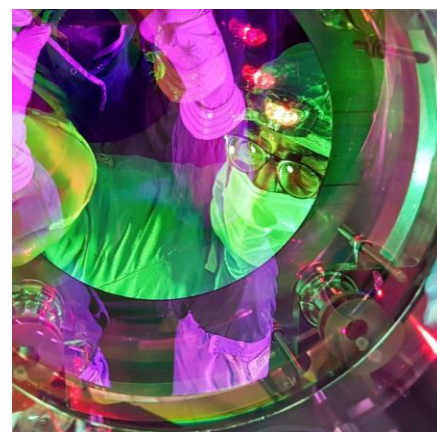




EUROPEAN
GRAVITATIONAL
OBSERVATORY



H2020 MSCA RISE 2020
GA 101003460



PROBES MID TERM REVIEW,

February 27, 2024

WP7 Report – Dissemination and Outreach

Vincenzo Napolano, EGO Communication Responsible/INFN

+ Transversal key objectives and messages

- Promote communication between the scientific community and the general public and increase science awareness in society
- Engage the general public about nuclear, particle and GW physics and related areas. Show how fundamental physics, although perceived as very abstract, contributes to solving very concrete problems.
- Scientific community can provide role models for society:
 - Science as an international cooperative endeavour
 - Science as diverse context, In which different skills and approaches are integrated
 - Promote the role of women in science
- A special attention to the youngest and to the students.



Actions, tools, contexts: a rich ecosystem



- Public tours of scientific facilities and research centers (especially EGO, CNRS, CERN, KEK, IFAE, INFN...)
- Events dedicated to youngest, students or children
- Public events for general public
- Art and science initiatives
- Installations, exhibitions and innovative languages (Theater, dance,
- Women in science
- Social media and web dissemination actions

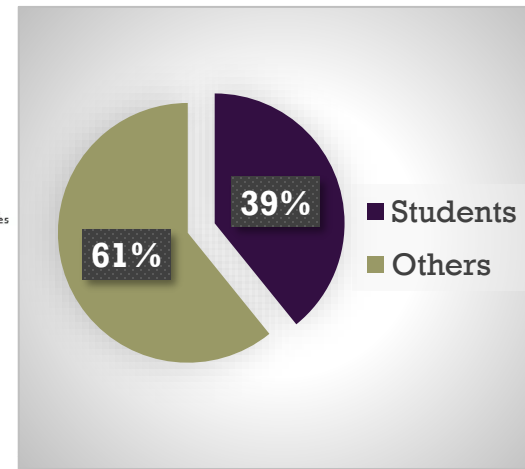
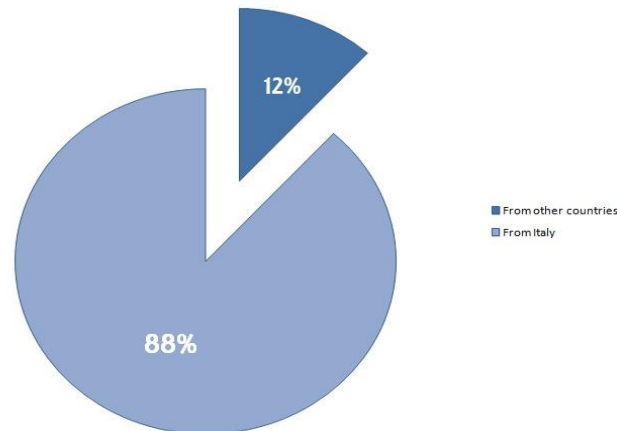
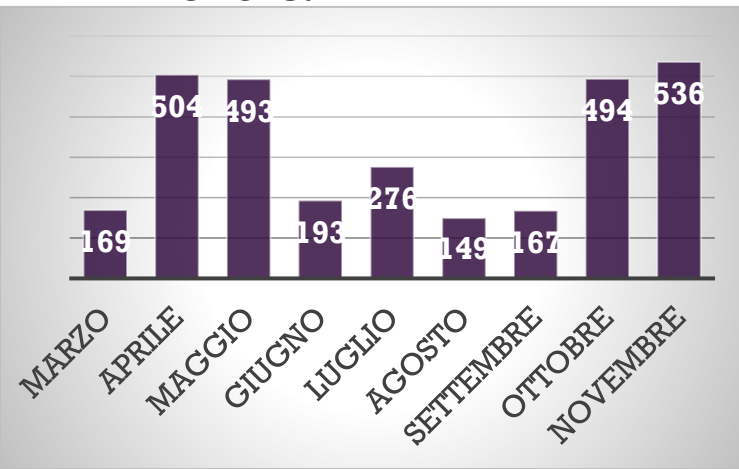


IN PERSON

Restarting in-person visits

In person visits restarted at the end of March 2022.

