

# INTERNATIONAL MASTERCLASSES HANDS ON PARTICLE PHYSICS

Report Masterclasses SG  
Uta Bilow + Ken Cecire  
11.05.2022, Podgorica





# INTERNATIONAL MASTERCLASSES

hands on particle physics

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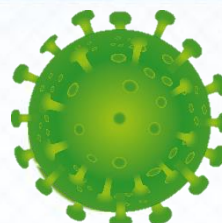
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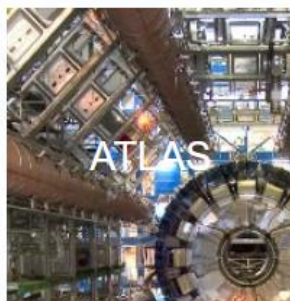
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## International Masterclasses

18<sup>th</sup> International Masterclasses 2022



ATLAS



ALICE



CMS



LHCb



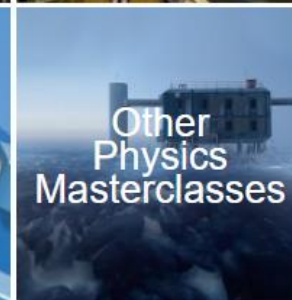
BELLE II



MINERvA



Particle  
Therapy



Other  
Physics  
Masterclasses



Masterclass on March  
15 at Nikhef,  
Amsterdam





IGFAE, Santiago de Compostela, Spain



Yerevan, Armenia



Bibliotheca Alexandrina, Egypt

# Statistics for IMC22

numbers from 2021 in brackets

## CERN LHC Masterclasses

191 MCs with  
CERN VC (136)

- 94 ATLAS (57)
- 51 CMS (35)
- 22 LHCb (22)
- 24 ALICE (22)

## Fermilab LHC Masterclasses

32 MCs with  
Fermilab VC (38)

- 22 CMS (23)
- 10 ATLAS (5)

## MINERvA Masterclasses

9 MCs (11)  
5 VCs (7)

0 MCs with  
TRIUMF VC (5)

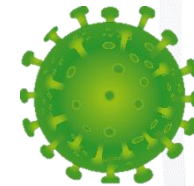
## KEK Belle II Masterclasses

11 MCs (10)  
3 VCs (3)

## GSI Hadron Therapy Masterclasses

28 MCs (33)  
5 VCs (6)

# 2022: Again a Pandemic Edition



Slide from Nov 2021

## IMC 22: What do we expect?

### Three settings:

- (1) Masterclasses at universities or labs (high school students allowed on campus)
- (2) Remote Masterclasses with students in classrooms
- (3) Remote Masterclasses with individual students, connecting from home (or elsewhere)

→ We have experience and are prepared for all 3 cases!

### Expected videocon situation:

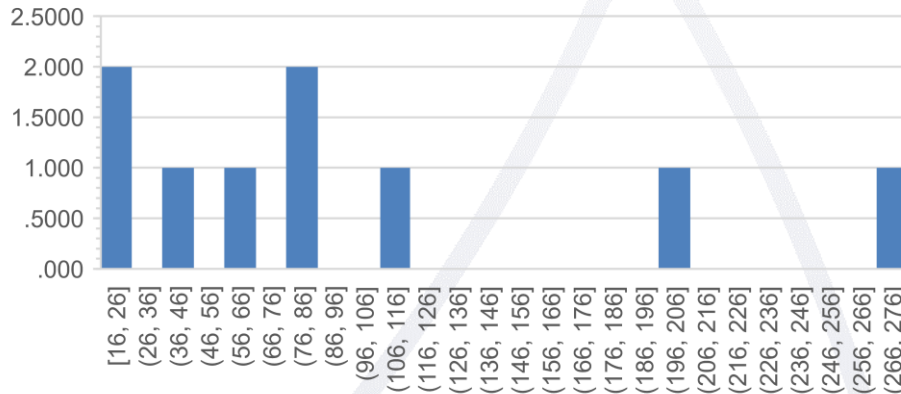
- (1) + (2): Sessions with student groups connecting
- (3): Sessions with individual students connecting → one dedicated week March 7-12
- Moderators might not sit together

### **What really happened:**

- Student groups connected
- Individual students connected
- One dedicated „online“ week
- All other weeks: **often mixed settings!**

