References

G. Amarasuriya, C. Tellambura, and M. Ardakani. Asymptotically-exact performance bounds of AF multi-hop relaying over Nakagami fading. *IEEE Transactions on Communications*, 59:962–967, 2011.

M.A. Antepli, E. Uysal-Biyikoglu, and H. Erkal. Optimal packet scheduling on an energy harvesting broadcast link. *IEEE Journal on Selected Areas in Communications*, 29:1721–1731, 2011.

A. Aprem, C.R. Murthy, and N.B. Mehta. Transmit power control policies for energy harvesting sensors with retransmissions. *IEEE Journal of Selected Topics in Signal Processing*, 7:895–906, 2013.

S. Avallone and A. Banchs. A channel assignment and routing algorithm for energy harvesting multiradio wireless mesh networks. *IEEE Journal on Selected Areas in Communications*, 34:1463–1476, 2016.

F. Azmat, Y. Chen, and N. Stocks. Predictive modelling of RF energy for wireless powered communications. *IEEE Communications Letters*, 20:173–176, 2016.

F. Azmat, Y. Zhou, and Y. Chen. New cooperative strategy for cognitive radios with wireless powered primary users. *International Journal of Communication Systems*, 31:1–1, 2018.

B.C. Babu and S. Gurjar. A novel simplified two-diode model of photovoltaic (PV) module. *IEEE Journal of Photovoltaics*, 4:1156–1161, 2014.

Y.H. Bae and J.W. Baek. Achievable throughput analysis of opportunistic spectrum access in cognitive radio networks with energy harvesting. *IEEE Transactions on Communications*, 64:1399–1400, 2015.

S. Beeby and N. White. *Energy Harvesting for Autonomous Systems*. Artech House, 2010.

F. Ben Khelifa and M.-S. Alouini. Prioritizing data/energy thresholding-based antenna switching for SWIPT-enabled secondary receiver in cognitive radio networks. *IEEE Transactions on Cognitive Communications and Networking*, 3:782–800, 2017a.

F. Ben Khelifa and M.-S. Alouini. Precoding design of MIMO amplify-and-forward communication system with an energy harvesting relay and possibly imperfect CSI. *IEEE Access*, 5:578–594, 2017b.

F. Ben Khelifa, A. Sultan, and M.-S. Alouini. Sum-rate enhancement in multiuser MIMO decode-and-forward relay broadcasting channel with energy harvesting relays. *IEEE Journal on Selected Areas in Communications*, 34:3675–3684, 2016.

F. Ben Khelifa, K. Tourki, and M.-S. Alouini. Proactive spectrum sharing for SWIPT in MIMO cognitive radio systems using antenna switching technique. *IEEE Transactions on Green Communication and Networking*, 1:204–222, 2017.

C. Bergozini, D. Brunelli, and L. Benini. Comparison of energy intake prediction algorithms for systems powered by photovoltaic harvesters. *Microelectronics Journal*, 41:766–777, 2010.

H.J. Bergveld, W.S. Kruijt, and P.H.L. Notten. Electronic-network modeling of rechargeable NiCd cells and its application to the design of battery management systems. *Journal of Power Sources*, 77:143–158, 1999.

E. Bjornson, J. Hoydis, M. Kountouris, and M. Debbah. Massive MIMO systems with non-ideal hardware: energy efficiency, estimation, and capacity limits. *IEEE Transactions on Information Theory*, 60:7112–7139, 2014.

E. Boshkovska, D.W.K. Ng, N. Zlatanov, and R. Schober. Practical non-linear energy harvesting model and resource allocation for SWIPT systems. *IEEE Communications Letters*, 19:2082–2085, 2015.

M. Buettner, G. Yee, E. Anderson, and R. Han. X-MAC: a short preamble MAC protocol for duty-cycled wireless sensor networks. *ACM SenSys 2006*, 1:307–320, 2006.

S. Buzzi, C.-L. I, T.E. Klein, H.V. Poor, C. Yang, and A. Zappone. A survey of energy-efficient techniques in 5G networks and challenges ahead. *IEEE Journal on Selected Areas in Communications*, 34:697–709, 2016.

Y. Cao, X.-Y. Liu, M.-Y. Wu, and M.K. Khan. EHR: routing protocol for energy harvesting wireless sensor networks. *IEEE International Conference on Parallel and Distributed Systems*, 1:56–63, 2016.

B.K. Chalise, H.A. Surweera, G. Zheng, and G.K. Karagiannidis. Beamforming optimization for full-duplex wireless-powered MIMO systems. *IEEE Transactions on Communications*, 65:3750–3764, 2017.

H. Chen, Y. Li, J.L. Rebelatto, B.F. Uchoa-Filho, and B. Vucetic. Harvest-then-cooperate: wireless-powered cooperative communications. *IEEE Transactions on Signal Processing*, 63:1700–1711, 2015.

Y. Chen. Energy-harvesting af relaying in the presence of interference and Nakagami-m fading. *IEEE Transactions on Wireless Communications*, 15:1008–1017, 2016.

Y. Chen and N.C. Beaulieu. Optimum pilot symbol assisted modulation. *IEEE Transactions on Communications*, 55:1536–1546, 2007.

Y. Chen and N.C. Beaulieu. Performance of collaborative spectrum sensing for cognitive radio in the presence of Gaussian channel estimation errors. *IEEE Transactions on Communications*, 57:1944–1947, 2009.

Y. Chen, D.B. da Costa, and H. Ding. Effect of CCI on WPC with time-division energy and information transmission. *IEEE Wireless Communications Letters*, 5:168–171, 2016a.

Y. Chen, D.B. da Costa, and H. Ding. Interference analysis in wireless power transfer. *IEEE Communications Letters*, 21:2318–2321, 2017a.

Y. Chen, W. Feng, R. Shi, and N. Ge. Pilot-based channel estimation for AF relaying using energy harvesting. *IEEE Transactions on Vehicular Technology*, 66:6877–6886, 2017b.

Y. Chen, G.K. Karagidinis, H. Lu, and N. Cao. Novel approximations to the statistics of products of independent random variables and their applications in wireless communications. *IEEE Tranactions on Vehicular Technology*, 61: 443–454, 2012.

