

## References

- Akyildiz, I. F., Gutierrez-Estevez, D. M., and Reyes, E. C. (2010), "The evolution to 4G cellular systems: LTE-Advanced", *Physical Communication, ScienceDirect*, Vol. 4, pp. 217–244 Dec 2010
- Alaka, S. P., Narasimhan, T. L., and Chockalingam, A. (2016), "Coded Index Modulation for Non-DC-Biased OFDM in Multiple LED Visible Light Communication", in *Vehicular Technology Conference (VTC Spring)*, IEEE, Nanjing, China May 2016
- Alshamary, H. A. J. and Xu, W. (2016), "Efficient Optimal Joint Channel Estimation and Data Detection for Massive MIMO Systems", in *Information Theory (ISIT)*, IEEE, Barcelona, Spain July 2016
- Berrou, C., Glavieux, A., and Thitimajshima, P. (1993), "Near Shannon limit error-correcting coding and decoding: Turbo-codes", in *ICC*, pp. 1064–1070, IEEE May 1993
- Björnson, E., Sanguinetti, L., Hoydis, J., and Debbah, M. (2015), "Optimal Design of Energy-Efficient Multi-User MIMO Systems: Is Massive MIMO the Answer?", *IEEE Trans. Wireless Commun.*, Vol. 14, No. 6, pp. 3059–3075 June 2015
- Björnson, E., Larsson, E. G., and Debbah, M. (2016), "Massive MIMO for Maximal Spectral Efficiency: How Many Users and Pilots Should Be Allocated?", *IEEE Trans. Wireless Commun.*, Vol. 15, No. 2, pp. 1293 – 1308 Feb 2016
- Bogale, T. E. and Le, L. B. (2014), "Pilot optimization and channel estimation for multiuser massive MIMO systems", in *CISS*, IEEE, Princeton, NJ March 2014
- Chatzigeorgiou, I. A., Rodrigues, M. R. D., Wassell, I. J., and Carrasco, R. A. (2007), "Comparison of Convolutional and Turbo Coding for Broadband FWA Systems", *IEEE Trans. on Broadcasting*, Vol. 53, No. 2, pp. 494–503 June 2007
- Chen, J. and Lau, V. K. N. (2014), "Two-Tier precoding for FDD multi-Cell massive MIMO time-varying interference networks", *J. Sel. Areas Commun.*, Vol. 32, No. 6, pp. 1230–1238 June 2014
- Chockalingam, A. and Rajan, B. S., *Large MIMO Systems*, Cambridge University Press 2014
- Cisco (2017), *Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2016-2021, white paper*, VNI Febraury 2017
- Couillet, R., Debbah, M., and Silverstein, J. W. (2011), "A deterministic equivalent for the analysis of correlated MIMO multiple access channels", *IEEE Trans. Inf. Theory*, Vol. 57, No. 6, pp. 3493–3514 May 2011
- Cover, T. M. and Thomas, J. A., *Elements of Information Theory*, Wiley-Interscience 2006
- Dai, Y. and Dong, X. (2016), "Power Allocation for Multi-Pair Massive MIMO Two-Way AF Relaying With Linear Processing", *IEEE Trans. Wireless Commun.*, Vol. 15, No. 9, pp. 5932–5946 September 2016
- de Lamare, R. C. (2013), "Massive MIMO Systems: Signal Processing Challenges and Research Trends", ArXiv:1310.7282 Oct 2013
- Dharanipragada, S. and Arun, K. S. (1997), "Bandlimited Extrapolation Using Time-Bandwidth Dimension", *IEEE Trans. Signal Proces.*, Vol. 45, No. 12, pp. 2951–2966 Dec 1997
- Du, Z., Song, X., Cheng, J., and Beaulieu, N. C. (2009), "A Convergence Study of Iterative Channel Estimation Algorithms for OFDM Systems in Dispersive Time-Varying Channels", in *Wireless Communications and Networking Conference (WCNC)*, IEEE April 2009
- Edelman, A. and Rao, N. R., *Random Matrix Theory*, Cambridge university press 2005
