REINFORCE

REsearch INfrastructures FOR Citizens in Europe

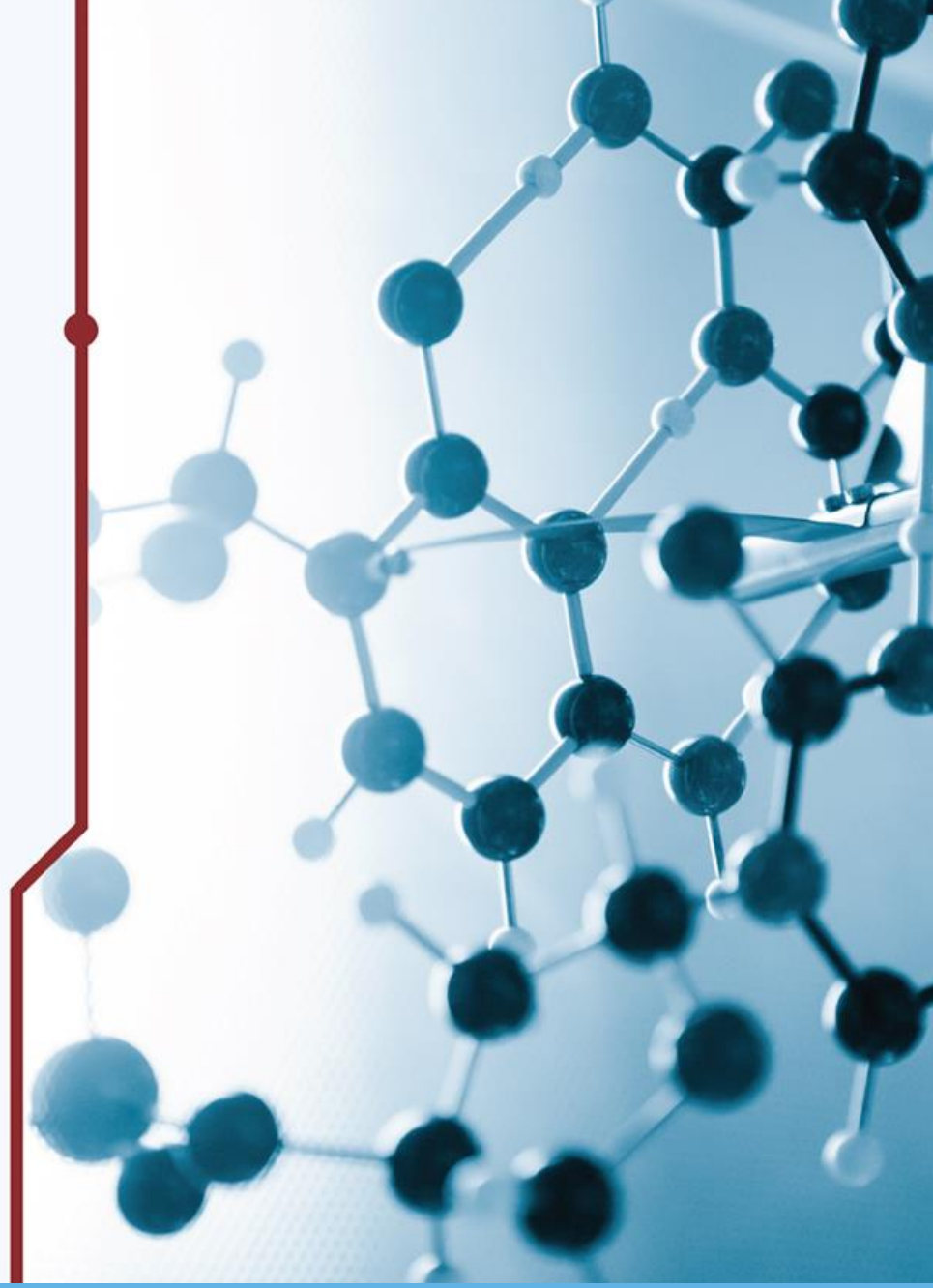
The REINFORCE project

How Citizens can play an active role in ground breaking research ?

24 March, 2021

Stavros Katsanevas , Gary Hemming (EGO)

From the REINFORCE Coordinator and the Technical Manager



REINFORCE
REsearch INfrastructures FOR Citizens in Europe

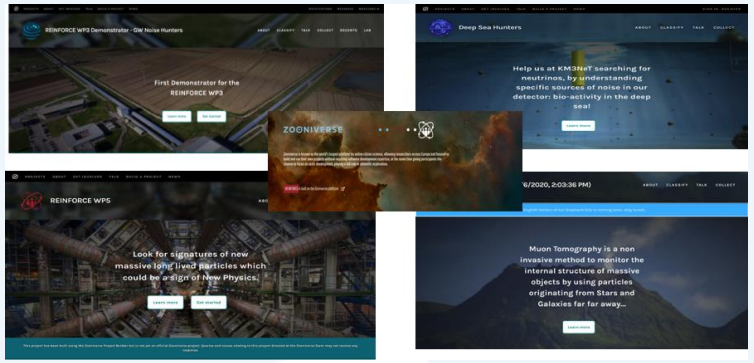
Goals (in detail)

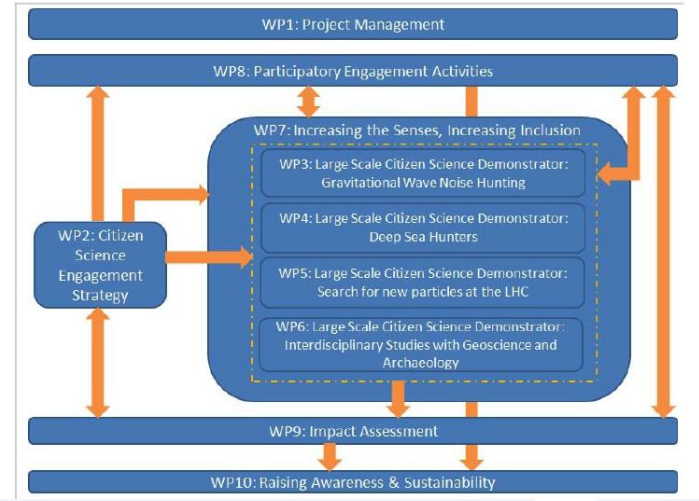
1. ***Develop the Science (Science With)***
    1. ***"Fundamental" science,*** *accompanying* ***Gravitational Wave*** *and* ***Multi-messenger (Virgo, KM3net, CR)*** *scientific revolutions in progress and strengthening the* ***Interdisciplinary links with Particle Physics*** *searches (dark Matter @ LHC)*
    2. ***Environmental science*** *through the imbedding of "fundamental science" infrastructures in the Geosphere (Virgo, KM2Net, CR)*
    3. ***Multi-sensoriality (extension to sound)*** *accompanying the the Multi-messenger understanding of the cosmos and the many sensory manifestations of earth, atmosphere and life (soundscape movement). Not only increasing inclusion . Also increasing the researchers discrimination power of signal over background through the use of sound.*
    4. ***Develop a Roadmap with other Astroparticle Large Infrastructures (1-2 September 2022)***

2. ***Develop Societal aspects (And For Society)***
    1. ***Inclusion and diversity*** *. Extend participation to visually impaired, confined, seniors*
    2. ***Art and Science*** *border trespassing, linking the cognitive and the affective*
    3. ***Critical thinking*** *in a world of media inflation and digital connectivity. Formulate hypotheses, estimate proper biases, manage uncertainty, collective versus herd thinking,…*

REINFORCE in a slide

- 11 Partners from Argentina, Austria, Belgium, France, Greece, Italy, UK
- Management: Coordinator, Technical Coordinator, Project Officer, Ethics and Innovation managers, and Advisory Board (WP1)
- 4 demonstrators @ Zooniverse (WP3,4,5,6)
- A transversal project: sonification (WP7)
- 4 WPs on Engagement , Impact and Roadmapping (WP2,8, 9,10)
- Software tools:
  - Gitlab software repository
  - Web sites:
    - Participant Portal for internal communication https://ep.ego-gw.eu/reinforce/
    - A public portal https://www.reinforceeu.eu/project





Methodology Challenges

- ***W.r.t the content***
  1. *Assure close communication between the four infrastructure WPs as well as with the sonification WP*
  2. *Avoid the "instrumentalisation" of the citizen as a simple classification machine, develop her/his critical thinking, obtain critical feedback in a two way process*
  3. *Efficiently mix algorithms, machine learning and human skills and effectively move from the correlational to the causal*
  4. *Avoid simple "illustration"/paternalism in multisensoriality, art-science and critical thinking*
- ***W.r.t the participants***
  1. *Bring new audiences to Zooniverse, including new categories (senior, disable, artistic disposed persons)*
  2. *Poll effectively participants and accompany properly their contributions, use a sufficiently elaborate feedback mechanism, to avoid fast disengagement after a first enthusiastic participation (a common CS problem)*
  3. *Language barriers*
- ***W.r.t the scientific community***
  1. *Persuade the corresponding scientific communities that it is not only outreach and communication but it can have major scientific returns (example of DETCHAR and Virgo/LIGO)*
  2. *Develop relationships with other research infrastructures (e.g. those inside ESCAPE:* LSST, SKA, CTA)➔ Roadmap

A citizen scientist identified a new source of glitches and helped scientist optimize their detector against them, thus contributing in the optimization of a GW detector!

Gravity Spy

WELCOME TO THE ZOONIVERSE

People-powered research

See All Projects

FEATURED PROJECTS

SNAPSHOT KAROO

AÑO NUEVO ISLAND - ANIMAL COUNT

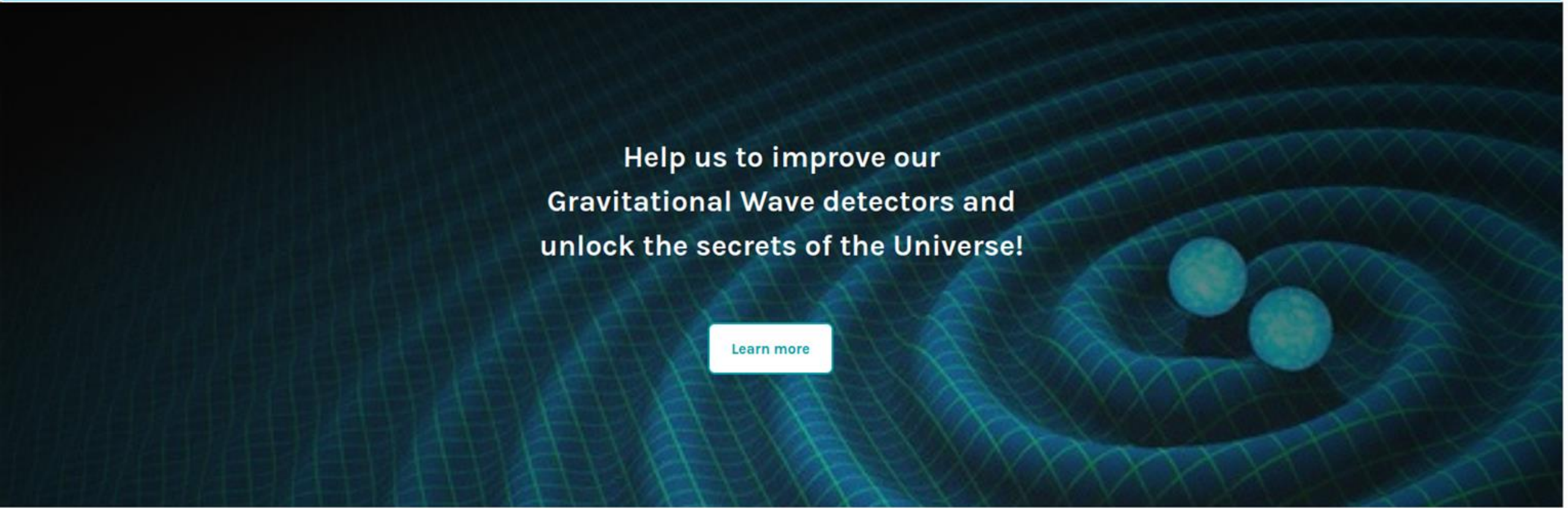
NOTES FROM NATURE - TERRESTRIAL PARASITE

GWITCHHUNTERS

We'd love to find out about your experience on this project. Please take 5 minutes to fill in this anonymous survey https://survey3.zsi.at/index.php/474782?lang=en

Attend an Interactive Citizen Science Workshop

Would you like to know how citizens can play an active role in the advance of ground-breaking research and share your views and experiences? Attend the interactive workshop organized by REINFORCE! For more information and the program of the event take a look here.