Y. Chen, J.A. Nossek, and A. Mezghani. Circuit-aware cognitive radios for efficient communications. *IEEE Wireless Communications Letters*, 2:323–326, 2013.

Y. Chen and H.-S. Oh. A survey of measurement-based spectrum occupancy modeling for cognitive radios. *IEEE Communications Surveys and Tutorials*, 18:848–859, 2016a.

Y. Chen and H.-S. Oh. Spectrum measurements modelling and prediction based on wavelets. *IET Communications*, 10:2192–2198, 2016b.

Y. Chen, K.T Sabnis, and R.A. Abd-Alhameed. New formula for conversion efficiency of RF EH and its wireless applications. *IEEE Transactions on Vehicular Technology*, 65:9410–9414, 2016b.

Y. Chen, R. Shi, W. Feng, and N. Ge. AF relaying with energy harvesting source and relay. *IEEE Transactions on Vehicular Technology*, 66:874–879, 2017c.

Y. Chen, C.-X. Wang, H. Xiao, and D. Yuan. Novel partial relay selection for cooperative diversity in Nakagami-*m* fading channels. *IEEE Transactions on Vehicular Technology*, 60:3497–3503, 2011a.

Y. Chen, C. Wang, and B. Zhao. Performance comparison of feature-based detectors for spectrum sensing in the presence of primary user traffic. *IEEE Signal Processing Letters*, 18:291–294, 2011b.

Y. Chen, N. Zhao, and M.-S. Alouini. Wireless energy harvesting using signals from multiple fading channels. *IEEE Transactions on Communications*, 65: 5027–5039, 2017d.

Y. Cheng, P. Fu, Y. Ding, B. Li, and X. Yuan. Proportional fairness in cognitive wireless powered communication networks. *IEEE Communications Letters*, 21:1397–1400, 2017.

Y. Chen, Z. Xie, and N. Zhao. Energy analysis of co-channel harvesting in wireless networks. *IEEE Communications Letters*, 22:530–533, 2018.

W. Chung, S. Park, S. Lim, and D. Hong. Spectrum sensing optimization for energy-harvesting cognitive radio systems. *IEEE Transactions on Wireless Communications*, 13:2601–2613, 2014.

B. Clerckx and E. Bayguzina. Waveform design for wireless power transfer. *IEEE Transactions on Signal Processing*, 64:6313–6328, 2016.

A. Collado and A. Georgiadis. Optimal waveforms for efficient wireless power transmission. *IEEE Microwave and Wireless Components Letters*, 24:354–356, 2014.

D.R. Cox. Prediction by exponentially weighted moving averages and related methods. *Journal of the Royal Statistical Society: Series B (Methodological)*, 23:414–422, 1961.

T.V. Dam and K. Langendoen. An adaptive energy-efficient MAC protocol for wireless sensor networks. *ACM SenSys 2003*, 1:171–180, 2003.

P.D. Diamantoulakis, K.N. Pappi, G.K. Karagiannidis, H. Xing, and A. Nallanathan. Joint downlink/uplink design for wireless powered networks with interference. *IEEE Access*, 5:1534–1547, 2017.

Z. Ding, I. Krikidis, B. Sharif, and H.V. Poor. Wireless information and power transfer in cooperative networks with spatially random delays. *IEEE Transactions on Wireless Communications*, 13:4440–4453, 2014.

Z. Ding, X. Lei, G.K. Karagiannidis, R. Schober, J. Yuan, and V.K. Bhargava. A survey on non-orthogonal multiple access for 5G networks: research challenges and future trends. *IEEE Journal on Selected Areas in Communications*, 35: 2181–2195, 2017a.

Z. Ding, Y. Liu, J. Choi, Q. Sun, M. Elkashlan, C.-L. I, and H.V. Poor. Application of non-orthogonal multiple access in LTE and 5G networks. *IEEE Communications Magazine*, 55:185–191, 2017b.

R. Doose, K.R. Chowdhury, and M.D. Felice. Routing and link layer protocol design for sensor networks with wireless energy transfer. *Proceedings of IEEE GLOBECOM*, 1:1–5, 2010.

M. Doyle, T.F. Fuller, and J. Newman. Modeling of galvanostatic charge and discharge of the lithium/polymer/insertion cell. *Journal of the Electrochemical Society*, 140:1526–1533, 1993.

A. El Shafie, N. Al-Dhahir, and R. Hamila. A sparsity-aware cooperative protocol for cognitive radio networks with energy-harvesting primary user. *IEEE Transactions on Communications*, 63:3118–3131, 2015.

M. Erol-Kantarci and H.T. Touftah. Suresense: sustainable wireless rechargeable sensor networks for the smart grid. *IEEE Wireless Communications*, 19:30–36, 2012.

Z.A. Eu, H.-P. Tan, and W.K.G. Seah. Design and performance analysis of MAC schemes for wireless sensor networks powered by ambient energy harvesting. *Ad Hoc Networks*, 9:300–323, 2011.

X. Fafoutis and N. Dragoni. ODMAC: an on-demand MAC protocol for energy harvesting wireless sensor networks. *Proceedings of ACM PE-WASUN*, 1:49–56, 2011.

FCC. Notice of proposed rule making. *ET Docket No. 04-113*, 2004.

FCC Spectrum Policy Task Force. Report of the spectrum efficiency working group. *Technical Report*, 2002.

I. Flint, X. Lu, N. Privault, D. Niyato, and P. Wang. Performance analysis of ambient RF energy harvesting: a stochastic geometry approach. *IEEE Global Telecommunications Conference 2014*, 1:1448–1453, 2014.

Y. Gao, Y. Chen, and A. Bekkali. Performance of passive UHF RFID in cascaded correlated generalized Rician fading. *IEEE Communications Letters*, 20:660–663, 2016a.

Y. Gao, Y. Chen, and A. Hu. Throughput and BER of wireless powered DF relaying in Nakagami-m fading. *Science China Information Sciences*, 60, 2017.

