Openred

Development of a Citizen Science Network for Measuring Environmental Gamma Radiation in Spain

CITIZEN SCIENCE IN RADIOACTIVITY MEASUREMENT: EMPOWERING EUROPEANS FOR BETTER ENVIRONMENTAL MONITORING
Brussels, Belgium

Nacho Sáez
Daniel Lisbona
Ibercivis
04/06/2025

Who

Brussels, 04 June 2025

Daniel Lisbona, Engagement & communication.

Nacho Sáez, Electronic Engineer

Ibercivis foundation

¿What is Openred?

Who we are

ibercivis
people doing science

Spanish non-profit foundation devoted to citizen science legally established in 2011

Board:

What we do

Research through citizen science methodologies
Analysis of citizen science
Promotion and Support of citizen science in Spain and beyond

Ibercivis foundation

¿What is Openred?

> 80 Citizen Science initiatives

> 15 European Projects

> 80.000 citizen scientists

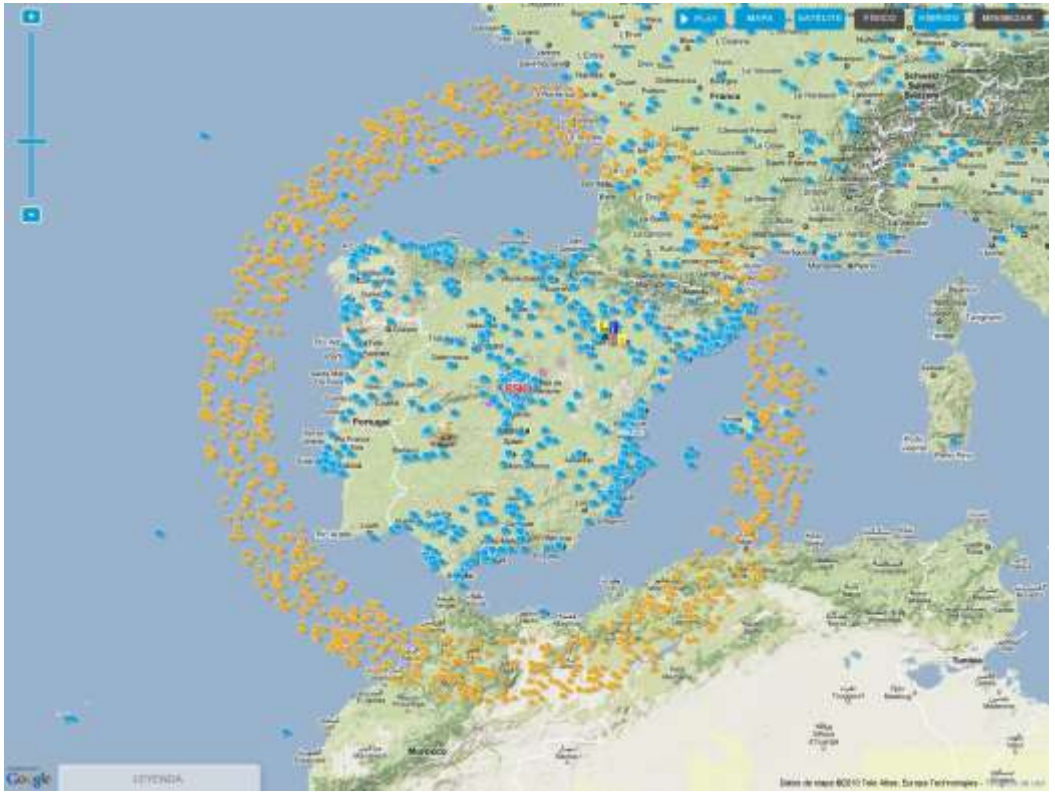
> 10 years promoting Science

Volunteer computing

¿What is Openred?

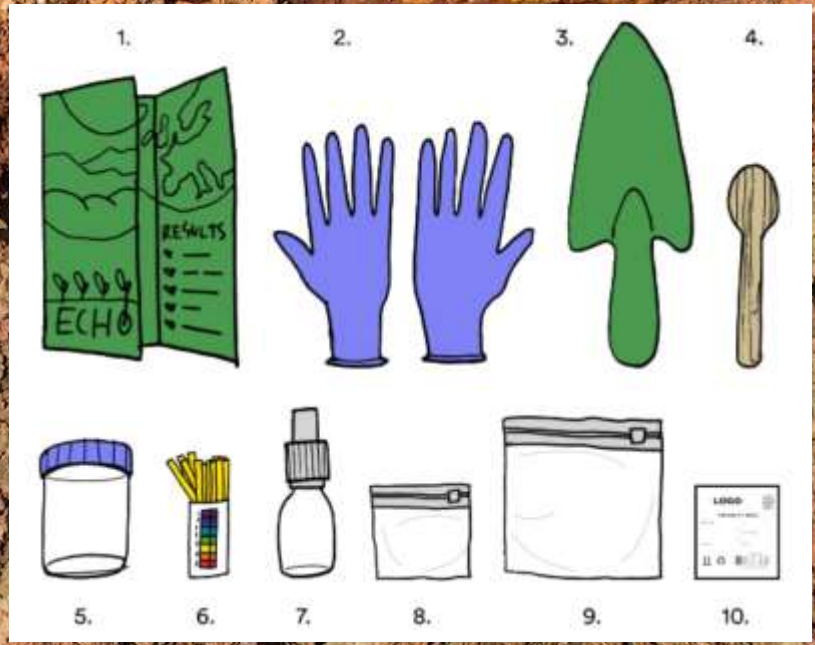
Ibercivis BOINC_

- 14 scientific projects
- 50,000 participants
- 18 scientific articles
- 3 doctoral theses



Vigilantes del Aire_

ECHO_
16,500 sites in different climate and biogeographic regions assessed



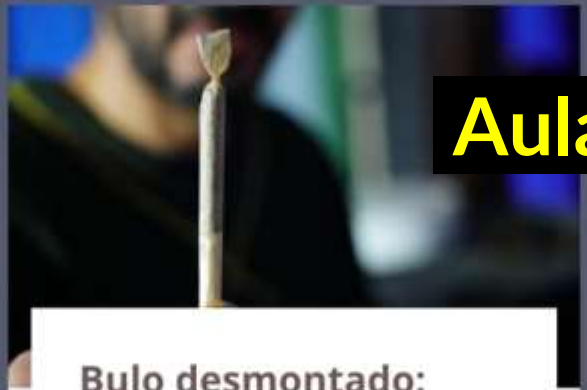
Pájaros en la nube_

AulaCheck_

Desmontando bulos: ¿El 5G es peligroso?

