# Visualizing Science

Exploring innovative tools for outreach and education

**Henrique Carvalho**

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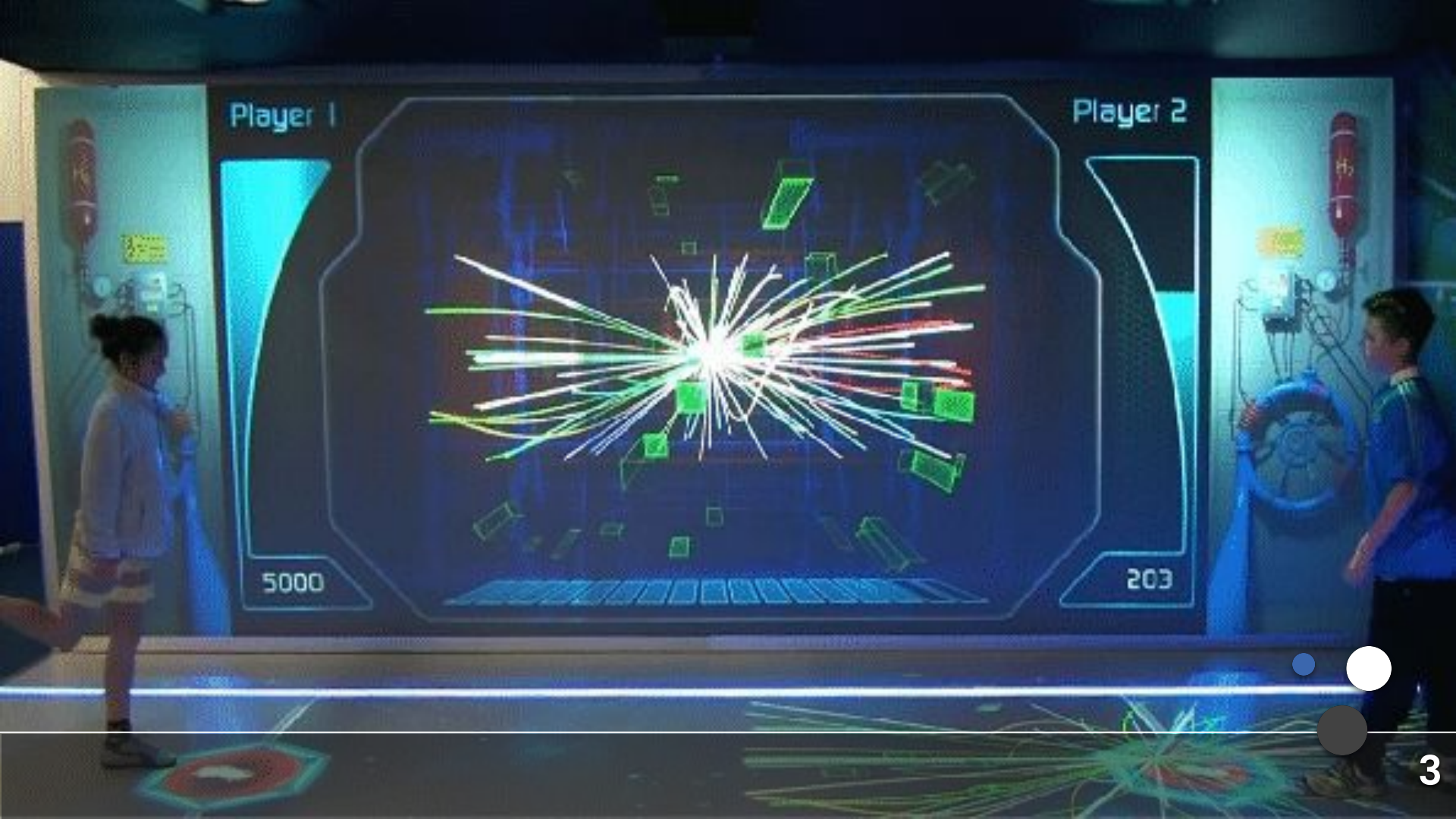
LABORATÓRIO DE INSTRUMENTAÇÃO
E FÍSICA EXPERIMENTAL DE PARTÍCULAS

# A quick view in the past

Some big interactive projects
(but with big budgets)


