

Moe Win

Curriculum Vitae

Contents

1	GENERAL INFORMATION	1
1.1	EDUCATION	1
1.2	RESEARCH SUMMARY	1
1.3	HONORS AND AWARDS	2
2	EXPERIENCE	3
2.1	WORK EXPERIENCE	3
2.2	CONSULTING EXPERIENCE	3
2.3	TEACHING EXPERIENCE	3
2.4	RESEARCH HIGHLIGHTS	4
2.5	RESEARCH FUNDING	5
3	PROFESSIONAL & SCHOLARLY ACTIVITIES	6
3.1	IEEE JOURNALS & CONFERENCE ACTIVITIES	6
3.2	GRADUATE STUDENT SUPERVISION & EXAMINATION	7
3.3	COLLABORATORS (within the past 48 months)	7
4	PUBLICATIONS, PATENTS, & PRESENTATIONS	8
4.1	TEXTBOOKS/CHAPTERS	8
4.2	JOURNAL PAPERS (Published/Accepted)	8
4.3	JOURNAL PAPERS (Submitted)	10
4.4	JOURNAL PAPERS (In Preparation)	10
4.5	REFEREED CONFERENCE PROCEEDINGS	11
4.6	THESES	16
4.7	INTERNAL REPORTS	16
4.8	INVITED TALKS & SPECIAL PRESENTATIONS	16
5	PROFESSIONAL REFERENCES	21

1 GENERAL INFORMATION

Moe Win

(United States Citizen)

Details can be found at <http://www.moewin.com>

Business

Wireless Systems Research Department
AT&T Labs - Research
Room A5-1B04, 200 S. Laurel Avenue
Middletown, NJ 07748-4801 USA
Tel: (732) 420-9016
Fax: (732) 368-9422
e-mail: win@ieee.org

Residence

157 Portland Road
Highlands, NJ 07732 USA
Tel: (732) 872-6605
Mobile: (732) 319-5591
URL: <http://www.moewin.com>

1.1 EDUCATION

- **Doctor of Philosophy** in Electrical Engineering, May 1998
University of Southern California, Los Angeles, CA
Topic: Wireless Multiple Access Communications using Ultra-Wide Bandwidth
Impulse Radio in Dense Multipath Channels
Advisor: Professor Robert A. Scholtz
- **Master of Science** in Applied Mathematics, May 1998
University of Southern California, Los Angeles, CA
Topic: Polyphase Sequences
Advisor: Professor Solomon W. Golomb
- **Master of Science** in Electrical Engineering, May 1989
University of Southern California, Los Angeles, CA
Topic: Coherent Optical Communications using Frequency Stabilized Solid State Lasers
Advisor: Professor Robert A. Scholtz
- **Bachelor of Science** in Electrical Engineering with *Magna Cum Laude*, May 1987
Texas A&M University, College Station, TX
Topic: PPM Sequences with Desirable Correlation (Honors Undergraduate Thesis)
Advisor: Professor Costas N. Georghiadis

1.2 RESEARCH SUMMARY

Fifteen years of experience in leading research institutions working on a broad range of communications problems including measurement and modeling of time-varying channels, design and analysis of multiple antenna systems, ultrawide-bandwidth communications systems, and optical communications systems. Widely published in leading journals, with worldwide contacts in communication theory and wireless systems.

1.3 HONORS AND AWARDS

- Honorable mention as the runner-up for the Communications Society **Stephen O. Rice Prize Paper Award** “for the best paper in the field of Communications Theory published in the IEEE Transactions on Communications,” 2000.
- **Presidential Fellow**, “the highest honors the university bestows upon its graduate students.” Presidential Fellows Program provides formal training in leadership to its most promising future leaders in the professional and graduate schools, USC, 1996-1997.
- NetWorld+Interop '97 **Best Student Paper Award** of IEEE Communications Society, Fourth Annual NetWorld+Interop Engineer Conference, 1997.
- Phi Kappa Phi Student Recognition Award at the Sixteenth Annual Academic Honors Convocation for “outstanding scientific and scholarly works,” USC, 1997.
- Best Poster Presentation Award for “outstanding poster presentation,” at CSI Annual Technical Review, USC, 1997.
- IEEE ISSSTA '96 Best Student Paper Award, IEEE Fourth International Symposium on Spread Spectrum Techniques and Applications, Mainz, Germany, 1996.
- Outstanding Research Paper Award (First Award) for “best research paper written by a student,” USC, 1996.
- Best Poster Presentation Award (First Award) for “outstanding poster presentation,” at CSI Annual Technical Review, USC, 1996.
- NASA Monetary Award for “creative development, technical innovation, and contribution to the National Space Program, and to the mission of the Jet Propulsion Laboratory,” 1993.
- NASA Monetary Award for “creative development, technical innovation, and contribution to the National Space Program, and to the mission of the Jet Propulsion Laboratory,” 1991.
- University Undergraduate Fellow for “superior academic and research contributions in the community of undergraduate and faculty scholars,” Texas A&M University, 1986-1987.
- Class Rank: Top 3% in College of Engineering, Texas A&M University.
- Academic Excellence Award, 1985-1986, Texas A&M University.
- Distinguished Student Award for “outstanding academic achievement,” Texas A&M University, Spring 1986.
- Undergraduate Summer Research Award, Texas A&M University, Summer 1996.
- Herman F. Heep Scholarship for “superior scholastic performance, outstanding leadership qualities, and participation in student activities and organizations,” Texas A&M University, 1985.
- Dean’s List for “highest rank of scholastic success,” Mountain View College, Fall 1983, and Spring 1984.
- Honorable mention for “excellent achievement in Mathematics,” Mountain View College, 1984.
- All Star Student of the Year for “exceptional achievement in Science, Math and Technology,” Mountain View College, 1984.

2 EXPERIENCE

Detailed description of specific research projects can be found at <http://www.moewin.com> or hard copies will be mailed when requested.

2.1 WORK EXPERIENCE

- **AT&T Labs – Research, Wireless Systems Research Department** Middletown, NJ
 Promoted to Principal Technical Staff Member *Apr. 2000 – Present*
 Senior Technical Staff Member *Jan. 1998 – Mar. 2000*
- **Jet Propulsion Laboratory, California Institute of Technology** Pasadena, CA
 Member of Technical Staff
 Digital Signal Processing Research Group *July 1996 – Dec. 1996*
 Guidance and Control Section *Jan. 1991 – June 1995*
 Communications Systems Research Section *May 1987 – Jan. 1991*
- **University of Southern California** Los Angeles, CA
 Research Assistant
 Integrated Media Systems Center (IMSC) *Sept. 1996 – Dec. 1997*
 Communication Sciences Institute (CSI) *June 1994 – Aug. 1996*
- **Texas A&M University** College Station, TX
 Student Researcher
 Telecommunication and Control Systems Laboratory (TCSL) *June 1986 – May 1987*
- **Texas Engineering Experiment Station (TEES)** College Station, TX
 Laboratory Technician
 VLSI CAD laboratory & Microelectronics Research Center *Mar. 1985 – May 1986*

2.2 CONSULTING EXPERIENCE

- **RadioLabs, Consortium at University of Rome “Tor Vergata”** Rome, Italy
 Technology Consultant *Mar. 2000 – Present*
- **Graham & James LLP** Los Angeles, CA
 Consultant *Oct. 1996 – Feb. 1997*
- **Pulson Communications & Time Domain Systems, Inc.** Huntsville, AL
 Consultant *June 1994 – Sept. 1995*

2.3 TEACHING EXPERIENCE

- **Texas A&M University**, Department of Electrical Engineering
 Teaching Assistant, Mar. 1985 – May 1986
- **Mountain View College**, Mathematics Laboratory
 Teaching Assistant, May 1984 – Aug. 1984
- **University of Texas (Arlington)**, Summer Institute of Linguistics
 Teaching Assistant, Sept. 1983 – Dec. 1983