Y. Gao, Y. Chen, Z. Xie, and G. Hu. Wireless energy-harvesting cognitive radio with feature detectors. *KSII Transactions on Internet and Information Systems*, 10:4625–4641, 2016b.

Y. Gao, Y. Chen, Y. Zhou, and N. Cao. BER and achievable rate analysis of wireless powered communications with correlated links. *IET Communications*, 12:310–316, 2018.

J. Gong, S. Zhang, X. Wang, S. Zhou, and Z. Niu. Supporting quality of service in energy harvesting wireless links: the effective capacity analysis. *IEEE International Conference on Communications Workshops*, 1:901–906, 2014.

J.A. Gow and C.D. Manning. Development of a photovoltaic array model for use in power-electronics simulation studies. *IEEE Proceedings – Electrical Power Applications*, 146:193–200, 1999.

I.S. Gradshteyn and I.M. Ryzhik. *Tables of Integrals, Series and Products*. Academic Press, 2000.

P. Grover and A. Sahai. Shannon meets Tesla: wireless information and power transfer. *Proceedings of the IEEE International Symposium on Information Theory*, 1:2363–2367, 2010.

T. Ha, J. Kim, and J.-M. Chung. HE-MAC: harvest-then-transmit based modified EDCF MAC protocol for wireless powered sensor networks. *IEEE Transactions on Wireless Communications*, 17:3–16, 2018.

M.A. Hasan and S.K. Parida. An overview of solar photovoltaic panel modeling based on analytical and experimental viewpoint. *Renewable and Sustainable Energy Reviews*, 60:75–83, 2016.

D. Hasenfratz, A. Meier, C. Moser, J.-J. Chen, and L. Thiele. Analysis, comparison, and optimization of routing protocols for energy harvesting wireless sensor networks. *IEEE International Conference on Sensor Networks, Ubiquitous, and Trustworthy Computing*, 1:19–26, 2010.

M.O. Hasna and M-S. Alouini. Outage probability of multihop transmission over Nakagami fading channels. *IEEE Communications Letters*, 7:216–218, 2003.

M.O. Hasna and M.-S. Alouini. Harmonic mean and end-to-end performance of transmission systems with relays. *IEEE Transactions on Communications*, 52:130–135, 2004.

S. Haykin. Cognitive radio: brain-empowered wireless communications. *IEEE Journal on Selected Areas in Communications*, 23:201–220, 2005.

C. He, A. Arora, M.E. Kiziroglou, D.C. Yates, D. OHare, and E.M. Yeatman. MEMS energy harvesting powered wireless biometric sensor. *Proceedings of the International Workshop on Wearable and Implantable Body Sensor Networks 2009*, 1:207–212, 2009.

P. He, L. Zhao, S. Zhou, and Z. Niu. A dual band rectenna using broadband Yagi antenna array for ambient RF power harvesting. *IEEE Transactions on Vehicular Technology*, 64:4525–4536, 2015.

C.K. Ho and R. Zhang. Optimal energy allocation for wireless communications with energy harvesting constraints. *IEEE Transactions on Signal Processing*, 60:4808–4818, 2012.

E. Hossain and M. Hasan. 5G cellular: key enabling technologies and research challenges. *IEEE Instrumentation and Measurement Magazine*, 18:11–21, 2015.

C. Hoymann, W. Chen, J. Montojo, A. Golitschek, C. Koutsimanis, and X. Shen. Relaying operation in 3GPP LTE: challenges and solutions. *IEEE Communications Magazine*, 50:156–162, 2012.

K.-Y. Hsieh, F.-S. Tseng, and T.-L. Ku. A spectrum and energy cooperation strategy in hierarchical cognitive radio cellular networks. *IEEE Wireless Communications Letters*, 5:252–255, 2016.

J. Hsu, S. Zahedi, A. Kansal, M. Srivastava, and V. Raghunathan. Adaptive duty cycling for energy harvesting systems. *Proceedings of IEEE ISLPED 2006*, 1:180–185, 2006.

C. Huang, R. Zhang, and S. Cui. Throughput maximization for the Gaussian relay channel with energy harvesting constraints. *IEEE Journal on Selected Areas in Communications*, 31:1469–1479, 2013.

K. Huang and V.K.N. Lau. Enabling wireless power transfer in cellular networks: architecture, modeling and deployment. *IEEE Transactions on Wireless Communications*, 13:902–912, 2014.

D. Hwang, K.C. Hwang, D.I. Kim, and T.-J. Lee. Self-energy recycling for RF powered multi-antenna relay channels. *IEEE Transactions on Wireless Communications*, 16:812–824, 2017.

F. Iannello, O. Simeone, and U. Spagnolini. Medium access control protocols for wireless sensor networks with energy harvesting. *IEEE Transactions on Communications*, 60:1381–1389, 2012.

R. Jain, A. Durresi, and G. Babie. Throughput fairness index: an explanation. *ACM Forum Contribution 99-0045*, 1999.

X. Ji, J. Xu, Y.L. Che, Z. Fei, and R. Zhang. Adaptive mode switching for cognitive wireless powered communications systems. *IEEE Wireless Communications Letters*, 6:386–389, 2017.

L. Jiang, H. Tian, S. Gjessing, and Y. Zhang. Secure beamforming in wireless-powered cooperative cognitive radio networks. *IEEE Communications Letters*, 20:522–525, 2016.

Y. Jing and H. Jafarkhani. Single and multiple relay selection schemes and their achievable diversity orders. *IEEE Transactions on Wireless Communications*, 8:1414–1423, 2009.

N.L. Johnson, S. Kotz, and N. Balakrishnan. *Continuous Univariate Distributions - I*. Wiley, 1994.

H. Ju and R. Zhang. Throughput maximization in wireless powered communication networks. *IEEE Transactions on Wireless Communications*, 13:418–428, 2014.

M. Ju, K. Kang, K. Hwang, and C. Jeong. Maximum transmission rate of PSR/TSR protocols in wireless energy harvesting DF-based relay networks. *IEEE Journal on Selected Areas in Communications*, 33:2701–2717, 2015.

P. Kamalinejad, C. Mahapatra, Z. Sheng, S. Mirabbasi, V.C.M. Leung, and Y.L. Guan. Wireless energy harvesting for the Internet of Things. *IEEE Communications Magazine*, 53:102–108, 2015.