# CERN webinars

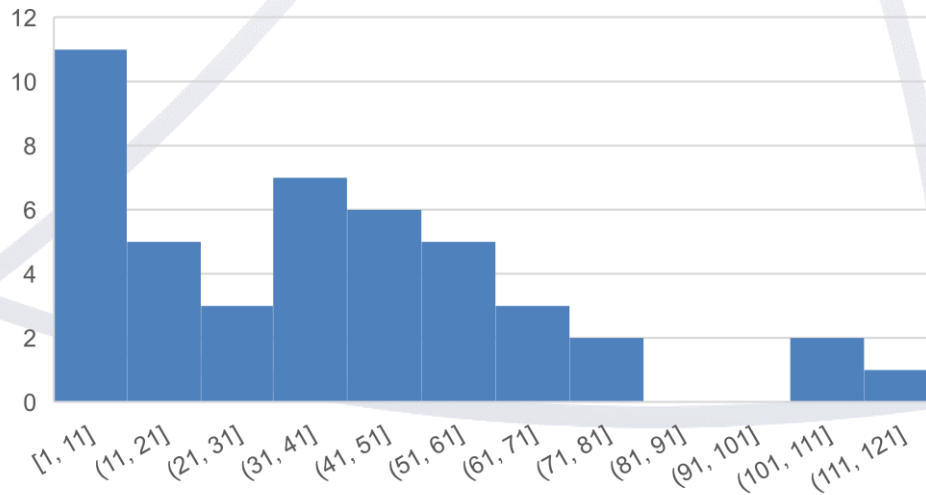
Unique views in webinars, "online week"



## „Online week“ 7.-12.3.

- 9 videoconferences
- Between 16 and 269 unique views

Unique views in webinars, "group" weeks

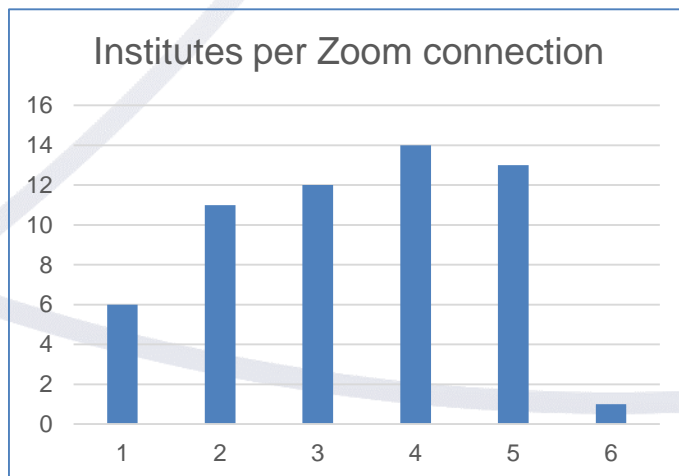


## All other weeks

- 48 videoconferences
- Between 1 and 112 unique views

# Masterclasses with CERN

- Videoconferences set up as webinars
  - In case of low number of connecting parties, moderators upgraded groups and individuals to be "panelists" (share video/audio)
  - Moderators connected from everywhere, team of 60!
  - Again many last-minute cancellations (~ 18%)
  - 233 Masterclasses registered, 191 MCs took place
- Several „not-so-international“ videoconferences

