

Selim Olcum

MIT, Koch Institute for Integrative Cancer Research, 500 Main St. 76-221, Cambridge, MA, 02139
olcum@mit.edu selimolcum.mit.edu +1 (617) 253-3203

EDUCATION	Ph.D., Bilkent University, Electrical Engineering, Ankara, Turkey	2010
	M.S., Bilkent University, Electrical Engineering, Ankara, Turkey	2005
	B.S., Bilkent University, Electrical Engineering, Ankara, Turkey	2003
RESEARCH EXPERIENCE	Massachusetts Institute of Technology , Koch Institute for Integrative Cancer Research Research Scientist in the Manalis lab	since 2013
	Massachusetts Institute of Technology , Department of Biological Engineering Postdoctoral Associate in the Manalis lab	2011 – 2013
	Georgia Institute of Technology , Department of Mechanical Engineering Visiting Scholar in the Degertekin lab	2006 – 2007
	Bilkent University , Department of Electrical Engineering Research Assistant in the Atalar lab	2003 – 2010
HONORS	ASELSAN Doctoral Fellow, Turkey	2008 – 2010
	National Graduate Research Fellow, TUBITAK, Turkey	2005 – 2010
	Graduate Education Scholarship, Bilkent University	2003 – 2010
	International Research Fellowship Grant, TUBITAK, Turkey	2006
	Undergraduate Merit Scholarship, Bilkent University	2000 – 2002
SELECTED PAPERS	1. N. Cermak [†] , S. Olcum [†] ([†] equal contribution), F. F. Delgado, S. C. Wasserman, K. R. Payer, M. A. Murakami, R. J. Kimmerling, M. M. Stevens, Y. Kikuchi, A. Sandikci, D. M. Weinstock, S. R. Manalis, “High-throughput single-cell growth measurements via serial microfluidic mass sensor arrays”, <i>Nature Biotechnology</i> , 34, pp.1052-1059, 2016. see MIT News for the news article.	
	2. S. Olcum [†] , N. Cermak [†] , S. C. Wasserman, S. R. Manalis, “High-speed multiple-mode mass sensing resolves dynamic nanoscale mass distributions”, <i>Nature Communications</i> , 6, 2015. see MIT News for the news article.	
	3. S. Olcum [†] , N. Cermak [†] , S. C. Wasserman, K. S. Christine, H. Atsumi, K. Payer, W. Shen, J. Lee, A. M. Belcher, S. N. Bhatia, S. R. Manalis, “Weighing nanoparticles in solution at the attogram scale”, <i>Proceedings of the National Academy of Sciences</i> , (PNAS), Jan 12, 2014. see MIT News for the news article or PNAS Journal Club in highlighted articles section.	
	4. A. Ozgurluk, A. Atalar, H. Köymen and S. Olcum [‡] ([‡] corresponding author), “Radiation Impedance of Collapsed Capacitive Micromachined Ultrasonic Transducers”, <i>IEEE Transactions on Ultrasonic Ferroelectrics and Frequency Control</i> , vol.59 (6), pp.1301-1308, 2012.	
	5. S. Olcum , Y. Yamaner, A. Bozkurt, H. Köymen and A. Atalar, “Deep-Collapse Operation of Capacitive Micromachined Ultrasonic Transducers”, <i>IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control</i> , vol.58(11), p.2475, 2011.	
	6. S. Olcum , Y. Yamaner, A. Bozkurt, H. Köymen and A. Atalar, “An Equivalent Circuit Model for Transmitting Capacitive Micromachined Ultrasonic Transducers in Collapse Mode”, <i>IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control</i> , vol.58(7), p.1468, 2011.	
	7. Y. Yamaner, S. Olcum , H.K. Oguz, A. Bozkurt, H. Köymen and A. Atalar, “High Power CMUTs: Design and Experimental Verification”, <i>IEEE Transactions on Ultrasonic Ferroelectrics and Frequency Control</i> , vol.59 (6), pp.1276-1284, 2012.	

SELIM OLCUM

8. **S. Olcum**, A. Kocabas, A. Atalar and A. Aydinli, “Tunable Surface Plasmon Resonance on an Elastomeric Substrate”, *Optics Express*, vol.17(10), p.8542, 2009.