A. Kansal, J. Hsu, S. Zahedi, and M.B. Srivastava. Power management in energy harvesting sensor networks. *ACM Transactions on Embedded Computing Systems*, 6:1–35, 2007.

M. Kashef and A. Ephremides. Optimal partial relaying for energy-harvesting wireless networks. *IEEE/ACM Transactions on Networking*, 24:113–122, 2016.

K. Kawashima and F. Sato. A routing protocol based on the power generation pattern of sensor nodes in energy harvesting wireless sensor networks. *International Conference on Network-Based Information Systems*, 1:470–475, 2013.

S.M. Kay. *Fundamentals of Statistical Processing, Volume I: Estimation Theory*. Prentice Hall, 1993.

S.M. Kay. *Fundamentals of Statistical Processing, Volume II: Detection Theory*. Prentice Hall, 1998.

F.H. Khan, Y. Chen, and M.-S. Alouini. Novel receivers for AF relaying with distributed STBC using cascaded and disintegrated channel estimation. *IEEE Transactions on Wireless Communications*, 11:1370–1379, 2012.

T.A. Khan, A. Alkhateeb, and R.W. Heath. Millimeter wave energy harvesting. *IEEE Transactions on Wireless Communications*, 15:6048–6062, 2016.

J. Kim, and J.-W. Lee. Energy adaptive MAC protocol for wireless sensor networks with RF energy transfer. *IEEE ICUFN 2011*, 1:89–94, 2011.

J. Kim and J.-W. Lee. Performance analysis of the energy adaptive MAC protocol for wireless sensor networks with RF energy transfer. *IEEE ICTC 2011*, 1:14–19, 2011.

S. Kisseleff, I.F. Akyildiz, and W.H. Gerstacker. Magnetic induction-based simultaneous wireless information and power transfer for single information and multiple power receivers. *IEEE Transactions on Communications*, 65: 1396–1410, 2017.

K. Kotani and T. Ito. High efficiency CMOS rectifier circuit with self Vth cancellation and power regulation functions for UHF RFIDs. *IEEE ASSCC 2007*, 1:119–122, 2007.

K. Kotani, A. Sasaki, and T. Ito. High-efficiency differential-drive CMOS rectifier for UHF RFIDs. *IEEE Journal of Solid-State Circuits*, 44:3011–3018, 2009.

I. Krikidis, G. Zheng, and B. Ottersten. Harvest-use cooperative networks with half/full-duplex relaying. *IEEE WCNC 2013*, 1:4256–4260, 2013.

M.L. Ku, Y. Chen, and K.J.R. Liu. Data-driven stochastic models and policies for energy harvesting sensor communications. *IEEE Journal on Selected Areas in Communications*, 33:1505–1520, 2015.

M.-L. Ku, Y. Han, H.-Q. Lai, Y. Chen, and K.J.R. Liu. Power waveforming: wireless power transfer beyond time reversal. *IEEE Transactions on Signal Processing*, 64:5819–5834, 2016.

J.N. Laneman, D.N.C. Tse, and G.W. Wornell. Cooperative diversity in wireless networks: efficient protocols and outage behavior. *IEEE Transactions on Information Theory*, 50:3062–3080, 2004.

T. Le, K. Mayaram, and T. Fiez. Efficient far-field radio frequency energy harvesting for passively powered sensor networks. *IEEE Journal of Solid-State Circuits*, 43:1287–1302, 2008.

P. Lee, Z.A. Eu, M. Han, and H.-P. Tan. Empirical modeling of a solar-powered energy harvesting wireless sensor node for time-slotted operation. *IEEE WCNC 2011*, 1:179–184, 2011.

S. Lee and R. Zhang. Cognitive wireless powered network: spectrum sharing models and throughput maximization. *IEEE Transactions on Cognitive Communications and Networks*, 1:335–346, 2015.

S. Lee, R. Zhang, and K. Huang. Opportunistic wireless energy harvesting in cognitive radio networks. *IEEE Transactions on Wireless Communications*, 12:4788–4799, 2013.

V. Leonov. Thermoelectric energy harvesting of human body heat for wearable sensors. *IEEE Sensors Journal*, 13:2284–2291, 2013.

Z. Li, Y. Peng, W. Zhang, and D. Qiao. J-RoC: a joint routing and charging scheme to prolong sensor network lifetime. *IEEE International Conference on Network Protocols*, 1:373–382, 2011.

H. Liang, C. Zhong, H.A. Suraweera, G. Zheng, and Z. Zhang. Optimization and analysis of wireless powered multi-antenna cooperative systems. *IEEE Transactions on Wireless Communications*, 16:3267–3281, 2017.

Y.C. Liang, Y. Zeng, E.C.Y. Peh, and A.T. Hoang. Sensing-throughput tradeoff for cognitive radio networks. *IEEE Transactions on Wireless Communications*, 7:1326–1337, 2008.

L. Liu, R. Zhang, and K.-C. Chua. Wireless information transfer with opportunistic energy harvesting. *IEEE Transactions on Wireless Communications*, 12:288–300, 2013.

L. Liu, R. Zhang, and K.-C. Chua. Secrecy wireless information and power transfer with MISO beamforming. *IEEE Transactions on Signal Processing*, 62:1850–1863, 2014a.

L. Liu, R. Zhang, and K.-C. Chua. Multi-antenna wireless powered communication with energy beamforming. *IEEE Transactions on Communications*, 62:4349–4361, 2014b.

P. Liu, S. Gazor, I.-M. Kim, and D.I. Kim. Noncoherent relaying in energy harvesting communication systems. *IEEE Transactions on Wireless Communications*, 14:6940–6954, 2015a.

R. Liu and W. Trappe. *Securing Wireless Communications at the Physical Layer*. Springer, 2009.

Y. Liu, Z. Yang, R. Yu, Y. Xiang, and S. Xie. An efficient MAC protocol with adaptive energy harvesting for machine-to-machine networks. *IEEE Access*, 3:358–369, 2015b.