IES Son Rullan (Baleares) 3 de marzo de 2023 1 comentario

Read More →



Bulo desmontado: Sobre el cannabis y su uso contra el colesterol y la depresión

IES Martínez Vargas (Huesca) 2 de febrero de 2023 1 comentario

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LA GUANÁBANA CURA EL CÁNCER

IES Jaume I (Valencia) 14 de mayo de 2023 1 comentario

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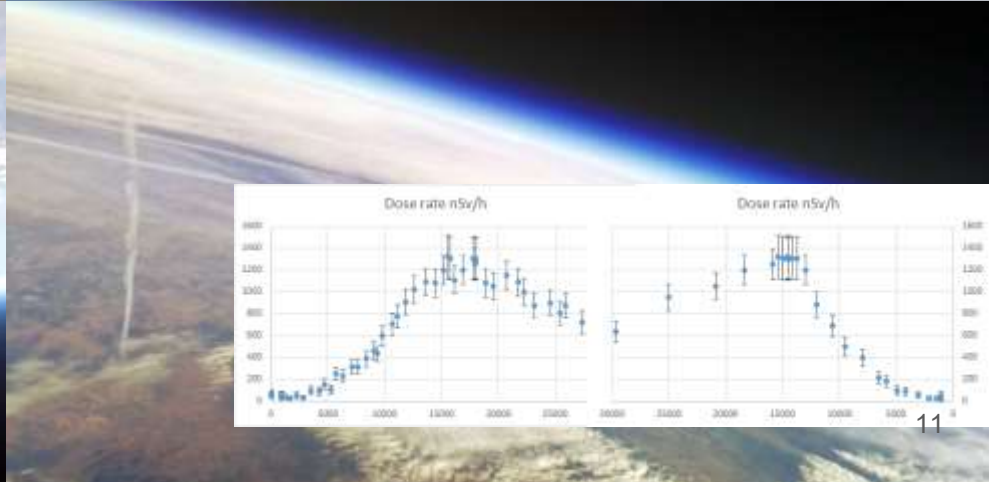
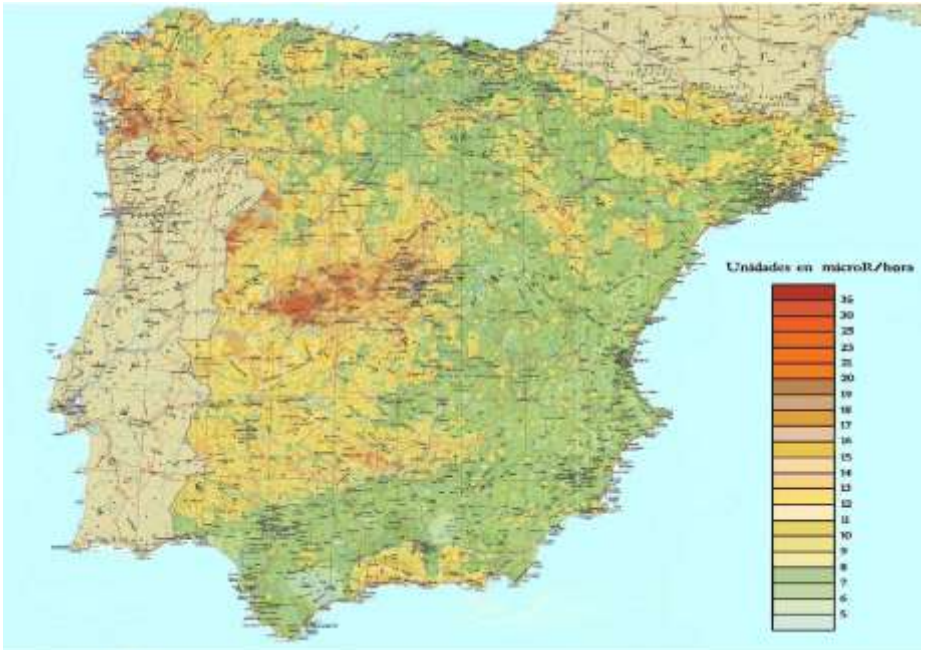
Servet_


Dose rate nSv/h
Dose rate nSv/h

Openred Objectives

- Promote a citizen network for measuring environmental gamma radiation in Spain

- Promote a citizen culture focused on radiological protection



Map of the natural gamma radiation in Spain (MARNA).
Source: https://www.csn.es/varios/marna/index.html

Consortium-partners

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Universidad Zaragoza
1542

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UC UNIVERSIDAD DE CANTABRIA

Ciemat
Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas

Francisco Castejón Magaña,
CSN Commissioner

Francisco Sanz García,
Executive director Ibercivis Foundation

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Openred experts group.

¿What is Openred?

Arturo Vargas Drechsler
PhD in nuclear engineering from the UPC. He is currently director of the UPC's Institute of Energy Technologies and leads the environmental radioactivity subgroup.

Maria Amor Duch Guillen
Doctor of Science (Physics). Director of Research and Head of the Radiation Protection Service at the UPC. Specializing in medical physics and environmental dosimetry.

Anna Camp Brunés
Researcher at the Institute of Energy Technologies of the Polytechnic University of Catalonia.