- Erceg, V., Greenstein, L. J., Tjandra, S. Y., Parkoff, S. R., Gupta, A., Kulic, B., Julius, A. A., and Bianchi, R. (1999), "An empirically based path loss model for wireless channels in suburban

- environments", *IEEE J. Sel. Areas Commun.*, Vol. 17, No. 7, pp. 1205–211 July 1999
- Foschini, G. and Gans, M. (1998), "On Limits of Wireless Communications in a Fading Environment when Using Multiple Antennas", *Wireless Pers. Commun.*, Vol. 6, No. 3, pp. 311–335 March 1998
- Foschini, G. J. (1996), "Layered space-time architecture for wireless communication in a fading environment when using multi-element antennas", *Bell Labs Technical Journal*, Vol. 1, No. 2, pp. 41–59 1996
- Fu, W., Cao, P., and Thompson, J. (2016), "Achievable Rate Performance of TDD Multi-cell Massive MIMO with Non-Orthogonal Pilots", in *Proceedings of the 20th International ITG Workshop on Smart Antennas (WSA 2016)*, VDE March 2016
- Gallager, R. (2006), "Course materials for 6.450 Principles of Digital Communications I", MIT OpenCourseWare (<http://ocw.mit.edu/>) Fall 2006
- Gao, X., Tufvesson, F., and Edfors, O. (2013), "Massive MIMO channels □ Measurements and models", in *Asilomar Conference on Signals, Systems and Computers*, IEEE, Pasific grove November 2013
- Gao, X., Edfors, O., Rusek, F., and Tufvesson, F. (2015), "Massive MIMO Performance Evaluation Based on Measured Propagation Data", *IEEE Trans. Wireless Commun.*, Vol. 14, No. 7, pp. 3899–3909 July 2015
- Goldsmith, A., *Wireless communications*, Cambridge university press 2005
- H., P. and Wu, Y. (2001), "On the Complexity of Turbo Decoding Algorithms", in *Vehicular Technology Conference*, pp. 1439–1443 May 2001
- Hoydis, J., Hoek, C., Wild, T., and ten Brink, S. (2012), "Channel Measurements for Large Antenna Arrays", in *ISWCS*, IEEE Aug 2012
- Jindal, N., Lozano, A., and Marzetta, T. L. (2009), "What is the value of joint processing of pilots and data in block-fading channels?", in *IEEE International Symposium on Information Theory (ISIT)*, IEEE, Seoul, South Korea June 2009
- Jose, J., Ashikhmin, A., Marzetta, T. L., and Vishwanath, S. (2009), "Pilot contamination problem in multi-cell TDD systems", in *IEEE International Symposium on Information Theory*, IEEE June 2009
- Kadrija, F., Simko, M., and Rupp, M. (2013), "Iterative Channel Estimation in LTE Systems", in *Smart Antennas (WSA)*, IEEE March 2013
- Kay, S. M., *Fundamentals of Statistical Signal Processing: Estimation Theory*, Prentice Hall PTR 1993
- Khansefid, A. and Minn, H. (2015), "Achievable Downlink Rates of MRC and ZF Precoders in Massive MIMO With Uplink and Downlink Pilot Contamination", *IEEE Transactions on Communications*, Vol. 63, No. 12, pp. 4849–4864 December 2015
- Kong, C., Zhong, C., Papazafeiropoulos, A. K., Matthaiou, M., and Zhang, Z. (2015), "Sum-Rate and Power Scaling of Massive MIMO Systems With Channel Aging", *IEEE Trans. Commun.*, Vol. 63, No. 12, pp. 4879–4893 December 2015
- Kyösti, P., Meinilä, J., Hentilä, L., Zhao, X., Jämsä, T., Narandzic, M., Milojevic, M., Schneider, C., Hong, A., Ylitalo, J., Holappa, V.-M., Alatossava, M., Bultitude, R., de Jong, Y., and Rautiainen, T. (2007), *WINNER II Channel Models, Tech. rep.*, Information Society Technologies October 2007
