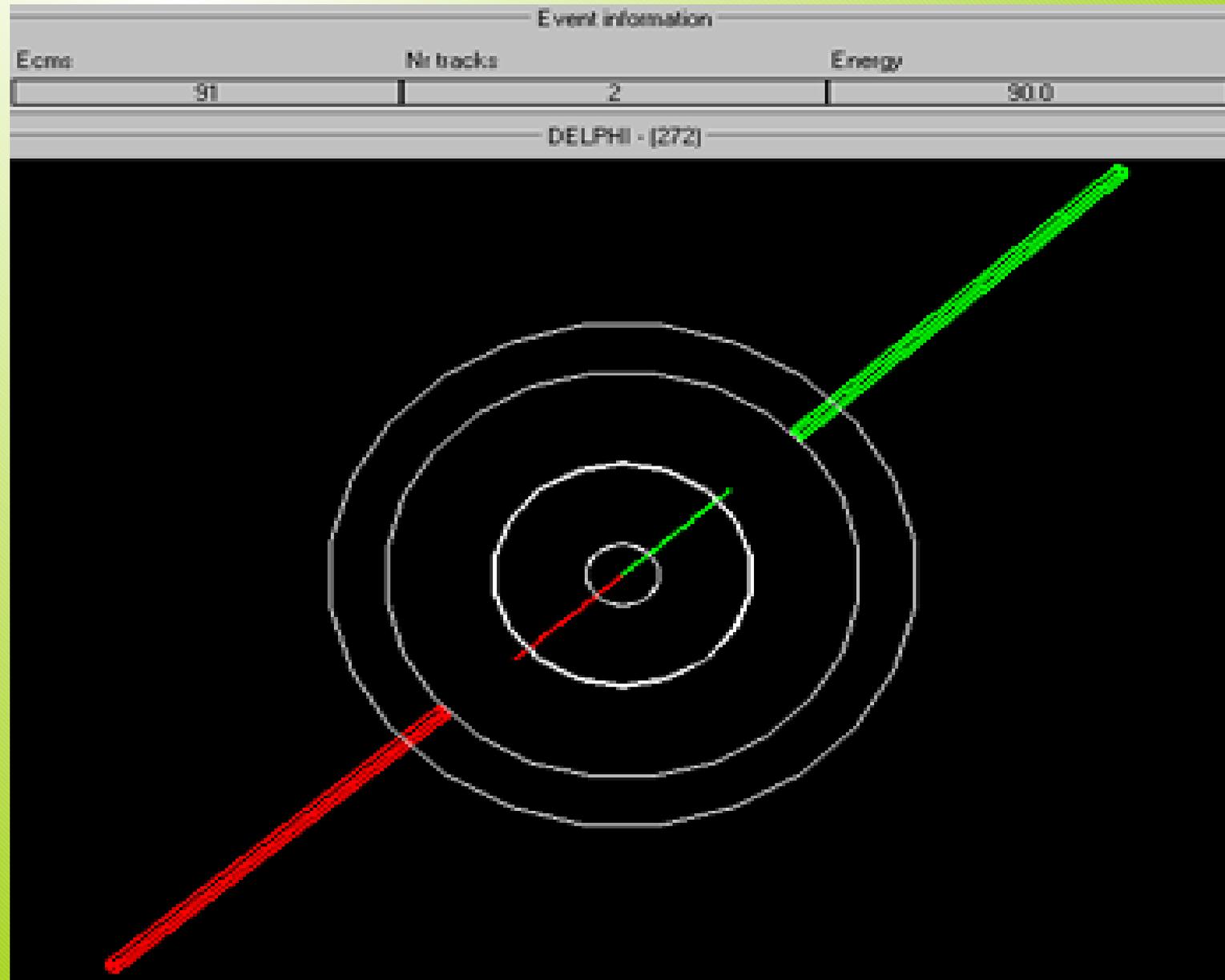
- *Lectures*
- *Data analysis/computer exercises*
- *International videoconference*

