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#protoDUNE

cern.ch/cenf



Neutrino
PLATFORM

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SK HSSIP 2019

What was
the aim
of our project?



**Development of the website
dedicated to the outreach activities
of the Neutrino Platform**



Let's start!

Neutrino

- Smallest and lightest building blocks of the universe
- Hardly interact with other particles and have no charge
- Having nearly no mass, they traverse the cosmos at almost the speed of light
- Of the four fundamental forces in the universe, neutrinos interact with only two — gravity and the weak force, which is responsible for the radioactive decay of atoms
- 3 types or more?
- Oscillate
- Their own antiparticle?

Why neutrinos?

NEW PHYSICS

They may give us answers to fundamental questions like

- Where do we come from
- They may clarify the nature of dark matter
- The matter/antimatter imbalance in the universe

Neutrino platform

- CERN Neutrino platform is a project, which supports and partners with all neutrino projects at CERN and worldwide, while creating a community of people with the same goal
- ICARUS
- ProtoDUNE







What were we doing?



Meetings







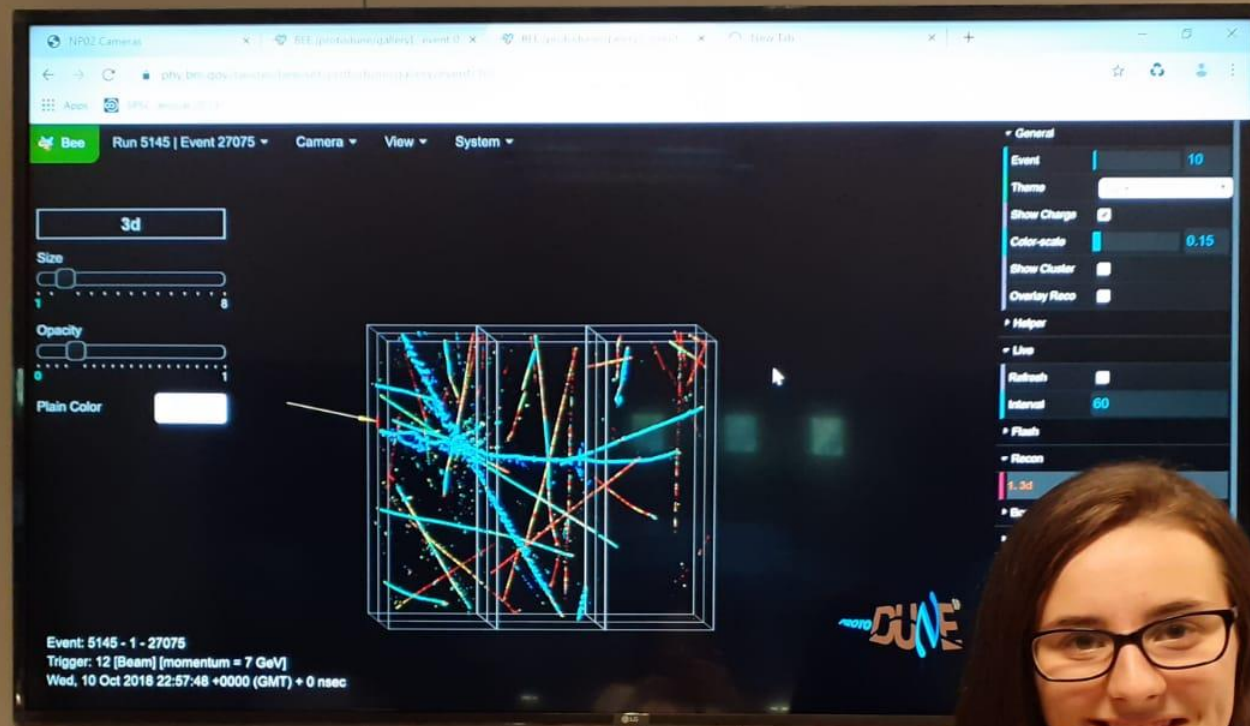




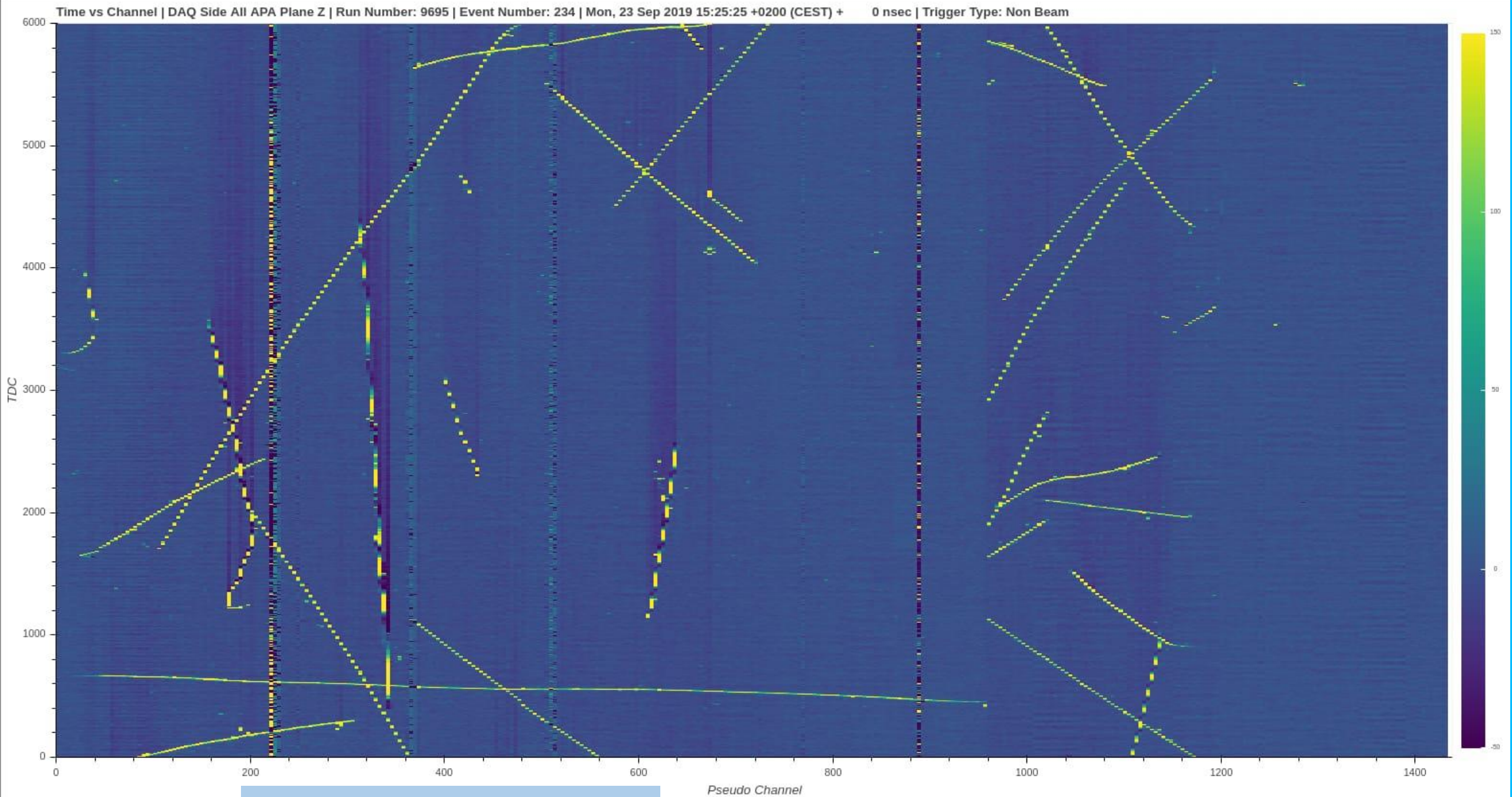
He showed us the coolest thing in CERN...