Claudia Grossi
PhD in Physics. Her work covers diverse fields of experimental and theoretical physics, including nuclear physics, radiation protection, biophysics, geophysics, and atmospheric sciences.

Openred experts group.

¿What is Openred?

Begoña Pérez López
Master's degree in Biomedical Physics and a PhD in Physics. She works in the Ionizing Radiation Dosimetry Unit at CIEMAT. She is an expert in in vivo measurement methods and gamma spectrometry.

Roser Sala Escarrabill
PhD in Psychology from the Autonomous University of Barcelona. She is a Senior Scientist at CIEMAT, specifically at the Center for Sociotechnical Research (CISOT).

Luis Quindós Poncela
Professor Emeritus ad Honorem of the Faculty of Medicine of the UC and professor of Medical Physics and Radiation Protection, Radiological Contamination and Advanced Waste Management.

Beatriz Gómez Barrera
R&D and Knowledge Transfer Project Manager at the University of Zaragoza, at the Institute of Biocomputation and Physics of Complex Systems

Openred experts group.

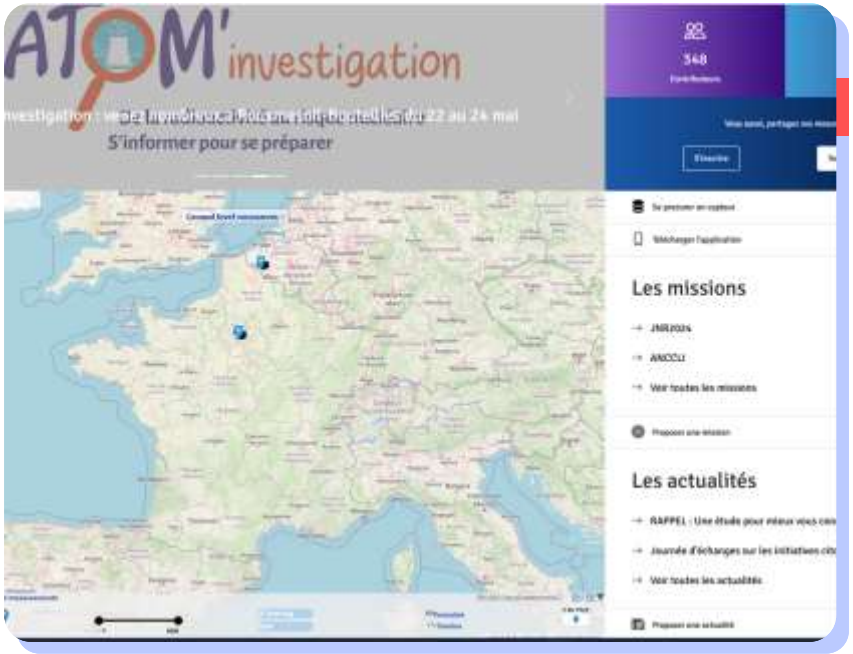
¿What is Openred?

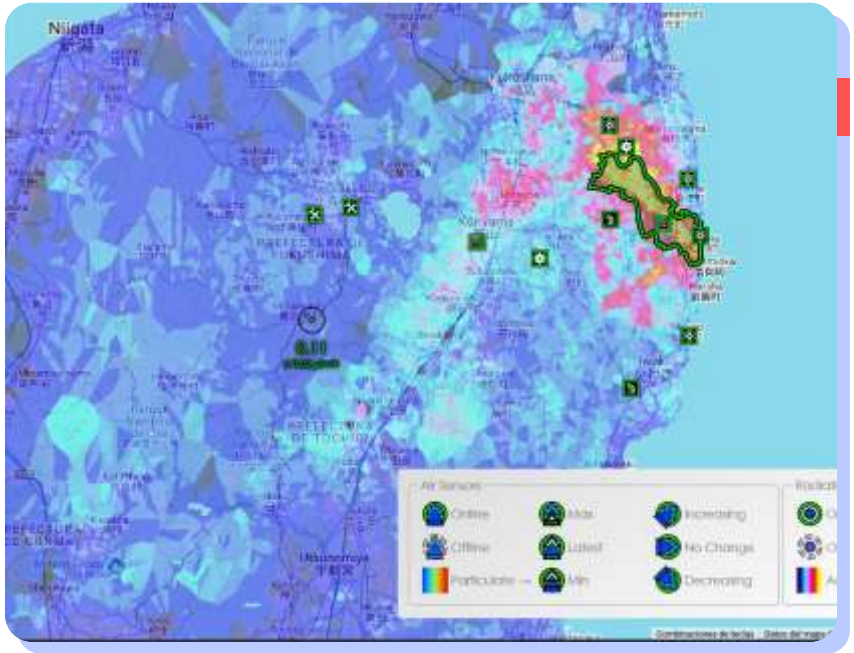
Jorge Puimedón
Professor of atomic, molecular, and nuclear physics at the University of Zaragoza. He has worked in the underground laboratories of Modane (France) and Canfranc (Spain). He is a member of CAPA and GIFNA.

Susana Cebrián Guajardo
PhD in Physical Sciences. Professor of Theoretical Physics. Expert in dark matter, neutrinos, and subterranean physics. Member of CAPA and LSC, she participates in ANAIS, DarkSide, IAXO, NEXT, and TREX-DM.

Francisco Castejón Magaña
Nuclear Safety Council commissioner, PhD from the Complutense University of Madrid. He has dedicated his career to thermonuclear fusion research at the CIEMAT National Fusion Laboratory.

