

**MARK D. LUMSDEN**  
Neutron Scattering Division  
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Distinguished R&D Staff  
Spectroscopy Section Head  
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## Education

Ph.D. in Physics, McMaster University, Hamilton, Canada 1999  
Thesis: "X-Ray Diffraction Study of the Spin-Peierls Phase Transition"  
Supervisor: Bruce D. Gaulin, McMaster University

B.Sc. in Physics, St. Francis Xavier University, Antigonish, Canada 1993

## Appointments

Spectroscopy Section Head 2020-present  
Neutron Scattering Division, Oak Ridge National Laboratory

Leader, Spectroscopy Group 2017-2020  
Neutron Scattering Division, Oak Ridge National Laboratory

Leader, Time-of-Flight Spectroscopy Group 2012-2017  
Quantum Condensed Matter Division, Oak Ridge National Laboratory

Distinguished R&D Staff 2014-present  
Oak Ridge National Laboratory

Senior R&D Staff, Oak Ridge National Laboratory 2007-2014

R&D Staff, Oak Ridge National Laboratory 2001-2007

Eugene P. Wigner Fellow, Oak Ridge National Laboratory 1999-2001

## Professional Memberships

- *Fellow*, American Physical Society (2015) "For contributions to the understanding of magnetism in iron-based superconductors using neutron scattering techniques."
- *Fellow*, Neutron Scattering Society of America (2018) "For outstanding applications of neutron scattering to the study of iron-based superconductors and other problems at the forefront of condensed matter physics, and for important contributions to the advancement of inelastic neutron scattering in North America."
- *Fellow*, American Association for the Advancement of Science (2021) "For outstanding contributions to the understanding of magnetism in iron-based superconductors and other quantum materials through application of neutron scattering techniques."

## Honors and Awards

Fellow of the American Association for the Advancement of Science 2021

Fellow of the Neutron Scattering Society of America 2018

ORNL outstanding team accomplishment and Director's award: fractionalized excitations in  $\alpha$ -RuCl<sub>3</sub> 2016

Fellow of the American Physical Society 2015

Gordon Battelle Award for scientific research – principal investigator 2011

ORNL award for scientific research and Director's team award: research on Fe-based superconductors 2009

ORNL significant event award: research on Fe-based superconductors 2008

ORNL significant event award: development of SPICE data acquisition system 2005

Eugene P. Wigner Fellowship - ORNL 1999-2001

NSERC Postdoctoral Fellowship - Natural Sciences and Engineering Research Council of Canada 1999-2001

## Outreach

Co-organizer of workshop “Quantum Materials: New Insights from Neutron Scattering”. Virtual workshop hosted by University of Minnesota (June 9-10, 2021)	2021
Member of the TRIUMF Molecular and Materials Science Experiments Evaluation Committee	2015-2021
Co-organizer of workshop (hosted at Georgia Tech) “Early Quantum Materials Science at the Second Target Station”	2017
Communication Secretary, Neutron Scattering Society of America	2013-2017
Invited Participant, NSF Workshop on Midscale Instrumentation for Quantum Materials	2016
Participant and editor of workshop report for the 2013 Berkeley workshop on “Quantum Condensed Matter”	2013
Organizer, “Neutron Scattering Studies of Advanced Materials” symposium at 2013 MRS Fall Meeting	2013
Lead Organizer of a workshop entitled “Future of Inelastic Neutron Scattering at ORNL” to discuss plans and opportunities for future instrumentation at both SNS and HFIR, June 5-6, 2014, Oak Ridge National Laboratory	2014
“Inelastic Neutron Scattering”, Lecture to students as part of the IGERT workshop “Neutron Scattering for the Science and Engineering of the 21st Century”, Feb. 25- March 1, 2013, Oak Ridge National Laboratory.	2013
Led demonstration experiments using triple-axis spectrometers at the “National School on Neutron and X-Ray Scattering”	2009-2011
Secretary, SNS HFIR Users Group Executive Committee	2005-2007

