CURRICULUM
– Lia Lavezzi –

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ACADEMIC RECORD

- **PhD in Physics** **18/01/2008**
  University of Pavia, Italy
  - nuclear and sub-nuclear physics curriculum
  - thesis: *The fit of nuclear tracks in high precision spectroscopy experiments*
  - tutor prof. A. Rotondi, referee prof. F. Iazzi

- **Degree in Physics** **28/03/2003**
  University of Pavia, Italy
  - final evaluation 110/110 cum laude
  - thesis: *Double β^+ decay. An experiment proposal*
  - tutor prof. G. Bendiscioli, co-tutor dott. V. Filippini

- **High school diploma** **1997**
  Liceo - Ginnasio Ugo Foscolo, Pavia, Italy
  - classical studies curriculum
  - final evaluation 60/60

FELLOWSHIPS & AWARDS

- **PIFI Fellowship** **2017 - 2019**
  Chinese Academy of Science President's International Fellowship Initiative (PIFI), CAS, Beijing, China

- **IHEP-INFN Joint Fellowship** **2016 - 2019**
  Joint Fellowship of Institute of High Energy Physics (IHEP) of the Chinese Academy of Science (Beijing, China) and Istituto Nazionale di Fisica Nucleare (INFN, Italy)

- **Best Talk in the New Technology Section** **2017**
  Awarded to the talk given at the conference IFAE 2017, Trieste, Italy

- **Doctoral Studies Scholarship** **2004-2007**
  Ranked first place in the selection exam for 19*th* course

- **I.S.U. Scholarship** **1999-2002**
  University of Pavia, for academic years 1999/2000, 2000/01, 2001/02

- **Annual A.S.U.F. Award** **1994-1995**
  Winner of the award *Associazione Studenti Ugo Foscolo* (Student Association of the high school) in the academic year

POST - DOCTORAL RESEARCH ACTIVITIES

- **IHEP, Beijing, P.R.C.** **2016-2019**
  BESIII Collaboration @ IHEP
  supervisors prof. H. Liu, prof. M. Maggiora
  main activity: implementation of the simulation and reconstruction software for the new inner tracker of the BESIII spectrometer, based on the triple-GEM technology. Participation to the testbeams at CERN and MAMI for the project.

- **University of Torino, Italy** **2014- 2015**
  PANDA Collaboration @ FAIR
  supervisor prof. M. Greco
  main activity: development of the algorithm for fit of secondary tracks for the PANDA experiment and of the software for the simulation and reconstruction of the Straw Tube Tracker of the PANDA experiment.

- **INFN, Section of Pavia, Italy** **2010-2013**
  PANDA Collaboration @ FAIR
  supervisors prof. A. Rotondi, dott. P. Montagna
  main activity: software development in the PANDA and FAIR computing frameworks (Straw Tube Tracker, pattern recognition, Kalman fit, track following, particle identification)

- **University of Pavia - General Chemistry Department, Italy** **2008-2009**
  Simulations of a gamma well-source of ^{60}Co
  supervisor prof. A. Faucitano
  main activity: simulation of a radioactive source and its shielding

GRADUATE RESEARCH ACTIVITY

- **University of Pavia - Physics Department, Italy** **2006-2007**
  Characterization of Germanium detectors for gamma spectrometry in hypernuclear physics field
  supervisor prof. A. Rotondi
  main activity: calculation of the electric field of the germanium detector

PARTICIPATION TO SCHOOLS

- **XVII Seminario Nazionale di Fisica Nucleare e Subnucleare** **20-26/09/2004**
  Otranto, Serra degli Alimini, Italy

- **ESC15** **25-31/10/2015**
  7th INFN International School on Architectures, tools and methodologies for developing efficient large scale scientific computing applications
  Bertinoro, Forlì – Cesena, Italy

- **SNRI–VI** **1-5/10/2018**
  Sixth National Seminar on Innovative detectors
  Bologna – Ferrara, Italy

LANGUAGES

- **Italian** mother tongue
- **English** level: fluent (written/spoken)
- **Chinese** level: starter (written/spoken)
- **Latin** from classical studies at school
- **Ancient Greek** from classical studies at school

COMPUTER SCIENCE

- *OS* Windows, Linux, Unix
- *Programming languages* C, C++, FORTRAN, shell, HTML
- *applications* Office, LaTeX

scientific area programming

- ***GEANT3, GEANT4, Virtual Monte Carlo (VMC)***
  Simulation codes for transport of particles in material
- ***ROOT***
  C++ interpreter and collection of tools for data analysis
- ***ANSYS, GARFIELD++***
  Simulation codes for simulation of electron motion in electric/magnetic fields
- ***GEANE***
  Software for the extrapolation of the track parameters and the associated covariance matrix

