

# Daniel Leslie Hall

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## PARTICULARS

### PROFESSIONAL AND RESEARCH INTERESTS

My primary interest is the development and operation of smaller, more powerful particle accelerators for science and industry. Related interests include scientific instrumentation, control systems and materials characterisation.

### EDUCATION

Cornell University Ph.D. in Physics	Ithaca, NY, USA <i>Graduation expected in December 2017</i>
University of Manchester M.Sc. by Research in Particle Physics <i>Awarded with Merit</i>	Manchester, UK <i>2012</i>
University of Manchester M.Phys. in Physics <i>First Class(1:1); Exchange year at UC Santa Barbara</i>	Manchester, UK <i>2011</i>

### CURRENT STATUS

F-1 (student) Visa. Dual citizen of Australia and the UK. Eligible for E-3 or H1-B Visa.

### RESEARCH EXPERIENCE

- **Graduate research assistant, Cornell University**, Aug 2012 - Present.

My Ph.D. studies have focussed on the research and development of Nb<sub>3</sub>Sn as a next-generation superconductor for use in superconducting radio-frequency accelerator cavities; in particular, understanding the mechanisms that limit the quality factor and quench field of Nb<sub>3</sub>Sn cavities fabricated using the vapour diffusion process. Beyond this focus, projects I have worked on during my time at Cornell University include:

- RF cavity commissioning and testing using the cavity commissioning facilities at Cornell University,
- Upgrading, maintaining, and operating the UHV coating furnace for the production of Nb<sub>3</sub>Sn, including the development and implementation of a new control system,
- The design and development, in collaboration with a team of engineers, of a new high-speed temperature mapping system for cavity testing,
- Detecting the presence of higher-order modes in the Energy Recovery Linac 7-cell cryomodule using beam-based methods,
- The design, fabrication and operation of a high-field sample host cavity with an associated temperature mapping system for characterising novel RF superconductors.

During my time at Cornell I have also been responsible for the training of new graduate students, as well as having served as a mentor to a number of undergraduate research assistants.

- **M.Sc. research student, University of Manchester**, Sep 2011 - Aug 2012.

As a masters graduate student I was a member of the High Energy Physics group, and part of the SuperNEMO collaboration searching for neutrinoless double-beta decay. My work was primarily focussed on understanding the Geiger trackers in the demonstrator module for the SuperNEMO experiment. I developed a Monte Carlo simulation using ROOT and GEANT4 to model the tracker's response and the readout from the electronics of the module. This simulation was used to evaluate the demonstrator module's performance and capabilities.

- **M.Phys. research student, University of Manchester**, Sep 2010 - June 2011.

During my M.Phys. research internships, I was involved with two groups in the physics department. As part of the Nuclear Physics group, I worked on improving a computational method for searching large amounts of data obtained from triple coincidence gamma-ray spectroscopy, looking for tell-tale signs of known (and unknown) decay paths. Later, as part of the Accelerator Physics group, I was involved in the study and simulation of higher-order modes in the then-experimental Third Harmonic cavities in use on the FLASH fast electron laser at DESY.

- **Undergraduate research assistant, UC Santa Barbara**, June - Sep 2010.

Working as an assistant in the Neutron Multiplicity Detector Group, under the supervision of Prof. Harry Nelson, I analysed the early data from the high energy neutron detector installed at the Soudan mine in Minnesota, and was also involved in the development of the analysis code to discern high energy neutron events in the detector.

## TEACHING EXPERIENCE

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- **REU/SRCCS mentor, Cornell University**, Feb 2013 - Present

I have been heavily involved in the Research Experience for Undergraduates (REU) and Summer Research for Community College Students (SRCCS) programmes at Cornell University. These programmes consist of mentoring a student or small group of students while they assist in the group's research. All of my mentees have made significant contributions, which have been included in our scientific publications.

- **Laboratory teaching assistant, Cornell University**, Jan - May 2014

I was a laboratory assistant in an electromagnetism course for engineering students, assisting them with their experiments and answering questions on the underlying physics.

- **Graduate teaching assistant, University of Manchester**, Sep 2011 - Jun 2012

During the fall semester I was an instructor in the beginner C programming for physicists course, and during the spring I was an assistant in the first-year physics teaching laboratory.