## Relevant Experience and Internal Activities

- Laboratory Directed Research & Development (LDRD) – initiative lead for Neutron Sciences 2017-present.
- Principal investigator of the ORNL LDRD project “Spectroscopy of quantum matter under extreme pressures”.
- Lead author of the “Quantum Matter” section of the “First Experiments; Spallation Neutron Source; Second Target Station” document
- I have been strongly involved in the development of the science case / technical concept for the MANTA cold neutron spectrometer, a proposed world-class triple-axis spectrometer for HFIR.
- Member of the instrument advisory team for the CHES direct geometry spectrometer for Second Target Station
- As instrument scientist on the HB-3 Triple-Axis Spectrometer at HFIR (2001-2011), I helped to develop a world leading science program on that instrument.
- I was part of a 3-person team that developed SPICE (Spectrometer and Instrument Control Environment), a LabVIEW-based data acquisition system designed to operate and control most of the instrument suite at the High Flux Isotope Reactor (HFIR). This software has been operating instruments at HFIR for over 20 years and has been adopted by several other neutron scattering facilities around the world.

## Scientific Interests

My principal scientific interests concentrate on the use of elastic and inelastic neutron scattering techniques in the study of quantum materials. Topics of interest have included complex magnetism and novel effects in quantum magnets, interplay between magnetism and itinerant electrons, search for fractionalized quasiparticles in quantum spin liquid candidates, studies of topological magnons, and studies of static and dynamic magnetism in iron-based superconductors.

