

Peiyuan Chen

Curriculum Vitae

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Education

- Sep 2020 – **Bachelor of Science in Physics**, *Jilin University*, Changchun, China
Present ○ Double First-Class University, Project 985/211.
- Jan 2024 – **Visiting Honor Student, Physics**, *Georgia Institute of Technology*, Atlanta, USA
May 2024
- Jun 2024 – **Research Assistant (RA), TDLI & PandaX Group**, *Shanghai Jiao Tong University (SJTU)*, Shanghai, China
Present ○ Conduct PMT characterization and performance tests for the PandaX program (e.g., gain, SPE response, dark rate, linearity, and stability).
○ Contribute to the development and validation of the photo-detection / photoelectronics readout system, including test setup integration and data quality checks.
○ Perform waveform-based signal processing and analysis (baseline/rms evaluation, charge integration, and hit/peak extraction) to support detector calibration and performance studies.

Publications & Patents

- Publications ○ **Advanced Materials**, May 2024. “*Bi-Interlayer Strategy for Modulating NiCoP-Based Heterostructure toward High-Performance Aqueous Energy Storage Devices.*” Co-author (third).
○ **Submitted**, 2025. “*Performance Test and Circuit Simulation for R12699-406-M4 Photomultiplier Tube Base.*” Co-first author.
○ **In Preparation**, 2025. “*Comparative Study of Position Reconstruction Performance between Two-Inch and Three-Inch PMT Arrays for Large-Scale Xenon Detectors.*” First author.
- Patents ○ Chinese Invention Patent: CN215414302U — *A Small Wind Tunnel Device Used in Laboratory.*
○ Chinese Invention Patent: CN113466487B — *Method of Measuring Wind Speed Using a Constant Flow Thermal Anemometer.*

Research Experience

- Oct 2024 – **The Construction of a 3-Inch PMT Readout Array and Position Reconstruction Algorithm**, *PandaX(The Particle and Astrophysical Xenon Detector) Collaboration, Shanghai Jiao Tong University*, Shanghai, China
Present ○ Designed and implemented a full readout system for a 55-PMT array.
○ Characterized PMT performance and developed signal processing & position reconstruction algorithms (RoG, LRF, CNN).
○ Validated methods with Geant4 simulations, achieving a position resolution of $\sigma \approx 0.66$ mm.
- Design and Testing of Flexible Base Circuit Board for PandaX-20T**
○ Developed flexible circuit boards for large-scale detectors, enhancing reliability under cryogenic and high-voltage conditions.
○ Optimized signal transmission, reducing electronic noise and improving amplification efficiency.
○ Presented a keynote speech at the PandaX Collaboration Annual Meeting.
- Linearity Characterization of R12699-406-M4 PMTs for PandaX-20T**
○ Constructed a dedicated testing system and circuit simulation framework to probe PMT linearity over a wide dynamic range.
○ Validated base-induced nonlinearity phenomena and engineered an optimized dual-capacitor base architecture.
○ Developed a nonlinearity correction method, ensuring stable detector response from sub-keV to multi-MeV energies.

- Mar 2024 – **Research Internship at the Trinity PeV Neutrino Observatory**, *Georgia Institute of Technology*,
 May 2024 Atlanta, USA
- Designed and fabricated key connection components, ensuring signal integrity and stability under extreme conditions.
 - Advanced observatory readiness for deployment.
- Jan 2022 – **Calibration Device Design for PandaX-III**, *PandaX Collaboration*, *Shanghai Jiao Tong University*,
 Mar 2022 Shanghai, China
- Designed a high-pressure xenon detector calibration device for Micromegas readout.
 - Reduced device thickness while maintaining mechanical strength and leak-tightness in high-pressure and vacuum environments.
 - Enhanced calibration reliability for precision detector evaluation.

█ Awards & Honors

- 2025 High-Level Academic Competition Achievement Scholarship, Jilin University
- 2023 National First Prize — Ranked 1st Nationwide, China Undergraduate Physics Experiment Tournament, Ministry of Education of PRC.
- 2023 Student of the Year (Group Member), Shanghai Jiao Tong University
- 2021 National 13th Place, China Undergraduate Physics Tournament
- 2021 Grand Prize, Northeast Division Undergraduate Physics Tournament

█ Leadership & Service

- Feb 2021 – **Founder & Chairman, China Undergraduate Physics Tournament (CUPT) Community of**
 Jun 2023 **Jilin University**, *Jilin University*, Changchun, China
- Founded the CUPT community, set policies and development goals; guided the 2021 team in experimental design and preparation.
 - Recruited and mentored new members; delivered lectures on experimental design and data analysis.
- May 2022 **Tournament Chairman & Referee, JLUPT**, *Jilin University*, Changchun, China
- Organized and chaired the university physics tournament; established standardized scoring guidelines and ensured fairness.

█ Skills

- Programming & Data Python; C++; MATLAB; ROOT (data analysis, fitting, signal processing); Geant4; Git; LaTeX
- Experimental PMT characterization (gain, afterpulsing, dark noise); detector readout & signal processing; DAQ system setup; high-pressure/vacuum system design & testing; circuit design & performance testing
- Computation Monte Carlo simulations (optical/particle); finite element analysis; material simulations; ML-based position reconstruction (barycenter, MLE, ML)