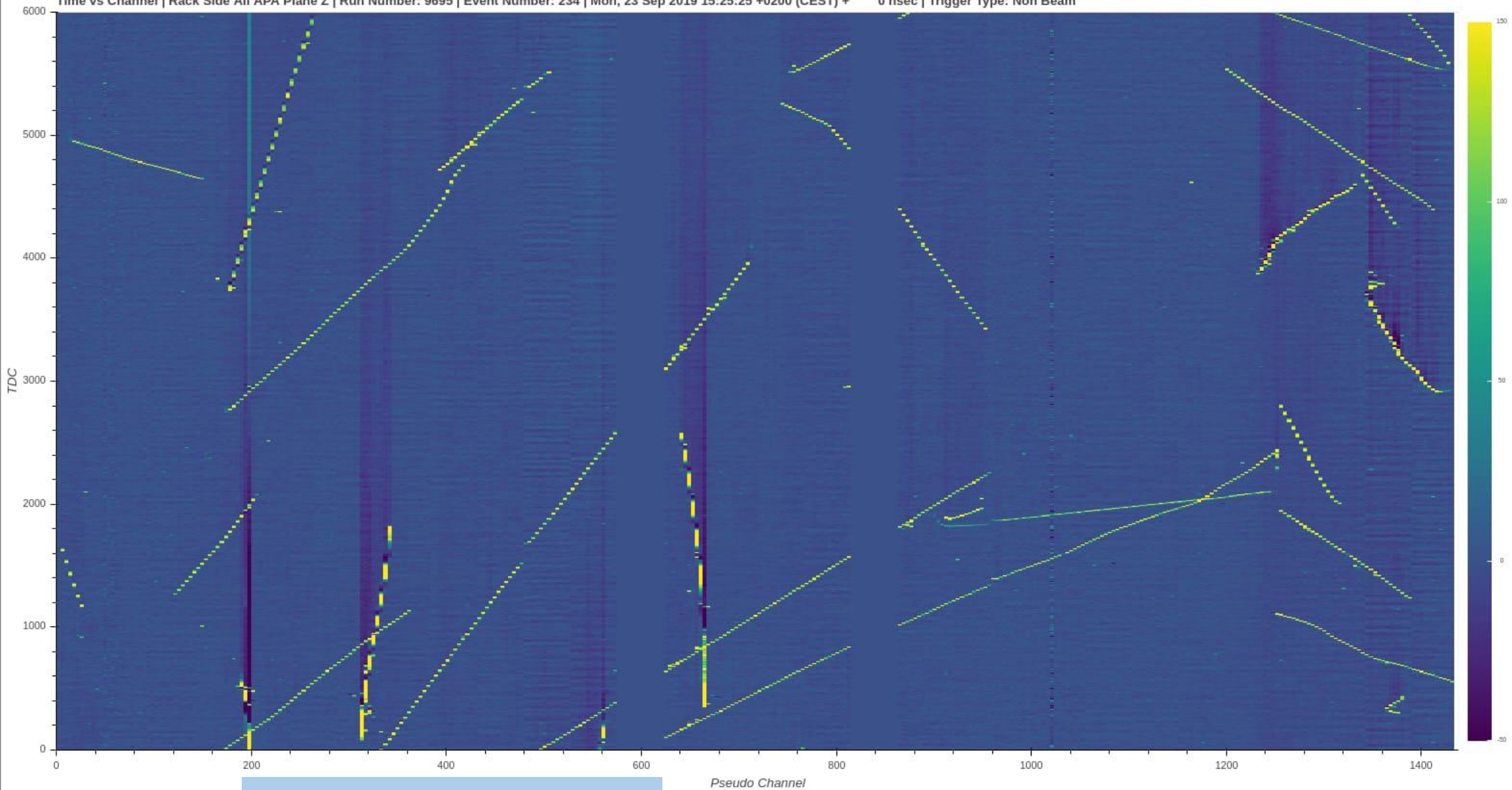
Nitrogen shower



Data from the detector



Our real-time data



Our real-time data



Sarah



Davide



Informal coffee meeting



Life lessons

Life lessons

- Asking the right questions
- Always be polite and professional
- You can always change your direction in life
- Don't give up, even if you are met with challenges

Bonus: **ASK YOUR MOM!**



Infographics

NEUTRINO

THE SHY GHOST



ONCE UPON A TIME, THERE WAS A LITTLE GHOST CALLED NEUTRINO. SINCE HE WAS THE SMALLEST PART OF THE UNIVERSE, EVERYONE IGNORED HIM. HE BECAME REALLY SHY AND ANTISOCIAL. HE DIDN'T INTERACT WITH ANYTHING AND ANYBODY.