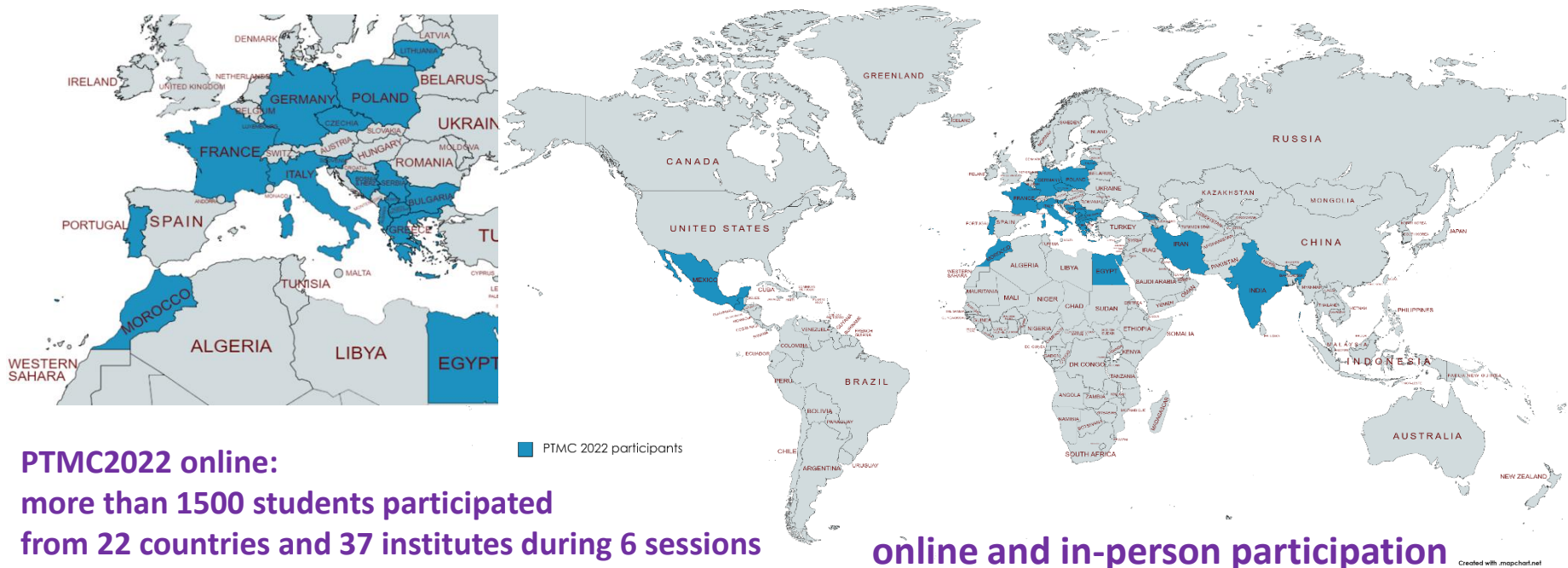




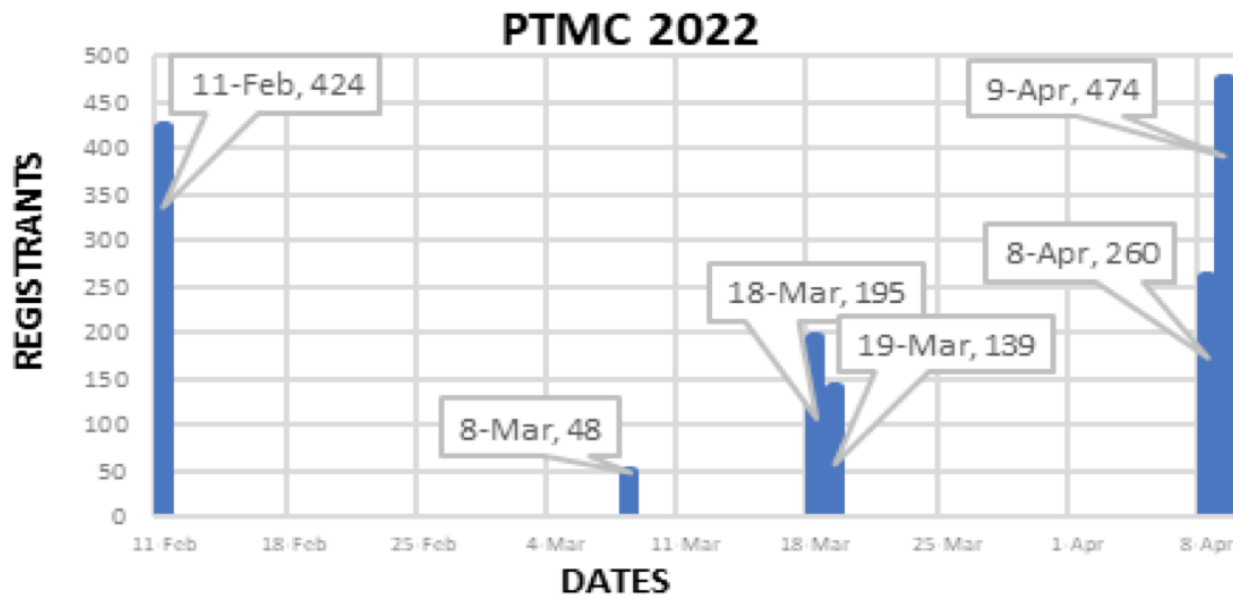
# Participants of online PTMC in IMC2022

PTMC: <https://indico.cern.ch/event/840212/>

Several new countries



**PTMC2022 online:**  
more than 1500 students participated  
from 22 countries and 37 institutes during 6 sessions  
web pages with agendas of every institute with material  
in different languages, publicly available for future events



