

# DR ROBBY MCKILLIAM

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POSITION	Research Fellow Institute for Telecommunications Research Division of Information Technology, Engineering and the Environment University of South Australia
ADDRESS	University of South Australia ITR – Building W Mawson Lakes Boulevard Mawson Lakes SA 5095
CONTACT	Phone +61 8 8302 3602 Email <a href="mailto:robby.mckilliam@unisa.edu.au">robby.mckilliam@unisa.edu.au</a> Internet <a href="http://www.itr.unisa.edu.au/~mckillrg">www.itr.unisa.edu.au/~mckillrg</a>
QUALIFICATIONS	PhD Electrical Engineering University of Queensland, Brisbane, 2010 Bachelor of Engineering Honours 1st Class (Computer Systems) Bachelor of Science (Mathematics) University of Queensland, Brisbane, 2006
APPOINTMENTS	2011 – present University of South Australia Research Fellow
RESEARCH AREAS	Communications; signal processing; synchronisation and channel estimation; algorithm design, implementation and testing; lattice theory and the geometry of numbers; statistics and estimation theory.

## RESEARCH GRANTS

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### *Safer Roads through Wireless Communications*

Alex Grant, Robby McKilliam, Paul Alexander.

ARC Linkage Project 2013. Funding period: 2013-2015. Amount funded: \$170k.

(Univ. of South Australia, Cohda Wireless)

## INDUSTRIAL PROJECTS

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### *Global Sensor Network (GSN)*

2011 – 2013. Funding: Australian Space Research Program (ASRP), \$5m.

International research project with national and international partners including industry.

Designed and analysed waveforms and multi-user receiver for satellite terminals and ground station with focus on receiver acquisition and synchronisation.

## TEACHING

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### *Signals and Systems (EET 3041)*

University of South Australia, 2013, 2014.

Course coordinator, developer, and lecturer.

### *Modern Communication Systems (EET 4036)*

University of South Australia, 2012.

Lecturer.

### *Digital Communications (COMS 4100)*

University of Queensland, 2010.

Lecturer.

## AWARDS AND PRIZES

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### *Technology of the Year 2013 Award*

Awarded by Wireless Innovation Forum to ITR's Global Sensor Network (runner up was NASA)

### *University of Queensland Deans Commendation for Outstanding PhD thesis 2010*

University wide award for outstanding doctoral thesis.

### *Canon Information Systems Research Australia (CiSRA) prize 2009*

Industry based best student paper award, \$2000.

### *Australian postgraduate award (APA), 2007-2010*

Federal PhD scholarship. \$20000 p.a.

### *CSIRO Research Scholarship, 2007*

PhD topup scholarship. \$8000 p.a.

### *Maude Walker Postgraduate Scholarship, 2007*

University of Queensland postgraduate award. \$1200.

## INVITED PRESENTATIONS

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*Workshop on interactions between number theory and wireless communication*

University of York, United Kingdom, 2014.

*International Symposium on the Mathematical Theory of Networks and Systems (MTNS)*

Melbourne University, Australia, 2012.

*Australian Communications Theory Workshop (AusCTW)*

Victoria University, New Zealand, 2012.

*Australian Communications Theory Workshop (AusCTW)*

Melbourne University, Australia, 2011.

## SERVICE TO COMMUNITY

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*Professional memberships*

IEEE Member since 2007

IEEE Information Theory Society

IEEE Communications Society

IEEE Signal Processing Society

*Reviewer for top-level international journals and reference lists*

IEEE Transactions on Signal Processing

IEEE Transactions on Information Theory

IEEE Transactions on Communications

IEEE Transactions on Aerospace and Electronic Systems

IEEE Signal Processing Letters

Reviewer for the American Mathematical Society's *Mathematical Reviews* (2009 - present)

*Reviewer for top-level international and Australian conferences*

IEEE International Conference on Acoustics Speech and Signal Processing (ICASSP)

IEEE International Conference on Communications (ICC)

ACM-SIAM Symposium on Discrete Algorithms (SODA)

Australian Communications Theory Workshop

*Assessor for the Australian Research Council*

Discovery Project grant applications (2014)

Linkage Project grant applications (2013, 2014)

*Organising Committee Member for top-level international and Australian conferences*

IEEE Information Theory Workshop (SSP) 2014 – Finance Chair

International Symposium on Information Theory and its Applications (ISITA) 2014 – Local Finance Chair

Australian Communications Theory Workshop (AusCTW) 2013 – Technical Programme Chair

Defense Applications of Signal Processing Workshop (DASP) 2011 – Publications Chair

*Technical Program Committee for top-level international and Australian conferences*

IEEE International Conference on Acoustics Speech and Signal Processing (2015)

Australian Communications Theory Workshop (2012)

**Doctoral Thesis**

- [1] **R. G. McKilliam**. *Lattice theory, circular statistics and polynomial phase signals*. PhD thesis, University of Queensland, Australia, December 2010.