**SUDDENLY A SCIENTIST TREAD HIM DOWN.
THIS LED TO THE SUDDEN INTEREST BY
SCIENTISTS FROM AROUND THE WORLD
WHO WERE TRYING TO MAKE HIM MORE
EXTROVERT - TO INTERACT WITH OTHER
THINGS. BUT EVEN NOW IT IS REALLY
CHALLENGING.**

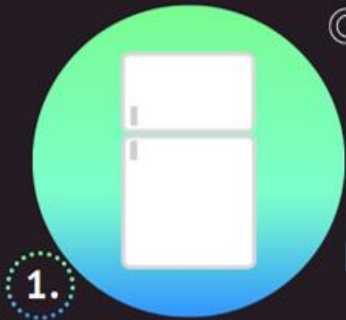


**THEY FOUND OUT THAT NEUTRINO IS
SCHIZOPHRENIC - HE CHANGES 3 FLAVORS.
?BUT WHY?**



**HERE IN THE CERN NEUTRINO PLATFORM
WE ARE SUPPORTING FUTURE EXPERIMENTS
ON ANSWERING QUESTIONS LIKE THIS AND
MANY MORE (FOR EXAMPLE WHY DOES THE
UNIVERSE EXIST?)**

RECIPE FOR CATCHING NEUTRINOS



CRYOSTAT

COOLS DOWN
THE ARGON TO 87K (-184°C)
IT IS DONE WITH
LIQUID NITROGEN

DETECTOR
LOOKS FOR NEUTRINO
FOOTPRINTS

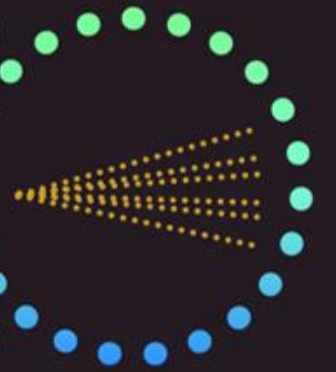


LIQUID ARGON

FOR ITS DENSE PROPERTIES,
PERFECT FOR COLLISIONS
TRANSPARENT AND LOOKS
LIKE DENSE WATER

BEAM OF NEUTRINOS
VERY DENSE
AROUND A TRILLION NEUTRINOS
ARE BEING FIRED EVERY TWO
SECONDS

4.



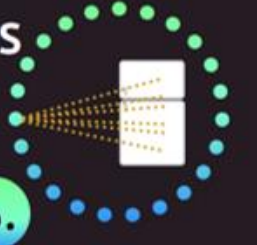
5.



FILL THE CRYOSTAT WITH
LIQUID ARGON AND CREATE
AN ELECTRIC FIELD INSIDE

SHOOT A BEAM OF NEUTRINOS
THROUGH IT

6.



7.

LOOK FOR NEUTRINO
FOOTPRINTS AND WONDER
IN THE IMAGES



Webpage

Before

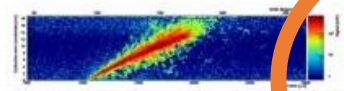
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WA104

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Images

Image 2



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Image 1



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After

CE

Neutrino, the shy ghost



What is a neutrino?

- Neutrinos are the smallest and lightest building blocks of the universe.
- Their name, which means "little neutral one", refers to the fact that they carry no electrical charge and have a tiny mass.
- "Ghost particles" - They hardly interact with other particles. Even at the moment around thousand trillions are passing through you. Don't worry they are harmless. :-)
- Of the four fundamental forces in the universe, neutrinos interact with only two — gravity and the weak force, which is responsible for the radioactive decay of atoms.
- Neutrinos are the second most abundant particles in the universe after photons.
- Having nearly no mass, they traverse the cosmos at almost the speed of light.
- Neutrinos are produced in nuclear reaction in stars or specialized laboratories.
- Up till now 3 types have been discovered. But there may be more...
- Every neutrino can switch between 3 faces called flavors.
- Neutrinos may be their own antiparticle.

Three known neutrino types

Three generations of Matter (fermions)
Trois générations de particules de matière (fermions)

	I	II	III	
Mass	2.4 MeV/c ²	1.27 GeV/c ²	171.2 GeV/c ²	0
Charge	$\frac{2}{3}$	$\frac{2}{3}$	$\frac{2}{3}$	0
Spin	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1
Name	u up	c charm	t top	γ Photon
	4.8 MeV/c ²	104 MeV/c ²	4.2 GeV/c ²	0
	$-\frac{1}{3}$	$-\frac{1}{3}$	$-\frac{1}{3}$	0
	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1
	d down	s strange	b bottom	g Gluon

QUARKS

Neutrino joke :-D

A neutrino walks into a bar. The barman says "We don't serve neutrinos." The neutrino replies: "I was just passing through."



Our supervisor



Super
Sweet
Supervisor
Simona

THANK YOU!