YI JIA

B412 Main building, Institute of High Energy Physics, Chinese Academy of Sciences
19B Yuquan Road, Shijingshan District, Beijing, China 100049
+86 17813704569 ⋄ yijia@ihep.ac.cn

EDUCATION

Massachusetts Institute of Technology, Cambridge, US *August 2016 - August 2018*
Ph.D. in Particle Physics

Xi'an Jiaotong University, Xi'an, China *September 2012 - June 2016*
Bachelor of Science in Physics

Stony Brook University, Stony Brook, US *August 2014 - May 2015*
Exchange student in Physics

EMPLOYMENT

Institute of High Energy Physics, Beijing, China *May 2025 - Present*
Associate Professor in the Experimental Physics Division

Massachusetts Institute of Technology, Cambridge, US *April 2022 - May 2025*
Research Scientist in the Laboratory for Nuclear Science

Massachusetts Institute of Technology, Cambridge, US *September 2018 - April 2022*
Postdoctoral Associate in the Laboratory for Nuclear Science

RESEARCH INTERESTS

I am strongly interested in the intersection of particle physics and astrophysics.

RESEARCH EXPERIENCE

Jiangmen Underground Neutrino Observatory (JUNO) *May 2025 - Current*
Associate Professor at IHEP

I work on the precision measurements of oscillation parameters with reactor neutrinos, development of a supernova early warning system, and the first detection of the diffuse supernova neutrino background.

Alpha Magnetic Spectrometer (AMS) *April 2022 - May 2025*
Research Scientist at MIT

· **Lead the analysis of the AMS publication "Properties of Cosmic Lithium Isotopes Measured by the Alpha Magnetic Spectrometer" (Phys. Rev. Lett. 134, 201001 (2025)).** Lithium is unique in having three possible sources: primordial nucleosynthesis, cosmic-ray spallation, and stellar processes. The origin of ^{7}Li is particularly uncertain due to the long-standing discrepancy between Big Bang predictions and observations. I performed the first measurement of cosmic-ray fluxes of ^{6}Li and ^{7}Li isotopes in the rigidity range from 1.9 to 25 GV. Above ∼7 GV, an identical rigidity dependence of the ^{6}Li and ^{7}Li fluxes was found. This shows that they are both produced by collisions of heavier cosmic-ray nuclei with the interstellar medium and, in particular, excludes the existence of a sizable primary component in the ^{7}Li flux.

Alpha Magnetic Spectrometer (AMS) *September 2018 - March 2022*
Postdoctoral Associate at MIT

· **Lead the analysis of the AMS publication "Properties of Daily Helium Fluxes" (Phys. Rev. Lett. 128, 231102 (2022)).** I performed the precision measurement of daily helium fluxes in cosmic rays in the rigidity (momentum/charge) interval from 1.71 to 100 GV based on 7.6×10^8

helium nuclei collected with AMS. I found that below $\sim$ 7 GV the helium flux exhibits larger time variations than the proton flux. Remarkably, below 2.4 GV a hysteresis between helium to proton flux ratio and the helium flux was observed at larger than 7σ level. These results provide unique inputs to the understanding of cosmic rays in the heliosphere.

- **Lead the analysis of the AMS publication "Periodicities in the Daily Proton Fluxes from 2011 to 2019 Measured by the Alpha Magnetic Spectrometer on the International Space Station from 1 to 100 GV" (Phys. Rev. Lett. 127, 271102 (2021)).** Before AMS, there are no daily measurements of the rigidity dependence of 9-day, 13.5-day, and 27-day periodicities over a broad range of rigidities. I performed the precision measurement of the daily proton fluxes in cosmic rays in the rigidity interval from 1 to 100 GV based on 5.5×10^9 protons collected with the AMS. Recurrent flux variations with a period of 9, 13.5, and 27 days are observed. Unexpectedly, the strength of 9-day and 13.5-day periodicities increases with increasing rigidities up to $\sim$ 20 GV.

