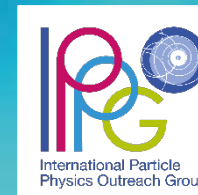


International Masterclasses: Forward from Pandemic

Uta Bilow, Technische Universität Dresden
Kenneth Cecire, University of Notre Dame

09.07.2022
ICHEP 2022, Bologna



International Masterclasses

High school students (15-19 y.)

- are made „scientists for one day“
- get invited to a research lab or university

3 elements

1

Introductory talks
standard model, detectors, accelerators

2

measurement with HEP data

3

International videoconference
3-5 groups + 2 physicists as moderators at
CERN, Fermilab, KEK, GSI, TRIUMF



Broad Scope of Masterclasses

- LEP/LHC (since 2005/2011)
- Belle II (since 2020)
- MINERvA (since 2019)
- Particle Therapy (since 2020)

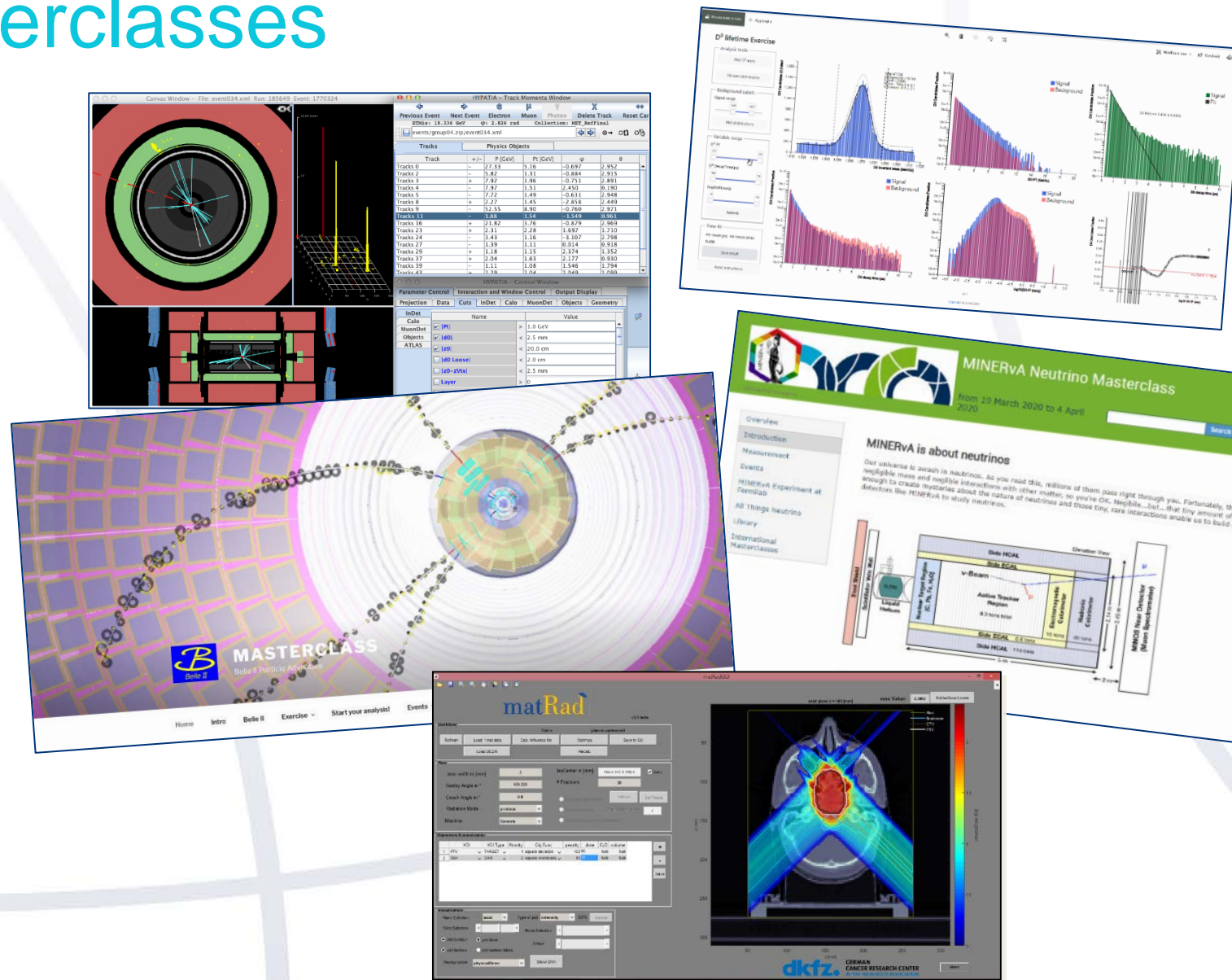
Under development:

- NOvA
- MicroBooNE

More Masterclasses:

- IceCube
- Pierre Auger
- DarkSide
- ...

09.07.2022



Worldwide Outreach Program

- Organized by IPPOG (International Particle Physics Outreach Group)
- Every year in spring, 7 weeks around March
- 220 research labs from 60 countries
- 2019: 15.000 high school students



Coordination: Ken Cecire
(QuarkNet) / Uta (TU Dresden)

Before COVID

- High school students visit research lab
- Work shoulder to shoulder with physicists
- Videoconference with student groups (10-300 students)

1



2

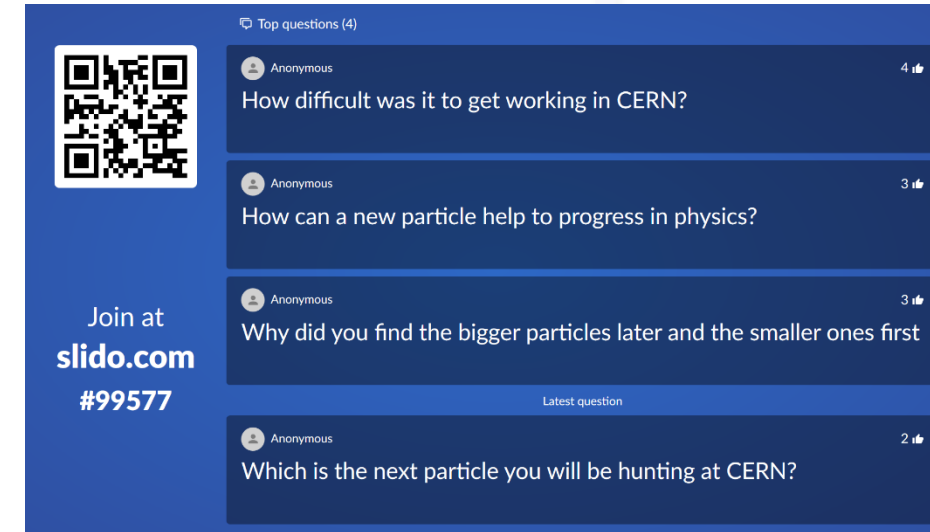


3



During Pandemic I: 2020

- Program started on Feb 26
- All videoconferences suspended by March 18
 - 25% completed (CERN program, started earlier)
 - All other programs (Fermilab, KEK, GSI): < 20%
- Summer program offered, but few interest
 - Videoconferences on June 26-27
 - 4 registrations only
 - New: Use of slido.com, to engage with the audience



Top questions (4)

