Omer Faruk Yilmaz

Contact Information

Communications Sciences Institute
3740 McClintock Avenue EEB-500
Los Angeles, CA 90089-2565

mobile: (951) 880-3747
e-mail: oyilmaz@usc.edu
web: http://www-scf.usc.edu/~oyilmaz/

Area of Technical Proficiency

Fiber optical transmission systems (advanced modulation formats, direct/coherent detection, digital signal processing), optical signal processing (for analog RF and digital communications signals), photonic devices (design, fabrication, characterization), mathematical modeling & simulations (device and system level)

Education

University of Southern California (USC), Ph.D. August 2006 – December 2011 (Expected)

Electrical Engineering, GPA: 4.00/4.00

- Thesis: Advanced Nonlinear Optical Signal Processing Techniques for High Speed, Reconfigurable Optical Fiber Networks
  Advisor: Prof. Alan E. Willner

University of California, Riverside (UC Riverside), M.S. September 2004 – June 2006

Electrical Engineering, GPA: 4.00/4.00

Middle East Technical University (METU), Turkey, B.S. September 2000 – June 2004

Electrical and Electronics Engineering, GPA: 3.74/4.00 (Rank: 16/304)

Professional Experience

Research/Teaching Assistant, USC August 2006 – Present
Los Angeles, CA

- Graduate-level teaching: Communication Systems, Modern Solid State Devices
- Undergraduate-level teaching: Circuits and Systems, Applied Linear Algebra for Engineering, Communication Systems Design

Research/Teaching Assistant, UC Riverside September 2004 – June 2006
Riverside, CA

- Undergraduate-level teaching: Engineering Circuits, Digital/Analog VLSI Design.

Summer Intern, TUBITAK-BILTEN (VLSI Design Group) July 2003 – August 2003
(Scientific & Technical Research Council of Turkey) Ankara, Turkey

- Design and optimization of RAM for a nine-channel satellite camera using Verilog HDL

Summer Intern, ASELSAN INC. (Crypto Systems Group) July 2002 – August 2002
Ankara, Turkey

- Design and testing of GPS receivers for Tactical Area Communications System Project

Patent Application

O. F. Yilmaz, S. Khaleghi, M. R. Chitgarha, A. E. Willner, "Optical Tunable Tapped-Delay-Lines using Wavelength Conversion and Chromatic Dispersion based Delays," U.S. Serial Number 61/450,080.

Research Experience

Optical Signal Processing for Spectrally-Efficient Modulation Formats:

Applications of Tunable Optical Delays based on Wavelength Conversion/Chromatic Dispersion:

- Increased optical delay dynamic range by six orders of magnitude using cascaded acousto-optic modulators, achieved > 3.6 μs delays for 100 Gbit/s DQPSK signals.
- Demonstrated a variable length optical ATM packet buffer with a ten-packet-length buffer depth and a reconfiguration time of 25 ps.
- Demonstrated a tunable optical tapped-delay-line filter for the following applications: CD equalization, data pattern recognition (80 Gbit/s DQPSK, 120 Gbit/s 16-QAM signals), and optical Discrete Fourier Transform (DFT) for OFDM signals.

Multicasting and Wavelength Conversion:

- Demonstrated the use of phase modulated pumps for efficient (> 0 dB) wavelength conversion and multicasting of phase modulated signals utilizing parametric amplification.
- Demonstrated the multicasting of 40 Gbit/s OOK signals using optical sampling and supercontinuum generation in a highly nonlinear fiber. Also, showed the multicasting of 100 Gbit/s Polarization Multiplexed OOK signals using bi-directional wavelength conversion.
- Explored multiplexing of two DPSK signals into a single DQPSK signal for increased spectral efficiency in periodically-polled Lithium Niobate (PPLN) waveguides.
- Demonstrated tunable wavelength conversion of 100 Gbit/s DQPSK signals, optical multiplexing of 160 Gbit/s OTDM signals using Silicon waveguides in collaboration with Prof. Alex Gaeta (Cornell University).

