

Joshua M. Kovitz

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CURRENT STATUS

I am currently a **Postdoctoral Scholar** at UCLA collaborating with Prof. Rahmat-Samii on the development of novel antenna and RF concepts that integrate new technologies (e.g. 3D printing, metamaterials) for emerging applications such as Cognitive Radio, CubeSats, and mmWave wireless.

EDUCATION

University of California Los Angeles - Los Angeles, CA 2012-15
PhD in Electrical Engineering 4.0 / 4.0 GPA

- Thesis: Innovative Antenna Designs for Broadband CP Wireless Systems and Software Radios
- **Advisor: Yahya Rahmat-Samii**; Committee: Tatsuo Itoh, Babak Daneshrad, and Mario Gerla

University of California Los Angeles - Los Angeles, CA 2010-12
MS in Electrical Engineering 4.0 / 4.0 GPA

- Thesis: Nature-Inspired Optimization Techniques Applied to Antennas for Wireless Communications and Radar
- **Advisor: Yahya Rahmat-Samii**; Committee: Tatsuo Itoh, and Lieven Vandenberghe

University of Houston - Houston, TX 2006-10
BS in Electrical Engineering 3.983 / 4.0 Cumulative GPA; Summa Cum Laude

- Concentration in electromagnetics, antenna engineering, and analog electronics
- **Advisors: Stuart Long, David Jackson, and Donald Wilton**

FELLOWSHIPS, SCHOLARSHIPS, AND AWARDS

- Recipient of the **Raj Mitra Award** to attend the 2016 IEEE Antennas & Propagation Symposium
- **Second place** award winner for the 2015 IEEE International Antennas and Propagation Symposium double-blind **student paper competition** (out of 173 submitted papers)
- URSI National Radio Science Meeting Travel Award 2013
- Awarded the prestigious National Defense Science and Engineering Graduate (**NDSEG**) **3-year Fellowship** in 2012 (only 8% of EE applicants were awarded nationwide)
- Recipient of the University Fellowship for being the **Highest Ranked Student** for the UCLA PhD Preliminary Exam in the Physical & Wave Electronics Area
- Recipient of the 2012 **Edward K. Rice Outstanding Masters Student Award**
- Awarded the 2012 **Distinguished M.S. Thesis Award** in Physical & Wave Electronics
- 1st Place Winner in Student Poster Competition for the IEEE CLASTECH Symposium 2012
- Outstanding Senior (2009-10) and Outstanding Junior (2008-09) within ECE department
- Awarded an NSF REU position and the Provost Undergraduate Research Scholarship

TEACHING EXPERIENCE

Teaching Assistant Spring 2014, Spring 2015
University of California Los Angeles EE162A: *Wireless Communication Links and Antennas*

Undergraduate Student Proctor Fall 2009 - May 2010
University of Houston ECE 1331: *Introduction to Computing*

BOOK CHAPTERS

1. **J. M. Kovitz** and Y. Rahmat-Samii, "Novelties of Spectral Domain Analysis in Antenna Characterizations: Concept, Formulation, and Applications," in *Advanced Computational Electromagnetic Methods*, eds. Wenhua Yu, Wenxing Li, Atef Elsherbeni, Yahya Rahmat-Samii, pp.67-123, Artech House, 2015.