## Publications

**h-index:** Web of science: 42; Scopus: 43; Google Scholar: 50

**ORCID Profile:** <https://orcid.org/0000-0002-5472-9660>

**Web of Science Profile:** <https://www.webofscience.com/wos/author/record/1492918>

**Scopus Profile:** <https://www.scopus.com/authid/detail.uri?authorId=35569981200>

**Google Scholar Profile:** <https://scholar.google.com/citations?user=rnKLMxcAAAJ&hl=en>

1. Seung-Hwan Do, Joseph A. M. Paddison, Gabriele Sala, Travis J. Williams, Koji Kaneko, Keitaro Kuwahara, Andrew F. May, Jiaqiang Yan, Michael A. McGuire, Matthew B. Stone, **Mark D. Lumsden**, and Andrew D. Christianson, “Gaps in topological magnon spectra: Intrinsic versus extrinsic effects”, *Phys. Rev. B* **106**, L060408 (2022).
2. Yaokun Su, Hillary L. Smith, Matthew B. Stone, Douglas L. Abernathy, **Mark D. Lumsden**, Carl P. Adams, and Chen Li, “Frustration-induced diffusive scattering anomaly and dimension change in  $\text{FeGe}_2$ ”, *Phys. Rev. B* **106**, 024406 (2022).
3. G. Sala, M. Mourigal, C. Boone, N. P. Butch, A. D. Christianson, O. Delaire, A. J. DeSantis, C. L. Hart, R. P. Hermann, T. Huegle, D. N. Kent, J. Y. Y. Lin, **M. D. Lumsden**, M. E. Manley, D. G. Quirinale, M. B. Stone, and Y. Z., “CHESS: The future direct geometry spectrometer at the second target station”, *Rev. Sci. Instrum.* **93**, 065109 (2022)
4. G. Sala, M. B. Stone, Binod K. Rai, A. F. May, Pontus Laurell, V. O. Garlea, N. P. Butch, **M. D. Lumsden**, G. Ehlers, G. Pokharel, D. Mandrus, D. S. Parker, S. Okamoto, Gábor B. Halász, A. D. Christianson, “Van Hove singularity in the magnon spectrum of the antiferromagnetic quantum honeycomb lattice”, *Nat. Commun.* **12**, 171 (2021).
5. Brian C. Sales, V. O. Garlea, M.B. Stone, **M. D. Lumsden**, S. E. Nagler, D. Mandrus, and M. A. McGuire, “Possible observation of Kondo screening cloud in  $\text{Yb}_{14}\text{MnSb}_{11}$ ” *Philosophical Magazine* **100**, 1204 (2020)
6. G. Sala, M. B. Stone, Binod K. Rai, A. F. May, D. S. Parker, Gábor B. Halász, Y. Q. Cheng, G. Ehlers, V. O. Garlea, Q. Zhang, **M. D. Lumsden**, and A. D. Christianson, “Crystal field splitting, local anisotropy, and low-energy excitations in the quantum magnet  $\text{YbCl}_3$ ”, *Phys. Rev. B* **100**, 180406(R) (2019).
7. Lekh Poudel, Jon M. Lawrence, Liusuo S. Wu, Georg Ehlers, Yiming Qiu, Andrew F. May, Filip Ronning, **Mark D. Lumsden**, David Mandrus and Andrew D. Christianson, “Multicomponent fluctuation spectrum at the quantum critical point in  $\text{CeCu}_{6-x}\text{Ag}_x$ ”, *npj Quantum Materials* **4**, 52 (2019).
8. Christian Balz, Paula Lampen-Kelley, Arnab Banerjee, Jiaqiang Yan, Zhilun Lu, Xinzhe Hu, Swapnil M. Yadav, Yasu Takano, Yaohua Liu, D. Alan Tennant, **Mark D. Lumsden**, David Mandrus, and Stephen E. Nagler, “Finite field regime for a quantum spin liquid in  $\alpha\text{-RuCl}_3$ ”, *Phys. Rev. B (Rapid Communications)* **100**, 060405(R) (2019).
9. L. S. Wu, S. E. Nikitin, M. Brando, L. Vasylichko, G. Ehlers, M. Frontzek, A. T. Savici, G. Sala, A. D. Christianson, **M. D. Lumsden**, and A. Podlesnyak, “Antiferromagnetic ordering and dipolar interactions of  $\text{YbAlO}_3$ ”, *Phys. Rev. B* **99**, 195117 (2019).
10. J. C. Leiner, H. O. Jeschke, R. Valentí, S. Zhang, A. T. Savici, J. Y. Y. Lin, M. B. Stone, **M. D. Lumsden**, Jiawang Hong, O. Delaire, Wei Bao, and C. L. Broholm, “Frustrated Magnetism in Mott Insulating  $(\text{V}_{1-x}\text{Cr}_x)_2\text{O}_3$ ”, *Phys. Rev. X* **9**, 011035 (2019).
11. L.S. Wu, S.E. Nikitin, Z. Wang, W. Zhu, C.D. Batista, A.M. Tsvetlik, A.M. Samarakoon, D.A. Tennant, M. Brando, L. Vasylichko, M. Frontzek, A.T. Savici, G. Sala, G. Ehlers, A.D. Christianson, **M.D. Lumsden** & A. Podlesnyak, “Tomonaga–Luttinger liquid behavior and spinon confinement in  $\text{YbAlO}_3$ ”, *Nature Communications* **10**, 698 (2019).
12. A. E. Taylor, R. Morrow, **M. D. Lumsden**, S. Calder, M. H. Upton, A. I. Kolesnikov, M. B. Stone, R. S. Fishman,