Y. Liu, Y. Zhang, R. Yu, and S. Xie. Integrated energy and spectrum harvesting for 5G wireless communications. *IEEE Network*, 29:75–81, 2015c.

X. Lu, P. Wang, D. Niyato, D.I. Kim, and Z. Han. Wireless networks with RF energy harvesting: a contemporary survey. *IEEE Communications Surveys and Tutorials*, 17:757–789, 2015.

Y. Luo, J. Zhang, and K.B. Letaief. Optimal scheduling and power allocation for two-hop energy harvesting communication systems. *IEEE Transactions on Wireless Communications*, 12:4729–4741, 2013.

Y. Ma, H. Chen, Z. Lin, Y. Li, and Vucetic B. Distributed and optimal resource allocation for power beacon-assisted wireless-powered communications. *IEEE Transactions on Communications*, 63:3569–3583, 2015.

Y. Mao, G. Yu, and C. Zhong. Energy consumption analysis of energy harvesting systems with power grid. *IEEE Wireless Communications Letters*, 2:611–614, 2013.

M. Mao, N. Cao, Y. Chen, and Y. Zhou. Multi-hop relaying using energy harvesting. *IEEE Wireless Communications Letters*, 4:565–568, 2015.

G. Martinez, S. Li, and C. Zhou. Wastage-aware routing in energy-harvesting wireless sensor networks. *IEEE Sensors Journal*, 14:2967–2974, 2014.

J. Masuch, M. Delgado-Restituto, D. Milosevic, and P. Baltus. An RF-to-DC energy harvester for co-integration in a low power 2.4GHz transceiver frontend. *IEEE International Symposium on Circuits and Systems 2012*, 1: 680–683, 2012.

B. Medepally and N.B. Mehta. Voluntary energy harvesting relays and selection in cooperative wireless networks. *IEEE Transactions on Wireless Communications*, 9:3543–3553, 2010.

D. Michalopoulos, H.A. Suraweera, and R. Schober. Relay selection for simultaneous information transmission and wireless energy transfer: a tradeoff perspective. *IEEE Journal on Selected Areas in Communications*, 33: 1578–1594, 2015.

N. Michelusi, K. Stamatiou, and M. Zorzi. Transmission policies for energy harvesting sensors with time-correlated energy supply. *IEEE Transactions on Communications*, 61:2988–3001, 2013.

A. Minasian, S. ShahbazPanahi, and R.S. Adve. Energy harvesting cooperative communication systems. *IEEE Transactions on Wireless Communications*, 13: 6118–6131, 2014.

P.D. Mitcheson, E.M. Yeatman, G.K. Rao, A.S. Holmes, and B.S. Shariff. Energy harvesting from human and machine motion for wireless electronic devices. *Proceedings of the IEEE*, 96:1457–1486, 2008.

R. Moghe, Y. Yang, F. Lambert, and D. Divan. A scoping study of electric and magnetic field energy harvesting for wireless sensor networks in power system applications. *Proceedings of IEEE ECCE 2009*, 1:3550–3557, 2009.

M. Moradian and F. Ashtiani. Optimal relaying in a slotted aloha wireless network with energy harvesting nodes. *IEEE Journal on Selected Areas in Communications*, 33:1680–1692, 2015.

M.Y. Naderi, P. Nintanavongsa, and K.R. Chowdhury. RF-MAC: a medium access control protocol for re-chargeable sensor networks powered by wireless energy harvesting. *IEEE Transactions on Wireless Communications*, 13:3926–3937, 2014.

A.A. Nasir, X. Zhou, S. Durrani, and R.A. Kennedy. Relaying protocols for wireless energy harvesting and information processing. *IEEE Transactions on Wireless Communications*, 12:3622–3636, 2013.

A.A. Nasir, X. Zhou, S. Durrani, and R.A. Kennedy. Throughput and ergodic capacity of wireless energy harvesting based DF relaying networks. *Proceedings of IEEE ICC 2014*, 1:4066–4071, 2014.

D.W.K. Ng, E.S. Lo, and R. Schober. Multiobjective resource allocation for secure communication in cognitive radio networks with wireless information and power transfer. *IEEE Transactions on Communications*, 65:3166–3184, 2016.

K. Nguyen, V.-H. Nguyen, D.-D. Le, Y. Ji, D.A. Duong, and S. Yamada. ERI-MAC: an energy-harvested receiver-initiated MAC protocol for wireless sensor networks. *International Journal of Distributed Sensor Networks*, 10:1–8, 2014.

P. Nintanavongsa, U. Muncuk, D.R. Lewis, and K.R. Chowdhury. Design optimisation and implementation for RF energy harvesting circuits. *IEEE Journal of Emerging and Selected Topics in Circuits and Systems*, 2:24–33, 2012.

K. Nishioka, N. Sakitani, Y. Uraoka, and T. Fuyuki. Analysis of multicrystalline silicon solar cells by modified 3-diode equivalent circuit model taking leakage current through periphery into consideration. *Solar Energy Materials Solar Cells*, 91:1222–1227, 2007.

O. Orhan and E. Erkip. Energy harvesting two-hop communication networks. *IEEE Journal on Selected Areas in Communications*, 33:2658–2670, 2015.

O. Ozel, K. Tutuncuoglu, J. Yang, S. Ulukus, and A. Yener. Transmission with energy harvesting nodes in fading wireless channels: optimal policies. *IEEE Journal on Selected Areas in Communications*, 29:1732–1743, 2011.

O. Ozel and S. Ulukus. Achieving AWGN capacity under stochastic energy harvesting. *IEEE Transactions on Information Theory*, 58:6471–6483, 2012.

G. Pan, H. Lei, Y. Deng, L. Fan, J. Yang, Y. Chen, and Z. Ding. On secrecy performance of MISO SWIPT systems with TAS and imperfect CSI. *IEEE Transactions on Communications*, 64:3831–3843, 2016.

J.A. Paradiso and T. Starner. Energy scavenging for mobile and wireless electronics. *IEEE Pervasive Computing*, 4:18–27, 2005.

S. Park and D. Hong. Optimal spectrum access for energy harvesting cognitive radio networks. *IEEE Transactions on Wireless Communications*, 12:6166–6179, 2013.