Radio-over-Fiber Systems:
Demonstrated a continuous True-Time Delay system using conversion/dispersion method with > 20 GHz bandwidth enhancement for wideband RF signals in collaboration with Prof. Moshe Tur (Tel Aviv University).

Direct-Detection Optical OFDM with VCSELs:
Demonstrated 10 Gbit/s direct-detection OFDM signals with 16-QAM modulated subcarriers using optical-injection locked VCSELs in collaboration with Prof. Connie Chang-Hasnain (UC Berkeley).

Optical Fiber Sensors:
Worked on sweep-free distributed Brillouin sensing using multiple pump and probe tones along with homodyne detection in collaboration with Prof. Moshe Tur (Tel Aviv University).

Organic LED/Photovoltaic Cells:
Designed, fabricated, and characterized a hybrid cathode for organic solar cells and organic LEDs for increased conversion efficiency.

Honors and Awards

- Ming Hsieh Institute Ph.D. Scholar Award (given to five outstanding senior Ph.D. students in Electrical Engineering Department at USC (EE-USC) (2011)
- Paper at Conference on Lasers and Electro-Optics (CLEO) is upgraded to Invited Paper (2010)
- IEEE Photonics Society Travel Grant Program Award (2010)
- Best Student Paper Semifinalist in Optical Fiber Communications Conference (OFC) (2010)
- Paper in Optics Letters is selected as one of two papers for OSA Spotlight in Optics (May 2010)
- Research highlighted in the DARPA Weekly Activity Reports (WAR) (2009 and 2010)
- Best Student Research Paper Award, EE-USC (2010)
- Best Teaching Assistant (TA) Award (2010) and Honorable Mention TA Award (2007), EE-USC
- Post-deadline Paper in OFC 2009
- Post-deadline Paper in Nonlinear Optics Conference (NLO) (2009)
- UC Riverside Industry Day Poster Award with "Hybrid Organic-Inorganic Light-Emitting-Diodes" (2005)
- College Fellowship Award for graduate studies at UC Riverside (2004-2005)
- Innovative and Robust Design Award in the senior project competition at IEEE METU (2004)
- Prof. Bulent Kerim ALTAY Award by EE department at METU (2001 and 2003)
- Turkish Government Scholarship in METU (2000-2004)
- Ranked 143rd (in top 0.01%) in nationwide University Entrance Examination over 1.5 Million applicants (2000)

Technical Skills

Operation and characterization of active/passive optical components: lasers, modulators, receivers, amplifiers, fibers, couplers, interferometers, polarization-based components, filters, isolators, circulators, EDFAs, semiconductor optical amplifiers, highly nonlinear fibers, and PPLNs

Fiber transmission system design, modeling, and testing:

- 10-640 Gbit/s single and multi-carrier (OFDM) signal generation, noncoherent & coherent detection of advanced modulation formats
- Re-circulating fiber loop measurements for long-distance transmission
- High speed timing and synchronization in optical and electrical communication systems using clock recovery and demultiplexing techniques
- System performance assessment and impairment characterization through measurements using real-time and sampling scopes, arbitrary waveform generators, optical/RF spectrum analyzers, vector network analyzer, chirp/dispersion analyzer, polarization analyzer, optical modulation analyzer, and high-speed optoelectronic components
- Mathematical modeling of linear and nonlinear photonic devices
- Digital signal processing techniques for communication systems

RF System/Component Modeling and Characterization: Transfer function, intermodulation distortion (IMD), spurious-free dynamic range (SFDR), and noise figure measurements

Electronic/Photonic Device Fabrication and Characterization: Cleanroom experience, MOS (Group IV) and Organic (Polymer) device fabrication & testing (etching, mask design, doping, metal coating, probing, and etc.), CVD growth, Scanning and Transmission Electron Microscopy, Atomic Force Microscopy, Near-Field Scanning Optical Microscopy

Design, Modeling/Testing Tools: MATLAB, Rsoft Optsim, VPI, LabVIEW, Verilog HDL, Xilinx, ALTERA, Synopsys, Cadence IC, PSpice

Programming Languages: C, C++

Project Management

Proposal preparation to government agencies (NSF, DARPA), industrial corporations (Intel, HP Labs, Cisco Systems): program planning (timeline and milestone setting), risk assessment, coordination of experiments, writing periodic progress reports, active involvement in kick-off meetings and program reviews.

