Elisabetta Montagna

Education

- **PostDoc position** March 2024 - ongoing
  Istituto Nazionale Fisica Nucleare - Sezione di Bologna
  - Research topic: *Study of the charge and light readout of a Xe-doped LAr detector.*
  - The work is focused on the setup of a small-scale Liquid Argon Time Projection Chamber (LArTPC) (200 L) equipped with innovative photon detection systems: an X-ARAPUCA device and a VUV-SiPM-based system. The LArTPC response will be determined using cosmic rays and radioactive sources. The properties of xenon-doped LAr and the response of the detector will be studied in terms of charge and light readout with different concentrations of xenon.

- **PhD student in Particle Physics (3rd year)** Nov 2020 - June 2024
  Alma Mater Studiorum - Università di Bologna
  - Dissertation title: *Validation of SiPMs for the DUNE Far Detector Photon Detection System through the development and commissioning of a cryogenic facility.*
  - Supervisors: Prof. Alessandro Gabrielli (Alma Mater Studiorum - Università di Bologna), Dr. Michele Pozzato (INFN).
  - My research work is focused on the characterization and validation of Silicon Photomultipliers at cryogenic temperature for the Photon Detection System of the DUNE experiment. I am responsible for INFN Bologna of implementation, commissioning and operations of a facility for massive cryogenic qualification of SiPMs.
  - Research training period at the Neutrino Platform (CERN), from January to July 2023.
  - PhD exams passed: Theoretical Astroparticle, Photonics, Advanced Data Acquisition, Higgs and Electroweak Physics at the LHC.

- **Master Degree in Nuclear and Subnuclear Physics** Oct 2015 - Sept 2020
  Alma Mater Studiorum - Università di Bologna, final mark: 110/110
  - Dissertation title: *Characterization of SiPMs for the Photon Detection system of the DUNE Far Detector.*
  - Supervisors: Dr. Gabriele Sirri (INFN), Dr. Alessandro Montanari (INFN), Dr. Michele Pozzato (INFN).
  - My thesis work consisted in testing and a full characterization of several SiPMs devices from different manufacturers for the Photon Detection System of the DUNE Far Detector.

- **Erasmus+ Programme** Sept 2016 - March 2017
  University of York, UK

- **Bachelor Degree in Physics** Sept 2010 - Oct 2015
  Alma Mater Studiorum - Università di Bologna, final mark: 95/110
  - Dissertation title: *Studio di scintillatori accoppiati a SiPM per un tracciatore di particelle cariche* (*Study of scintillators coupled to SiPM for a charged particle detector*)
  - Supervisors: Dr. Gabriele Sirri (INFN), Dr. Michele Pozzato (INFN), Dr. Laura Pasqualini (Alma Mater Studiorum - Università di Bologna).
  - My thesis work consisted in studying the response of scintillator bars and optimization of the coupling to Silicon Photomultipliers, for application in short baseline neutrino experiments.

Extracurricular activities

- **XXX Giornate di Studio sui Rivelatori**
  Aosta Valley, Italy. 13^{th}-17^{th} june 2022.
  - Poster presentation: *System for cryogenic qualification of SiPMs*
- **International Neutrino Summer School, (INSS)**
  CERN. 2^{nd}-13^{th} august 2021.
- **International School on AstroParticle Physics, (ISAPP)**
  Valencia, Spain. 21^{st}-30^{th} july 2021.
- **School of Underground Physics, (SoUP)**
  28^{th} june-2^{nd} july 2021.
  - Poster presentation on behalf of the DUNE collaboration: *Characterization of SiPMs for the Photon Detection System of DUNE Far Detector.*
- **2^{nd} BCD International School On High Energy Physics**
  Cargese, Corsica (France). 11^{th}-15^{th} April 2016.

Working Experience

- **Tutor for the course "Laboratory of electronics"** Nov 2021 - March 2022
  Alma Mater Studiorum - Università di Bologna, Course lecturer: Prof. Gilda Scioli.

Research activities

- **DUNE Experiment** 2020 – Present

The *Deep Underground Neutrino Experiment (DUNE)* is a next generation long baseline neutrino oscillation experiment, aimed to study oscillation parameters, determine neutrino mass ordering and a possible CP violation in the leptonic sector. Its dual site design will foresee as Far Detector a LAr TPC to study neutrino interactions. A Photon Detection System (PDS) based on Silicon Photomultipliers will be used to collect the resulting scintillation light. My work inside the DUNE Photon Detection Consortium focused on the characterization at cryogenic temperature of the SiPMs to instrument the DUNE PDS. The work I performed included:
– the selection and full characterization of the best SiPM model;
– the analysis of the SiPM parameters from the test results;
– the development of a custom facility for massive cryogenic qualification of SiPMs;
– a test campaign on a large scale to validate all the SiPMs for the first module of DUNE Far Detector.

During the training period at the Neutrino Platform (CERN) I also partecipated in the assembly, testing and mounting of the Photon Detection System modules of ProtoDUNE Phase II. Throughout the modules' tests I developed a study on the optimization of the electronic box geometry in order to reduce an observed light leakage.