- Larsson, E. G., Edfors, O., Tufvesson, F., and Marzetta, T. L. (2014), "Massive MIMO for Next Generation Wireless Systems", *IEEE Commun. Magz.*, Vol. 52, No. 2, pp. 186–195 Feb 2014
- Li, Y., Fan, P., Leukhin, A., and Liu, L. (2017), "On the Spectral and Energy Efficiency of Full-Duplex Small-Cell Wireless Systems With Massive MIMO", *IEEE Trans. Vehicular Technology*, Vol. 66, No. 3, pp. 2339–2353 March 2017
- Liu, L., Matolak, D. W., Tao, C., Li, Y., and Chen, H. (2016a), "Sum-Rate Capacity Investigation of Multiuser Massive MIMO Uplink Systems in Semi-Correlated Channels", May 2016a
- Liu, Y. and Sezginer, S. (2012), "Iterative compensated MMSE channel estimation in LTE systems", in *Communications (ICC)*, IEEE June 2012
- Liu, Y., Yang, Z., Ning, T., and Wu, H. (2014), "Efficient Quality-of-Service (QoS) Support in Mobile Opportunistic Networks", *IEEE Transactions on Vehicular Technology*, Vol. 63, No. 9, pp. 4574–4584 November 2014

- Liu, Y., Bashar, A. M. A. E., Li, F., Wang, Y., and Liu, K. (2016b), "Multi-copy data dissemination with probabilistic delay constraint in mobile opportunistic device-to-device networks", in *World of Wireless, Mobile and Multimedia Networks (WoWMoM)*, IEEE July 2016b
- Lu, L. et al. (2014), "An Overview of Massive MIMO: Benefits and Challenges", *IEEE J. Sel. Topics Signal Process.*, Vol. 8, No. 5, pp. 742–758 Oct 2014
- Marzetta, T. L. (2006), "How Much Training is Required for Multiuser MIMO?", in *Fortieth Asilomar Conference on Signals, Systems and Computers*, pp. 359–363, IEEE Oct 2006
- Marzetta, T. L. (2010), "Noncooperative Cellular Wireless with Unlimited Numbers of Base Station Antennas", *IEEE Trans. Wireless Commun.*, Vol. 9, No. 11, pp. 3590–3600 Nov 2010
- Mohammed, S. K. and Larsson, E. G. (2013), "Per-antenna constant envelope precoding for large multi-user MIMO systems", *IEEE Trans. Commun.*, Vol. 61, No. 3, pp. 1059–1071 February 2013
- Muller, R. R., Cottatellucci, L., and Vehkaperä, M. (2014), "Blind Pilot Decontamination", *IEEE J. Sel. Topics Sig. Proces.*, Vol. 8, No. 5, pp. 773–886 Oct 2014
- Nayebi, E., Ashikhmin, A., Marzetta, T. L., Yang, H., and Rao, B. D. (2017), "Precoding and Power Optimization in Cell-Free Massive MIMO Systems", *IEEE Trans. Wireless Commun.*, Vol. 16, No. 7, pp. 4445–4459 May 2017
- Nelson, E. and van den Dam, R. (2015), *Telco 2015, Tech. rep.*, IBM Institute for Business Value 2015
- Neumann, D., Joham, M., and Utschick, W. (2014), "Suppression of pilot-contamination in massive MIMO systems", in *Signal Processing Advances in Wireless Communications (SPAWC)*, IEEE June 2014
- Ngo, H. Q. (2015), "Massive MIMO: Fundamentals and System Designs", Ph.D. thesis, Linköping University, SE-581 83 Linköping, Sweden January 2015
- Ngo, H. Q. and Larsson, E. G. (2012), "EVD-based channel estimation in multicell multiuser MIMO systems with very large antenna arrays", in *International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pp. 3249 – 3252, IEEE March 2012
- Ngo, H. Q., Larsson, E. G., and Marzetta, T. L. (2013a), "Energy and Spectral Efficiency of Very Large Multiuser MIMO Systems", *IEEE Trans. Commun.*, Vol. 61, No. 4, pp. 1436–1449 April 2013a
- Ngo, H. Q., Larsson, E. G., and Marzetta, T. L. (2013b), "The Multicell Multiuser MIMO Uplink with Very Large Antenna Arrays and a Finite-Dimensional Channel", *IEEE Trans. Commun.*, Vol. 61, No. 6, pp. 2350–2361 June 2013b
