

INTERNATIONAL MASTERCLASSES HANDS ON PARTICLE PHYSICS

Masterclass Report

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28th IPPOG meeting, 26.11.2024

IMC 25: The plan

9 Masterclass measurements

- ATLAS, CMS, LHCb, ALICE, Belle II, Particle Therapy, Pierre Auger, MINERvA, NOvA

5 Videoconference centers

- CERN, Fermilab, GSI, KEK, Malargüe (Pierre Auger)

Videoconference situation

- Zoom video conferences
- Review of CERN video conferences in progress

Circulars for preparation

- Bi-weekly in 2024, weekly in 2025
- [Archive](#) (bottom of page)

LHC
Masterclasses



- CERN** program
- Feb 15 – April 11
 - Girls Masterclasses on Feb 11

LHC and Neutrino
Masterclasses



- Fermilab** program
- March 10 – April 11

Particle Therapy
Masterclasses



- GSI** program
- Dates during period Feb 24 – April 11
 - Girls Masterclasses on Feb 11

Belle II
Masterclasses



- KEK** program
- Dates during period Feb 24 – April 11
 - Europe, U.S., Japan, plus India in May

Auger
Masterclasses



- Pierre Auger** program
- Dates during period Feb 24 – April 11

Process of registration

- Sep 6: Announcement of dates
- Oct 4: Survey for the best dates for ALICE and LHCb
- Oct 18: Announcement of schedule and registration procedure
- **Nov 1: Registration opened**

- Nov 29 / Dec 6: Registration forms close, signing up by email is still possible; Announcement of Intl. Day of Women and Girls in Science