Background


ATOM' investigation
S'informer pour se préparer
548
Les missions
Les actualités


Niigata

Actividades	Meses																												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Actividad 1: Coordinación y supervisión del proyecto																													
T1.1 Coordinación administrativa, financiera y científica																													
T1.2 Verificación de requisitos de calidad, ética, datos y riesgos																													
T1.3 Organización de las reuniones del proyecto																													
T1.4 Logística del proyecto																													
Actividad 2: Estudio de viabilidad																													
T2.1 Análisis de la arquitectura de proyectos similares																													
T2.2 Análisis del estado del arte en tecnologías de detección de radiación gamma																													
T2.3 Respuesta de detectores gamma a utilizar en el proyecto																													
T2.4 Análisis de los aspectos sociales, económicos y operacionales																													
Actividad 3. Infraestructura tecnológica																													
T3.1 Desarrollo de la infraestructura web															H3														
T3.2 Mejora y validación de tecnologías de medición de la radiación gamma a partir de los resultados del hackathon																H4													
T3.3 Establecimiento de alianzas con agentes del mundo maker																													
T3.4 Identificación de puntos de mejora y refinado de la infraestructura tecnológica																													
Actividad 4. Organización y ejecución de actividades participativas																													
T4.1 Hackathon multi-ciudad												H2																	
T4.2 Misiones participativas																									H5				
T4.3 Experimentos de inteligencia colectiva																													
T4.4 Validación y análisis de las medidas otorgadas por la ciudadanía																													H6
Actividad 5. Comunicación y diseminación																													
T5.1 Acciones del plan de comunicación y diseminación		H1																											
T5.2 Campañas de comunicación específicas																													

Figura 1. Cronograma del proyecto

Phases

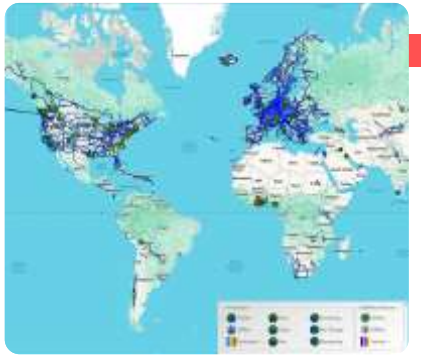
1 State-of-the-Art Analysis

2 Deployment of the infrastructure

3 Participatory activities

State-of-the-Art Analysis

¿What is Openred?



Safecast Map

Analysis of the architecture of similar projects (Safecast, OpenRadiation, etc.)

Radiacode 102

Analysis of existing gamma measurement devices (low-cost)

Safecast meeting

Analysis of socio-economic and operational factors

Calibration laboratory UPC

Response of the gamma detectors to be used in the project

State-of-the-Art Analysis

Analysis of existing gamma measurement devices (low-cost)

Analysis of low-cost commercial devices and web platforms for the gamma radiation measurement network.

State-of-the-Art Analysis

¿What is Openred?

Detector		Sensor type	Radiation detected	Price(€)	Dose rate range (µSv/h)	GPS	Data management
GammaPix		CMOS Camera	Rayos X – Gamma	≈ 15	-	Yes	The data is viewed through the App.
GMC500+		Geiger-Müller	Beta – Gamma – Rayos X,	≈ 150	0 – 42500	No	It has associated software. Data is displayed on screen and recorded in a file.
RadiaCode 102		Scintillator (CsI)	Rayos X – Gamma	≈ 230	0.1 - 1000	Yes	It has an associated app. Data is displayed on screen and saved to a file.
Rium GM		Geiger-Müller	Rayos X – Gamma	≈ 120	0.05 - 10000	Yes	The data is displayed through the app and can be sent to the OpenRadiation website. There is no display.
Safecast bGeigieZen		Geiger-Müller	Alfa – Beta – Gamma – Rayos X,	≈ 350	-	Yes	MicroSD card for recording data and automatically sending it to the Safecast database. It also has a screen.
SmartGeiger		Geiger-Müller	Rayos X – Gamma	≈ 40	-	No	The data is displayed through the App. Without its own screen.

State-of-the-Art Analysis

¿What is Openred?

Analysis conducted by the Polytechnic University of Catalonia.

- Linearity and reproducibility.
- Angular response.
- Energy response.
- Influence of temperature.
- Measurement of cosmic radiation.

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Analysis developed by UPC. Linearity and reproducibility:

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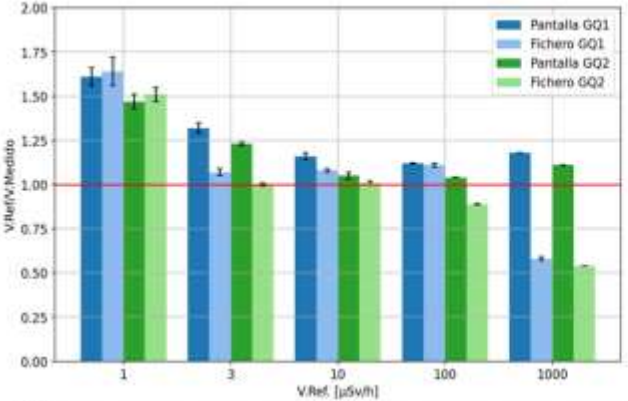
GQ