- Up to 2023 we had about 10000 visitors (regular tours +special events)
- Total number of students 65%
- Total number of non-Italian visitors: 12%
- Remote live visits continue: 1000 remote visitors in the last nine months.



- ✚ Time slots for the visits are Tuesday and Saturday 10 am (80/100 persons per day are allowed)
- The calendar is almost fully booked up to end 2023
- Online form for booking on www.ego-gw.it and www.virgo-gw.eu
- 10 EGO researchers + 5 external collaborators involved as guides (We are progressively reversing these proportions)
- A significant effort of organization, coordination and visitor reception (0,5 FTE)
- An online survey available (response rate 20%)
- A photographic contest for the visitors just launched
- A new visit-format for kids!



Education & Public Outreach at IFAE

Other activities

- Lab visits
- Talks in schools
- Public Talks
- Summer fellowships for undergraduates





Science offers role models



+ Women Listening to the cosmos

- July 15th 2022, Cascina
- September 23rd 2022, La Nunziata (Pisa)
- December 1st 2022, Festa della Toscana (Pisa)
- May 23rd 2023, Festival Dell'Astronomia (Livorno)



PLACES AND EVENTS

The places where we tell stories and ideas add meaning and context to what we are telling

La Nunziatina, Pisa, Open-air courtyard for concerts and performances

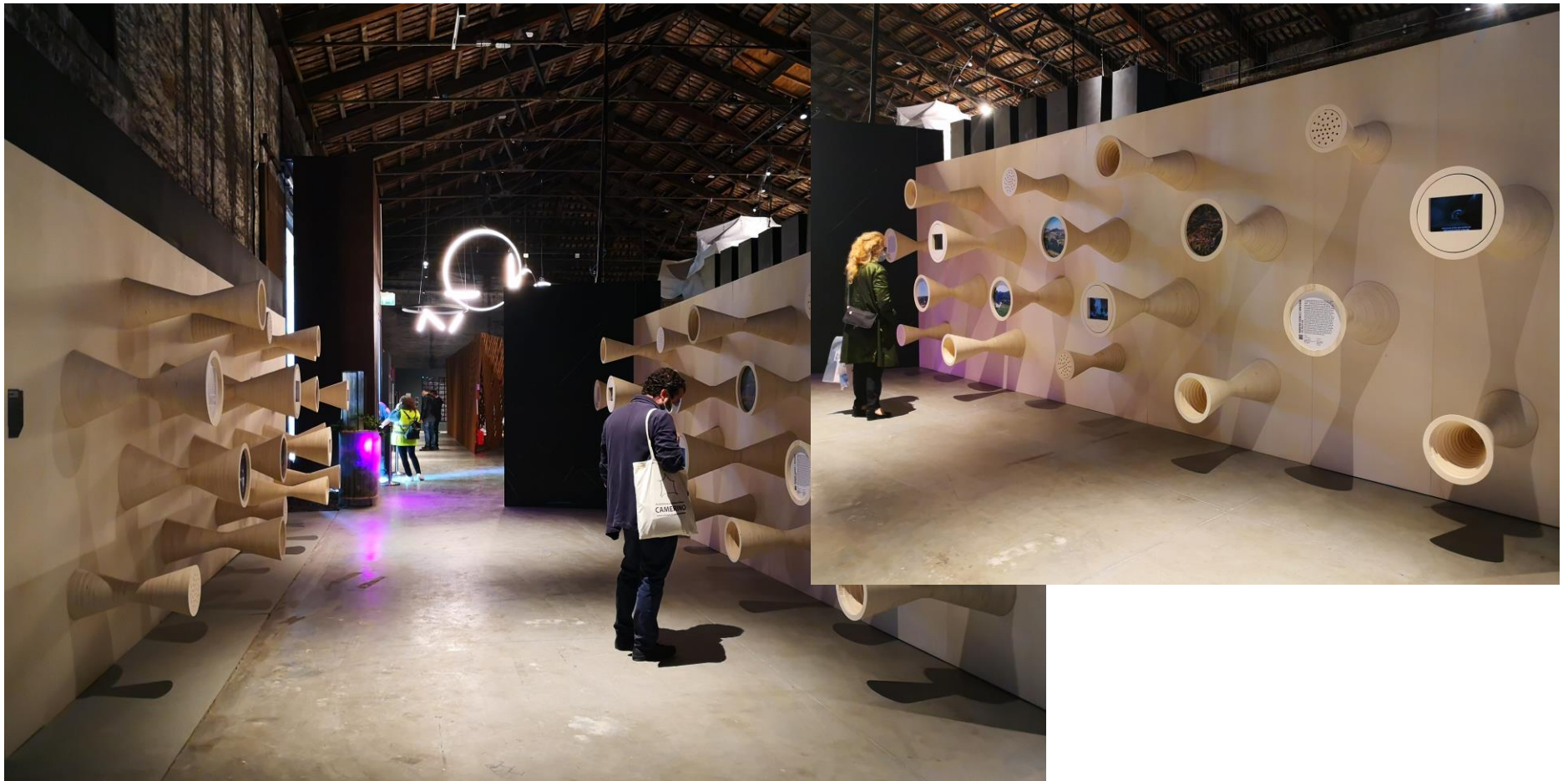
October 30th 2022, Genoa Science Festival
May 12th 2022, Scienza e Virgola (Trieste)
September 29th 2023, Bergamo
October 8th 2023, Città del Teatro, Cascina