- Dec 13: Release of schedules

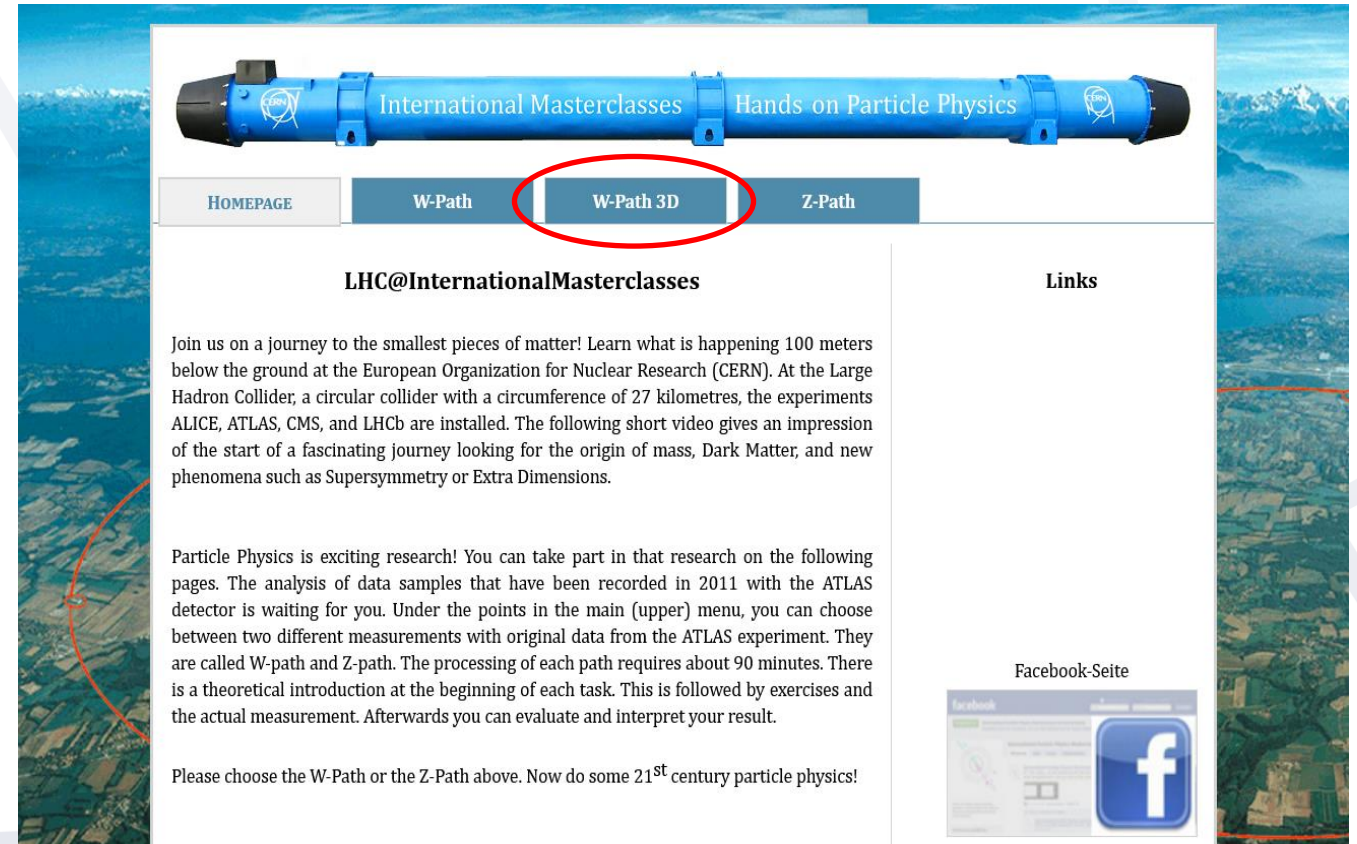
IMC 25: Registration

- Registrations started on Nov 1st


	CERN						Fermilab				Auger	KEK	GSI
	ATLAS Z	ATLAS W	CMS	LHCb	ALICE S.P.	ALICE RAA	ATLAS Z	CMS	MINERvA	NOvA	Pierere Auger	Belle II	Particle Therapy
VC slots	135	30	70	35	40	5	many				35	25	35
registrations	80	17	65	30	29	2	2	8	2	1	~10		18
MC in 2024	115		67	26	36		9	28	8	5	17	16	47

New: 3D event display for ATLAS W (slides from Lasha Sharmazanashvili)

- We have developed the web page for the Tracer for the official IPPOG Masterclasses site
- Tracer is available by standalone additional tab (Thanks to Uta & Tim)
- The draft is available at the link <https://ippog-masterclasses-website.web.cern.ch>



- We added Tracer 3D event Display functionalities and Screenshots
- The new ATLAS interactive 3D viewer is also available



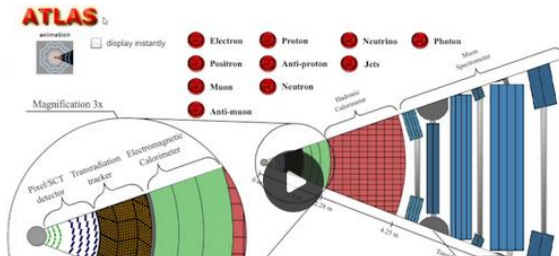
Identifying Particles

Here you can review how the detector is built. You will learn how elementary particles can be identified and how you can recognize them with our program. In a concluding exercise you may test your newly acquired knowledge.

Time for active playing! Discover the signals elementary particles leave in the detector with the help of the interactive animation of ATLAS below. Choose a specific particle from the upper menu and follow its way through the detector. Keep in mind that a dotted line represents the path of a neutral particle, which is not seen by the detector until it showers in a calorimeter, if at all.

The program that we will use is introduced on the [next page](#). It illustrates events of proton-proton collisions in cross-sectional view similar to the picture you see at the bottom of the page.

If you do not yet understand the structure of the ATLAS detector, you can find more information under the menu item [ATLAS detector](#).