2.4 RESEARCH HIGHLIGHTS

- **Ultra-Wide Bandwidth Communications:** Performed pioneering work on UWB radio (which is substantially immune to fading) and provided a foundation for the design of UWB wireless networks for high data rate communications. Specific contributions include:
 - **Propagation Measurement and Statistical Modeling:** Conducted the first UWB signal propagation experiments, devised a statistical propagation channel model, and demonstrated the robustness of a UWB signal in a multipath environment.
 - **Receiver Design, Analysis and Simulations:** Proposed theoretical analysis and experimental techniques, all of which enabled the efficient design and accurate performance prediction of UWB transmission. Proposed reduced-complexity Rake receivers based on partial combining (PRake) and selective combining (SRake), and evaluated their link performance in a *realistic* UWB channel.
 - **Unified Spectral Analysis:** Derived general expressions for the PSD of a variety of time-hopping spread-spectrum signaling schemes in the presence of timing jitter using *stochastic theory*.
 - **Probabilistic Invariance with Application to FCC Rule Making:** Proved that total interference from radiators located at points of a Poisson random set obeys stable laws and possesses a *surprising* invariance with respect to essentially *any* fading distribution. Hence these results are valid for a large class of fading environments and are helpful in characterizing the effect of unlicensed transmitters in the context of the proposed FCC rule making for UWB transmissions.
- **MIMO Systems:** Developed an analytical framework for the performance of reduced-complexity MIMO systems in multipath-fading environments. We proposed choosing a subset of antennas at both transmit and receive ends. Derived simple, yet tight, bounds on the performance of such systems.
- **Optimum Combining:** Solved an open problem (considered intractable for 20+ years) of optimum combining (OC) in wireless systems using *random matrix theory*. Results obtained are general and valid for arbitrary number of antennas as well as interferers, and were confirmed by Monte Carlo simulation. Fundamental and new insights that are useful in design of MIMO systems with OC were obtained.
- **Hybrid selection/maximal-ratio combining (H-S/MRC) diversity system:** Developed an analytical framework to study the performance of an H-S/MRC in a multipath-fading environment. With H-S/MRC, L out of N diversity branches are selected and combined using MRC. This technique provides improved performance over L branch MRC, when additional diversity is available. The results were obtained for any L and N .
- **Efficient Evaluation of Error Rate for Hybrid diversity systems:** Derived simple explicit bounds for assessing the error rate of hybrid diversity systems. The bounds are tight and valid for all values of SNR; thus alleviating the need for complicated analysis and multiple numerical integrals. Contrary to a previous conjecture, the penalty of a hybrid diversity system relative to MRC diversity was shown not to be a constant; it is not independent of the SNR and the target SEP.
- **Inverse Symbol Error Probability for Diversity Reception:** Derived upper and lower bounds on the inverse SEP for multichannel reception with MRC in fading. The new bounds enable the derivation of the symbol error outage (SEO), SEP-based outage probability, in a shadowing environment and are useful for the design of digital radio systems with diversity reception.
- **Inequalities Arising from Linear Programming:** Conjectured new inequalities that are not easily obtainable by the direct method of Hardy, Littlewood, and Pólya. These inequalities arise in a variety of communication engineering problems and were proved using ideas of convexity and linear programming.
- **Optimal Search Strategies:** Developed algorithms and derived the performance of optimal search strategies. This work provides the fundamental basis for the acquisition of spread spectrum signals in general and third generation WCDMA wireless systems in particular.

- **Reduced-Complexity Rake Receivers:** Quantified the effects of spreading bandwidth on spread spectrum systems in dense multipath environments in terms of receiver performance, receiver complexity, and channel parameters. Developed a novel analytical framework that provides fundamental insights on how wideband reduced-complexity selective Rake receivers can best take advantage of multipath and a theoretical basis for deciding how many fingers should be included in the receiver architecture for wideband systems in general and for third generation wireless systems in particular.
- **Canonical Forms for Performance of MRC in Correlated Nakagami Fading:** Derived closed-form expressions for three performance measures: 1) probability density function of the combiner output SNR; 2) error rate for coherent detection; and 3) outage probability. Obtained a canonical structure for these performance measures as a weighted sum of the corresponding expressions for a non-diversity (single-branch) system. This result is fundamental: the canonical structure depends only on the properties of the channel and diversity combiner, and not on the specific modulation technique.
- **Frequency Noise Measurement and Model for an Optical Phased-Locked Loop (OPLL):** Modeled the frequency noise spectrum of diode-pumped Nd:YAG ring lasers. Verified the model with experimentally measured frequency noise. Demonstrated for the first time that this spectrum possesses strong $1/f$ and $1/f^2$ components, in addition to having the commonly accepted white frequency noise model. Designed and analyzed the OPLL for free-space coherent optical communications and experimentally demonstrated phase locking of both the CW and BPPM optical signal.

2.5 RESEARCH FUNDING

- *ULTRAWAVES: ULTRA-Wideband Audio Video Entertainment System*, (participated in proposal writing with RadioLabs researchers Francesco Vatalaro and Dajana Cassioli)
Sponsor: European Commission for European Union
Amount: 2,562,628.00 euro **Dates:** Apr. 1, 2002 – Sept. 30, 2004.
- *Acquisition of Instrumentation for Testing of Ultra-Wideband Wireless and Wired Communications and Design of Enabling Instrumentation*, (participated in proposal writing with Robert A. Scholtz, Alan E. Willner, and John Choma)
Sponsor: National Science Foundation
Amount: \$ 403,952.00 **Dates:** Sept. 1, 1996 – Aug. 31, 1998.
- *Integrated Media Systems Center*, (participated in proposal writing with Chrysostomos L. (Max) Nikias, Alexander A. Sawchuk, Robert A. Scholtz and approximately 30 primary investigators)
Sponsor: Engineering Research Center Program of the National Science Foundation
Amount: \$ 12.4 million **Dates:** Over 5 years, beginning July 1 1996.
- *Wideband Time-Hopping for Multiple-Access Communications*, (participated in proposal writing with William H. Steier, Robert A. Scholtz and eleven senior investigators)
Sponsor: Joint Services Electronics Program
Amount: \$ 2.9 million **Dates:** Apr. 1, 1994 – Mar. 31, 1997.
- *Undergraduate Fellows Research Support* with Costas N. Georghiades
Sponsor: Texas A&M University
Amount: Unlimited CPU time and related technical books **Dates:** Sept. 1, 1986 – May 31, 1987.
- *Undergraduate Summer Research Grant* with Costas N. Georghiades
Sponsor: Texas A&M University
Amount: \$ 2875.00 **Dates:** May 1, 1986 – Aug. 31, 1986.

3 PROFESSIONAL & SCHOLARLY ACTIVITIES

3.1 IEEE JOURNALS & CONFERENCE ACTIVITIES

- **Editor:** Equalization and Diversity for the IEEE TRANSACTIONS ON COMMUNICATIONS, July 1998-Present.
- **Guest Editor:** IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS, Special Issue on Ultra Wide Band Radio in Multi-Access Wireless Communications, 2002.
- **Technical Program Chair:**
 1. Communication Theory Symposium, IEEE International Conference on Communications (ICC '03), Anchorage, Alaska, June, 2003.
 2. IEEE Conference on Ultra Wideband Systems and Technologies (UWBST '02), Baltimore, MD, May 20-23, 2002.
 3. Communication Theory Symposium, IEEE Global Communications Conference (GLOBECOM '00), San Francisco, CA, Nov. 27 - Dec. 1, 2000.
- **Technical Program Vice-Chair:**
 1. IEEE International Conference on Communications (ICC '02), A 50th Anniversary of Communication Society Event, New York, NY, Apr. 28 - May 2, 2002.
- **Tutorial Chair:** IEEE Semiannual International Vehicular Technology Conference (VTC '01-Fall), Atlantic City, NJ, Oct. 7-11, 2001.
- **Steering Committee Member:** IEEE Conference on Ultra Wideband Systems and Technologies (UWBST 02), Baltimore, MD, May 20-23, 2002.
- **Technical Program Committee Member:**
 1. IEEE Wireless Communications and Networking Conference (WCNC '02), Orlando, FL, Mar. 17-21, 2001.
 2. Communication Theory Symposium, IEEE Global Communications Conference (GLOBECOM '01), San Antonio, TX, Nov. 25-29, 2001.
 3. Symposium on Communication Theory, IEEE Global Communications Conference (GLOBECOM '99), Rio de Janeiro, BRAZIL, Dec. 5-9, 1999.
 4. IEEE Wireless Communications and Networking Conference (WCNC '99), New Orleans, LA, Sept. 21-25, 1999.
 5. IEEE 49th Annual International Vehicular Technology Conference (VTC '99-Spring), Houston, TX, May 16-20, 1999.
- **International Advisory Committee Member:** IEEE 50th International Vehicular Technology Conference (VTC '99-Fall), Amsterdam, The Netherlands, Sept. 19-22, 1999.
- **Session Chairman:** for 12 technical sessions (2 of which were invited sessions) at major conferences worldwide over the last 5 years.
- **Session Organizer:** for 14 technical sessions (2 of which were invited sessions) at major conferences worldwide over the last 5 years.