Academic Service

Reviewer for the following journals: IEEE/OSA Journal of Lightwave Technology, IEEE Journal of Selected Topics in Quantum Electronics, Optical Society of America (OSA) Optics Letters, OSA Optics Express.

Member of the following technical societies: IEEE, IEEE Photonics Society, IEEE Communications Society, and OSA.

Languages

English (Fluent), Turkish (Native), German (Beginner)

Selected Publications

Authored in 63 publications (3 Invited, 20 Journal, and 40 Conference papers). The complete list can be found at `http://www-scf.usc.edu/~oyilmaz/`

Invited Papers

1. A. E. Willner, S. R. Nuccio, and **O. F. Yilmaz**, "Recent Advances in Tunable Optical Delays and Their Applications," Invited Paper, Society of Photo-Instrumentation Engineers (SPIE) Photonics West, Conference, paper 7949, San Jose, CA, 2011.
2. A. E. Willner, **O. F. Yilmaz**, S. R. Nuccio, and X. Wu, "Energy Requirements of all Optical Signal Processing," Invited Paper, IEEE Journal of Selected Topics in Quantum Electronics, Special Issue on Green Photonics, vol. 17, pp. 320-332, 2011.
3. S. R. Nuccio, **O. F. Yilmaz**, X. Wang, J. Wang, X. Wu, and A. E. Willner, "1.16- s Continuously Tunable Optical Delay of a 100-Gb/s DQPSK Signal Using Wavelength Conversion and Chromatic Dispersion in an HNLF," Invited Paper, Conference on Lasers and Electro-Optics (CLEO), paper CFJ2, San Jose, CA, 2010.

Journal Papers

1. **O. F. Yilmaz**, J. Wang, S. Khaleghi, X. Wang, S. R. Nuccio, X. Wu, and A. E. Willner, "Pre-Conversion Phase Modulation of Input Differential Phase-Shif-Keying Signals for Wavelength Conversion and Multicasting Applications Using Phase-Modulated Pumps," Optics Letters, vol. 36, pp. 731-733, 2011.
2. **O. F. Yilmaz**, S. R. Nuccio, X. Wu, and A. E. Willner, "40 Gb/s Optical Packet Buffer Using Conversion/Dispersion Based Delays," IEEE/OSA Journal of Lightwave Technology, Special Issue on the Conference on Optical Fiber Communications, vol. 28, pp. 616-623, 2010.
3. **O. F. Yilmaz**, L. Christen, X. Wu, S. R. Nuccio, I. M. Fazal, and A. E. Willner, "Time-Slot-Interchange of 40 Gb/s Variable Length Optical Packets Using Conversion/Dispersion-Based Tunable Delays," Optics Letters, vol. 33, pp. 1954-1956, 2008.
4. **O. F. Yilmaz**, S. Chaudhary, and M. Ozkan, "Hybrid organic-inorganic electrode for enhanced charge injection or collection in organic opto-electronic devices," Nanotechnology, 17, pp. 3662-3667, 2006.
5. S. R. Nuccio, **O. F. Yilmaz**, X. Wang, H. Huang, J. Wang, X. Wu, and A. E. Willner, "Higher-Order Dispersion Compensation to Enable a 3.6-μs Wavelength Transparent Delay of a 100-Gb/s DQPSK Signal," Optics Letters, vol. 35, pp. 2985-2987, 2010.

