# 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 |

## AWARDS

2017 Killam Graduate Teaching Assistant Award.

2015 Stuart Blussom Quantum Matter Institute QuEST Fellowship.

## REFEREED PUBLICATIONS

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).
(16 authors)

2023 D. Fujimoto, O. Brazil, W. C. Oliver, *et al*, "$^{8}$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).
(19 authors)

2021 D. Fujimoto, "bfit: A Python Application For Beta-Detected NMR", *J. Open Source Softw.*, **6**, 65 (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).

2019 D. Fujimoto, R. M. L. McFadden, *et al*, "The dynamics of liquid 1-ethyl-3-methylimidazolium acetate measured with implanted-ion $^{8}$Li $\beta$-NMR", *Chem. Mat.*, **31**, 22, 9346–9353 (2019).
(16 authors)

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).

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 $LaAlO_3$ on the quadrupolar splitting of the implanted $^8Li^+$ NMR", *J. Phys. Conf. Ser.*, **2462**, 1, 012058 (2023).
(11 authors)

2023 W. A. MacFarlane, M. Oudah R. M. L. McFadden, D. Huang, A. C. Chatzichristos, D. Fujimoto, *et al*, "$^8$Li $\beta$NMR studies of Epitaxial Thin Films of the 3D topological Dirac semimetal $Sr_3SnO$", *J. Phys. Conf. Ser.*, **2462**, 1, 012057 (2023).
(18 authors)

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 $^8Li^+$ Implanted in $\alpha$-$Al_2O_3$", *J. Phys. Conf. Ser.*, **2462**, 1, 012009 (2023).
(17 authors)

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).
(19 authors)

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).
(48 authors)

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 $^{31}$Mg $\beta$-Radiation-Detected NMR Spectroscopy", *Angew. Chem. Int. Ed.*, **61**, 35, e202207137 (2022).
(25 authors)

2022 J. R. Adelman, D. Fujimoto, *et al*, "Nuclear magnetic resonance of $^8$Li ions implanted in ZnO", *Phys. Rev. B* (2022).
(17 authors)

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).
(21 authors)

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).
(12 authors)

2021 V. L. Karner, A. Chatzichristos, D. L. Cortie, D. Fujimoto, *et al*, "Evolution of the metallic state in $LaNiO_3/LaAlO_3$ superlattices measured by $^8$Li $\beta$-detected NMR", *Phys. Rev. B*, **104**, 20, 205114 (2021).
(16 authors)

2020 R. M. L. McFadden, A. Chatzichristos, D. L. Cortie, D. Fujimoto, *et al*, "Local electronic and magnetic properties of the doped topological insulators $Bi_2Se_3$:Ca and $Bi_2Te_3$:Mn investigated using ion-implanted $^8$Li $\beta$-NMR", *Phys. Rev. B*, **102**, 235206 (2020).
(16 authors)

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 $CrSe_2$ Using $^8$Li $\beta$-NMR", *RSC Adv.*, **10**, 8190–8197 (2020).
(15 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 $Bi_2Te_2Se$ investigated via $\beta$-detected nuclear magnetic relaxation and resonance of $^8$Li", *Phys. Rev. B*, **99**, 125201 (2019).
(19 authors)

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 $LaNiO_3$ using $^8$Li $\beta$-NMR", *Phys. Rev. B*, **100**, 16, 165109 (2019).
(22 authors)

2019 A. Chatzichristos, R. M. L. McFadden, M. H. Dehn, S. R. Dunsiger, D. Fujimoto, *et al*, "Bi-Arrhenius diffusion and surface trapping of $^8Li^+$ in rutile $TiO_2$", *Phys. Rev. Lett.*, **123**, 9, 095901 (2019).
(15 authors)

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 $Mg^{2+}$ complexes in ionic liquid solutions by $^{31}$Mg $\beta$-NMR spectroscopy", *Dalt. Trans.*, **47**, 41, 14431–14435 (2018).
(26 authors)

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).
(13 authors)

2018 R. M. L. McFadden, A. Chatzichristos, M. H. Dehn, D. Fujimoto, *et al*, "On the Use of $^{31}$Mg for $\beta$-Detected NMR Studies of Solids", *JPS Conf. Proc.*, **21**, 011047 (2018).
(20 authors)

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).
(12 authors)

## MANUSCRIPTS IN PREPARATION

in press J. O. Ticknor, J. Adelman, A. Chatzichristos, M. H. Dehn, L. Egoriti, D. Fujimoto, *et al*, "Ion-Implanted $^{8}$Li Nuclear Magnetic Resonance in Highly Oriented Pyrolytic Graphite", *Phys. Rev. B*, arXiv:2301.07821 (in press). (16 authors)

## CONFERENCE PRESENTATIONS

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
"$^{8}$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 $\beta$NMR relaxation" (Poster)

2020 American Physical Society March Meeting (virtual session)
"Ionic liquid dynamics measured with implanted-ion $\beta$-NMR" (Oral)

2020 American Physical Society March Meeting (COVID cancelled)
"Surface and bulk dynamics of compressed polystyrene films: A $\beta$-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
"$\beta$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 $\beta$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)

## EXPERIMENTS

2020– D. Fujimoto, W. A. MacFarlane, "Interfacial dynamics of ionic liquids and glasses measured with $\beta$-NMR", *TRIUMF Experiment*, **M2072**, Approved (2020–).