3.2 GRADUATE STUDENT SUPERVISION & EXAMINATION

- Served as **Co-Advisor** of Dajana Cassioli, “*Ultra-Wideband Wireless Communications: from Statistical Model, Simulations to Performance Analysis*,” Ph.D. Thesis Advisor: Francesco Vatalaro, Dipartimento di Ingegneria Elettronica, **Università di Roma “Tor Vergata”**, Rome, ITALY, December 2002.
- Served as **Co-Advisor** of Sasan Haghani, “*Simple Bounds on the Error Probability of M-ary Signaling with Hybrid Diversity*,” M.Sc. Research Thesis Advisor: Norman C. Beaulieu, Department of Electrical and Computer Engineering, **University of Alberta**, Edmonton, Alberta, CANADA, June 2002.
- Served on **Dissertation Committee** of Li Zhao, “*Ultra-Wideband Technology for Short-Range Wireless Communications*,” Ph.D. Thesis Advisor: Alexander M. Haimovich, Department of Electrical and Computer Engineering, Center for Communications and Signal Processing Research, **New Jersey Institute of Technology**, Newark, USA, December 2002.
- Served as an **External Examiner** of Hlaing Minn thesis entitled, “*Some Issues in Enabling Technologies for High Data Rate Reliable Wireless Communications: OFDM and Adaptive ARQ*,” Ph.D. Thesis Advisor: Vijay K. Bhargava, Department of Electrical and Computer Engineering, **University of Victoria**, Victoria, BC, CANADA, November 2001.
- Served as an **External Examiner** of Nicholas J. Baas thesis entitled, “*Decomposition of Rayleigh Fading Dispersive Channels*,” Ph.D. Thesis Advisor: Desmond P. Taylor, Department of Electrical and Electronic Engineering, **University of Canterbury**, Christchurch, NEW ZEALAND, June 2000.
- Served on **Dissertation Committee** of Matthijs A. Visser, “*Adaptive Interference Cancellation Techniques for Multicarrier Modulated Systems*,” Ph.D. Thesis Advisor: Yeheskel Bar-Ness, Department of Electrical and Computer Engineering, Center for Communications and Signal Processing Research, **New Jersey Institute of Technology**, Newark, USA, April 1999.

3.3 COLLABORATORS (within the past 48 months)

Collaborated with a large number of researchers across multiple disciplines around the globe, as listed on <http://www.moewin.com>, including:

1. *Lawrence A. Shepp* - Professor of Statistics, Department of Statistics, Rutgers University
2. *Benjamin F. Logan* - Mathematics and Cryptography Research, AT&T Shannon Laboratories
3. *Ioannis Karatzas* - Eugene Higgins Professor of Applied Probability, Columbia University
4. *Norman C. Beaulieu* - Professor and EIC (*Trans. on Commun.*), Dept. of ECE, University of Alberta
5. *Jack H. Winters* - Technology Leader, Wireless Systems Research Department, AT&T Labs
6. *Marco Chiani* - Professor, Dipartimento di Elettronica, Informatica e Sistemistica, University of Bologna
7. *Andreas F. Molisch* - Associate Professor, Vienna University of Technology, now with AT&T Labs
8. *Ranjan K. Mallik* - Assistant Professor, Dept. of EE, Indian Institute of Technology - Delhi
9. *Francesco Vatalaro* - Professor, Dept. of Electronic Engineering, Università di Roma “Tor Vergata”
10. *Dajana Cassioli* - Ph.D. Candidate, Dept. of Electronic Engineering, Università di Roma “Tor Vergata”
11. *Costas N. Georghiades* - J.W.Runyon, Jr. Professor, Dept. of EE, Texas A&M University
12. *Zoran A. Kostić* - Principal Technical Staff Member, AT&T Research Labs

4 PUBLICATIONS, PATENTS, & PRESENTATIONS

4.1 TEXTBOOKS/CHAPTERS

1. Moe Z. Win, “Ultra-wideband radio,” in *Wiley Encyclopedia of Telecommunications*, John G. Proakis, Ed. 2002, John Wiley & Sons, Inc., **Invited Chapter**, in preparation.
2. Moe Z. Win, Giorgio M. Vitetta, and Jack H. Winters, “Equalization techniques for mitigating transmission impairments in lightwave transmission systems,” in *Optical Fiber Communications IV*, Ivan P. Kaminow and Tingye Li, Eds. 2002, vol. 2, pp. 965–997, Academic Press, **Invited Chapter**.
3. P. Vijay Kumar, Moe Z. Win, Hsiao-Feng Lu, and Costas N. Georghiadis, “Error-control coding techniques and applications for lightwave transmission channels,” in *Optical Fiber Communications IV*, Ivan P. Kaminow and Tingye Li, Eds. 2002, vol. 2, pp. 902–964, Academic Press, **Invited Chapter**.
4. Moe Z. Win and George Chrisikos, “Impact of spreading bandwidth and selection diversity order on selective Rake reception,” in *Wideband Wireless Digital Communications*, Andreas F. Molisch, Ed. 2001, pp. 424–454, Prentice Hall Publishers, **Invited Chapter**.
5. Robert A. Scholtz and Moe Z. Win, “Impulse radio,” in *Wireless Communications*, Savo G. Glisic and Pentti A. Leppänen, Eds. 1997, pp. 245–263, Kluwer Academic Publishers, **Invited Chapter**.

4.2 JOURNAL PAPERS (Published/Accepted)

1. Ranjan K. Mallik and Moe Z. Win, “Analysis of hybrid selection/maximal-ratio combining in correlated Nakagami fading,” *IEEE Trans. Commun.*, vol. 50, 2002, to appear.
2. Ranjan K. Mallik, Moe Z. Win, and Jack H. Winters, “Performance of dual diversity predetection EGC in correlated Rayleigh fading with unequal branch SNR’s,” *IEEE Trans. Commun.*, vol. 50, 2002, to appear.
3. Dajana Cassioli, Moe Z. Win, and Andreas F. Molisch, “The ultra-wide bandwidth indoor channel: from statistical model to simulations,” *IEEE J. Select. Areas Commun.*, vol. 20, no. 8, Aug. 2002, to appear.
4. R. Jean-Marc Cramer, Robert A. Scholtz, and Moe Z. Win, “An evaluation of the ultra-wideband propagation channel,” *IEEE Trans. Antennas Propagat.*, vol. 50, no. 6, June 2002, to appear.
5. Moe Z. Win and Ranjan K. Mallik, “Error analysis of noncoherent M -ary FSK with postdetection EGC over arbitrarily correlated Nakagami and Rician channels,” *IEEE Trans. Commun.*, vol. 50, no. 4, Mar. 2002.
6. Moe Z. Win and Jack H. Winters, “Virtual branch analysis of symbol error probability for hybrid selection/maximal-ratio combining in Rayleigh fading,” *IEEE Trans. Commun.*, vol. 49, no. 11, pp. 1926–1934, Nov. 2001.
7. Ranjan K. Mallik and Moe Z. Win, “Error probability of binary NFSK and DPSK with postdetection combining over correlated Rician channels,” *IEEE Trans. Commun.*, vol. 48, no. 12, pp. 1975–1978, Dec. 2000.
8. Moe Z. Win, George Chrisikos, and Nelson R. Sollenberger, “Performance of Rake reception in dense multipath channels: Implications of spreading bandwidth and selection diversity order,” *IEEE J. Select. Areas Commun.*, vol. 18, no. 8, pp. 1516–1525, Aug. 2000.