There are stories that allow us to link scientific knowledge to other areas of knowledge, to the great social challenges and to our inner world

+ 2021 Venice Architecture Biennale

■ The future of gravitational waves research



+ Land art and soundscape on site at Virgo

- **By Luca Serasini and Massimo Magrini**
- **From October 2022 to May 2023**



+ Lucca Comics & Games 2023

■ In the context of the Comics&Science Palace



BLACK HOLE: A NEW INTERACTIVE INSTALLATION BY EGO AND INFN AT CITTÀ DELLA SCIENZA IN NAPLES

Today, November 23rd 2022, as part of the Futuro Remoto science festival in Naples, the exhibition "Space (to the Future)" will be inaugurated. The European Gravitational Observatory (EGO) was involved in the creation of an interactive installation on black holes.

[READ MORE](#)



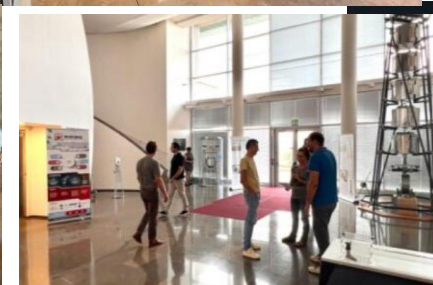
"THE SOUND OF THE UNIVERSE" AT GENOA SCIENCE FESTIVAL



CodyTrip
Tutti in gita
Safer Internet Day onde gravitazionali
PISA
8-9 febbraio 2022
<https://codemooc.org/codytrip-2022-pisa>



"LE DONNE E I PAESAGGI DELL'ASTRONOMIA", AT PISA



A TWO DAYS WORKSHOP AT EGO FOR FOSTERING CITIZENS ROLE IN FUNDAMENTAL SCIENCE



Metti una sera a Cascina
GIOVEDÌ 4 AGOSTO 2022 ORE 21.30
GIARDINO TIZIANO TERZANI
BIBLIOTECA COMUNALE PEPPINO IMPASTATO - CASCINA
Le Mappedel Cosmo
Sterie che hanno cambiato l'universo



Researchers Night, Pint of science, Science Festiv

+ And much more...





FOR THE YOUNGEST

Education & Public Outreach at IFAE

■ Programs for Highschool Students:

🌀 Bojos per la Física:

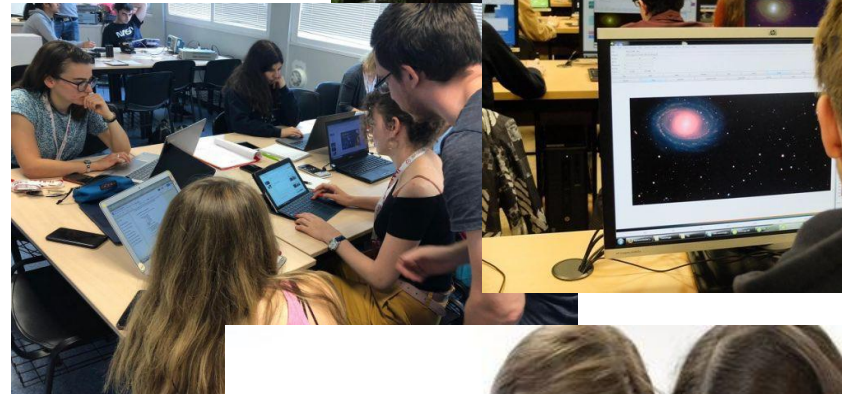
- ✿ All-year program: hands-on activities.
- ✿ 150 students apply every year

🌀 Joves i Ciència:

- ✿ Summer-camp about fundamental physics.
- ✿ 100 students apply every year

🌀 Barcelona International Science Challenge:

- ✿ Summer-camp about detector technology.
- ✿ 50 students apply every year





SUMMER STUDENTS PROGRAM AT FNAL AND OTHER US (SPACE SCIENCE) LABORATORIES

**AVERAGE OF 25 MASTER
STUDENTS/YEAR
IN PHYSICS/ENGINEERING**

APPROVED AS A UNIPI COURSE FOR 6 CFU

**TRAINED
A TOTAL OF >600 STUDENTS SINCE 1984
(MANY BY PROBES RESEARCHERS)**

MANY MASTER/PHD THESES FOLLOWED

**FORMIDABLE OPPORTUNITY
TO INVOLVE THE NEW GENERATIONS
IN FUNDAMENTAL/APPLIED PHYSICS
RESEARCH**



<https://www.unipi.it/index.php/maths-physics-and-nature/item/5153-summer-student-at-fermilab>

Internships at Space Science Labs

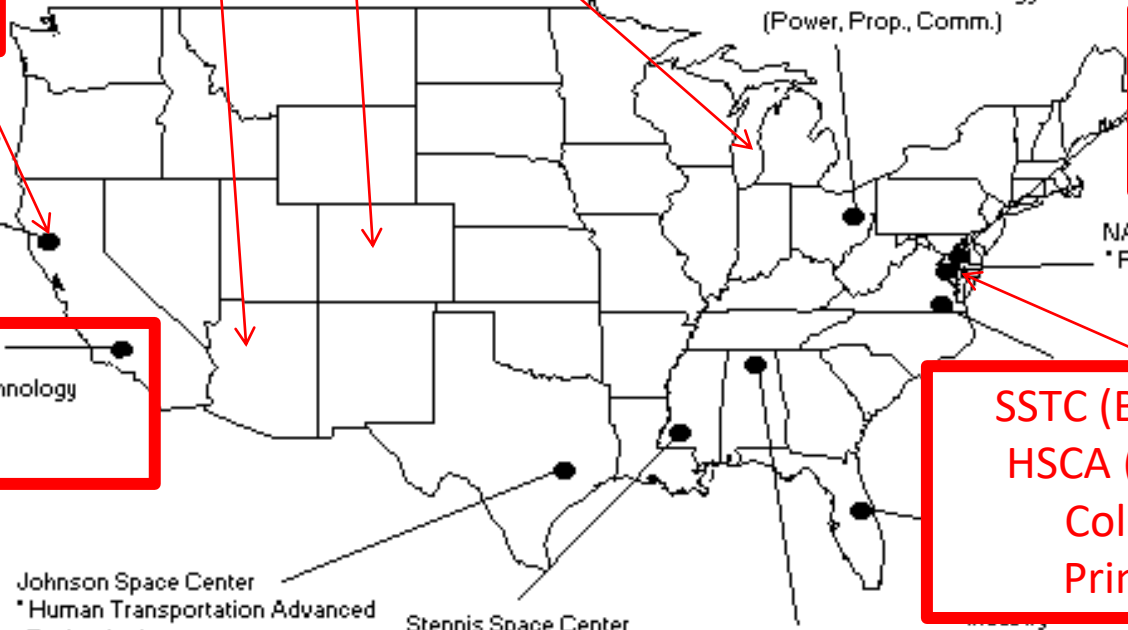
Fermilab, Argonne, Purdue,
Colorado, Arizona

Stanford,
SLAC

Ames Research Center
* Thermal Protection
Sys./ARC Jets
* Info Sys./Intelligent

Jet Propulsion Laboratory
* Advanced Robotics Technology
Caltech

ASI, INAF, INFN (ISSNAF, CAIF)
supported 30 students outside
Fermilab in 2010-2019



Lewis Research Center
* Spacecraft Systems Technology
* Research and Technology
(Power, Prop., Comm.)

Goddard Space Flight Center
* Technology Development
for Space and Earth Science
* Advanced Instrument and
Sensor Technologies

NASA Headquarters
* Program Management

SSTC (Baltimore)
HSCA (Harvard)
Columbia
Princeton

Johnson Space Center
* Human Transportation Advanced
Technologies

Stennis Space Center
* Propulsion Test Technologies
* Communication Remote
Sensing Application

Marshall Space Flight Center
* Propulsion Technology

Fermilab Village, a great Laboratory to train students



+ Laboratory on sounds, signal and noise

- Developed for Bright Night 2022 (European Researcher's Night in Pisa)
- Embedded in Virgo tours for elementary schools
- Offered at Lucca Comics&Games 2023



