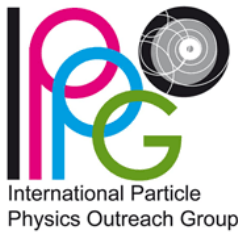


INTERNATIONAL MASTERCLASSES HANDS ON PARTICLE PHYSICS



Nantes



Swedish teachers CERN 3.11.2023



Despina Hatzifotiadou

A day of immersion in particle physics for 16-18 year old pupils

Typical day of International Masterclasses

Morning : introductory lectures on

- Particle physics (elementary particles, forces, Standard Model and beyond)
- Detectors – accelerators – experimental methods

Visit of laboratory / experimental site / discussion with scientists and graduate students

Lunch – usually offered by the Host Institute

Afternoon : students analyse data from an LHC experiment and do a physics measurement
They work in groups of 2 per computer;
analysis is visual in most cases

At the end of the day : Video Conference
moderated by two physicists at CERN and connecting up to 5 institutes
presentation / merging/ discussion of results, answering questions, quiz



IPPOG : INTERNATIONAL PARTICLE PHYSICS OUTREACH GROUP



Network of scientists + communicators to promote and coordinate outreach + educational activities (in particle physics). Share experiences, resources and best practices

EPPOG established in 1997 (CERN Council/ECFA)
IPPOG Collaboration: 41 members (33 countries, CERN, 7 int. collaborations: ALICE, ATLAS, CMS, LHCb, Belle II, HAWC+Auger) + two associate members (DESY, GSI)

<https://ippog.org>

IPPOG Meets twice a year (Spring, Autumn)

Flagship activity: International Particle Physics Masterclasses

<https://physicsmasterclasses.org>

Global cosmics, <https://ippog.org/global-cosmic-rays-portal>

Resource database <https://ippog.org/ippog-resource-database>

A bit of history and present status

1996: Started in UK

2005: Adopted by EPPOG (European Particle Physics Outreach Group) for all Europe

Use data from LEP (the Large Electron Positron collider, CERN, 1989-2000)

OPAL Identifying Particles

DELPHI Hands on CERN

Z⁰ decays / calculation of branching ratios

2006: U.S. joined program

2010: preparing to move to LHC-based Masterclasses

2011: Start using data from LHC

ALICE Looking for strange particles , Nuclear modification factor R_{AA}

ATLAS W+W⁻ (MINERVA), Z⁰ (HYPATIA)