Get started

This Project is organized in increasing order of difficulty. We suggest starting in the Playground to get familiar with our data and practice with some basic "noise hunting", then progress to the next levels in ascending order of difficulty. At each level, you will discover new challenging tasks. And, if it is not enough for you, we have some special challenges that you can take on your mobile device via the Zooniverse app!

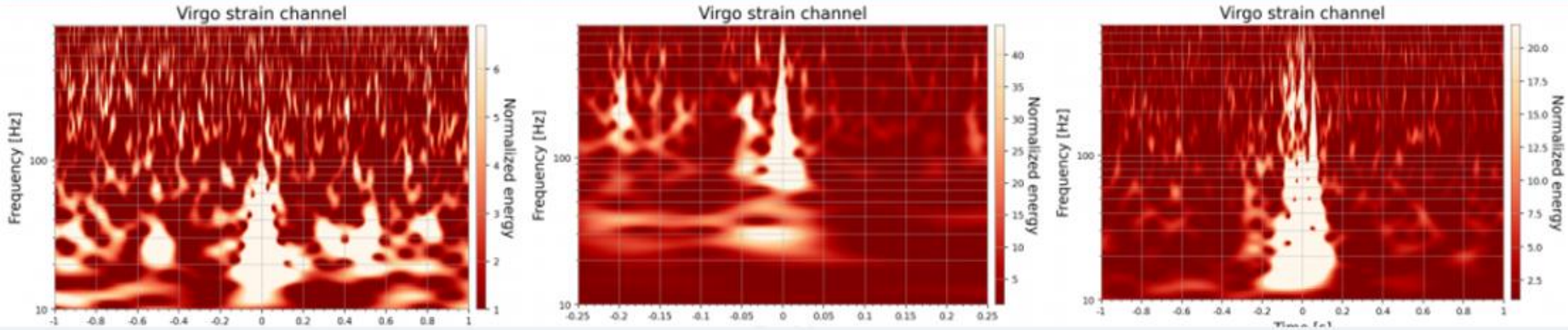
Playground - What is a glitch?

Level 1 - Catch the noise

Level 2 - Find them all!

Level 3 - Watch out the sensors!

Mobile Challenge - Noise Profilers



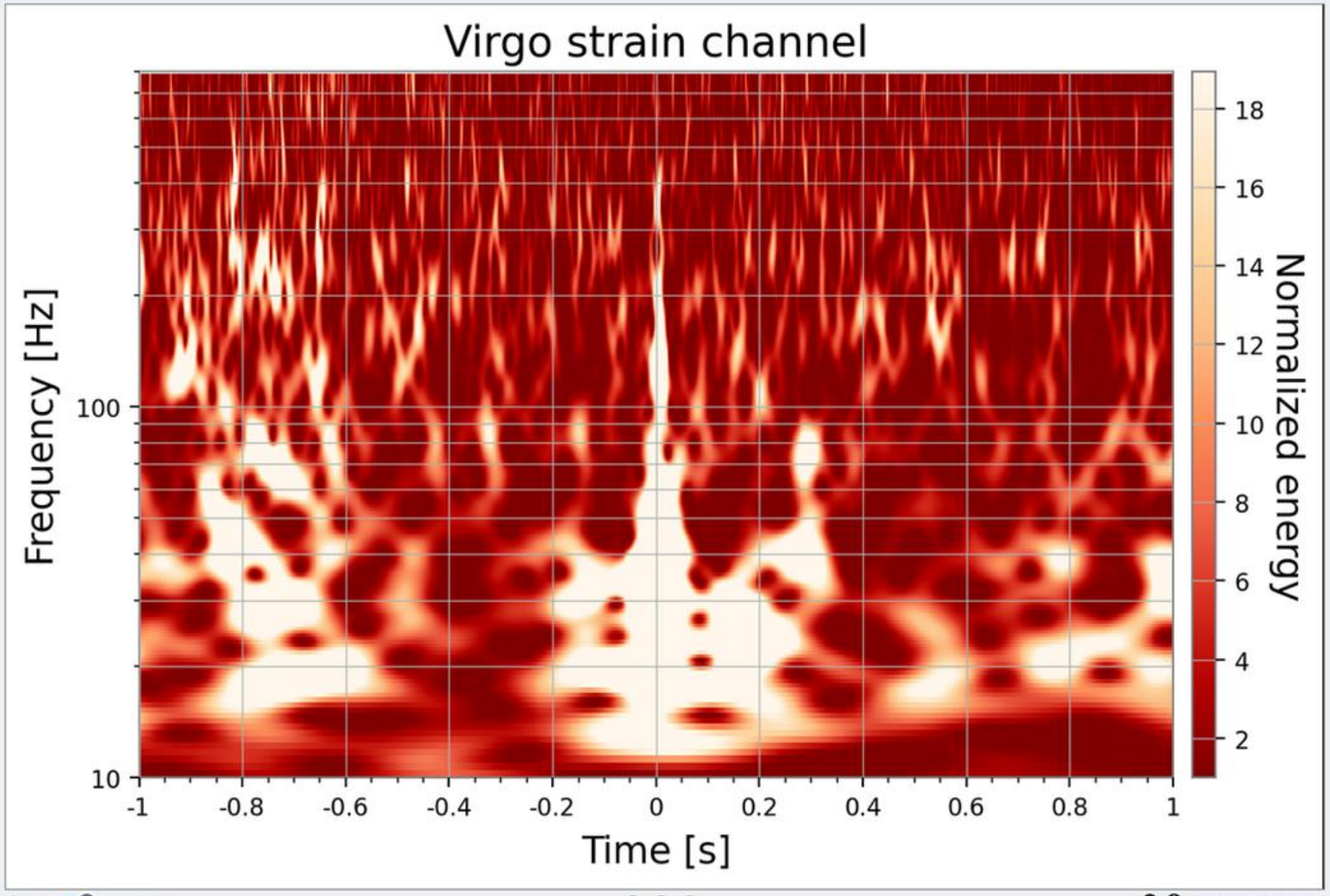
5 people are talking about **GWitchHunters** right now.

Join in

GWITCHHUNTERS STATISTICS

39% Complete

2,136	281,194	18,300	4,028
Volunteers	Classifications	Subjects	Completed Subjects



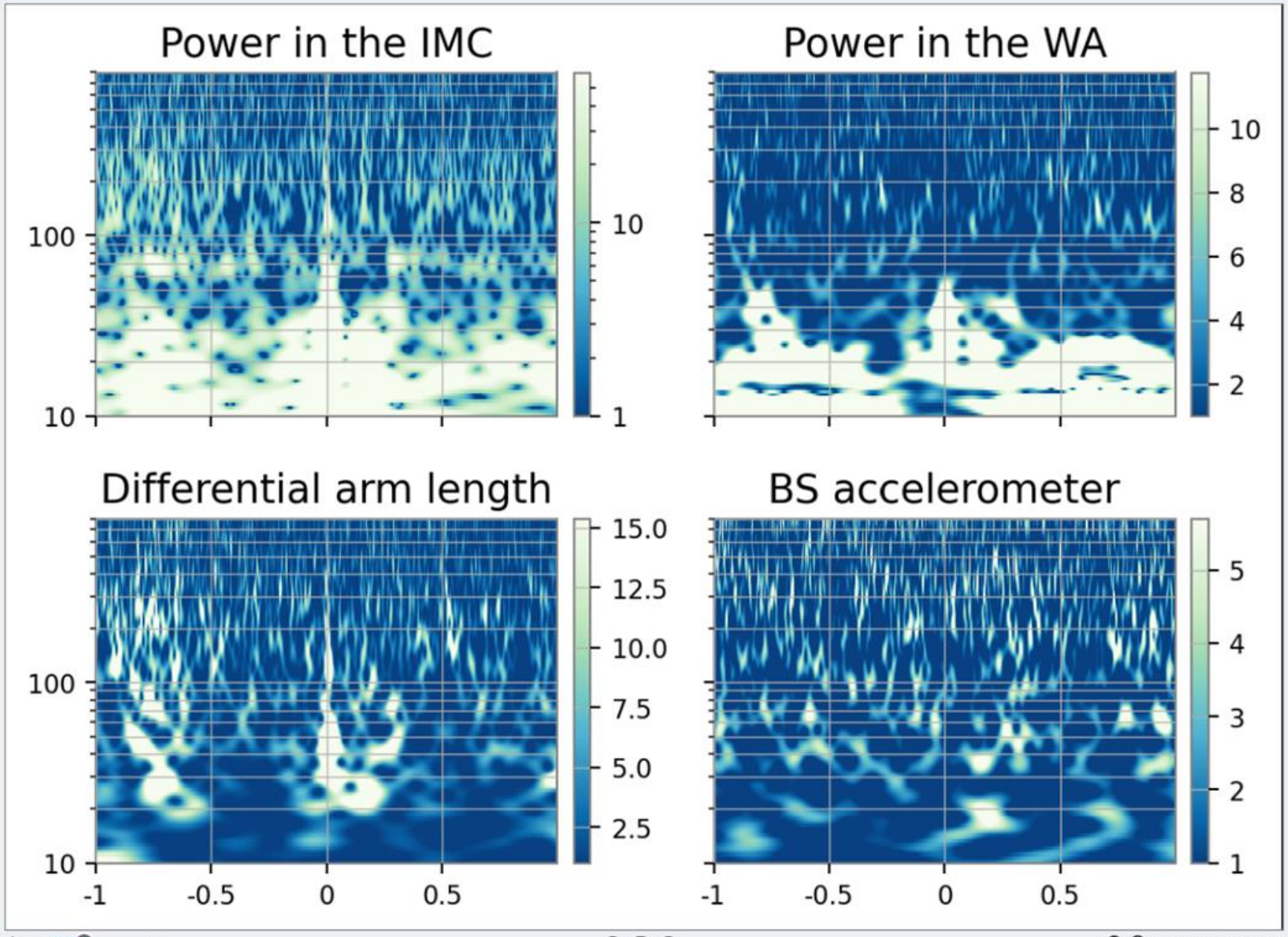
You should sign in!

TASK | TUTORIAL

Do you see a glitch? Can you identify its class?

- Blip
- Extremely Loud
- Helix
- Koi Fish
- Low Frequency Burst
- Scattered Light
- Scratchy
- Tomte
- Violin Mode
- I do not see anything !

