Discovering cosmic rays with OCRA

Outreach activities for students and teachers

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for the OCRA collaboration

ICRC2021 | 12 – 23 July 2021

Outline

Who is OCRA?

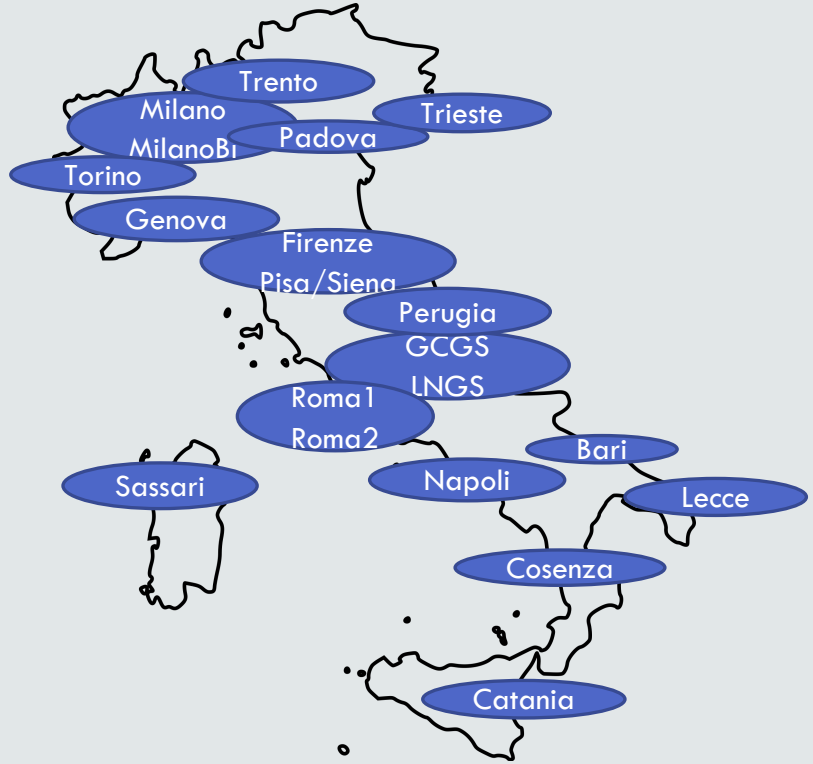
OCRA at the International Cosmic Day 2020

Other OCRA activities

OCRA – Outreach Cosmic Ray Activities

Born in 2018 as a **national outreach project of INFN** with the aim of collecting, within a national framework, the numerous **public engagement activities in the field of cosmic ray physics** already present at a local level.

Today OCRA counts 21 of the INFN divisions and laboratories as its members.



https://web.infn.it/OCRA/

Ocra INFN Ocra INFN Ocra_INFN

International Cosmic Day at OCRA

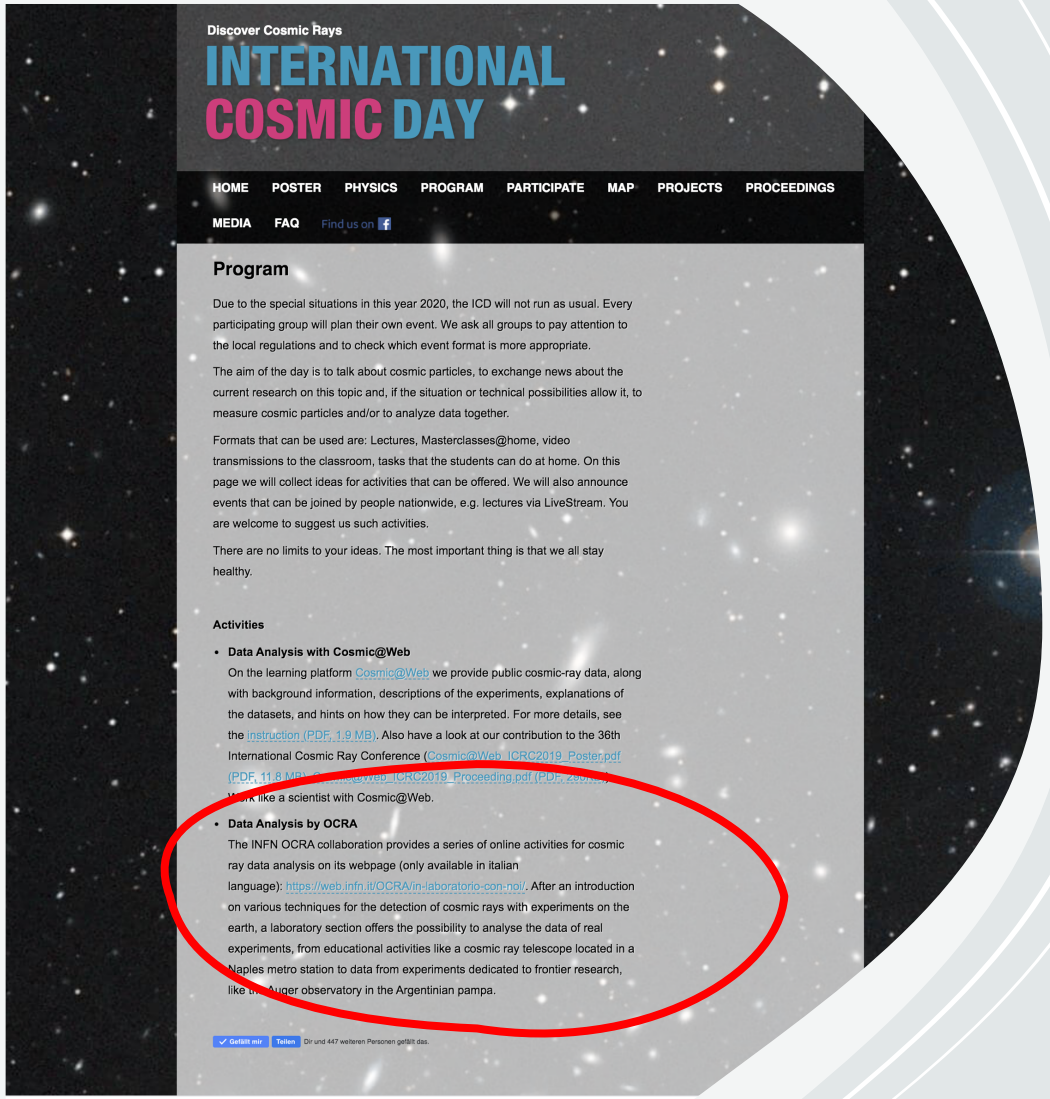
International Cosmic Day (ICD) organized every year by DESY

