

TAKUMI KUWAHARA

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Center for High-Energy Physics, Peking University
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RESEARCH INTERESTS

Particle Physics Phenomenology of Models beyond the Standard Model

[Keywords]: Supersymmetric Models, Grand Unified Theories, CP Violation, Quark Flavor Physics, Lepton Flavor Physics, Dark Matter, Dark Sector Searches, Composite Particles, Inflation, Quantum Corrections

SELECTED PUBLICATIONS

- [1] M. Ibe, A. Kamada, S. Kobayashi, **Takumi Kuwahara**, and W. Nakano.
“*Ultraviolet Completion of a Composite Asymmetric Dark Matter Model with a Dark Photon Portal*”
arXiv:[1811.10232](#), JHEP 1903 (2019) 173
- [2] A. Kamada and **Takumi Kuwahara**.
“*LHC lifetime frontier and visible decay searches in composite asymmetric dark matter models*”
arXiv:[2112.01202](#), JHEP 03 (2022) 176.
- [3] J. Hisano, **Takumi Kuwahara**, and Y. Omura.
“*Threshold Corrections to Baryon Number Violating Operators in Supersymmetric $SU(5)$ GUTs.*”
arXiv:[1503.08561](#), Nucl.Phys. B898 (2015) 1-29
and its extension,
B. Bajc, J. Hisano, **Takumi Kuwahara**, and Y. Omura.
“*Threshold Corrections to Dimension-six Proton Decay Operators in Non-minimal SUSY $SU(5)$ GUTs.*”
arXiv:[1603.03568](#), Nucl.Phys. B910 (2016) 1

RESEARCH EMPLOYMENT

Postdoctoral fellow

Center for High-Energy Physics, Peking University Sep. 2021 - Aug. 2025 (expected: delayed due to COVID-19)

Center for Theoretical Physics of the Universe, Particle Theory and Cosmology group, Institute for Basic Science Sep. 2017-Aug. 2020

University of Tokyo, High Energy Physics Theory Group Apr. 2017 - Aug. 2017

EDUCATION

[Nagoya University](#), Nagoya, Japan

Ph.D., [Physics](#), March 2017

- Thesis Title: *Next-Leading Order Corrections for Proton Decay in Supersymmetric Unification*
- Supervisor: [Junji Hisano, Ph.D](#)

M.S., [Physics](#), March 2014

- Thesis Title: *Proton Decay in SUSY $SU(5)$ GUTs Revisited after Discovery of the Higgs Boson*
- Supervisor: [Junji Hisano, Ph.D](#)

Tokyo University of Science, Tokyo, Japan

B.S., **Physics**, March 2012

RESEARCH FELLOWSHIP

Research Fellow

Apr. 2016 - Aug. 2018

Japan Society for the Promotion of Science (JSPS)

Research Assistant

Jul. 2014 - Mar. 2015

Department of Physics, Nagoya University

Supervisors: Junji Hisano, Ph.D

TEACHING EXPERIENCE

Co-instructor

- Basic Experiments on Physics
Aichi Medical University

fall semester 2013–2015

Teaching Assistant

- Mathematics for Physics (G30: for students studying abroad)
Department of Physics, Nagoya University
- Mathematics for Physics
Department of Physics, Nagoya University

fall semester 2015

fall semester 2013

AWARDS

Travel Awards

- Overseas Dispatching for Young Scientists, Nagoya, Japan

March 2016

Student Awards

- Exemption from Refund of a Scholar Loan (JASSO)
- Exemption from Refund of a Scholar Loan (JASSO)

March 2016

March 2014

PUBLICATIONS

According to the custom in the particle physics community, the alphabetical authorship is used.

