

PROMOTION RECOMMENDATION  
The University of Michigan  
College of Engineering  
Department of Electrical Engineering and Computer Science

Anthony Grbic, associate professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering, is recommended for promotion to professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering.

Academic Degrees:

Ph.D. 2005 University of Toronto, Electrical Engineering, Toronto, Canada  
M.A.Sc. 2000 University of Toronto, Electrical Engineering, Toronto, Canada  
B.A.Sc. 1998 University of Toronto, Electrical Engineering, Toronto, Canada

Professional Record:

2012 – 2014 Ernest and Bettine Kuh Distinguished Faculty Scholar, Department of Electrical Engineering and Computer Science, University of Michigan  
2011 – present Associate Professor (with tenure), Department of Electrical Engineering and Computer Science, University of Michigan  
2006 – 2011 Assistant Professor, Department of Electrical Engineering and Computer Science, University of Michigan

Summary of Evaluation:

Teaching: Professor Grbic has taught four different undergraduate and graduate courses, ranging from 200- to 500-level classes. His teaching record is outstanding, and student evaluations and comments have been uniformly excellent. Professor Grbic is one of the Radiation Laboratory's most skilled and appreciated instructors for the mandatory electromagnetics course EECS 230. Since 2009, his Q1/Q2 scores in EECS 230 have averaged 4.36/4.70. This is extremely high for what is arguably one of the most difficult required undergraduate courses in the department. The scores reflect Professor Grbic's ability to explain difficult material and concepts in a clear and concise manner, as well as his uncanny ability to connect with students. Two years ago, Professor Fawwaz Ulaby and he completely revamped the lab section of the course. Professor Grbic also designed an integrated project aimed at the development of a functional radio for EECS 430. Because of his efforts, the Michigan chapter of Eta Kappa Nu, the electrical and computer engineering honor society, voted this class as one of their favorites in 2009. Finally, he has developed and taught a new special topics graduate-level course on metamaterials (EECS 598) that is popular among students from multiple departments. Letters received from former undergraduate and graduate students are all positive and strongly supportive of his promotion. Additionally, he has advised several undergraduate students on topics related to his research. He has been an excellent mentor for his graduate students and has advised six M.S. students. Professor Grbic has graduated five Ph.D. students and has another five in progress.

Research: Professor Grbic is at the forefront of metamaterials research and is widely recognized for his circuit-based approaches and his more recent pioneering work on bianisotropic metasurfaces. His

research includes both theoretical and experimental aspects and has been primarily centered on: (i) bulk metamaterials; (ii) sub-wavelength focusing; and (iii) transmission-line based metamaterials.

Professor Grbic has an outstanding publication record and much of his research, in addition to being published in the specialized scientific journals, has been covered in articles in *Scientific American*, *Science*, and *Nature*. He has published over 45 full-length articles in journals (over 25 since 2011). In addition, he has published over 16 short articles (with several since 2011). He has numerous refereed conference papers and abstracts, more than 30 of which were invited. His accomplishments have been recognized both internally and externally with numerous prestigious awards including the PECASE, NSF CAREER, AFOSR Young Investigator Awards, the University of Michigan Henry Russel Award, and the Ernest and Bettine Kuh Distinguished Faculty Scholar Award. Major sources of his research funding include NSF (CAREER), AFOSR (YIP, MURI and DURIP), AFRL, NRO, KACST and multiple companies.

#### Recent and Significant Publications:

- C. Pfeiffer and A. Grbic, "Bianisotropic metasurfaces for optimal polarization control: Analysis and synthesis," *Physical Review Applied*, vol. 2, 044011, October 2014.
- C. Pfeiffer and A. Grbic, "Metamaterial Huygens' surfaces: tailoring wavefronts with reflectionless sheets," *Physical Review Letters*, vol. 110, 197401, May 2013.
- M. Ettore, S. M. Rudolph and A. Grbic, "Generation of propagating Bessel beams using leaky-wave modes: experimental validation," *IEEE Trans. AP*, vol. 60, pp. 2645 - 2653 June 2012.
- G. Gok and A. Grbic, "Tensor transmission-line metamaterials," *IEEE Trans. on Antenn. & Propagation*, vol. 58, no. 5, pp. 1559 – 1566, May 2010.
- A. Grbic, L. Jiang, R. Merlin, "Near-field plates: subdiffraction focusing with patterned surfaces," *Science*, vol. 320, no. 5874, pp. 511-513, April 25, 2008.

Service: Professor Grbic's service on departmental committees is valued and external service is extensive. In EECS, he served for two years on the ECE Executive Committee. He is now serving on the executive committee of the U-M NSF MRSEC on Photonics and Multiscale Nanomaterials. In 2014, he was the graduate advisor for Applied Electromagnetics and RF Circuits. He has been heavily involved in program development at the graduate level, serving on the Graduate Program Merger and the Graduate Program Futures committees. Professor Grbic continues to be actively engaged in issues related to diversity, equity and inclusion for underrepresented minority and women graduate students and postdocs.

Professor Grbic continues to build a very strong record of service in the Institute of Electrical and Electronic Engineers (IEEE). His involvement on major committees and in the organization of programs and symposia speak well not only to his energetic contributions but to the respect he is given by his colleagues in IEEE. He is a technical program co-chair for the 2016 IEEE Antennas and Propagation Society International Symposium and the USNC-URSI National Radio Science Meeting. He was a member of the technical program committee for the same symposium in 2012 and in 2014. He was also a technical program committee member for the Eighth International Congress on Advanced Electromagnetic Materials in Microwave and Optics (Metamaterials '14) held in Copenhagen, Denmark. Professor Grbic recently completed a five-year term as an associate editor of *IEEE Antennas and Wireless Propagation Letters* and currently serves as the vice chair of technical activities of the IEEE Southeastern Michigan Section of the IEEE Antennas and Propagation Society, a position he has held since 2007.

External Reviewers:

Reviewer A: "Tony is one of the stars of the field of metamaterials ... His creative work is widely recognised in the community and he shows great potential for further outstanding contributions to research in electromagnetic phenomena."

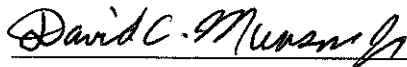
Reviewer B: "...I would say that he is now one of the top five researchers in the world in the area of microwave metamaterials. His research record and his reputation more than justify his promotion to Full Professor."

Reviewer C: "He is one of the most influential leaders, internationally renowned and highly productive trendsetters in the fields of metamaterials, microwave engineering, and numerous aspects of applied electromagnetics."

Reviewer D: "... he is one of the fastest rising stars in his field, and he is making numerous significant impacts on a field in which there is no shortage of bright minds."

Reviewer E: "Prof. Grbic is one of a handful of researchers who has forged a path of innovation, taking emerging metamaterial concepts and translating them to practice in the RF domain."

Summary of Recommendation: Professor Grbic is a very prominent researcher and educator in the field of applied electromagnetics with emphasis on metamaterials. He has made significant contributions in research, teaching, and service. His record of service is above and beyond that of others in his stage of career. It is with the support of the College of Engineering Executive Committee that I recommend Anthony Grbic for promotion to professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering.



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David C. Munson, Jr.  
Robert J. Vlasic Dean of Engineering  
College of Engineering

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