- Seminars
- Measurements with a muon telescope
- Video call and discussion of the results
- Questionnaire and/or Kahoot

6 November 2019
About 1000 students in 20 INFN divisions and laboratories

ICD 2020


Discover Cosmic Rays
INTERNATIONAL COSMIC DAY
HOME POSTER PHYSICS PROGRAM PARTICIPATE MAP PROJECTS PROCEEDINGS
MEDIA FAQ Find us on
Poster
Discover Cosmic Rays
INTERNATIONAL COSMIC DAY
November 4 | 2020
Cosmic particles, these unnoticed particles that surround us all the time, are the focus of this day. Students, teachers and scientists get together to talk and learn about Cosmic Rays and answer questions like:
What are cosmic particles?
Where do they come from?
How can they be measured?
And what can we learn from them?
If you want to know more about the secrets they bring with and to be part of this day, get here more information:
Image Credit: DESY, Science Communication Lab
http://icd.desy.de
https://www.facebook.com/InternationalCosmicDay
Fermilab
QuarkNet
ICD2020_general_poster (5.2 MB)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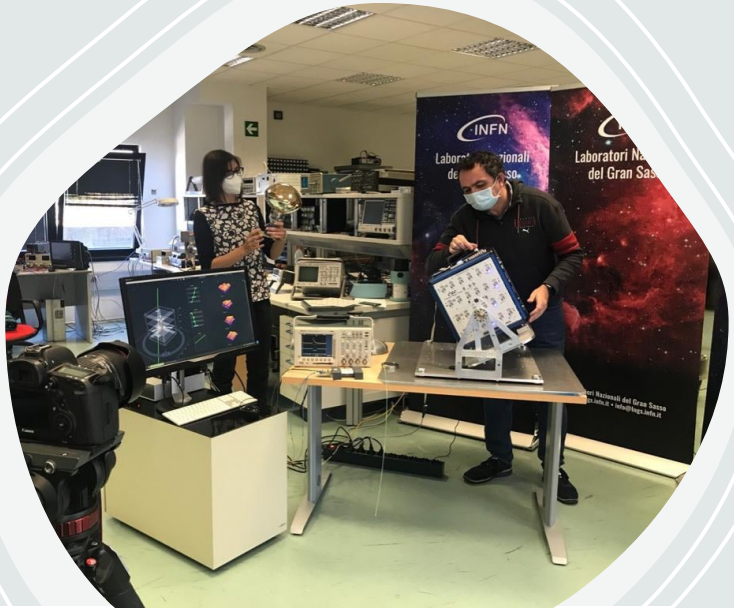
Program
Due to the special situations in this year 2020, the ICD will not run as usual. Every participating group will plan their own event. We ask all groups to pay attention to the local regulations and to check which event format is more appropriate.
The aim of the day is to talk about cosmic particles, to exchange news about the current research on this topic and, if the situation or technical possibilities allow it, to measure cosmic particles and/or to analyze data together.
Formats that can be used are: Lectures, Masterclasses@home, video transmissions to the classroom, tasks that the students can do at home. On this page we will collect ideas for activities that can be offered. We will also announce events that can be joined by people nationwide, e.g. lectures via LiveStream. You are welcome to suggest us such activities.
There are no limits to your ideas. The most important thing is that we all stay healthy.
Activities
Data Analysis with Cosmic@Web
On the learning platform Cosmic@Web we provide public cosmic-ray data, along with background information, descriptions of the experiments, explanations of the datasets, and hints on how they can be interpreted. For more details, see the instruction (PDF, 1.9 MB). Also have a look at our contribution to the 36th International Cosmic Ray Conference (Cosmic@Web_ICRC2019_Poster.pdf (PDF, 11.8 MB) Cosmic@Web_ICRC2019_Proceeding.pdf (PDF, 200
Work like a scientist with Cosmic@Web.
Data Analysis by OCRA
The INFN OCRA collaboration provides a series of online activities for cosmic ray data analysis on its webpage (only available in italian language): https://web.infn.it/OCRA/in-laboratorio-con-noi/. After an introduction on various techniques for the detection of cosmic rays with experiments on the earth, a laboratory section offers the possibility to analyse the data of real experiments, from educational activities like a cosmic ray telescope located in a Naples metro station to data from experiments dedicated to frontier research, like the Auger observatory in the Argentinian pampa.