PEER-REVIEWED JOURNAL PAPERS

1. **J. M. Kovitz**, J. Choi, and Y. Rahmat-Samii, "CRLH Networks for Wideband CP Arrays: Revisit, review, and extensions of current techniques for high-performance antenna systems," *IEEE Microwave Magazine* (under review)
2. **J. M. Kovitz**, J. Santos, Y. Rahmat-Samii, N. Chamberlain, and R. Hodges, "High-Performance Circularly-Polarized Patch Subarrays for Dual-Band Direct-to-Earth Communications in Future Mars Rover Missions," *IEEE Antennas and Propagation Magazine* (under review)
3. Y. Rahmat-Samii, V. Manohar, and **J. M. Kovitz**, "Think Small, Dream Big: Reviewing Recent Antenna Developments for CubeSats," *IEEE Antennas and Propagation Magazine* (accepted) **(special issue on CubeSats)**
4. **J. M. Kovitz**, H. Rajagopalan, and Y. Rahmat-Samii, "Circularly-polarised half E-shaped patch antenna: a compact and fabrication-friendly design," *IET Microwaves, Antennas, and Propagation*. vol. 10, no. 9, pp. 932-938, June 2016.
5. **J. M. Kovitz**, H. Rajagopalan, and Y. Rahmat-Samii, "Design and Implementation of Broadband MEMS RHCP/LHCP Reconfigurable Arrays using Rotated E-Shaped Patch Elements," *IEEE Transactions on Antennas and Propagation*. vol. 63, no. 6, pp. 2497-2507, June 2015.
6. **J. M. Kovitz** and Y. Rahmat-Samii, "Using Thick Substrates and Capacitive Probe Compensation to Enhance the Bandwidth of Traditional CP Patch Antennas," *IEEE Transactions on Antennas and Propagation*, vol. 62, no. 10, pp. 4970-4979, October 2014.
7. I. Kim, **J. M. Kovitz**, and Y. Rahmat-Samii, "Enhancing the Power Capabilities of the Stepped Septum Using an Optimized Smooth Sigmoid Profile," *IEEE Antennas and Propagation Magazine*, vol. 56, no. 5, pp. 16-42, October 2014.
8. H. Rajagopalan, **J. M. Kovitz**, and Y. Rahmat-Samii, "MEMS Reconfigurable Optimized E-Shaped Patch Antenna Design for Cognitive Radio," *IEEE Transactions on Antennas and Propagation*, vol. 62, no. 3, pp. 1056-1064, March 2014. **(special issue on cognitive radios)**
9. **J. M. Kovitz**, H. Rajagopalan, and Y. Rahmat-Samii. "Practical and Cost-Effective Bias Network Implementations for Reconfigurable Antennas," *IEEE Antennas and Wireless Propagation Letters*, vol. 11, pp. 1552-1555, December 2012.
10. Y. Rahmat-Samii, **J. M. Kovitz**, H. Rajagopalan, "Nature-Inspired Optimization Techniques in Communication Antenna Designs," *Proceedings of the IEEE*, vol. 100, no.7, pp. 2132-44, July 2012. **(invited paper - special issue on antennas in wireless communications)**

PEER-REVIEWED CONFERENCE PAPERS

1. V. Manohar, **J. M. Kovitz** and Y. Rahmat-Samii, "A Novel Customized Spline-Profiled mm-Wave Horn Antenna for Emerging High Performance CubeSats," *37th Annual Meeting of Antenna Measurement Techniques Assoc.*, October 2016. (accepted for presentation)
2. V. Manohar, **J. M. Kovitz** and Y. Rahmat-Samii, "Ka band Umbrella Reflectors for CubeSats: Revisiting Optimal Feed Location and Gain Loss," *International Conference on Electromagnetics in Advanced Applications*, September 2016. (**invited paper**)
3. **J. M. Kovitz** and Y. Rahmat-Samii, "Enhancing Rejection in Cognitive Radio Filtennas using a Reconfigurable Filter+Antenna Approach," *IEEE Antennas and Propagation International Symposium*, June 2016.
4. B. Zhang, **J. M. Kovitz**, and Y. Rahmat-Samii, "A Hemispherical Monopole Rectenna Array for Multi-Directional, Multi-Polarization, and Multi-Band Ambient RF Energy Harvesting," *IEEE Antennas and Propagation International Symposium*, June 2016.
5. **J. M. Kovitz**, V. Manohar, and Y. Rahmat-Samii, "A Spline-Profiled Conical Horn Antenna Assembly Optimized for Deployable Ka-Band Offset Reflector Antennas in CubeSats," *IEEE Antennas and Propagation International Symposium*, June 2016. (**special session on CubeSats**)
6. J. Santos, **J. M. Kovitz** and Y. Rahmat-Samii, "Interplanetary Communications from Mars: Development and Testing of a Novel Compact Circularly Polarized Subarray," *37th Annual Meeting of Antenna Measurement Techniques Assoc.*, October 2015.
7. Y. Rahmat-Samii, L. Amaro, **J. M. Kovitz**, and J. Harrell, "Absolute Near-Field Determination of the RapidScat Reflector Antenna onboard the International Space Station," *37th Annual Meeting of Antenna Measurement Techniques Assoc.*, October 2015.
8. **J. M. Kovitz**, J. Choi, and Y. Rahmat-Samii, "Dispersion Engineered Right/Left-Handed Transmission Lines Enabling Near-Octave Bandwidths for Wideband CP Patch Arrays," *IEEE Antennas and Propagation International Symposium*, July 2015. (**2nd Place Contest Winner**)
9. **J. M. Kovitz**, J. Santos, and Y. Rahmat-Samii, "The CP Half E-shaped Patch: Evolving from Linear Polarization to Compact Single Feed Circularly Polarized Antennas," *IEEE Antennas and Propagation International Symposium*, July 2015.
10. Y. Rahmat-Samii, L. Amaro, and **J. M. Kovitz**, "Normalized Plane Wave Spectra: Quantification of Measured Near-Fields for the ISS-RapidScat using Measured Far-field Patterns," *IEEE Antennas and Propagation International Symposium*, July 2015. (**special session on radio astronomy**)
11. Y. Rahmat-Samii, L. Amaro, and **J. M. Kovitz**, "Characterizing the Near Field Strength of ISS-RapidScat Reflector Antenna From Measurement Data Using Spectral Back Projection Method," *9th European Conference on Antennas and Propagation*, April 2015.
12. **J. M. Kovitz** and Y. Rahmat-Samii, "Enhanced broadband performance of thick CP patch antennas: A novel annular gap capacitor design," *IEEE Antennas and Propagation International Symposium*, July 2014.
13. **J. M. Kovitz** and Y. Rahmat-Samii, "Understanding the radiation pattern anomalies in the broadband CP reconfigurable E-shaped patch," *IEEE Antennas and Propagation International Symposium*, July 2014.
14. **J. M. Kovitz** and Y. Rahmat-Samii, "Ensuring robust antenna designs using multiple diverse optimization techniques," *IEEE Antennas and Propagation International Symposium*, July 2013.
15. I. Kim, **J. M. Kovitz**, and Y. Rahmat-Samii, "Sigmoid profiled septum: Evaluation of parabolic reflectors with the septum feed horn," *IEEE Antennas and Propagation International Symposium*, July 2013.

