Alessio Caminata Curriculum Vitae updated:28/7/2018

Personal data:

Alessio Caminata
Place and date of birth:
Email:

Research

-From February 2017: researcher at INFN (Istituto Nazionale di Fisica Nucleare) in Genoa
-March 2014- February 2017: Post-doc INFN Genoa

Studies

-January 2011-March 2014: PhD student University of Genoa
-30/9/2010: Master Degree in Physics (110/110 con lode), University of Genoa
-07/10/2008: Undergraduate in Physics (110/110 con lode), University of Genoa

Research responsibilities

-From 2017: L2 manager for Dark Side experiment
-From 2017: member of the steering committee of the Borexino experiment
-From 2017: shift manager for the CUORE collaboration
-From 2014: manager of the simulation code for the Borexino experiment
-2016: manager for the Borexino experiment for the CNAF computing center

Grants

INFN Grant - 19593, PESCE R&D

Didactics

2013-2014, 2012-2013, 2011-2012: assistant professor, physics class, Genoa University, Engineering department

Selected outreach activities

2018 - Pint of Science: "Alla ricerca di nuova fisica con il metro cubo più freddo dell'Universo"
2017 - Lecture to "Università della terza età"-UniTE about solar neutrinos
2014-2013-2012- Stage high school students: introduction to the methodologies and instrumentation used in high energy physics

Study grants

2011-2013 PhD Grant, University of Genoa
2015-2010 Grant for undergraduate/master students, Cassa Depositi e Prestiti AMT Genova

Research interest and activities

Borexino/SOX

Borexino is a 300 tons liquid scintillator detector in data taking at Laboratori Nazionali del Gran Sasso from 2007. It's primary scientific goal is the measurement of the flux of the neutrinos coming from the Sun. Data taking has been divided into two phases: from 2007 to 2010 and from 2011 up to now. Between the two phases, an extensive purification campaign of the liquid scintillator took place. Thanks to the extreme level of radio purity achieved, Borexino has been able to perform the spectroscopy of the solar neutrinos. Moreover, the presence of antineutrinos emitted from the Earth has been proven with more than 5 σ of confidence level. Finally, limits on rare processes events like correlation between antineutrinos and gravitational waves and antineutrinos gamma ray bursts have been set. In the last years, in parallel with the second phase of data taking, there have been preliminary activities for the SOX experiment [1], i.e. using the Borexino detector to investigate the existence of sterile neutrinos using a high activity 144Ce-144Pr anti-neutrino generator. Unfortunately, due to showstopper in the generator production, the SOX program is stopped at the moment.

My activity in the Borexino has been focused on the improvements on the Monte Carlo simulation code and on the usage of the simulations for data analysis. Since 2014, I was responsible for the refactoring of the code in view of phase 2 data analysis. The refactoring regarded both the

description of the detector with a substantial increase of the agreement between data and MC in the analysis fiducial volume and the development of a novel efficient method for simulating external background events surviving passive shielding [2]. In order to improve the precision of the input parameters of the simulation, I was involved in the measurement of the optical properties of the scintillator using ellipsometric and spectrophotometric techniques. These techniques were fundamental for the improvements in the latest solar neutrino analysis [3-4] and in the detection of geoneutrinos emitted by the Earth [5]. At mid 2017 I was elected in the steering committee of the experiment. In this period, the main focus of the committee is the forthcoming calibration campaign of the detector.

CUORE

CUORE (Cryogenic Underground Observatory for Rare Events) is an experiment in data taking at Laboratori Nazionali del Gran Sasso since 2017. It's main scientific goal is the investigation of the existence of neutrinoless double beta decay. If observed, it will prove the Majorana nature of the neutrino mass and give important indications on the absolute mass of this particle. CUORE is investigating this decay using bolometric techniques. The core of the detector are 988 crystals of TeO2 kept at the temperature of 10 mK thanks to an innovative cryostat. CUORE recently published its first search of neutrinoless double beta decay reaching so far the best limit on the half life of this process for the 130Te nucleus [6].

During the commissioning and preparation phase of the experiment I was involved both in hardware and software activities. From the software point of view, I was involved in the development of the DAQ code of experiment. This C++ code, based on Cuoricino and Cuore-0 prototypes, has been extended to scale from 50 to 1000 channels exploiting the features of parallel computing. From the hardware point of view, I was involved in the commissioning of the cryostat, based on DU-refrigerator [7]. After the starting of the data taking, I worked on data analysis being responsible for the estimation of the detector efficiency [6].