# International Particle Physics Masterclasses map

2013: 38 countries, 167 universities, 10 000 students



# *LEP events (2005 - 2010)*

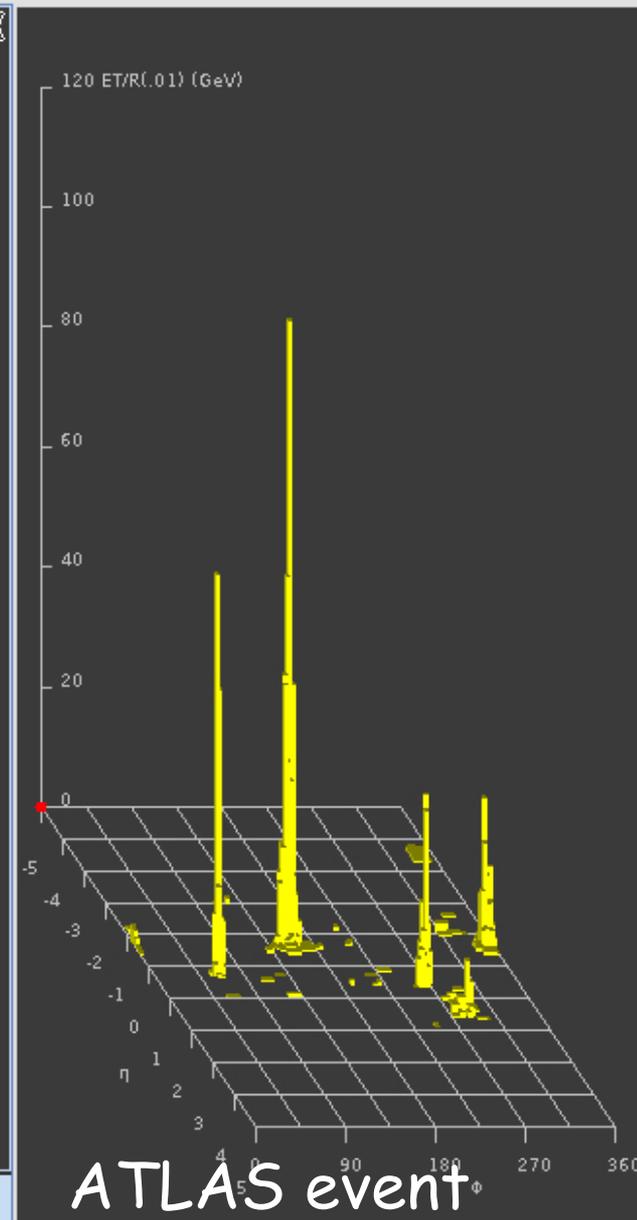
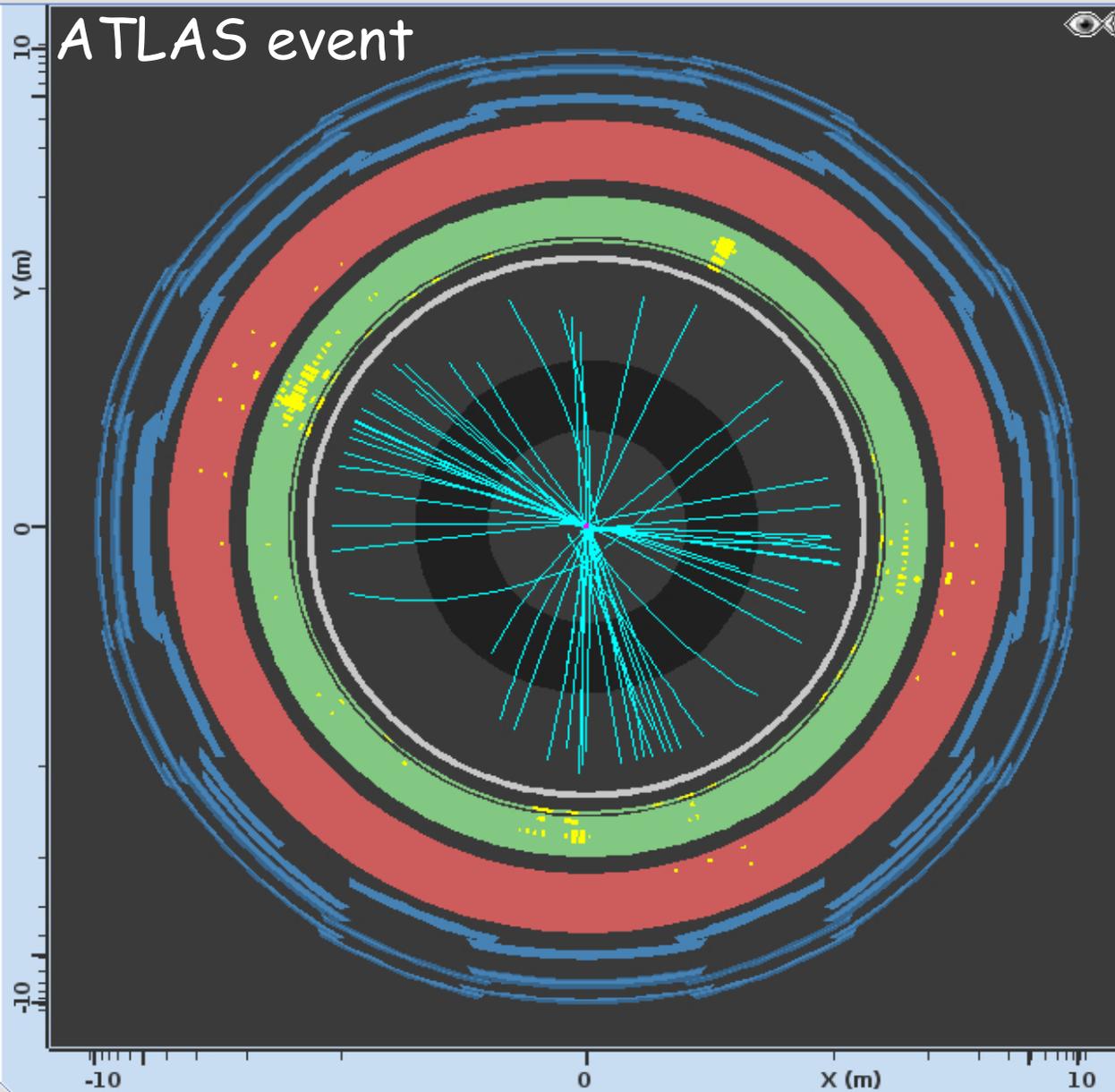