Alpha Magnetic Spectrometer (AMS) *August 2016 - August 2018*
Ph.D. degree at MIT
Supervisor: Professor Samuel C. C. Ting

- Thesis title: "Measurement of Secondary Cosmic Rays Lithium, Beryllium, and Boron by the Alpha Magnetic Spectrometer"

- Worked on flux measurements of secondary cosmic rays Li, Be, and B. The results were published with the title **"Observation of New Properties of Secondary Cosmic Rays Lithium, Beryllium, and Boron by the Alpha Magnetic Spectrometer on the International Space Station" (Phys. Rev. Lett. 120, 021101 (2018))**. This paper was selected as an Editors' Suggestion and featured in Physics Magazine. The total error on each of the fluxes is 3%-4% at 100 GV, which is an improvement of more than a factor of 10 compared to previous measurements. Measurements of the secondary cosmic ray nuclei fluxes are important in understanding the propagation of cosmic rays in the Galaxy.

- Developed a new method to measure the charge of cosmic-ray particles up to nickel (charge Z=28) with the AMS silicon tracker. My method takes into account the saturation effects of the $\sim$ 200,000 readout channels of the tracker electronics and has been widely used among the members of the AMS Collaboration. This work allows the precision measurements of heavy nuclei and opens a new era to explore the origin of heavy elements in our universe. With my method to identify the nuclei, precision measurements of the heavy cosmic ray nuclei (charge range: Z$\geq$9) were obtained and published in the Physical Review Letters.

Enriched Xenon Observatory (EXO)
Jiangmen Underground Neutrino Observatory (JUNO) *February 2016 - June 2016*
Senior thesis and internship at the Institute of High Energy Physics (IHEP), Beijing, China
Supervisor: Dr. Wen Liangjian, Dr. Li Yufeng

- Worked on the design and optimization of the Time Projection Chamber (TPC) for the nEXO ("next EXO"), a tonne-scale experiment using Xenon-136 to search for neutrinoless double beta decay.
- Explored the perspective for JUNO to measure neutrinos from the pp chain inside the Sun.

T2K (Tokai to Kamioka) experiment *September 2014 - May 2015*
Exchange program and research at the State University of New York at Stony Brook (SBU)
Supervisor: Professor Clark McGrew

- Conducted a measurement of the charged current pion interaction rate on the water with ND280 pi-zero detector (PØD) of T2K experiment, a long-baseline neutrino oscillation experiment in Japan.

Deep Underground Neutrino Experiment (DUNE) *Summer 2014*
Research Experience for Undergraduates (REU) at the University of Notre Dame (ND)
Supervisor: Professor John M. LoSecco

· Worked on simulations to explore an optimal design of neutrino beamline, leading to a better resolution of the CP phase for the future DUNE experiment.

