

Cosmic SOS workshop development

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Workshop motivation

- Development of a workshop about radiation set in the context of space
- Target group 13-15 y.o. (we already have many offers for 16+)
- In the form of an adventure game

Why radiation?

1. Students are interested (Häußler, Hoffman, et al., 1998)
2. Omnipresent in our daily life (medical, industrial, energy, and entertainment sectors)
3. Many reported misconceptions (e.g., Libarkin et al., 2011; Morales & Tuzon, 2022; Neumann, 2014)
4. Experiments usually not available in schools

Why space and space travel?

1. Students are interested (OECD, 2016; Holstermann & Bögeholz, 2007; Zoechling et al., 2022)
2. Growing importance in our daily life and the future of humankind

The storyline/experiments will be the basis for the design of a new Digital Learning Module

<https://digital-learning-modules.web.cern.ch/>

Storyline

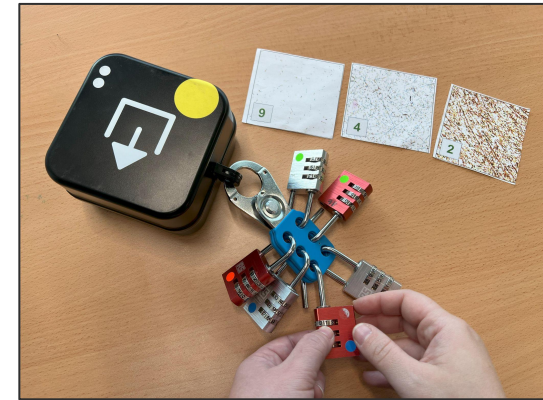
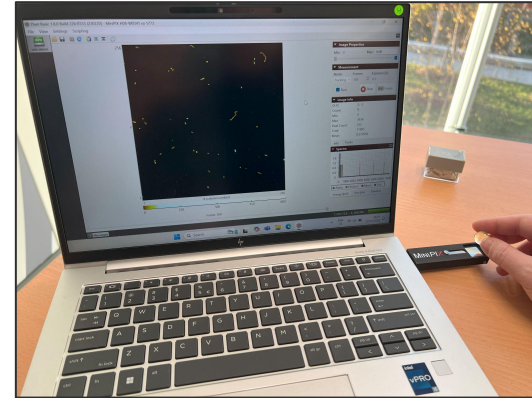
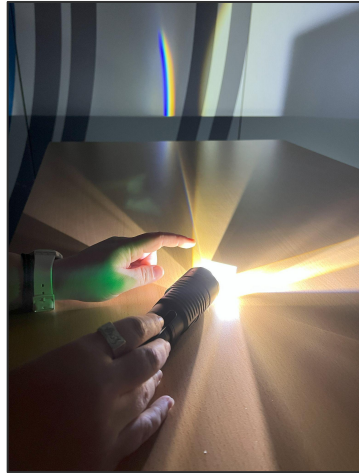
“You and your fellow crew members are on a critical mission to save Earth. An unknown signal from deep space has caused malfunctions in our spaceship's systems, and it's up to you to troubleshoot and repair the damage. Each activity you complete will bring you one step closer to deciphering the signal and ensuring the safety of our planet.”

Participants use various detectors (IR cameras, Geiger counters, MiniPIX) to solve puzzles

Links to CERN's contribution to aerospace research – from the AMS, MiniPIX on ISS, to CERN's aerospace facilities



Challenges



Support material




FROM CERN TO AEROSPACE

CERN Science Gateway

Lab workshop
Cosmic SOS


Discover particle detectors as you travel through space!

Safety Instructions




FRAGILE
HANDLE WITH CARE
MANIPULATOR AVEC
PRECAUTION

Sensitive and very expensive equipment

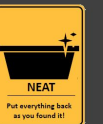


HOT SURFACE

Resistors and batteries might heat up during operation. Turn off after use.



Keep rocks in the boxes



NEAT
Put everything back as you found it!

Group Roles & Responsibilities

 <p>Systems Engineer Responsible for handling the equipment.</p>	 <p>Mission Safety Officer Responsible for safe use of equipment and PPE.</p>
 <p>Mission Documentation Specialist</p>	 <p>Communication Officer</p>

CERN & Aerospace

Aerospace and particle physics share technical similarities, for example:

- Both need electronics that can function in high radiation environments, extreme temperatures and high vacuum conditions.
- Both need to handle large amounts of data quickly and autonomously.



Cosmic SOS

Discover particle detectors as you travel through space!

Systems Engineer:
Mission Safety Officer:
Mission Documentation Specialist:
Communication Officer:

Welcome aboard!

On your table you can find several tools. Please make sure that, before using your tool, you read the relevant safety and operation instructions found in the Equipment Instructions Sheet.

Please put on your safety goggles, and wear them for the duration of the workshop.

Challenge 1: Find the Damaged Resistor

Due to the unknown signal, the space mission is leaving you unable to contact mission control. One of the resistors on its electric circuit board is damaged. Your task is to identify the faulty component.

Prediction

Think first! How will these colors (blue, red, green, yellow, violet) be arranged and why? Write your prediction here.

The order of colors is:



JWST.

ion control says you need to detect light. Different colors, like a rainbow, have different energies.

Which light color do you think has higher energy? red green blue

Explanation: Light dispersion

When visible light passes through a prism, it splits into different colors ("light dispersion"). This happens because different colors of visible light have different energies and bend ("refract") by different amounts. Blue light bends more because it has higher energy, and red light bends less because it has lower energy.

Equipment Instructions Sheet

RGB Torch

- Press on the white button.
- Press again in order to see a different light color.





Pixel detector MiniPIX-EDU

- Never touch the sensor with your hands or with any other object!
- Plug the pixel detector in one of the laptop USB ports.
- Keep the detector window closed (left image) whenever you are not taking a measurement.
- Slide the detector window (right image) before starting a measurement.

Software instructions

Start the laptop (LOGIN local user: user, password: Tsp@2023)

Plug in the detector in the USB port.

Open the PivotPro software.

Check the Detector Connection: In the top-left corner, ensure that the status indicator is green. If it appears red, it means the software doesn't recognise the detector. Try reloading the software or reconnecting the detector. It should be like the right screenshot below:



Status and next steps

- Tested for the first time at “*Elargis tes horizons*” on 16/11/2024
- Testing with school groups during the next months at CERN Science Gateway
- Still adapting the worksheets
- To be uploaded in zenodo at a later stage
- Already uploaded in the educational resources webpage



<https://educational-resources.web.cern.ch/cosmic-sos>

Thanks for your attention!

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References

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