- A. Paramekanti, P. M. Woodward, and A. D. Christianson, “Origin of magnetic excitation gap in double perovskite  $\text{Sr}_2\text{FeOsO}_6$ ”, *Phys. Rev. B* **98**, 214422 (2018).
13. G. Sala, M. B. Stone, B. K. Rai, A. F. May, C. R. Dela Cruz, H. Suriya Arachchige, G. Ehlers, V. R. Fanelli, V. O. Garlea, **M. D. Lumsden**, D. Mandrus, and A. D. Christianson, “Physical properties of the trigonal binary compound  $\text{Nd}_2\text{O}_3$ ”, *Phys. Rev. Mat.* **2**, 14407 (2018)
  14. J G Rau, L S Wu, A F May, A E Taylor, I-Lin Liu, J Higgins, N P Butch, K A Ross, H S Nair, **M D Lumsden**, M J P Gingras and A D Christianson, “Behavior of the breathing pyrochlore lattice  $\text{Ba}_3\text{Yb}_2\text{Zn}_5\text{O}_{11}$  in applied magnetic field”, *J. Phys.:Condens. Matter* **20**, 455801 (2018).
  15. S. E. Nikitin, L. S. Wu, A. S. Sefat, K. A. Shaykhtudinov, Z. Lu, S. Meng, E. V. Pomjakushina, K. Conder, G. Ehlers, **M. D. Lumsden**, A. I. Kolesnikov, S. Barilo, S. A. Guretskii, D. S. Inosov, and A. Podlesnyak, “Decoupled spin dynamics in the rare-earth orthoferrite  $\text{YbFeO}_3$ : Evolution of magnetic excitations through the spin-reorientation transition”, *Phys. Rev. B* **98**, 064424 (2018).
  16. A. Banerjee, P. Lampen-Kelley, J. Knolle, C. Balz, A.A. Aczel, B. Winn, Y.H. Liu, D. Pajerowski, J.Q. Yan, C.A. Bridges, A.T. Savici, B.C. Chakoumakos, M.D. Lumsden, D.A. Tennant, R. Moessner, D.G. Mandrus, S.E. Nagler, “Excitations in the field-induced quantum spin liquid state of  $\alpha\text{-RuCl}_3$ ”, *npj Quantum Materials* **3**, 8 (2018).
  17. A. Podlesnyak, M. Loguillo, G. M. Rucker, B. Haberl, R. Boehler, G. Ehlers, L. L. Daemen, D. Armitage, M. D. Frontzek and **M. Lumsden**, “Clamp cell with *in situ* pressure monitoring for low-temperature neutron scattering measurements”, *High Pressure Research* **38**, 482 (2018).
  18. S. Calder, D. J. Singh, V. O. Garlea, **M. D. Lumsden**, Y. G. Shi, K. Yamaura, and A. D. Christianson, “Interplay of spin-orbit coupling and hybridization in  $\text{Ca}_3\text{LiOsO}_6$  and  $\text{Ca}_3\text{LiRuO}_6$ ”, *Phys. Rev. B* **96**, 184426 (2017).