S. Park and D. Hong. Achievable throughput of energy harvesting cognitive radio networks. *IEEE Transactions on Wireless Communications*, 13:1010–1022, 2014.

S. Park, H. Kim, and D. Hong. Cognitive radio networks with energy harvesting. *IEEE Transactions on Wireless Communications*, 12:1386–1397, 2013.

M. Peng, Y. Liu, D. Wei, W. Wang, and H.-H. Chen. Hierarchical cooperative relay based heterogeneous networks. *IEEE Wireless Communications*, 18: 48–56, 2011.

Y. Peng, Z. Li, W. Zhang, and D. Qiao. Prolonging sensor network lifetime through wireless charging. *Proceedings of IEEE RTSS*, 1:129–139, 2010.

M. Pinuela, P.D. Mitcheson, and S. Lucyszyn. Ambient RF energy harvesting in urban and semi-urban environments. *IEEE Transactions on Microwave Theory and Techniques*, 61:2715–2726, 2013.

J.R. Piorno, C. Bergonzini, D. Atienza, and T.S. Rosing. Prediction and management in energy harvested wireless sensor nodes. *Proceedings of Wireless VITAE 2009*, 1:6–10, 2009.

J. Polastre, J. Hill, and D. Culler. Versatile low power media access for wireless sensor networks. *ACM SenSys 2004*, 1:95–107, 2004.

J. Pradha J, S.S. Kalamkar, and A. Banerjee. Energy harvesting cognitive radio with channel-aware sensing strategy. *IEEE Communications Letters*, 18:1171–1174, 2014.

M. Pratibha, K.H. Li, and K.C. Teh. Channel selection in multichannel cognitive radio systems employing RF energy harvesting. *IEEE Transactions on Vehicular Technology*, 65:457–462, 2016.

M. Pratibha, K.H. Li, and K.C. Teh. Optimal spectrum access and energy supply for cognitive radio systems with opportunistic RF energy harvesting. *IEEE Transactions on Vehicular Technology*, 66:7114–7122, 2017.

J.G. Proakis. *Digital Communications*. McGraw-Hill, 2001.

L.P. Qian, G. Feng, and V.C.M. Leung. Optimal transmission policies for relay communication networks with ambient energy harvesting relays. *IEEE Journal on Selected Areas in Communications*, 34:3754–3768, 2016.

QinetiQ. Cognitive radio technology: a study for Ofcom. *Technical Report*, 2007.

T. Rakia, Y.-C. Yang, F. Gebali, and M.-S. Alouini. Optimal design of dual-hop VLC/RF communication system with energy harvesting. *IEEE Communications Letters*, 20:1979–1982, 2016.

R. Ramanathan and R. Hain. Toplogy control of multihop wireless networks using transmit power adjustment. *IEEE INFOCOM 2000*, 2:404–413, 2000.

D. Ramasur and G.P. Hancke. A wind energy harvester for low power wireless sensor networks. *Proceedings of the IEEE International Instrumentation and Measurement Technology Conference*, 1:2623–2627, 2012.

P. Ramezani and A. Jamalipour. Throughput maximization in dual-hop wireless powered communication networks. *IEEE Transactions on Vehicular Technologies*, 66:9304–9312, 2017.

R. Rao, S. Vrudhula, and D.N. Rakhmatov. Battery modeling for energy aware system design. *Computer Magazine*, 36:77–87, 2003.

U. Raza, P. Lukkarni, and M. Sooriyabandara. Low power wide area networks: an overview. *IEEE Communications Surveys and Tutorials*, 19:855–873, 2017.

C. Renner, J. Jessen, and V. Turau. Lifetime prediction for supercapacitor powered wireless sensor nodes. *Proceedings of FGSN 2009*, 1:55–58, 2009.

S. Roundy, P.K. Wright, and J. Rabaey. A study of low level vibrations as a power source for wireless sensor nodes. *Computer Communications*, 26:1131–1144, 2003.

S. Scorcioni, L. Larcher, and A. Bertacchini. A 868MHz CMOS RF-DC power converter with −17dBm input power sensitivity and efficiency higher than 40% over 14dB input range. *2012 ESSCIRC*, 1:109–112, 2012a.

S. Scorcioni, L. Larcher, and A. Bertacchini. Optimised CMOS RF-DC converters for remote wireless powering of RFID applications. *2012 IEEE International Conference on RFID*, 1:47–53, 2012b.

S. Scorcioni, L. Larcher, and A. Bertacchini. A reconfigurable differential CMOS RF energy scavenger with 60% peak efficiency and −21 dBm sensitivity. *IEEE Microwave and Wireless Components Letters*, 23:155–157, 2013.

H. Shafieirad, R.S. Adve, and S.S. Panahi. Max-SNR opportunistic routing for large-scale energy harvesting sensor networks. *IEEE Transactions on Green Communications and Networking*, PP:1–1, 2018.

C. Shen, W.-C. Li, and T.-H. Chang. Wireless information and energy transfer in multi-antenna interference channel. *IEEE Transactions Signal Processing*, 62:6249–6264, 2014.

M. Sherman, A.N. Mody, R. Martinez, and C. Rodrigues. IEEE standards supporting cognitive radio and networks, dynamic spectrum access, and coexistence. *IEEE Communications Magazine*, 46:72–79, 2008.

Q. Shi, W. Xu, T.-H. Chang, Y. Wang, and E. Song. Joint beamforming and power splitting for MISO interference channel with SWIPT: An SOCP relaxation and decentralized algorithm. *IEEE Transactions on Signal Processing*, 62: 6194–6208, 2014.

M.K. Simon and M.-S. Alouini. *Digital Communications Over Fading Channels*. Wiley, 2005.

A. Singh, M.R. Bhatnagar, and R.K. Malik. Secrecy outage of a simultaneous wireless information and power transfer cognitive radio system. *IEEE Wireless Communications Letters*, 5:288–291, 2016.

P. Sitka, P. Corke, L. Overs, P. Valencia, and T. Wark. Fleck – a platform for real-world outdoor sensor networks. *Proceedings of ISSNIP 2007*, 1:709–714, 2004.