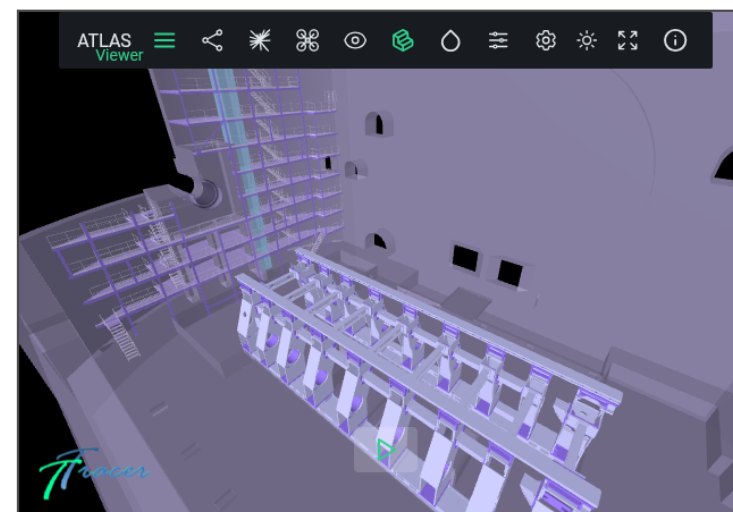
W-path 3D

- Aims/Tasks
- Identifying Particles
- ATLAS Detector**
- The Event Display Tracer
- Identifying Particles
- Exercise 1
- Identifying Events
- Measurement
- Analysis

Here, you'll learn about the structure of the ATLAS detector and how particles interact with the detector material. You can learn using videos, texts, and interactive resources, including the ATLAS Viewer tool developed by Tracer.

Products of proton-proton collisions are detected by the ATLAS detector (ATLAS stands for A Toroidal LHC ApparatuS). In the middle of ATLAS, two particle bunches (each with 100 billion protons) collide with each other after they have been accelerated in opposite directions in the LHC. It is therefore not possible to predict which parts of one proton will collide with which parts of another one nor can we tell which protons collide at all. When protons collide they may simple scatter off each other but stay whole or they will interact more violently and disintegrate. In the latter case, new particles are formed. From the data, physicists are able to say which physical processes may have taken place during the collisions. To do this, they need a good understanding of the detector and its function. So let's take a look at these points, below.