## SKILLS

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- **Programming languages and computing:** Strong knowledge of MatLab/Octave, including GUI development and DAQ interface/control. Proficient in C and C++, including ROOT data analysis framework. Working knowledge of Python and Fortran. Ample experience developing code for DAQ and control system instrumentation. Highly competent with LaTeX and the Microsoft Office suite.
- **Technical skills:** Experience with cryogenics systems (including helium recovery and liquefaction); vacuum systems; RF systems including klystron operation; cleanroom procedures; UHV furnace operation and maintenance; and accelerator cavity development and commissioning. Drafting experience with AutoCAD. Capable SEM operator with EDS and EBSD experience.
- **Project skills:** Experience with public speaking; project management, scheduling and budgeting; mentoring and personnel training; and scientific outreach.

## LANGUAGES

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Fluent in English and Italian. Working knowledge of French.

## AWARDS AND HONOURS

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- European Accelerator Student Poster Prize, International Particle Accelerator Conference, 2017
- Silverman Memorial Travel Award, Cornell University, 2017
- Young Researcher Oral Presentation Prize, 17th International Conference on RF Superconductivity, 2015
- Best student poster prize, International Workshop on Higher Order Modes, 2014
- Education Abroad Programme exchange student at the University of California, Santa Barbara, 2009-2010
- President, Physics Society of the University of Manchester (PhysSoc), 2008-2009

## TALKS

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1. (*Pending*) “Development of high performance Nb<sub>3</sub>Sn cavities for SRF applications”, *18th International Conference of RF Superconductivity*, Lanzhou, China, July 2017
2. “First Results From New Single-Cell Nb<sub>3</sub>Sn Cavities Coated at Cornell University”, *8th International Particle Accelerator Conference*, Copenhagen, Denmark, May 2017
3. “Recent advances on high Q<sub>0</sub> Nb<sub>3</sub>Sn cavities”, *Tesla Technology Collaboration workshop*, East Lansing, Michigan, USA, February 2017
4. (*Public lecture*) “The science of CHESS: The operation and use of a high energy synchrotron light source”, *SUNY Broome*, Binghamton, NY, USA, November 2016
5. “Next generation Nb<sub>3</sub>Sn cavities: Current performance, limitations, and considerations for practical use”, *Tesla Technology Collaboration workshop*, Paris, France, July 2016
6. “Current peak performance of 1.3 GHz single-cell Nb<sub>3</sub>Sn cavities coated at Cornell with associated sample surface analysis”, *7th International Workshop on Thin Films and New Ideas for Pushing the Limits of RF Superconductivity*, Newport News, Virginia, USA, July 2016
7. “Nb<sub>3</sub>Sn Cavities: Material Characterization and Coating Process Optimization”, *17th International Conference of RF Superconductivity*, Whistler, British Columbia, Canada, September 2015
8. “Measuring HOM parameters with beam for Cornell’s ERL cavities”, *Workshop on Higher Order Modes in Superconducting Cavities*, Batavia, Illinois, USA, July 2014

## PUBLICATIONS

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### PEER-REVIEWED JOURNALS

- [1] Sam Posen and Daniel Leslie Hall. Nb<sub>3</sub>Sn superconducting radiofrequency cavities: fabrication, results, properties, and prospects. *Superconductor Science and Technology*, 30(3):33004, 2017.
- [2] R Eichhorn, C Daly, F Furuta, A Ganshyn, M Ge, D Gonnella, Daniel Leslie Hall, V Ho, G H Hoffstaetter, M Liepe, J May-Mann, T O’Connell, S Posen, P Quigley, J Sears, and V Veshcherevich. Thermocurrents and their role in high Q cavity performance. *Phys. Rev. Accel. Beams*, 19(1):12001, January 2016.
- [3] D Gonnella, R Eichhorn, F Furuta, M Ge, Daniel Leslie Hall, V Ho, G Hoffstaetter, M Liepe, T O’Connell, S Posen, P Quigley, J Sears, V Veshcherevich, A Grassellino, A Romanenko, and D A Sergatskov. Nitrogen-doped 9-cell cavity performance in a test cryomodule for LCLS-II. *Journal of Applied Physics*, 117(2):23908, 2015.
- [4] Chaoyue Becker, Sam Posen, Nickolas Groll, Russell Cook, Christian M. Schlepütz, Daniel Leslie Hall, Matthias Liepe, Michael Pellin, John Zasadzinski, and Thomas Proslir. Analysis of Nb<sub>3</sub>Sn surface layers for superconducting radio frequency cavity applications. *Applied Physics Letters*, 106(8):082602, February 2015.
- [5] S. Posen, M. Liepe, and Daniel Leslie Hall. Proof-of-principle demonstration of Nb<sub>3</sub>Sn superconducting radiofrequency cavities for high Q<sub>0</sub> applications. *Applied Physics Letters*, 106(8):082601, February 2015.