FIELD GUIDE



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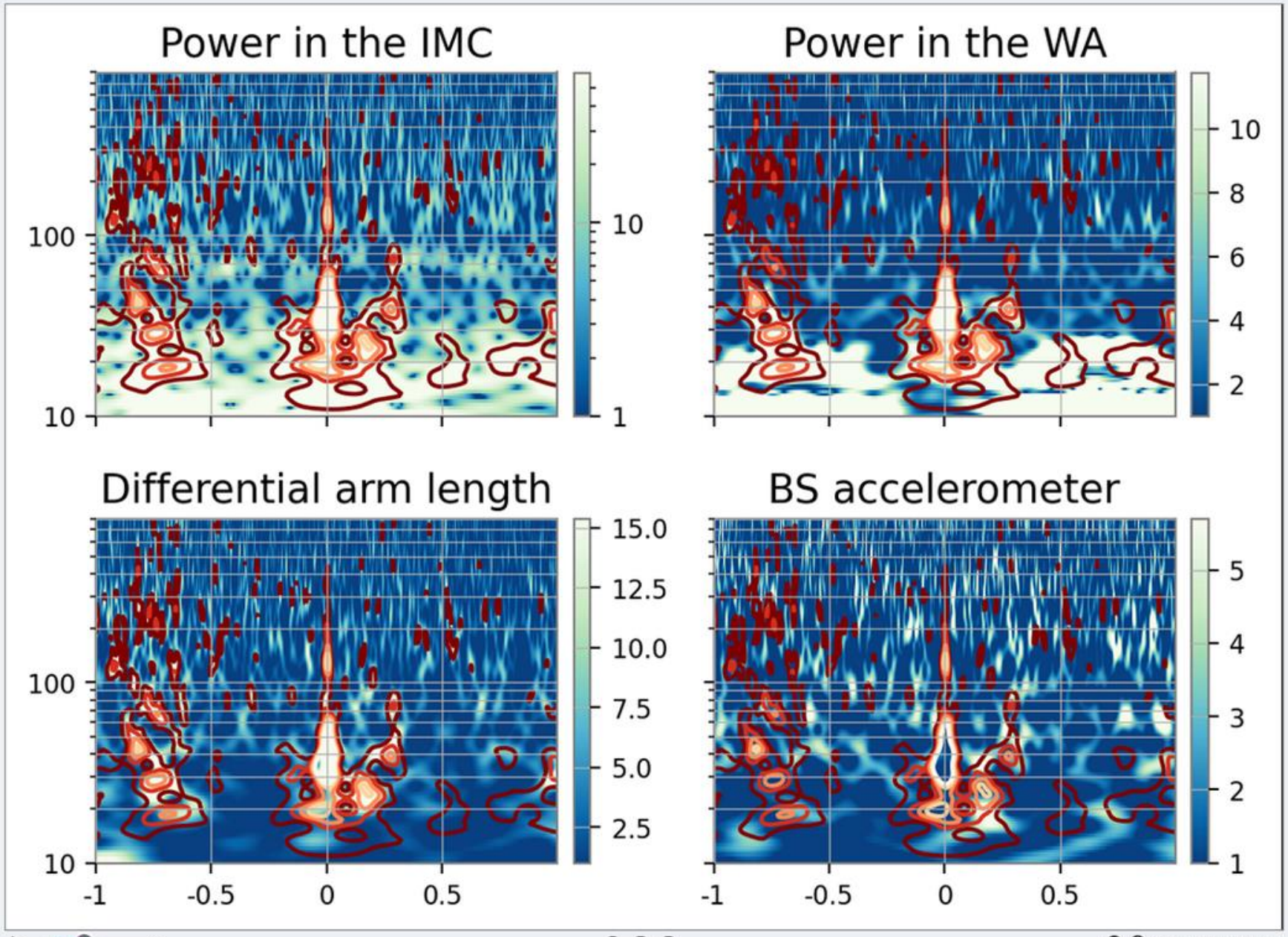
FIELD GUIDE

You should sign in!



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FIELD GUIDE

Deep Sea Explorers

Deep sea explorers great work! The scientists of KM3NeT thank you for your contribution! You have reached 10,000 classifications! How much more can you do until the end of March? Let's find out...

Announcements :

Workshop announcement : Would you like to know how citizens can play an active role in the advance of ground-breaking research and share your views and experiences? Attend the **interactive workshop** organized by REINFORCE! For more information and the program of the event take a look here.

Survey : We'd also love to find out about your experience on this project! Please take 5 minutes to fill in the anonymous survey https://survey3.zsi.at/index.php/734131?lang=en

Great work! Looks like this project is out of data at the moment!
See the results or dismiss this message

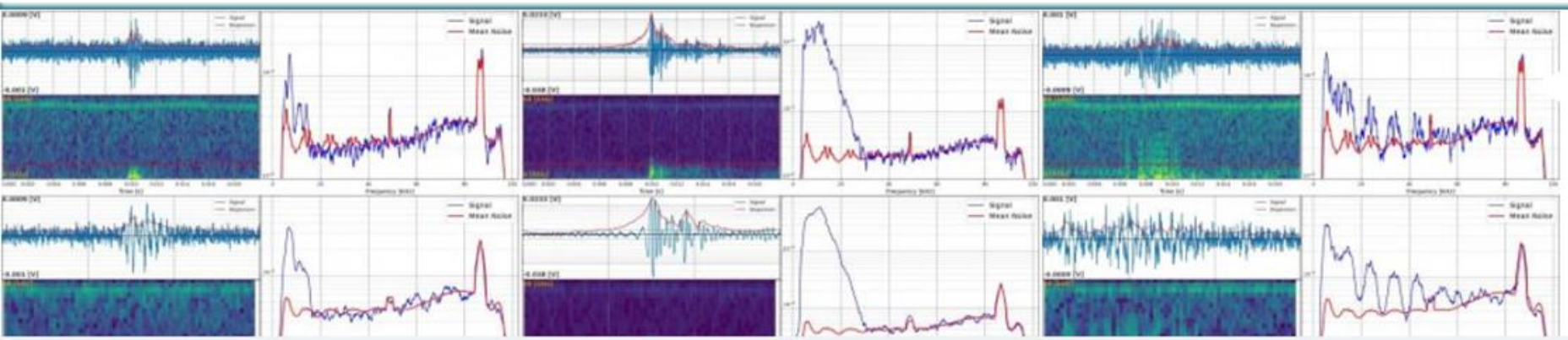
Help us to study bio-activity in the deep sea! With your help, we will better understand marine sources of noise in the KM3NeT detector, making our search for neutrinos

Get started

You can classify light (BIOLUMINESCENCE) or acoustic (BIOACOUSTICS) signals. Of course, you can also do both!

BIOLUMINESCENCE 1: Peak counting

BIOACOUSTICS 1: Cetacean click identification



1 person is talking about **Deep Sea Explorers** right now.

Join in

DEEP SEA EXPLORERS STATISTICS

100% Complete

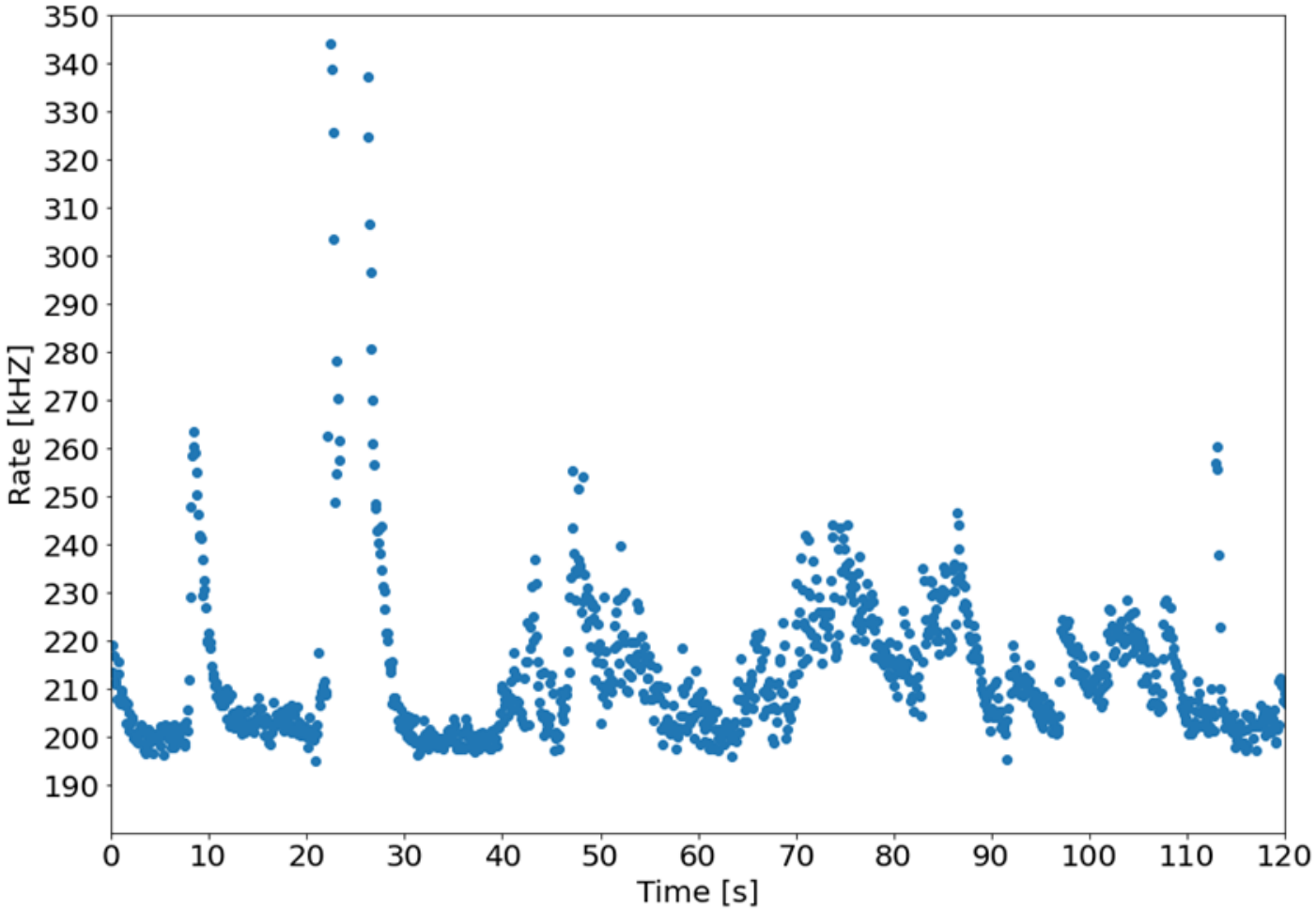
389	11,692	528	528
Volunteers	Classifications	Subjects	Completed Subjects

WORDS FROM THE RESEARCHER

ABOUT DEEP SEA EXPLORERS

EXTERNAL PROJECT LINKS

FINISHED!



TASK | TUTORIAL

What is the classification of this event?