**Journal Papers** (reverse chronological order, 2008 – present)

- [2] **R. G. McKilliam**, I. V. L. Clarkson, and B. G. Quinn. Fast sparse period estimation. *IEEE Signal Process. Letters*, 22(1):62–66, Jan. 2015.
- [3] **R. G. McKilliam**, B. G. Quinn, I. V. L. Clarkson, B. Moran, and B. N. Vellambi. Polynomial phase estimation by least squares phase unwrapping. *IEEE Trans. Sig. Process.*, 62(8):1962–1975, April 2014.
- [4] **R. G. McKilliam**, A. Pollok, and W. Cowley. Simultaneous symbol timing and frame synchronization for phase shift keying. *IEEE Trans. Commun.*, 62(3):1114–1123, Mar. 2014.
- [5] **R. G. McKilliam**, A. Pollok, B. Cowley, V. Clarkson, and B. Quinn. Carrier phase and amplitude estimation for phase shift keying using pilots and data. *IEEE Trans. Sig. Process.*, 61(15):3976–3989, Aug. 2014.
- [6] **R. G. McKilliam** and A. Pollok. On the Cramér–Rao bound for polynomial phase signals. *Signal Processing*, 95:27–31, Feb. 2014.
- [7] **R. G. McKilliam**, A. Grant, and I. V. L. Clarkson. Finding a closest point in a lattice of Voronoi’s first kind. *SIAM Journal on Discrete Mathematics*, 28(3):1405–1422, Sep. 2014.
- [8] A. Pollok and **R. G. McKilliam**. Modified Cramér–Rao bounds for continuous-phase modulated signals. *IEEE Trans. Commun.*, 62(5):1681–1690, May 2014.
- [9] J. Kodithuwakku, N. Letzepis, **R. G. McKilliam**, and A. Grant. Decoder-assisted timing synchronization in multiuser CDMA systems. *IEEE Trans. Commun.*, 62(5):2061–2071, Jun. 2014.
- [10] **R. G. McKilliam**, R. Subramanian, E. Viterbo, and I. V. L. Clarkson. On the error performance of the  $a_n$  lattices. *IEEE Trans. Inform. Theory*, 58(9):5941–5949, Sep. 2012.
- [11] **R. G. McKilliam**, B. G. Quinn, and I. V. L. Clarkson. Direction estimation by minimum squared arc length. *IEEE Trans. Sig. Process.*, 60(5):2115–2124, May 2012.
- [12] **R. G. McKilliam**, W. D. Smith, and I. V. L. Clarkson. Linear-time nearest point algorithms for Coxeter lattices. *IEEE Trans. Inform. Theory*, 56(3):1015–1022, Mar. 2010.
- [13] **R. G. McKilliam**, B. G. Quinn, I. V. L. Clarkson, and B. Moran. Frequency estimation by phase unwrapping. *IEEE Trans. Sig. Process.*, 58(6):2953–2963, June 2010.
- [14] **R. G. McKilliam** and I. V. L. Clarkson. Identifiability and aliasing in polynomial-phase signals. *IEEE Trans. Sig. Process.*, 57(11):4554–4557, Nov. 2009.
- [15] **R. G. McKilliam**, I. V. L. Clarkson, and B. G. Quinn. An algorithm to compute the nearest point in the lattice  $A_n^*$ . *IEEE Trans. Inform. Theory*, 54(9):4378–4381, Sep. 2008.