- Ngo, H. Q., Matthaiou, M., Duong, T. Q., and Larsson, E. G. (2013c), "Uplink Performance Analysis of Multicell MU-SIMO Systems With ZF Receivers", *IEEE Trans. Veh. Technol.*, Vol. 62, No. 9, pp. 4471–4482 November 2013c
- Ngo, H. Q., Larsson, E. G., and Marzetta, T. L. (2014), "Aspects of favorable propagation in Massive MIMO", in *Signal Processing Conference (EUSIPCO)*, pp. 76–80, IEEE Sept 2014
- Nguyen, T. M., Ha, V. N., and Le, L. B. (2015), "Resource Allocation Optimization in Multi-User Multi-Cell Massive MIMO Networks Considering Pilot Contamination", *IEEE Access*, Vol. 3, pp. 1272–1287 August 2015
- Noh, S., Zoltowski, M. D., Sung, Y., and Love, D. J. (2014), "Pilot Beam Pattern Design for Channel Estimation in Massive MIMO Systems", *IEEE Journal of Selected Topics in Signal Processing*, Vol. 8, No. 5, pp. 787–801 October 2014
- Ozcelik, H., Czinik, N., and Bonek, E. (2005), "What Makes a Good MIMO Channel Model?", in *Proceedings of IEEE 61st Vehicular Technology Conference*, pp. 156–160 May 2005
- Payami, S. and Tufvesson, F. (2012), "Channel Measurements and Analysis for Very Large Array Systems At 2.6 GHz", in *European Conference on Antennas and Propagation (EUCAP)*, pp. 433–437, IEEE March 2012
- Pi, Z. and Khan, F. (2012), "A Millimeter-wave Massive MIMO System for Next Generation Mobile Broadband", in *Signals, Systems and Computers (ASILOMAR)*, pp. 693–698, IEEE Nov 2012
- Poutanen, J., Tufvesson, F., Haneda, K., Kolmonen, V.-M., and Vainikainen, P. (2012), "Multi-Link MIMO Channel Modeling Using Geometry-Based Approach", *IEEE Trans. Antennas and Propag.*,

- Vol. 60, No. 2, pp. 587–596 February 2012
- Raschkowski, L., Kyösti, P., Kusume, K., Jämsä, T., and Nurmela, V. (2015), *METIS Channel Models, Tech. rep.*, METIS February 2015
- Rusek, F., Persson, D., Lau, B. K., Larsson, E. G., Marzetta, T. L., Edfors, O., and Tufvesson, F. (2013), “Scaling Up MIMO Opportunities and challenges with very large arrays”, *IEE Sig. Proces.*, Vol. 30, No. 1, pp. 40–60 Jan 2013
- Sayeed, A. M. (2002), “Deconstructing multiantenna fading channels”, *IEEE Trans. Signal Process.*, pp. 2563–2579 2002
- Shannon, C. E. (1948), “A Mathematical Theory of Communication”, *The Bell System Technical Journal*, Vol. XXVII, No. 3 July 1948
- Shariati, N., Björnson, E., Bengtsson, M., and Debbah, M. (2014), “Low-Complexity Polynomial Channel Estimation in Large-Scale MIMO With Arbitrary Statistics”, *IEEE J. Sel. Topics in Sig. Proces.*, Vol. 8, No. 5, pp. 825–830 October 2014
- Shi, J., Sha, X., Zhang, Q., and Zhang, N. (2012), “Extrapolation of Bandlimited Signals in Linear Canonical Transform Domain”, *IEEE Trans. Signal Proces.*, Vol. 60, No. 3, pp. 1502–1508 March 2012
- So, J., Kim, D., Lee, Y., and Sung, Y. (2015), “Pilot Signal Design for Massive MIMO Systems: A Received Signal-To-Noise-Ratio-Based Approach”, *IEEE Signal Process. Letters*, Vol. 22, No. 5, pp. 549–553 May 2015
- Talwar, S., Viberg, M., and Paulraj, A. (1996), “Blind separation of synchronous co-channel digital signals using an antenna array-part I”, *IEEE Trans. Signal Process.*, Vol. 44, No. 5, pp. 1184–1197 May 1996