# LHC events 2011 - 2013

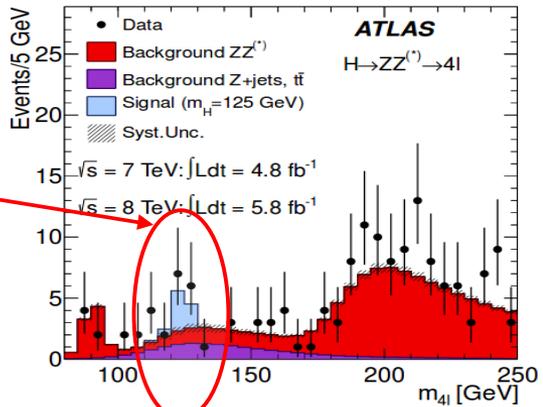
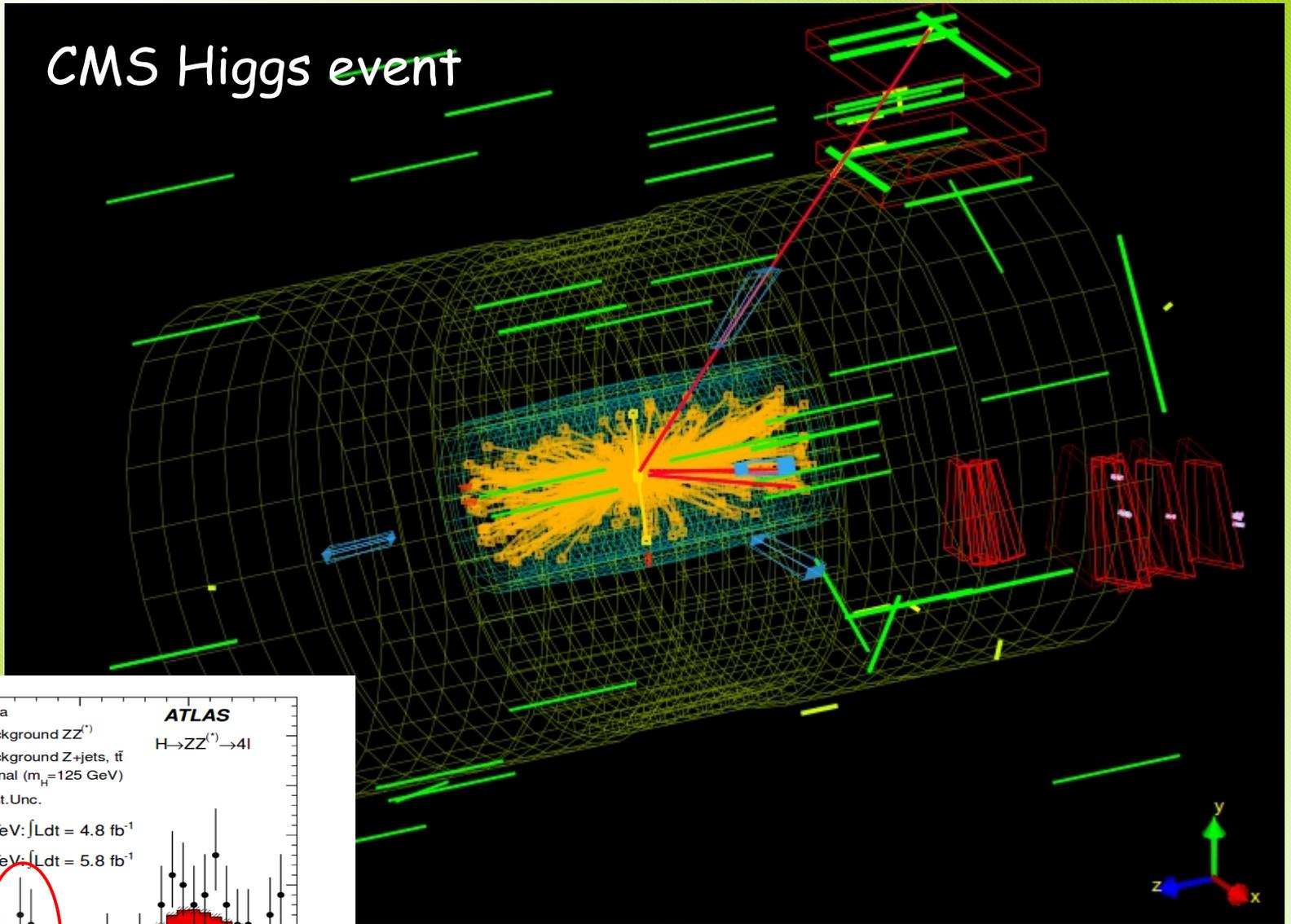
ATLAS

