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CERN ANNOUNCES NEW EXPERIMENTS TO SEARCH FOR DARK MATTER

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The globe of the European Organization for Nuclear Research, CERN, is illuminated outside Geneva, Switzerland | Photo Credit: AP

CERN, which hosts the world's largest and most powerful particle accelerator, is planning a new experiment to look for particles associated with the mysterious dark matter which makes up about 27% of the universe, the European Physics lab said.

The European Organisation for Nuclear Research (CERN) announced on March 5 that it has approved the experiment designed to look for light and weakly interacting particles at the Large Hadron Collider (LHC) — a giant lab in a 27-kilometre tunnel straddling the French-Swiss border.

FASER, or the Forward Search Experiment, will complement CERN's ongoing physics programme, extending its discovery potential to several new particles, the lab said in a statement.

Some of these sought-after particles are associated with dark matter, which is a hypothesised kind of matter that does not interact with the electromagnetic force and consequently cannot be directly detected using emitted light.

Astrophysical evidence shows that dark matter makes up about 27% of the universe, but it has never been observed and studied in a laboratory.

With an expanding interest in undiscovered particles, particularly long-lived particles and dark matter, new experiments have been proposed to expand the scientific potential of CERN's accelerator complex and infrastructure as part of the Physics Beyond Collider (PBC) study, under whose aegis FASER operates.

"This novel experiment helps diversify the physics programme of colliders such as the LHC, and allows us to address unanswered questions in particle physics from a different perspective," Mike Lamont, co-coordinator of the PBC study group, said in a statement.

The four main LHC detectors are not suited for detecting the light and weakly interacting particles that might be produced parallel to the beam line, he said. They may travel hundreds of metres without interacting with any material before transforming into known and detectable particles, such as electrons and positrons.

The exotic particles would escape the existing detectors along the current beam lines and remain undetected.

The detector's total length is under five metres and its core cylindrical structure has a radius of 10 centimetres. It will be installed in a side tunnel along an unused transfer line which links the LHC to its injector, the Super Proton Synchrotron.

A collaboration of 16 institutes is building the detector and will carry out the experiments which will start taking data from LHC's Run 3 between 2021 and 2023.

FASER will search for a suite of hypothesised particles including so-called “dark photons”, particles which are associated with dark matter, neutralinos and others. “It is very exciting to have FASER approved for installation at CERN. It is amazing how the collaboration has come together so quickly and we are looking forward to recording our first data when the LHC starts up again in 2021,” said Jamie Boyd, co-spokesperson of the FASER experiment.

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