ATLAS Detector Viewer by Tracer

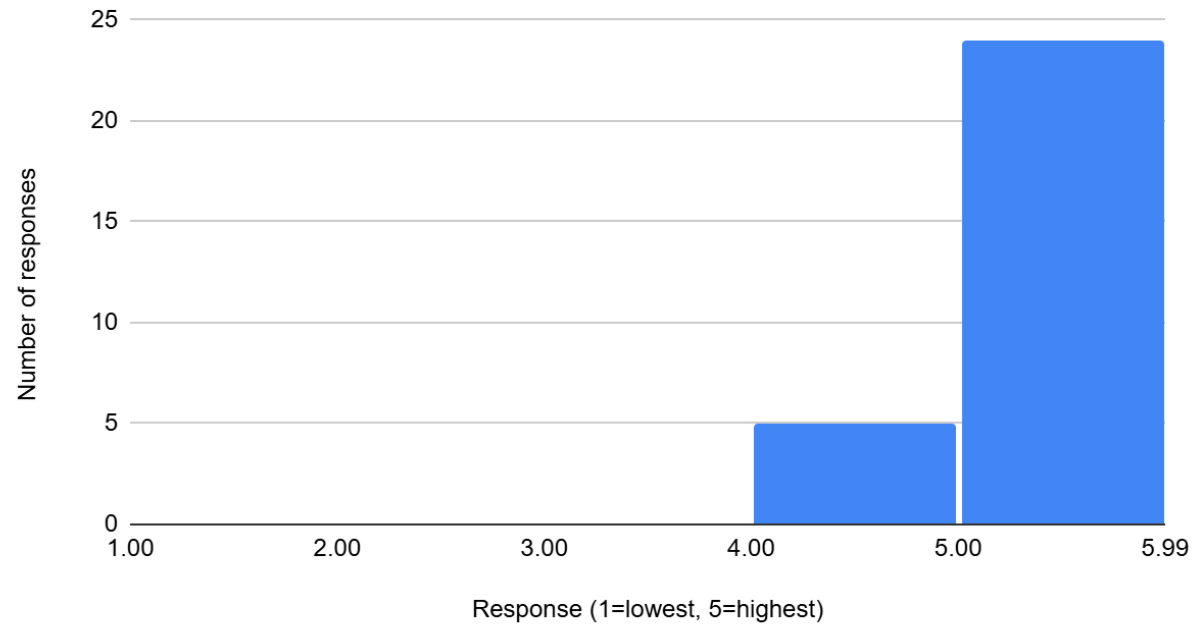


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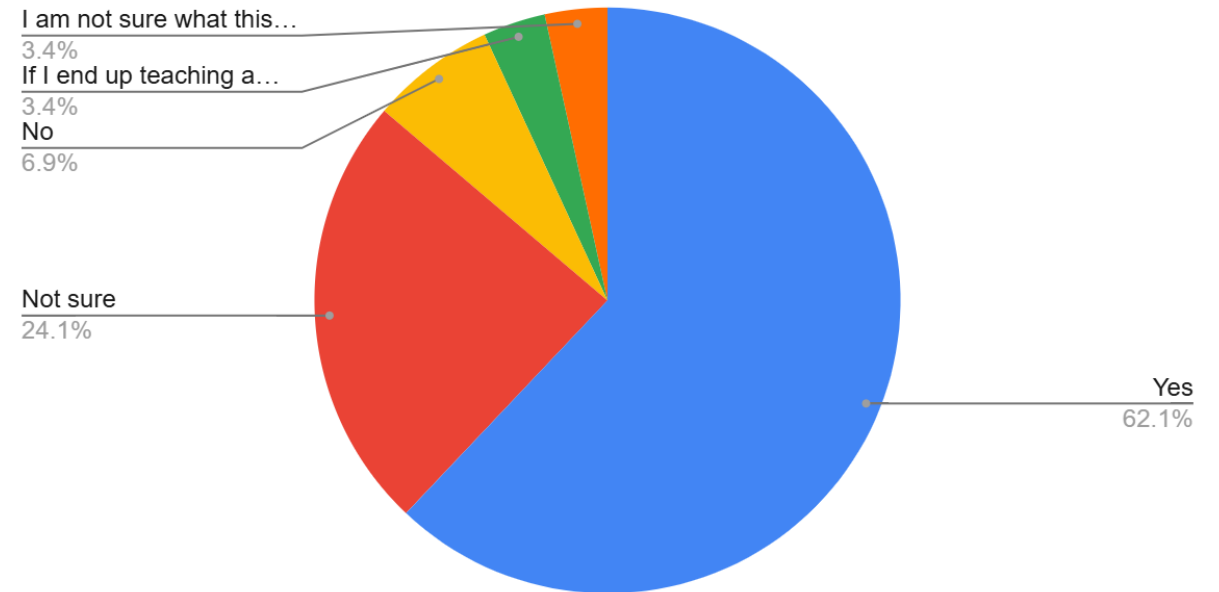
World Wide Data Day 2024 (W2D2)

