Approved by the Regents
May 16, 2019

PROMOTION RECOMMENDATION
The University of Michigan
College of Literature, Science, and the Arts

Thomas A. Schwarz, 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	University of Michigan
M.S.	2002	University of Michigan
M.S.E.	2001	University of Michigan
B.S.E.	1999	University of Michigan

Professional Record:

2012 – present	Assistant Professor, Department of Physics, University of Michigan
2011 – 2012	Associate Scientist, Fermi National Laboratory, Batavia, IL
2006 – 2011	Post-doctoral Associate, Department of Physics, University of California, Davis

Summary of Evaluation:

Teaching – Professor Schwarz has taught five different courses over ten semesters at Michigan that span from introductory to senior lecture and laboratory classes. In nine of the ten semesters, his teaching evaluations ranked him above 50% of college-taught courses, and in seven of the ten semesters, his evaluations were in the top 25%, with several near-perfect scores. Professor Schwarz has introduced many innovative elements in his teaching. In Physics 453 (Introduction to Quantum Mechanics), he worked with a GSI to add a significant computational component to the course. This effort fits well with the department's goals to improve and enhance students' computational proficiency. In addition to his classroom teaching, Professor Schwarz has mentored four graduate students, two post-doctoral scholars, and thirteen undergraduate students. He is mentoring some of the best graduate students in the department, two of his students have won National Science Foundation Graduate Student Research Fellowships.

Research – Professor Schwarz's research field is experimental high-energy physics (HEP), which focuses on the study of matter at its smallest distance and highest energy that modern experiments can probe. He conducts research at the Large Hadron Collider with the ATLAS experiment, and has established an independent research program, highly recognized within and external to the ATLAS Collaboration. The experimental signatures that Professor Schwarz and his team used in their physics analysis are the heaviest third generation of lepton (tau-lepton) and quarks (top and bottom). The $t\bar{t}H$ production is the rarest Higgs boson production mode at the LHC at only 0.9% of the total Higgs production cross section. Therefore, it is very difficult to detect the $t\bar{t}H$ signal in experiments at the LHC. Professor Schwarz and his team focused their analysis on $H \to \gamma\gamma$ decay associated with a pair of top quarks decaying to either hadrons or leptons. In addition to his outstanding physics records at Fermilab and CERN, Professor Schwarz developed expertise and took on leadership roles on a critical part of the experimental apparatus, the ATLAS Muon Spectrometer. Similar to his physics program, Professor Schwarz's

hardware work also has an ambitious range, including both Phase I and Phase II detector upgrade projects of the front-end electronics design and construction for both trigger and readout systems of the ATLAS Muon Spectrometer.

Recent and Significant Publications:

"Searches for resonant and non-resonant Higgs boson pair-production in the $bb\tau\tau$ decay channel with 36.1 fb^{-1} pp collision data at $\sqrt{s}$ = 13 TeV with the ATLAS detector," The ATLAS Collaboration with G. Aad, et al, submitted to *Physical Review Letters*, arxiv:1808.00336.

"Observation of Higgs boxon production in association with a top quark pari with the LHC at the ATLAS detector," The ATLAS Collaboration with G. Aad, et al, submitted to *Physics Letters B*, arXiv:1806.00425.

"Search for minimal supersymmetric standard model Higgs bosons H/A and for a Z' boson in the $\tau\tau$ final state produced in *pp* collisions at $\sqrt{s}$ = 13 TeV with the ATLAS Detector," The ATLAS Collaboration with G. Aad, et al, *European Physical Journal*, C76, 2016 p. 585.

"Measurement of the charge asymmetry in highly boosted top-quark pair production in $\sqrt{s}$ = 8 TeV *pp* collision data collected by the ATLAS experiment," The ATLAS Collaboration with G. Aad, et al, *Physics Letters B*, 756, 2016, pp. 52-71.

Service – Professor Schwarz has made significant service contributions at the department, university, and national levels. He has twice served on the departmental Graduate Admissions Committee and he organized assistant professor lunches to study the graduate course curriculum. His national service includes being a member of the organizing committee for the 2015 Division of Particles and Fields (DPF) conference, and chairing sessions at both DPF 2015 and the Top 2015 Conference. He also served on the Diversity Committee of US ATLAS. His most significant national service is as a Level 2 Manager for the muon system for the U.S. ATLAS HL-LHC Upgrade Project. Professor Schwarz's role in the $15M muon sub-project has been to negotiate and define the U.S. scope of the muon project, matching the expertise and capabilities at U.S. institutions to the tasks needed for ATLAS to succeed.

External Reviews:

Reviewer (A)

"…ATLAS upgrades for the HL-LHC, a $245M project. …Tom's group's current focus is on the $H\rightarrow\gamma\gamma$ coupling measurements, where they play a key role… Tom is responsible for the US contributions to the muon detector upgrade… He clearly has the detailed technical knowledge and understanding of the required resources to lead the project to completion."

Reviewer (B)

"He has pioneered new ways to improve the sensitivity to Higgs boson produced in association to top quarks. … His mentorship of graduate students is another area in which he also excels. My interactions with his students in the past assures me that he dedicates valuable time and effort to educate them and to help develop their careers."

Reviewer (C)

"Professor Schwarz was elected to, and has successfully convened, one of the most important such groups for ATLAS: the top quark cross section group. … Such leaders must combine a deep knowledge of physics, superb hardware capabilities, good management skills, and excellent

leadership abilities. … That Prof. Schwarz has been selected attests to his abilities and the esteem by which he [is] held with his peers."

Reviewer (D)
"…Dr. Schwarz has become a leader in several very important areas of his ATLAS experiment, as a contributor to very high profile and high priority measurements, and as a leader in detector upgrades to the experiment that will keep ATLAS at the forefront for the duration of the LHC and the upcoming high-luminosity LHC."

Reviewer (E)
"In this extremely competitive environment [it] is noteworthy that Tom has played a leadership role in such a large number of ATLAS publications over the last ~6 years and that he was asked to play a very significant leadership role within the upgrade project. He is clearly held in very high regard by his direct peers."

Reviewer (F)
"…Prof. Tom Schwarz and his research group have made exceptional contributions to the data analysis in several areas. They have been involved in several key analysis [sic]: (i) in the investigation of the Higgs sector, (ii) in the search for extensions of the Higgs sector, and (iii) in the search for new physics with top quarks."

Reviewer (G)
"Tom's physics research has focused on the most cogent of topics accessible at the LHC: the Higgs sector – both its detection and related searches for new physics."

Summary of Recommendation:
Professor Schwarz has established an outstanding research program, making significant contributions to the high-energy physics community. He is a committed and innovative teacher and an effective mentor, and has made significant service contributions to the college, and nationally. The Executive Committee of the College of Literature, Science, and the Arts and I recommend that Assistant Professor Thomas A. Schwarz be promoted to the rank of associate professor of physics, with tenure, College of Literature, Science, and the Arts.

Elizabeth R. Cole, Interim Dean
Professor of Women's Studies, Psychology,
and Afroamerican and African Studies
College of Literature, Science, and the Arts

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