@European Research Night

INNOVATIVE LANGUAGES



+ The Sound of the Universe

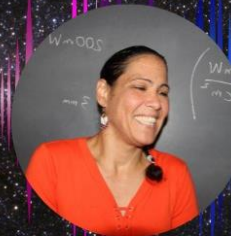
- Event about multisensoriality and inclusivity in astronomy
- July 19th 2022, Lajatico
- October 30th 2022, Festival della Scienza (Genova)



IL SUONO DELL'UNIVERSO

Domenica 30 ottobre 2022 - h 21

Festival della Scienza Genova - Palazzo Ducale



Wanda Díaz Merced
Astronoma di EGO



Stavros Katsanevas
Direttore di EGO



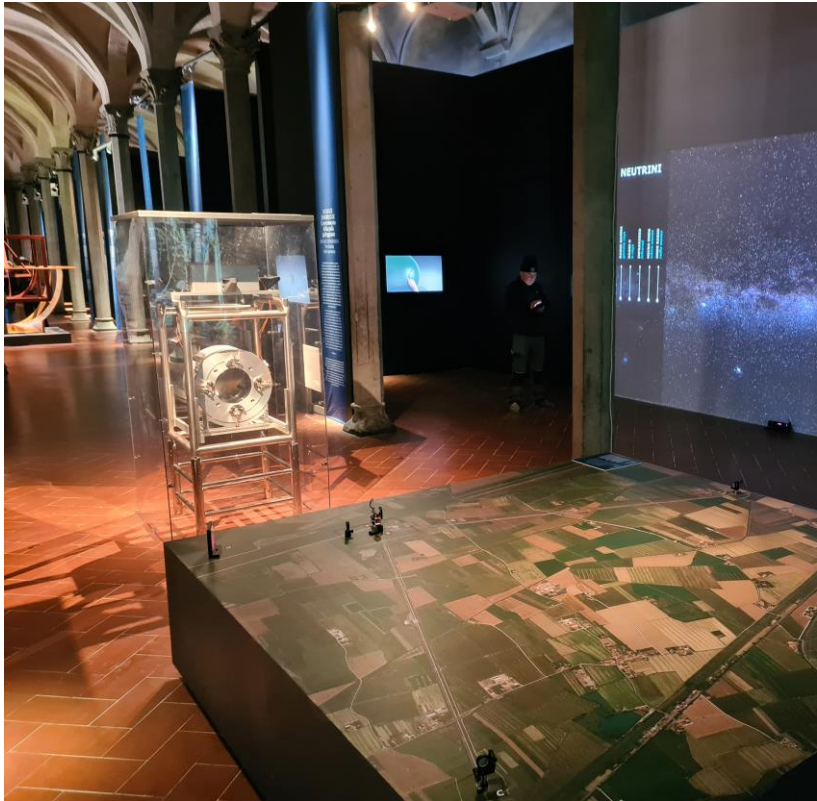
Massimo Magrini
Sound Designer

A cura dell'Osservatorio Gravitazionale Europeo (EGO)

