

(1) CV

[Master's thesis research and new product development research at general companies]

April 1995 - July 2002

After entering graduate school at Nagoya University in 1995, he became involved in physical experiments using high-energy beams using accelerators. In the master's program, he participated in a direct detection experiment of neutrino particles, and worked on developing a three-dimensional trajectory detector for charged particles that are generated simultaneously with neutrinos, which he wrote in his master's thesis.

I worked as an engineer at a general company for about 5 years and developed a new product, "In-vehicle sensors for competition vehicles (GPS, 6-component force meter, and analyzes driving operations to quantitatively evaluate driving skills)" at Suzuka Circuit Formula Racing School.

[Dissertation research] April 2003 to November 19, 2006

At Kyoto University's Nuclear Hadron Laboratory, he belonged to the Relativistic Heavy Ion Collider (RHIC) experimental group under the guidance of then Associate Professor Saito, and was engaged in the development of a polarization meter using a polarized hydrogen target. Resident at Brookhaven National Laboratory (BNL), under the guidance of Dr. Gerry Bunce and Dr. Alessandro Bravar, he worked consistently on the design, development, and practical application of the world's only polarized proton accelerator beam polarization meter. It is summarized in a dissertation and major academic papers [1]. All experimental results from a polarized proton accelerator have meaning as physical quantities only after they are normalized by the proton beam polarization measured by this polarization meter. My first research result was the creation of a beam polarization meter, which is essential for evaluating the performance of polarized proton accelerators and for obtaining physical results from RHIC spin experiments. This achievement was recognized, and we won the RHIC-AGS Thesis Award Competition 2007 1st place (out of 10 candidates).

[Research associate] November 20, 2006 to June 2008

Belongs to the BNL Medium energy group (leader Dr. Gerry Bunce) and participates in the STAR experiment. Engaged in construction of Forward Meson Spectrometer. During the RUN8 period from February to mid-March 2008, I was in charge of setting up the polarized hydrogen target polarization meter and online data analysis. After that, offline analysis was also performed, and the final beam polarization was announced to the experimental group. She published a summary of these research results in a major paper [2] and won the 4th Young Encouragement Award (Experimental Nuclear Physics) from the Physical Society of Japan in 2010.

[Researcher (Scientific Research), High-Intensity Proton Accelerator Program Promotion Department, Postdoctoral Researcher, KEK Institute for Nuclear Sciences]

July 2008 - March 2011

Belongs to the group of Professor Saito (at the time) of the High-Intensity Proton Accelerator Project Promotion Department and participates in the W Trigger project of the PHENIX experiment. Launched the basic concept of the "J-PARC muon g-2/EDM experiment" that takes advantage of the features of JPARC's new muon beam line, and was engaged in verifying feasibility and accuracy, and designing the detector to be placed in the storage ring [3]. LOI was submitted to KEK Nuclear Research Institute PAC in July 2009.

[KEK Accelerator Research Facility 4th Research Division] April 2011 - September 2016

Engaged in main ring construction work for SuperKEKB. We worked on a new design and fabrication of normal conducting magnets to be installed near the collision points of electron and positron beam lines. In 2016, we worked on maintaining the hundreds of normal conductive electromagnets on the beamline, which has a 3km circumference, including measuring the magnetic field before beamline installation, alignment work during beamline installation, and checking power connections before operation. It contributed to the Phase 1 operation of the SuperKEKB project, which was conducted from April to July 2018. We also summarized our results in papers.

Meanwhile, the "J-PARC muon g-2/EDM experiment" continued, contributing to the submission of the experimental conceptual design document (CDR) in January 2012 and the technical design document (TDR) in May 2015. Furthermore, the applicant's original idea of the three-dimensional helical beam injection method was summarized and published in an academic paper [4]. In order to demonstrate this injection method, we set up a beamline device using an electron gun with support from the Grants-in-Aid for Scientific Research shown below.

- Young Researcher B Project Number 23740216 (Representative) Allocation amount: 4,550,000 yen (of which direct expenses: 3,500,000 yen)

- Fundamental research B Project number 26287055 (representative) Allocation amount: 12,480,000 yen (of which direct expenses: 9,600,000 yen)

"Demonstration test of beam injection into a solenoid storage magnet using a three-dimensional spiral trajectory" April 2014 - March 2018

[Associate Professor, Department of Quantum Beam Science, Graduate School of Science and Engineering, Ibaraki University] October 2016 - Present

He has been stationed at the "Tokai Satellite Campus" (located within the Ibaraki Quantum Beam Research Center) established by Ibaraki University since 2016 and is working full-time on the J-PARC muon g-2/EDM experiment. The details of the experimental technology development are summarized in [3], and the results of demonstration experiments of three-dimensional spiral orbit

injection in a beam line device using an electron gun are reported at domestic and international conferences. Currently, we are receiving support from the following Grants-in-Aid for Scientific Research.

- Fundamental research A Project number 19H00673 (representative), Allocation amount: 34,840,000 yen (of which direct expenses: 26,800,000 yen)

"Demonstration test of beam injection into a solenoid storage magnet using a three-dimensional spiral trajectory" April 2014 - March 2018

- Fundamental Research A Project Number 18H03707 (shared), April 2018 - March 2020

"Realization of low-speed section of muon linear accelerator for precise measurement of muon anomalous magnetic efficiency"

- Specially promoted research project number 20H05625 (shared), July 2020 - March 2026

"Ultra-precision measurement of muon anomalous magnetic efficiency and electric dipole efficiency"

Received the 10th Toshiko Yuasa Award (Silver Prize) in 2022 for the results of conceptual design and demonstration experiments of three-dimensional spiral orbit injection [3,4].