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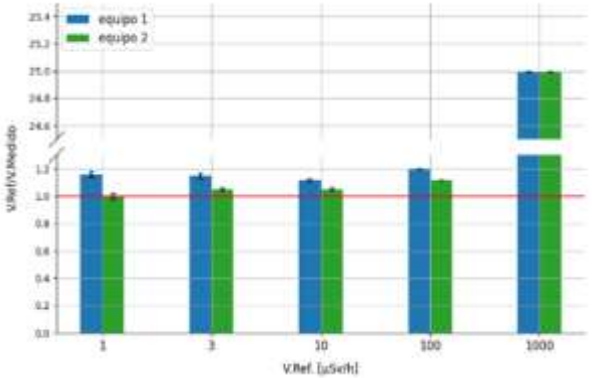
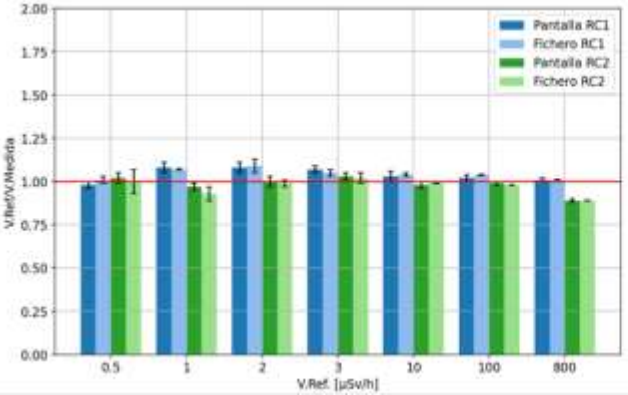
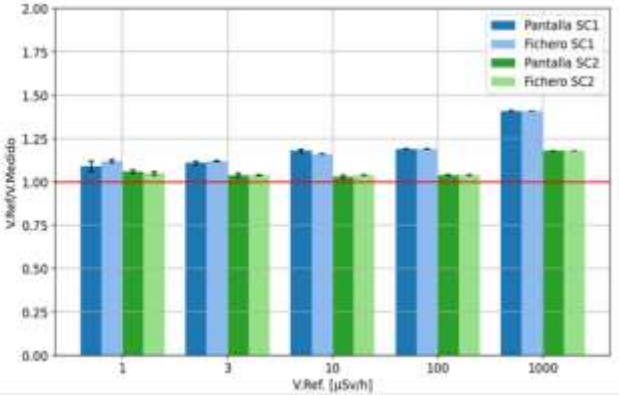


RC



SC



Analysis developed by UPC.
Angular response:

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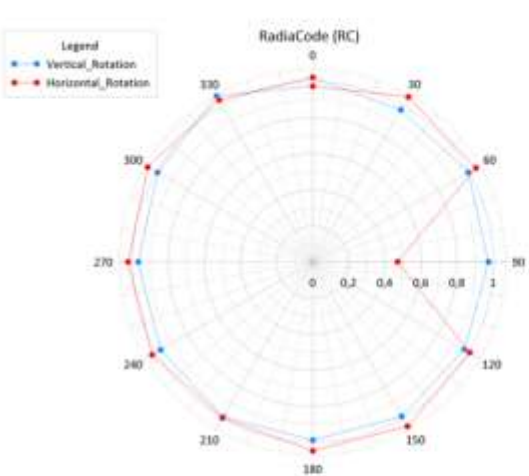
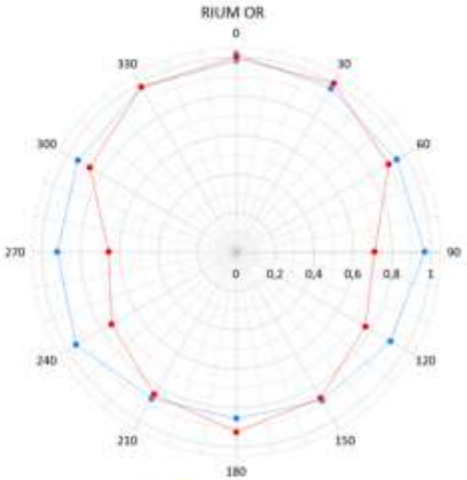
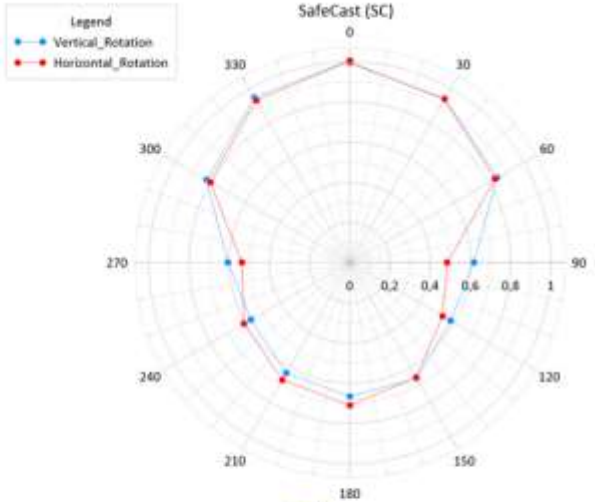