2011-04-30 18:31:36 CEST source:event023 run:180636 ev:61861604 lumiBlock:360

HYPATIA



# CMS Higgs event



## ATLAS and CMS (pp collisions)

- W bosons and Higgs boson

- proton structure  $R^+ = W^+/W^-$

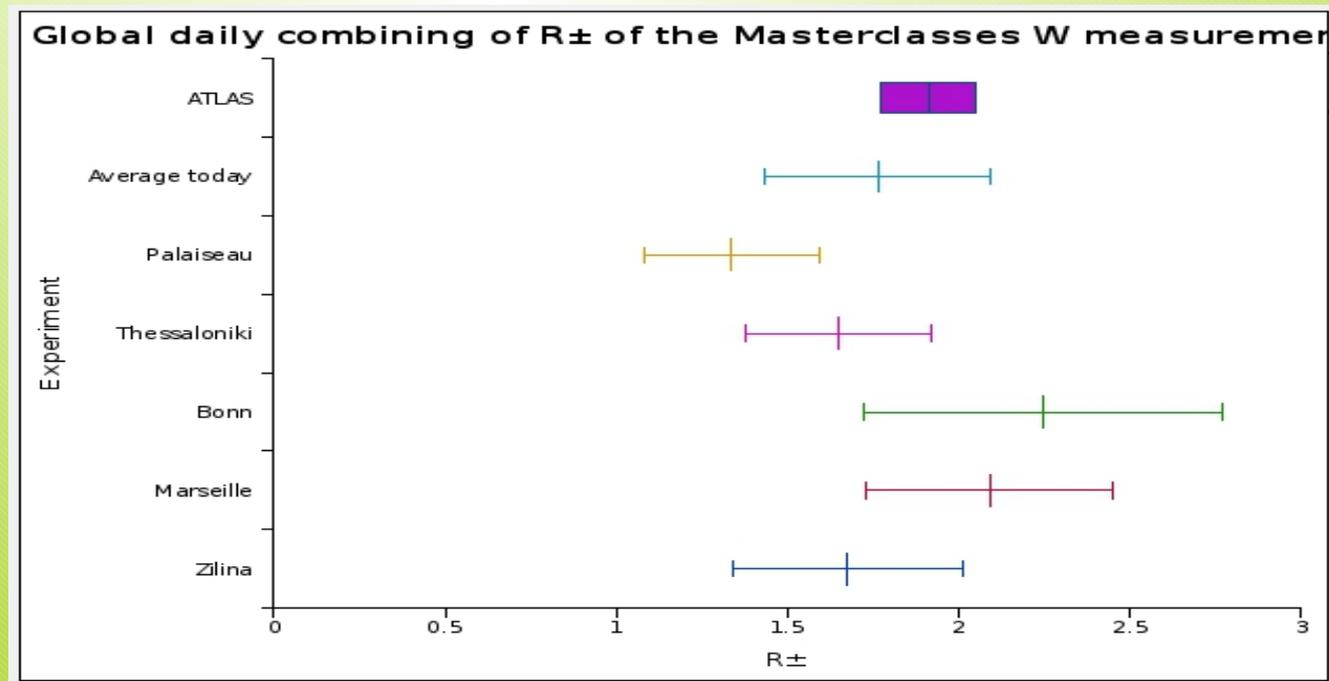
- Z bosons and Higgs boson

## ALICE (lead - lead collisions)

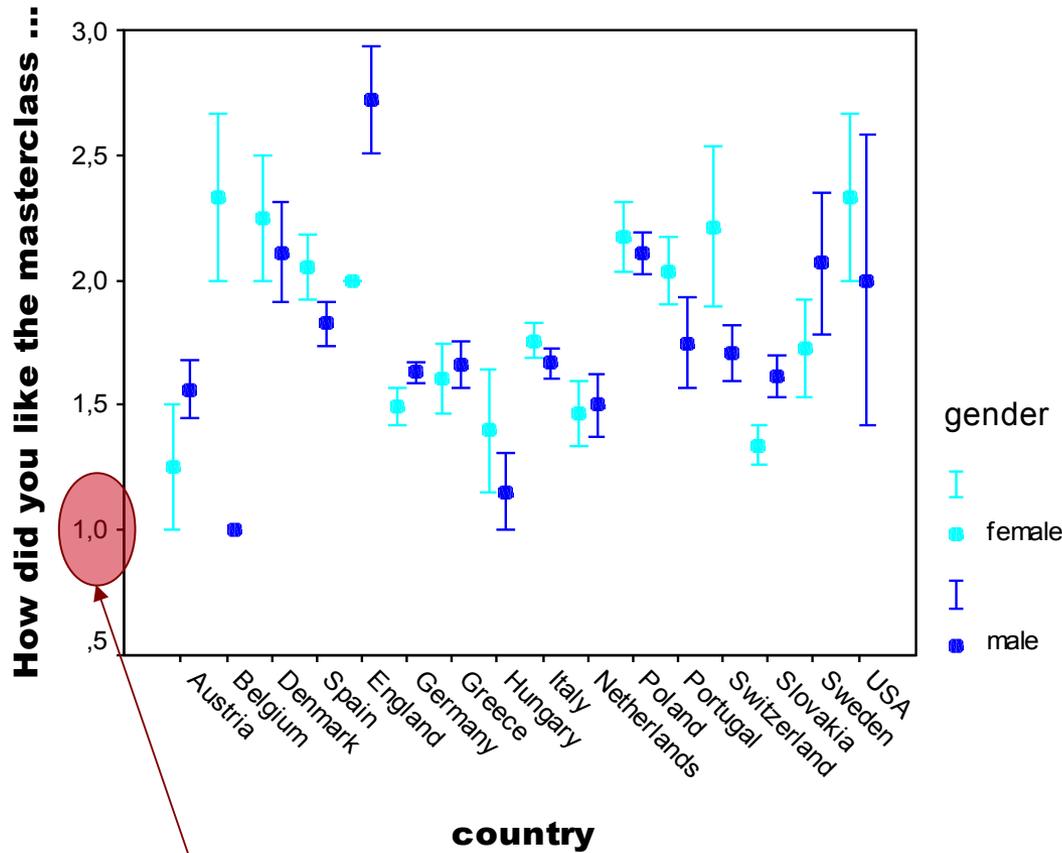
- Strange particles, signs of QGP



17.3.2011



# Do they like it ?



Best mark 1 (worst 5)



# *Success of Masterclasses*

- 1. Collaboration*
- 2. Involvement of researchers*
- 3. Real experimental data*
- 4. Format (lectures, data analysis, videoconference)*



# Cascade projects



*U of Birmingham: teams of 3-6 high school students make 20 min presentations at their schools and send videos to organizers*

**UNIVERSITY OF BIRMINGHAM** **New National competition for 2007-8** **STFC**  
**a Cascade of Particle Physics in schools & colleges**  
An exciting Opportunity to....  
*Enhance your A Level studies* *Develop Key Communication Skills*  
• *Make personal links with Research staff at a leading University*  
• *Win money to help finance a trip to CERN*



*CERN accelerator control room*

*Slovakia* 4 teams in 2009  
15 teams in 2010 } *Total audience 500 -600*  
16 teams in 2011 } *students*