ICD 2020 with OCRA

National **online edition** with almost **3000 participants** from about **70 different schools** from all over Italy.

Broadcast by the Gran Sasso National Laboratories and directed by the Gran Sasso Science Institute.



Access for 500 students on Zoom webinar and parallel **live streaming on YouTube and Facebook**

YouTube **https://www.youtube.com/watch?v=Ihchwat5Hlk**

https://web.infn.it/OCRA/international-cosmic-day/international-cosmic-day-2020/

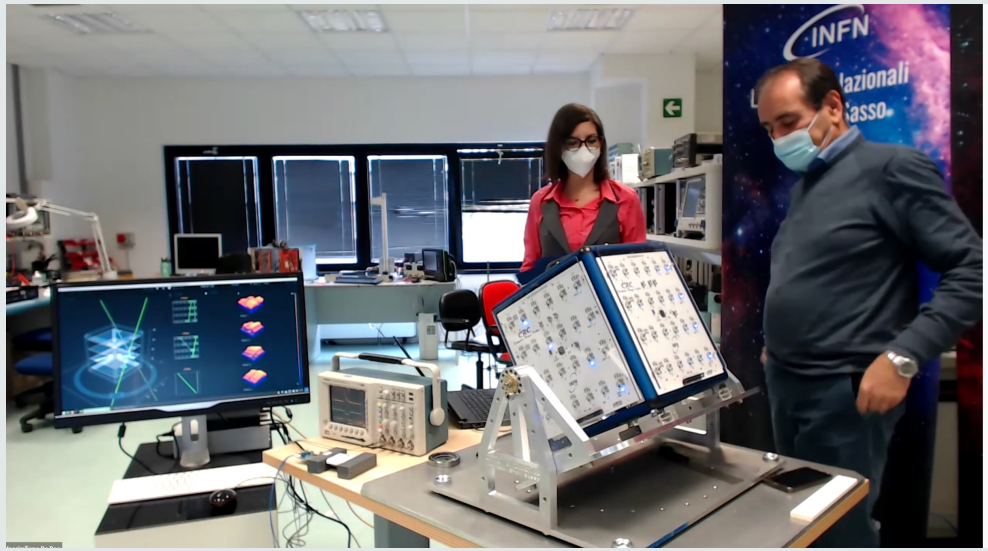
ICD OCRA Program

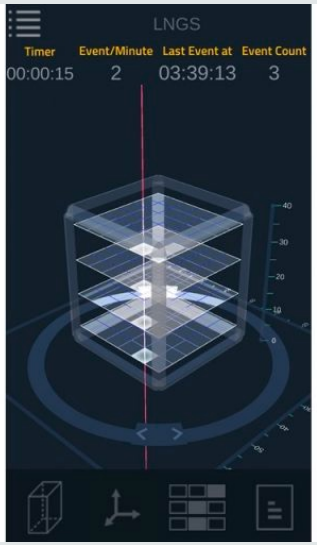
9:30 - 9:45	***Greetings***
9:45 - 10:00	***Introduction to Cosmic Ray physics***
10:00 - 10:10	***OCRA and ICD activities***
10:10 - 10:30	***The Cosmic Ray Cube and use of the CosmicRayLive app***
10:30 - 12:00	***Measurement of the cosmic ray flux from LNGS and talks with researchers from GSSI and UNIVAQ***
12:00 - 12:15	***Kahoot! quiz.***
12:15 - 12.30	***Connection with La Palma - Canary Islands with the MAGIC experiment***

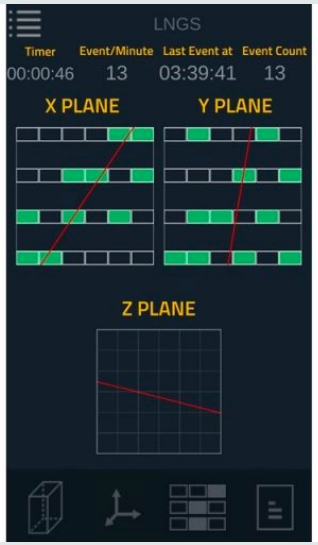
*Live interaction via **INFN Instagram page**, **OCRA INFN Facebook** profile and **OCRA INFN Twitter** with researchers answering students' questions!*