9. **S. Olcum**, M.N. Senlik and A. Atalar, “Optimization of the Gain-Bandwidth Product of capacitive Micromachined Ultrasonic Transducers”, *IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control*, vol.52(12), p.2211, 2005.

OTHER
JOURNAL
PAPERS

10. A. Cetin, M.M. Stevens, N.L. Calistri, M. Fulciniti, **S. Olcum**, R.B. Kimmerling, N. Munshi and S.R. Manalis. “Determining therapeutic susceptibility in multiple myeloma by single-cell mass accumulation”, *Nature Communications*, *accepted*, 2017.

11. M. Stevens, C. Maire, N. Chou, M. Murakami, D. Knoff, Y. Kikuchi, R. Kimmerling, H. Liu, S. Haidar, N. Calistri, N. Cermak, **S. Olcum**, A. Idbaih, P. Wen, D. Weinstock, K. Ligon and S. Manalis “Precise measurement of single cancer cell mass accumulation predicts drug susceptibility”, *Nature Biotechnology*, 34, pp.1161-1167, 2016.

see [MIT News](#) for the news article.

12. F. F. Delgado, N. Cermak, V. C. Hecht, S. Son, Y. Z. Li, S. M. Knudsen, **S. Olcum**, J. M. Higgins, J. Z. Chen, W. H. Grover and S. R. Manalis, “Intracellular Water Exchange for Measuring the Dry Mass, Water Mass and Changes in Chemical Composition of Living Cells”, *PLOS ONE*, vol.8 (7), e67590, 2013.

13. H. Köymen, A. Atalar, E. Aydogdu, C. Kocabas, **S. Olcum**, A. Ozgurluk and A. Unlugedik, “An Improved Lumped Element Nonlinear Circuit Model for a Circular CMUT Cell”, *IEEE Transactions on Ultrasonic Ferroelectrics and Frequency Control* vol.59 (8), pp.1791-1799, 2012.

14. M.N. Senlik, **S. Olcum**, H. Köymen and A. Atalar, “Radiation Impedance of an Array of Circular Capacitive Micromachined Ultrasonic Transducers”, *IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control*, vol.57(4), p.969, 2010.

15. V. Tas, **S. Olcum**, M.D. Aksoy and A. Atalar, “Reducing Anchor Loss in Micromechanical Extensional Mode Resonators”, *IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control*, vol.57(2), p.448, 2010.

16. H.K. Oguz, **S. Olcum**, M.N. Senlik, A. Atalar and H. Köymen, “Nonlinear Modeling of an Immersed Transmitting Capacitive Micromachined Ultrasonic Transducer for Harmonic Balance Analysis”, *IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control*, vol.57(2), p.438, 2010.

17. H. Köymen, M.N. Senlik, A. Atalar and **S. Olcum**, “Parametric Linear Modelling of Circular CMUT Membranes in Vacuum”, *IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control*, vol.54(6), p.1229, 2007.

PAPERS IN
CONFERENCE
PROCEEDINGS

18. **S. Olcum**, N. Cermak and S.R. Manalis, “Precision mass measurements in solution reveal properties of single cells and bioparticles”, *IEEE Electron Device Meeting*, Washington DC, 2015.

19. **S. Olcum**, N. Cermak, S.C. Wasserman, K. Payer, W. Shen, J. Lee and S.R. Manalis, “Suspended Nanochannel Resonators at Attogram Precision”, *Micro Electro Mechanical Systems*, San Francisco, 2014.

20. **S. Olcum**, Y. Yamaner, A. Bozkurt, H. Köymen and A. Atalar, “CMUT Array Element Operating in Deep-Collapse Mode of Operation”, *Proceedings of the IEEE Ultrasonics Symposium*, Orlando, 2011.

21. **S. Olcum**, Y. Yamaner, A. Bozkurt, H. Köymen and A. Atalar, “An Equivalent Circuit for Collapse Mode of CMUTs”, *Proceedings of the IEEE Ultrasonics Symposium*, San Diego, 2010.

22. **S. Olcum**, H.K. Oguz, M.N. Senlik, F.Y. Yamaner, A. Bozkurt, A. Atalar and H. Köymen “Wafer Bonded Capacitive Micromachined Underwater Transducers”, *Proceedings of the IEEE Ultrasonics Symposium*, Rome, 2009.