*Time to prepare projects: ~ 4-5 weeks*

*Mentors - volunteers from all HEP community*

# *Cascade projects cont'd*

*What are we all made of? Atoms - Quarks - ?*

*Particle Accelerators - How do they work?*

*Medical Applications of Particle Accelerators - What are they?*

*Recreating the Early Universe at the LHC*

*Antimatter*

*Dark matter*

*Quantum nature of elementary particles*

*Neutrinos*

*Are there more than 3 spatial dimensions?*

*Search for new particles. Higgs boson*

*History of the Universe*



# Cascade projects cont'd

*The format is very successful. Students love to work in teams and present things.*

*The particle physics community in Slovakia responded very well and volunteered to become mentors*

*Masterclasses (MC) seem to be a good spring board for Cascade. MC are a 1 day thing, in Cascade we invite curious minds for a deeper adventure*

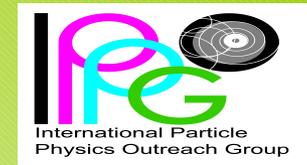
*Cascade is relatively easy to organize.*

*Best Cascade presentations have the qualities we had hoped for. Team members are interested in pursuing scientific career*



# IPPOG resources database

<http://ippog.web.cern.ch/resources>



Videos, brochures, posters, talks, programs, tips for exhibits, hands-on activities,...