P.C. Sofotasios, S. Muhaidat, G.K. Karagiannidis, and B.S. Shariff. Solutions to integrals involving the Marcum Q-function and applications. *IEEE Signal Processing Letters*, 22:1752–1756, 2015.

C. Song, Y. Huang, P. Carter, J. Zhou, S. Yuan, Q Xu, and M. Kod. A novel six-band dual CP rectenna using improved impedance matching technique for ambient RF energy harvesting. *IEEE Transactions on Antennas and Propagation*, 64:3160–3171, 2016.

C. Song, Y. Huang, J. Zhou, and P. Carter. Improved ultrawideband rectennas using hybrid resistance compression technique. *IEEE Transactions on Antennas and Propagation*, 65:2057–2062, 2017.

M. Stoopman, S. Keyrouz, H.J. Visser, K. Philips, and W.A. Serdijn. A self-calibrating RF energy harvester generating 1V at −26.3 dBm. *2013 Symposium on VLSI Circuits (VLSIC)*, 1:C226–C227, 2013.

M. Stoopman, S. Keyrouz, H.J. Visser, K. Philips, and W.A. Serdijn. Co-design of a CMOS rectifier and small loop antenna for highly sensitive RF energy harvesters. *IEEE Journal of Solid-State Circuits*, 49:622–634, 2014.

G. Stuber. *Principles of Mobile Communication.* Kluwer Academic Publishing, 2001.

S. Sudevalayam and P. Kulkarni. Energy harvesting sensor nodes: survey and implications. *IEEE Communications Surveys and Tutorials*, 13:443–461, 2011.

H. Sun, Y. Guo, M. He, and Z. Zhong. A dual band rectenna using broadband Yagi antenna array for ambient RF power harvesting. *IEEE Antennas and Wireless Propagation Letters*, 12:918–921, 2013.

Y. Sun, O. Gurewitz, and D. Johnson. RI-MAC: a receiver-initiated asynchronous duty cycle MAC protocol for dynamic traffic loads in wireless sensor networks. *ACM SenSys 2008*, 1:1–14, 2008.

K.C. Syracuse and W.D.K. Clark. A statistical approach to domain performance modeling for oxyhalide primary lithium batteries. *Proceedings of the 12th Annual Battery Conference on Applications and Advances*, 1:14–17, 1997.

R. Tandra and A. Sahai. SNR walls for signal detection. *IEEE Journal of Selected Topics in Signal Processing*, 2:4–16, 2008.

B. Tong, Z. Li, G. Wang, and W. Zhang. How wireless power charging technology affects sensor network deployment and routing. *IEEE International Conference on Distributed Computing Systems*, 1:438–447, 2010.

C. Tracy and H. Widom. On orthogonal and symplectic matrix ensembles. *Communications in Mathematical Physics*, 177:727–754, 1996.

T.A. Tsiftsis, G.K. Karagiannidis, P.T. Mathiopoulos, and S.A. Kotsopoulos. Nonregenerative dual-hop cooperative links with selection diversity. *EURASIP Journal of Wireless Communications and Networking*, 2006:1–8, 2006.

H. Urkowitz. Energy detection of unknown deterministic signals. *Proceedings of the IEEE*, 55:523–531, 1967.

M. Usman and I. Koo. Access strategy for hybrid underlay-overlay cognitive radios with energy harvesting. *IEEE Sensors Journal*, 14:3164–3173, 2014.

L.R. Varshney. Transporting information and energy simultaneously. *Proceedings of the IEEE International Symposium on Information Theory*, 1612–1616, 2008.

M.G. Villalva, J.F. Gazoli, and E.R. Filho. Comprehensive approach to modeling and simulation of photovoltaic arrays. *IEEE Transactions on Power Electronics*, 24:1198–1208, 2009.

E. Visotsky, S. Kuffner, and R. Peterson. On collaborative detection of TV transmissions in support of dynamic spectrum sharing. *Proceedings of the IEEE 1st Symposium on Dynamic Spectrum Access Networks*, 1:338–345, 2005.

B. Wang, D. Tsonev, S. Videv, and H. Haas. On the design of a solar-panel receiver for optical wireless communications with simultaneous energy harvesting. *IEEE Journal on Selected Areas in Communications*, 33:1612–1623, 2015.

K. Wang, Y. Chen, and M.-S. Alouini. BER and optimal power allocation for amplify-and-forward relaying using pilot-aided maximum likelihood estimation. *IEEE Transactions on Communications*, 62:3462–3475, 2014.

T. Wang, A. Cano, G.B. Giannakis, and J.N. Laneman. High-performance cooperative demodulation with decode-and-forward relays. *IEEE Transactions on Communications*, 55:1427–1438, 2007.

W.S. Wang, T. O'Donnell, N. Wang, M. Hayes, B. O'Flynn, and C. O'Mathuna. Design considerations of sub-mW indoor light energy harvesting for wireless sensor systems. *ACM Journal on Emerging Technologies in Computing Systems*, 6:4424–4435, 2010.

D. Wu and R. Negi. Effective capacity: a wireless link model for support of quality of service. *IEEE Transactions on Wireless Communications*, 2:630–643, 2003.

W. Xiao, W.G. Dunford, and A. Capel. A novel modeling method for photovoltaic cells. *IEEE Power Electronics Specialists Conference 2004*, 1:1950–1956, 2004.

W. Xiao, F.F. Edwin, G. Spagnuolo, and J. Jatskevich. Efficient approaches for modeling and simulating photovoltaic power systems. *IEEE Journal of Photovoltaics*, 3:500–508, 2013.

L. Xie, Y. Shi, Y.T. Hou, and W. Lou. Wireless power transfer and applications to sensor networks. *IEEE Wireless Communications*, 20:140–145, 2013.

Z. Xie, Y. Chen, Y. Gao, Y. Wang, and Y. Su. Wireless powered communication networks using peer harvesting. *IEEE Access*, 5:3454–3464, 2017.

D. Xu and Q. Li. Joint power control and time allocation for wireless powered underlay cognitive radio networks. *IEEE Wireless Communications Letters*, 6:294–297, 2017.