Thu, November 14th, went well:
(Survey of teachers, 29/49 reporting)

How would you rate W2D2 overall?

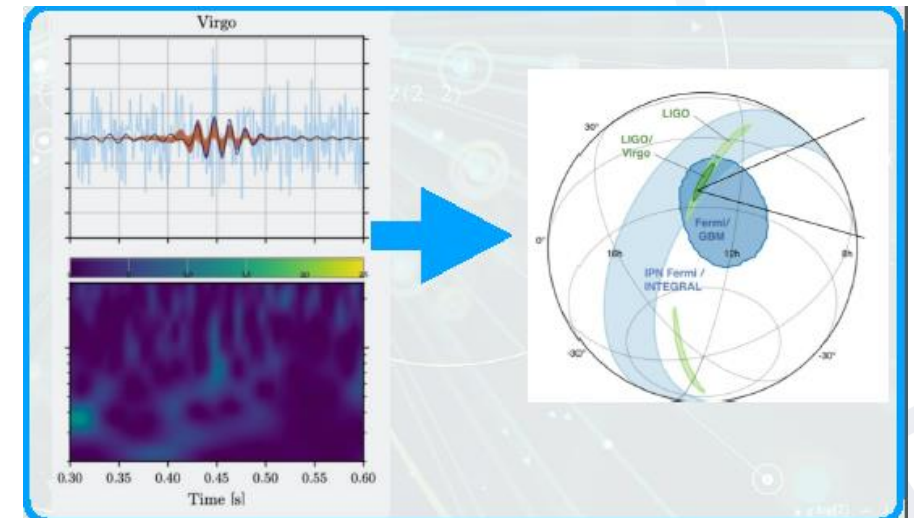


Do you plan to participate in International Masterclasses in the coming Feb/Mar/Apr?