The screenshot shows the IPPOG website interface. At the top left is the IPPOG logo. To its right are links for "Login / Sign-up / FAQs" and a search input field with a "Search" button. Below the logo is the text "International Particle Physics Outreach Group". A navigation bar contains links for "HOME", "ABOUT", "MEMBERS", "RESOURCES", and "MASTERCLASSES". Below this is a breadcrumb trail "HOME > RESOURCES" and a "Resources" section header. On the left is a vertical menu with categories: "Activities" (Cart Demonstration, Display, Classroom Activity, Facilitated Activity, Presentation, Game), "Programs & Events", "Media" (Professional Development & Coaching), "Exhibits" (Permanent Exhibitions, Portable Exhibitions, Exhibits), "Souvenir / Novelty Item", and "FAQs". Below the menu is a "Welcome !" section with "What is this?" and "Who is this for?" and a note about sharing items. The main content area features a "Learning Topics" section with a green atom icon and a list: "Physics", "Technology", "International Collaboration", and "Broader Impacts". Below this are "LATEST" and "FEATURED" tabs, with the "LATEST" tab selected, showing a photo of three people at a computer workstation. On the right is a "Search by" sidebar with dropdown menus for "Learning Topic", "Audience", "Item Type", "Availability", "Duration", and "Language", and a "Key Words" text input field. At the bottom of the sidebar is a "GO" button. Below the sidebar is a "Resources in your language" section with links for "English", "Italian", "French", "Portuguese", "German", and "Spanish".

## *IPPOG resources database cont'd*

*First-ever global database for materials related to particle physics outreach and informal education.*

*It houses videos, brochures, posters, talks, programs and events, media, exhibits, ideas for hands-on activities in a variety of languages.*

*The aim of the collection is to help physicists, communicators and teachers find new ways and tools to teach particle physics in their classes and in public.*

*New items can be submitted after registration by anyone. The database can be searched by the learning topic, audience, item type, topic and language. A rating system enables users to give credits to the popular items.*

*The database is still in its early stages (~ 300 items) and we invite users to make suggestions that could help improving it .*

## *Future activities*

*International Cosmic Day, Sep 2013*

*Win a beamtime at CERN competition 2014*



## *WG5 meeting, October 16, cont'ed*

*... and discussion of FUNDING:*

*Siggi Bethke was impressed by the work done by IPPOG.*

*He clearly wants to get a recommendation for sustainable IPPOG funding into the WG5 report.*

*WG5 would not spell out details of how much exactly, and from whom, nor how the money should be administrated, and who should e.g. make the selection of personnel and the contracts.*

*This should be sorted out between the funding bodies and IPPOG.*

*James thinks, that from his point of view clearly CERN should be the main funding body for IPPOG.*



# 3 IPPOG funding eras (M. Kobel)



*Before mid 2008: ~zero funding*  
*- individual personal efforts*

*Mid 2008 - today: patchwork funding*

*- IMC and upgrade for LHC:*

*Various in-kind contributions from institutes and CERN*

*German Helmholtz Alliance, Gentner and Research Ministry BMBF*

*- Database and IPPOG organisation:*

*Synergy with other projects (PATHWAY)*

*50% FTE for two years from CERN*

*Future: must be secured*

*- Some fundings ending (Helmholtz, German BMBF)*

*- Some fundings uncertain (CERN, Gentner)*

*- safer and more reliable perspective (less patchwork) critical to the effectiveness and sustainability of IPPOG*

*- task for new IPPOG chairs from 2013 !*