- One peak
- Two peaks
- Multiple peaks
- Weird

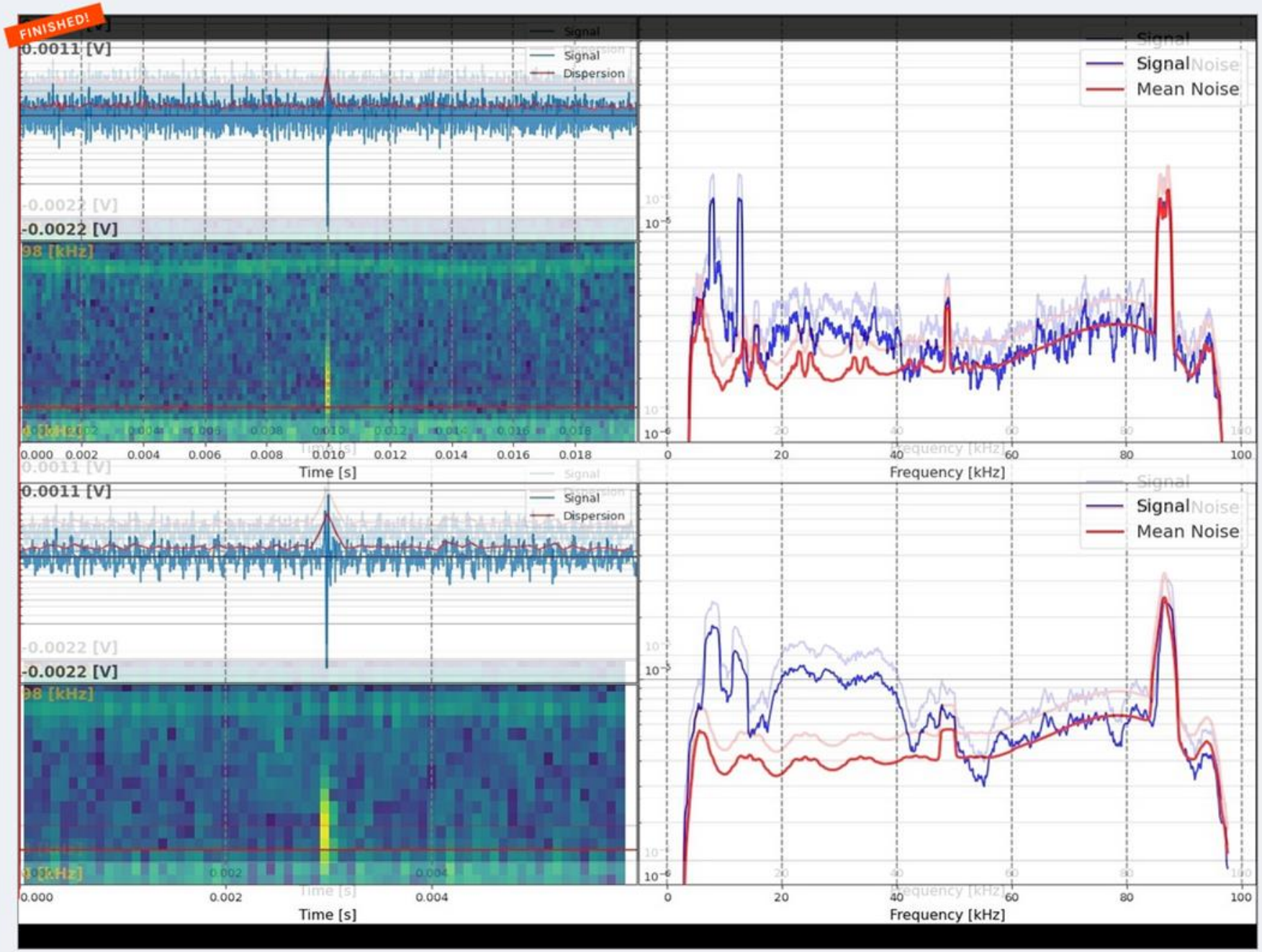
NEED SOME HELP WITH THIS TASK?

Done & Talk | Done

FIELD GUIDE

SWITCH TO DARK THEME

FINISHED!



TASK | TUTORIAL

What is your proposed identification?

- Sperm whale
- Short-finned pilot whale
- Pure noise
- Something else

NEED SOME HELP WITH THIS TASK?

Done & Talk | Done

FIELD GUIDE

SWITCH TO DARK THEME

New Particle Search at CERN

We'd love to find out about your experience on this project! Please take 5 minutes to fill in the anonymous survey https://survey3.zsi.at/index.php/734131?lang=en

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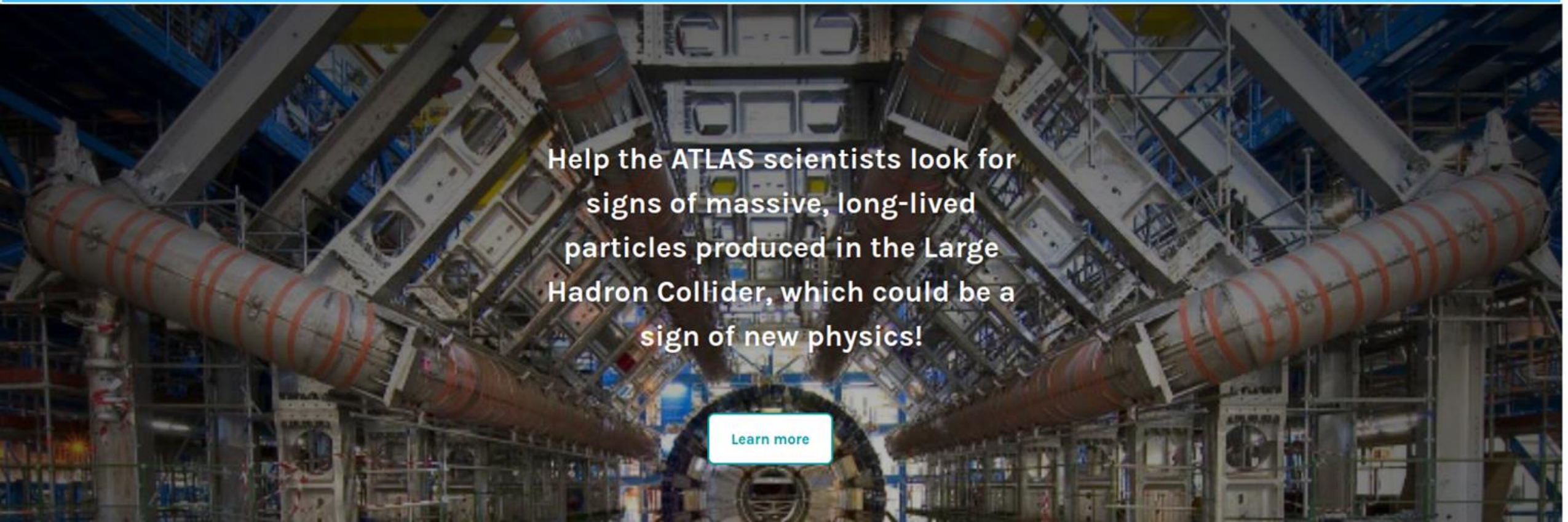


Get started

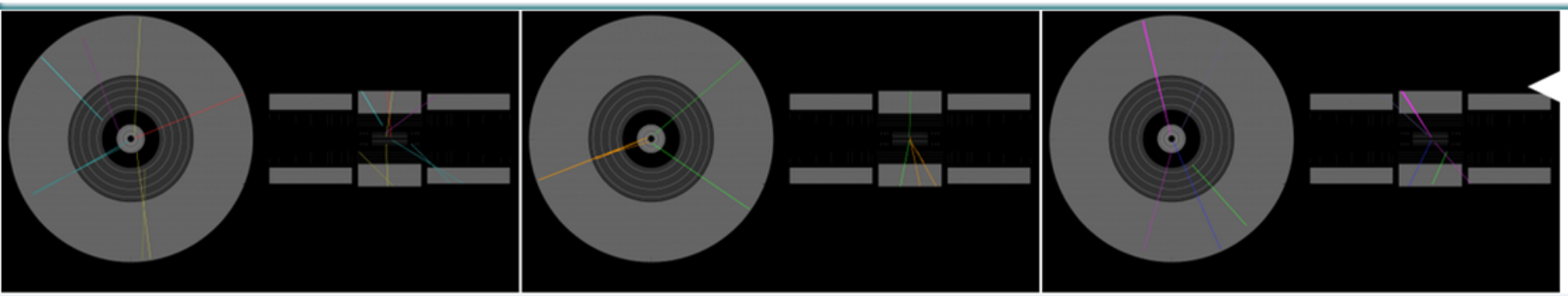
The project consists of three stages. We strongly recommend you take part in them in order. In Stage 1, you will identify Displaced Vertices, which are the signatures of long-lived particles. In Stage 2, you will identify the signatures of known particles (electrons, muons, photons) in the ATLAS detector. In Stage 3 you will: a) search for Higgs boson decays to a pair of photons and b) look for long-lived particles decaying far from the beam collision point. NOTE: In stages 2 and 3 you will be directed to an external online tool called HYPATIA. It is run by the research team of this project and is not hosted on Zooniverse.

Stage 1 - Displaced Vertex Identification

Stage 2 - Particle Identification

Stage 3a - Study of Higgs Bosons

Stage 3b - Discovery of Long Lived Particles



3 people are talking about **New Particle Search at CERN** right now.

Join in

NEW PARTICLE SEARCH AT CERN STATISTICS

4% Complete

1,320	55,081	5,080	946
Volunteers	Classifications	Subjects	Completed Subjects

We'd love to find out about your experience on this project! Please take 5 minutes to fill in the anonymous survey https://survey3.zsi.at/index.php/734131?lang=en

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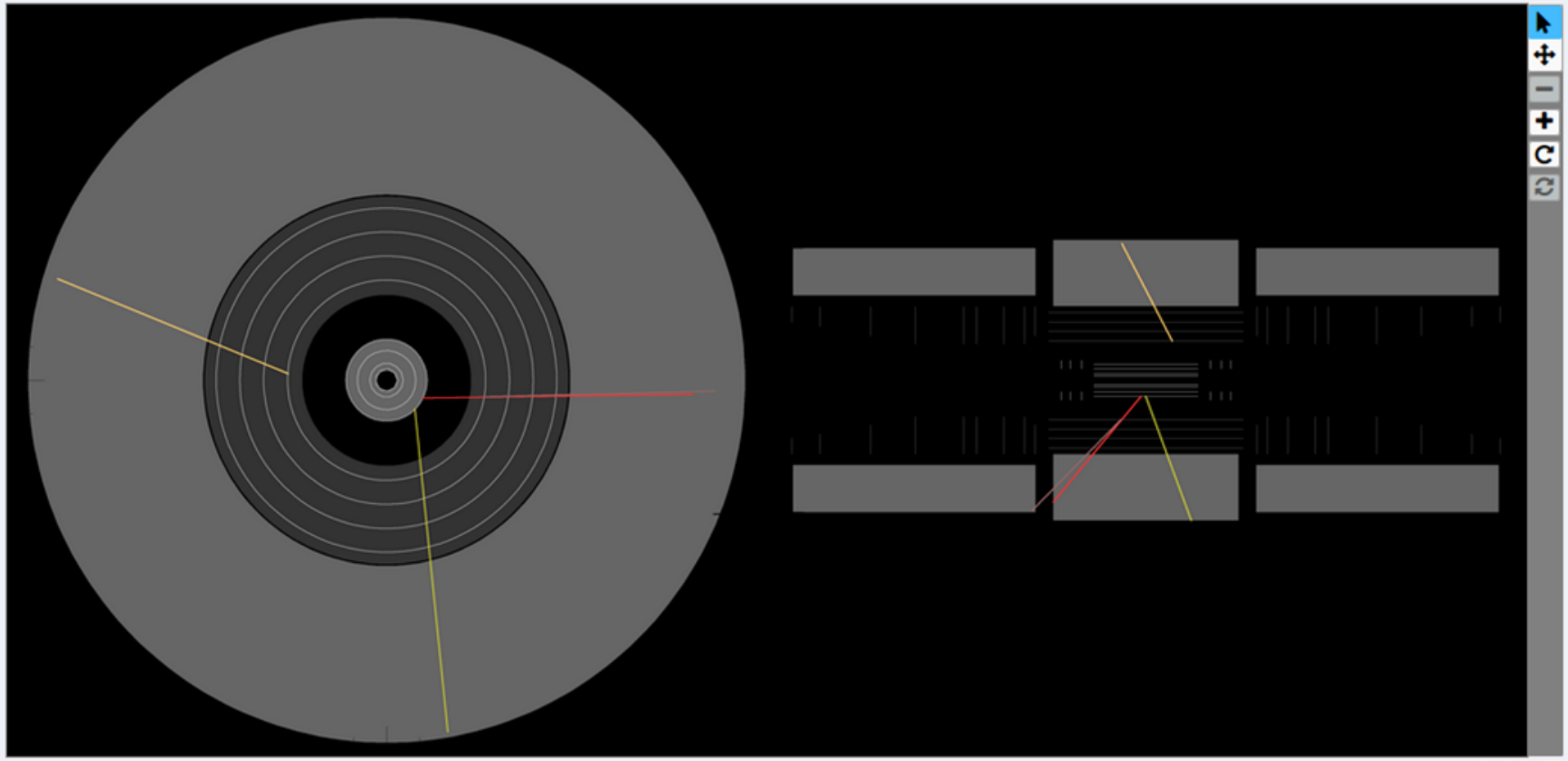


TASK | TUTORIAL

Place a marker on any displaced vertices that you can see. If you do not see any displaced vertices, just click "Done".