   (Selected by the editors as one of two papers for the May 2010 OSA Spotlight in Optics)
6. X. Wu, A. Bogoni, **O. F. Yilmaz**, S. R. Nuccio, J. Wang, and A. E. Willner, "Eightfold 40-320 Gbit/s Phase-Coherent Multiplexing and 320-40 Gbit/s Demultiplexing using Highly Nonlinear Fibers," Optics Letters, vol. 35, pp. 1896-1898, 2010.
7. S. R. Nuccio, **O. F. Yilmaz**, X. Wu, and A. E. Willner, "Fine Tuning of Conversion/Dispersion Based Optical Delays with a 1-pm Tunable Laser using Cascaded Acousto-Optic Mixing," Optics Letters, vol. 35, pp. 523-525, 2010.
8. I. M. Fazal, **O. F. Yilmaz**, S. R. Nuccio, B. Zhang, A. E. Willner, C. Langrock, and M. M. Fejer, "Optical Data Packet Synchronization and Multiplexing Using a Tunable Optical Delay Based on Wavelength Conversion and Chromatic Dispersion," Optics Express, vol. 15, pp. 10492-10497, 2007.

Conference Proceedings

1. **O. F. Yilmaz**, L. Yaron, S. Khaleghi, M. R. Chitgarha, M. Tur, and A. E. Willner, "True-Time-Delays using Conversion/Dispersion with Flat Magnitude Response for Wideband RF Signals," European Conference on Optical Communications (ECOC), paper Mo.1.A.6, Geneva, Switzerland, 2011.
2. **O. F. Yilmaz**, S. Khaleghi, M. R. Chitgarha, S. R. Nuccio, and A. E. Willner, "Demonstration of 28-40-Gbaud, OOK/BPSK/QPSK Data-Transparent Optical Correlation with Control/Tunability over Time Delays, Phases and Number of Taps," IEEE/OSA Optical Fiber Communications Conference (OFC), paper OThN1, Los Angeles, CA, 2011.