PEER-REVIEWED CONFERENCE PAPERS (CONTINUED)

16. Y. Rahmat-Samii and **J. M. Kovitz**, "Recent advances in evolutionary optimization techniques in applied electromagnetics," *Proceedings of the URSI International Symposium on Electromagnetic Theory*, May 2013.
17. S. Kailaswar, R. Zheng, **J. M. Kovitz**, Q. Phung, Z. Ding, and G. Song. "ConcreteCom: A New Communication Paradigm for Building Structural Health Monitoring" *BuildSys 2012, 4th ACM Workshop On Embedded Sensing Systems For Energy-Efficiency In Buildings*, November 2012.
18. **J. M. Kovitz**, H. Rajagopalan, and Y. Rahmat-Samii. "A Novel Optimized Broadband Reconfigurable RHCP/LHCP E-shaped Patch Antenna," *IEEE Antennas and Propagation International Symposium*, July 2012.
19. H. Rajagopalan, **J. M. Kovitz**, and Y. Rahmat-Samii. "Frequency Reconfigurable E-shape Patch Antenna using Nature Inspired Optimization," *IEEE Antennas and Propagation International Symposium*, July 2012.
20. **J. M. Kovitz** and Y. Rahmat-Samii, "Micro-Actuated Pixel Patch Antenna Design using Particle Swarm Optimization," *IEEE Antennas and Propagation International Symposium*, July 2011. **(special session on evolutionary computation)**

