

# DEREK FUJIMOTO

## CURRICULUM VITAE

### TRIUMF

4004 Wesbrook Mall, Vancouver, BC, V6T 2A3  
778 873 0054  
dfujimoto@triumf.ca

### EDUCATION

2021	University of British Columbia	Ph.D. (Physics)
2015	University of British Columbia	M.Sc. (Physics)
2013	McGill University	B.Sc. (Physics)

### PROFESSIONAL EMPLOYMENT

2021–	Postdoctoral Researcher	TRIUMF
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### AWARDS

- 2017 Killam Graduate Teaching Assistant Award.
- 2015 Stuart Blussom Quantum Matter Institute QuEST Fellowship.

### REFEREED PUBLICATIONS

- 2024 M. Zhao, R. Mammei, D. Fujimoto, “QuSpin Zero-Field Magnetometer Characterization for the TUCAN Experiment”, *Meas. Sci. Technol.*, **36**, 015113 (2024).
- 2024 T. Higuchi, H. Akatsuka, A. Brossard, D. Fujimoto, *et al*, “Polarized Cold-neutron Reflectometry at JRR-3/MINE2 for the Development of Ultracold-neutron Spin Analyzers for a Neutron EDM Experiment at TRIUMF”, *J. Phys. Soc. Jpn.*, **93**, 091009 (2024).
- 2024 E. Thoeng, M. Asaduzzaman, P. Kolb, R. M. L. McFadden, G. D. Morris, J. O. Ticknor, S. R. Dunsiger, V. L. Karner, D. Fujimoto, *et al*, “Depth-resolved characterization of Meissner screening breakdown in surface treated niobium”, *Sci. Rep.*, **14**, 21487 (2024).
- 2023 D. Fujimoto, V. L. Karner, M. H. Dehn, *et al*, “Near-surface dynamics of the ionic liquid EMIM-Ac above and below the glass transition”, *J. Phys. Conf. Ser.*, **2462**, 1, 012051 (2023).
- 2023 D. Fujimoto, O. Brazil, W. C. Oliver, *et al*, “<sup>8</sup>Li Spin Relaxation as a Probe of the Modification of Molecular Dynamics by Inelastic Deformation of Glassy Polystyrene”, *J. Phys. Conf. Ser.*, **2462**, 1, 012053 (2023).
- 2023 J. O. Ticknor, J. Adelman, A. Chatzichristos, M. H. Dehn, L. Egoriti, D. Fujimoto, *et al*, “Ion-Implanted <sup>8</sup>Li Nuclear Magnetic Resonance in Highly Oriented Pyrolytic Graphite”, *Phys. Rev. B*, **108**, 195437 (2023).
- 2023 W. A. MacFarlane, D. Fujimoto, R. M. L. McFadden, “Inverse Laplace Transform Approaches to  $\beta$ NMR Relaxation”, *J. Phys. Conf. Ser.*, **2462**, 1, 012015 (2023).