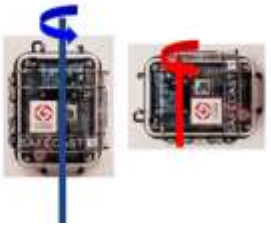




RC

OR

SC



Energetic response

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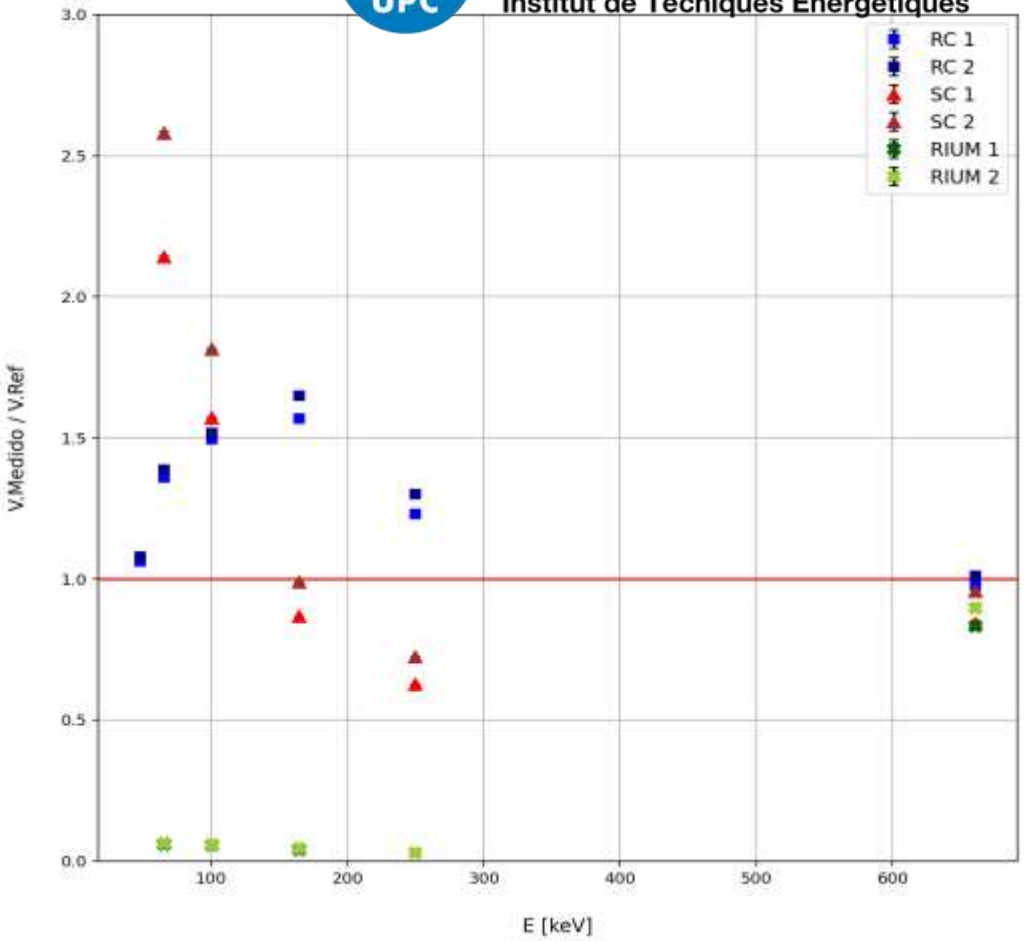
Ratio between the detector response (V.Measured) and the LCD reference value (V.Ref) at different energies (keV). RadiaCode (RC 1 and RC2), SafeCast (SC1 and SC2), and Open Radiation (RIUM 1 and RIUM 2).

Qualities used:
N-80 ~ 65 keV
N-120 ~ 100 keV
N-200 ~ 165 keV
N-300 ~ 250 keV
137Cs 661.6 keV



Analysis developed by UPC. Temperature:

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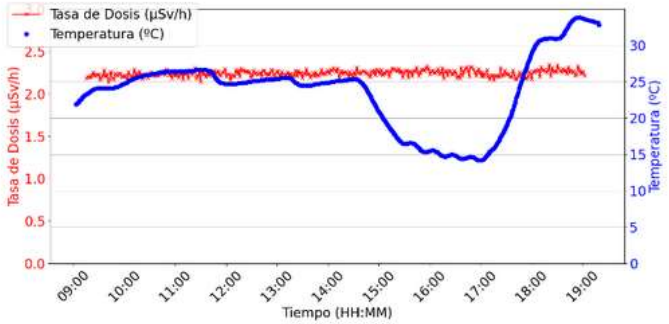
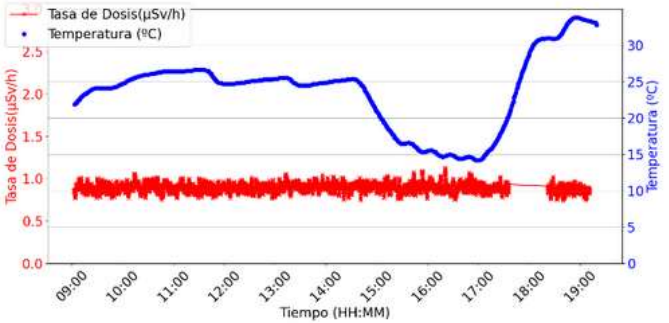
RC



SC



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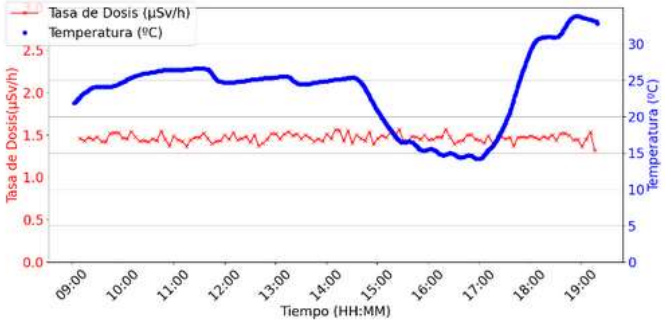


Participatory Activities

¿What is Openred?

Hackathon Secure The Valley

Hackathon for device improvement

February 2025
Madrid, Zaragoza

Safecast Missions

Measurement Missions (to be defined)

Sept 2025 - May 2026
Several locations

Experimento Colectivamente19

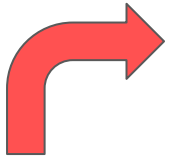
Collective intelligence experiments (knowledge & perception)

May 2026

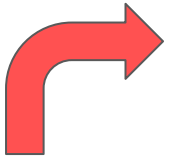
Participatory activities: hackathon.

¿What is Openred?

Challenge statement.



Solution development.



Solution defence and presentation.

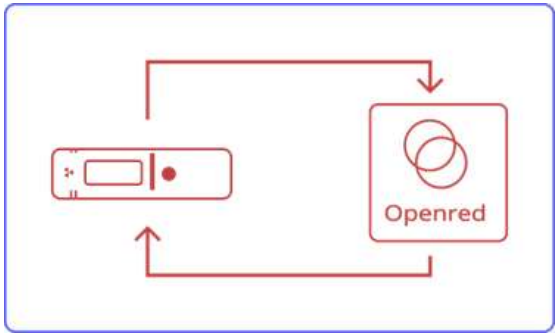
Ideas generation.

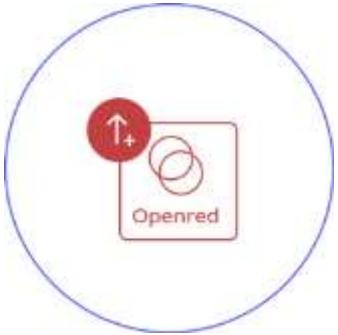
Enjoy the activity.