  19. L. S. Wu, S. E. Nikitin, M. Frontzek, A. I. Kolesnikov, G. Ehlers, **M. D. Lumsden**, K. A. Shaykhtudinov, E.-J. Guo, A. T. Savici, Z. Gai, A. S. Sefat, and A. Podlesnyak, “Magnetic ground state of the Ising-like antiferromagnet  $\text{DyScO}_3$ ” *Phys. Rev. B* **96**, 144407 (2017) [Editor’s Suggestion]
  20. Arnab Banerjee, Jiaqiang Yan, Johannes Knolle, Craig A. Bridges, Matthew B. Stone, **Mark D. Lumsden**, David G. Mandrus, David A. Tennant, Roderich Moessner, Stephen E. Nagler, “Neutron scattering in the proximate quantum spin liquid  $\alpha\text{-RuCl}_3$ ” *Science* **356**, 1055 (2017)
  21. A. E. Taylor, S. Calder, R. Morrow, H. L. Feng, M. H. Upton, **M. D. Lumsden**, K. Yamaura, P. M. Woodward, and A. D. Christianson, “Spin-Orbit Coupling Controlled  $J=3/2$  Electronic Ground State in  $5d^3$  Oxides”, *Phys. Rev. Lett.* **118**, 207202 (2017).
  22. Marc Janoschek, Gerry Lander, Jon M. Lawrence, E. D. Bauer, Jason C. Lashley, **Mark Lumsden**, Douglas L. Abernathy, and J. D. Thompson, “Relevance of Kondo physics for the temperature dependence of the bulk modulus in plutonium” *Proceedings of the National Academy of Sciences of the United States of America*, **114**, E268 (2017)
  23. M. B. Stone, V. O. Garlea, B. Gillon, A. Cousson, A. D. Christianson, **M. D. Lumsden**, S. E. Nagler, D. Mandrus, and B. C. Sales, “Excitations and magnetization density distribution in the dilute ferromagnetic semiconductor  $\text{Yb}_{14}\text{MnSb}_{11}$ ”, *Phys. Rev. B* **95**, 020412(R) (2017)
  24. S. Calder, J. W. Kim, A. E. Taylor, M. H. Upton, D. Casa, Guixin Cao, D. Mandrus, **M. D. Lumsden**, and A. D. Christianson, “Strong anisotropy within a Heisenberg model in the  $J_{\text{eff}}=1/2$  insulating state of  $\text{Sr}_2\text{Ir}_{0.8}\text{Ru}_{0.2}\text{O}_4$ ”, *Phys. Rev. B* **94**, 220407(R) (2016)
  25. A. Banerjee, C. A. Bridges, J.-Q. Yan, A. A. Aczel, L. Li, M. B. Stone, G. E. Granroth, **M. D. Lumsden**, Y. Yiu, J. Knolle, S. Bhattacharjee, D. L. Kovrizhin, R. Moessner, D. A. Tennant, D. G. Mandrus and S. E. Nagler, “Proximate Kitaev quantum spin liquid behaviour in a honeycomb magnet” *Nature Materials* **15**, 733 (2016)
  26. A. E. Taylor, R. Morrow, R. S. Fishman, S. Calder, A. I. Kolesnikov, **M. D. Lumsden**, P. M. Woodward, and A. D. Christianson, “Spin-orbit coupling controlled ground state in  $\text{Sr}_2\text{ScOsO}_6$ ” *Phys. Rev. B* **93**, 220408(R), (2016)