CONFERENCE RECORD

- *The new Cylindrical GEM Inner Tracker of the BESIII experiment: test beam results of two prototypes* (talk)
  INSTR17: Instrumentation for Colliding Beam Physics 27/02-03/03/2017
  Budker Institute of Nuclear Physics (BINP), Novosibirsk, Russia

- *Results from testbeams of prototypes for the cylindrical GEM new inner tracker of the BESIII experiment* (talk and poster)
  IFAE2017: XVI Incontri di Fisica delle Alte Energie 19/04-21/04/2017
  Trieste, Italy

- *The new Cylindrical GEM Inner Tracker of BESIII* (talk)
  PANIC17: Particles and Nuclei International Conference 01-05/09/2017
  IHEP, Beijing, P.R.C.

- *Performance of the micro-TPC Reconstruction for GEM Detectors at High Rate* (talk)
  IEEE17: 2017 IEEE Nuclear Science Symposium and Medical Imaging Conference 21-28/10/2017
  Atlanta, Georgia, USA

- *Implementation of the code for the simulation of the response of a triple-GEM tracker and its comparison to the experimental data* (poster)
  Frontier Detectors for Frontier Physics: 14th Pisa meeting on advanced detectors 27/05-2/06/2018
  La Biodola, Isola d'Elba, Italy

SEMINARS

- Invited seminar **22/05/2019**
  INF N Ferrara, Ferrara, Italy
  An overview of the BESIII experiment

- Invited talk at PANDA Tracking Computing Workshop **19/09/2018**
  GSI, Darmstadt, Germany (via eZUCE)
  GEANE

- Invited seminar **19/06/2018**
  Peking University, Beijing, P.R.C.
  An overview on the BESIII Cylindrical GEM Internal Tracker

- talk at IHEP-INFN Annual Cooperative Meeting **9-10/05/2018**
  Presidenza INFN, Roma, Italy
  BESIII CGEM-based New Inner Tracker Status Report

- Tutor at PANDA Computing Week **23-27/07/2012**
  University of Torino, Torino, Italy

- Invited seminar **18/10/2012**
  INFN Torino, Torino, Italy
  Tracking techniques in the PANDA target spectrometer

RESPONSIBILITIES & ROLES

BESIII experiment *(present)*

- member of BESIII Collaboration since 2015 (CGEM-IT group)
- member of IHEP Software group since 2016
- offline software coordinator for CGEM-IT project (w/ Wu Linghui)
- responsible of Data Quality for CGEM-IT project
- convener of Data Quality Group for BESIII, since 2018 (w/ Chengdong Fu)

PANDA experiment *(before)*

- member of PANDA Collaboration since 2004 (Software and Tracking groups)
- detector expert within software group for Straw Tube Tracker until 2014
- *external contributor* to *fairroot* framework, common software for all the FAIR experiments, for the GEANE (track follower) interface
- maintainer of the GEANE interface
- author of the WIKI page for the documentation on the GEANE interface

more

- referee for the NIM A and NIM A Proceedings
- post-doc representative in the Physics Department Council at University of Torino in 2014-2015
- exam committee member at University of Pavia for the sectors: applied physics for cultural, environmental and medical purposes, nuclear and sub-nuclear physics and experimental physics
- component of the commission and supervisor during the exam for the contest *Premio per la Fisica Valerio Filippini*, organized by INFN Pavia, for the years 2010, 2011, 2012, 2013

AREAS OF COMPETENCE AND AQUIRED SKILLS

❖ Software – Monte Carlo simulations

Simulation of the transport of particles in materials with the most used engines, *i.e.* GEANT3, GEANT4 and the Virtual Monte Carlo (VMC)

- simulation (GEANT4) of the Cylindrical GEM Inner Tracker for the BESIII experiment, with update of the geometry description of the active components and the implementation of the passive elements
- simulation (VMC) of the Straw Tube Tracker for the PANDA experiment, with the implementation of the geometry of the detector and the maintenance of the full simulation code of the Straw Tube Tracker
- simulation (GEANT4) of a 60Co source and its shielding for the Chemistry Department
- simulation (GEANT3) of a detector for the measurement of the double beta decay for the Graduation Thesis

Digitization, *i.e.* simulation of the response of the detectors to the passage of the particles with Garfield++ and ANSYS

- implementation of the **GTS** (*Garfield-based Triple-GEM Simulator*), *i.e.* a code which simulates the response of the a triple-GEM to the passage of a charged particle. This included:
    - Modelization of the main parameters starting from simulations performed with Garfield++ and ANSYS to simulate the electric field inside the GEM and its impact on the formation and development of the multiplication avalanche;
    - Tuning of the results on the experimental information gained in different testbeams, to obtain a simulated data compatible with the experimental ones.
- The resulting code is used to simulate the BESIII Cylindrical GEM Inner Tracker response with a minor CPU-time consumption with respect to the complete simulation and was ported to the official BESIII software framework.