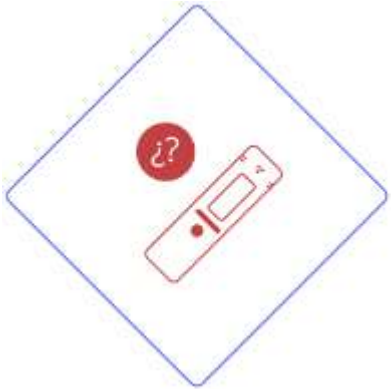
Hackathon Openred challenges

¿What is Openred?

- { Hacking, software, hardware, connectivity }
- { Analysis and data validation, gamifying, design }
- { Other devices }

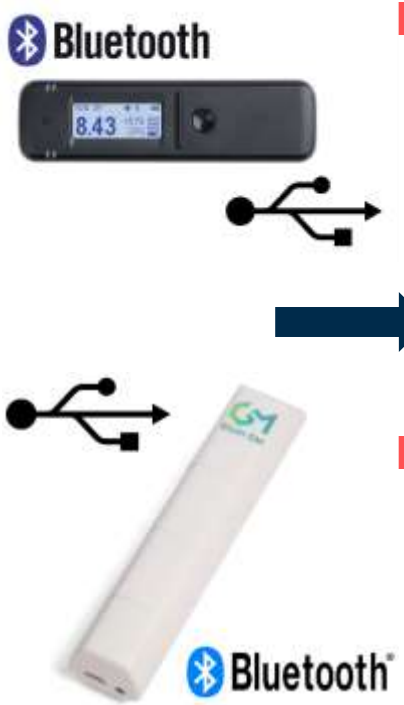


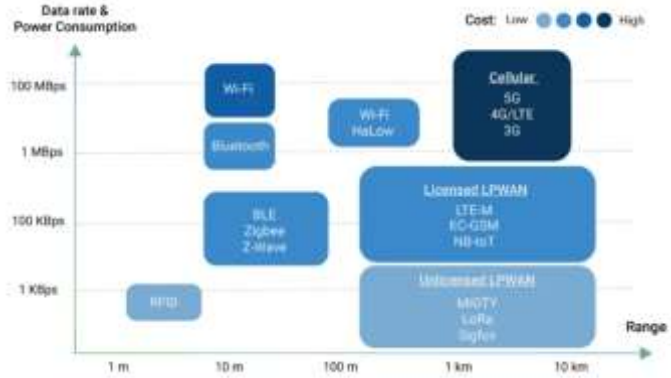




{ Category 1: Hacking, software, hardware, connectivity}

¿What is Openred?





Through a connectivity solution, the device can communicate with the Openred platform.

Integration with the Openred platform via API.

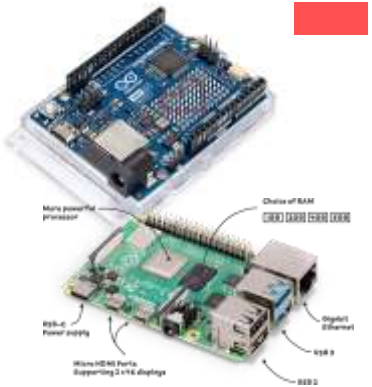
{ Category 2: Analysis and data validation, gaming, design }

¿What is Openred?

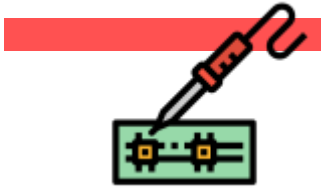
{ Category 3: Alternative devices }

¿What is Openred?

Development boards



Integration in Openred



Nuevos detectores DoItYourself

www.open-red.es

Openred experts group

¿What is Openred?

National Fusion Laboratory

¿What is Openred?

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Laboratorio Nacional de Fusión
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Infraestructuras Científicas y Técnicas Singulares

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Hackathon Openred solutions

¿What is Openred?

Buena pregunta
Hackathon Madrid
2º Prize
It proposes linking with data from the Automatic Station Network and with atmospheric data.

Macacos Computacionales
Hackathon Zaragoza
1º Prize
Proposes improved visualization and linking with OpenWeather data.

Servet
Hackathon Zaragoza
Not awarded
Through the TTGO T-BEAM platform, geopositioning acquisition and linking with OpenWeather atmospheric data.
TTN Network

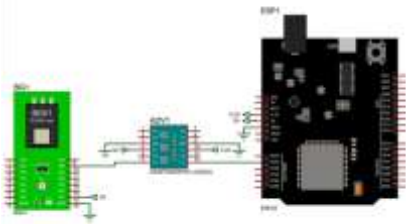
Serra-trones
Hackathon Zaragoza
3º Prize
It offers specific hardware for geopositioning and atmospheric conditions.

Hackathon Openred solutions

¿What is Openred?

Non-Fiction
Hackathon Madrid
Not awarded
Raspberry Pi-based platform for direct communication with any device. Uses a battery detector. Communication with the platform via Wi-Fi, LTE, 4G, and more.

TTN-Madrid
Hackathon Madrid
1º Prize
TTGO-based platform with TTN Lorawan communication. USB and Bluetooth communication.



MEL2
Hackathon Madrid
3º Prize
TTGO-based platform with TTN Lorawan communication. USB and Bluetooth communication.

Gamma on
Hackathon Zaragoza
2º Prize
Gamification and loyalty system proposal for the Openred platform

Hackathon Openred solutions

¿What is Openred?