***Moderation** by researcher experienced in conducting TV shows and moderating outreach events*

Muon flux measurement and data analysis



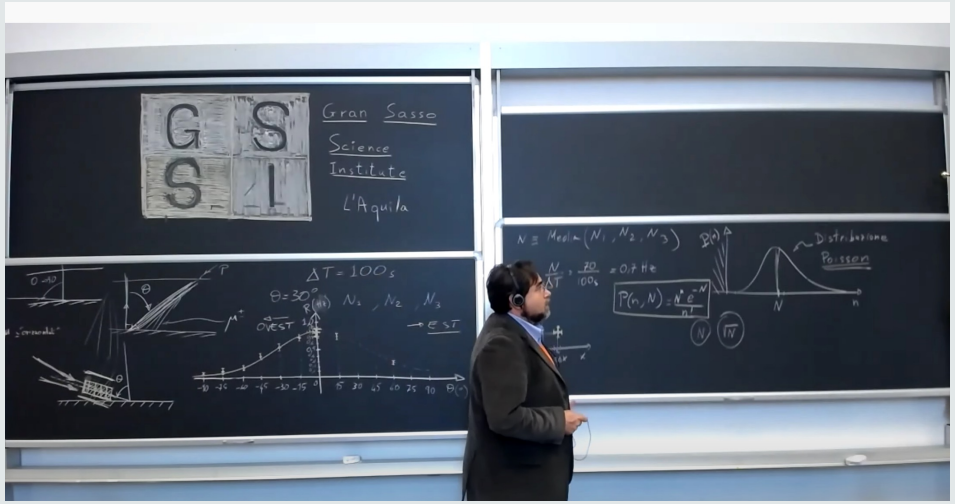




Measurement of the muon flux as a function of the zenith angle at the LNGS using the **Cosmic Ray Cube (CRC)** and its app «Cosmic Rays Live» to allow for **students to connect remotely** to the telescope and **carry out the measurements by themselves**!

International Cosmic Day 2020 - 4 Novembre 2020

angolo [gradi]	conteggio [100 s]	conteggio [100 s]	conteggio [100 s]
0	77	83	82
-15	78	73	64
-30	44	60	53
-45	43	42	39
-60	21	21	21
-75	15	13	16
-90	11	8	9
15	67	83	65
30	52	56	60
45	36	44	34
60	39	29	29
75	25	15	19
90	7	8	7

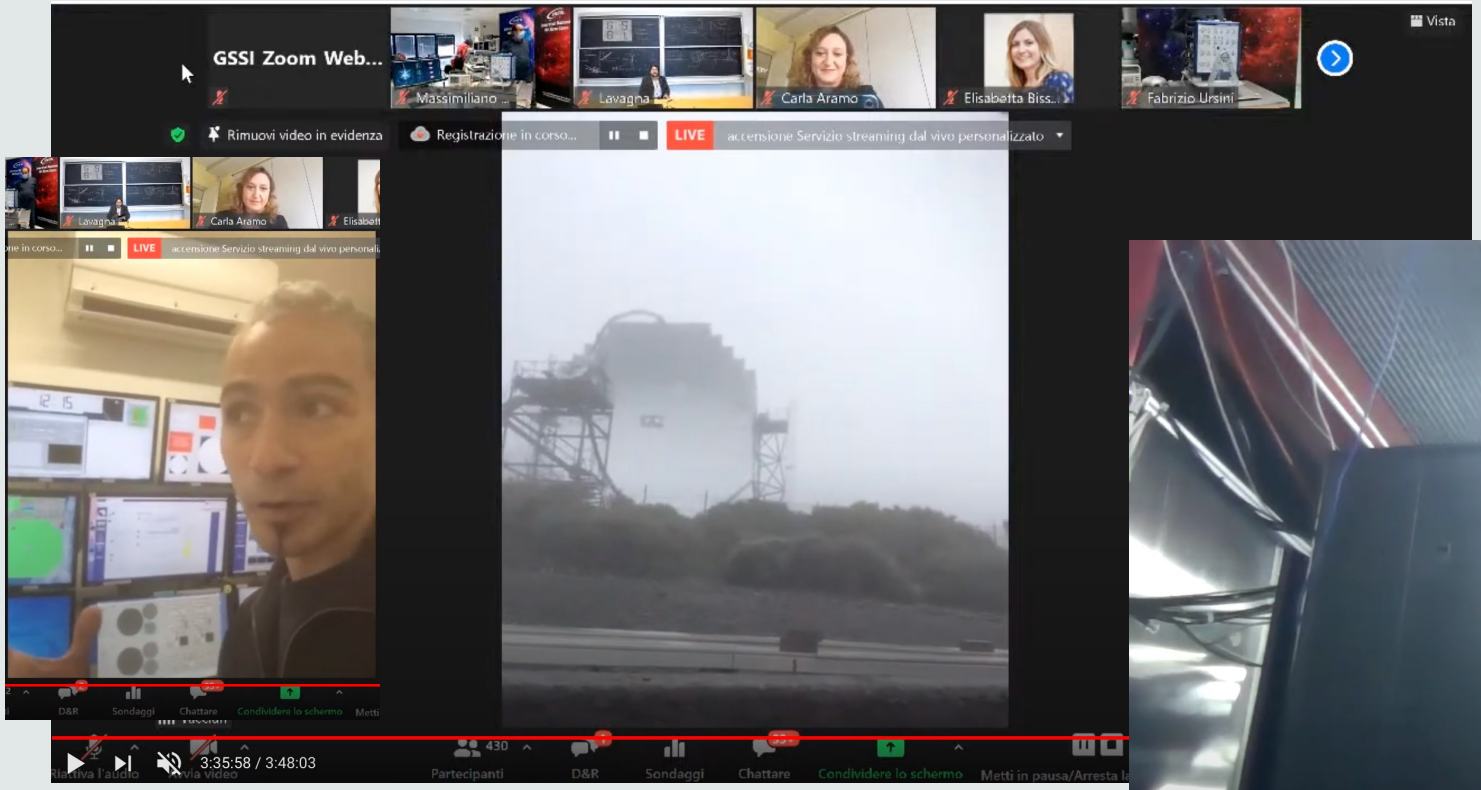


You can download the app Cosmic Rays Live for free!