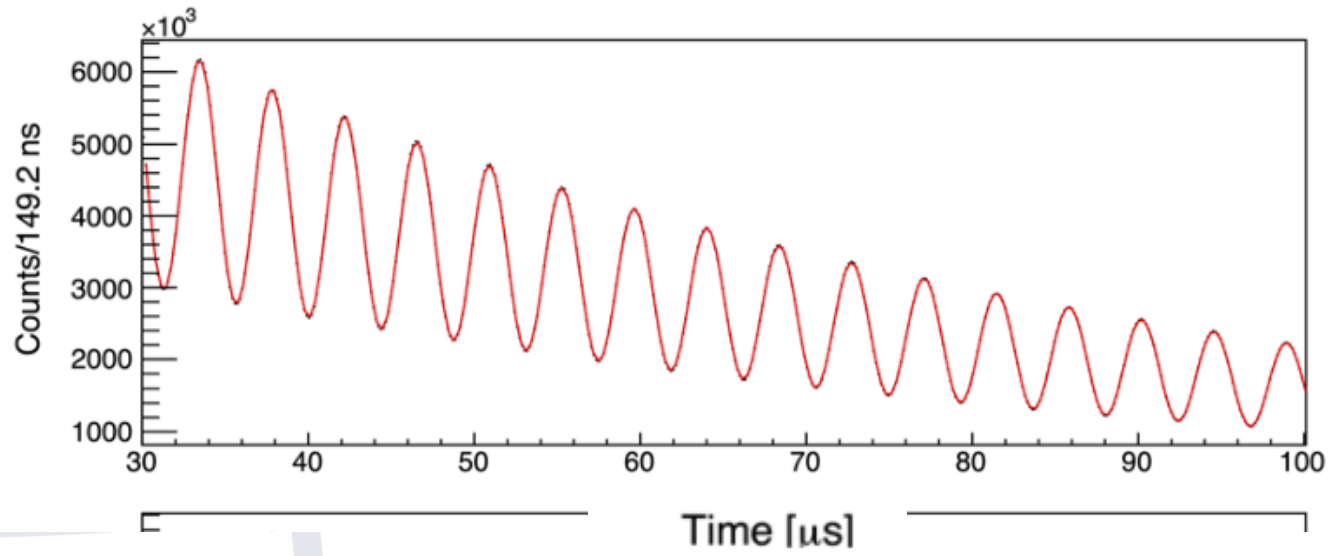
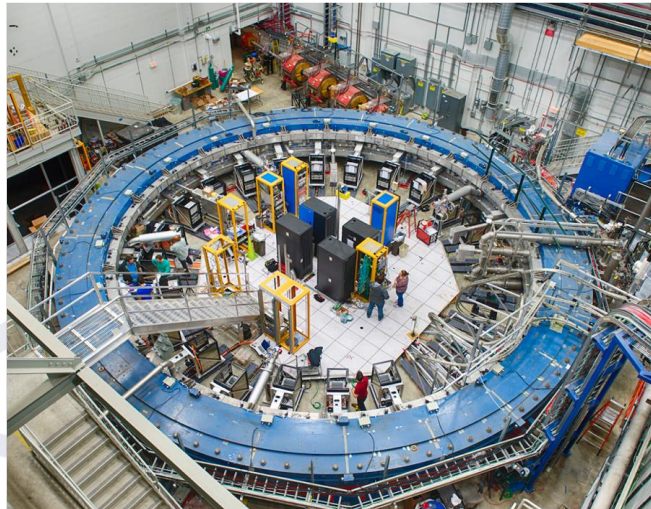
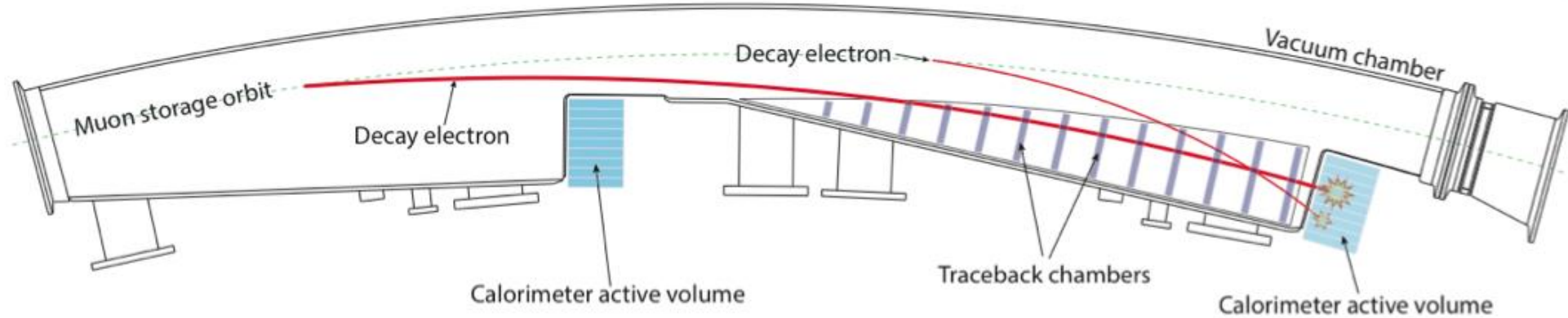
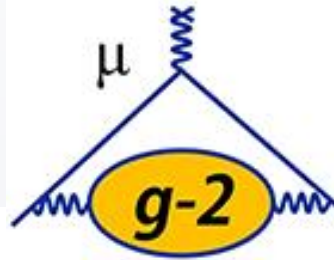