Furthermore, in addition to activities related to the J-PARC muon g-2/EDM experiment (E34), we are also involved in the muon ultrafine structure precision measurement experiment (MuSEUM), which is working on the use of ultraprecision magnetic fields as a common technology development, and the muon Penning trap experiment. He is also actively engaged in developing new research activities that make the most of the J-PARC MLF muon beamline for fundamental physics experiments (H-Line) [Explanatory paper, Japanese only].

- Challenging research (exploratory) Project number 19K21872 (representative), allocation amount: 6,500,000 yen (of which direct expenses: 5,000,000 yen)

"Development of precision muon measurement method using Penning trap" April 2019 - March 2021

- Fundamental Research S Project Number 18H03707 (Sharing), April 2018 - March 2020

"Precise measurement of muon mass and magnetic moment using electromagnetic traps and search for new physics."

(3) Major recent publications

[1] "Measurement of the analyzing power in pp elastic scattering in the peak CNI region at RHIC", H. Okada(IINUMA), I.G. Alekseev, A. Bravar, G. Bunce, S. Dhawan, R. Gill, W. Haeberli, O. Jinnouchi, A. Khodinov, A. Kponou *et al.*. Feb 2005. 4 pp.

Published in Phys.Lett. B638 (2006) 450-454. <https://doi.org/10.1016/j.physletb.2006.06.008>

[2] "[Measurements of single and double spin asymmetry in pp elastic scattering in the CNI region with a polarized atomic hydrogen gas jet target](#)", I.G. Alekseev, A. Bravar, G. Bunce, S. Dhawan, K.O. Eyser, R. Gill, W. Haeberli, H. Huang, O. Jinnouchi, A. Kponou, H.Okada(IINUMA), *et al.*. May 1, 2009. 18 pp. Phys.Rev. D79 (2009) 094014. <https://doi.org/10.1103/PhysRevD.79.094014>

[3] "New approach to the muon g-2 and EDM experiment at J-PARC"

H.Iinuma, 2011. 5 pp. Published in J.Phys.Conf.Ser. 295 (2011) 012032

国際会議論文 9th International Spin Physics Symposium (SPIN2010) 27 September–2 October, 2010, Jülich, Germany (peer-reviewed paper)

[4] "Three dimensional spiral injection scheme for the g-2/EDM experiment at J-PARC", H. Iinuma,

H. Nakayama, Katsunobu Oide, Ken-ichi Sasaki, Naohito Saito, Tsutomu Mibe and Mitsushi Abe.

Oct 1. 2016 12pp, Published in: Nucl.Instrum.Meth.A 832 (2016) 51-62.

<https://doi.org/10.1016/j.nima.2016.05.126> (peer-reviewed paper)

[5] "A New Approach for measuring the Muon Anomalous Magnetic Moment and Electric Dipole Moment", M. Abe *et.al.*, Jan 10, 2019. 24pp. Published in PTEP 2019 (2019) 5, 053C02.

<https://doi.org/10.1093/ptep/ptz030> (peer-reviewed paper)

[6] "Precise control of a strong X-Y coupling beam transportation for J-PARC muon g-2/EDM experiment", H. Iinuma et al., in Proc. IPAC'23, Venice, Italy, May 2023, pp. 304-307.

doi:10.18429/JACoW-IPAC2023-MOPA110

[7] "Design of a Strong X-Y Coupling Beam Transport Line for J-PARC Muon g-2/EDM Experiment"

"H. Iinuma, H. Nakayama, M.Abe, K. Sasaki, T. Mibe. IEEE Transactions on Applied Superconductivity, vol. 32 no. 6, pp. 1-5(2022) doi: 10.1109/TASC.2022.3161889

[8] "Demonstration of three-dimensional spiral injection for the J-PARC muon g-2/EDM

experiment", R. Matsushita et al., in Proc. IPAC'23, Venice, Italy, May 2023, pp. 327-330.

doi:10.18429/JACoW-IPAC2023-MOPA118

[9] "Design Method of Active Shield Steering Magnet for Fine Tuning of Muon Injection Orbit Into g-2/EDM Precision Measurements Magnet",

M. Abe, H. Iinuma, K. Sasaki, et al., IEEE Transactions on Applied Superconductivity, vol. 32 no. 6, pp. 1-5 (2022) doi: 10.1109/TASC.2022.3190247

[10] "Development of Precise Shimming Technique With Materials Having Low Saturation Magnetization",

K. Sasaki, H. Iinuma, M. Abe, et al., IEEE Transactions on Applied Superconductivity, vol. 32 no. 6, pp. 1-7 (2022) doi: 10.1109/TASC.2022.3190803

[11] "Magnetic design and method of a superconducting magnet for muon g-2 /EDM precise measurements in a cylindrical volume with homogeneous magnetic field",

M. Abe, Y. Murata, H. Iinuma, T. Ogitsu, N. Saito, K. Sasaki, T. Mibe, H. Nakayama. May 11, 2018.
13 pages Published in: Nucl.Instrum.Meth.A 890 (2018) 51-63.

<https://doi.org/10.1016/j.nima.2018.01.026>