9. Moe Z. Win and Robert A. Scholtz, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” *IEEE Trans. Commun.*, vol. 48, no. 4, pp. 679–691, Apr. 2000, Honorable mention as the runner-up for the Communications Society **Stephen O. Rice Prize Paper Award**.
10. Moe Z. Win and Jack H. Winters, “Analysis of hybrid selection/maximal-ratio combining in Rayleigh fading,” *IEEE Trans. Commun.*, vol. 47, no. 12, pp. 1773–1776, Dec. 1999.
11. Moe Z. Win and Zoran A. Kostić, “Impact of spreading bandwidth on Rake reception in dense multipath channels,” *IEEE J. Select. Areas Commun.*, vol. 17, no. 10, pp. 1794–1806, Oct. 1999.
12. Moe Z. Win, Xiaoxin Qiu, Robert A. Scholtz, and Victor O. K. Li, “ATM-based TH-SSMA network for multimedia PCS,” *IEEE J. Select. Areas Commun.*, vol. 17, no. 5, pp. 824–836, May 1999.
13. Moe Z. Win, “On the power spectral density of digital pulse streams generated by M -ary cyclostationary sequence in the presence of stationary timing jitter,” *IEEE Trans. Commun.*, vol. 46, no. 9, pp. 1135–1145, Sept. 1998.
14. Solomon W. Golomb and Moe Z. Win, “Recent results on polyphase sequences,” *IEEE Trans. Inform. Theory*, vol. 44, no. 2, pp. 817–824, Mar. 1998.
15. Moe Z. Win, Chien-C. Chen, and Robert A. Scholtz, “Optical phase-locked loop (OPLL) for an amplitude modulated communications link using solid state lasers,” *IEEE J. Select. Areas Commun.*, vol. SAC-13, no. 3, pp. 569–576, Apr. 1995, **Outstanding Research Paper Award (USC)**.
16. Andreas F. Molisch, Moe Z. Win, and Jack H. Winters, “Space-time-frequency coding for MIMO-OFDM systems,” *IEEE Commun. Lett.*, 2002, to appear.
17. Moe Z. Win and Robert A. Scholtz, “Infinite Rake and selective Rake receivers for ultra-wide bandwidth transmissions in multipath environments,” *IEEE Commun. Lett.*, 2002, to appear.
18. Moe Z. Win, George Chrisikos, and Jack H. Winters, “MRC performance for M -ary modulation in arbitrarily correlated Nakagami fading channels,” *IEEE Commun. Lett.*, vol. 4, no. 10, pp. 301–303, Oct. 2000.
19. Moe Z. Win, George Chrisikos, and Nelson R. Sollenberger, “Effects of chip rate on selective Rake combining,” *IEEE Commun. Lett.*, vol. 4, no. 7, pp. 233–235, July 2000.
20. Moe Z. Win and Zoran A. Kostić, “Virtual path analysis of selective Rake receiver in dense multipath channels,” *IEEE Commun. Lett.*, vol. 3, no. 11, pp. 308–310, Nov. 1999.
21. Moe Z. Win and Robert A. Scholtz, “On the energy capture of ultra-wide bandwidth signals in dense multipath environments,” *IEEE Commun. Lett.*, vol. 2, no. 9, pp. 245–247, Sept. 1998.
22. Moe Z. Win and Robert A. Scholtz, “On the robustness of ultra-wide bandwidth signals in dense multipath environments,” *IEEE Commun. Lett.*, vol. 2, no. 2, pp. 51–53, Feb. 1998.
23. Moe Z. Win and Robert A. Scholtz, “Impulse radio: How it works,” *IEEE Commun. Lett.*, vol. 2, no. 2, pp. 36–38, Feb. 1998.
24. Chien-C. Chen and Moe Z. Win, “Frequency noise measurement of diode-pumped Nd:YAG ring lasers,” *IEEE Photonics Technol. Lett.*, vol. 2, no. 11, pp. 772–774, Nov. 1990.

4.3 JOURNAL PAPERS (Submitted)

1. Moe Z. Win and Jack H. Winters, “On maximal ratio combining in correlated Nakagami channels with unequal fading parameters and SNR’s among branches: An analytical framework,” *IEEE Trans. Inform. Theory*, 2001, accepted pending revision.
2. Moe Z. Win and Jack H. Winters, “Exact error probability expressions for maximal ratio combining in correlated Nakagami channels with unequal fading parameters and branch powers,” *IEEE Trans. Commun.*, 2001, accepted pending revision.
3. Marco Chiani, Moe Z. Win, Alberto Zanella, and Jack H. Winters, “Error probability for optimum combining of M -ary PSK signals in the presence of interference and noise,” *IEEE Trans. Commun.*, 2002, submitted.
4. Ranjan K. Mallik, Moe Z. Win, Joushua W. Shao, Mohamed-Slim Alouini, and Andrea Goldsmith, “Channel capacity of adaptive transmission with maximal ratio combining in correlated Rayleigh fading,” *IEEE Trans. Wireless Commun.*, 2002, submitted.
5. Marco Chiani, Moe Z. Win, Alberto Zanella, and Jack H. Winters, “A Laguerre polynomial based bound on the symbol error probability for adaptive antennas with optimum combining,” *IEEE Trans. Wireless Commun.*, 2002, submitted.
6. Moe Z. Win, Ranjan K. Mallik, George Chrisikos, and Jack H. Winters, “Higher order statistics of the output SNR of hybrid selection/maximal-ratio combining,” *IEEE Trans. Wireless Commun.*, 2002, submitted.
7. Ranjan K. Mallik, Moe Z. Win, Marco Chiani, Alberto Zanella, and Jack H. Winters, “Bit error probability for optimum combining of binary signals in the presence of interference and noise,” *IEEE Trans. Wireless Commun.*, 2001, submitted.
8. Andrea Conti, Moe Z. Win, and Marco Chiani, “On the inverse symbol error probability for diversity reception,” *IEEE Trans. Commun.*, 2001, submitted.
9. Marco Chiani, Moe Z. Win, Alberto Zanella, Ranjan K. Mallik, and Jack H. Winters, “Bounds and approximations for optimum combining of signals in the presence of multiple co-channel interferers and thermal noise,” *IEEE Trans. Commun.*, 2001, submitted.
10. Moe Z. Win, Norman C. Beaulieu, Lawrence A. Shepp, Benjamin F. Logan, and Jack H. Winters, “Rapid error rate evaluation of MPSK with hybrid selection/maximal ratio combining,” *IEEE Trans. Commun.*, 2001, submitted.
11. Sennur Ulukus, Ezio Biglieri, and Moe Z. Win, “Selection of modulation and multicode formats for maximum throughput in CDMA,” *IEEE J. Select. Areas Commun.*, 2000, submitted.
12. Andrea Conti, Moe Z. Win, Marco Chiani, and Jack H. Winters, “Bit error outage for diversity reception in shadowing environment,” *IEEE Commun. Lett.*, 2001, submitted.

4.4 JOURNAL PAPERS (In Preparation)

1. Moe Z. Win, “A unified spectral analysis of generalized time-hopping spread-spectrum signals in the presence of timing jitter,” *IEEE J. Select. Areas Commun.*, 2002, in preparation, **Invited Paper**.
2. Moe Z. Win and Robert A. Scholtz, “Characterization of ultra-wide bandwidth wireless indoor communications channel: A communication theoretic view,” *IEEE J. Select. Areas Commun.*, 2002, in preparation, **Invited Paper**.