23. **S. Olcum**, A. Atalar, H. Köymen, K. Oguz and M.N. Senlik “Experimental Characterization of Capacitive Micromachined Ultrasonic Transducers”, *Proceedings of the IEEE Ultrasonics Symposium*, New York, 2007.

24. **S. Olcum**, A. Atalar, M.N. Senlik and H. Köymen, “Calculation of Transformer Ratio in Mason’s

SELIM OLCUM

- Equivalent Circuit for cMUTs”, *Proceedings of the IEEE Ultrasonics Symposium*, Vancouver, 2006.
25. **S. Olcum**, A. Atalar, M.N. Senlik and H. Köymen, “Stagger Tuned cMUT Array for Wideband Airborne Applications”, *Proceedings of the IEEE Ultrasonics Symposium*, Vancouver, 2006.
 26. **S. Olcum**, M.N. Senlik, C. Bayram and A. Atalar, “Design Charts to Maximize the Gain-Bandwidth Product of Capacitive Micromachined Ultrasonic Transducers”, *Proceedings of the IEEE Ultrasonics Symposium*, Rotterdam, 2005.
 27. A. Ozgurluk, A. Atalar, H. Köymen and **S. Olcum**, “Radiation Impedance of an Array of Circular Capacitive Micromachined Ultrasonic Transducers in Collapsed State”, *Proceedings of the IEEE Ultrasonics Symposium*, Orlando, 2011.
 28. Y. Yamaner, **S. Olcum**, A. Bozkurt, H. Köymen and A. Atalar, “Design and Implementation of Capacitive Micromachined Ultrasonic Transducers for High Power”, *Proceedings of the IEEE Ultrasonics Symposium*, Orlando, 2011.
 29. Y. Yamaner, **S. Olcum**, A. Bozkurt, H. Köymen and A. Atalar, “Optimizing CMUT Geometry for HIFU Applications”, *Proceedings of the IEEE Ultrasonics Symposium*, San Diego, 2010.
 30. H.K. Oguz, **S. Olcum**, M.N. Senlik, A. Atalar and H. Köymen “Wafer Bonded Capacitive Micromachined Transducers for Underwater Applications”, *Proceedings of European Conference on Underwater Acoustics*, Istanbul, 2010.
 31. M.N. Senlik, **S. Olcum**, H. Köymen and A. Atalar “Bandwidth, Power and Noise Considerations in Airborne CMUTs”, *Proceedings of the IEEE Ultrasonics Symposium*, Rome, 2009.
 32. H.K. Oguz, **S. Olcum**, M.N. Senlik, A. Atalar and H. Köymen “A Novel Equivalent Circuit Model for CMUT”, *Proceedings of the IEEE Ultrasonics Symposium*, Rome, 2009.
 33. A. Bozbey, C.A. Tunc, **S. Olcum** and A. Fujimaki “Front-end Design of an Analog to Digital Converter Circuit”, *Proceedings of International Superconductive Electronics Conference*, Fukuoka, 2009.
 34. M.N. Senlik, **S. Olcum** and A. Atalar, “Interaction between a CMUT cell and a Liquid Medium around the Parallel Resonance Frequency”, *Proceedings of the IEEE Ultrasonics Symposium*, New York, 2007.
 35. H. Köymen, A. Atalar, **S. Olcum** and M.N. Senlik, “Radiation Impedance of Circular CMUT membranes”, *19th International Congress on Acoustics*, Madrid, 2007
 36. M.N. Senlik, A. Atalar, H. Köymen and **S. Olcum**, “Radiation Impedance and Equivalent Circuit for Immersed CMUT Array Element”, *Proceedings of the IEEE Ultrasonics Symposium*, Vancouver, 2006.
 37. J.M. Ortiz-Rodriguez, A.R. Hefner; D. Berning, C. Hood, and **S. Olcum**, “Computer-Controlled Characterization of High-Voltage, High-Frequency SiC Devices”, *Proceedings of Computers in Power Electronics*, Troy, 2006.
 38. M.N. Senlik, **S. Olcum** and A. Atalar, “Improved Performance of cMUT with non-uniform membranes”, *Proceedings of the IEEE Ultrasonics Symposium*, Rotterdam, 2005.
 39. C. Bayram, **S. Olcum**, M.N. Senlik and A. Atalar, “Bandwidth Improvement in a cMUT Array with Mixed Sized Elements”, *Proceedings of the IEEE Ultrasonics Symposium*, Rotterdam, 2005.