- **ICARUS Experiment** 2020 – Present

I am collaborating to the Data Acquisition and in particular as a shifter in monitoring the detector operation during the beam runs and detector calibration. The activity included:
– monitoring of the DAQ system;
– check the stability of the beam;
– monitoring the cryogenic system of the detector.

Publications

Following a list of the most significant publications with a major personal contribution. For a full list please refer to the related attachment.

- M. Guarise et al. "A newly observed phenomenon in the characterisation of SiPM at cryogenic temperature". JINST 16.10 (2021), T10006. doi: 10.1088/1748-0221/16/10/T10006
- M. Andreotti, et al (corresponding author **E. Montagna**) "Cryogenic Characterization of Hamamatsu HWB MPPCs for the DUNE Photon Detection System" accepted by JINST 16 November (2023)

Conferences and Workshops

- **110th National Congress of the Italian Physics Society (SIF)**
  Bologna, Italy. 9^{th}-13^{th} september 2024.
  - Talk on behalf of the DUNE collaboration: *Characterization and validation of SiPMs for DUNE Far Detector Photon Detection System.*
- **Incontri di Fisica delle Alte Energie (IFAE)**
  Firenze, Italy. 3^{rd}-5^{th} april 2024.
  - Poster presentation on behalf of the DUNE collaboration: *Validazione di SiPMs per il sistema di fotorivelazione del DUNE Far Detector*
- **IEEE Nuclear Science Symposium, Medical Imaging Conference and Room Temperature Semiconductor Detector Conference**
  Milano, Italy. 7^{th}-11^{th} november 2022.
  - Poster presentation: *System for massive cryogenic validation of SiPMs*
- **107th National Congress of the Italian Physics Society (SIF)**
  Online contribution. 13^{th}-17^{th} september 2021.
  - Talk on behalf of the DUNE collaboration: *Validation test of photosensors for DUNE experiment*
- **International conference of Plasma Physics for Fusion, (IAPS4Fusion)**
  Oxford - London, UK. Oct-3^{rd} Nov 2016.

Major talks at DUNE meetings

I give regularly reports during working package meetings. Here a list of major talks at collaboration level:

- **DUNE Collaboration Meeting** – 22^{nd}-26^{th} May 2023
  - Results presented in the proposed paper "Cryogenic Characterization of Hamamatsu HWB MPPCs for the DUNE Photon Detection System".
- **DUNE Collaboration Meeting** – 23^{rd}-27^{th} January 2023
  - Report on the HPK SiPM paper status.
- **DUNE Collaboration Meeting** – 12^{th}-16^{th} September 2022
  - Status of SiPMs and mass-test facility.

Skills and competences

IT skills

- **Programming languages**: PYTHON (intermediate), C++ (intermediate), LaTeX(advanced).
- **Software and toolkit**: CERN ROOT (intermediate), LabVIEW (intermediate), Arduino IDE (advanced), MS Office (advanced), Geant4 (basic).
- **OS**: Unix (intermediate), Windows (advanced).

Technical skills

- **Laboratory instrumentation**: scopes, pulse generators, power suppliers, front-end electronics, VME modules, Arduino, Raspberry;
- **Detectors**: Scintillators, SiPMs.

Languages

- **Italian**: Native speaker
- **English**: Advanced - C1 CLA (Centro Linguistico di Ateneo)
- **French**: Elementary

Outreach

- **Official guide of the Neutrino Platform** March - July 2023
  CERN, Giving guided tour of the Neutrino Platform.
- **Pioggia di particelle dallo spazio** 29^{th} September 2023
  Bologna, Notte europea dei ricercatori. Co-responsible of INFN stand open to the public.
- **Pioggia di particelle dallo spazio** 30^{th} September 2022
  Bologna, Notte europea dei ricercatori. Co-responsible of INFN stand open to the public.
- **C'é nebbia e nebbia** 27^{th} November 2020
  Bologna, Notte europea dei ricercatori. Co-responsible of INFN stand open to the public.

I hereby authorize the use of my personal data in accordance to the GDPR 679/16 - "European regulation on the protection of personal data"

September 20, 2024

Signature (Elisabetta Montagna)

Publications

[1] Adam Abed Abud et al. "Doping Liquid Argon with Xenon in ProtoDUNE Single-Phase: Effects on Scintillation Light". In: (Feb. 2024). arXiv: 2402.01568 [physics.ins-det].

[2] Adam Abed Abud et al. "Performance of a modular ton-scale pixel-readout liquid argon time projection chamber". In: (Mar. 2024). arXiv: 2403.03212 [physics.ins-det].

[3] M. Andreotti et al. "Cryogenic characterization of Hamamatsu HWB MPPCs for the DUNE photon detection system". In: *JINST* 19.01 (2024), T01007. DOI: 10.1088/1748-0221/19/01/T01007.