G. Yang, C.K. Ho, and Y.L. Guan. Dynamic channel estimation and power allocation for wireless power beamforming. *Proceedings of the IEEE International Conference on Communications 2014*, 1:1–5, 2014.

G. Yang, G.-Y. Lin, and H.-Y. Wei. Markov chain performance model for IEEE 802.11 devices with energy harvesting source. *IEEE GLOBECOM*, 1:5212–5217, 2012.

J. Yang and S. Ulukus. Optimal packet scheduling in an energy harvesting communication system. *IEEE Transactions on Communications*, 60:220–230, 2012.

W. Ye, J. Heidemann, and D. Estrin. An energy-efficient MAC protocol for wireless sensor networks. *IEEE INFOCOM 2002*, 3:1567–1576, 2002.

S. Yin, Z. Qu, and S. Li. Achievable throughput optimization in energy harvesting cognitive radio systems. *IEEE Journal on Selected Areas in Communications*, 33:407–422, 2015.

S. Yin, E. Zhang, Z. Qu, L. Yin, and S. Li. Optimal cooperation strategy in cognitive radio systems with energy harvesting. *IEEE Transactions on Wireless Communications*, 13:4693–4707, 2014.

H. Yoo, M. Shim, and D. Kim. Dynamic duty-cycle scheduling schemes for energy-harvesting wireless sensor networks. *IEEE Communications Letters*, 16:202–204, 2012.

W. Yu, L. Musavian, and N. Qiang. Tradeoff analysis and joint optimization of link-layer energy efficiency and effective capacity toward green communications. *IEEE Transactions on Wireless Communications*, 15:3339–3353, 2016.

M.-R. Zenaidi, Z. Rezki, and M.-S. Alouini. Performance limits of online energy harvesting communications with noisy channel state information at the transmitter. *IEEE Access*, 5:1239–1249, 2017.

Y. Zeng, C.L. Koh, and Y.-C. Liang. Maximum eigenvalue detection: theory and application. *Proceedings of the IEEE International Conference on Communications (ICC'08)*, 1:4160–4164, 2008.

Y. Zeng and Y.-C. Liang. Eigenvalue-based spectrum sensing algorithms for cognitive radio. *IEEE Transactions on Communications*, 57:1784–1793, 2009a.

Y. Zeng and Y.-C. Liang. Spectrum-sensing algorithms for cognitive radio based on statistical covariances. *IEEE Transactions on Vehicular Technology*, 58: 1804–1815, 2009b.

Y. Zeng and R. Zhang. Full-duplex wireless-powered relay with self-energy recycling. *IEEE Wireless Communications Letters*, 4:201–204, 2015a.

Y. Zeng and R. Zhang. Optimized training design for multi-antenna wireless energy transfer in frequency-selective channel. *Proceedings of the IEEE International Conference on Communications 2015*, 1–5, 2015b.

C. Zhai, J. Liu, and L. Zheng. Cooperative spectrum sharing with wireless energy harvesting in cognitive radio networks. *IEEE Transactions on Vehicular Technology*, 65:5303–5316, 2016a.

C. Zhai, J. Liu, and L. Zheng. Relay-based spectrum sharing with secondary users powered by wireless energy harvesting. *IEEE Transactions on Communications*, 64:1875–1887, 2016b.

D. Zhang, Z. Chen, M.K. Awad, N. Zhang, H. Zhou, and X. Shen. Utility-optimal resource management and allocation algorithm for energy harvesting cognitive radio sensor networks. *IEEE Journal on Selected Areas in Communications*, 34:3552–3565, 2016.

R. Zhang and C.K. Ho. MIMO broadcasting for simultaneous wireless information and power transfer. *IEEE Transactions on Wireless Communications*, 12:1989–2001, 2013.

Y. Zhang, W. Han, D. Li, P. Zhang, and S. Cui. Power versus spectrum 2-D sensing in energy harvesting cognitive radio networks. *IEEE Transactions on Signal Processing*, 63:6200–6212, 2015.

N. Zhao, Y. Cao, R. Yu, Y. Chen, M. Jin, and V.C.M. Leung. Artificial noise assisted secure interference networks with wireless power transfer. *IEEE Transactions on Vehicular Technology*, PP:1–1, 2017a.

N. Zhao, S. Zhang, F.R. Yu, Y. Chen, A. Nallanathan, and V.C.M. Leung. Exploiting interference for energy harvesting: a survey, research issues, and challenges. *IEEE Access*, 5:10403–10421, 2017b.

G. Zheng, Z. Ho, E.A. Jorswieck, and Ottersten B. Information and energy cooperation in cognitive radio networks. *IEEE Transactions on Signal Processing*, 62:2290–2303, 2014.

C. Zhong, X. Chen, Z. Zhang, and G.K. Karagiannidis. Wireless-powered communications: Performance analysis and optimization. *IEEE Transactions on Communications*, 63:5178–5190, 2015a.

C. Zhong, H.A. Suraweera, G. Zheng, I. Krikidis, and Z. Zhang. Wireless information and power transfer with full duplex relaying. *IEEE Transactions on Communications*, 62:3447–3461, 2014.

C. Zhong, G. Zheng, Z. Zhang, and G.K. Karagiannidis. Optimum wirelessly powered relaying. *IEEE Signal Processing Letters*, 22:1728–1732, 2015b.

B. Zhou, H. Hu, S.-Q. Huang, and H.-H. Chen. Intracluster device-to-device relay algorithm with optimal resource allocation. *IEEE Transactions on Vehicular Technology*, 62:2315–2326, 2013a.

X. Zhou. Training-based SWIPT: optimal power splitting at the receiver. *IEEE Transactions on Vehicular Technology*, 64:4377–4382, 2015.

X. Zhou, R. Zhang, and C.K. Ho. Wireless information and power transfer: architecture design and rate-energy tradeoff. *IEEE Transactions on Communications*, 61:4754–4767, 2013b.

T. Zhu, Z. Zhong, Y. Gu, T. He, and Z.-L. Zhang. Leakage-aware energy synchronization for wireless sensor networks. *Proceedings of ACM MobiSys 2009*, 1:319–332, 2009.