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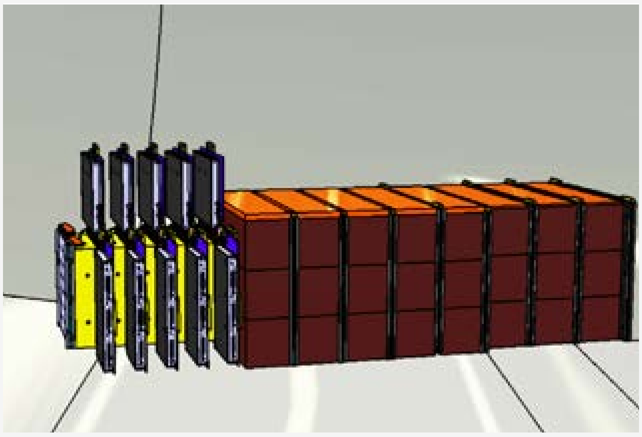

LHC: CERN APPROVES SDN@LHC EXPERIMENT

CERN in Geneva is opening up a new frontier in the search for dark matter and the study of neutrinos. A new experiment will operate on the world's largest and most powerful particle accelerator. CERN's Research Board has approved the ninth experiment that will use the Large Hadron Collider: SND@LHC, or Scattering and Neutrino Detector at the LHC, the new SND particle detector.
Designed to detect and study neutrinos, SND@LHC will be installed 480m far from the collision point of the ATLAS experiment, at a very small angle to the beams' direction of incidence. It will be installed in 2021 in an underground tunnel connecting the LHC to the Super Proton Synchrotron, and it will start recording data in 2022 when the LHC will restart.
With a volume of roughly 2 m^3, the experimental apparatus has the ambitious goal of concentrating into such a compact volume the equipment needed to carry out all the measurements required to identify neutrinos and to study their properties.
Theorised by Austrian physicist Wolfgang Pauli in 1930 and first observed in 1956, neutrinos, amongst the most enigmatic elementary particles in the Universe, are studied using both natural and artificial sources, such as accelerators. SND@LHC will measure neutrinos of unprecedented energy and, for the first time, produced by a particle collider (an accelerator in which two beams of particles collide with each other). It will, thus, open a new frontier in neutrino physics. SND@LHC will open a new frontier in the study of neutrinos and the search for dark matter. More specifically, since most of them originate from decays of heavy quarks, neutrinos provide a unique way to study the production of these quarks, which would otherwise be inaccessible.
SND@LHC will also search for new particles, that interact with matter very weakly, not predicted by the Standard Model of particles and fields, and which might constitute the so-called dark matter of the Universe. The SND setup, in fact, consists of a so-called target region where neutrinos interact in the

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tungsten material and micrometer-resolution tracer detectors reconstruct the interaction vertex. After this region, there is a calorimeter that measures the energy of the neutrinos and an identification system for the muons. The setup is also able to measure the time between the production and interaction of neutrinos, which is about 480m away, thus telling them apart from possible new particles of larger mass that would travel more slowly.

The experiment involves a group of 180 scientists from 20 institutes in 10 countries from Asia to America, coordinated by Giovanni De Lellis, physicist at the University of Naples Federico II and INFN associate. The Universities of Bari, Bologna and Naples and the corresponding INFN divisions are collaborating on the project. The National Institute for Nuclear Physics (INFN) is making a decisive contribution to the construction of the particle detectors produced in the neutrino interaction and to the development of systems for analysing the data that will be acquired in the coming years. ■