Modera Andrea Parlangei

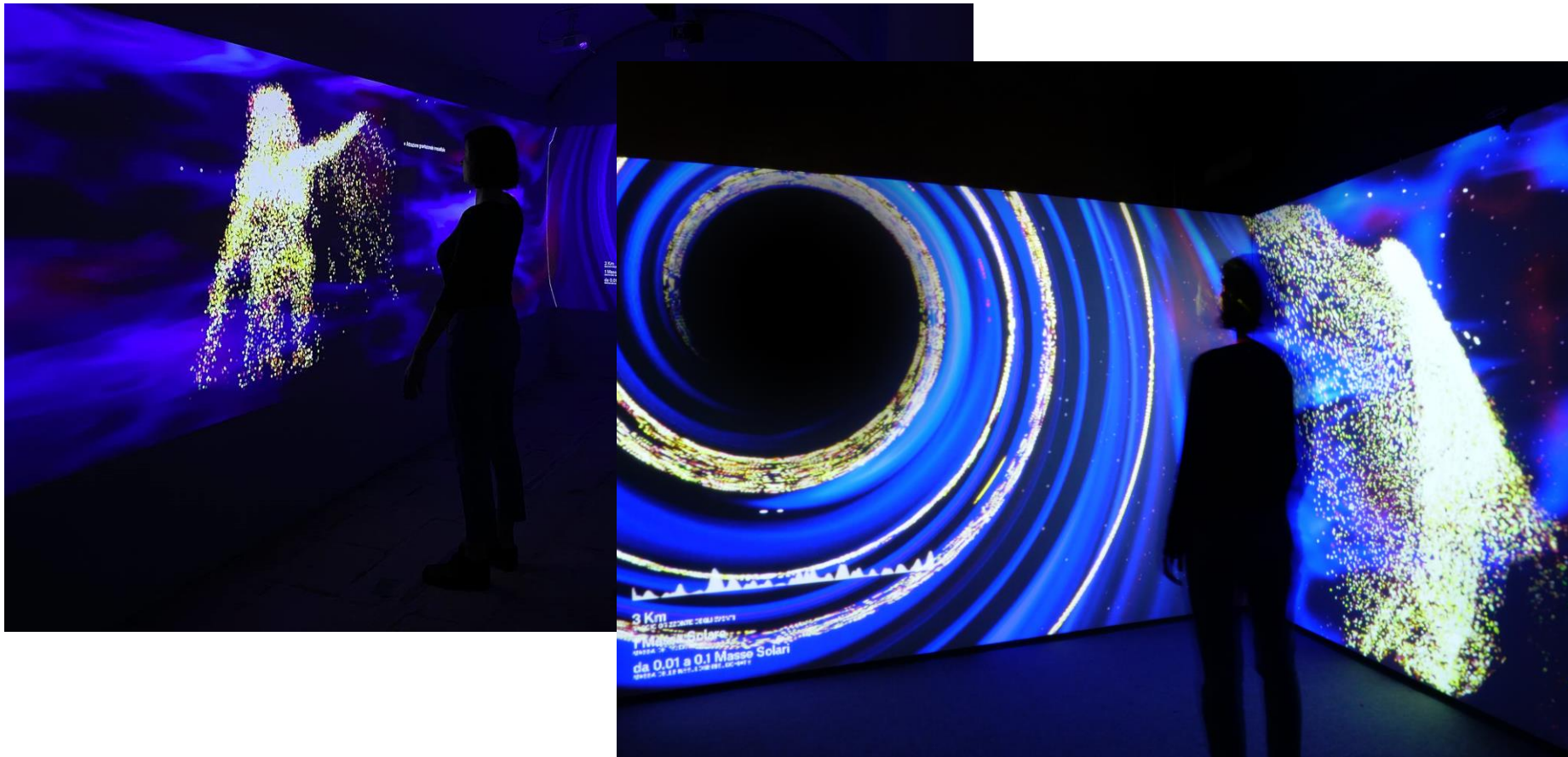
+ Splendori Celesti exhibition in Florence

- In collaboration with Museo Galileo



+ Buco Nero Installation at Città della Scienza (Napoli)

- Developed by INFN and EGO



THE MULTIMESSENGER VAN

The VAN will travel **throughout Italy and Europe.**

A design based on sustainable criteria.

Children and young people will be involved with **events dedicated to schools.**

Several tens of thousands of people involved each year.

Accessible to **visitors with sensory, motor or cognitive disabilities,** aiming to reach culturally and economically disadvantaged audiences

Multimessenger Astronomy and the contribute of research infrastructures for **the global challenges of sustainability.**