Join at **slido.com** #99577

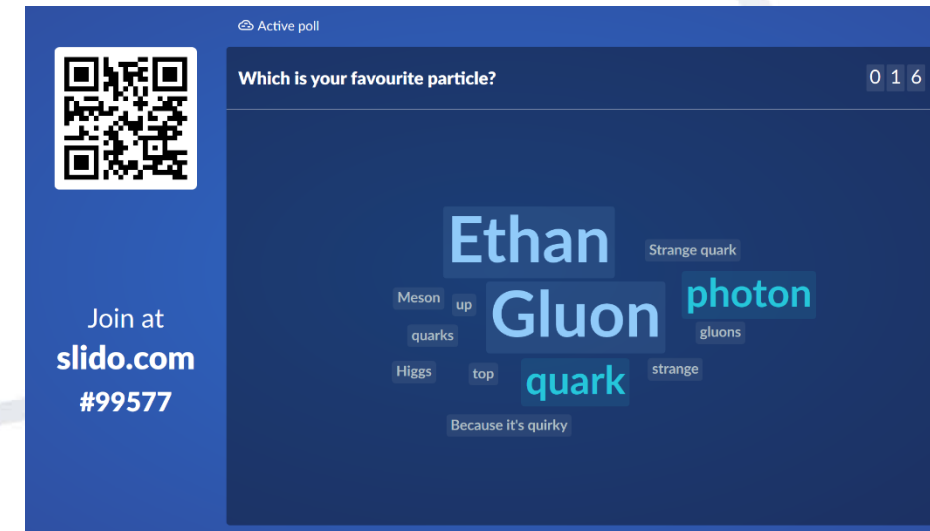
Anonymous 4 likes
How difficult was it to get working in CERN?

Anonymous 3 likes
How can a new particle help to progress in physics?

Anonymous 3 likes
Why did you find the bigger particles later and the smaller ones first

Latest question

Anonymous 2 likes
Which is the next particle you will be hunting at CERN?



Active poll

Join at **slido.com** #99577

Which is your favourite particle? 0 1 6

Ethan
Gluon
quark
Because it's quirky

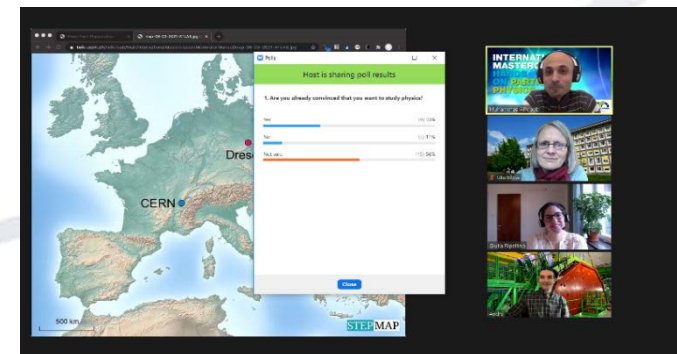
Meson up quarks Higgs top strange quark photon gluons

During Pandemic II: 2021

almost all Masterclasses given online

- 1 Remote lectures
- 2 Hands-on part in breakout rooms
- 3 Videoconference held as Zoom webinars
 - up to 250 unique viewers
 - Zoom polls and Q&A function
 - Quiz via kahoot app
 - Teams of 3 moderators, incl. 1 technical moderator

Plus: Additional event in summer 2021: BAMC and BAMA
(Big Analysis of Muons in CMS/ATLAS = simplified measurement)



During Pandemic III: 2022

Planning: in-person sessions, 1 dedicated online week

Reality: many mixed sessions

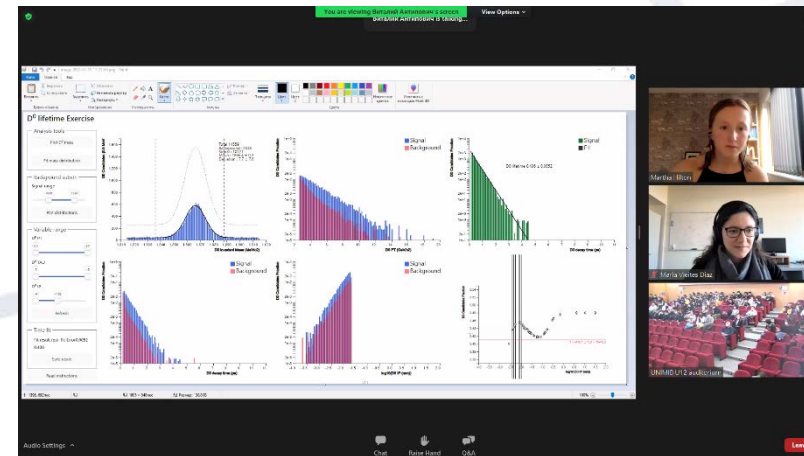
- groups and individual students in one session