New developments: GW Masterclass (slides by Gideon Koekoek and Manolis Chaniotakis)

- Topics: data analysis and sky localisation
- Students match ringdown with known pattern
- Fit signal, combine data
- Use timing from multiple detectors to determine direction in space
- 3 events in current package, extended version with 20 events under development

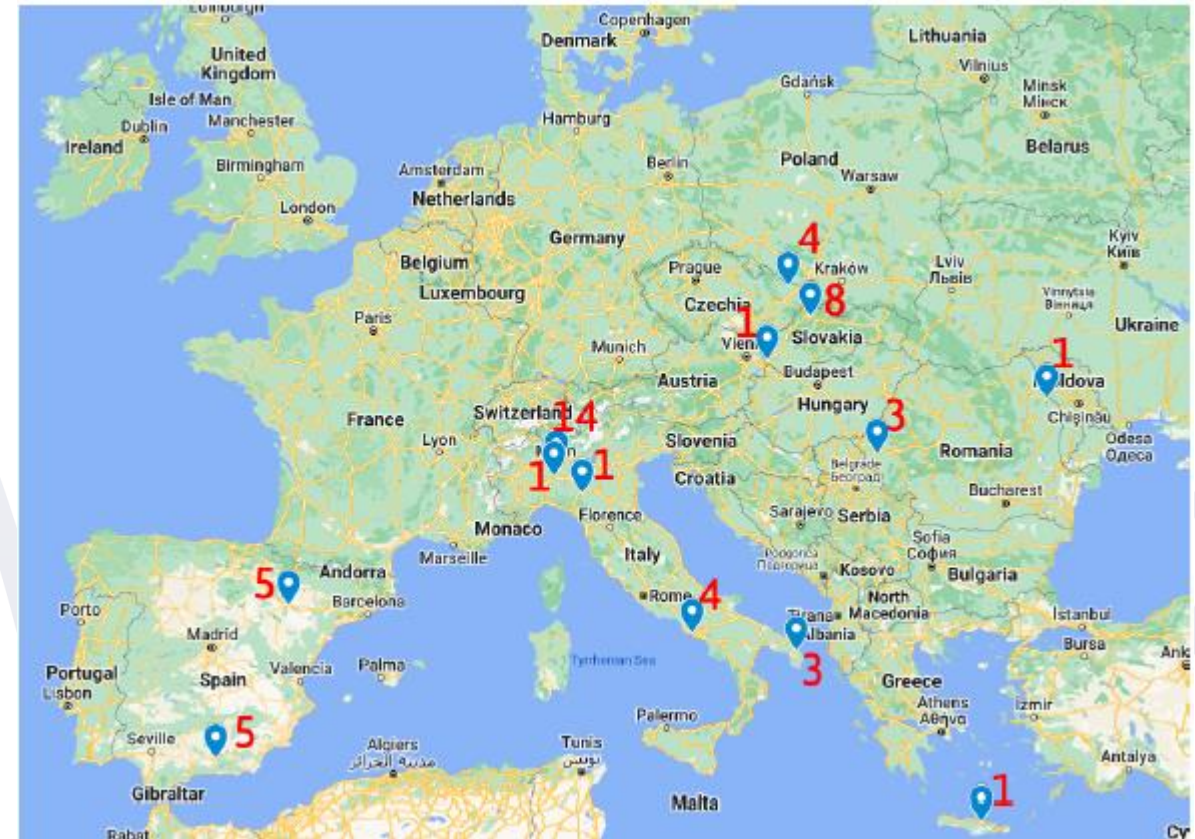


New developments: g-2 MC (slides: Sean Foster and René Reimann)



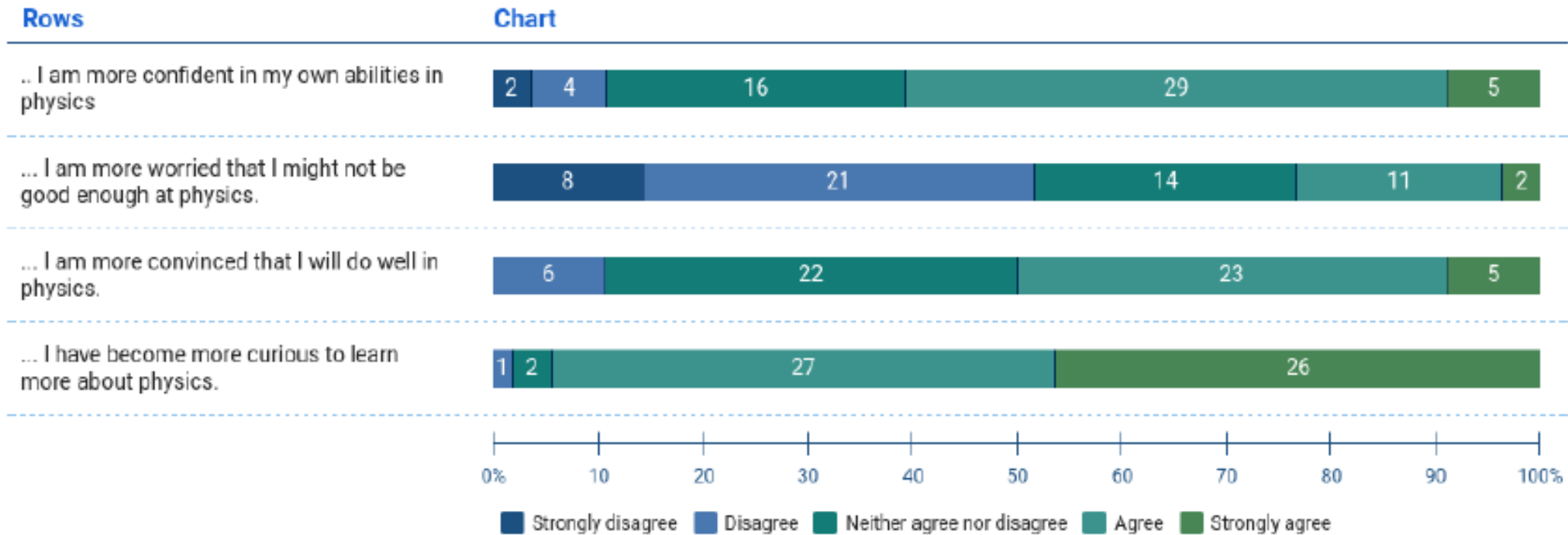
Evaluation of ATLAS Z Masterclasses at U Oslo

- testing their prior awareness of particle physics
- testing their understanding of some of the most relevant topics of the Z-path
- asking what they liked/disliked about the programme
- their view on fundamental research and what we are doing at CERN
- what they think about their own (possible) future in academia