PEER-REVIEWED PUBLICATIONS

1. M. Aguilar *et al.*, (AMS Collaboration), "Properties of Cosmic Lithium Isotopes Measured by the Alpha Magnetic Spectrometer", Phys. Rev. Lett. **134**, 201001 (2025). Editors' Suggestion, also Featured in Physics
2. M. Aguilar *et al.*, (AMS Collaboration), "Solar Modulation of Cosmic Nuclei over a Solar Cycle: Results from the Alpha Magnetic Spectrometer", Phys. Rev. Lett. **134**, 051001 (2025).
3. M. Aguilar *et al.*, (AMS Collaboration), "Antiprotons and Elementary Particles over a Solar Cycle: Results from the Alpha Magnetic Spectrometer", Phys. Rev. Lett. **134**, 051002 (2025). Editors' Suggestion, also Physics Viewpoint
4. M. Aguilar *et al.*, (AMS Collaboration), "Properties of Cosmic Deuterons Measured by the Alpha Magnetic Spectrometer", Phys. Rev. Lett. **132**, 261001 (2024). Editors' Suggestion, also Featured in Physics
5. M. Aguilar *et al.*, (AMS Collaboration), "Temporal Structures in Positron Spectra and Charge-Sign Effects in Galactic Cosmic Rays", Phys. Rev. Lett. **131**, 151002 (2023).
6. M. Aguilar *et al.*, (AMS Collaboration), "Properties of Cosmic-Ray Sulfur and Determination of the Composition of Primary Cosmic-Ray Carbon, Neon, Magnesium, and Sulfur: Ten-Year Results from the Alpha Magnetic Spectrometer", Phys. Rev. Lett. **130**, 211002 (2023).
7. M. Aguilar *et al.*, (AMS Collaboration), "Temporal Structures in Electron Spectra and Charge Sign Effects in Galactic Cosmic Ray", Phys. Rev. Lett. **130**, 161001 (2023). Editors' Suggestion, also Physics Viewpoint
8. M. Aguilar *et al.*, (AMS Collaboration), "Properties of Daily Helium Fluxes", Phys. Rev. Lett. **128**, 231102 (2022).
9. M. Aguilar *et al.*, (AMS Collaboration), "Periodicities in the Daily Proton Fluxes from 2011 to 2019 Measured by the Alpha Magnetic Spectrometer on the International Space Station from 1 to 100 GV", Phys. Rev. Lett. **127**, 271102 (2021).
10. M. Aguilar *et al.*, (AMS Collaboration), "Properties of a New Group of Cosmic Nuclei: Results from the Alpha Magnetic Spectrometer on Sodium, Aluminum, and Nitrogen", Phys. Rev. Lett. **127**, 021101 (2021).
11. M. Aguilar *et al.*, (AMS Collaboration), "Properties of Heavy Secondary Fluorine Cosmic Rays: Results from the Alpha Magnetic Spectrometer", Phys. Rev. Lett. **126**, 081102 (2021). Editors' Suggestion
12. M. Aguilar *et al.*, (AMS Collaboration), "The Alpha Magnetic Spectrometer (AMS) on the international space station: Part II – Results from the first seven years", Physics Reports, **894**, 1-116 (2021).
13. M. Aguilar *et al.*, (AMS Collaboration), "Properties of Iron Primary Cosmic Rays: Results from the Alpha Magnetic Spectrometer", Phys. Rev. Lett. **126**, 041104 (2021). Featured in Physics

14. Y. Jia, Q. Yan, V. Choutko, H. Liu, and A. Oliva, "Nuclei charge measurement by the Alpha Magnetic Spectrometer silicon tracker", Nucl. Instrum. Methods Phys. Res., Sect. A 972, 164169 (2020).

15. M. Aguilar *et al.*, (AMS Collaboration), "Properties of Neon, Magnesium, and Silicon Primary Cosmic Rays Results from the Alpha Magnetic Spectrometer", Phys. Rev. Lett. **124**, 211102 (2020). Editors' Suggestion, also Featured in Physics

16. M. Aguilar *et al.*, (AMS Collaboration), "Properties of Cosmic Helium Isotopes Measured by the Alpha Magnetic Spectrometer", Phys. Rev. Lett. **123**, 181102 (2019). Editors' Suggestion

17. M. Aguilar *et al.*, (AMS Collaboration), "Towards Understanding the Origin of Cosmic-Ray Electrons", Phys. Rev. Lett. **122**, 101101 (2019).

18. M. Aguilar *et al.*, (AMS Collaboration), "Towards Understanding the Origin of Cosmic-Ray Positrons", Phys. Rev. Lett. **122**, 041102 (2019). Editors' Suggestion

19. M. Aguilar *et al.* (AMS Collaboration), "Precision Measurement of Cosmic-Ray Nitrogen and its Primary and Secondary Components with the Alpha Magnetic Spectrometer on the International Space Station", Phys. Rev. Lett. **121**, 051103 (2018).

20. M. Aguilar *et al.*, (AMS Collaboration), "Observation of Complex Time Structures in the Cosmic-Ray Electron and Positron Fluxes with the Alpha Magnetic Spectrometer on the International Space Station", Phys. Rev. Lett. **121**, 051102 (2018). Editors' Suggestion

21. M. Aguilar *et al.*, (AMS Collaboration), "Observation of Fine Time Structures in the Cosmic Proton and Helium Fluxes with the Alpha Magnetic Spectrometer on the International Space Station", Phys. Rev. Lett. **121**, 051101 (2018).