3. Moe Z. Win and Lawrence A. Shepp, “Insights into wireless telephony obtained from Poisson random sets and vice versa,” *to be submitted to J. Appl. Prob.*, 2002, in preparation.
4. James A. Reeds, Lawrence A. Shepp, and Moe Z. Win, “Monotone parametric dependence of a generalized mean,” *to be submitted to J. of Math. Analysis and Applications*, 2002, in preparation.
5. Sasan Haghani, Norman C. Beaulieu, and Moe Z. Win, “Simple bounds on the error probability of two-dimensional signaling with hybrid diversity,” *to be submitted to IEEE Trans. Commun.*, 2002, in preparation.
6. Dajana Cassioli, Moe Z. Win, Francesco Vatalaro, and Andreas F. Molisch, “Low-complexity Rake receivers in ultra-wideband channels,” *to be submitted to IEEE J. Select. Areas Commun.*, 2002, in preparation.
7. Andreas F. Molisch, Moe Z. Win, and Jack H. Winters, “Reduced-complexity multiple transmit/receive antenna systems,” *to be submitted to IEEE Trans. Commun.*, 2002, in preparation.
8. Andreas F. Molisch, Moe Z. Win, Yang-Soek Choi, and Jack H. Winters, “Capacity of MIMO systems with antenna selection,” *to be submitted to IEEE Trans. Commun.*, 2002, in preparation.
9. Moe Z. Win and Jack H. Winters, “On hybrid selection/maximal-ratio combining of diversity branches with unequal SNR in Rayleigh fading: An analytical framework,” *to be submitted to IEEE Trans. Commun.*, 2002, in preparation.
10. Neelesh B. Mehta, Zoran A. Kostić, and Moe Z. Win, “Fast scheduling diversity and its impact on CDMA Rake receivers exploiting multipath channel diversity,” *to be submitted to IEEE J. Select. Areas Commun.*, 2002, in preparation.
11. Moe Z. Win, George Chrisikos, and Andreas F. Molisch, “Impact of spreading bandwidth on selective Rake reception in multipath channels with arbitrary power delay profile,” *to be submitted to IEEE J. Select. Areas Commun.*, 2002, in preparation.
12. Moe Z. Win, Lawrence A. Shepp, and Al’bert N. Shiryaev, “An optimal search procedure,” *to be submitted to J. Appl. Prob.*, 2002, in preparation.

4.5 REFEREED CONFERENCE PROCEEDINGS

1. Andrea Conti, Moe Z. Win, and Marco Chiani, “A new class of tight and invertible bounds on the SEP for diversity reception,” in *Proc. IEEE International Symposium on Information Theory*, July 2002, Lausanne, SWITZERLAND.
2. Ranjan K. Mallik and Moe Z. Win, “Code lag estimation of Rayleigh-faded spread spectrum signals using an antenna array,” in *Proc. IEEE International Symposium on Information Theory*, July 2002, Lausanne, SWITZERLAND.
3. Andrea Conti, Moe Z. Win, and Marco Chiani, “QoS-based outage probability for diversity reception,” in *Proc. IEEE Int. Conf. on Commun.*, May 2002, New York, NY.
4. Marco Chiani, Moe Z. Win, Alberto Zanella, and Jack H. Winters, “A simple and asymptotically tight upper bound on the symbol error probability of adaptive antennas with optimum combining,” in *Proc. IEEE Int. Conf. on Commun.*, May 2002, New York, NY.
5. Ranjan K. Mallik, Moe Z. Win, and Marco Chiani, “Exact analysis of optimum combining in interference and noise over a Rayleigh fading channel,” in *Proc. IEEE Int. Conf. on Commun.*, May 2002, New York, NY.

6. Dajana Cassioli, Moe Z. Win, Francesco Vatalaro, and Andreas F. Molisch, “Performance of selective Rake reception in a realistic UWB channel,” in *Proc. IEEE Int. Conf. on Commun.*, May 2002, New York, NY.
7. Marco Chiani, Moe Z. Win, Alberto Zanella, and Jack H. Winters, “An analytical framework for the performance evaluation of optimum combining for M -PSK signals,” in *Proc. Conf. on Inform. Sci. and Sys.*, Mar. 2002, Princeton, NJ.
8. Alberto Zanella, Moe Z. Win, Jack H. Winters, and Marco Chiani, “Symbol error probability of high spectral efficiency MIMO systems,” in *Proc. Conf. on Inform. Sci. and Sys.*, Mar. 2002, Princeton, NJ.
9. Marco Chiani, Andrea Conti, and Moe Z. Win, “Analysis of the BEP for M -QAM in fading channel,” in *Proc. Conf. on Inform. Sci. and Sys.*, Mar. 2002, Princeton, NJ.
10. Marco Chiani, Moe Z. Win, Alberto Zanella, and Jack H. Winters, “Exact symbol error probability for optimum combining in the presence of multiple co-channel interferers and thermal noise,” in *Proc. IEEE Global Telecomm. Conf.*, Nov. 2001, vol. 2, pp. 1182–1186, San Antonio, TX.
11. Moe Z. Win and Ranjan K. Mallik, “Error analysis of noncoherent M -ary FSK with postdetection EGC over correlated Nakagami and Rician channels,” in *Proc. IEEE Int. Conf. on Commun.*, June 2001, vol. 7, pp. 2241–2245, Helsinki, FINLAND.
12. Andreas F. Molisch, Moe Z. Win, and Jack H. Winters, “Capacity of MIMO systems with antenna selection,” in *Proc. IEEE Int. Conf. on Commun.*, June 2001, vol. 2, pp. 570–574, Helsinki, FINLAND.
13. Jack H. Winters and Moe Z. Win, “Hybrid-selection/optimum combining,” in *Proc. IEEE Semiannual Veh. Technol. Conf.*, May 2001, vol. 1, pp. 113–117, Rhodes, GREECE.
14. Dajana Cassioli, Moe Z. Win, and Andreas F. Molisch, “A statistical model for the UWB indoor channel,” in *Proc. IEEE Semiannual Veh. Technol. Conf.*, May 2001, vol. 2, pp. 1159–1163, Rhodes, GREECE.
15. Andreas F. Molisch, Moe Z. Win, and Jack H. Winters, “Reduced-complexity transmit/receive-diversity systems,” in *Proc. IEEE Semiannual Veh. Technol. Conf.*, May 2001, vol. 3, pp. 1996–2000, Rhodes, GREECE.
16. Andreas F. Molisch, Moe Z. Win, and Jack H. Winters, “Space-time-frequency-coding for MIMO-OFDM systems,” in *Proc. 4th European Personal Mobile Commun. Conf.*, Feb. 2001, Vienna, AUSTRIA.
17. Sennur Ulukus, Ezio Biglieri, and Moe Z. Win, “Optimum modulation and multicode formats in CDMA systems with multiuser receivers,” in *INFOCOM*, Apr. 2001, vol. 1, pp. 395–402, Anchorage, Alaska.
18. Moe Z. Win, George Chrisikos, Andreas F. Molisch, and Nelson R. Sollenberger, “Selective Rake diversity in multipath fading with arbitrary power delay profile,” in *Proc. IEEE Global Telecomm. Conf.*, Dec. 2000, vol. 2, pp. 960–964, San Francisco, CA.
19. Moe Z. Win, Ranjan K. Mallik, George Chrisikos, and Jack H. Winters, “Higher order statistics of the output SNR of hybrid selection/maximal-ratio combining,” in *Proc. IEEE Global Telecomm. Conf.*, Dec. 2000, vol. 2, pp. 922–926, San Francisco, CA.
20. Ranjan K. Mallik, Moe Z. Win, and Jack H. Winters, “Performance of predetection dual diversity in correlated Rayleigh fading: EGC and SD,” in *Proc. IEEE Global Telecomm. Conf.*, Dec. 2000, vol. 2, pp. 932–936, San Francisco, CA.