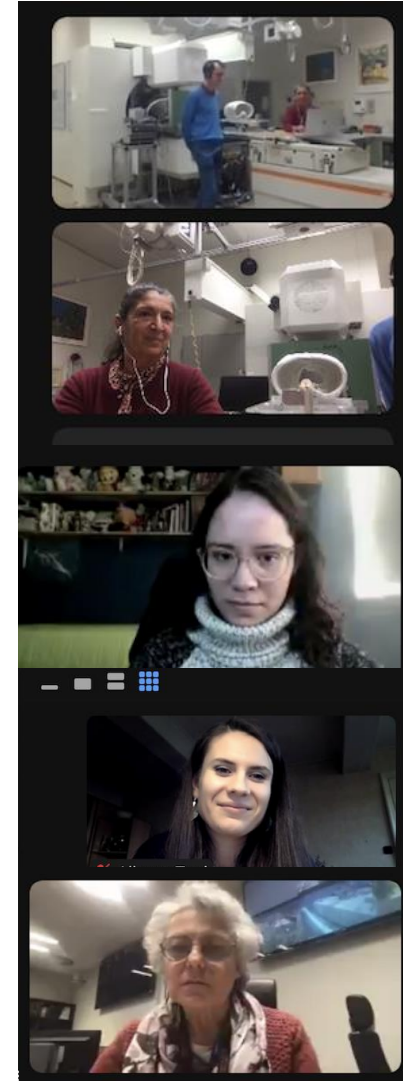
AGENDA:

<https://www.dropbox.com/scl/fi/346g72h3ixzzpn7n13t16/PTMC-2022-Dates.docx?dl=0&rlkey=p4drxxytpllmdsx8bffx9bymw>