22. M. Aguilar *et al.*, (AMS Collaboration), "Observation of New Properties of Secondary Cosmic Rays Lithium, Beryllium, and Boron by the Alpha Magnetic Spectrometer on the International Space Station", Phys. Rev. Lett. **120**, 021101 (2018). Editors' Suggestion, also Featured in Physics

23. M. Aguilar *et al.*, (AMS Collaboration), "Observation of the Identical Rigidity Dependence of He, C, and O Cosmic Rays at High Rigidities by the Alpha Magnetic Spectrometer on the International Space Station", Phys. Rev. Lett. **119**, 251101 (2017).

CONFERENCE PROCEEDINGS

1. Y. Jia, (on behalf of the AMS Collaboration), "Precision Measurement of Daily Proton and Helium Fluxes by the Alpha Magnetic Spectrometer", Proceedings of the 38th International Cosmic Ray Conference (ICRC2023), Vol. 444.

2. Y. Jia, (on behalf of the AMS Collaboration), "Properties of Primary Cosmic Ray Protons, Helium, Carbon, and Oxygen Nuclei Measured with the Alpha Magnetic Spectrometer on the International Space Station", Proceedings of the 29th International Conference on Lepton and Photon Interactions (LP2019), Vol. 367.

3. Y. Jia, (on behalf of the AMS Collaboration), "Observation of the New Properties of the Secondary Cosmic Rays Lithium, Beryllium and Boron with the Alpha Magnetic Spectrometer on the International Space Station", Proceedings of the 39th International Conference on High Energy Physics (ICHEP2018), Vol. 340.

INVITED SEMINARS AND TALKS

"Experimental overview of neutrinos", Neutrinos and related New Physics Research (NuPhyR), Zhuhai, Guangzhou. *November 29 2025*

"JUNO Status", HEPiX Fall 2025 Workshop, Lanzhou. *November 3 2025*

"Measurements of the Cosmic Ray Nuclei with the Alpha Magnetic Spectrometer (AMS)", the Center for Nuclear Astrophysics across Messengers (CeNAM) Frontiers in Nuclear Astrophysics Meeting, Michigan State University, East Lansing. *May 25 2023*

"Time variations of cosmic ray particles measured by AMS", Space and Cosmic Ray Physics online Seminar at University of Maryland. *October 17 2022*

"Latest Results from the Alpha Magnetic Spectrometer", Center for Cosmology and Astroparticle Physics (CCAPP) seminar at Ohio State University, Columbus. *October 4 2022*

"Unique Properties of Cosmic Rays: Results from the Alpha Magnetic Spectrometer", 14th Conference on the Intersections of Particle and Nuclear Physics (CIPANP 2022), Lake Buena Vista, Florida, United States. *September 2 2022*

"Latest Results from the Alpha Magnetic Spectrometer: Precision Measurements of Daily Proton and Helium Fluxes", Laboratory for Nuclear Science Lunchtime Seminar, MIT. *September 14 2021*

"Alpha Magnetic Spectrometer on the International Space Station", Seminar at the experimental physics division, Institute of High Energy Physics (IHEP), Beijing, China. *November 22 2019*

"Precision Measurement of Elementary Particle and Nuclei Fluxes in Cosmic Rays with AMS on the International Space Station", Seminar at Princeton University. *January 15 2019*

CONFERENCES

"Unique Properties of Daily Proton Fluxes by the Alpha Magnetic Spectrometer", 45th Scientific Assembly of the Committee on Space Research (COSPAR), Busan, South Korea. *July 14 2024*

"Precision Measurement of Daily Proton and Helium Fluxes by the Alpha Magnetic Spectrometer", The 38th International Cosmic Ray Conference (ICRC2023), Nagoya, Japan. *August 2 2023*