Under-Reviewed Manuscripts

- [1] Ayuki Kamada, Shin Kobayashi, and **Takumi Kuwahara**.
“*Perturbative Unitarity of Strongly Interacting Massive Particle Models*”
arXiv:[2210.01393](#)

Peer-Reviewed Publications

- [1] Ayuki Kamada and **Takumi Kuwahara**.
“*LHC lifetime frontier and visible decay searches in composite asymmetric dark matter models*”
arXiv:[2112.01202](#), doi:[10.1007/JHEP03\(2022\)176](#), JHEP 03 (2022) 176
- [2] Ayuki Kamada, Hee Jung Kim, and **Takumi Kuwahara**.
“*Maximally self-interacting dark matter: models and predictions*”
arXiv:[2007.15522](#), doi:[10.1007/JHEP12\(2020\)202](#), JHEP 12 (2020) 202.
- [3] Ayuki Kamada and **Takumi Kuwahara**.
“*Lessons from T^μ_μ on inflation models: two-loop renormalization of η in the scalar QED*”
arXiv:[1909.04229](#), doi:[10.1103/PhysRevD.103.116001](#), Phys.Rev.D 103 (2021) 11, 116001.
- [4] Ayuki Kamada, and **Takumi Kuwahara**.
“*Lessons from T^μ_μ on inflation models: two-scalar theory and Yukawa theory*”
arXiv:[1909.04228](#), doi:[10.1103/PhysRevD.101.096012](#), Phys.Rev. D 101 (2020) no.9, 096012.
- [5] Masahiro Ibe, Ayuki Kamada, Shin Kobayashi, **Takumi Kuwahara**, and Wakutaka Nakano.
“*Baryon-Dark Matter Coincidence in Mirrored Unification*”
arXiv:[1907.03404](#), doi:[10.1103/PhysRevD.100.075022](#), Phys.Rev. D 100 (2019) no.7, 075022.
- [6] Wataru Kuramoto, **Takumi Kuwahara**, and Ryo Nagai.
“*Renormalization Effects on Electric Dipole Moments in Electroweakly Interacting Massive Particle Models*”
arXiv:[1902.05360](#), doi:[10.1103/PhysRevD.99.095024](#), Phys.Rev. D99 (2019) no.9, 095024
- [7] Masahiro Ibe, Ayuki Kamada, Shin Kobayashi, **Takumi Kuwahara**, and Wakutaka Nakano.
“*Ultraviolet Completion of a Composite Asymmetric Dark Matter Model with a Dark Photon Portal*”
arXiv:[1811.10232](#), doi:[10.1007/JHEP03\(2019\)173](#), JHEP 1903 (2019) 173
- [8] Jason L. Evans, Kenji Kadota, and **Takumi Kuwahara**.
“*Revisiting Flavor and CP Violation in Supersymmetric $SU(5)$ with Right-Handed Neutrinos*”
arXiv:[1807.08234](#), doi:[doi:10.1103/PhysRevD.98.075030](#), Phys.Rev. D98 (2018) no.7, 075030
- [9] Junji Hisano, **Takumi Kuwahara**, Yuji Omura, and Takeki Sato.
“*Two-loop Anomalous Dimensions for Four-Fermi Operators in Supersymmetric Theories.*”
arXiv:[1703.08329](#), doi:[10.1016/j.nuclphysb.2017.06.021](#), Nucl.Phys. B922 (2017) 77-93
- [10] Junji Hisano, Wataru Kuramoto, and **Takumi Kuwahara**.
“*Light Stop, Heavy Higgs, and Heavy Gluino in Supersymmetric Standard Models with Extra Matters.*”
arXiv:[1611.07670](#), doi:[10.1093/ptep/ptx031](#), PTEP 2017 (0) 033
- [11] Borut Bajc, Junji Hisano, **Takumi Kuwahara**, and Yuji Omura.
“*Threshold Corrections to Dimension-six Proton Decay Operators in Non-minimal SUSY $SU(5)$ GUTs.*”
arXiv:[1603.03568](#), doi:[10.1016/j.nuclphysb.2016.06.017](#), Nucl.Phys. B910 (2016) 1