21. Moe Z. Win, Norman C. Beaulieu, Lawrence A. Shepp, Benjamin F. Logan, and Jack H. Winters, “Tight simple bounds on the error probability of hybrid diversity combining,” in *Proc. IEEE International Symposium on Information Theory and Its Applications*, Nov. 2000, pp. 955–959, Honolulu, HI.
22. Walid K. M. Ahmed, Moe Z. Win, Peter J. McLane, and Jack H. Winters, “Error exponents for the correlated Nakagami fading channel with maximal-ratio combining,” in *Proc. IEEE International Symposium on Information Theory and Its Applications*, Nov. 2000, pp. 968–971, Honolulu, HI.
23. George Chrisikos and Moe Z. Win, “Performance of M -QAM with nonlinear transmit amplifiers in fading channels,” in *Proc. IEEE Radio and Wireless Conf.*, Sept. 2000, pp. 51–54, Denver, CO.
24. Ranjan K. Mallik and Moe Z. Win, “Channel capacity in evenly correlated Rayleigh fading with different adaptive transmission schemes and maximal ratio combining,” in *Proc. IEEE International Symposium on Information Theory*, June 2000, p. 412, Sorrento, ITALY.
25. Moe Z. Win and Jack H. Winters, “Exact error probability expressions for H-S/MRC in Rayleigh fading: A virtual branch technique,” in *Proc. IEEE Global Telecomm. Conf.*, Dec. 1999, vol. 1, pp. 537–542, Rio de Janeiro, BRAZIL.
26. Moe Z. Win and Jack H. Winters, “Exact error probability expressions for MRC in correlated Nakagami channels with unequal fading parameters and branch powers,” in *Proc. IEEE Global Telecomm. Conf., Symp. on Comm. Theory*, Dec. 1999, vol. 5, pp. 2331–2335, Rio de Janeiro, BRAZIL.
27. Moe Z. Win, “Spectral density of random time-hopping spread-spectrum UWB signals with uniform timing jitter,” in *Proc. Military Comm. Conf.*, Nov. 1999, vol. 2, pp. 1196–1200, Atlantic City, NJ.
28. Moe Z. Win, George Chrisikos, and Jack H. Winters, “Error probability for M -ary modulation using hybrid selection/maximal-ratio combining in Rayleigh fading,” in *Proc. Military Comm. Conf.*, Nov. 1999, vol. 2, pp. 944–948, Atlantic City, NJ.
29. Moe Z. Win, George Chrisikos, and Jack H. Winters, “Error probability for M -ary modulation in correlated Nakagami channels using maximal ratio combining,” in *Proc. Military Comm. Conf.*, Nov. 1999, vol. 1, pp. 70–75, Atlantic City, NJ.
30. R. Jean-Marc Cramer, Robert A. Scholtz, and Moe Z. Win, “On the analysis of UWB communication channels,” in *Proc. Military Comm. Conf.*, Nov. 1999, vol. 2, pp. 1191–1195, Atlantic City, NJ.
31. Moe Z. Win, Ranjan K. Mallik, George Chrisikos, and Jack H. Winters, “Canonical expressions for the error probability performance for M -ary modulation with hybrid selection/maximal-ratio combining in Rayleigh fading,” in *Proc. IEEE Wireless Commun. and Networking Conf.*, Sept. 1999, vol. 1, pp. 266–270, New Orleans, LA, **Invited Paper**.
32. Moe Z. Win, George Chrisikos, and Nelson R. Sollenberger, “Impact of spreading bandwidth and diversity order on the error probability performance of Rake reception in dense multipath channels,” in *Proc. IEEE Wireless Commun. and Networking Conf.*, Sept. 1999, vol. 3, pp. 1558–1562, New Orleans, LA, **Invited Paper**.
33. Moe Z. Win and Jack H. Winters, “On maximal ratio combining in correlated Nakagami channels with unequal fading parameters and SNR’s among branches: An analytical framework,” in *Proc. IEEE Wireless Commun. and Networking Conf.*, Sept. 1999, vol. 3, pp. 1058–1064, New Orleans, LA, **Invited Paper**.
34. R. Jean-Marc Cramer, Robert A. Scholtz, and Moe Z. Win, “Spatio-temporal diversity in ultra-wideband radio,” in *Proc. IEEE Wireless Commun. and Networking Conf.*, Sept. 1999, vol. 2, pp. 888–892, New Orleans, LA, **Invited Paper**.

35. Moe Z. Win and Jack H. Winters, “Analysis of hybrid selection/maximal-ratio combining in Rayleigh fading,” in *Proc. IEEE Int. Conf. on Commun.*, June 1999, vol. 1, pp. 6–10, Vancouver, CANADA.
36. Moe Z. Win and Zoran A. Kostić, “Impact of spreading bandwidth on Rake reception in dense multipath channels,” in *Proc. 8th Comm. Theory Mini Conf.*, June 1999, pp. 78–82, Vancouver, CANADA.
37. Moe Z. Win and Jack H. Winters, “Analysis of hybrid selection/maximal-ratio combining of diversity branches with unequal SNR in Rayleigh fading,” in *Proc. 49th Annual Int. Veh. Technol. Conf.*, May 1999, vol. 1, pp. 215–220, Houston, TX.
38. R. Jean-Marc Cramer, Moe Z. Win, and Robert A. Scholtz, “Evaluation of the multipath characteristics of the impulse radio channel,” in *Proc. 9th IEEE Int. Symp. on Personal, Indoor and Mobile Radio Communications*, Sept. 1998, vol. 2, pp. 864–868, Boston, MA.
39. Robert A. Scholtz, R. Jean-Marc Cramer, and Moe Z. Win, “Evaluation of the propagation characteristics of ultra-wideband communication channel,” in *Proc. IEEE AP-S Int. Symp. and USNC/URSI National Radio Science Meeting*, June 1998, vol. 2, pp. 626–630, Atlanta, GA, **Keynote Paper**.
40. R. Jean-Marc Cramer, Moe Z. Win, and Robert A. Scholtz, “Impulse radio multipath characteristics and diversity reception,” in *Proc. IEEE Int. Conf. on Commun.*, June 1998, vol. 3, pp. 1650–1654, Atlanta, GA.
41. Fernando Ramírez-Mireles, Moe Z. Win, and Robert A. Scholtz, “Performance of ultra-wideband time-shift-modulated signals in the indoor wireless impulse radio channel,” in *Proc. 31st Asilomar Conf. on Signals, Systems and Computers*, Nov. 1997, vol. 1, pp. 192–196, Pacific Grove, CA.
42. Moe Z. Win and Robert A. Scholtz, “Statistical characterization of ultra-wide bandwidth wireless communications channel,” in *Proc. 31st Asilomar Conf. on Signals, Systems and Computers*, Nov. 1997, Pacific Grove, CA, **Invited Paper**.
43. Moe Z. Win and Robert A. Scholtz, “Energy capture vs. correlator resources in ultra-wide bandwidth indoor wireless communications channels,” in *Proc. Military Comm. Conf.*, Nov. 1997, vol. 3, pp. 1277–1281, Monterey, CA, **Invited Paper**.
44. Moe Z. Win, “Power spectral density of binary digital pulse streams in the presence of independent uniform timing jitter,” in *Proc. Military Comm. Conf.*, Nov. 1997, vol. 2, pp. 550–553, Monterey, CA, **Invited Paper**.
45. Robert A. Scholtz and Moe Z. Win, “Impulse radio,” in *Proc. 8th IEEE Int. Symp. on Personal, Indoor and Mobile Radio Communications*, Sept. 1997, Helsinki, FINLAND, **Invited Paper**.
46. Moe Z. Win, Robert A. Scholtz, and Mark A. Barnes, “Ultra-wide bandwidth signal propagation for indoor wireless communications,” in *Proc. IEEE Int. Conf. on Commun.*, June 1997, vol. 1, pp. 56–60, Montréal, CANADA.
47. Moe Z. Win and Robert A. Scholtz, “Comparisons of analog and digital impulse radio for multiple-access communications,” in *Proc. IEEE Int. Conf. on Commun.*, June 1997, vol. 1, pp. 91–95, Montréal, CANADA.
48. Moe Z. Win, Ji-Her Ju, Xiaoxin Qiu, Victor O. K. Li, and Robert A. Scholtz, “ATM based ultra-wide bandwidth (UWB) multiple-access radio network for multimedia PCS,” in *Proc. IEEE Network+Interop Engineers Conference on Broadband Access – Technologies, Systems and Services*, May 1997, Las Vegas, NE, **Best Student Paper Award**.