ABSTRACTS AND PRESENTATIONS

1. B. Zhang, **J. M. Kovitz**, and Y. Rahmat-Samii. "Multi-Directional, Multi-Polarization, and Multi-Band RF Energy Harvesting: Modeling and Development of a Hemispherical Monopole Array," *North American Radio Science Meeting (URSI)*, Boulder, CO, January 2017. *(to be presented)*
2. V. Manohar, **J. M. Kovitz**, and Y. Rahmat-Samii. "Development and Characterization of a Ka Band Mesh Reflector Antenna for Emerging High Performance CubeSats," *North American Radio Science Meeting (URSI)*, Boulder, CO, January 2017. *(to be presented)*
3. B. Zhang, **J. M. Kovitz**, and Y. Rahmat-Samii, " Ambient RF Energy Harvesting With a Novel Hemispherical Rectenna Array," *Annual Research Review*, University of California, Los Angeles, February 2016.
4. V. Manohar, **J. M. Kovitz**, and Y. Rahmat-Samii, "Ka Band Offset Reflector Antennas for CubeSats: Mesh Characterization and Innovative Feed Designs," *Annual Research Review*, University of California, Los Angeles, February 2016.
5. **J. M. Kovitz** and Y. Rahmat-Samii, "Wideband CP Patch Antenna Arrays: Challenges and Novel Design Solutions using Composite Right/Left-Handed Feed Networks," *Annual Research Review*, University of California, Los Angeles, February 2015.
6. **J. M. Kovitz** and Y. Rahmat-Samii, "A Spectral Approach to Characterize the Near-Field Antenna Performance of the ISS-RapidScat via Fast Fourier Transform," *UCLA Tech Forum*, University of California, Los Angeles, February 2015.
7. J. P. Santos, **J. M. Kovitz** and Y. Rahmat-Samii, "Next-Generation Antenna Arrays for Direct-to-Earth Communications in Mars Rovers," *UCLA Tech Forum*, University of California, Los Angeles, February 2015.
8. **J. M. Kovitz** and Y. Rahmat-Samii, "Radiation Pattern Anomalies in the Broadband CP Reconfigurable E-shaped Patch Antenna," *North American Radio Science Meeting*, Boulder, CO, January 2014.
9. **J. M. Kovitz** and Y. Rahmat-Samii. "A Novel MEMS Reconfigurable Wideband E-Shaped Patch Element for Advanced Cognitive Radio Base Stations," *North American Radio Science Meeting (URSI)*, Boulder, CO, January 2013.

ABSTRACTS AND PRESENTATIONS (CONTINUED)

10. **J. M. Kovitz** and Y. Rahmat-Samii. "A Comparative Study between CMA Evolution Strategies and Particle Swarm Optimization for Antenna Applications," *North American Radio Science Meeting (URSI)*, Boulder, CO, January 2013.
11. **J. M. Kovitz**, H. Rajagopalan, and Y. Rahmat-Samii, "Practical Techniques to Implement Bias Lines for Reconfigurable Microwave Antennas," *Annual Research Review*, University of California, Los Angeles, December 2012.
12. **J. M. Kovitz** and Y. Rahmat-Samii, "Comparison of Nature-Inspired Optimization Techniques for Antenna Applications in Communications," *Annual Research Review*, University of California, Los Angeles, December 2012.
13. **J. M. Kovitz**, H. Rajagopalan, and Y. Rahmat-Samii. "Next Generation MEMS Reconfigurable E-Shaped Patch Antenna Design using Particle Swarm Optimization," *North American Radio Science Meeting (URSI)*, Boulder, CO, Jan 2012.
14. I. Kim, **J. M. Kovitz**, and Y. Rahmat-Samii. "Smoothed Sigmoid and Stepped Circularly Polarized Septum Design using Particle Swarm Optimization." *North American Radio Science Meeting (URSI)*, Boulder, CO, Jan 2012.
15. **J. M. Kovitz**, H. Rajagopalan, and Y. Rahmat-Samii, "MEMS Reconfigurable E-Shaped Patch Design using Particle Swarm Optimization," *Annual Research Review*, University of California, Los Angeles, November 2011.
16. I. Kim, **J. M. Kovitz**, and Y. Rahmat-Samii, "Smoothed Sigmoid Circularly Polarized Waveguide Septum Design using Particle Swarm Optimization," *Annual Research Review*, University of California, Los Angeles, November 2011.
17. **J. M. Kovitz** and Y. Rahmat-Samii, "Optimizing Micro-Actuated Pixel Patch Antennas with Particle Swarm Optimization," *IEEE Coastal Los Angeles Section CLASTECH Symposium*, El Segundo, CA, October 2011. (**First place contest winner**)
18. **J. M. Kovitz** and Y. Rahmat-Samii, "Optimizing Micro-Actuated Pixel Patch Antennas with Particle Swarm Optimization," *Annual Research Review*, University of California, Los Angeles, March 2011.
19. **J. M. Kovitz** and Y. Rahmat-Samii, "Particle Swarm Optimization in Designing Reconfigurable Pixelled Patch Antennas," *North American Radio Science Meeting (URSI)*, Boulder, CO, Jan. 2011.