### CONFERENCE PROCEEDINGS

- [1] Mingqi Ge, Fumio Furuta, Daniel Gonnella, Daniel Leslie Hall, Georg Hoffstaetter, Matthias Liepe, Tim O’Connell, and James Sears. Surface Topography Techniques at Cornell University: Optical Inspection and Surface Replica. In *Proceedings of IPAC 2016*, Busan, May 2016.
- [2] Daniel Leslie Hall, John Julian Kaufman, Matthias Liepe, and James Maniscalco. Surface Analysis Studies of Nb<sub>3</sub>Sn Thin Films. In *Proceedings of IPAC 2016*, Busan, May 2016.
- [3] Daniel Leslie Hall, Matthias Liepe, and James Maniscalco. RF Measurements on High Performance Nb<sub>3</sub>Sn Cavities. In *Proceedings of IPAC 2016*, Busan, May 2016.
- [4] James Maniscalco, Daniel Leslie Hall, Matthias Liepe, O. B. Malyshev, R. Valizadeh, and S. Wilde. New Material Studies in the Cornell Sample Host Cavity. In *Proceedings of IPAC 2016*, Busan, May 2016.
- [5] James Maniscalco, Daniel Gonnella, Daniel Leslie Hall, Peter Koufalis, and Matthias Liepe. Pulsed Field Limits in SRF Cavities. In *Proceedings of IPAC 2016*, Busan, May 2016.
- [6] Daniel Gonnella, Ralf Georg Eichhorn, Fumio Furuta, Mingqi Ge, Anna Grassellino, C. Grimm, Daniel Leslie Hall, Y. He, V. Ho, Georg Hoffstaetter, Matthias Liepe, James Maniscalco, O. Melnychuk, Tim O’Connell, Sam Posen, Peter Quigley, Alex Romanenko, James Sears, and Vadim Veshcherevich. Update on Nitrogen-Doped 9-Cell Cavity Performance in the Cornell Horizontal Test Cryomodule. In *Proceedings of IPAC 2015*, Richmond, Virginia, May 2015.