Dark Side

The DarkSide experiment aims at the direct detection of dark matter via elastic scattering in liquid argon using a dual phase time projection chamber (TPC). The project is hosted at Laboratori Nazionali del Gran Sasso. At the moment the DarkSide-50 experiment is in data taking (50 kg of Ar depleted in 39Ar). The TPC is surrounded by an active veto to tag neutron induced nuclear recoil in liquid argon. In parallel the design of the next generation experiment is taking place, in which 20 tons of argon will be the target.

I joined the collaboration in 2017 and I am involved in the design of the veto for the DarkSide-20k experiment. In parallel to the design of DarkSide-20k, an R&D devoted to study the possible directionality of the nuclear recoil signal is taking place using a small TPC and neutrons produced at Laboratori Nazionali del Sud. I am involved in the slow control and database of the system. The commissioning of the apparatus will be completed in the spring and data taking is foreseen in summer 2018.

Selected presentations at conferences

6/2018 5th International Solar Neutrino Conference, *Monte Carlo simulation in solar neutrino experiments* - invited talk, Dresden (Germany)

2/2018 **Lake Louise Winter Institute 2018**, *The latest results on solar neutrinos from Borexino*, A.Caminata on behalf of Borexino Collaboration - invited talk, Lake Louise (Canada)

7/2016 **Neutrino 2016**, *Improvements in the simulation code of the SOX experiment*, A. Caminata on behalf of SOX Collaboration, London (England).

3/2016 **Magellan Workshop - Connecting Neutrino Physics and Astronomy**, *Monte Carlo simulations in neutrino physics: the example of the SOX experiment*, A. Caminata on behalf of SOX Collaboration, invited talk, Hamburg (Germany).

10/2015 **The International Conference on Particle Physics and Astrophysics**, *Understanding the detector behavior through Montecarlo and calibration studies in view of the SOX measure*, A. Caminata on behalf of SOX Collaboration, invited talk, Moscow (Russia).

References

[1] SOX: Short distance neutrino Oscillations with BoreXino
Borexino Collaboration (Bellini, G. *et al.*) JHEP 1308 (2013) 038 arXiv:1304.7721

[2] The Monte Carlo simulation of the Borexino detector
Borexino Collaboration (M. Agostini (GSSI, Aquila) *et al.*). Apr 7, 2017. 24 pp.
Published in Astropart.Phys. 97 (2018) 136-159

[3] Improved measurement of 8B solar neutrinos with 1.5 kt y of Borexino exposure
Borexino Collaboration (M. Agostini (GSSI, Aquila) *et al.*). Sep 3, 2017. 13 pp.
e-Print: arXiv:1709.00756 [hep-ex] | PDF

[4] First Simultaneous Precision Spectroscopy of pp, 7Be, and pep Solar Neutrinos with Borexino Phase-II
Borexino Collaboration (M. Agostini (GSSI, Aquila) *et al.*). Jul 28, 2017. 8 pp.
e-Print: arXiv:1707.09279 [hep-ex] | PDF

[5] Spectroscopy of geoneutrinos from 2056 days of Borexino data
Borexino Collaboration (M. Agostini (Munich, Tech. U.) *et al.*). Jun 15, 2015. 5 pp.
Published in Phys.Rev. D92 (2015) no.3, 031101

[6] First Results from CUORE: A Search for Lepton Number Violation via 0νββ Decay of 130Te
CUORE Collaboration (C. Alduino (South Carolina U.) *et al.*). Oct 22, 2017. 8 pp.
e-Print: arXiv:1710.07988 [nucl-ex] | PDF

[7] The CUORE Cryostat: A 1-Ton Scale Setup for Bolometric Detectors
CUORE Collaboration (C. Ligi (INFN, Rome) *et al.*). Mar 10, 2016. 7 pp.
Published in J.Low.Temp.Phys. 184 (2016) no.3-4, 590-596

[8] DarkSide-20k: A 20 Tonne Two-Phase LAr TPC for Direct Dark Matter Detection at LNGS
C.E. Aalseth (PNL, Richland) *et al.*. Jul 25, 2017. 144 pp.
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