Player 1
Player 2
5000
203

# Back to our reality

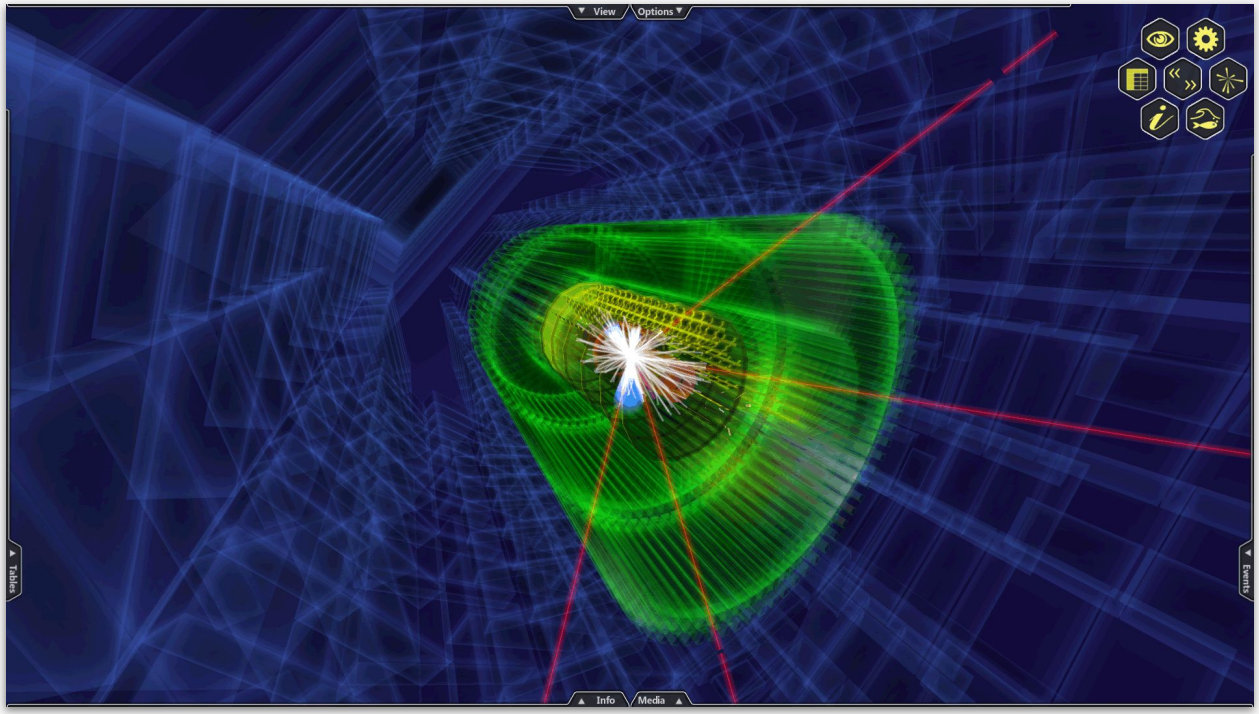
What can be done
on a shoestring budget

# 3D Event Analysis Tools

Interactive investigation of data collected by the experiment to “make discoveries” like physicists do.