3. **O. F. Yilmaz**, S. Khaleghi, N. Ahmed, S. R. Nuccio, I. M. Fazal, X. Wu, and A. E. Willner, "Reconfigurable and Finely Tunable Optical Tapped Delay Line to Achieve 40 Gb/s Equalization and Correlation using Conversion/Dispersion Based Delays," European Conference on Optical Communications (ECOC), paper Mo.2.A.2, Torino, Italy, 2010.
4. **O. F. Yilmaz**, J. Wang, X. Wang, S. R. Nuccio, X. Wu, and A. E. Willner, "Multicasting of 50 Gb/s RZ-DPSK Signals using Self-Seeded FWM with Phase Modulated Pumps for SBS Suppression," European Conference on Optical Communications (ECOC), paper P3.23, Torino, Italy, 2010.
5. **O. F. Yilmaz**, S. R. Nuccio, J. Wang, X. Wu, and A. E. Willner, "Multicasting of 40-Gbit/s NRZ-OOK Data into 24 RZ Copies using a Single Pump and Supercontinuum Generation," Conference on Lasers and Electro-Optics (CLEO), paper CWI3, San Jose, CA, 2010.
6. **O. F. Yilmaz**, S. R. Nuccio, X. Wang, J. Wang, I. M. Fazal, J.-Y. Yang, X. Wu, and A. E. Willner, "Experimental Demonstration of 8-Fold Multicasting of a 100 Gb/s Polarization-Multiplexed OOK Signal Using Highly Nonlinear Fiber," IEEE/OSA Conference on Optical Fiber Communications (OFC), paper OWP8, San Diego, CA, 2010.
7. **O. F. Yilmaz**, S. R. Nuccio, Z. Bakhtiari , X. Wu, J. Wang, L. Zhang, and A. E. Willner, "Wavelength Conversion and 9-fold Multicasting of a 21.4 Gbit/s DPSK Data Channel using Supercontinuum Generation," OSA Topical Meeting on Nonlinear Optics (NLO), **Post-Deadline paper PDPA3**, Honolulu, Hawaii, 2009.
8. **O. F. Yilmaz**, S. R. Nuccio, X. Wu, and A. E. Willner, "10-Packet-Depth, 40 Gb/s Optical Buffer with a <0.5 ns Reconfiguration Time using 116 ns, Continuously Tunable Conversion/Dispersion Delays," IEEE/OSA Conference on Optical Fiber Communications (OFC), **Post-Deadline paper PDPC7**, San Diego, CA, 2009.
9. **O. F. Yilmaz**, S. R. Nuccio, S. Khaleghi, J.-Y. Yang, L. Christen, and A. E. Willner, "Optical Multiplexing of Two 21.5 Gb/s DPSK Signals into a Single 43 Gb/s DQPSK Channel with Simultaneous 7-Fold Multicasting in a Single PPLN Waveguide," IEEE/OSA Conference on Optical Fiber Communications (OFC), paper OThM4, San Diego, CA, 2009.
10. A. Voskoboinik, **O. F. Yilmaz**, A. E. Wilner, and M. Tur, "Sweep-free Distributed Brillouin Sensing using Multiple Pump and Probe Tones," European Conference on Optical Communications (ECOC), paper We.10.P1.01, Geneva, Switzerland, 2011.
11. Y. Yue, H. Huang, L. Zhang, J. Wang, J.-Y. Yang, **O. F. Yilmaz**, J. S. Levy, M. Lipson, and A. E. Willner, "Experimental demonstration of UWB Monocycle Pulse Generation using Two-Photon Absorption in a Silicon Waveguide," European Conference on Optical Communications (ECOC), paper We.10.P1.24, Geneva, Switzerland, 2011.
12. S. Khaleghi, **O. F. Yilmaz**, M. R. Chitgarha, I. M. Fazal, and A. E. Willner, "80-Gbit/s DQPSK Optical Tapped-Delay-Line Equalization using Finely Tunable Delays, Phases and Amplitudes," IEEE/OSA Optical Fiber Communications Conference (OFC), paper OThN4, Los Angeles, CA, 2011.
13. S. R. Nuccio, Z. Bakhtiari, **O. F. Yilmaz**, and A. E. Willner, "Wavelength-Conversion of 160-Gbit/s PDM 16-QAM Using a Single Periodically-Poled Lithium Niobate Waveguide," IEEE/OSA Optical Fiber Communications Conference (OFC), paper OWG5, Los Angeles, CA, 2011.
14. M. R. Chitgarha, S. Khaleghi, **O. F. Yilmaz**, J.-Y. Yang, and A. E. Willner, "Demonstration of Baud-Rate-Variable and Channel-Spacing-Tunable Demultiplexing of 10-40-Gbaud OFDM Subcarriers using a Multi-Tap Optical DFT," IEEE/OSA Optical Fiber Communications Conference (OFC), paper OWG3, Los Angeles, CA, 2011.
15. J. Wang, **O. F. Yilmaz**, S. R. Nuccio, X. Wu, Z. Bakhtiari, Y. X. Li, J.-Y. Yang, H. Huang, Y. Yue, I. M. Fazal, R. Hellwarth, and A. E. Willner, "Data Traffic Grooming/Exchange of a Single 10-Gbit/s TDM Tributary Channel between Two Pol-Muxed 80-Gbit/s DPSK Channels," Conference on Lasers and Electro-Optics (CLEO), paper CFJ5, San Jose, CA, 2010.
16. L. Christen, **O. F. Yilmaz**, S. R. Nuccio, X. Wu, and A. E. Willner, "Optical Pseudo-Random Bit Sequence Generator using a Dual-Drive Mach-Zehnder Modulator as a Linear Feedback Shift Register," IEEE Lasers and Electro-Optics Society Annual Meeting, paper TuP3, Newport Beach, CA, 2008.
17. I. M. Fazal, **O. F. Yilmaz**, S. R. Nuccio, B. Zhang, C. Langrock, M. M. Fejer, and A. E. Willner, "Experimental Time-Slot-Interchange Data Packet Switching using a Reconfigurable and Continuously-Tunable Optical 24-ns Delay Based on Wavelength Conversion and Inter-channel Chromatic Dispersion," European Conference on Optical Communications (ECOC), paper P066, Berlin, 2007.

References available upon request.