**Peer-reviewed Conference Papers** (reverse chronological order, 2008 – present)

- [16] B. G. Quinn, I. V. L. Clarkson, and **R. G. McKilliam**. On the periodogram estimators of periods from interleaved sparse, noisy timing data. In *IEEE Statistical Signal Processing Workshop*, pages 232–235, Gold Coast, Australia, Jul. 2014.
- [17] D. Haley, L. M. Davis, A. Pollok, Y. Chen, G. Lechner, M. Lavenant, S. A. Barbulescu, J. Buetefer, W. G. Cowley, A. Grant, T. Kemp, I. Land, R. Luppino, **R. G. McKilliam**, and H. Soetiyono. Software defined radio based global sensor network architecture. In *Wireless Innovation Forum Conference on Communications Technologies and Software Defined Radio*, 2014.
- [18] **R. G. McKilliam**, A. Pollok, B. Cowley, I. V. L. Clarkson, and B. G. Quinn. Noncoherent least squares estimators of carrier phase and amplitude. In *Proc. Internat. Conf. Acoust. Spe. Sig. Process. (ICASSP)*, pages 4888–4892, Vancouver, May 2013.
- [19] B. G. Quinn, I. V. L. Clarkson, and **R. G. McKilliam**. On the periodogram estimator of period from sparse, noisy timing data. In *Asilomar Conference on Signals, Systems, and Computers*, 2013.
- [20] J. Kodithuwakku, N. Letzepis, A. Grant, and **R. G. McKilliam**. Decoder-aided synchronization for multiuser CDMA systems. In *Proc. Australian Communications Theory Workshop (AusCTW)*, pages 31–36, Jan. 2013.
- [21] **R. G. McKilliam** and A. Grant. Finding short vectors in a lattice of Voronoi’s first kind. In *IEEE International Symposium on Information Theory Proceedings (ISIT)*, pages 2157–2160, July 2012.
- [22] B. G. Quinn, I. V. L. Clarkson, and **R. G. McKilliam**. Estimating period from sparse, noisy timing data. In *IEEE Statistical Signal Processing Workshop (SSP)*, pages 193–196, Aug. 2012.
- [23] J. Kodithuwakku, N. Letzepis, A. Grant, and **R. G. McKilliam**. Code-acquisition via the projection method for CDMA systems in high MAI channels. In *IEEE International Conference on Communications (ICC)*, pages 2575–2579, 2012.
- [24] **R. G. McKilliam**, B. G. Quinn, I. V. L. Clarkson, and B. Moran. The asymptotic properties of polynomial phase estimation by least squares phase unwrapping. *Proc. Internat. Conf. Acoust. Spe. Sig. Process. (ICASSP)*, pages 3592–3595, May 2011.
- [25] **R. G. McKilliam**, D. J. Ryan, I. V. L. Clarkson, and I. B. Collings. Block noncoherent detection of hexagonal QAM. *Proc. Australian Communications Theory Workshop (AusCTW)*, pages 65–70, Feb. 2010.
- [26] **R. G. McKilliam**, I. V. L. Clarkson, D. J. Ryan, and I. B. Collings. Linear-time block noncoherent detection of PSK. In *Proc. Internat. Conf. Acoust. Spe. Sig. Process. (ICASSP)*, pages 2465–2468, Taipei, Taiwan, Apr. 2009.
- [27] **R. G. McKilliam**, I. V. L. Clarkson, B. G. Quinn, and B. Moran. Polynomial-phase estimation, phase unwrapping and the nearest lattice point problem. *Asilomar Conference on Signals, Systems, and Computers*, pages 493–495, Nov. 2009.
- [28] **R. G. McKilliam**, D. J. Ryan, I. V. L. Clarkson, and I. B. Collings. An improved algorithm for optimal noncoherent QAM detection. *Proc. Australian Communications Theory Workshop (AusCTW)*, pages 64–68, Jan. 2008.

- [29] **R. G. McKilliam**, I. V. L. Clarkson, W. D. Smith, and B. G. Quinn. A linear-time nearest point algorithm for the lattice  $A_n^*$ . In *International Symposium on Information Theory and its Applications*, Dec. 2008.
- [30] **R. G. McKilliam** and I. V. L. Clarkson. Maximum-likelihood period estimation from sparse, noisy timing data. In *Proc. Internat. Conf. Acoust. Spe. Sig. Process. (ICASSP)*, pages 3697–3700, Las Vegas, NV, USA, Mar. 2008.
- [31] B. G. Quinn, **R. G. McKilliam**, and I. V. L. Clarkson. Maximizing the periodogram. In *IEEE Global Communications Conference*, pages 1–5, Dec 2008.

## Patents

- [32] **R. G. McKilliam**, A. Pollok, and B. Cowley. Synchronisation using pilots and data. International patent PCT/AU2013/000139, Feb. 2014.
- [33] **R. G. McKilliam**, A. Pollok, and B. Cowley. Carrier phase and amplitude estimation for phase shift keying using pilots and data. International patent PCT/AU2013/001464, Dec. 2013.
- [34] D. Haley, J. Buetefuer, A. Grant, W. Cowley, G. Lechner, I. R. Land, **R. G. McKilliam**, A. Pollok, L. M. Davis, R. R. Luppino, and A. Barbulescu. Communication system and method. International patent PCT/AU2013/001078, Sep. 2013.
- [35] A. Grant, D. Haley D. Lawrie, **R. G. McKilliam**, W. Cowley, and L. M. Davis. Channel allocation in a communication system. International patent PCT/AU2013/000895, Aug. 2013.
- [36] A. Grant, D. Haley, **R. G. McKilliam**, W. G. Cowley, and T. Chan. Multi-access communication system. International patent PCT/AU2013/001079, Sep. 2013.