- 2023 V. L. Karner, A. Chatzichristos, D. Fujimoto, *et al*, “Effects of the rhombohedral distortion in  $\text{LaAlO}_3$  on the quadrupolar splitting of the implanted  $^8\text{Li}^+$  NMR”, *J. Phys. Conf. Ser.*, **2462**, 1, 012058 (2023).
- 2023 W. A. MacFarlane, M. Oudah, R. M. L. McFadden, D. Huang, A. C. Chatzichristos, D. Fujimoto, *et al*, “ $^8\text{Li}$   $\beta$ NMR studies of Epitaxial Thin Films of the 3D topological Dirac semimetal  $\text{Sr}_3\text{SnO}$ ”, *J. Phys. Conf. Ser.*, **2462**, 1, 012057 (2023).
- 2023 W. A. MacFarlane, J. K. Shenton, Z. Salman, A. Chatzichristos, D. L. Cortie, M. Dehn, D. Fujimoto, *et al*, “The Site and High Field  $\beta$ NMR Properties of  $^8\text{Li}^+$  Implanted in  $\alpha\text{-Al}_2\text{O}_3$ ”, *J. Phys. Conf. Ser.*, **2462**, 1, 012009 (2023).
- 2023 E. Thoeng, R. M. L. McFadden, S. Saminathan, G. D. Morris, P. Kolb, B. Matheson, M. Asaduzzaman, R. Baartman, S. Dunsiger, D. Fujimoto, *et al*, “A New High Parallel-Field Spectrometer at TRIUMF’s  $\beta$ -NMR Facility”, *Rev. Sci. Instrum.*, **94**, 023305 (2023).
- 2023 R. Matsumiya, H. Akatsuka, C. P. Bidinosti, C. A. Davis, B. Franke, D. Fujimoto, (et al), “The Precision nEDM Measurement with UltraCold Neutrons at TRIUMF”, *JPS Conf. Proc.*, **37**, 020701 (2023).
- 2022 R. M. L. McFadden, D. Szunyogh, N. Bravo-Frank, A. Chatzichristos, M. H. Dehn, D. Fujimoto, *et al*, “Magnesium(II)-ATP Complexes in 1-Ethyl-3-Methylimidazolium Acetate Solutions Characterized by  $^{31}\text{Mg}$   $\beta$ -Radiation-Detected NMR Spectroscopy”, *Angew. Chem. Int. Ed.*, **61**, 35, e202207137 (2022).
- 2022 J. R. Adelman, D. Fujimoto, *et al*, “Nuclear magnetic resonance of  $^8\text{Li}$  ions implanted in  $\text{ZnO}$ ”, *Phys. Rev. B*, 106, 035205 (2022).
- 2022 Y. Komatsu, R. Shimizu, R. Sato, M. Wilde, K. Nishio, T. Katase, D. Matsumura, H. Saitoh, M. Miyauchi, J. R. Adelman, R. M. L. McFadden, D. Fujimoto, *et al*, “Repeatable Photoinduced Insulator-to-Metal Transition in Yttrium Oxyhydride Epitaxial Thin Films”, *Chem. Mat.*, **34**, 8, 3616–3623 (2022).
- 2022 I. McKenzie, D. Fujimoto, *et al*, “A  $\beta$ -NMR study of the depth, temperature, and molecular-weight dependence of secondary dynamics in polystyrene: Entropy–enthalpy compensation and dynamic gradients near the free surface”, *J. Chem. Phys.*, **156**, 8, 084903 (2022).
- 2021 D. Fujimoto, “bfit: A Python Application For Beta-Detected NMR”, *J. Open Source Softw.*, **6**, 65 (2021).
- 2021 V. L. Karner, A. Chatzichristos, D. L. Cortie, D. Fujimoto, *et al*, “Evolution of the metallic state in  $\text{LaNiO}_3/\text{LaAlO}_3$  superlattices measured by  $^8\text{Li}$   $\beta$ -detected NMR”, *Phys. Rev. B*, **104**, 20, 205114 (2021).
- 2020 D. Fujimoto, W. A. MacFarlane, J. Rottler, “Energy barriers and cooperative motion at the surface of freestanding glassy polystyrene films”, *J. Chem. Phys.*, **153**, 15, 154901 (2020).
- 2020 R. M. L. McFadden, A. Chatzichristos, D. L. Cortie, D. Fujimoto, *et al*, “Local electronic and magnetic properties of the doped topological insulators  $\text{Bi}_2\text{Se}_3\text{:Ca}$  and  $\text{Bi}_2\text{Te}_3\text{:Mn}$  investigated using ion-implanted  $^8\text{Li}$   $\beta$ -NMR”, *Phys. Rev. B*, **102**, 235206 (2020).