Remember to place marks in both the transversal (left) and longitudinal (right) views.

Please make sure that you have read the detailed instructions provided at the help link below.

Displaced vertex 0 of 0 required drawn

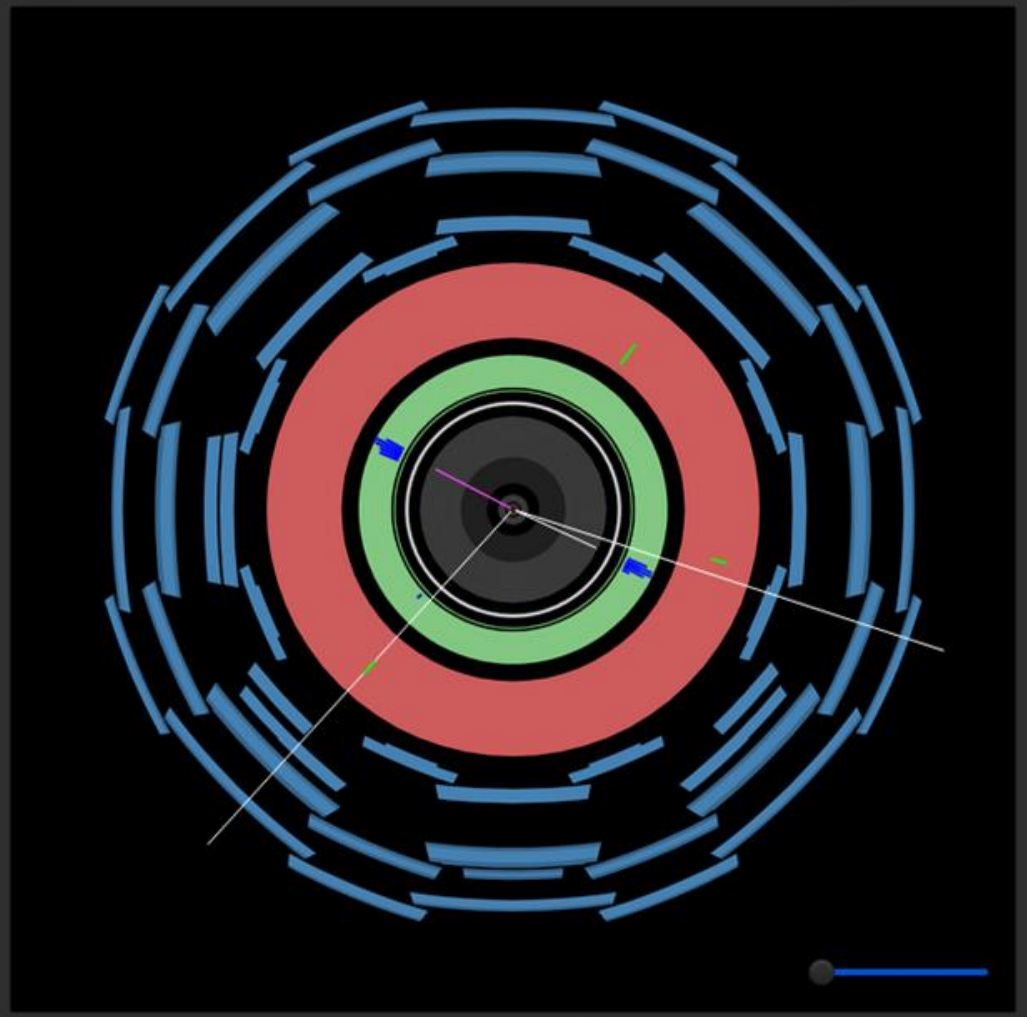
NEED SOME HELP WITH THIS TASK?

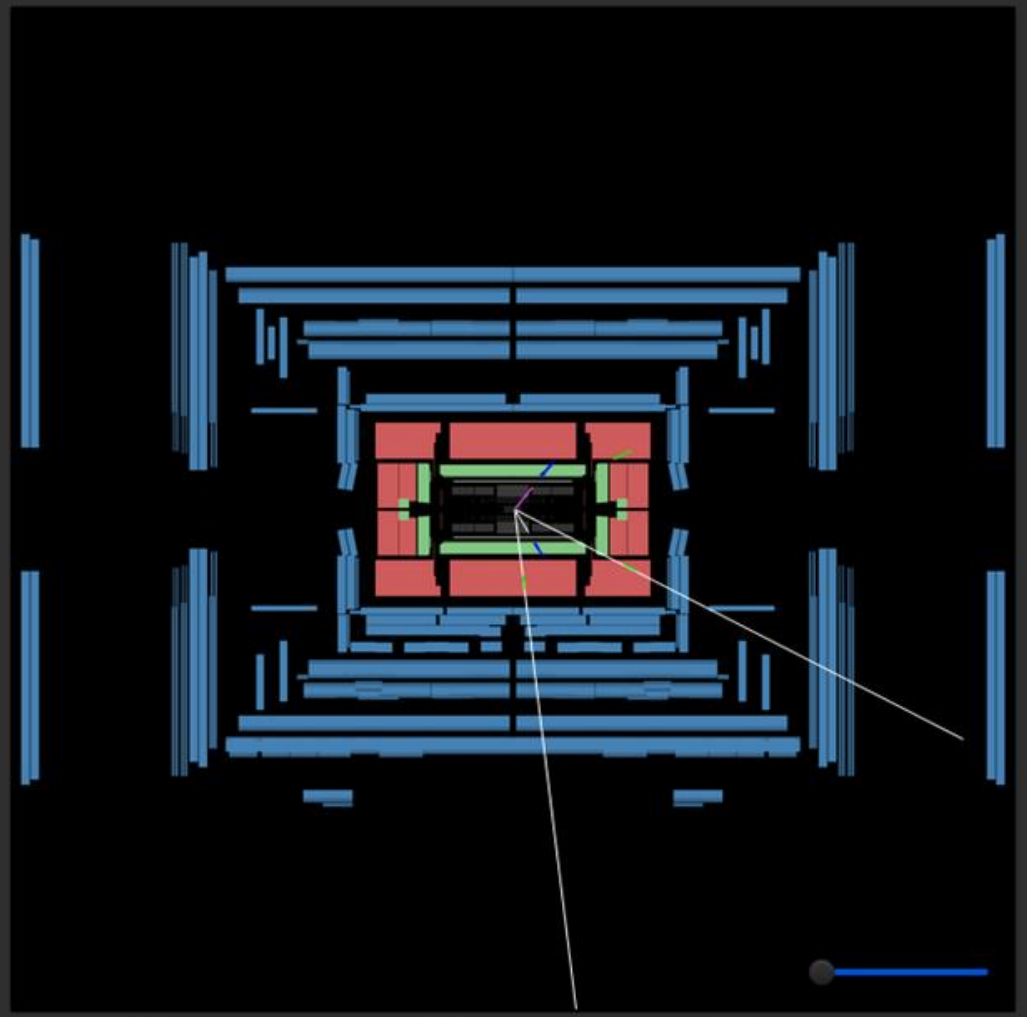
Done & Talk | Done

FIELD GUIDE

SWITCH TO DARK THEME

HELLENIC REPUBLIC
National and Kapodistrian University of Athens
EST. 1837





+ Electron | + Muon | + Photon | + Conv. Photon | − Delete | → Next | ? Help

Particle	+/-	p_T [GeV]	φ [rad]	θ [rad]
track_1	-	52.1	2.66	0.89
track_2	-	14.43	-0.32	1.45
track_3	+	7.54	-2.31	0.47
track_4	+	28.28	-0.43	1.03
cluster_1		56.12	2.67	0.86

Particle	+/-	p_T [GeV]	e/μ/γ

Cosmic Muon Images

We'd love to find out about your experience on this project! Please take 5 minutes to fill in the anonymous survey https://survey3.zsi.at/index.php/734131?lang=en

Congratulations everyone! Thank you for your contribution! You are getting close to 50,000 classifications! How fast can you get there? Keep up the good work here!

Attend a Citizen Science Interactive Workshop

Would you like to know how citizens can play an active role in the advance of ground-breaking research and share your views and experiences? Attend the **interactive workshop** organized by REINFORCE! For more information and the program of the event take a look here.

Using Muon Tomography we can probe the internal structure of massive objects, like volcanoes, with particles from stars and galaxies far far away... help us identify these particles inside our

Get started

Take a look into events registered by our detectors and help us to categorise their signal. In both of the workflows in the project you are welcome to try and find the proper particle tracks and extra particle strikes on the detector surfaces. The "Introductory" workflow looks at simpler cases, where our computer proposes a track. The "FreeStyle" workflow looks at events where the proposition of a track becomes difficult for our machine but it should be easy if you spent some time in the "Introductory" workflow.

FreeStyle

COSMIC MUON IMAGES STATISTICS

50% Complete

510	47,684	8,840	4,896
Volunteers	Classifications	Subjects	Completed Subjects

3 people are talking about **Cosmic Muon Images** right now.

Join in

WORDS FROM THE RESEARCHER

"I am very excited about this project because at last we get the chance to investigate our methods in great detail with the

ABOUT COSMIC MUON IMAGES

We are a team of young researchers from different walks of science. We place muon detectors all around the globe and we study the inner structure of massive objects from **volcanoes** to ancient **tombs** and from underground **tunnels** to **blast furnaces**.

