

PROMOTION RECOMMENDATION  
THE UNIVERSITY OF MICHIGAN  
COLLEGE OF LITERATURE, SCIENCE, AND THE ARTS

Approved by the  
Regents  
May 21, 2015

Jeffrey J. McMahon, assistant professor of physics, College of Literature, Science, and the Arts, is recommended for promotion to associate professor of physics, with tenure, College of Literature, Science, and the Arts.

Academic Degrees:

Ph.D. 2006 Princeton University  
B.A. 1999 University of California, Berkeley

Professional Record:

2009 – present Assistant Professor, Department of Physics, University of Michigan  
2009 Senior Researcher, Kavli Institute for Cosmological Physics (KICP),  
University of Chicago  
2006 – 2009 Enrico Fermi and KICP Post-doctoral Fellow, Kavli Institute for  
Cosmological Physics, University of Chicago

Summary of Evaluation:

Teaching – Professor McMahon has made outstanding contributions to the physics' undergraduate curriculum and has earned high marks from his students as well as the admiration of his colleagues. He has taught introductory mechanics, an intermediate course in modern physics, and upper-level course in electricity and magnetism. Most recently, he has taken on the second-semester honors introductory course and introduced a flipped classroom in which students watch pre-lecture videos that Professor McMahon prepares in order to devote more classroom time to active discussion, problem-solving, and group work. This approach has been well received by students. Professor McMahon has mentored eighteen undergraduate students in his laboratory and is currently the thesis advisor of three graduate students.

Research – Professor McMahon is an experimental astrophysicist who studies the cosmic microwave background (CMB) often described as the afterglow of the Big Bang 13.7 billion years ago. This radiation emanates from every location in the sky with a thermal spectrum nearly identical to that of a glowing object 2.7 degrees above absolute zero. The deviations from this spectrum have a very specific pattern that carries a wealth of information about the geometry and contents of the universe, as well as the physical processes that shaped the universe from its earliest moments. Professor McMahon is an expert in designing and building the necessary measurement systems to capture the data and is also expert in analyzing the data. Results from his experiments are increasing rapidly and in 2013 he listed thirteen publications. Professor McMahon is the principal investigator on one major grant from the National Science Foundation and three more from the National Aeronautics and Space Administration. External reviewers praise his experimental skill and place him at or near the top of his cohort.

Recent and Significant Publications:

“The Atacama Cosmology Telescope: CMB polarization at  $200 < l < 9000$ ,” with S. Naess, et al., *Journal of Cosmology and Astroparticle Physics*, 10, 2014, p. 007.

“Detection of B-mode polarization in the cosmic microwave background with data from the South Pole telescope,” with D. Hanson, et al., *Physics Review Letters*, 111, 2013, p. 141301.

“Constraints on cosmology from the cosmic microwave background power spectrum of the 2500-square degree SPT-SZ survey,” with Z. Hou, et al., *Astrophysical Journal*, 782, 2014, p. 74.

“Galaxy clusters selected with the Sunyaev-Zel’dovich Effect from 2008 South Pole telescope observations,” with K. Vanderlinde, et al., *Astrophysical Journal*, 722, 2010, p. 2.

Service – Professor McMahon has made significant service contributions in a number of areas, including national service, departmental and university committees, and outreach activities. He has served on the department’s Undergraduate Concerns, Graduate Admissions, and IT committees, and on the LSA Machine Shop Committee. He was also elected to the Michigan Institute for Research in Astrophysics Executive Committee. Professor McMahon was the organizer of a special session on “The Exciting Future of the Cosmic Microwave Background” at the American Astronomical Society’s 2014 winter meeting. He has given two presentations for the Saturday Morning Physics program, has been featured at a public Science Cafe event in Ann Arbor, and presented a public lecture at the Adler Planetarium in Chicago.

#### External Reviewers:

##### Reviewer (A)

“He has made solid technology contributions to these scientifically first-rate projects, and somehow he has been able to maintain ties to both in spite of the intense competition between them. ... I am sure that if he is tenured at Michigan he will continue his work with top notch experiments, his research will attract students and postdocs, and the he will continue to bring new opportunities to the university.”

##### Reviewer (B)

“This is a significant contribution to one of the two arcminute-scale CMB polarization experiments and evidences the respect for his work by some of the senior leaders in the field... Even in Jeff’s own cohort, there is no one who is doing the same combination of technology development and science. ... Jeff is certainly among the top people [of his cohort] in the field and his record of accomplishment would justify tenure anywhere.”

##### Reviewer (C)

“Some of the most important results in the field are based on his contributions. ... He is an excellent researcher, and his group will bring credit to your department in the years to come.”

##### Reviewer (D)

“He is very well known, and held in uniformly high regard, by the CMB experimentalists he works with and competes against, and his contributions to the big projects he has worked on are very well appreciated. ... McMahon has already demonstrated...that he will function very effectively in this environment... This impression is based not only upon McMahon’s ability to get involved in such a diverse set of projects, but also in his success with grants, which is amazing given the funding climate the past few years.”

Reviewer (E)

“What distinguishes Jeff from his competitors is excellence in detector development. I am impressed by Jeff’s accomplishments and agenda. ... I understand the importance of his work, and highly respect his achievements so far. (Plus, he has been very successful in obtaining large grants for doing precisely this work.)”

Reviewer (F)

“I am particularly impressed with Prof. McMahon’s work on ACTPol, where his metamaterial antireflection coatings for silicon have recently enabled world-leading measurements of the E-mode CMB spectrum. ... McMahon has contributed to an impressively wide range of projects, with significant impact on each. ... I am also impressed with the number of undergraduates who have done research in his lab over the past five years; he is clearly committed to undergraduate education and training...”

Reviewer (G)

“I believe that this is the future of bolometric detectors and Jeff is the one who has charted the way. The second area in which Jeff has really taken off is with his studies of metamaterials for antireflection coating and impedance matching. ... It is beautiful experimental work that is pushing our field forward. ... He has got a winning combination of potential, creativity, and drive...”

Reviewer (H)

“Jeff is one of the top CMB experimentalists of his generation. ... Jeff has already emerged as one of the leaders of his generation.”

Reviewer (I)

“Jeff is a powerhouse in both intellectual ability and creativity.”

Summary of Recommendation:

Professor McMahon has shown the highest intellectual quality, productivity, and leadership in creating and disseminating knowledge in physics. The Executive Committee of the College of Literature, Science, and the Arts and I recommend that Assistant Professor Jeffrey J. McMahon be promoted to the rank of associate professor of physics, with tenure, College of Literature, Science, and the Arts.



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Andrew D. Martin  
Dean, and Professor of Political Science  
College of Literature, Science, and the Arts

May 2015