[Editor's Suggestion]

27. J. G. Rau, L. S. Wu, A. F. May, L. Poudel, B. Winn, V. O. Garlea, A. Huq, P. Whitfield, A. E. Taylor, **M. D. Lumsden**, M. J. P. Gingras, and A. D. Christianson, "Anisotropic Exchange within Decoupled Tetrahedra in the Quantum Breathing Pyrochlore  $\text{Ba}_3\text{Yb}_2\text{Zn}_5\text{O}_{11}$ " *Phys. Rev. Lett.* **116**, 257204 (2016).
28. S. Calder, J. G. Vale, N. A. Bogdanov, X. Liu, C. Donnerer, M. H. Upton, D. Casa, A. H. Said, **M. D. Lumsden**, Z. Zhao, J. -Q. Yan, D. Mandrus, S. Nishimoto, J. van den Brink, J. P. Hill, D. F. McMorrow and A. D. Christianson, "Spin-orbit-driven magnetic structure and excitation in the 5d pyrochlore  $\text{Cd}_2\text{Os}_2\text{O}_7$ ", *Nature Communications* **7**, 11651 (2016)
29. T. J. Williams, A. E. Taylor, A. D. Christianson, S. E. Hahn, R. S. Fishman, D. S. Parker, M. A. McGuire, B. C. Sales, and **M. D. Lumsden**, "Extended magnetic exchange interactions in the high-temperature ferromagnet  $\text{MnBi}$ ", *Appl. Phys. Lett.* **108**, 192403 (2016).
30. H. B. Cao, A. Banerjee, J.-Q. Yan, C. A. Bridges, **M. D. Lumsden**, D. G. Mandrus, D. A. Tennant, B. C. Chakoumakos, and S. E. Nagler, "Low-temperature crystal and magnetic structure of  $\alpha\text{-RuCl}_3$ " *Phys. Rev. B* **93**, 134423 (2016)
31. Jiao Y.Y. Lin, Hillary L. Smith, Garrett E. Granroth, Douglas L. Abernathy, **Mark D. Lumsden**, Barry Winn, Adam A. Aczel, Michael Aivazis, Brent Fultz, "MCViNE – An object oriented Monte Carlo neutron ray tracing simulation package" *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment* **810**, 86 (2016)
32. W. A. Phelan, S. M. Koochpayeh, P. Cottingham, J. A. Tutmaher, J. C. Leiner, **M. D. Lumsden**, C. M. Lavelle, X. P. Wang, C. Hoffmann, M. A. Siegler, N. Haldolaarachchige, D. P. Young and T. M. McQueen, "On the Chemistry and Physical Properties of Flux and Floating Zone Grown  $\text{SmB}_6$  Single Crystals", *Scientific Reports* **6**, 20860 (2016).
33. L. Poudel, C. de la Cruz, E. A. Payzant, A. F. May, M. Koehler, V. O. Garlea, A. E. Taylor, D. S. Parker, H. B. Cao, M. A. McGuire, W. Tian, M. Matsuda, H. Jeon, H. N. Lee, T. Hong, S. Calder, H. D. Zhou, **M. D. Lumsden**, V. Keppens, D. Mandrus, and A. D. Christianson, "Structural and magnetic phase transitions in  $\text{CeCu}_{6-x}\text{T}_x$  ( $T=\text{Ag, Pd}$ )" *Phys. Rev. B* **92**, 214421 (2015)
34. S. Calder, J.H. Lee, M.B. Stone, **M.D. Lumsden**, J.C. Lang, M. Feyngenson, Z. Zhao, J.-Q. Yan, Y.G. Shi, Y.S. Sun, w, Y. Tsujimoto, K. Yamaura and A.D. Christianson, "Enhanced spin-phonon-electronic coupling in a 5d oxide" *Nature Communications* **6**, 8916 (2015).
35. S. Calder, J. W. Kim, G.-X. Cao, C. Cantoni, A. F. May, H. B. Cao, A. A. Aczel, M. Matsuda, Y. Choi, D. Haskel, B. C. Sales, D. Mandrus, **M. D. Lumsden**, and A. D. Christianson, "Evolution of competing magnetic order in the  $J_{\text{eff}}=1/2$  insulating state of  $\text{Sr}_2\text{Ir}_{1-x}\text{Ru}_x\text{O}_4$ " *Phys. Rev. B* **92**, 165128 (2015)
36. T. J. Williams, A. A. Aczel, **M. D. Lumsden**, S. E. Nagler, M. B. Stone, J.-Q. Yan, and D. Mandrus, "Magnetic correlations in the quasi-two-dimensional semiconducting ferromagnet  $\text{CrSiTe}_3$ " *Physical Review B* **92**, 144404 (2015)
37. Marc Janoschek, Pinaki Das, Bismayan Chakrabarti, Douglas L. Abernathy, **Mark D. Lumsden**, John M. Lawrence, Joe D. Thompson, Gerard H. Lander, Jeremy N. Mitchell, Scott Richmond, Mike Ramos, Frans Trouw, Jian-Xin Zhu, Kristjan Haule, Gabriel Kotliar and Eric D. Bauer, "The valence-fluctuating ground state of plutonium", *Science Advances* **1**, e1500188 (2015)
38. Igor Zaliznyak, Andrei T. Savici, **Mark Lumsden**, Alexei Tsvetlik, Rongwei Hu, and Cedomir Petrovic, "Spin-liquid polymorphism in a correlated electron system on the threshold of superconductivity", *Proceeding of the National Academy of Sciences* **112**, 10316 (2015)
39. M. B. Stone, **M. D. Lumsden**, V. O. Garlea, B. Grenier, E. Ressouche, E. C. Samulon, and I. R. Fisher, "Field-induced spin density wave and spiral phases in a layered antiferromagnet", *Phys. Rev. B* **92**, 020415(R) (2015)