Android:https://play.google.com/store/apps/details?id=com.DigitalComoedia.CosmicRaysLive&hl=it

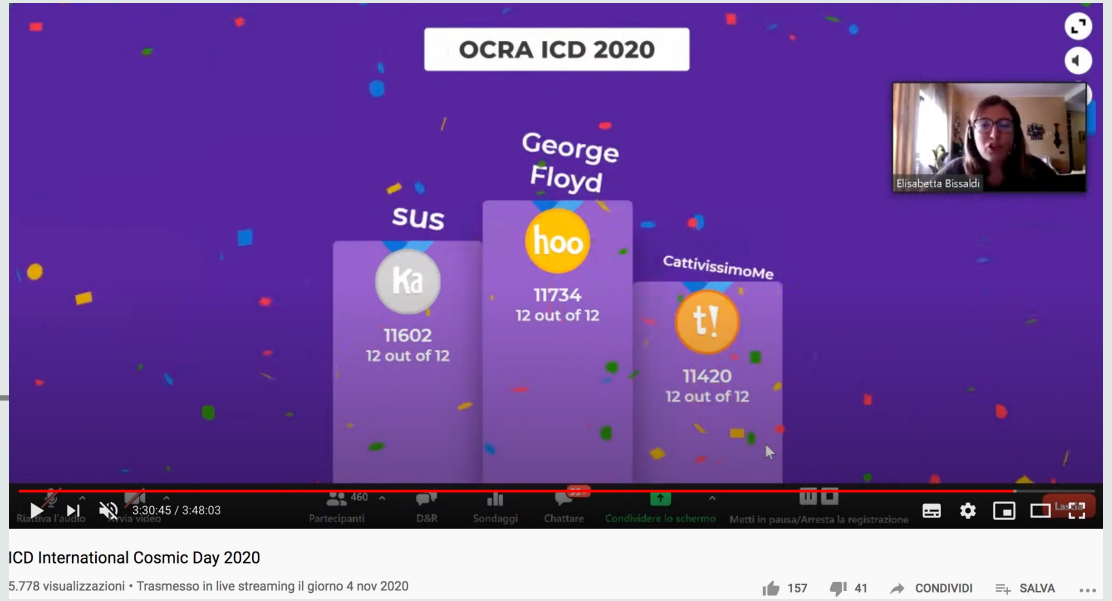
Apple: https://apps.apple.com/it/app/cosmic-rays-live/id1312853002

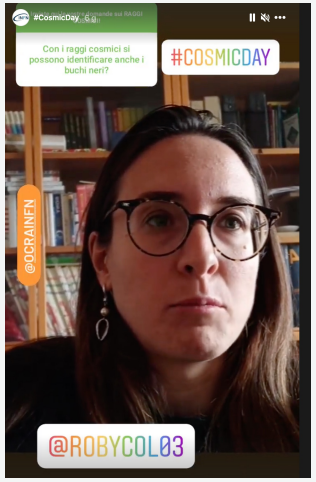
Connection with the MAGIC experiment at La Palma - Canary Islands and with the LNGS underground laboratory