Jacques is in charge of the group activities being the most experienced researcher he takes care of the design and the calibration of our detectors, and plans the future

EXTERNAL PROJECT LINKS

- REINFORCE
- Cosmic Muons Images
- Diaphane
- Arche
- Institute des 2 Infinis Lyon

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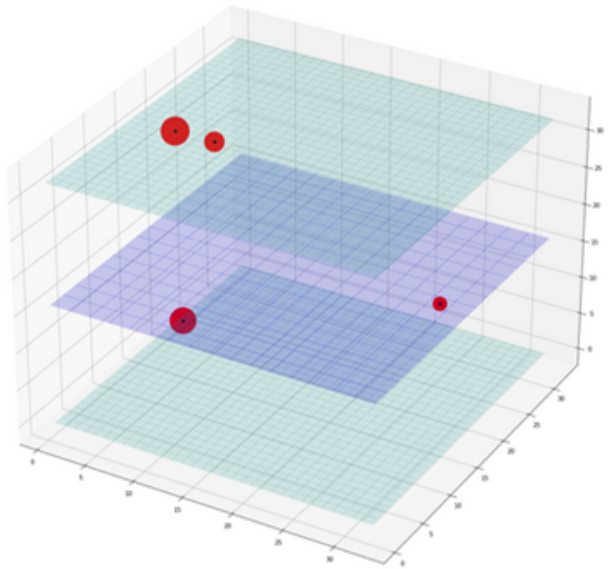
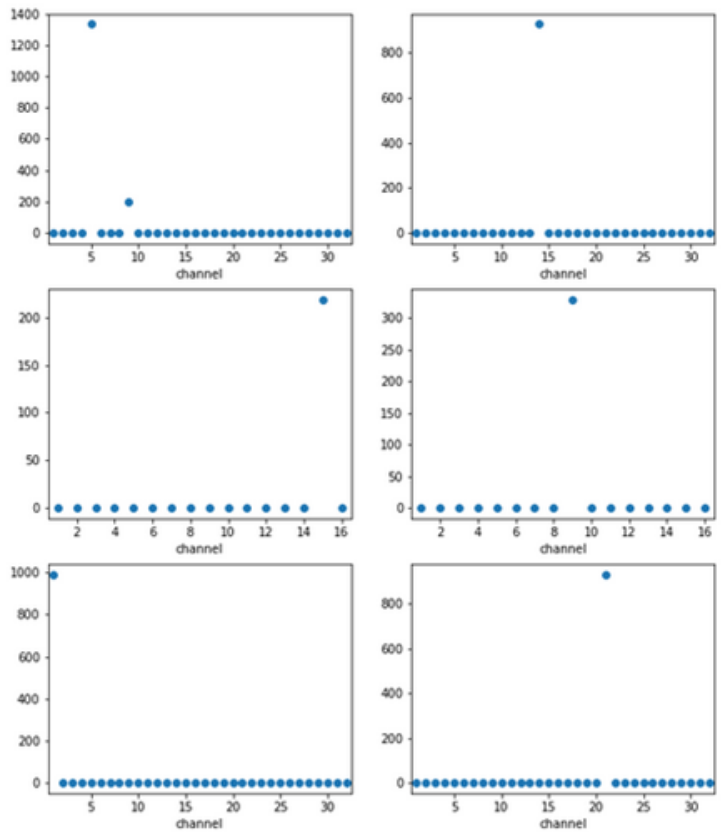




TASK | TUTORIAL

Is there a pattern?
Note: finding the proper lines by eye is not always easy. You can answer "Yes..." and if your trials in the next step fail, you can always come back here and change your answer.

yes i can see a pattern (track or track with extra points)

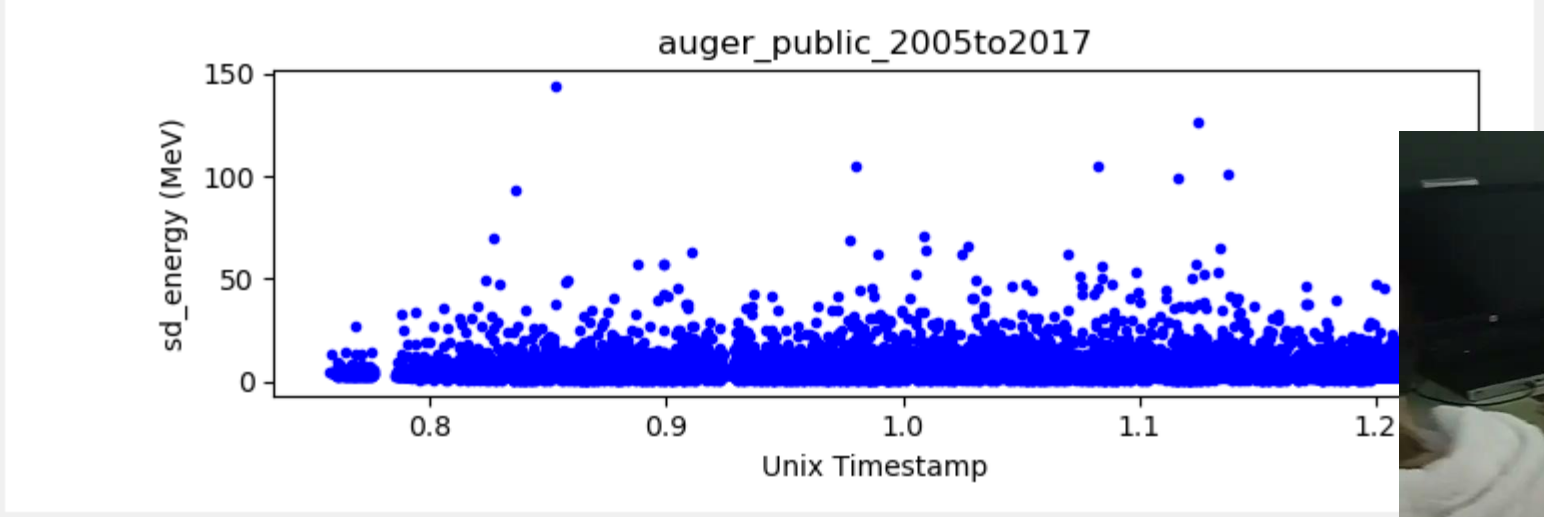
no track and nothing remarkable

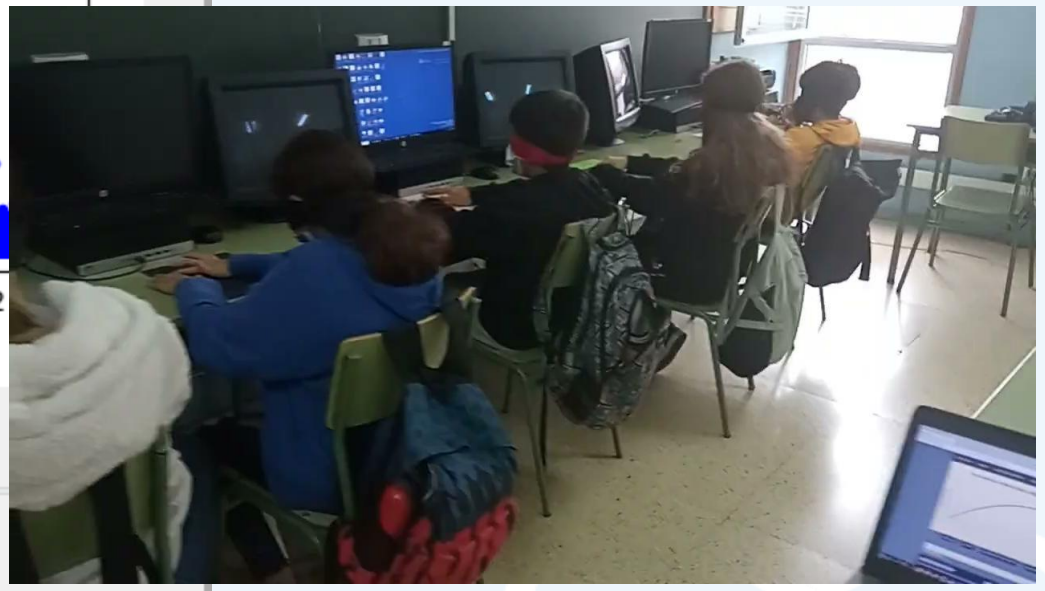
NEED SOME HELP WITH THIS TASK?

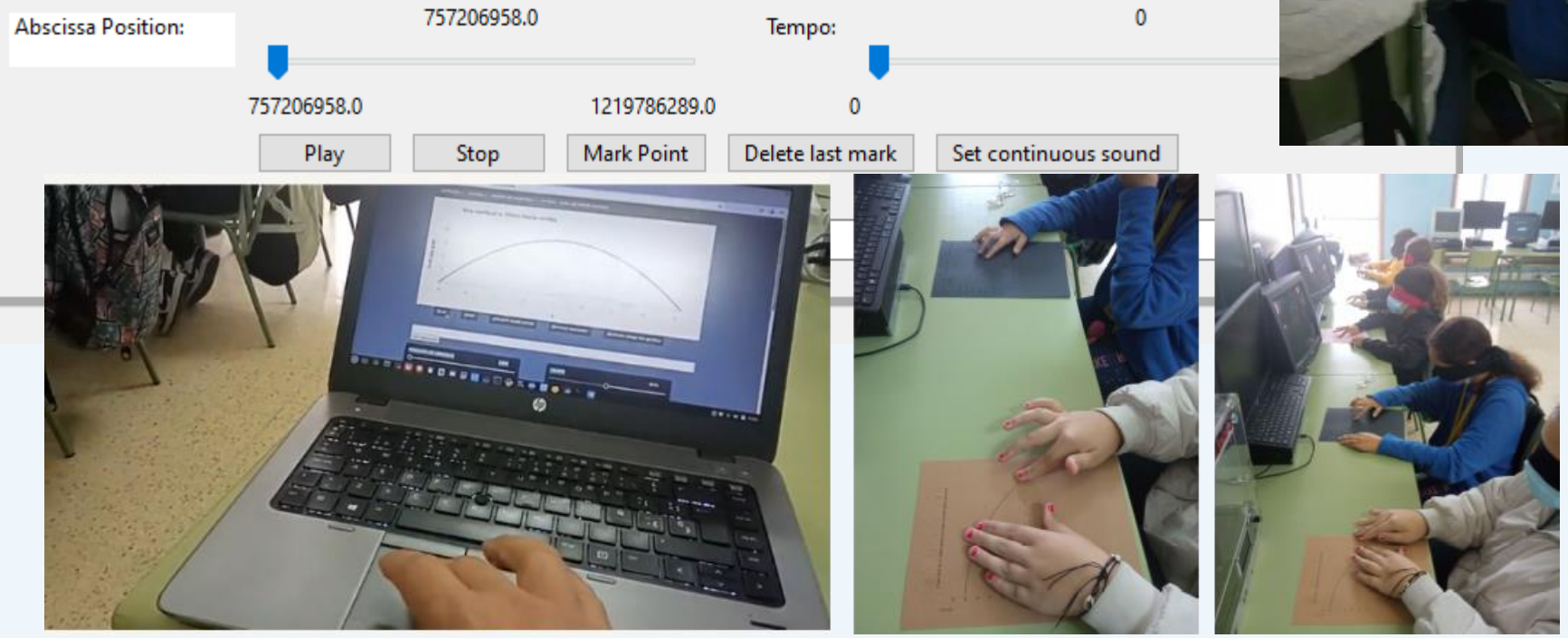
Done & Talk | Done

FIELD GUIDE

SWITCH TO DARK THEME


auger_public_2005to2017
sd_energy (MeV)
150
100
50
0
0.8
0.9
1.0
1.1
1.2
Unix Timestamp




Abscissa Position:
757206958.0
Tempo:
0
757206958.0
1219786289.0
0
Play
Stop
Mark Point
Delete last mark
Set continuous sound

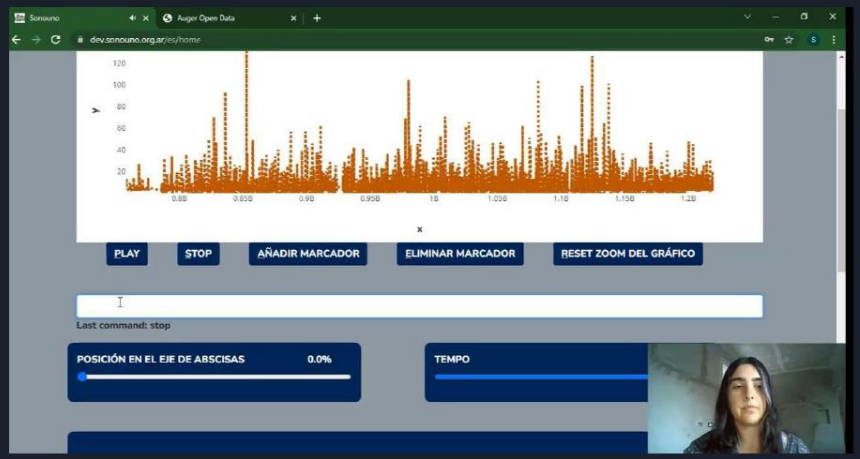
Sonification

SonoUno web interface for astronomical data sonification

Johanna Casado, Gonzalo De La Vega,
Martín Domínguez, Beatriz García.