- 2020 J. O. Ticknor, I. Umegaki, R. M. L. McFadden, V. L. Karner, A. Chatzichristos, D. Fujimoto, *et al*, “Investigation of Ionic and Anomalous Magnetic Behavior in CrSe<sub>2</sub> Using <sup>8</sup>Li  $\beta$ -NMR”, *RSC Adv.*, **10**, 8190–8197 (2020).
- 2019 D. Fujimoto, R. M. L. McFadden, *et al*, “The dynamics of liquid 1-ethyl-3-methylimidazolium acetate measured with implanted-ion <sup>8</sup>Li  $\beta$ -NMR”, *Chem. Mat.*, **31**, 22, 9346–9353 (2019).  
(16 authors)
- 2019 R. M. L. McFadden, A. Chatzichristos, K. H. Chow, D. L. Cortie, M. H. Dehn, D. Fujimoto, *et al*, “Ionic and electronic properties of the topological insulator Bi<sub>2</sub>Te<sub>2</sub>Se investigated via  $\beta$ -detected nuclear magnetic relaxation and resonance of <sup>8</sup>Li”, *Phys. Rev. B*, **99**, 125201 (2019).
- 2019 V. L. Karner, A. Chatzichristos, D. L. Cortie, M. H. Dehn, O. Foyevtsov, K. Foyevtsova, D. Fujimoto, *et al*, “Local Metallic and Structural Properties of the Strongly Correlated Metal LaNiO<sub>3</sub> using <sup>8</sup>Li  $\beta$ -NMR”, *Phys. Rev. B*, **100**, 16, 165109 (2019).
- 2019 A. Chatzichristos, R. M. L. McFadden, M. H. Dehn, S. R. Dunsiger, D. Fujimoto, *et al*, “Bi-Arrhenius diffusion and surface trapping of <sup>8</sup>Li<sup>+</sup> in rutile TiO<sub>2</sub>”, *Phys. Rev. Lett.*, **123**, 9, 095901 (2019).
- 2018 D. M. Szunyogh, R. M. L. McFadden, V. L. Karner, A. Chatzichristos, T. D. Goodacre, M. H. Dehn, L. Formenti, D. Fujimoto, *et al*, “Direct observation of Mg<sup>2+</sup> complexes in ionic liquid solutions by <sup>31</sup>Mg  $\beta$ -NMR spectroscopy”, *Dalt. Trans.*, **47**, 41, 14431–14435 (2018).
- 2018 I. McKenzie, Y. Chai, D. L. Cortie, J. A. Forrest, D. Fujimoto, *et al*, “Direct measurements of the temperature, depth and processing dependence of phenyl ring dynamics in polystyrene thin films by  $\beta$ -detected NMR”, *Soft Matter*, **14**, 36, 7291–7544 (2018).
- 2018 R. M. L. McFadden, A. Chatzichristos, M. H. Dehn, D. Fujimoto, *et al*, “On the Use of <sup>31</sup>Mg for  $\beta$ -Detected NMR Studies of Solids”, *JPS Conf. Proc.*, **21**, 011047 (2018).
- 2018 V. L. Karner, R. M. L. McFadden, M. H. Dehn, D. Fujimoto, *et al*, “Beta-Detected NMR of LSAT and YSZ”, *JPS Conf. Proc.*, **21**, 011024 (2018).
- 2016 D. Fujimoto, C. Hearty, “Characterization of the aging and excess noise of a Hamamatsu fine mesh photopentode.”, *Nucl. Instrum. Methods Phys. Res. Sect. A*, **823**, 149–155 (2016).

## MANUSCRIPTS IN PREPARATION

- 2025 W. A. MacFarlane, R. M. L. McFadden, S. Spencer, A. Chatzichristos, J. O. Ticknor, J. H. Brewer, D. L. Cortie, M. H. Dehn, S. R. Dunsiger, D. Fujimoto, *et al*, “ $\beta$ NMR of <sup>8</sup>Li<sup>+</sup> Implanted in  $\alpha$ -Quartz”, *Phys Rev B*. (2025).

## CONFERENCE PRESENTATIONS

- 2023 nEDM2023 - The 5th Workshop on Searches for a Neutron Electric Dipole Moment  
“Overview and Status of the TUCAN EDM Experiment” (Oral)

- 2023 New physics searches at the precision frontier (INT-23-1b)  
 “Progress and Goals of the TRIUMF nEDM Measurement” (Oral)
- 2023 Winter Nuclear & Particle Physics Conference 2023  
 “An Introduction to the TUCAN EDM Measurement” (Oral)
- 2022 15th International Conference on Muon Spin Rotation Relaxation and Resonance  
 “First depth-resolved beta-NMR measurements of 1-ethyl-3-methylimidazolium acetate” (Oral)
- 2022 15th International Conference on Muon Spin Rotation Relaxation and Resonance  
 “Near-surface dynamics of 1-ethyl-3-methylimidazolium acetate above and below the glass transition” (Poster)
- 2022 15th International Conference on Muon Spin Rotation Relaxation and Resonance  
 “ $^8\text{Li}$  spin relaxation as a probe of the modification of molecular dynamics by inelastic deformation of glassy polystyrene” (Poster)
- 2022 15th International Conference on Muon Spin Rotation Relaxation and Resonance  
 “Inverse Laplace transform approaches to  $\beta\text{NMR}$  relaxation” (Poster)
- 2020 American Physical Society March Meeting (virtual session)  
 “Ionic liquid dynamics measured with implanted-ion  $\beta\text{-NMR}$ ” (Oral)
- 2020 American Physical Society March Meeting (COVID cancelled)  
 “Surface and bulk dynamics of compressed polystyrene films: A  $\beta\text{-NMR}$  study” (Poster)
- 2018 American Physical Society March Meeting  
 “Molecular Dynamics of Polystyrene Films: Comparison Between Atomistic Simulations and beta-NMR Measurements” (Oral)
- 2017 The 14th International Conference on Muon Spin Rotation, Relaxation and Resonance  
 “ $\beta\text{NMR}$  studies of Enhanced Dynamics in Polymer Thin Films” (Oral)
- 2017 The 14th International Conference on Muon Spin Rotation, Relaxation and Resonance  
 “Spin-lattice relaxation in  $\beta\text{NMR}$  through molecular dynamics” (Poster)
- 2015 The 21st Belle II General Meeting  
 “Hamamatsu Photopentode Excess Noise Factor” (Oral)
- 2015 16th Annual Meeting of the APS Northwest Section  
 “A Belle II Custom Photomultiplier Tube” (Oral)