"Precision Measurement of Daily Electron, Positron, Proton, and Helium Fluxes with the Alpha Magnetic Spectrometer" and "Unique Properties of Primary Cosmic Rays: Results from the Alpha Magnetic Spectrometer ", TeV Particle Astrophysics (TeVPA 2022), Queen's University, Kingston, Ontario, Canada. *August 8 - 12 2022*

"Unique Properties of Daily Proton Fluxes up to 100 GV", 44th Scientific Assembly of the Committee on Space Research (COSPAR), Athens, Greece. *July 17 2022*

"Precision Measurement of Periodicities in the Daily Proton Fluxes with AMS", The 37th International Cosmic Ray Conference (ICRC2021), Berlin, Germany. *July 14 2021*

"Precision measurements of ^{3}He-to-^{4}He ratio and individual ^{3}He and ^{4}He fluxes in Cosmic Rays with the Alpha Magnetic Spectrometer on the International Space Station", 43rd Scientific Assembly of the Committee on Space Research (COSPAR), Sydney, Australia. *January 28 - February 4 2021*

"Properties of secondary cosmic-ray nuclei by AMS on International Space Station", 2019 Meeting of the Division of Particles & Fields of the American Physical Society (DPF2019), Northeastern University, Boston, US. *July 29 - August 1 2019*

"Properties of Primary Cosmic Ray Protons, Helium, Carbon and Oxygen Nuclei Measured with the Alpha Magnetic Spectrometer on the ISS", The 29th International Symposium on Lepton Photon Interactions at High Energies (LP2019), Toronto, Canada. *August 5 - 10 2019*

"Precision measurement of the Energy Dependence of Primary and Secondary Cosmic Rays with the Alpha Magnetic Spectrometer on the International Space Station", The 27th International Workshop on Weak Interactions and Neutrinos (WIN2019), Bari, Italy. *June 2 - 8 2019*

"Observation of New Properties of Secondary Cosmic Rays Lithium, Beryllium, and Boron by the Alpha Magnetic Spectrometer on the International Space Station", International Conference on High Energy Physics (ICHEP), Seoul, Korea. *July 4 - 11 2018*

TEACHING AND MENTORSHIP

Lecturer of MIT 8.02 undergraduate course "Electricity and Magnetism" using the Technology Enabled Active Learning (TEAL) format *Fall 2023*

Jorge A Martinez, undergraduate at MIT *Summer 2022*
Topic: Design of a particle detector to measure gamma ray polarization in space

Giannii LaVecchia, graduate student at MIT *2021 - Current*
Topic: Cosmic isotopes measured with AMS

LEADERSHIP, SERVICE, AND OUTREACH

Leader of Analysis Group *2020 - Current*

· Leading the analysis of daily proton and helium fluxes in cosmic rays at MIT and the comparison with other International groups, including Hawaii University and INFN Sezione di Milano–Bicocca, Italy.

Lead Position in Detector Monitoring *2019 - 2020*

· Monitored AMS operation through commands from the AMS Payload Operations Control Centre (POCC) at CERN to NASA.
· Coordinated the monitoring of all sub-detectors at two control centers located at CERN and Taiwan.

Dean's Advisory Committee Meeting *March 2022*

· Presentation on behalf of the AMS-MIT group to the Dean's Advisory Committee for the Laboratory for Nuclear Science at MIT.

Conference Organization

· Member of the International Advisory Committee for the Center for Nuclear Astrophysics across Messengers (CeNAM) Frontiers in Nuclear Astrophysics Meeting, Michigan State University. *2023*
· Convener in cosmic ray session at TeVPA conference, Canada. *2022*
· Organizer of the "AMS Days at La Palma" conference, Spain. *2018*

Referee of Journals

· Physical Review Letters (PRL)
· Nuclear Instruments and Methods in Physics Research - section A (NIM-A)

Outreach

· Organized meetings with students and astronauts, including Luca Parmitano from European Space Agency and Chris Cassidy from NASA. *2021*
· Activities in filming the documentary "Among the Stars" on Disney Plus. *2019*