Funded by the EU project AHEAD,
Fondazione Pisa and sponsored by
IVECO



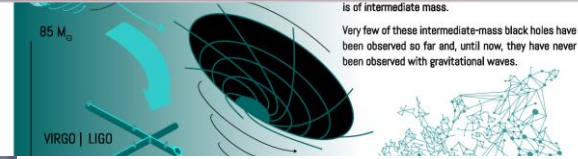
MEDIA, WEB AND SOCIAL MEDIA

are involved in Virgo

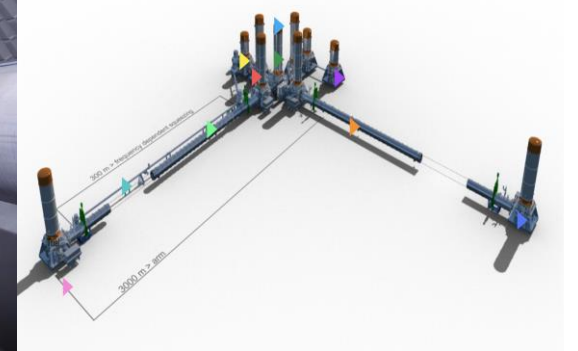


ELEONORA CAPOCASA
Virgo researcher, Laboratoire APC, CNRS

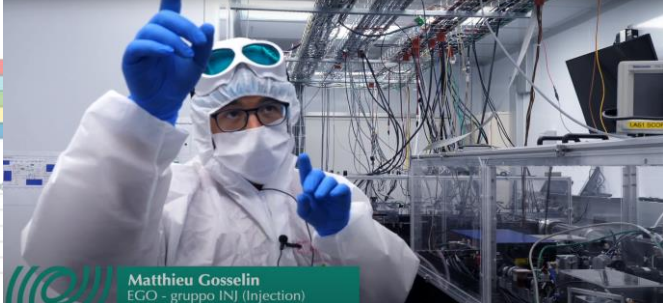
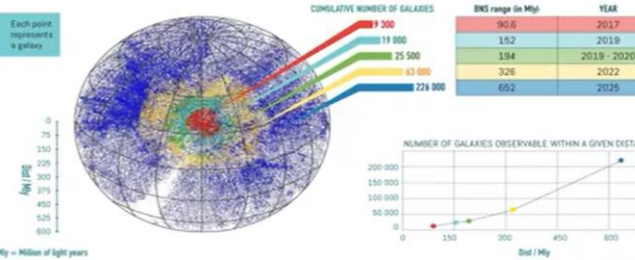
One of the most important noises that limit the sensitivity of our interferometer is quantum noise



is of intermediate mass.
Very few of these intermediate-mass black holes have been observed so far and, until now, they have never been observed with gravitational waves.

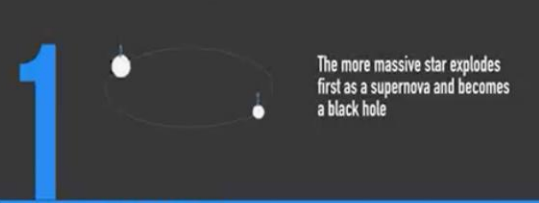


HOW MUCH OF THE UNIVERSE CAN WE EXPLORE WITH VIRGO?



Matthieu Goselin
EGO - gruppo INJ (Injection)

HOW DOES A BLACK HOLE AND NEUTRON STAR PAIR FORM AND MERGE?



The more massive star explodes first as a supernova and becomes a black hole



Valerio Boschi
INFN sezione di Pisa, Virgo - gruppo SAT (SuperATtenuatore)

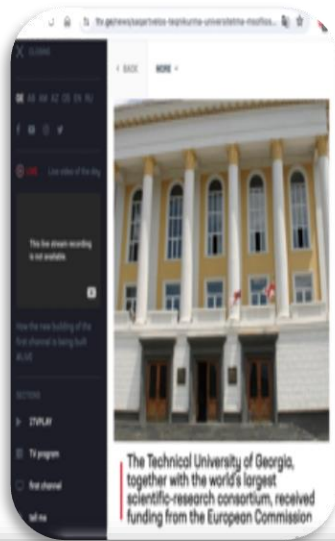


STAVROS KATSANEVAS
EGO Director

Il cosmo del paradiso e della Divina commedia è principalmente il cosmo Aristotelico, centrato sulla Terra

GTU: Probes outreach effort

2020: We got our first news story published in five different online news sites!



2021: RPOBES presented at "Night of European researchers" outreach program



2022: Two news articles
The Technical University of Georgia is moving into an active phase of collaboration with the COMET-experiment



2023: One news articles



project of the Ministry of Education, Science, Culture and Sports, the Rustaveli National Science Foundation of Georgia, the Ministry of Culture, prepared a documentary film about the activities and opportunities of the university.

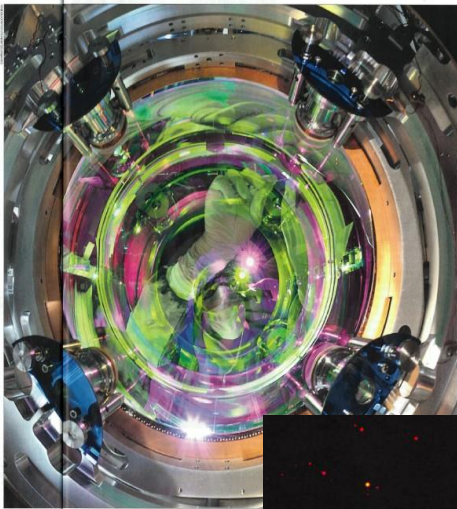
...the desire to share and become a direct member of the Technical University.

Das Schweigen der Spiegel

Vor fünf Jahren fing ein europäisches Observatorium Gravitationswellen ein – eines der bizarrsten Phänomene der Physik. Neue Experimente sollen nun tief in die Vergangenheit des Universums blicken. Ein Besuch am Gravitationswellen-Detektor bei Pisa.

Das Virgo-Interferometer ist ein riesiges Instrument, das aus vier kilometerlangen Armen besteht, die in einem Dreieck angeordnet sind. In der Mitte befindet sich ein zentraler Raum, in dem sich die Spiegel befinden, die die Lichtstrahlen reflektieren. Die Spiegel sind aus Quarz gefertigt und haben einen Durchmesser von 34 Zentimetern. Sie sind so präzise gefertigt, dass sie nur um ein Bruchteil eines Atoms von der idealen Form abweichen dürfen.