❖ Software – Algorithms for reconstruction

Pattern recognition for tracking detectors: implementation of track finding for primary and secondary tracks in the PANDA reconstruction

- Author (PANDA) of the *GEM extension*, *i.e.* the component of the track finding for primary tracks which adds to the track found by the central tracker the hits

from the GEM chambers, placed in the forward region of the Target Spectrometer, between the solenoid and dipolar fields, in a non-homogeneous magnetic field.

- Author (PANDA) of the preliminary version of the track finder for secondary tracks, *i.e.* tracks from the decay of a neutral long living particle, stemming from a vertex displaced *w.r.t.* the interaction point. This code was used for the simulations which entered the Straw Tube Tracker Technical Design Report (2012)

- Author (PANDA) of the newer, faster and more efficient version of the secondary track finder, based on Legendre transformation, *i.e.* the Hough transformation for curved tracks.

Track fitting: implementation of track fitting algorithms for PANDA reconstruction

- Author (PANDA) of the classes for the insertion of the Straw Tube Tracker (STT) in the global track fitting procedure:
    - implementation of the interface classes between STT and genfit, the package for the global Kalman fit
    - implementation inside genfit of the class for the description of the hit in a wire detector (added to the genfit release) and the class for the track representation needed in order to use GEANE (FORTRAN package distributed by CERN inside GEANT3) as track follower
    - co-author of the interface between GEANE and FAIR code *fairroot.* The interface is available to all the FAIR (GSI, Germany) experiments as part of the *fairroot* framework

Quality Assurance

- Author (PANDA) of the quality assurance macros for the Straw Tube Tracker

Particle Identification

- Author (PANDA) of the package for the Straw Tube Tracker to perform particle identification by means of the dE/dx *vs* momentum

❖ **Hardware – Characterization of tracking detectors**

Construction and *testbeams,* with participation to the construction and testing of the Cylindrical–GEM, participation to testbeams with planar GEM, cylindrical GEM and micro–*r*Well; data taking of BESIII experiment

- *construction* (CGEM-IT of BESIII):

- preparation of the vacuum sealing of the mandrels of layer II @ LNF INFN, Italy
- in–box high voltage tests of the GEM foils for the layer III @ LNF INFN, Italy

- *MPGD* testbeams:
  - 05-06/2016 @ CERN (GEM, planar)
  - 10/2016 @ CERN (Cylindrical–GEM, layer II prototype)
  - 05/2017 @ MAMI (GEM, planar, high rate)
  - 06/2017 @ CERN (Cylindrical–GEM, layer I)
  - 10/2017 @ CERN (micro–*r*Well)
  - 04/2018 @ CERN (GEM, planar)

- *BESIII* data taking as second shifter @ IHEP
- Testing of layer I, II, e III for the final construction of CGEM-IT and of the prototype of layer II, all currently at IHEP.

❖ **Software – Data analysis and simulation campaign**

Data analysis on OBELIX data and PANDA (from MC)

- Analysis of data from **OBELIX** experiment (LEAR, CERN), from annihilations of antiproton on ^{4}He nuclei at rest. The strangeness production enhancement in the annihilation on ^{4}He *w.r.t.* the one on protons makes them an optimum environment for the search of Quark Gluon Plasma, Pentaquark and Kaon-nucleon bound states (those researches were published in various articles in Nucl. Phys. A).

- Participated to different simulation campaigns for **PANDA** experiment:
  - benchmark $\eta_c \rightarrow K_s^0 K^+ \pi^- + \text{c.c.}$
    inserted in the PANDA Technical Progress Report (2005)
  - simulation campaign for the choice of the PANDA inner tracker between Straw Tube Tracker (STT) and Time Projection Chamber, with the final decision in favor of the former
    Simulation of both single tracks in the STT and the full tracking system and the benchmark channel $\bar{p}p \rightarrow \Lambda\bar{\Lambda}$. The results were published in the STT Technical Design Report (2012)

PERIODS ABROAD

long stay

- *at IHEP, Beijing, P.R.C.* **31/03/2016-31/03/2019**

short stay

- *at CERN, Prevessin, France* **periods between 2016-2018**
  for testbeams

- *at MAMI, Mainz, Germany* **period in 2017**
  for testbeam

- in different universities and research centers for *Collaboration Meetings, Conferences or direct collaborations* with local colleagues (*e.g.* Uppsala, Wuhan, Novosibirsk, Atlanta, GSI)

Pavia, 4/6/2019 Lia Lavezzi