2nd WAI - 17-18/11/2021

Working with real data!

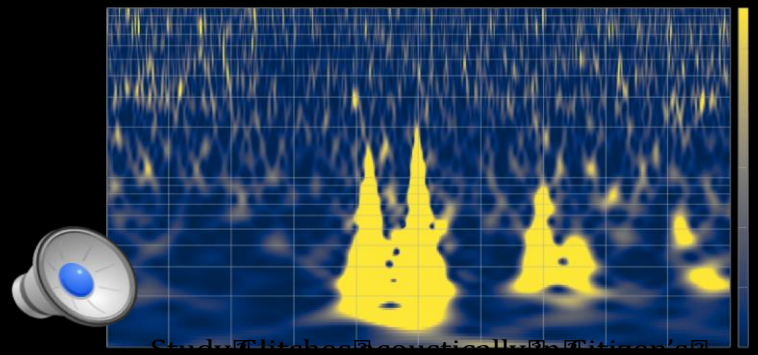


https://docs.google.com/file/d/1BjExBIHI5LEMdiMFFR8MEyVEIcpBiX-d/preview

REINFORCE
REsearch INfrastructures FOR Citizens in Europe

Inclusion for augmenting humanities perception capabilities from Multi-Messenger to Multi-sensorial

- From multi-messenger to multisensorial apprehension of reality
- Not only increasing inclusion. Also increasing the researchers discrimination power of signal over background through the use of sound.



Wanda joined Ego March 202 (photo Nature)

- *A rich program in development :*
  - *Sonification of astronomical data e.g. GWitchHunters*
  - *Sonified Course « The life and death of Stars » starting the 23rd of MArch in Australia*
  - *Multisensorial Telescope (vision, sound, vibration) ready soon*
  - *Large « visibility »/«acousticity » (Televisions, Newspapers,UN persentation…)*

REINFORCE
REsearch INfrastructures FOR Citizens in Europe

Science Café's

Exhibitions – Open Events

Examples of Participatory Engagement Activities

REINFORCE **Lab open days and field trips**

https://home.cern/news/news/cern/cern-education-prepare-visit-follow

Training Workshops

Webinars

Other Accompanying activities

Virtual Visits to Large Research Infrastructures in Physics

Figure 4 Dissemination of the visits

Figure 5 Screenshots from the virtual visits: Virgo (Top left); Pierre Auger Observatory (Top right); ATLAS experiment (bottom left) and ALICE experiment (bottom right) at CERN

A series of virtual visits have been co-organized by the REINFORCE project for the general public and the educational communities in the framework of the FRONTIERS Winter School (https://indico.ego-gw.it/event/133/) and FRONTIERS Summer School (https://indico.ea.gr/event/4/) 2021. The visits were to: Virgo GW detector (two visits with the collaboration of the EGO REINFORCE team and the Virgo outreach Group); Pierre Auger Observatory (two visits with the collaboration of CONICET and the Pierre Auger Outreach Group); ATLAS experiment at CERN (one visit with the support of IASA and the collaboration of the ATLAS outreach group); ALICE experiment at CERN (one visit with the support of IASA and INFN and the collaboration of the ALICE outreach group). Participants were able to connect and interact with researchers via ZOOM. In total, more than 100 teachers and 400 citizens were engaged in the virtual visits. A series of virtual visits to the Virgo gravitational-wave detector were also organised from March to June 2021

Vision-Building Workshop
Organised by EA, 21/07/2020, Online

Figure 8 - Banner of the visionary workshop

Fig. 9 Participants' perceptions of citizen science

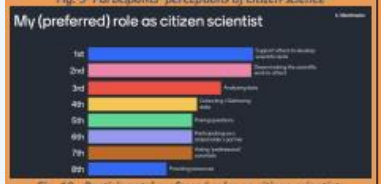


Fig. 10 - Participants' preferred roles as citizen scientists

A vision-building workshop was organised for the general public and educators on the 21st of July, 2020. The workshop was broadcast on Zoom and showcased the intended citizen-science projects in frontier physics, presented by experts from infrastructures such as CERN, Virgo/EGO and KM3NeT. Researchers from REINFORCE introduced their ideas and engaged with participants to better understand their interest, motivations and ideas to get involved and contribute via citizen science.

The goals of the workshop were to: Introduce participants to the key aspects of citizen engagement in (citizen) science; Explain the project's vision / showcase examples of how citizens can contribute to large research infrastructures; Present hands-on experiences of how citizens can contribute to the work of large research infrastructures; Build interest in participating in REINFORCE demonstrator projects; Understand their interest and motivation to participate in REINFORCE citizen science projects.

The workshop was built to allow ample time for interaction, and feedback-collection through online tools such as Mentimeter.

According to the participants' feedback, the thematic area of a citizen-science project seems to be one of the main motivational factors, along with the chance to interact with top scientists in their field and understand the process of scientific research.

Black Holes and Gravitational Waves in the Cosmic Concert by Tomàs Saraceno
Organised by EGO, 31/12/2020, Italy

Figure 2 - Poster of the event.

Figure 3 - Snapshot from the comments of the Nobel Prize in Physics, Barry Barish, for the cosmic concert by Tomas Saraceno.

On the evening of the 31st of December, 2020, Tomas Saraceno greeted the arrival of the new year with an installation in Rome and a cosmic concert in the context of the end of year festivities of the city of Rome. The Argentine artist staged a multisensory concert, made up of laser lights, sounds and vibrations, to explore the connections between the Earth and the cosmos, man and other living beings, nature, and the universe. Among the protagonists of this great cosmic concert were gravitational waves, which connect us to the most remote and distant phenomena that we have been able to detect, such as the collisions of black holes or neutron stars, millions, or billions of light years from Earth.

"The cosmic concert by Tomas Saraceno was the result of an authentic collaboration between artists and scientists from different disciplines", said Stavros Katsanevas, director of EGO. "Such as the astronomer Wanda Diaz-Merced, who is developing extraordinarily valuable research on the 'sonification' of cosmic signals of different nature." The event was broadcast at national level with tens of thousands of attendees. The large number of attendees at the concert had the opportunity to witness a unique and original combination of lights, sounds and vibrations, which highlighted our connections with the rest of the Universe. They could realise the importance of inclusion and the existence of different ways to observe the world. They were part of a communication with the Cosmos at a time when the circumstances of Covid-19 had caused a crisis in human communications and bonds worldwide.

Figure 12 - Moments from the Online Summer and Winter Schools, co-organised by the FRONTIERS and REINFORCE projects in 2020-2021

During 2020 and 2021, two e-Summer Schools and one e-Winter School were co-organised by the REINFORCE project. Participating teachers had the opportunity to learn about the science content in the fields of gravitational-wave astronomy, high-energy physics and astroparticle physics, from leading experts in the field, to perform hands–on activities and to be introduced to the framework of REINFORCE, to provide feedback on the introduction of citizen science into the classroom and to work with the first versions of the project demonstrators. These events empowered more than 200 teachers, who created their own educational activities based on the REINFORCE demonstrators and engaged deeply in further activities that were co-organised by REINFORCE, such as virtual visits for schools, as well as engaging their students with the project demonstrators that had already been launched and introducing them to the classroom.

The REINFORCE Winter Challenge

On the 18th January, 2022 (three months after the launch of the first REINFORCE demonstrator), the "REINFORCE Winter Challenge" was launched (http://reinforce.ea.gr/winter-challenge/). The aim of the challenge was to motivate citizens to participate in the activities of the *GWitchHunters* and the *New Particle Search at CERN* demonstrators. Citizens were asked to classify several events and get the chance to participate, along with researchers, science communicators and educators, in an International Training Course that will take place in July, 2022. The challenge was communicated to the 500,000 active users of the Zooniverse platform as well as through the REINFORCE dissemination channels.

Figure 20 - Screenshot of the Winter Challenge web-page in the REINFORCE community platform.