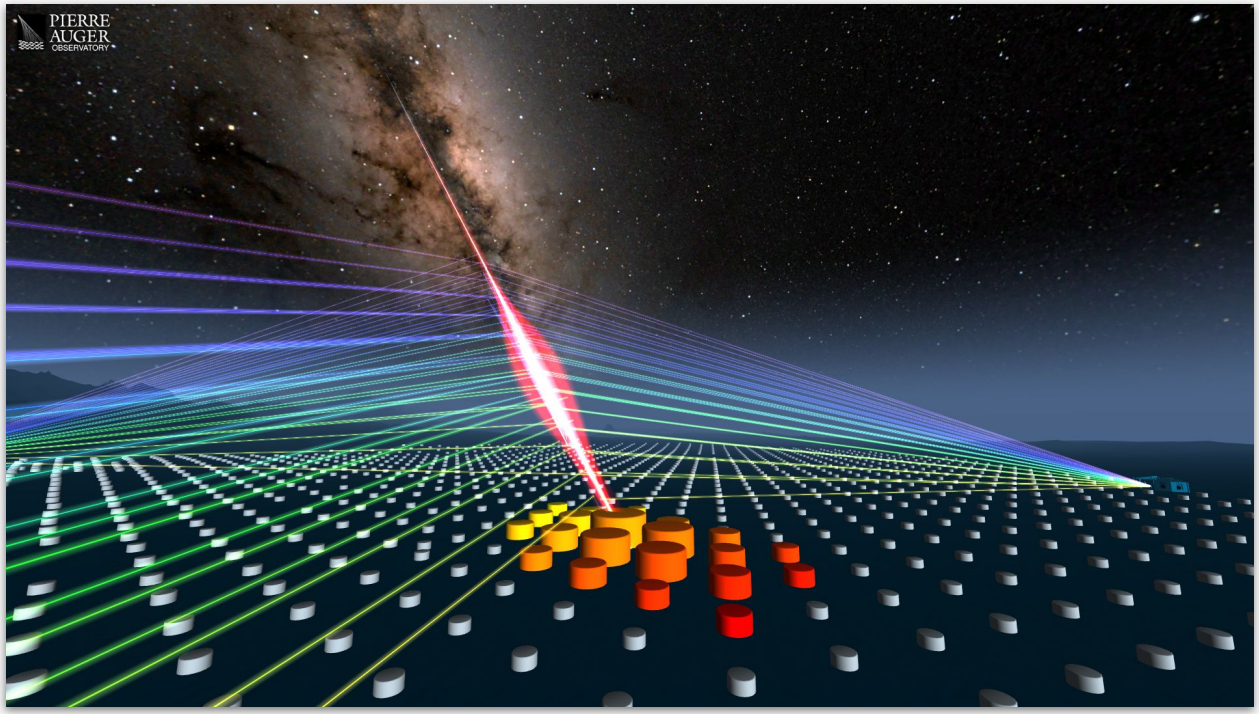
The aim of these tools is to give anyone a better understanding of how particle detectors work and the physics being studied at the experiments.