49. Fernando Ramírez-Mireles, Moe Z. Win, and Robert A. Scholtz, “Signal selection for the indoor wireless impulse radio channel,” in *Proc. 47th Annual Int. Veh. Technol. Conf.*, May 1997, pp. 2243–2247, Phoenix, AZ.
50. Moe Z. Win, Fernando Ramírez-Mireles, Robert A. Scholtz, and Mark A. Barnes, “Ultra-wide bandwidth (UWB) signal propagation for outdoor wireless communications,” in *Proc. 47th Annual Int. Veh. Technol. Conf.*, May 1997, pp. 251–255, Phoenix, AZ.
51. Moe Z. Win, Robert A. Scholtz, and Larry W. Fullerton, “Time-hopping SSMA techniques for impulse radio with an analog modulated data subcarrier,” in *Proc. IEEE Fourth Int. Symp. on Spread Spectrum Techniques & Applications*, Sept. 1996, pp. 359–364, Mainz, Germany.
52. Moe Z. Win, Robert A. Scholtz, and Chien-C. Chen, “Analysis of noise in optical phase-locked loop,” in *NASA Tech Briefs*, Sept. 1993.
53. Moe Z. Win, James R. Lesh, Chien-C. Chen, William K. Marshall, Marc D. Rayman, and Robert A. Scholtz, “Optical phase-locked loop for optical communication,” in *NASA Tech Briefs*, Apr. 1992.
54. Chien-C. Chen, D. Arbel, and Moe Z. Win, “100-Mbps coherent optical link demonstration using frequency stabilized solid state lasers,” in *Proc. SPIE Free-Space Laser Communication Technologies IV*, Jan. 1991, vol. 1635, pp. 215–224.
55. Moe Z. Win and Chien-C. Chen, “Analysis of a spatial tracking subsystem for optical communications,” in *Proc. SPIE Free-Space Laser Communication Technologies IV*, Jan. 1991, vol. 1635, pp. 318–325.
56. Chien-C. Chen and Moe Z. Win, “Laser frequency stability requirements for coherent space communications,” in *Proc. IEEE 45th Annual Symposium on Frequency Control*, May 1991, pp. 500–507.
57. Chien-C. Chen, Moe Z. Win, William K. Marshall, and James R. Lesh, “Low data rate coherent optical link demonstration using frequency stabilized solid state lasers,” in *Proc. SPIE Free-Space Laser Communication Technologies III*, Jan. 1991, vol. 1417.
58. Moe Z. Win, Chien-C. Chen, and Robert A. Scholtz, “Optical phase-locked loop (OPLL) for free-space laser communications with heterodyne detection,” in *Proc. SPIE Free-Space Laser Communication Technologies III*, Jan. 1991, vol. 1417.
59. Chien-C. Chen and Moe Z. Win, “Effect of earth albedo variation on the spatial acquisition subsystem of a planetary spacecraft,” in *Proc. SPIE Space Sensing, Communications, and Networking*, Jan. 1989, vol. 1059, pp. 52–59.
60. Moe Z. Win, “Estimation and tracking for deep-space optical communications,” in *Proc. SPIE Space Sensing, Communications, and Networking*, Jan. 1989, vol. 1059, pp. 80–87.
61. Moe Z. Win, N. Kehtarnavaz, and N. A. Mulani, “Estimation of diastole to systole changes from cardiac PET images,” in *Proc. IEEE Conference on Engineering Applications in Medicine and Biology*, Nov. 1987, pp. 850–851, Boston, MA.

4.6 THESES

1. Moe Z. Win, *Ultra-Wide Bandwidth Spread-Spectrum Techniques for Wireless Multiple-Access Communications*, Ph.D. thesis, Communication Sciences Institute, Department of Electrical Engineering, University of Southern California, Los Angeles, CA, May 1998, Thesis Advisor: Professor Robert A. Scholtz.
2. Moe Z. Win, “*Polyphase Sequences*,” M.S. thesis, Department of Mathematics, University of Southern California, Los Angeles, CA, May 1997, Thesis Advisor: Professor Solomon W. Golomb.
3. Moe Z. Win, “*PPM Sequences with Desirable Correlation Properties*,” Honors undergraduate thesis, Department of Electrical Engineering, Texas A&M University, College Station, TX, Apr. 1987, Thesis Advisor: Professor Costas N. Georghiades.

4.7 INTERNAL REPORTS

A list of 34 internal reports for AT&T Labs, JPL, USC, and Texas A&M can be found at <http://www.moewin.com> or hard copies will be mailed when requested.

4.8 INVITED TALKS & SPECIAL PRESENTATIONS

1. Moe Z. Win, “Ultra-wide bandwidth communications,” INFOCOM Department, University of Rome, “La Sapienza”, Rome, ITALY, Dec. 2000, Invited Talk at the Vehicular Technology/Communications Society joint Chapter, North Italy Section.
2. Moe Z. Win, “Selective Rake reception for ultra-wide bandwidth communications,” Department of Electrical and Information Systems, University of Bologna, Bologna, ITALY, Dec. 2000, Invited Talk.
3. Moe Z. Win, “Overview of ultra-wide bandwidth communications,” First european workshop on ultra wideband technology and open mobile access networks, Brussels, BELGIUM, Dec. 2000, Invited Plenary Talk.
4. Moe Z. Win and Jack H. Winters, “Similarities of PMD and DMD for 10Gbps equalization of lightwave channels,” IEEE 802.3ae 10Gb/s Task Force September 2000 Interim meeting, New Orleans, LA, Sept. 2000, Invited Talk.
5. Moe Z. Win, “Ultra wideband (UWB) communications technology,” IEEE radio and wireless conf., New Orleans, LA, Sept. 2000, Invited Talk.
6. Moe Z. Win, George Chrisikos, and Nelson R. Sollenberger, “Impact of spreading bandwidth and selection diversity order on Rake reception in dense multipath channels,” Communications seminar, **MorphICs Technology**, Inc., Campbell, CA, July 2000, Invited Talk.
7. Moe Z. Win and Jack H. Winters, “Analysis of hybrid selection/maximal-ratio combining in Rayleigh fading,” Wireless Local Technology Group, **AT&T Wireless Services**, Redmond, WA, June 1997, Invited Talk.
8. Moe Z. Win and Jack H. Winters, “Analysis of hybrid selection/maximal-ratio combining in Rayleigh fading,” Department of Electrical Engineering, Southern Methodist University, Dallas, TX, May 1999, Invited Talk.
9. Moe Z. Win, Ranjan K. Mallik, George Chrisikos, and Jack H. Winters, “Canonical expressions for the error probability performance for M -ary modulation with hybrid selection/maximal-ratio combining in Rayleigh fading,” IEEE Wireless Commun. and Networking Conf., New Orleans, LA, Sept. 1999, Invited Talk.