OCRA Kahoot! quiz

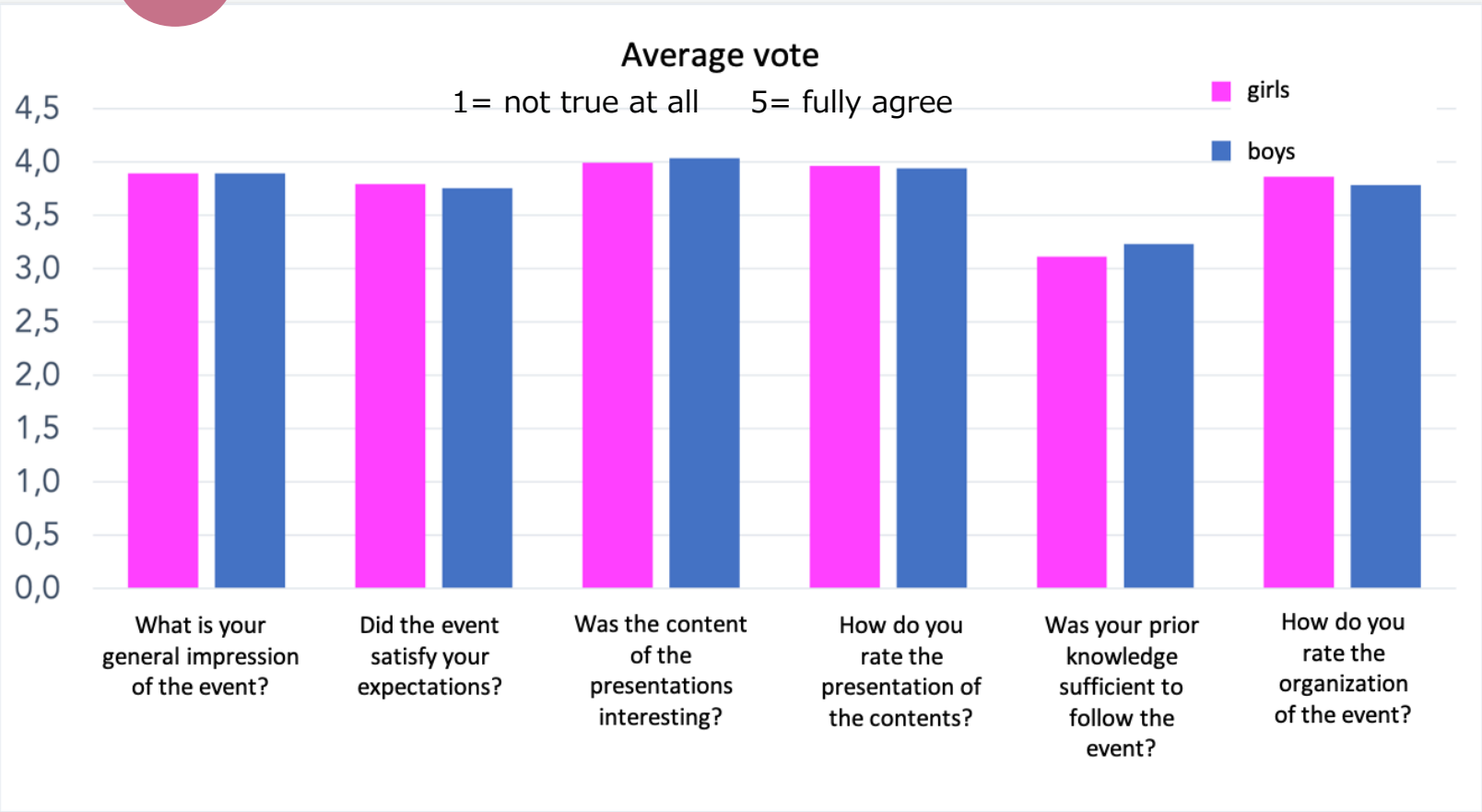
Twelve questions on cosmic rays and detectors with more than 1400 participating students!





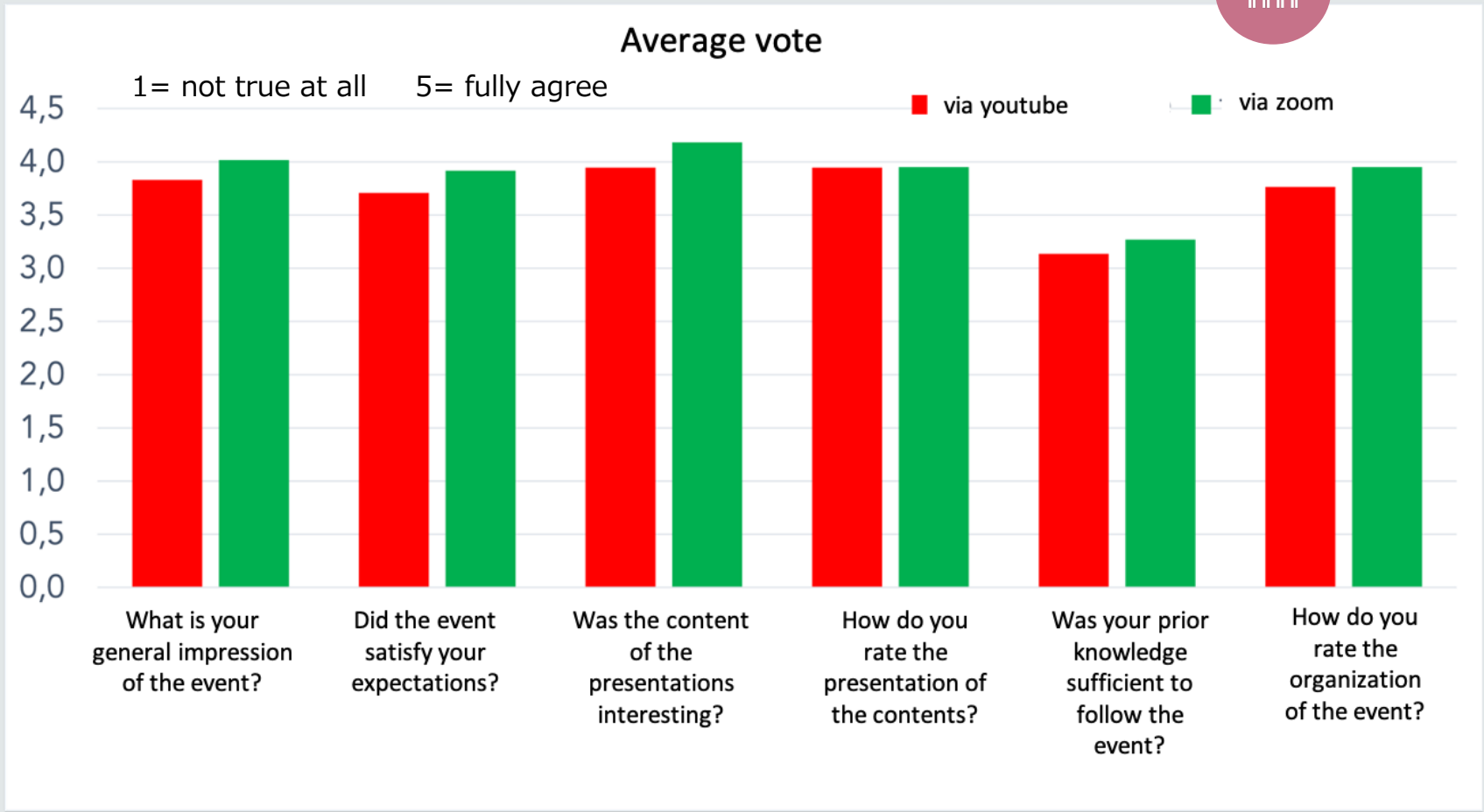
Researchers answer students' cosmic ray questions on Instagram