# ATLAS: CAMELIA



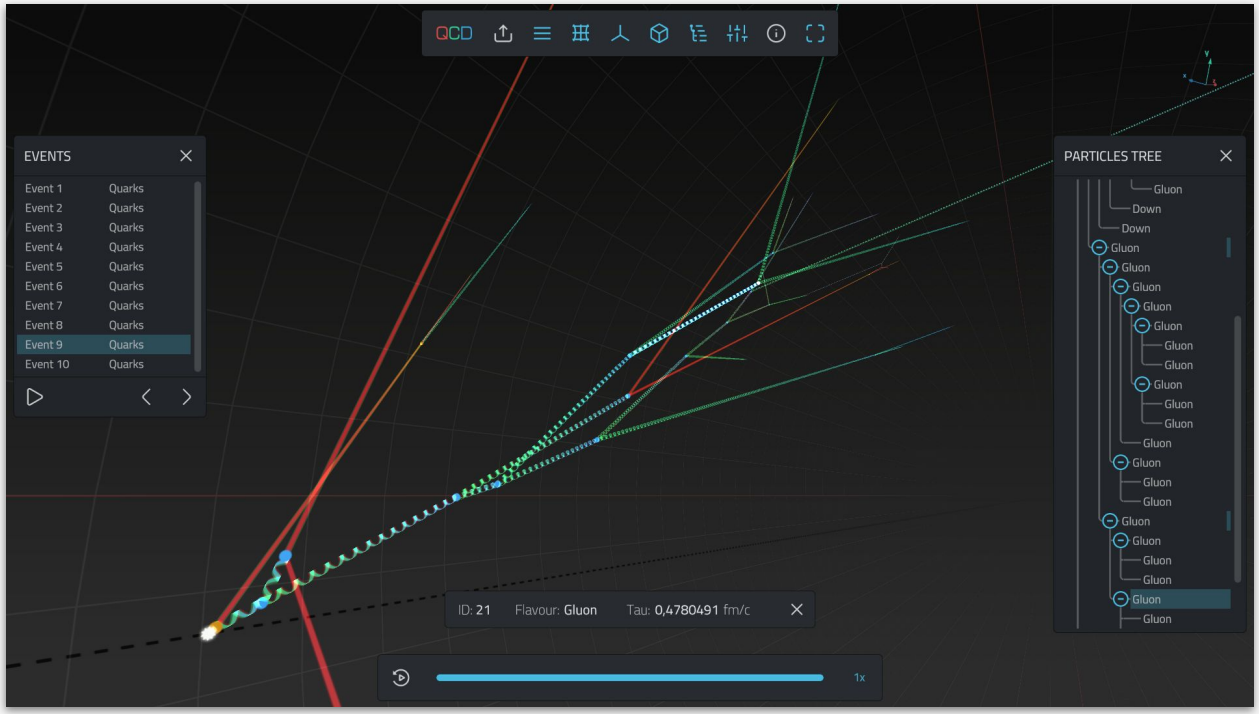

The beginning

# Pierre Auger Visualizer




https://opendata.auger.org/display.php

# QCD Explorer




https://wminho.lip.pt/qcd

# Hands On

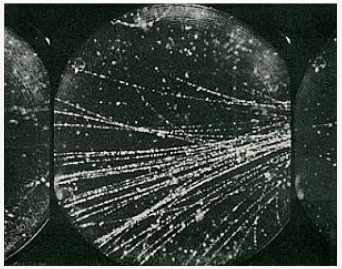
Learning experiences in which participants directly engage with materials, objects, or tools to explore concepts, solve problems, and gain practical skills.

Unlike passive learning methods like talks or reading, hands-on activities encourage active participation, allowing individuals to manipulate, observe, and interact with the subject.

# Cloud Chambers:

## simple but amazing

- Recreates a groundbreaking experiment
- Easy and for all ages
- A new unusual experience
- Learn new concepts
- Satisfying results

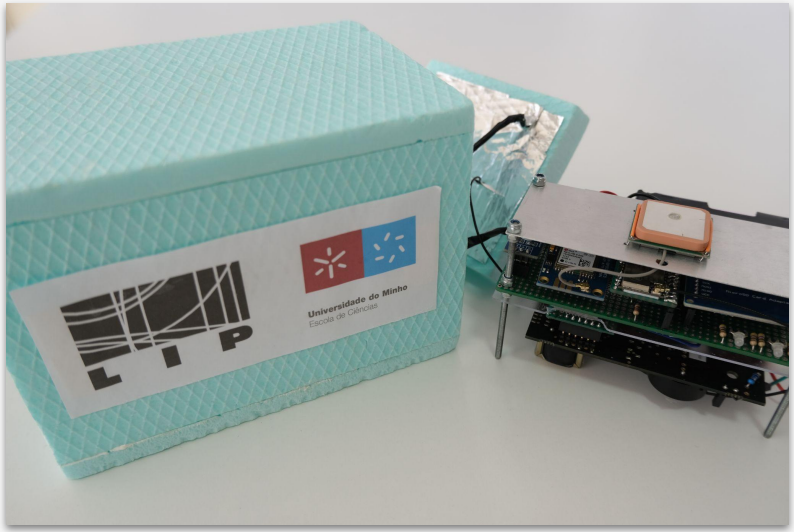


# Victor Hess balloon experiment:

## discovering cosmic rays

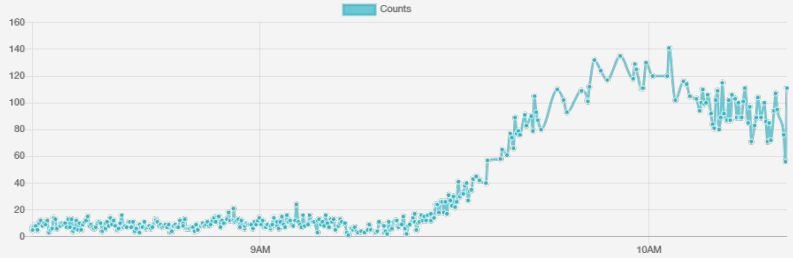
- Targeted for high school students
- A full year project, great for science clubs
- Cooperative implementation
- Learn a wide range of new skills
- Culminates in a unique event: the launch of a stratospheric balloon