CMS J/ψ, Z

LHCb Measurement of the D⁰ lifetime

More exercises added, nowadays



Central organisation

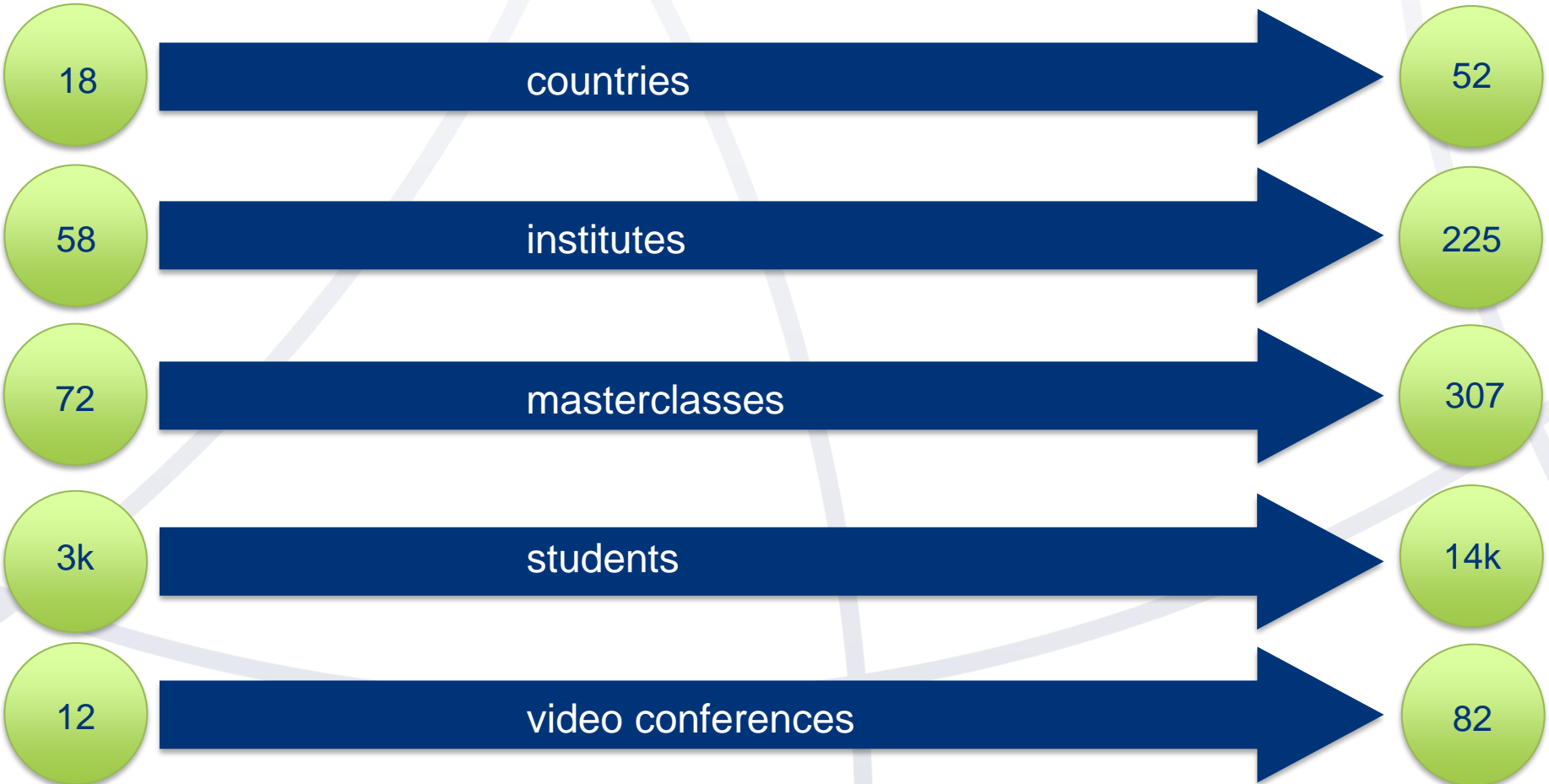
TU Dresden (Uta Bilow)

Quarknet (Ken Cecire)



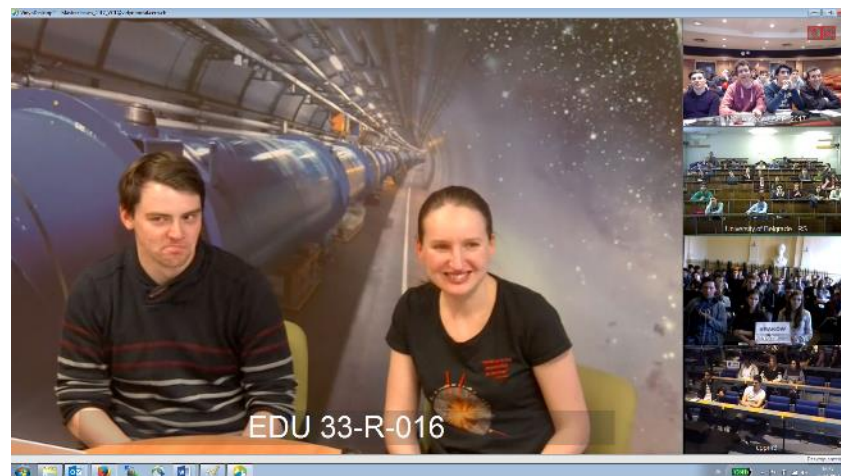
Statistics International Masterclasses

2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018



Video Conference

- Presentation of the moderators
- Welcome of the participating institutes
- General questions from the participating institutes
- Presentation of the results of the measurements by institutes
- Merging of results by moderators
- Comments, discussion, more questions
- Quiz



Often it is the highlights of the day

- General appreciation of the International Masterclasses very positive
- New countries join every year

Some information

International Masterclasses are typically announced in October

In 2024: 15 February – 27 March

11 February : International day of Women and Girls in Science : special masterclasses for girls

In 2024 : 9 February (Friday)

Limiting factors :

Computer rooms available at Institutes

Number of institutes per video conference (maximum 5)

In Sweden : Masterclasses in Uppsala – Lund (?) – Stockholm

LHC World Wide Data Day launched in 2016

<https://quarknet.org/content/world-wide-data-day>

This year : 9 November 2023