1078 STUDENTS



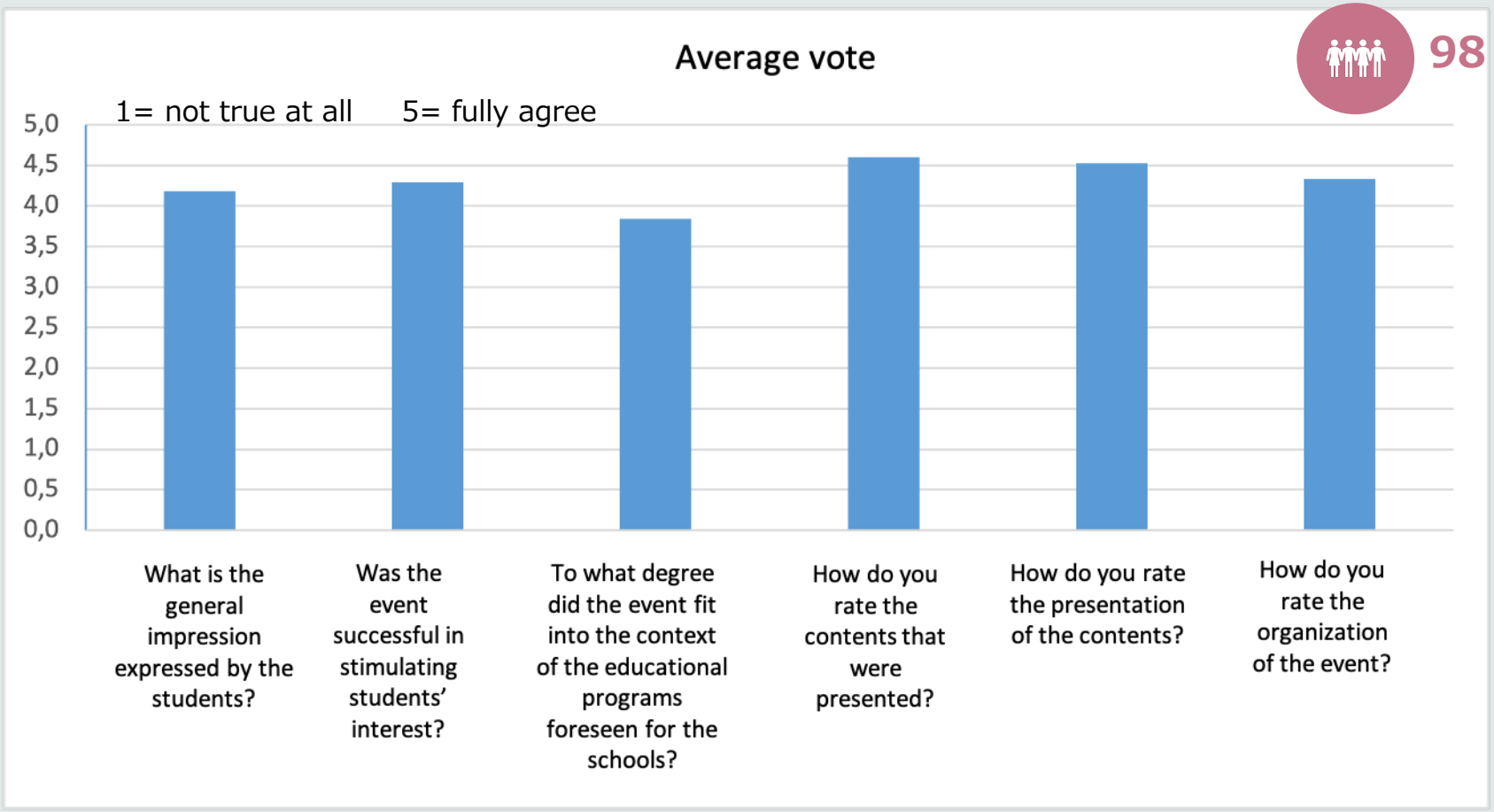
Students' satisfaction survey

1078 STUDENTS



Students' satisfaction survey for participants via Youtube and via Zoom

Teachers' satisfaction survey



98 TEACHERS

Other OCRA activities

Science camp for students

First edition: April 2019 at LNGS laboratories

About 30 students between 16 and 18 years and 5 teachers spent three days with introductive seminars, measurements of the cosmic ray flux at different altitudes around the Gran Sasso massif, data analysis and visit to the underground laboratories

Next OCRA science camp

4 days at Laboratori Nazionali di Frascati with the launch of a balloon equipped with instrumentation for the measurement of the cosmic ray flux during the flight.

