Contribution ID: **242** Type: **Poster**

Development and test of a DRS4-based DAQ system for the PADME experiment at the DAFNE BTF

Tuesday, 11 October 2016 16:30 (15 minutes)

The long standing problem of reconciling the cosmological evidence of the existence of dark matter with the lack of any clear experimental observation of it, has recently revived the idea that the new particles are not directly connected with the Standard Model gauge fields, but only through mediator fields or ''portals", connecting our world with new ''secluded" or ''hidden" sectors. One of the simplest models just adds an additional U(1) symmetry, with its corresponding vector boson A'.

At the end of 2015 INFN has formally approved a new experiment, PADME (Positron Annihilation into Dark Matter Experiment), to search for invisible decays of the A' at the DAFNE BTF in Frascati. The experiment is designed to detect dark photons produced in positron on fixed target annihilations ($e^+e^- \to \gamma A'$) decaying to dark matter by measuring the final state missing mass.

The collaboration aims to complete the design and construction of the experiment by the end of 2017 and to collect $\sim 10^{13}$ positrons on target by the end of 2018, thus allowing to reach the $\epsilon \sim 10^{-3}$ sensitivity up to a dark photon mass of ~ 24 MeV/c^2.

The experiment will be composed by a thin active diamond target where the positron beam from the DAFNE Linac will impinge to produce e^+e^- annihilation events. The surviving beam will be deflected with a $calO$(0.5 Tesla) magnet, on loan from the CERN PS, while the photons produced in the annihilation will be measured by a calorimeter composed of BGO crystals recovered from the L3 experiment at LEP. To reject the background from bremsstrahlung gamma production, a set of segmented plastic scintillator vetoes will be used to detect positrons exiting the target with an energy below that of the beam, while a fast small angle calorimeter will be used to reject the $e^+e^- \to \gamma\gamma(\gamma)$ background.

The DAQ system of the PADME experiment will handle a total of
$calO$(1000) channels, with an expected DAQ rate, defined by the DAFNE Linac cycle, of 50 Hz. To satisfy these requirements, we plan to acquire all the channels using the CAEN V1742 board, a 32 channels 5 GS/s digitizer based on the DRS4 (Domino Ring Sampler) chip.

Three such boards have successfully been used during the 2015 and 2016 tests at the DAFNE Beam Test Facility (BTF), where a complete DAQ system, prototypal to the one which will be used for the final experiment, has been set up. The DAQ system includes a centralized Run Control unit, which interacts with a distributed set of software modules handling the V1742 boards readout, and an Event Builder, which collects the data from the boards and creates the final raw events. In this talk we will report on the details of the DAQ system, with specific reference to our experience with the V1742 board.

Tertiary Keyword (Optional)

Secondary Keyword (Optional)

Primary Keyword (Mandatory)

DAQ

Primary author: LEONARDI, Emanuele (INFN Roma)

Co-authors: RAGGI, Mauro (LNF INFN); VALENTE, Paolo (Universita e INFN, Roma I (IT))

Presenter: LEONARDI, Emanuele (INFN Roma)

Session Classification: Posters A / Break

Track Classification: Track 1: Online Computing