Thoughts on their own capabilities in physics after IMC

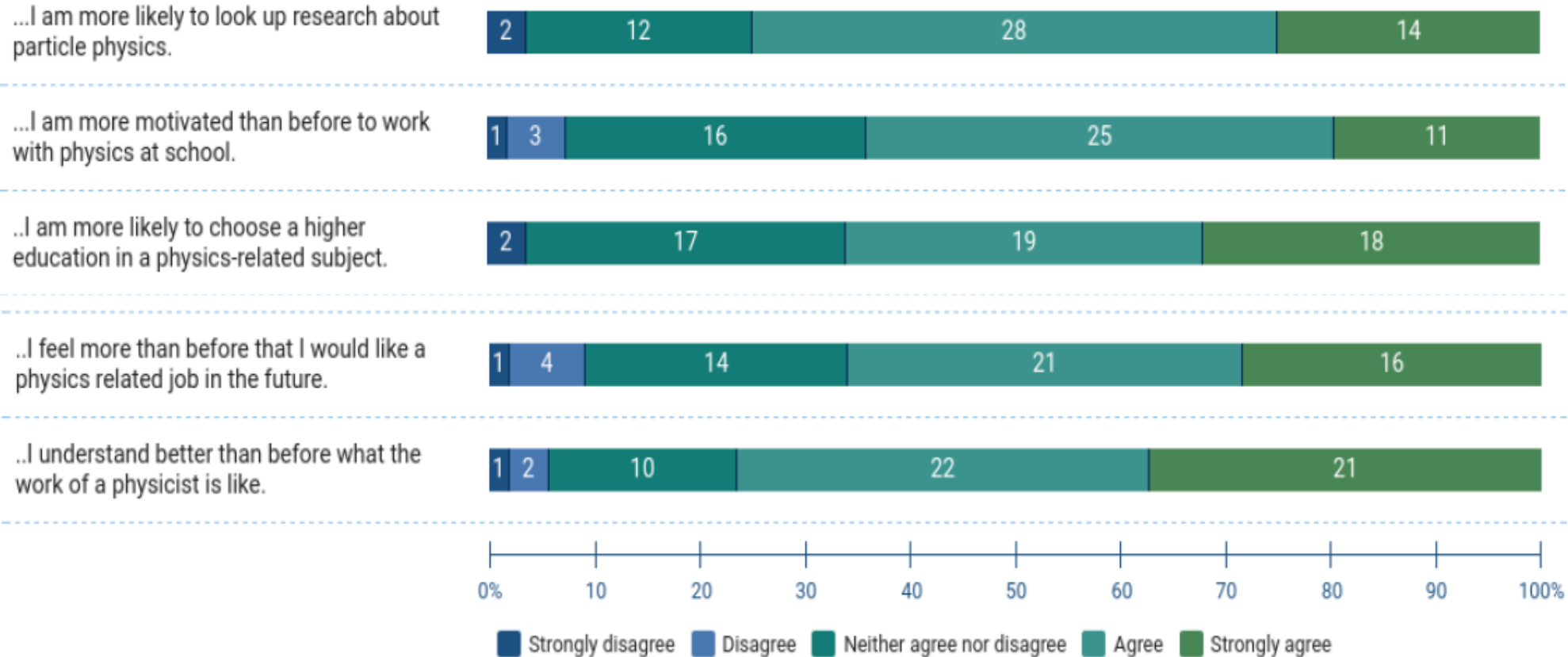
☰ After having taken part in this CERN Masterclass..



- in general very positive answers
- IMC seems to have given them additional motivation in doing physics

Interest in CERN, physics and particle physics?

☰ After having taken part in this CERN Masterclass..



Report MC2NC WG meeting

- Armenia: Rok reports new groups will do Belle II Masterclass
- Korea: Despina will hold ALICE Masterclass in Seoul next week
- Japan: Kazuo reports participation in Auger Masterclass for the first time
- Thailand: Kazuo has made contacts to Changmai, other contacts possible
- Taiwan: Kazuo and Ken have contacts with Central University
- Philippines, Singapore and Romania: QuarkNet teacher Tiberiu Dragoiu-Luca has initiated Masterclasses as he moved