PATENTS

1. Y. Rahmat-Samii, H. Rajagopalan, **J. M. Kovitz**, and J. P. Santos. "Low-Profile Circularly-Polarized Single-Probe Broadband Antenna." U.S. Patent No. 15/214,892. July 20, 2016. (non-provisional patent filed, awaiting issue)
2. Y. Rahmat-Samii, B. Zhang, and **J. M. Kovitz**. "Spherical Monopole Rectenna Arrays for Multi-Directional, Multi-Polarization, and Multi-Band Ambient RF Energy Harvesting." U.S. Patent No. 62/355,325. July 20, 2016. (provisional patent)

PODIUM TALKS AND SEMINARS

1. **J. M. Kovitz**, "Advanced Antenna Designs for Emerging Cognitive Radio and Space Technologies," *ECE Department Seminar*, University of California Davis, April 2016.
2. **J. M. Kovitz**, "Nature-Inspired Optimization: Parallel Implementation for Novel Antenna Designs in High Performance Broadband Systems," *Electrical Engineering Department Research Forum*, University of California Los Angeles, December 2014.

SOCIAL MEDIA ARTICLES AND NEWS REPORTS

1. J. P. Santos, **J. M. Kovitz**, and Y. Rahmat-Samii, "Talking to Mars: new antenna design could aid interplanetary communication," *The Conversation*, available at <https://theconversation.com/us/technology> (**invited article**)
2. ABC7 Eyewitness News, "Phone Home," aired on TV Channel 7 6pm News on 9/9/2015.

ADDITIONAL SCIENTIFIC ACTIVITIES

Grant Proposal Writing

Summer 2010 - Present

University of California Los Angeles

ARAM Laboratory

While at UCLA, I worked closely with Prof. Yahya Rahmat-Samii on writing several proposals for new and interesting research. These proposals were submitted to organizations such as the National Science Foundation and NASA's Jet Propulsion Laboratory. Not only did I help write some of the proposal, I carried out a significant portion of the research for the awarded grants and directed other students involved in the project.

University of Houston

Wireless System Research Group

I helped Prof. Rong Zheng write a proposal to the National Science Foundation to further develop communication systems between sensors for Wireless Structural Health Monitoring.

Journal Reviewer

2014-2016

- *IEEE Transactions on Antennas and Propagation*
- *IEEE Antennas and Propagation Magazine*
- *IEEE Antennas and Wireless Propagation Letters*

Conference Session Chair

July 2014

IEEE APS Symposium

Session 528: Wideband, Multiband, and CP Microstrip Antennas

Conference Reviewer

2015-2017

2015 European Conference on Antennas and Propagation

2016 International Symposium on Antennas and Propagation

2017 European Conference on Antennas and Propagation

Student Mentoring

Fall 2010 - Present

University of California Los Angeles

ARAM Laboratory

I have mentored many undergraduate and graduate students working in the Antenna Research, Analysis, and Measurement (ARAM) Laboratory. I primarily train them in the usage of antenna simulation and measurement equipment. I also devote time for discussing their research and any deep theoretical questions or doubts. I work with students in reviewing their journal papers, conference presentations, and theses to ensure clarity and depth. Some students have been **awarded prestigious awards** and recognition such as the UCLA Grad Slam Winner and Finalist for the 2015 APS Student Paper Competition.

TECHNICAL SKILLS

Programming Languages: C, C++, FORTRAN

Publishing Languages: LaTeX, PHP, HTML, WordPress, VB Script, Javascript, CSS

Applications: MATLAB, MS Office, AutoCAD

Simulation Suites: HFSS, FEKO, ADS, CST, IE3D

Numerical Algorithms: Method of Moments (MoM), Finite-Difference Time-Domain (FDTD), diffraction analysis including Physical Optics (PO), Geometrical Optics (GO), and Geometrical Theory of Diffraction (GTD), back-projection holography using FFT

Fabrication: general machining equipment (lathe, drill press, etc), PCB fabrication through photolithography and chemical etching, PCB fabrication through milling, SMD mounting/soldering, 3D printing

Measurement: vector network analyzer, spectrum analyzer, oscilloscope, far-field antenna pattern measurement, near-field antenna pattern measurement, antenna gain measurements

Working Status: US citizen

REFERENCES

References available upon request