GHOST PARTICLE

In pursuit of neutrinos to explain how our universe exists

Electronic Press Kit

CINÉCOOP productions

PROJECT DESCRIPTION

It's one of the biggest unsolved mysteries of the universe and for many scientists, neutrinos may be the storytellers to to resolve the matter. What happened immiediately after the big bang? How did we and everything we see throughout cosmos come to be?

Ghost Particle is a science documentary that follows international efforts to understand the universe with some of the largest experiments ever built to study the smallest of known things. Neutrinos are invisible, essentially massless, particles that pass through matter like ghosts. They behave in peculiar quantum ways and their identity-changing behaviour may hold the key to unlock big questions about the origin of the universe. So how to study the undetectable?

At CERN, the European Centre for Particle Physics, work is currently underway on a prototype experiment called Proto-DUNE to improve detection techniques of these baffling chameleons. It will lead to construction of one of the largest experiments in world: the Deep Underground Neutrino Experiment (DUNE) in the US. DUNE will see neutrinos created 1,300km away at Fermilab outside Chicago, and beamed to detectors in an old gold mine at the Sanford Underground Research Facility (SURF), located nearly two kilometers below the earth's surface in the Black Hills of South Dakota. Design and construction of this mega project will unfold over the coming decade.

Based at CERN, Ghost Particle offers inside access into how the world's best minds set out to do the seemingly impossible: design a machine to detect what cannot be seen. It is also a primer to better understand neutrinos. It considers the history of research leading to where we are today, looks ahead to where we are going, and discusses what makes this research so significant. It will take us from CERN in Switzerland, to a visit with a Nobel Prize winner at the Super K detector in Japan, to efforts for the next exciting chapter at DUNE in the US.

Teaser (1:37 mins): https://vimeo.com/359437279
Final cut (62 mins): https://vimeo.com/458756459 (please contact for password)

Title: Ghost Particle
Category: Science documentary, one off
Run time: 62 mins (shorter edit possible)

Production company: Cinécoop Productions
Director & Producer: Geneva Guerin
Production year: 2021

Production Country: Canada
Language: English

cinecoop.ca
geneva@cinecoop.ca

CHARACTERS

Francesca Stocker, PhD (Main character)

Francesca Stocler is a dynamic 25 year old Swiss PhD candidate from the University of Bern in experimental physics. She works at CERN on the ProtoDUNE team. The daughter of a well-known physicis and fluent in five languages, she finds herself at the nexus of theory and experiment at the precise moment neutrino research surges forward at a feverish pitch. Francesca is our guide and interpreter in this world of often inaccessible technical jargon. We accompany Francesca during the prototype experiment phase at CERN to test the technology that will be used for DUNE in the US, and we follow her through to the excitement of ProtoDUNE's successful results.

Other characters

Prof. Federico Sanchez Nieto (U of Geneva)

Dr. Sanchez Nieto is head of the Particle Physics Department at the University of Geneva and is a neutrino expert. He is our science communicator who unpacks concepts and provides deeper explaination of fundamental notions in physics related to neutrinos and neutrino experiments.

Bryan Ramson, PhD. (Fermilab)

Bryan is a post-doc at Fermilab in the US, which is heading the the DUNE mega project. Groomed from a young age to be a professional football player, he was more interested in studying particles in five dimensions. He will be our guide in the US at Fermilab.

Dr. Takaaki Kajita (Super Kamiokande)

Co-winner of the Nobel Prize in physics (2015), Dr. Kajita will introduce us to the quantum behaviour of neutrino oscillation, with the Super Kamiokande experiment in Japan. The DUNE experiment hopes to take his discoveries to new levels of understanding that might help explain the origin of the universe.

Marzio Nessi (CERN)

Marzio is the coordinator of the CERN neutrino platform. He is also the co-coordinator of the international DUNE collaboration. He will talk to us about the collaboration and the challenges inherent in building what will be among the largest most complese experiments in the world.

Stephen Pordes (Fermilab/CERN)

Dr. Stephen Pordes is on the cusp of retirement after devoting most of his career to the study of neutrinos. He will walk us through how exactly the machine that detects the virtually undetectable functions.