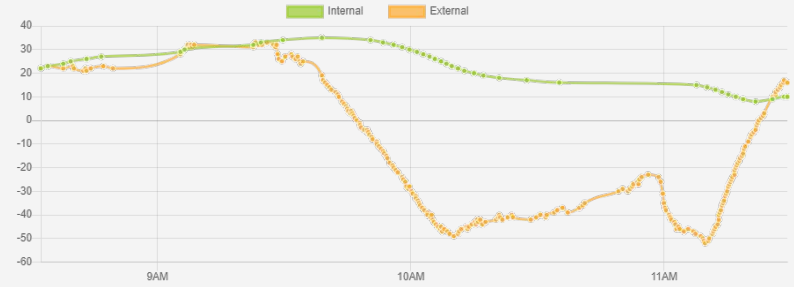
# Already launched three times

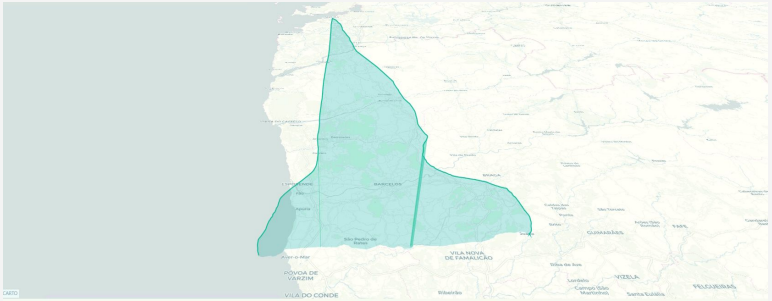


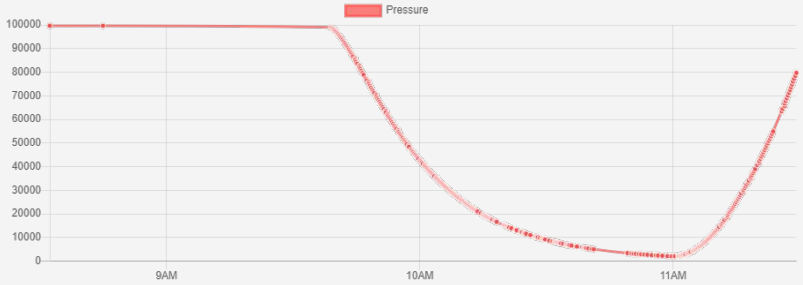

# And recovered… three times!

# Plots!!!



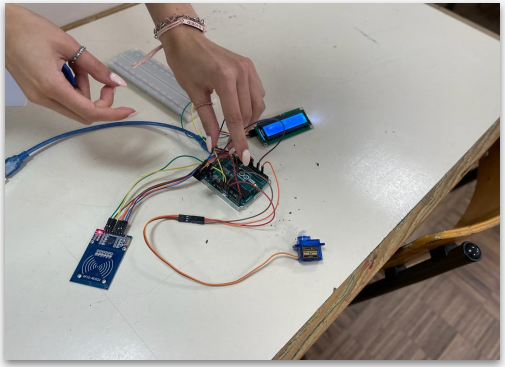




https://wminho.lip.pt/uploader/balloon/2 and https://wminho.lip.pt/uploader/balloon/4

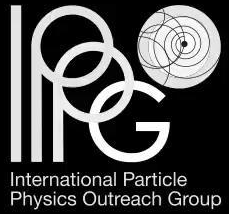
# Students with “hands in the dough”



# Masterclasses
## “hands on particle physics”

- Targeted for high school students
- A day at university, in contact with the scientists
- Deepens knowledge on a specific topic/experiment
- Analyze data with a scientific approach
- Promotes scientific cooperation


hands on particle physics



# Virtual / Mixed / Augmented reality

VR, MR, and AR have immense potential to improve scientific outreach and education in numerous ways:

Immersive Learning Environments

Interactive Experiences

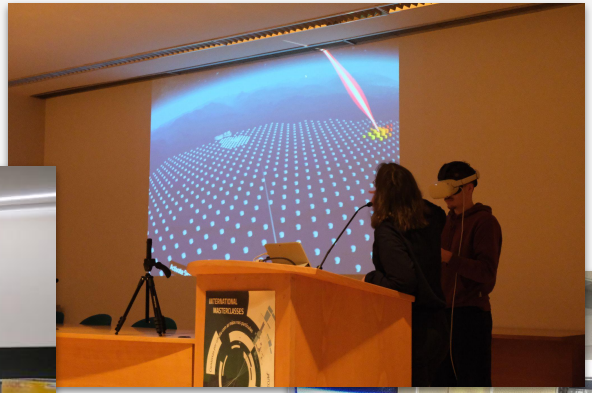
Visualizing Abstract Concepts

Accessibility

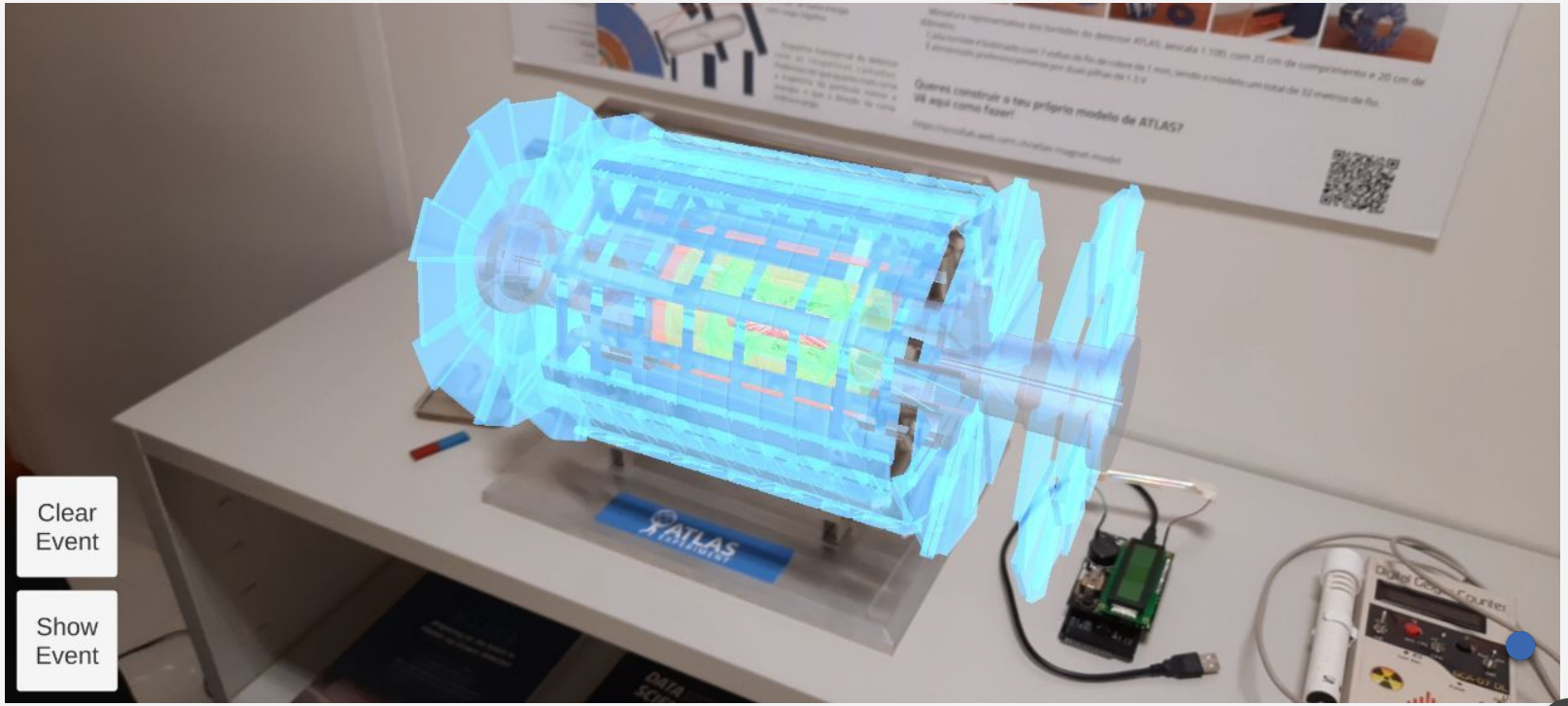
Gamification

Data Visualization

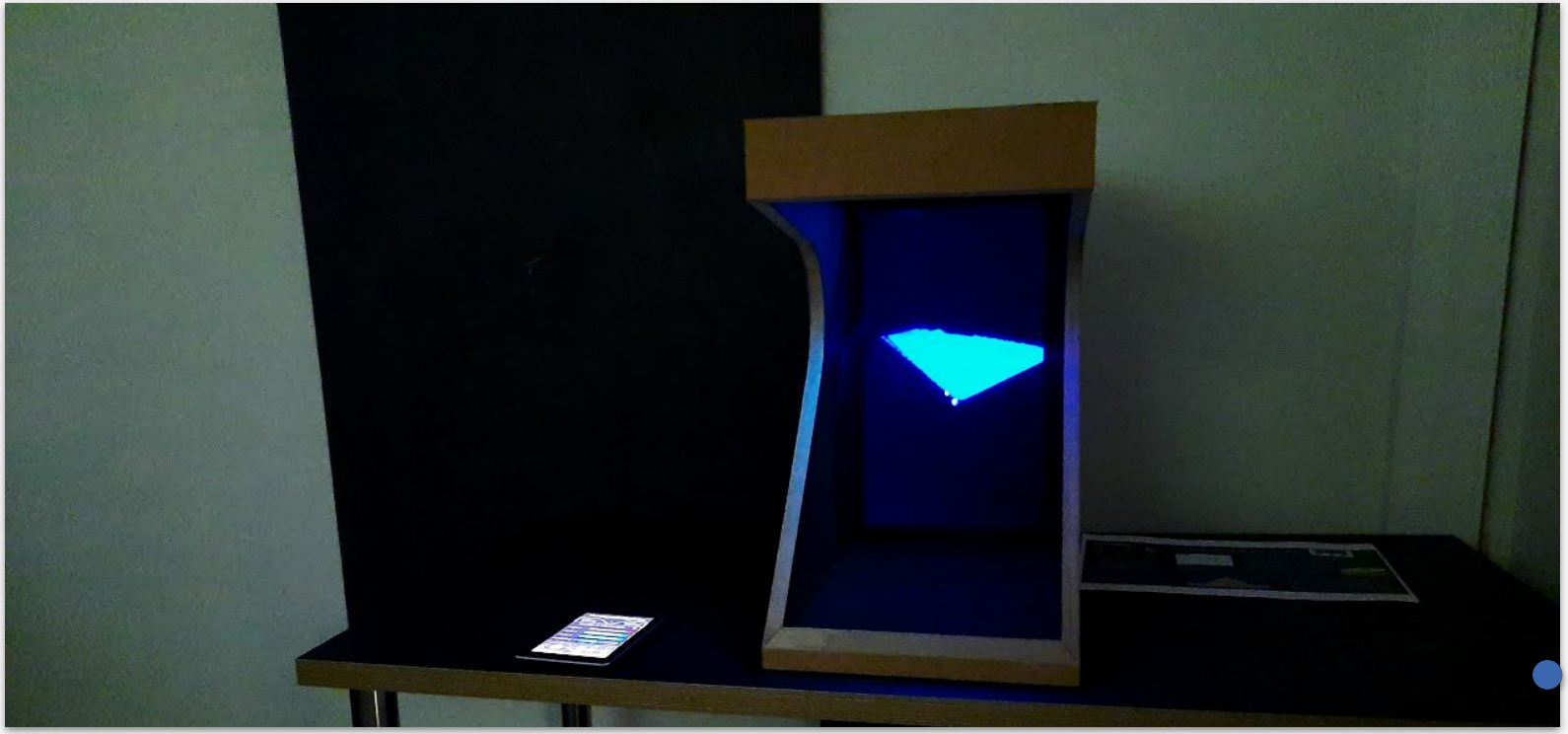
# AugerVR



# ATLAS Augmented Reality



# Lousal muography hologram



# Whats next?

Always be aware of new emerging technologies, from the gaming industry, communication to entertainment, but be aware of whether these new technologies have the potential to improve communication and take science to new audiences.