1 **2** Lecture and hands-on session: no effect

3 All videoconferences were set up as webinars

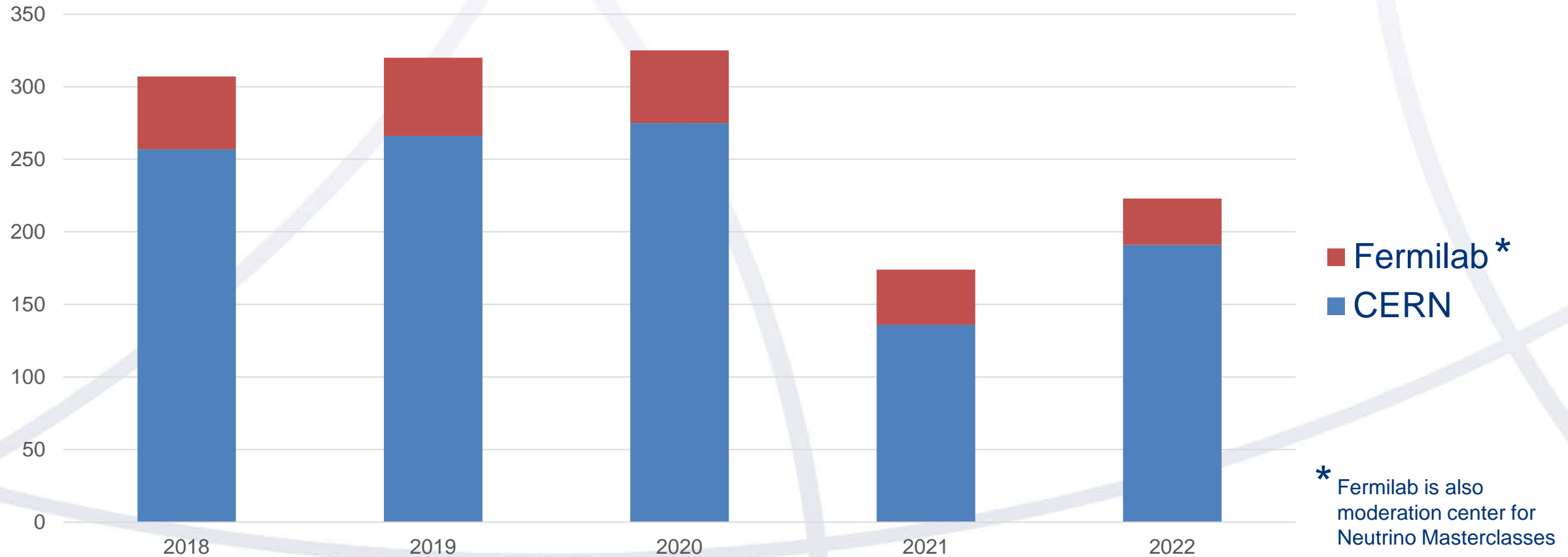
Recommendation for moderators:

- Upgrade groups to be panelist (sharing of audio & video possible)
- Upgrade individual participants as well (if not too many)
- Attention! Default setting: panelists cannot vote in polls



Impact of the pandemic on attendance

Scheduled LHC Masterclasses with Videoconference



Results and Experience

Participation

- Dropped initially during pandemic
- Institutes adapted quickly, numbers going up again

Online Version of Masterclasses



Reaches more people

- Open to students without regional restriction
- Tutors and moderators could engage from everywhere



Increased interaction during videocon

- All students involved via polls
- Lively discussion and many questions via Q&A function



Webinar style lacks personalization



Increased coordination and support effort

Plans for 2023

- In-person and online Masterclasses in the future
 - Strict separation in schedule
- Zoom videoconference for groups (with audio and video)
 - Interactive formats like Kahoot quiz or slido
- Period 2023 starts on Feb 11 with Girls' Masterclasses

www.physicsmasterclasses.org