The camp was foreseen to take place in spring of 2020 and was cancelled due to the Covid19 pandemic. We are hoping to realize it in the spring of 2022.

For more information on the balloon experiment see talk by Valerio Bocci: *MoCRiS a low-cost stratospheric balloon platform to measure the particle flux of cosmic ray showers in the high atmosphere*

Coming next!

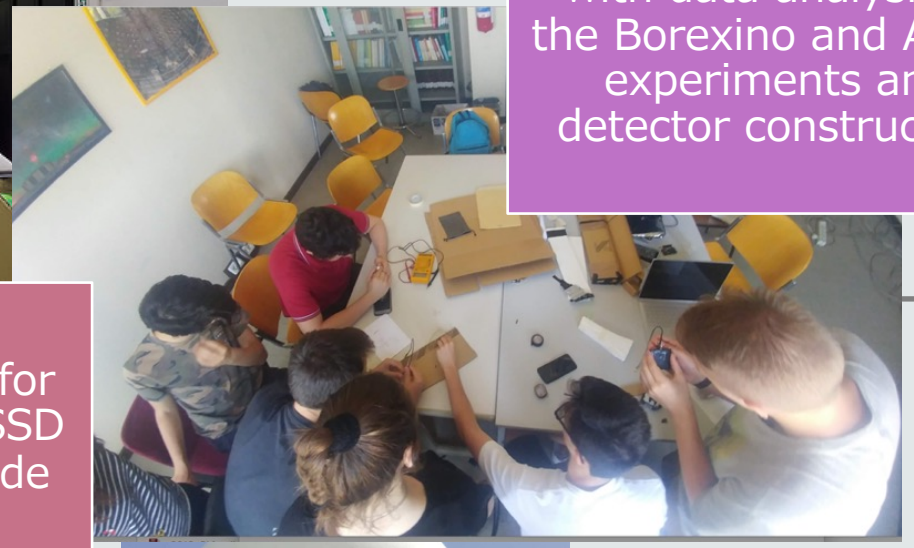
OCRA Cosmic Ray ONLINE Educational Activities

- Interactive labs dedicated to the description of muon measurements
- Materials for teachers for implementation in the classroom
- Spring 2021: online course for teachers

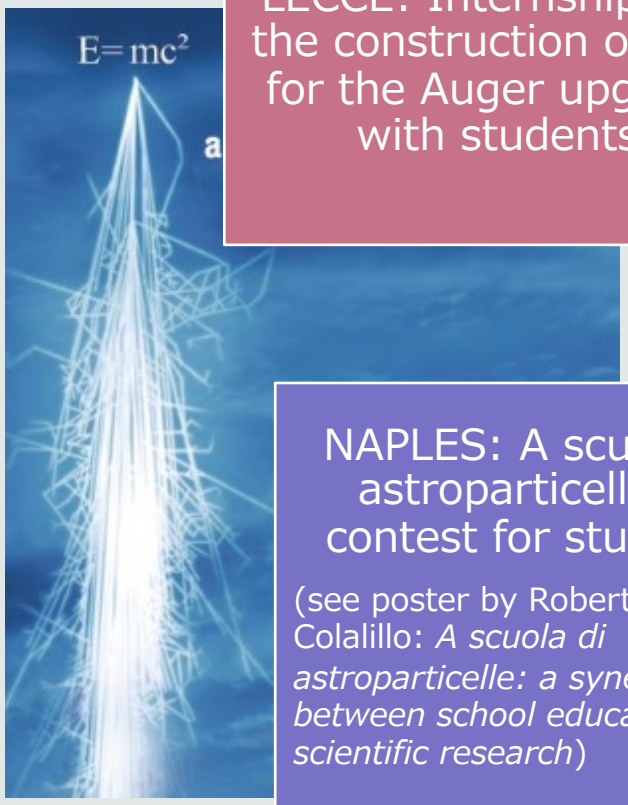
https://web.infn.it/OCRA/

See talk by Carla Aramo:
The online laboratories for OCRA – Outreach Cosmic Ray Activities INFN project

MILAN: Internships with data analysis of the Borexino and Auger experiments and detector construction



LECCE: Internships for the construction of SSD for the Auger upgrade with students



NAPLES: A scuola di astroparticelle: a contest for students

(see poster by Roberta Colalillo: *A scuola di astroparticelle: a synergy between school education and scientific research*)

ROME: Measurement of cosmic ray flux with a balloon

Local activities

Numerous local activities round up the outreach events by OCRA. The images show just a small number of them.

Conclusions

OCRA has been growing constantly since 2018 and has reached its goal of providing a national framework for the INFN cosmic ray outreach activities.

The ICD remains as core activity and new topics like the creation of educational materials are being tackled, in parallel with a multitude of local activities of various nature.

Now we really hope that we can get back soon to meeting students and teachers in person and doing outreach in presence!