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A summary

ANNEX 1: Summary of engagement activities up to M26

Country	Brief Description (Title of Event / Agenda / Structure of Workshops / Programme, etc.)	Date of Event	Category	Audience Type (majority)	Participants	URL
Italy	Il ritmo dello spazio	Dec 2019	Art exhibition	General Public / Citizens	30000	https://www.ego-gw.it/blog/2019/10/31/il-ritmo-dello-spazio/ https://sites.ego-gw.eu/ilritmodellospazio/
Germany	Open Science Conference 2020	3/12/2020	Conference	Academic / Researcher	100	https://www.open-science-conference.eu/
Italy	ESOF – EuroScience Open Forum	7/5/2020	Conference	General Public / Citizens	1400	https://www.esof.eu/en/home.html
Italy	ECSA conference 2020	9/6/2020	Conference	General Public / Citizens	140	https://www.ecsa-conference.eu/
Germany	Citizen Science SDG Conference	10/15/2020	Conference	Citizen Scientists / Organisations	200	https://www.museumfuernaturkunde.berlin/en/museum/events/knowledge-change-decade-citizen-science-2020-2030-support-sdgs
Ireland	European Science Engagement Conference 2020	10/30/2020	Conference	General Public / Citizens	60	https://eusea.info/
Italy	Gravitational waves, the Moon and the nearest planets, explored through stories, speeches and short videos.	11/27/2020	Conference	General Public / Citizens	2200	https://www.ego-gw.it/blog/2020/11/27/the-sound-of-the-universe/
Argentina	IAU Symposia	12/8/2020 - 12/12/2020	Conference	Academic / Researcher	200	https://www.iau.org/science/meetings/future/symposia/2528/
Italy	Black holes and gravitational waves in the cosmic concert by Tomàs Saraceno.	12/31/2020	Concert	General Public / Citizens	National online broadcast, with tens of thousands of attendees	https://www.ego-gw.it/blog/2020/12/30/black-holes-and-gravitational-waves-in-the-cosmic-concert-by-tomas-saraceno/
Italy	Cascina meets Virgo	9/1/2021	Conference	General Public / Citizens	150	https://www.ego-gw.it/blog/2021/09/01/cascina-meets-virgo/
Italy	A special evening under the stars of Virgo to discover Dante's cosmos and how we listen to and narrate the Universe today.	10/1/2021	Conference	General Public / Citizens	800	https://www.ego-gw.it/blog/2021/09/17/e-quindi-uscimmo-a-rivedere-le-stelle/
Online	ATLAS Week presentation	12/2/2021	Awareness	Academic / Researcher	50	https://ep.ego-gw.eu/tds/ql?c=285
Italy	Le Donne e i paesaggi dell'Astronomia,	10/3/2021	Conference	General Public / Citizens	120	https://www.ego-gw.it/blog/2021/10/01/le-donne-e-i-paesaggi-dellastronomia-pisa-book-festival-2021/
Online	IPPOG meeting presentation	5/19/2021	Awareness	Academic / Researcher	60	https://indico.cern.ch/event/1034126/
Italy	Stelle per tutti 2021	5/26/2021	Conference	General Public / Citizens	750	https://www.ego-gw.it/blog/2021/05/26/ego-ospita-la-giornata-di-divulgazione-inclusiva-deluai-per-il-2021/
Online	EESFYE conference presentation	6/19/2021	Awareness	Academic / Researcher	100	https://indico.cern.ch/event/1020541/
Online	ATLAS week presentation	7/2/2021	Awareness	Academic / Researcher	50	https://ep.ego-gw.eu/tds/ql?c=286
Online	EPS conference presentation	7/28/2021	Awareness	Academic / Researcher	100	https://www.eps-hep2021.eu/
Online	NuFact conference presentation	9/10/2021	Conference	Academic / Researcher	100	https://indico.cern.ch/event/855372/
Online	Poster Booth in the ECSA 2021 conference.	11/24/2021	Awareness	Academic / Researcher	150	https://hopin.com/events/the-future-of-citizen-science-sharing-experiences-from-the-european-community
Italy	Lo Spazio e i Sensi	9/24/2021	Conference	General Public / Citizens	450	https://www.ego-gw.it/blog/2021/09/24/lo-spazio-e-i-sensi-science-and-music-beyond-the-senses/
Online	Presentation regarding the impact of virtual visits to Virgo organized by REINFORCE with students from remote and underprivileged areas	11/15/2021	Awareness	Other	80	https://accefyn.com/microsites/nodos/astroco/ii-workshop-on-astronomy-beyond-the-common-senses-for-accessibility-and-inclusion/
Online	IPPOG meeting presentation	11/19/2021	Awareness	Academic / Researcher	60	https://indico.cern.ch/event/1084892/
Online	VIRTUAL RedPOP 2021	11/24/2021	Conference	General Public / Citizens	200	https://www.redpop.org/2021-recalculando-estrategias-de-divulgacin-cientfica
Online	Integration of topics of Gravitational Wave Astronomy or High Energy Physics into the school curriculum.	1/29/2020	Training	Secondary School Teachers	100	https://indico.ego-gw.it/event/133/
Online	Bridging the gap between science and society	6/1/2020	Awareness	General Public / Citizens	53	https://www.reinforceeu.eu/events/webinars/bridging-gap-between-science-and-society-through-citizen-science
Belgium	"Final Symposium" - Citizen Science: a scientific diamond?	6/30/2020	Conference	General Public / Citizens	40	https://cs-eu.net/events/internal/save-date-final-symposium-citizen-science-scientific-diamond
Online	How to help scientints in the gravitational wave noise hunt	10/16/2020	Awareness	General Public / Citizens	65	https://www.reinforceeu.eu/events/webinars/how-help-scientists-gravitational-wave-noise-hunt
Greece	VODAFONE Foundation: Teacher training event for teachers from rural schools in Greece	11/10/2020	Training	Secondary School Teachers	20	https://ep.ego-gw.eu/tds/ql?c=287
Greece	Two-day teacher training seminar: Black Holes and Gravitational Waves	12/15/2020	Workshop	Secondary School Teachers	80	https://ep.ego-gw.eu/tds/ql?c=288
Online	Virtual Visits to Virgo (87), ALICE (148) and Pierre Auger (178) experiments.	1/7/2021	Awareness	General Public / Citizens	413	indico.ea.gr/event/4
Greece	Invited talk in the Science Café of New York College	1/23/2021	Online / MOOC	General Public / Citizens	720 concurrent – 4500 via Youtube	https://www.facebook.com/events/695201467815434?active_tab=about
Online	Virtual Visit to Pierre Auger Observatory	2/5/2021	Online / MOOC	Secondary School Teachers	100	https://www.facebook.com/frontierseu/posts/1090681091393933
Greece	Training workshop	2/10/2021	Training	Secondary School Teachers	150	https://indico.ea.gr/event/1/

Close Monitoring

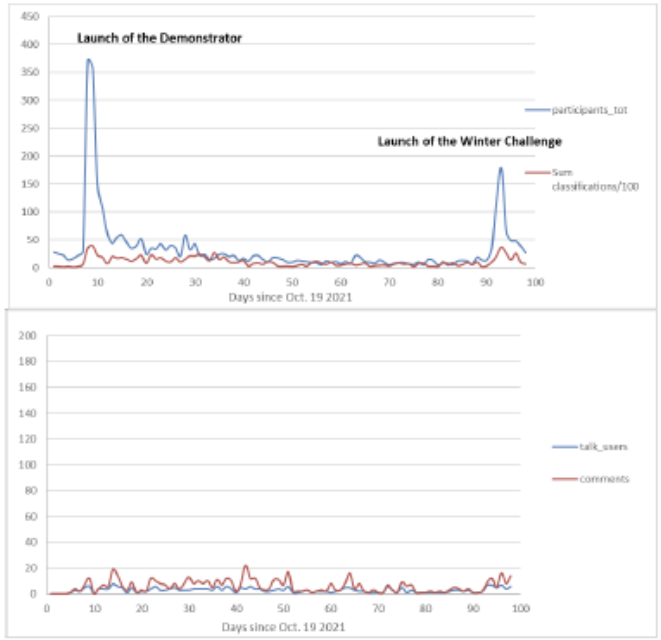
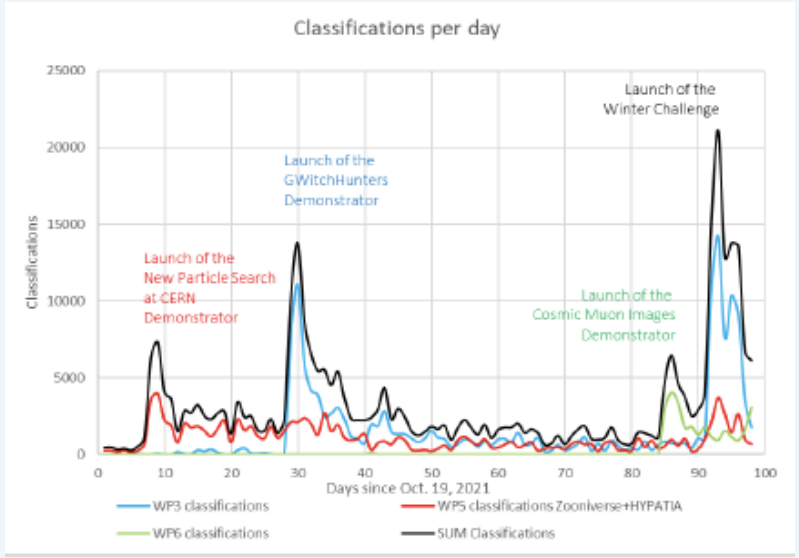
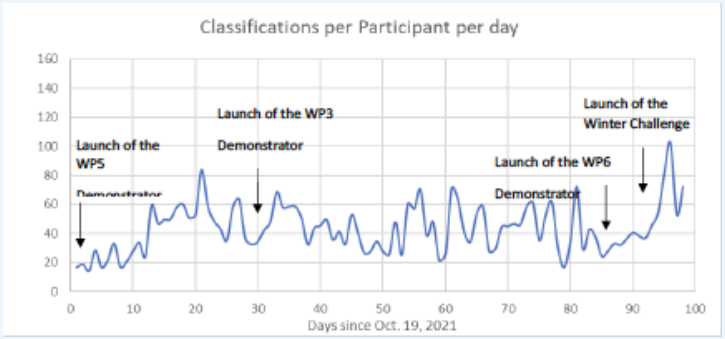


Figure 16 - Participants and classifications (divided by 100 for visualisation purposes) for the New Particle Search at CERN demonstrator (above) and Talk users and comments for the same demonstrator (below).





Engagement Metric	Value
Total number of users	2,280
Total number of classifications	105,641 (40,479 in Stage 1 and 65,162 in Stages 2 and 3)
Total number of discussions	367
Total number of comments	605
Days active	98

CERN/ATLAS

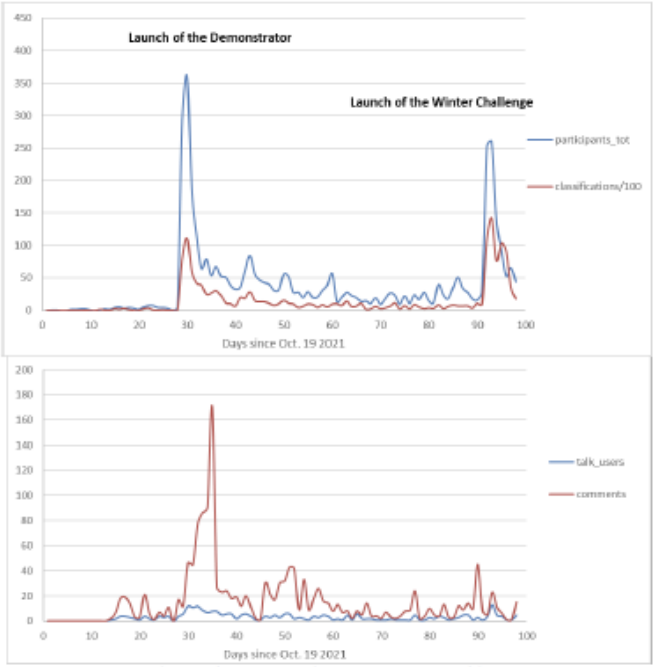


Figure 18 - Participants and classifications (divided by 100 for visualisation purposes) for the GWitchHunters demonstrator (above) and Talk users and comments for the same demonstrator (below).

Engagement Metric	Value
Total number of users	2,882
Total number of classifications	125,866
Total number of discussions	909
Total number of comments	1,503
Days active	70

Table 7 - Cumulative metrics for the *GWitchHunters* demonstrator

EGO/Virgo

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EGO member of IYBSSD

Basic sciences are the sine qua non for sustainable development

Agenda 2030 for Sustainable Development is the ambitious program that the Member States of the United Nations have agreed on to ensure a balanced, sustainable and inclusive development of the planet.

Basic sciences have an important contribution to make to the implementation of this program. They provide the essential means to meet crucial challenges such as universal access to food, energy, health coverage and communication technologies, depletion of the ozone layer, climate change, depletion of natural resources, extinction of living species.

Applications of technology are easy to recognize. On the other hand, contributions of basic, curiosity-based, sciences are not well appreciated. They are nonetheless at the basis of major technological advances that stimulate innovation, as well as essential for training future professionals and for developing capacity of populations who can take part in decisions that affect their future.

The International Year of Basic Sciences for Sustainable Development, that we will organize in 2022, will focus on these links between basic sciences and the Sustainable Development Goals. M. Spiro

https://www.iybssd2022.org/en/home/

Into the future (ideas for discussion)

- Increase the links with critical thinking
  - Start of critical thinking courses June (+Saul Perlmutter)
- Increase the use of means of participation other than the web
  - improved .apps (e.g. CREDO mobile .app for distributed UHECR sensing)
  - ”spatialisation’ of interactions (PCs @ Multimessenger Van, schools, universities, Visitor centres)
  - Construct distributed sensors for use in schools and elsewhere, move from software to operation
  - Extend the inclusion beyond the current scientific front to ASTEK **(**Art, Science and Traditional Ecological Knowledge) sensing (T. Saraceno: App linking astroparticle alerts distributed by the gravitational wave observatories and other astroparticle physics laboratories, well as their “multi-messenger” follow-up, environmental and geophysical alerts (earthquakes/seismicity, clouds, electromagnetic effects, cosmic rays, pollution), and biological alerts (dolphins, whales, wave events in the Tyrrhenian Sea) with TEK frameworks for planetary sensing, encouraging users to engage with citizen’s science and build their own planetary sensing practice)

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