- [7] Daniel Leslie Hall, Matthias Liepe, James Maniscalco, Sam Posen, and Thomas Proslier. Recent Studies on the Current Limitations of State-of-the-art Nb<sub>3</sub>Sn Cavities. In *Proceedings of IPAC 2015*, Richmond, Virginia, May 2015.
- [8] James Maniscalco, Daniel Leslie Hall, and Matthias Liepe. RF Performance Studies of Thin-Film Superconductors Using a Sample Host Cavity. In *Proceedings of IPAC 2015*, Richmond, Virginia, May 2015.
- [9] James Maniscalco, Daniel Leslie Hall, Matthias Liepe, Daniel Gonnella, and Sam Posen. H<sub>c2</sub> Measurements of Nb<sub>3</sub>Sn and Nitrogen-Doped Niobium using Physical Property Measurement System. In *Proceedings of IPAC 2015*, Richmond, Virginia, May 2015.
- [10] Sam Posen, Matthias Liepe, Daniel Leslie Hall, and Thomas Proslier. High Q<sub>0</sub> at Medium fields in Nb<sub>3</sub>Sn SRF cavities at 4.2 K. In *Proceedings of IPAC 2015*, Richmond, Virginia, May 2015.
- [11] P Bishop, M. Checchin, Holly Conklin, A. Crawford, E. Daly, K. Davis, M. Drury, Ralf Georg Eichhorn, J. Fischer, Fumio Furuta, Mingqi Ge, Daniel Gonnella, Anna Grassellino, C. Grimm, Terri Gruber, Daniel Leslie Hall, A. Hocker, Georg Hoffstaetter, John Julian Kaufman, G. Kulina, Matthias Liepe, James Maniscalco, M. Martinello, O. Melnychuk, Tim O'Connell, J. Ozelis, A. Palczewski, Peter Quigley, C.E. Reece, Alex Romanenko, M. Ross, A. Rowe, D. Sabol, James Sears, D. Sergatskov, W. Soyars, R. Stanek, Vadim Veshcherevich, R. Wang, and G. Wu. LCLS-II SRF Cavity Processing Protocol Development and Baseline Cavity Performance Demonstration. In *Proceedings of SRF 2015*, Whistler, BC, September 2015.
- [12] Fumio Furuta, Brian Clasby, Ralf Georg Eichhorn, B. Elmore, Mingqi Ge, Daniel Gonnella, Daniel Leslie Hall, Georg Hoffstaetter, R. Kaplan, John Julian Kaufman, Matthias Liepe, Tim O'Connell, Sam Posen, Peter Quigley, D. Sabol, James Sears, E. Smith, and Vadim Veshcherevich. Performance of the Croenll ERL Main Linac Prototype Cryomodule. In *Proceedings of SRF 2015*, Whistler, BC, September 2015.
- [13] Daniel Gonnella, Brian Clasby, Ralf Georg Eichhorn, B. Elmore, Fumio Furuta, Mingqi Ge, Anna Grassellino, C. Grimm, Daniel Leslie Hall, Y. He, Georg Hoffstaetter, J. Holzbauer, John Julian Kaufman, Peter Koufalis, Matthias Liepe, James Maniscalco, O. Melnychuk, Tim O'Connell, A. Palczewski, Y. Pischalnikov, C.E. Reece, Peter Quigley, Alex Romanenko, D. Sabol, W. Schappert, James Sears, D. Sergatskov, E. Smith, and Vadim Veshcherevich. Cryomodule Testing of Nitrogen-Doped Cavities. In *Proceedings of SRF 2015*, Whistler, BC, September 2015.
- [14] Daniel Leslie Hall, Brian Clasby, Holly Conklin, Ralf Georg Eichhorn, Terri Gruber, Georg Hoffstaetter, John Julian Kaufman, and Matthias Liepe. High Quality Factor Studies in SRF Nb<sub>3</sub>Sn Cavities. In *Proceedings of SRF 2015*, Whistler, September 2015.
- [15] Daniel Leslie Hall, Holly Conklin, Terri Gruber, John Julian Kaufman, James Maniscalco, Matthias Liepe, Byeonghee Yu, and Thomas Proslier. Surface Analysis and Material Property Studies of Nb<sub>3</sub>Sn on Niobium for Use in SRF Cavities. In *Proceedings of SRF 2015*, Whistler, September 2015.
- [16] Daniel Leslie Hall, Terri Gruber, John Julian Kaufman, Matthias Liepe, James Maniscalco, Sam Posen, Byeonghee Yu, and Thomas Proslier. Nb<sub>3</sub>Sn Cavities: Material Characterisation and Coating Process Optimisation. In *Proceedings of SRF 2015*, Whistler, September 2015.
- [17] Matthias Liepe, Brian Clasby, Ralf Georg Eichhorn, Fumio Furuta, Mingqi Ge, Daniel Gonnella, Terri Gruber, Daniel Leslie Hall, Georg Hoffstaetter, John Julian Kaufman, Peter Koufalis, James Maniscalco, Tim O'Connell, Peter Quigley, D. Sabol, James Sears, E. Smith, and Vadim Veshcherevich. Niobium Impurity-Doping Studies at Cornell and CM Cool-down Dynamic Effect on Q<sub>0</sub>. In *Proceedings of SRF 2015*, Whistler, BC, September 2015.
- [18] James Maniscalco, Brian Clasby, Terri Gruber, Daniel Leslie Hall, and Matthias Liepe. Recent Results from the Cornell Sample Host Cavity. In *Proceedings of SRF 2015*, Whistler, BC, September 2015.
- [19] James Maniscalco, Daniel Gonnella, Daniel Leslie Hall, Matthias Liepe, and E. Smith. H<sub>c2</sub> Measurements of Superconductors. In *Proceedings of SRF 2015*, Whistler, BC, September 2015.
- [20] Sam Posen, O. Melnychuk, Alex Romanenko, D. Sergatskov, Y. Trenikhina, Daniel Leslie Hall, and Matthias Liepe. Cutout Study of a Nb<sub>3</sub>Sn Cavity. In *Proceedings of SRF 2015*, Whistler, September 2015.
- [21] Y. Trenikhina, Sam Posen, Daniel Leslie Hall, and Matthias Liepe. Characterization of Nb<sub>3</sub>Sn Coated Nb Samples. In *Proceedings of SRF 2015*, Whistler, BC, September 2015.
- [22] Daniel Leslie Hall, Adam Bartnik, M. G. Billing, Daniel Gonnella, Georg Hoffstaetter, Matthias Liepe, and C. Mayes. Beam-based HOM Measurements in Cornell's ERL Main Linac Cavity. In *Proceedings of IPAC 2014*, Dresden, June 2014.
- [23] Daniel Leslie Hall, Matthias Liepe, Daniel A. Gonnella, and Ivaylo S. Madjarov. SRF Material Performance Studies using a Sample Host Cavity. In *Proceedings of IPAC 2014*, Dresden, June 2014.