TALKS & SEMINARS

1. **(invited)** “Microfluidics for the masses: Single cell growth for predicting therapy response”, International workshop on Nanomechanical Sensing, Kailua-Kona, Hawaii, 2017.
2. “Array of micromechanical mass sensors enables high-throughput single-cell growth-rate measurements”, Hilton Head Solid-state sensors, actuators and microsystems workshop, 2016.
3. **(invited)** “Precision mass measurements in solution reveal properties of single cells and bioparticles”, IEEE International Electron Device Meeting, Washington DC, 2015.
4. **(invited)** “High-speed multiple-mode mass sensing resolves dynamic nanoscale mass distributions”, International workshop on Nanomechanical Sensing, Auckland, New Zealand, 2015.

SELIM OLCUM

5. **(invited)** “Weighing particles with suspended microchannel resonators”, M3- Molecules, Materials and Medicines, Banff, Canada, 2012.
6. “High-throughput single-cell growth rate cytometry”, MIT Koch Institute Retreat, Cape Cod, MA, 2015.
7. “Weighing nanoparticles in solution at the attogram scale”, MIT Biophysics Retreat, Cape Cod, MA, 2014.
8. “Weighing nanoparticles in solution at the attogram scale”, Koch Institute Focus Seminar Series, Cambridge, MA, 2013.
9. “CMUT Array Element Operating in Deep-Collapse Mode of Operation”, *IEEE Ultrasonics Symposium*, Orlando, 2011.
10. “CMUT Array Element Operating in Deep Collapse Mode of Operation”, International Workshop on Micromachined Ultrasonic Transducers, Salerno, 2011.
11. “An Equivalent Circuit for Collapse Mode of CMUTs”, *IEEE Ultrasonics Symposium*, San Diego, 2010.
12. “Wafer Bonded Capacitive Micromachined Underwater Transducers”, *IEEE Ultrasonics Symposium*, Rome, 2009.
13. “Tunable Surface Enhanced Raman Spectroscopy on an Elastomeric Substrate”, ECASIA, Antalya, 2009.
14. “An Optical Microcantilever with Integrated Grating Coupler”, CLEO Europe, Munich, 2009.
15. “A New Underwater Transducer Technology: Capacitive Micromachined Ultrasonic Transducers”, NanoTR, Eskisehir, 2009.
16. “Tunable Surface Plasmon Resonance on an Elastomeric Grating”, NanoTR, Eskisehir, 2009.
17. “An Elastomeric Tunable SERS Substrate”, International Conference on Nanoscience + Technology, Keystone, 2008.
18. “Fabrication and Characterization of Capacitive Micromachined Ultrasonic Transducers”, International Workshop on Micromachined Ultrasonic Transducers, Antalya, 2007.
19. “Optimization of the Gain-Bandwidth Product of CMUTs”, International Workshop on Micromachined Ultrasonic Transducers, Munich, 2006.

PATENTS

1. “System and methods for measuring properties of particles.”, *patent pending*, US Provisional Patent Application No. 62/521,894 2017.
2. “Systems and methods for flowing particles.”, *patent pending*, U.S. Provisional Patent Application No. 62/480,148. 2017.
3. “Devices and methods for directing flow of particles.”, *patent pending*, Provisional Patent Application No. 62/480,148. 2017.
4. “Methods and articles for isolating single particles.”, *patent pending*, U.S. Provisional Patent Application No. 62/480,148. 2017.
5. “Simultaneous oscillation and tracking of multiple resonances via digitally implemented phase locked loop array”, *patent pending*, 2014.
6. “Serial Arrays of Suspended Microchannel Resonators”, US Patent 9,134,295, 2015.

TEACHING

Bilkent University, Department of Electrical Engineering

EXPERIENCE

Instructor, taught Analog Electronics (2 semesters) and Signals and Systems

2010 – 2011

Teaching Assistant for 7 courses and Lab Instructor for 5 courses

2003 – 2010

Bilkent University, Advanced Research Laboratory

2007 – 2010

Superuser & Trainer for PECVD reactors in the clean room.