## TEACHING

2019	Instructor	Enriched Experimental Physics
2016–18	Instructor	Enriched Physics I Laboratory
2016–17	Instructor	Experimental Physics Lab
2016–18	Head Teaching Assistant	Experimental Physics Lab
2015, 19	Head Teaching Assistant	Enriched Experimental Physics
2014–18	Head Teaching Assistant	Enriched Physics I Laboratory
2016–17	Teaching Assistant	Experimental Physics Lab
2014–15, 19	Teaching Assistant	Enriched Experimental Physics

## **SUPERVISED STUDENTS**

- 2024 M. Zhao, Undergraduate Coop.  
UBC Department of Physics and Astronomy
- 2023 A. Sankaran, Undergraduate Coop.  
UBC Department of Mechanical Engineering
- 2023 P. Luers, Undergraduate Coop.  
UBC Department of Physics and Astronomy
- 2023 T. Peterson, Undergraduate Coop.  
UNBC Department of Physics
- 2023 P. Berard, Undergraduate Coop.  
UBC Department of Mechanical Engineering
- 2022 R. Curtis, Undergraduate Coop.  
UBC Department of Physics and Astronomy
- 2022, 24 L. Smith, Undergraduate Coop.  
UBC Department of Mechanical Engineering

## **COMPLEMENTARY EDUCATION**

- 2023 Crane Operator Training.  
TRIUMF
- 2022 Advanced Radiation Protection Training (Nuclear Energy Worker).  
TRIUMF
- 2018 Instructional Skills Workshop.  
UBC Centre for Teaching, Learning, and Technology
- 2014, 17–18 Creating Inclusive Classrooms.  
UBC Centre for Teaching, Learning, and Technology
- 2013 TA Professional Development Workshop.  
UBC Department of Physics and Astronomy

## **UNIVERSITY SERVICE**

- 2023 WNPPC Student Poster Judge.
- 2022 WNPPC Student Presentation Judge.
- 2018 Graduate Course Load Review Committee.

## **RELATED WORK**

- Software API for interfacing with various Siglent devices using SCPI commands.  
<https://github.com/ucn-triumf/SiglentDevices>
- Software Unofficial QuSpin Zero Field Magnetometer DAQ and control API.  
<https://pypi.org/project/QZFM/>

- Software  $\beta$ -NMR and  $\beta$ -NQR data fitting and visualization GUI and API.  
<https://pypi.org/project/bfit/>
- Software Muon data (MUD) file reader and asymmetry calculator for  $\beta$ -NMR and  $\beta$ -NQR at TRIUMF.  
<https://pypi.org/project/bdata/>
- Software Muon data (MUD) file reader for  $\mu$ SR at TRIUMF.  
<https://pypi.org/project/mud-py/>
- Software GUI for the viewing and comparison of CCD images taken for the  $\beta$ -NMR and  $\beta$ -NQR experiments at TRIUMF.  
<https://pypi.org/project/bccd/>
- Hardware  $\beta$ -NMR spectrometer high-temperature upgrade.

## SKILLS

- Languages English (native), French (good).  
Python, L<sup>A</sup>T<sub>E</sub>X, Julia, Cython, MATLAB, ROOT, C++, BASH.
- Experimental Magnetic shielding,  $\beta$ -NMR,  $\beta$ -NQR, logic circuits, photomultiplier tubes, calorimetry, UHV systems, experiment & equipment design, clean room, cryogenics, ion beams.
- Computational Molecular dynamics, LAMMPS, Monte-Carlo, Gaussian DFT, curve fitting, data processing, Tkinter.
- Engineering Solidworks, 3D printing.
- Teaching Learner-centered, inquiry-based, evidence-based, Socratic questioning, course and rubric design, learning goals, creating inclusive classrooms.
- Soft Skills Leadership, organization, communication, presentations, safety.