2019–20 D. Fujimoto, R. F. Kiefl, W. A. MacFarlane, "Depth-resolved dynamics in polymer thin films near the glass transition using $\beta$NMR", *TRIUMF Experiment*, **M1892**, Closed (2019–20).

2018– D. Fujimoto, G. L. W. Cross, W. A. MacFarlane, "The modification of polymer dynamics by plastic deformation studied by $^8$Li $\beta$NMR", *TRIUMF Experiment*, **M1760**, Closed (2018–).

2021– M. Stachura, "$\beta$-NMR spectroscopy to explore the coordination chemistry of different Ac-based novel chelators and radiopharmaceuticals", *TRIUMF Experiment*, **L131**, Active (2021–).

2021– J. O. Ticknor, W. A. MacFarlane, "Exploration of dilute-limit lithium diffusion in anion substituted molybdenum disulfide using $\beta$-NMR", *TRIUMF Experiment*, **M2101**, Approved (2021–).

2021– J. O. Ticknor, W. A. MacFarlane, "$^8$Li studies of $Li^+$ ionic mobility in entropy stabilized oxides", *TRIUMF Experiment*, **M2100**, Approved (2021–).

2020– V. L. Karner, W. A. MacFarlane, "$\beta$-NMR investigation of the magnetism in $La_2CuO_4/LaNiO_3$ superlattices", *TRIUMF Experiment*, **M2078**, Approved (2020–).

2022– W. A. MacFarlane, J. O. Ticknor, "*beta*-NMR study of topological surface states in superconducting $Fe_{1+y}(Te_{1-x}Se_x)$", *TRIUMF Experiment*, **M2061**, Approved (2022–).

2021– W. A. MacFarlane, J. O. Ticknor, "Dilute-limit lithium diffusion in an inorganic solid state electrolyte thin film: Lithium lanthanum titanate", *TRIUMF Experiment*, **M2045**, Approved (2021–).

2020– I. McKenzie, J. A. Forrest, "Calibrating $^8Li_+$ implantation profiles in polystyrene and studying secondary dynamics in ultra-thin polystyrene films", *TRIUMF Experiment*, **M2038**, Closed (2020–).

2019– C. D. P. Levy, M. Stachura, "Using $\beta$-NMR spectroscopy to explore the coordination chemistry of different Ac-based novel chelators and radiopharmaceuticals", *TRIUMF Experiment*, **M1960**, Approved (2019–).

2019– J. A. Forrest, I. McKenzie, "Transformation of ultrastable polymer glasses", *TRIUMF Experiment*, **M1945**, Approved (2019–).

2018–19 M. H. Dehn, R. F. Kiefl, "Strain-induced ferroelectricity in $SrTiO_3$ thin films", *TRIUMF Experiment*, **M1871**, Closed (2018–19).

2018–19 I. McKenzie, "Local dynamics of polystyrene probed by $\mu$SR", *TRIUMF Experiment*, **M1841**, Closed (2018–19).

2018–21 R. M. L. McFadden, H. Nakamura, W. A. MacFarlane, "$^8$Li betaNMR study of the Inverse Perovskite Oxide Topological Dirac Semimetals", *TRIUMF Experiment*, **M1822**, Closed (2018–21).

2018–21 V. L. Karner, U. Niemann, W. A. MacFarlane, "$^8$Li $\beta$NMR study of the origin of the heavy fermions in epitaxial films of $LiV_2O_4$", *TRIUMF Experiment*, **M1821**, Closed (2018–21).

2017–21 R. M. L. McFadden, W. A. MacFarlane, "$\beta$-NMR studies of lithium-ion mobility in tunnel structured materials", *TRIUMF Experiment*, **M1771**, Closed (2017–21).

2017– R. M. L. McFadden, W. A. MacFarlane, "Polaronic effects in titanates studied with $\beta$-NMR", *TRIUMF Experiment*, **M1770**, Approved (2017–).

2017– R. M. L. McFadden, I. Umegaki, J. Sugiyama, W. A. MacFarlane, "$\beta$-NMR studies of dilute-limit lithium diffusion in van der Waals layered solids", *TRIUMF Experiment*, **M1743**, Approved (2017–).

2016–18 M. H. Dehn, R. F. Kiefl, "Magneto electric effects in $Cr_2O_3$", *TRIUMF Experiment*, **M1614**, Closed (2016–18).

2015–19 J. Sugiyama, "Li distribution in the interface between electrode and electrolyte", *TRIUMF Experiment*, **M1490**, Closed (2015–19).

2015–18 I. McKenzie, "Depth-resolved measurements of dynamics in polymer thin films using spin-polarized radioactive probes", *TRIUMF Experiment*, **M1354**, Closed (2015–18).

2016 W. A. MacFarlane, "$\beta$-NMR studies of the surface states of topological insulators", *TRIUMF Experiment*, **M1306**, Closed (2016).

## 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

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 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 $\beta$-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/`

Software A simple python GUI for extracting data from images of figures.
`https://pypi.org/project/rigur/`

Hardware $\beta$-NMR spectrometer high-temperature upgrade.

Software Microsoft spreadsheet plagiarism checker.
`https://pypi.org/project/compsheet/`

## SKILLS

Languages English (native), French (good).
Python, LaTeX, Julia, Cython, MATLAB, ROOT, C++, BASH.

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| Experimental | $\beta$-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. |