Dates: 11 Feb, 8 march 18, 19 March, 8, 9 April

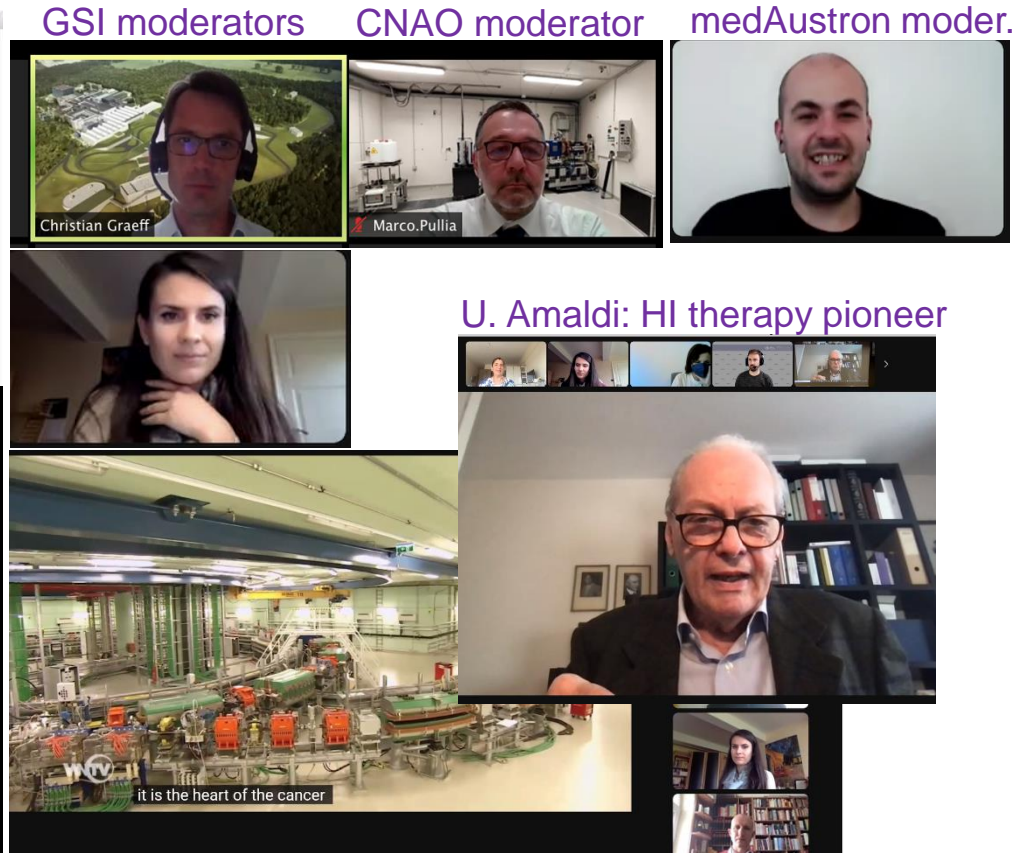
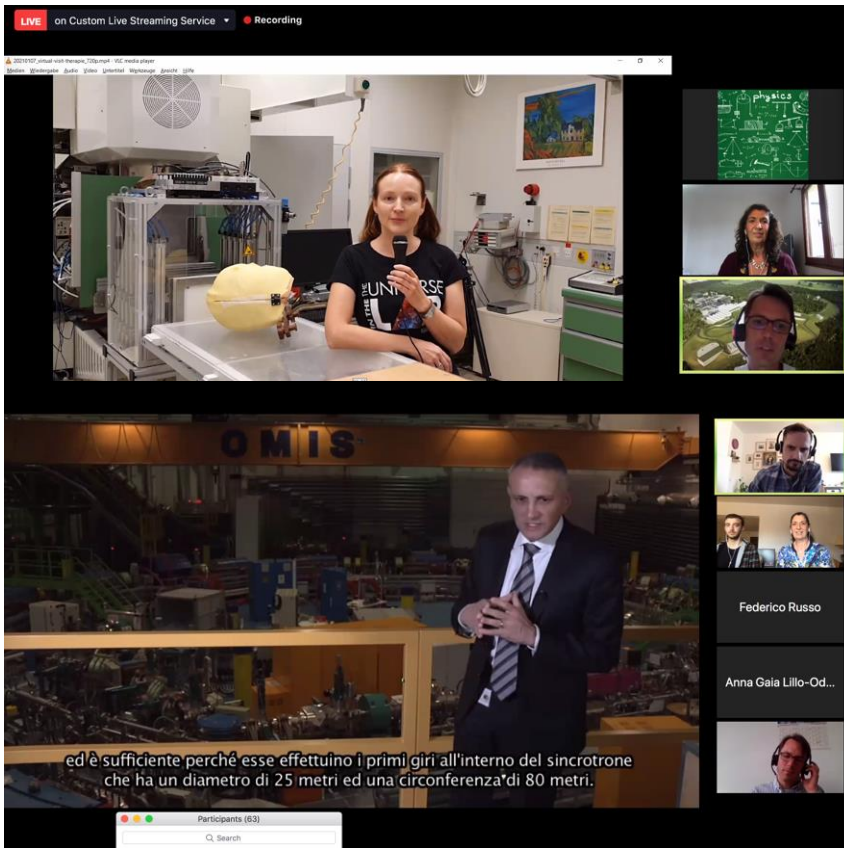


# Video-conference from GSI therapy room



# Virtual visits and video-conferences

Virtual visits during video-conference: GSI research institute, CNAO, MedAustron therapy centers



# QuarkNet and Fermilab

## Measurements

- ATLAS: some growth
- CMS: CIMA ratio calculation issue, otherwise continues to work well
  - Will fix for 2023
- MINERvA also works well → no changes
- New: NOvA test masterclass in April (Minnesota)
  - Compare near and far detector CC vs NC events
  - Far detectors by event display, use for coding near detector results
- Still working on ProtoDUNE

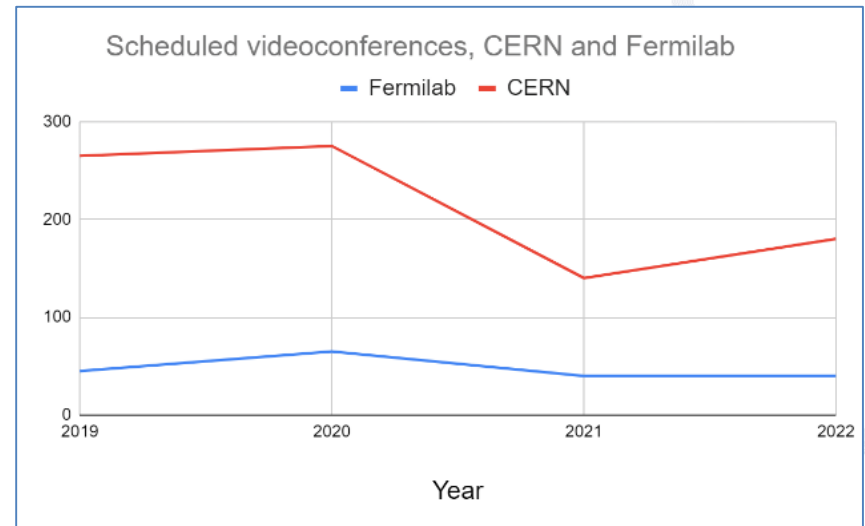
## News

- Kate Shaw now coordinating DUNE education and outreach

# QuarkNet and Fermilab

Videoconferences: changes started in 2022:

- Meetings to discuss changes – could only do some this year
- Moderator orientation format:
  - Online resources and guide
  - Videocon Q&A, discussion
- More Fermilab-oriented – stories, backgrounds
- New (and some old) questions for students
- Considering adoption of Kahoot quiz in 2023
- More adjustments in 2023



# BELLE II IMC in 2022

Back to live masterclasses (1/2 still online) – 216 students

- ❖ The events announced through IMC and Belle II collaboration channels
  - ❖ **Europe** - 3 events with a final video conference
  - ❖ 1 planned event for Japan cancelled due to Covid

	Institutes	Participants
Mar. 7 2022	4	90
Mar. 16 2022	4	71
Mar. 23 2022	3	75

- ❖ Tutorial , Jan.25 @Belle II General Meeting,
  - ❖ **Question time**, Mar.2
- ❖ Video conference with live connection to Belle II control room – live earthquake during 2<sup>nd</sup> VC.
- ❖ Quiz: own application and voting system – allows group ranking.
- ❖ Planned participation @FPCP2022 : Uni. Mississippi



# Belle II - exercises

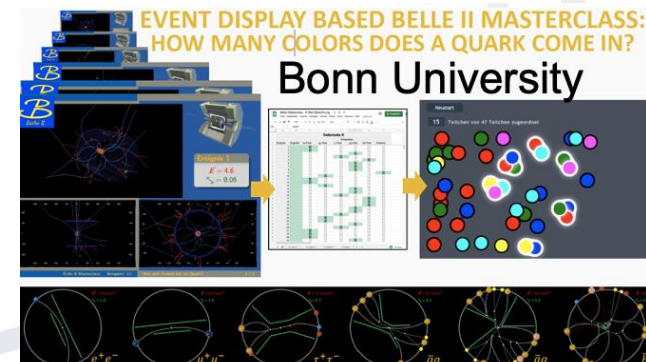
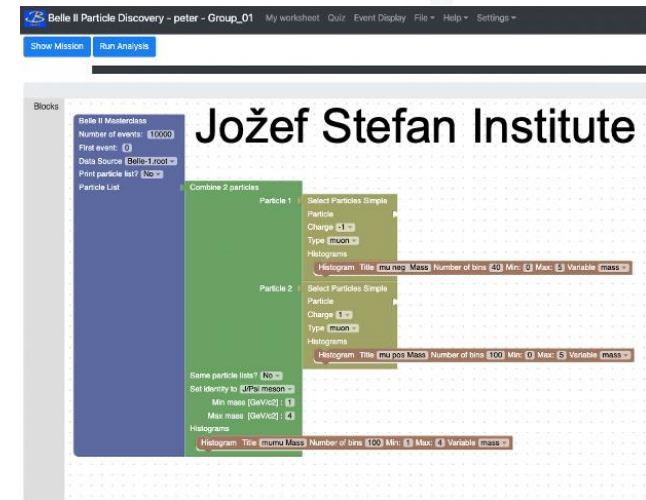
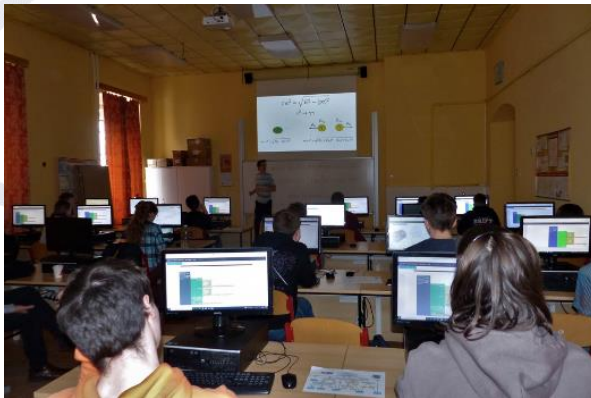
Two exercises – Choose one or do both:

❖ Spectroscopy – search for new particles 10 MEvents

- <https://belle2.ijs.si/masterclass/>
- Online server
  - able to handle more than 250 parallel users
- Event display added (not used before)

❖ **New in 2022:** Measure quark colors

- similar to LHC experiments
- <https://belle2.ijs.si/public/home/quark-colors/>
- Limited sets of events





# New participants in IMC22

- Yerevan (Armenia)
- Karachi, Islamabad, Lahore (Pakistan)
- Riga (Latvia)
- Skopje, Tetovo (North Macedonia)
- Tirana (Albania)
- Pristina (Kosovo)
- Guatemala (Guatemala)

Via PTMC



# Kharkiv/Ukraine

Physicists in Kharkiv held their first Masterclasses in summer 2021 (with help of IPPOG) and planned to participate in IMC22....



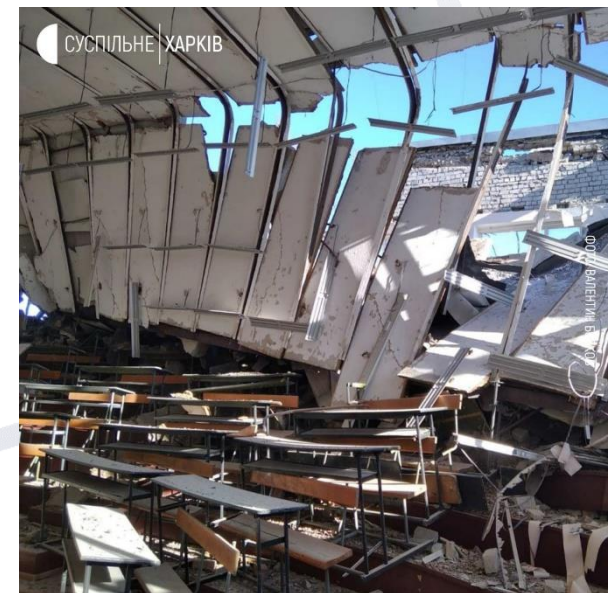
Source: Philip Kuznietsov, 26.02.2022

11.05.2022



Source: Philip Kuznietsov, 19.03.2022

Masterclasses SG report



# Reaction from IPPOG

As a result of the invasion of Ukraine by Russian forces, Ukrainian facilities are currently under siege and clearly unable to host International Masterclasses.

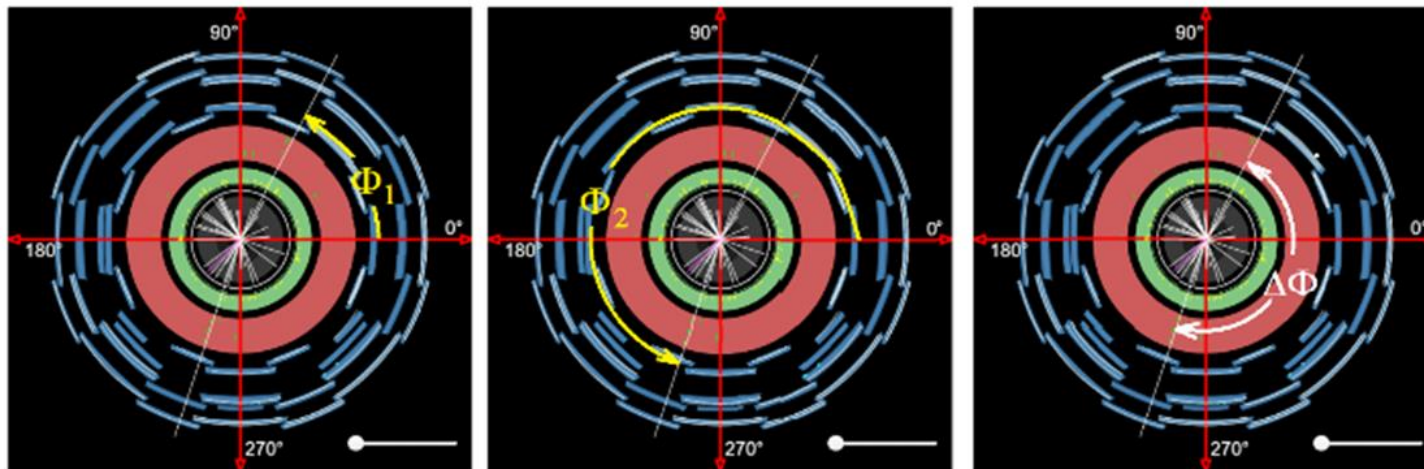
Furthermore, Ukrainian students, teachers and physicists are in danger and unlikely to be able to attend masterclasses at the scheduled dates.