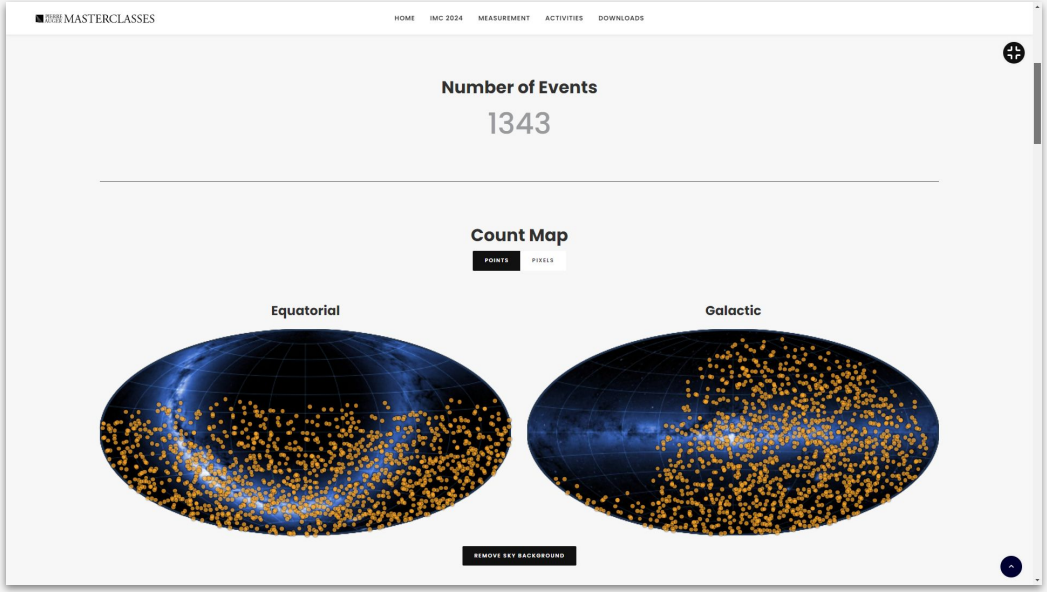
# Citizen science

**What is citizen science?**

Citizen science is any activity that involves the public in scientific research and thus has the potential to bring together science, policy makers, and society as a whole in an impactful way. Through citizen science, all people can participate in many stages of the scientific process, from the design of the research question, to data collection and volunteer mapping, data interpretation and analysis, and to publication and dissemination of results. Citizen science is also an approach of scientific work that may be used as a part of a broader scientific activity.

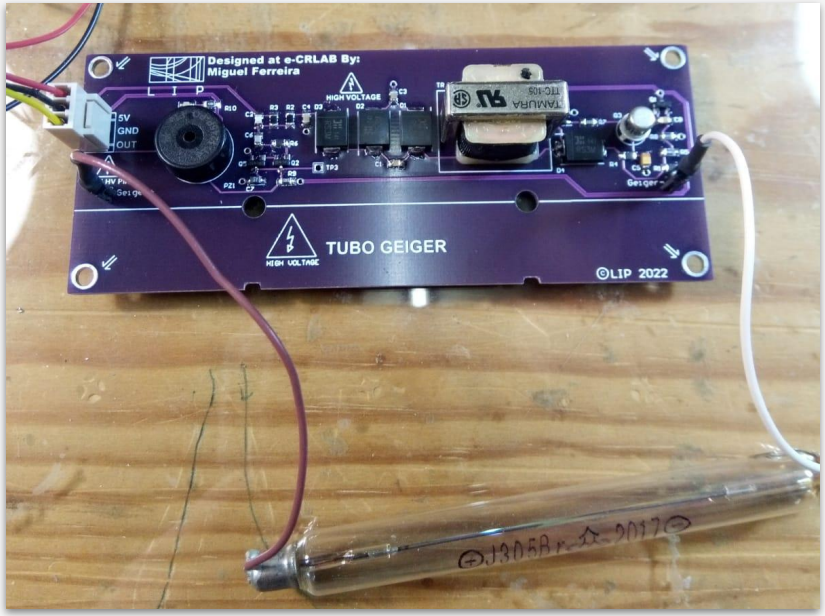
*from https://eu-citizen.science/*

# Auger open data
# reconstruction and analysis



# DIY geiger detector kit

## monitoring radioactivity nationwide



# Thank you
## for your attention

You can contact me at:

**hcarvalho@lip.pt**

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