40. A. E. Taylor, T. Berlijn, S. E. Hahn, A. F. May, T. J. Williams, L. Poudel, S. Calder, R. S. Fishman, M. B. Stone, A. A. Aczel, H. B. Cao, **M. D. Lumsden**, and A. D. Christianson, "Influence of interstitial Mn on magnetism in the room-temperature ferromagnet  $Mn_{1+\delta}Sb$ ", *Phys. Rev. B* **91**, 224418 (2015)
41. A. E. Taylor, R. Morrow, D. J. Singh, S. Calder, **M. D. Lumsden**, P. M. Woodward, and A. D. Christianson, "Magnetic order and electronic structure of the  $5d^3$  double perovskite  $Sr_2ScOsO_6$ ", *Phys. Rev. B* **90**, 100406(R) (2015)
42. W. T. Fuhrman, J. Leiner, P. Nikolić, G. E. Granroth, M. B. Stone, **M. D. Lumsden**, L. DeBeer-Schmitt, P. A. Alekseev, J.-M. Mignot, S. M. Koochpayeh, P. Cottingham, W. Adam Phelan, L. Schoop, T. M. McQueen, and C. Broholm, "Interaction Driven Subgap Spin Exciton in the Kondo Insulator  $SmB_6$ ", *Phys. Rev. Lett.* **114**, 036401 (2015)
43. S. Ibuka, Y. Nambu, T. Yamazaki, **M.D. Lumsden**, and T.J. Sato, "Anisotropic inplane spin correlation in the parent and Co-doped  $BaFe_2As_2$ : A neutron scattering study", *Physica C* **507**, 25 (2014).
44. J. Leiner, V. Thampy, A. D. Christianson, D. L. Abernathy, M. B. Stone, **M. D. Lumsden**, A. S. Sefat, B. C. Sales, Jin Hu, Zhiqiang Mao, Wei Bao, and C. Broholm, "Modified magnetism within the coherence volume of superconducting  $Fe_{1+\delta}Se_xTe_{1-x}$ ", *Phys. Rev. B* **90**, 100501(R) (2014) [Editor's Suggestion].
45. D. A. Sokolov, M. C. Aronson, L. Wu, Y. Zhu, C. Nelson, J. F. Mansfield, K. Sun, R. Erwin, J. W. Lynn, **M. Lumsden**, and S. E. Nagler, "Neutron, electron, and x-ray scattering investigation of  $Cr_{1-x}V_x$  near quantum criticality", *Phys. Rev. B* **90**, 035139 (2014).
46. G. S. Tucker, R. M. Fernandes, D. K. Pratt, A. Thaler, N. Ni, K. Marty, A. D. Christianson, **M. D. Lumsden**, B. C. Sales, A. S. Sefat, S. L. Bud'ko, P. C. Canfield, A. Kreyssig, A. I. Goldman, and R. J. McQueeney "Crossover from spin waves to diffusive spin excitations in underdoped  $Ba(Fe_{1-x}Co_x)_2As_2$ " *Phys. Rev. B* **89**, 180503(R) (2014).
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48. S. Anissimova, D. Parshall, G.D. Gu, K. Marty, **M.D. Lumsden**, Songxue Chi, J.A. Fernandez-Baca, D.L. Abernathy, D. Lamago, J.M. Tranquada and D. Reznik, "Direct observation of dynamic charge stripes in  $La_{2-x}Sr_xNiO_4$ ", *Nature Communications* **5**, 3467 (2014).
49. S. Calder, B. Sapiro, H. B. Cao, J. L. Niedziela, **M. D. Lumsden**, A. S. Sefat, and A. D. Christianson, "Magnetic structure and spin excitations in  $BaMn_2Bi_2$ " *Phys. Rev. B* **89**, 064417 (2014).
50. S. Calder, G.-X. Cao, S. Okamoto, J. W. Kim, V. R. Cooper, Z. Gai, B. C. Sales, **M. D. Lumsden**, D. Mandrus, and A. D. Christianson, " $J_{\text{eff}}=1/2$  Mott spin-orbit insulating state close to the cubic limit in  $Ca_4IrO_6$ " *Phys. Rev. B* **89**, 081104(R) (2014).
51. A. D. Christianson, **M. D. Lumsden**, K. Marty, C. H. Wang, S. Calder, D. L. Abernathy, M. B. Stone, H. A. Mook, M. A. McGuire, A. S. Sefat, B. C. Sales, D. Mandrus, and E. A. Goremychkin, "Doping dependence of the spin excitations in the Fe-based superconductors  $Fe_{1+y}Te_{1-x}Se_x$ ", *Phys. Rev. B* **87**, 224410 (2013)
52. Guixin Cao, Alaska Subedi, S. Calder, J.-Q. Yan, Jieyu Yi, Zheng Gai, Lekhanath Poudel, David J. Singh, **Mark D. Lumsden**, A. D. Christianson, Brian C. Sales, and David Mandrus, "Magnetism and electronic structure of  $La_2ZnIrO_6$  and  $La_2MgIrO_6$ : Candidate  $J_{\text{eff}}=1/2$  Mott insulators", *Phys. Rev. B* **87**, 155136 (2013).
53. Judy W. L. Pang, William J. L. Buyers, Aleksandr Chernatynskiy, **Mark D. Lumsden**, Bennett C. Larson, and Simon R. Phillpot, "Phonon Lifetime Investigation of Anharmonicity and Thermal Conductivity of  $UO_2$  by Neutron Scattering and Theory", *Phys. Rev. Lett.* **110**, 157401 (2013).
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