10. Moe Z. Win, George Chrisikos, and Nelson R. Sollenberger, “Impact of spreading bandwidth and diversity order on the error probability performance of Rake reception in dense multipath channels,” *IEEE Wireless Commun. and Networking Conf.*, New Orleans, LA, Sept. 1999, Invited Talk.
11. Moe Z. Win and Jack H. Winters, “On maximal ratio combining in correlated Nakagami channels with unequal fading parameters and SNR’s among branches: An analytical framework,” *IEEE Wireless Commun. and Networking Conf.*, New Orleans, LA, Sept. 1999, Invited Talk.
12. Moe Z. Win, “Ultra-wide bandwidth time-hopping impulse radio,” Communications Research Department, **Bell Laboratories, Lucent Technologies**, Murray Hill Laboratory, Murray Hill, NJ, June 1999, Invited Talk.
13. Moe Z. Win, “Ultra-wide bandwidth impulse radio,” Department of Electrical and Computer Engineering, University of California at Santa Barbara, Santa Barbara, CA, Mar. 1999, Invited Talk.
14. Moe Z. Win, “Impulse radio,” The Center for Communications and Signal Processing Research, Department of Electrical and Computer Engineering, New Jersey Institute of Technology, Piscataway, NJ, Mar. 1999, Invited Talk.
15. Moe Z. Win, “Ultra-wide bandwidth radio,” Department of Electrical and Computer Engineering, WINLAB, Rutgers University, Piscataway, NJ, Feb. 1999, Invited Talk.
16. Moe Z. Win, “Indoor UWB propagation measurements,” Ultra wideband systems and technology workshop, **Lawrence Livermore National Laboratory**, Livermore, CA, June 1998, Invited Talk.
17. Moe Z. Win, “Characterization of ultra-wide bandwidth wireless indoor communications channel: A communication theoretic view,” Ultra-wideband radio workshop, Solvang, CA, May 1998, Invited Talk.
18. Moe Z. Win, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” Wireless Communications Research Department, **Bell Laboratories, Lucent Technologies**, Crawford Hill Laboratory, Holmdel, NJ, June 1997, Invited Talk.
19. Moe Z. Win, “Ultrawideband communications,” Rockwell Broadband Wireless Workshop, **Rockwell Science Center Palo Alto Laboratory**, Palo Alto, CA, June 1997, **Honorary Lecture**.
20. Moe Z. Win, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” Wireless Systems Research Department, **AT&T Labs – Research**, Red Bank, NJ, June 1997, Invited Talk.
21. Moe Z. Win, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” Communications Research, **AT&T Labs – Research**, Florham Park, NJ, June 1997, Invited Talk.
22. Moe Z. Win and Robert A. Scholtz, “Statistical characterization of ultra-wide bandwidth wireless communications channel,” *Asilomar Conf. on Signals, Systems, and Computers*, Nov. 1997, Invited Talk.
23. Moe Z. Win, “Power spectral density of binary digital pulse streams in the presence of independent uniform timing jitter,” *Military Comm. Conf.*, Nov. 1997, Invited Talk.
24. Moe Z. Win and Robert A. Scholtz, “Energy capture vs. correlator resources in ultra-wide bandwidth indoor wireless communications channels,” *Military Comm. Conf.*, Nov. 1997, Invited Talk.
25. Moe Z. Win, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” Department of Electrical Engineering and Computer Sciences, University of California at Berkeley, Berkeley, CA, Apr. 1997, Invited Talk.

26. Moe Z. Win, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” Department of Electrical and Computer Engineering, University of Illinois at Urbana – Champaign, Urbana, IL, Apr. 1997, Invited Talk.
27. Moe Z. Win, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” Department of Electrical Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA, Apr. 1997, Invited Talk.
28. Moe Z. Win, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” Department of Electrical and Computer Engineering, The Johns Hopkins University, Baltimore, MD, Apr. 1997, Invited Talk.
29. Moe Z. Win, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” Department of Electrical and Computer Engineering, University of Wisconsin – Madison, Madison, WI, Apr. 1997, Invited Talk.
30. Moe Z. Win, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” Department of Electrical Engineering, University of Washington, Seattle, WA, Apr. 1997, Invited Talk.
31. Moe Z. Win, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” Department of Electrical and Computer Engineering, University of California at Davis, Davis, CA, Apr. 1997, Invited Talk.
32. Moe Z. Win, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” Department of Electrical Engineering, University of Notre Dame, Notre Dame, IN, Apr. 1997, Invited Talk.
33. Moe Z. Win, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” Department of Electrical Engineering, Ohio State University, Columbus, OH, Apr. 1997, Invited Talk.
34. Moe Z. Win, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” Department of Electrical Engineering, Arizona State University, Tempe, AZ, Mar. 1997, Invited Talk.
35. Moe Z. Win, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” Advanced Development and Research, **Ericsson**, Inc., Research Triangle Park, NC, Mar. 1997, Invited Talk.
36. Moe Z. Win, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” Department of Electrical and Computer Engineering, North Carolina State University, Raleigh, NC, Mar. 1997, Invited Talk.
37. Moe Z. Win, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” Department of Electrical Engineering and Computer Science, The George Washington University, Washington, DC, Mar. 1997, Invited Talk.
38. Moe Z. Win, “A communication theorist’s view of statistical channel characterization for ultra-wide bandwidth wireless communications,” Research seminar, **Time Domain Corporation**, Huntsville, AL, Mar. 1996, Invited Talk.
39. Moe Z. Win, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” Department of Electrical and Computer Engineering, University of Alabama in Huntsville, Huntsville, AL, Mar. 1997, Invited Talk.

40. Moe Z. Win, “Ultra-wide bandwidth time-hopping spread-spectrum impulse radio for wireless multiple-access communications,” Department of Electrical Engineering, University of Delaware, Newark, DE, Mar. 1997, Invited Talk.
41. Moe Z. Win and Robert A. Scholtz, “Time-hopping SSMA techniques for ultra-wide bandwidth radio,” Annual research review of Communication Sciences Institute, University of Southern California, Los Angeles, CA, Feb. 1997, **Best Poster Presentation Award**.
42. Moe Z. Win and Robert A. Scholtz, “Ultra-wide bandwidth signal propagation for indoor communications,” Annual research review of Communication Sciences Institute, University of Southern California, Los Angeles, CA, Feb. 1997.
43. Moe Z. Win and Robert A. Scholtz, “Time-hopping SSMA techniques for ultra-wide bandwidth radio,” Annual review of Joint Services Electronics Program, University of Southern California, Los Angeles, CA, Nov. 1996.
44. Moe Z. Win and Robert A. Scholtz, “Ultra-wide bandwidth signal propagation for indoor communications,” Annual review of Joint Services Electronics Program, University of Southern California, Los Angeles, CA, Nov. 1996.
45. Moe Z. Win, “Ultra-wideband radio and its application to telemetry,” Panel Presentation, International Telemetry Conference, San Diego, CA, Oct. 1996.
46. Moe Z. Win and Robert A. Scholtz, “Ultra-wide bandwidth (UWB) signal propagation for indoor multipath channel,” Presentation to **AMD** at IMSC, University of Southern California, Los Angeles, CA, Oct. 1996.
47. Moe Z. Win and Robert A. Scholtz, “Potential of impulse radio,” Presentation to **AT&T** at IMSC, University of Southern California, Los Angeles, CA, May 1996.
48. Moe Z. Win, Chien-C. Chen, and Robert A. Scholtz, “Optical phase-locked loop (OPLL) for laser communications,” **Outstanding Research Paper Award Ceremony**, University of Southern California, Los Angeles, CA, Mar. 1996.
49. Moe Z. Win and Robert A. Scholtz, “Wireless indoor communications,” Annual research review of Communication Sciences Institute, University of Southern California, Los Angeles, CA, Feb. 1996, **Best Poster Presentation Award**.
50. Moe Z. Win and Robert A. Scholtz, “High data rate wireless indoor communications and future research efforts,” Demonstrated the capability of wireless multimedia communications research thrust at Integrated Media Systems Center (IMSC) to **NSF site visit team members**, University of Southern California, Los Angeles, CA, Dec. 1995.
51. Moe Z. Win and Robert A. Scholtz, “Wireless communications with ultra-wide bandwidths,” Presentation to **Computing Devices International** (CDI), University of Southern California, Los Angeles, CA, Sept. 1995.
52. Moe Z. Win and Robert A. Scholtz, “Wireless multimedia communications,” Presentation to **Digital Equipment Corporation** (DEC), University of Southern California, Los Angeles, CA, Sept. 1995.
53. Moe Z. Win, Chien-C. Chen, and Robert A. Scholtz, “Optical phase-locked loop (OPLL) for free-space laser communications,” Communication Sciences Institute (CSI) seminar, University of Southern California, Los Angeles, CA, Feb. 1991.
54. Moe Z. Win, Chien-C. Chen, James R. Lesh, and Robert A. Scholtz, “Design and demonstration of an optical phase-locked loop (OPLL) for free-space optical communications,” Annual research review of Communication Sciences Institute, University of Southern California, Los Angeles, CA, Feb. 1990.

55. Chien-C. Chen, Moe Z. Win, William K. Marshall, Marc D. Rayman, Homayoon Ansari, and Kamran Shaik, “Coherent link demonstration for space communications,” OSA annual meeting, Orlando, FL, Oct. 1989.
56. Moe Z. Win and Costas N. Georghiades, “PPM sequences with desirable correlation properties,” University Undergraduate Fellows Symposium, Texas A&M University, College Station, TX, Apr. 1987.

5 PROFESSIONAL REFERENCES

Available upon request.