Anfangs hielten wir manche für verrückt. Man war einig, dass unsere Messungen nicht ausreichen würden. Heute wissen wir, dass wir recht hatten.



Newton Cavalcando l'onda gravitazionale

In questa puntata parliamo di onde gravitazionali previste dalla teoria di Einstein più di 100 anni fa. Perché sono così importanti e cosa ci dicono della ricerca, una specie di macchina del tempo, fin dai suoi primi vagiti? Ce ne parla il fisico Sasso Science Institute. Andremo poi a Pisa per vedere lo strumento che ci ha permesso di comprenderle.



VIRGO

L'UNIVERSO SI FA SUONO

Rai Radio 3



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nature > where i work > article

WHERE I WORK | 14 March 2022 | Correction 22 March 2022

Campaign supernova: why I need a finely tuned antenna

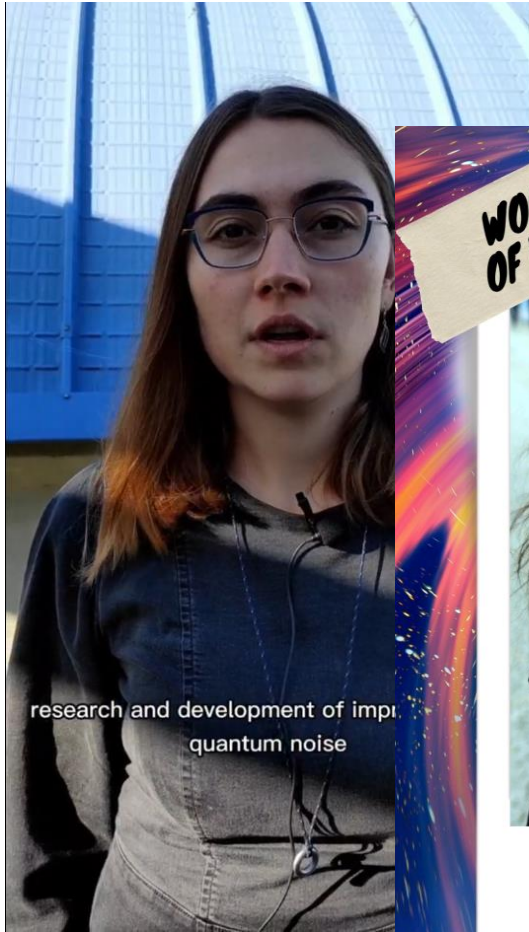
Julia Casanueva enhances the sensitivity of the Virgo interferometer to better detect distant stellar explosions.

Virginia Gewin
Twitter | Facebook | Email



www.ego-gw.it/press-reviews/

+ #WomenofVirgo and International Day of Women and Girls in Science





COOPERATIVE EFFORTS

Famelab 2022

- Final selection organized at EGO/Virgo



+ Italy-Japan Research on Gravitational Waves

- In October 2022 a delegation from the University of Perugia participated to the seminar “Italy-Japan Research on Gravitational Waves: The Birth of Multi-messenger Astrophysics” in Tokyo
- Prof. Helios Vocca and Prof. Daniele Porena, accompanied by the director general Dr.ssa Anna Vivolo, met with Prof. Takaaki Kaijita, 2015 Nobel Laureate in Physics and president of the Science Council of Japan



+ Pico – European Project proposal

- **Result of international cooperation between institutions**
- **Proposal accepted in the context of the European Researchers Night call**

List of participating organisations

#	Participating Organisation Legal Name	Country
1	EUROPEAN GRAVITATIONAL OBSERVATORY(EGO) (OSSERVATORIO GRAVITAZIONE EUROPEA)	Italy
2	UNIVERSITA DI PISA	Italy
3	ELLINOGERMANIKI AGOGI SCHOLI PANAGEA SAVVA AE	Greece
4	INSTITUTE OF ACCELERATING SYSTEMS AND APPLICATIONS	Greece
5	INSTITUTO DE FISICA DE ALTAS ENERGIAS	Spain
6	ISTITUTO NAZIONALE DI FISICA NUCLEARE	Italy
7	ISTITUTO NAZIONALE DI GEOFISICA E VULCANOLOGIA	Italy
8	TRUST-IT SRL	Italy
9	COMPLA SRL	Italy
10	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS	France
11	Associazione Cascinese Astrofili	Italy

Thank you!



EUROPEAN
GRAVITATIONAL
OBSERVATORY (EGO)

VINCENZO.NAPOLANO@EGO-GW.IT