- [24] Daniel Gonnella, Ralf Georg Eichhorn, Fumio Furuta, Mingqi Ge, Daniel Leslie Hall, Y. He, Georg Hoffstaetter, Matthias Liepe, Tim O'Connell, Sam Posen, Peter Quigley, James Sears, Vadim Veshcherevich, Anna Grassellino, and Alex Romanenko. Nitrogen-Doped 9-Cell Cavity Performance in the Cornell Horizontal Test Cryomodule. In *Proceedings of LINAC 2014*, Geneva, August 2014.
- [25] Daniel Leslie Hall, Charles D. Burton, and Matthias Liepe. Sample Plate Studies Using a High Field TE Cavity with Thermometry Mapping System. In *Proceedings of LINAC 2014*, Geneva, August 2014.
- [26] Nicholas Valles, Ralf G. Eichhorn, Fumio Furuta, Mingqi Ge, Daniel Gonnella, Daniel Leslie Hall, Y. He, V. Ho, Georg Hoffstaetter, Matthias Liepe, Tim O'Connell, Sam Posen, Peter Quigley, James Sears, and Vadim Veshcherevich. Cryomodule Performance of the Main Linac Prototype Cavity for Cornell's Energy Recovery Linac. In *Proceedings of PAC 2013*, Pasadena, CA, September 2013.
- [27] Ralf Georg Eichhorn, Ben Bullock, Brian Clasby, B. Elmore, Fumio Furuta, Mingqi Ge, Daniel Gonnella, Daniel Leslie Hall, A. Ganshin, Y. He, V. Ho, Georg Hoffstaetter, John Julian Kaufman, Matthias Liepe, Tim O'Connell, Sam Posen, Peter Quigley, James Sears, E. Smith, V. Shemelin, and Vadim Veshcherevich. High Q Cavities for the Cornell ERL Main Linac. In *Proceedings of SRF 2013*, Paris, September 2013.
- [28] Daniel Leslie Hall, Daniel Gonnella, Matthias Liepe, V. A. Arrieta, and S. R. McNeal. Quality Factor Measurements of the Ultramet 3 GHz Cavity Constructed Using Chemical Vapour Deposition. In *Proceedings of SRF 2013*, Paris, September 2013.
- [29] Daniel Leslie Hall, Matthias Liepe, Ivaylo S. Madjarov, Kevin P. McDermott, and Nicholas Valles. Development and Performance of a High Field TE-Mode Sample Host Cavity. In *Proceedings of SRF 2013*, Paris, September 2013.
- [30] Nicholas Valles, Ralf G. Eichhorn, Fumio Furuta, Mingqi Ge, Daniel Gonnella, Daniel Leslie Hall, Y. He, K. M. V. Ho, Georg H. Hoffstaetter, Matthias Liepe, Tim O'Connell, Sam Posen, Peter Quigley, James Sears, and Vadim Veshcherevich. Record Quality Factor Performance of the Prototype Cornell ERL Main Linac Cavity in the Horizontal Test Cryomodule. In *Proceedings of SRF 2013*, Paris, September 2013.