These conditions do not constitute the right environment for students to learn about peaceful international collaboration in physics.

Thus, regretfully, the International Masterclasses Steering Group has decided to postpone Ukrainian and Russian masterclass videoconferences until they can be conducted in a safe and positive environment.

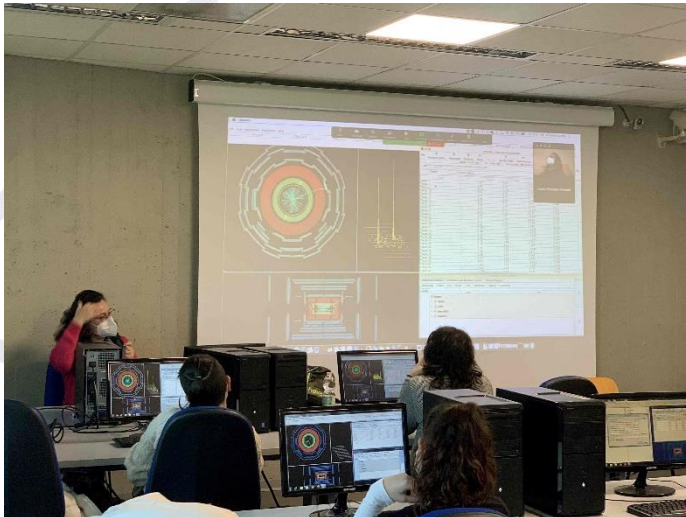
# World Wide Data Day 2021 (W2D2)

- Wed, December 1<sup>st</sup>
- for high school students, guided by physics teachers
- simplified measurement with data from ATLAS and CMS
- measurement  $\Phi$  and  $\Delta\Phi$
- 24-hour-span videoconference with 30 min calls to share and discuss results



# Int. Day of Women and Girls in Science

- On Feb 11<sup>th</sup>
- LHC MCs for girls [http://physicsmasterclasses.org/index.php?cat=women\\_in\\_science](http://physicsmasterclasses.org/index.php?cat=women_in_science)
- 11 groups participating (7)
- 550 students/unique viewers (290)
- Female lecturers and tutors (as much as possible)
- 4 videoconferences at CERN (3)
- 8 female moderators (6)



# Results from IMC SG Meeting today

Hybrid videoconferences are not ideal.

→ We will work on strict separation of online and in-presence events with the registration for IMC23

Increased demand for slots in Feb.

→ IMC will get a fixed start, beginning with IDWGS Masterclasses on Feb 11.

Single event with misbehaving students.

→ A small document „code of conduct“ will be prepared and made available, can be used by institutes.

# Backup-slides

# Acknowledgements PTMC

## matRad Developers

Wahl, Niklas  
Bangert, Mark  
Hans-Peter Wieser

## DKFZ Heidelberg

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Katrin Platzer, Malte Ellerbrock  
Noa Homolka Amit Ben Antony Bennan

## GSI

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GSI Biophysics:  
Christian Graeff, Radek Pleskac  
GSI ALICE, EMMI :  
Ralf Averbeck, Malzacher, Peter  
GSI IT :  
Thorsten Kollegger, Behnert, Katharina  
Osdoba, Sascha

**Sponsors** : Edmond Offermann



## CERN (staff and users)

CERN: tutors  
**Loc Org: Nikolaos Charitonidis**  
Alexander Gerbershagen  
Evangelia Dimovasili  
Elena Benedetto

CERN/ARIES: Maurizio Vretenar, Valerie Brunner  
CERN/ENLIGHT: Manjit Dosanjh Petya Georgieva  
CERN/KT: Manuela Cirilli Anais Rassat Rita Ferreira  
Giovanni Porcellana  
CERN: Visits Service Erwan Harrouch Francois Butin  
CERN: Training Centre: Eric Bonnefoy M-L LECOQ

## Uni Sarajevo: web pages

Amila Avdic  
Amra Ibrahimovic  
Mirsad Tunja  
Damir Skrijelj

## Online mode, web pages, training

Aris Mamaras (AUTH), Damir Skrijelj (UNSA)



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# Acknowledgements PTMC

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