

# 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

- 2025 W. A. MacFarlane, R. M. L. McFadden, S. L. Spencer, A. Chatzichristos, J. O. Ticknor, D. L. Cortie, M. H. Dehn, S. R. Dunsiger, D. Fujimoto, *et al*, “Lithium ion dynamics in synthetic quartz studied via the NMR of implanted  $^8\text{Li}^+$ ”, *Phys Rev B*. (2025).
- 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*, “ $^8\text{Li}$  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  $^8\text{Li}$  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  $\beta\text{NMR}$  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*, “ $^8\text{Li}$   $\beta\text{NMR}$  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  $\beta\text{NMR}$  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  $\beta\text{-NMR}$  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  $^{31}\text{Mg}$   $\beta\text{-Radiation}$ -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  $\beta\text{-NMR}$  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  $^8\text{Li}$   $\beta\text{-detected}$  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 Bi<sub>2</sub>Se<sub>3</sub>:Ca and Bi<sub>2</sub>Te<sub>3</sub>:Mn investigated using ion-implanted <sup>8</sup>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).

## 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
2013–18	Teaching Assistant	Enriched Physics I Laboratory

## **SUPERVISED STUDENTS**

2025	R. Stutters, Undergraduate Coop. UBC Engineering Physics
2024	N. Lo, Undergraduate Coop. U. Victoria Department of Mechanical Engineering
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.

## 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.