Hackathon Openred

Hackathon Openred Madrid

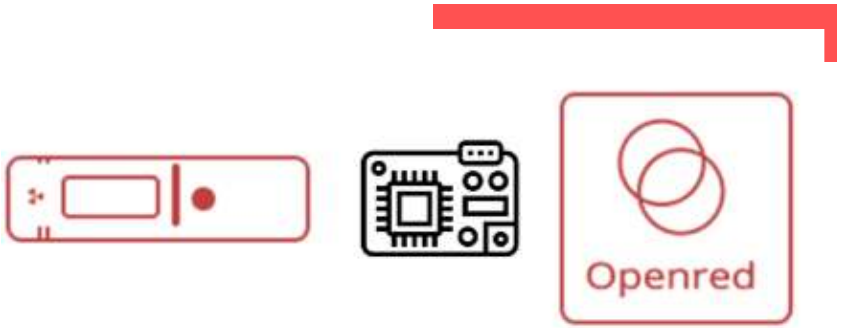
Hackathon Openred

Hackathon Openred Zaragoza

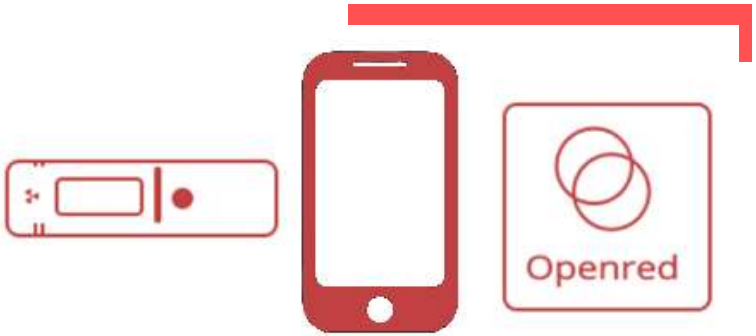
Hackathon Openred

Hackathon Openred Santander

Upload Openred system

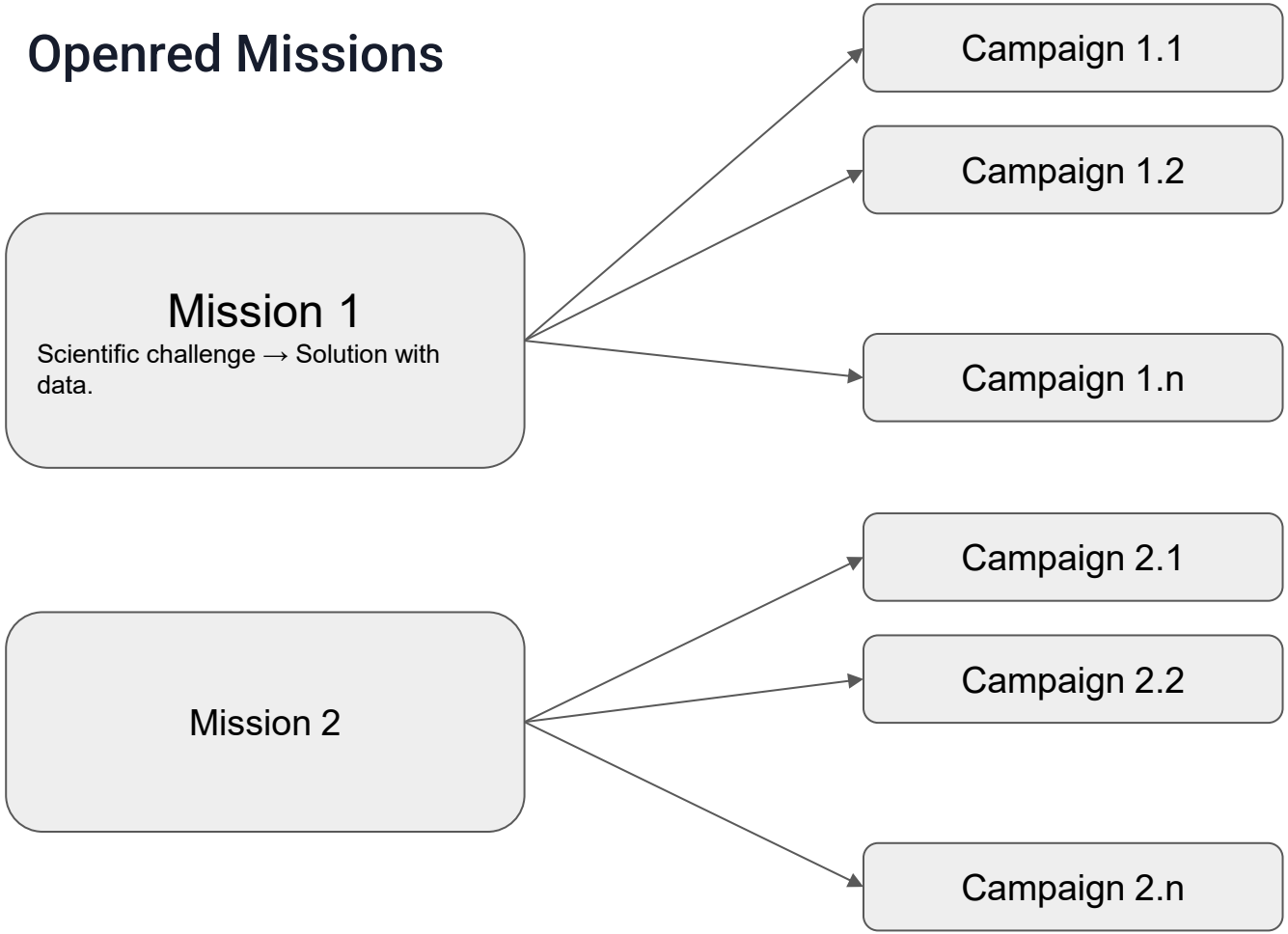


3rd party device solution



App smartphone solution

Openred Missions



Infrastructure deployment

- Data collection platform
- Improvement of devices based on Hackathon results
- Continuous Improvement of Technological Infrastructure (reusable)

Open red

Thanks!

Nacho Sáez
nachosaez@ibercivis.es

https://open-red.es

ibercivis
gente haciendo ciencia

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