- Telatar, I. E. (1999), “Capacity of Multi-antenna Gaussian Channels”, *European Trans. Telecommun.*, Vol. 10, No. 6, pp. 585–595 November 1999
- Tse, D. and Viswanath, P., *Fundamentals of wireless communication*, Cambridge university press 2005
- Tulino, A. and Verdu, S., *Random Matrix Theory and Wireless Communications*, Foundation and Trends in Communications and Information Theory. Delft, The Netherlands: Now Publishers, Inc. 2004
- Veeravalli, V. V., Liang, Y., and Sayeed, A. M. (2005), “Correlated MIMO wireless channels: capacity, optimal signaling, and asymptotics”, *IEEE Trans. Inf. Theory*, Vol. 51, No. 6, pp. 2058–2072 May 2005
- WANG, C.-X., WU, S., BAI, L., YOU, X., WANG, J., and I, C.-L. (2016), “Recent advances and future challenges for massive MIMO channel measurements and models”, *Sci China Inf Sci*, Vol. 59, No. 2, pp. 021301:1–021301:16, doi: 10.1007/s11432-015-5517-1 February 2016
- Weichselberger, W., Herdin, M., Ozelik, H., and Bonek, E. (2006), “A stochastic MIMO channel model with joint correlation of both link ends”, *IEEE Transactions on Wireless Communications*, Vol. 5, No. 1, pp. 90–100 January 2006
- Wen, C.-K., Jin, S., and Wong, K.-K. (2011), “On the Sum-Rate of Multiuser MIMO Uplink Channels with Jointly-Correlated Rician Fading Sign In or Purchase”, *IEEE Transactions on Communications*, Vol. 59, No. 10, pp. 2883–2895 October 2011
- Wu, S., Wang, C.-X., el Hadi M. Aggoune, Alwakeel, M. M., and He, Y. (2014), “A Non-Stationary 3-D Wideband Twin-Cluster Model for 5G Massive MIMO Channels”, *IEEE J. Sel. Areas Commun.*, Vol. 32, No. 6, pp. 1207–1218 June 2014
- Wu, S., Wang, C.-X., Haas, H., el Hadi M. Aggoune, Alwakeel, M. M., and Ai, B. (2015), “A Non-Stationary Wideband Channel Model for Massive MIMO Communication Systems”, *IEEE Transactions on Wireless Communications*, Vol. 14, No. 3, pp. 1434–1446 March 2015
- Yin, H., Gesbert, D., Filippou, M., and Liu, Y. (2013), “A Coordinated Approach to Channel Estimation in Large-Scale Multiple-Antenna Systems”, *IEEE J. Sel. Areas Commun.*, Vol. 31, No. 2, pp. 264–273 February 2013
- Zarei, S., Aulin, J., Gerstacker, W., and Schober, R. (2017), “Max-Min Multicell-Aware Precoding and Power Allocation for Downlink Massive MIMO Systems”, *IEEE Signal Processing Letters*,

Vol. 24, No. 10, pp. 1433–1437 June 2017

- Zhang, J., Yuan, X., and Ping, L. (2013a), “Hermitian precoding for distributed MIMO systems with individual channel state information”, *IEEE J. Sel. Areas Commun.*, Vol. 31, No. 2, pp. 241–250 2013a
- Zhang, J., Jiang, Y., Li, P., Zheng, F., and You, X. (2016), “Energy Efficient Power Allocation in Massive MIMO Systems Based on Standard Interference Function”, May 2016
- Zhang, M., Smith, P. J., and Shafi, M. (2007), “An Extended One-Ring MIMO Channel Model”, *IEEE Transactions on Wireless Communications*, Vol. 6, No. 8, pp. 2759–2764 August 2007
- Zhang, R. *et al.* (2013b), “Advances in Base- and Mobile-Station Aided Cooperative Wireless Communications”, *IEEE veh. technol. mag.* March 2013b
- Zheng, K., Ou, S., and Yin, X. (2014), “Massive MIMO Channel Models: A Survey”, *International J. Antennas and Propagation*, Vol. 18, No. 3, pp. 1617–1655 June 2014
- Zirwas, W. (2015), “Opportunistic CoMP for 5G massive MIMO Multilayer Networks”, in *Smart Antennas (WSA 2015)*, VDE March 2015