[4] A. Abed Abud et al. "Identification and reconstruction of low-energy electrons in the ProtoDUNE-SP detector". In: *Phys. Rev. D* 107.9 (2023), p. 092012. DOI: 10.1103/PhysRevD.107.092012. arXiv: 2211.01166 [hep-ex].

[5] A. Abed Abud et al. "Impact of cross-section uncertainties on supernova neutrino spectral parameter fitting in the Deep Underground Neutrino Experiment". In: *Phys. Rev. D* 107.11 (2023), p. 112012. DOI: 10.1103/PhysRevD.107.112012. arXiv: 2303.17007 [hep-ex].

[6] A. Abed Abud et al. "The DUNE Far Detector Vertical Drift Technology, Technical Design Report". In: (Dec. 2023). arXiv: 2312.03130 [hep-ex].

[7] Adam Abed Abud et al. "Highly-parallelized simulation of a pixelated LArTPC on a GPU". In: *JINST* 18.04 (2023), P04034. DOI: 10.1088/1748-0221/18/04/P04034. arXiv: 2212.09807 [physics.comp-ph].

[8] Adam Abed Abud et al. "Reconstruction of interactions in the ProtoDUNE-SP detector with Pandora". In: *Eur. Phys. J. C* 83.7 (2023), p. 618. DOI: 10.1140/epjc/s10052-023-11733-2. arXiv: 2206.14521 [hep-ex].

[9] P. Abratenko et al. "ICARUS at the Fermilab Short-Baseline Neutrino program: initial operation". In: *Eur. Phys. J. C* 83.6 (2023), p. 467. DOI: 10.1140/epjc/s10052-023-11610-y. arXiv: 2301.08634 [hep-ex].

[10] A. Abed Abud et al. "A Gaseous Argon-Based Near Detector to Enhance the Physics Capabilities of DUNE". In: (Mar. 2022). arXiv: 2203.06281 [hep-ex].

[11] A. Abed Abud et al. "Snowmass Neutrino Frontier: DUNE Physics Summary". In: (Mar. 2022). arXiv: 2203.06100 [hep-ex].

[12] Adam Abed Abud et al. "DUNE Offline Computing Conceptual Design Report". In: (Oct. 2022). arXiv: 2210.15665 [physics.data-an].

[13] Adam Abed Abud et al. "Scintillation light detection in the 6-m drift-length ProtoDUNE Dual Phase liquid argon TPC". In: *Eur. Phys. J. C* 82.7 (2022), p. 618. DOI: 10.1140/epjc/s10052-022-10549-w. arXiv: 2203.16134 [physics.ins-det].

[14] Adam Abed Abud et al. "Separation of track- and shower-like energy deposits in ProtoDUNE-SP using a convolutional neural network". In: *Eur. Phys. J. C* 82.10 (2022), p. 903. DOI: 10.1140/epjc/s10052-022-10791-2. arXiv: 2203.17053 [physics.ins-det].

[15] A. Abed Abud et al. "Design, construction and operation of the ProtoDUNE-SP Liquid Argon TPC". In: *JINST* 17.01 (2022), P01005. DOI: 10.1088/1748-0221/17/01/P01005. arXiv: 2108.01902 [physics.ins-det].

[16] A. Abud Abed et al. "Low exposure long-baseline neutrino oscillation sensitivity of the DUNE experiment". In: *Phys. Rev. D* 105.7 (2022), p. 072006. DOI: 10.1103/PhysRevD.105.072006. arXiv: 2109.01304 [hep-ex].

[17] C. Brizzolari et al. "Cryogenic front-end amplifier design for large SiPM arrays in the DUNE FD1-HD photon detection system". In: *JINST* 17.11 (2022), P11017. DOI: 10.1088/1748-0221/17/11/P11017. arXiv: 2207.13616 [physics.ins-det].

[18] A. Abed Abud et al. "Searching for solar KDAR with DUNE". In: *JCAP* 10 (2021), p. 065. DOI: 10.1088/1475-7516/2021/10/065. arXiv: 2107.09109 [hep-ex].

[19] M. Andreotti et al. "Coded masks for imaging of neutrino events". In: *Eur. Phys. J. C* 81.11 (2021), p. 1011. DOI: 10.1140/epjc/s10052-021-09798-y. arXiv: 2105.10820 [physics.ins-det].

[20] M. Guarise et al. "A newly observed phenomenon in the characterisation of SiPM at cryogenic temperature". In: *JINST* 16.10 (2021), T10006. DOI: 10.1088/1748-0221/16/10/T10006.

[21] V. Hewes et al. "Deep Underground Neutrino Experiment (DUNE) Near Detector Conceptual Design Report". In: *Instruments* 5.4 (2021), p. 31. DOI: 10.3390/instruments5040031. arXiv: 2103.13910 [physics.ins-det].

[22] E. Montagna. "Characterization of SiPM for the photodetection system of DUNE far detector". In: *Nuovo Cim. C* 45.1 (2021), p. 13. DOI: 10.1393/ncc/i2022-22013-0.