- [12] Junji Hisano, Daiki Kobayashi, Wataru Kuramoto, and **Takumi Kuwahara**.
“*Nucleon Electric Dipole Moments in High-Scale Supersymmetric Models.*”
arXiv:[1507.05836](#), doi:[10.1007/JHEP11\(2015\)085](#), JHEP 1511 (2015) 085
- [13] Junji Hisano, **Takumi Kuwahara**, and Yuji Omura.
“*Threshold Corrections to Baryon Number Violating Operators in Supersymmetric $SU(5)$ GUTs.*”
arXiv:[1503.08561](#), doi:[10.1016/j.nuclphysb.2015.06.022](#), Nucl.Phys. B898 (2015) 1-29
- [14] Junji Hisano, Daiki Kobayashi, **Takumi Kuwahara**, and Natsumi Nagata.
“*Decoupling Can Revive Minimal Supersymmetric $SU(5)$.*”
arXiv:[1304.3651](#), doi:[10.1007/JHEP07\(2013\)038](#), JHEP 1307 (2013) 038
- [15] Junji Hisano, **Takumi Kuwahara**, and Natsumi Nagata.
“*Grand Unification in High-scale Supersymmetry.*”
arXiv:[1304.0343](#), doi:[10.1016/j.physletb.2013.05.017](#), Phys.Lett. B723 (2013) 324-329

Conference Papers

- [1] **Takumi Kuwahara**, “*Renormalization Effects on Electric Dipole Moments in Electroweakly Interacting Massive Particle Models*”, arXiv:[1906.08721](#). (Proceedings of FPCP 2019 Conference)
- [2] **Takumi Kuwahara**, “*Threshold corrections to dimension-six proton decay operators in SUSY $SU(5)$* ”, doi:[10.1063/1.5010111](#). (Proceedings of Workshop on Neutrino Physics: Session of CETUP* 2016)
- [3] **Takumi Kuwahara**, “*GUT Scale Threshold Effect on Proton Decay*”, doi:[10.22323/1.248.0085](#). (Proceedings of FPCP 2015 Conference)
- [4] **Takumi Kuwahara**, “*Decoupling can revive minimal supersymmetric $SU(5)$* ”, doi:[10.22323/1.208.0034](#). (Proceedings of KMI2013)

PRESENTATIONS

(P): Poster presentation

International Conference Talks

- [1] IBS and KMI Joint Workshop 2022 (**invited talk**), “*LHC lifetime frontier and visible decay searches in composite asymmetric dark matter models*”, online, Aug. 2022
- [2] TDLI-PKU BSM workshop 2022: Electroweak lights the way, “*Dark Hadrons at Lifetime Frontier Experiments*”, online, Aug. 2022
- [3] KEK Theory Meeting on Particle Physics Phenomenology (KEK-PH2020), “*Baryon-Dark Matter Coincidence in Mirrored Unification*”, KEK, Japan, Feb. 2020
- [4] International joint workshop on the Standard Model and beyond (KEK-KIAS-NCTS-ITP CAS joint workshop), “*Electric Dipole Moments in Electroweakly Interacting Massive Particle Models*”, Beijing, China, Oct. 2019
- [5] New physics beyond the Standard Model (research program by Peng Huanwu Innovation Research Center for Theoretical Physics), “*Baryon-Dark Matter Coincidence and Composite Asymmetric Dark Matter*”, Beijing, China, Oct. 2019
- [6] Summer Institute 2019, “*UV Completions of Composite Asymmetric Dark Matter Model with Dark Photon Portal*”, Gangneung, Republic of Korea, July 2019
- [7] Conference on Flavor Physics and CP violation (FPCP) 2019, “*Renormalization Effects on Electric Dipole Moments in Electroweakly Interacting Massive Particle Models*”, Victoria, Canada, May 2019

- [8] KEK Theory Meeting (KEK-PH 2018 Winter), “*Revisiting Flavor and CP Violation in Supersymmetric $SU(5)$ with Right-Handed Neutrinos*”, KEK, Japan, Dec. 2018
- [9] SUSY 2018, “*Revisiting Flavor and CP Violation in Supersymmetric $SU(5)$ with Right-Handed Neutrinos*”, Barcelona, Spain, July 2018
- [10] Dark Side of the Universe, “*Two-loop Anomalous Dimensions for Four-Fermi Operators in Supersymmetric Theories*”, Daejeon, Republic of Korea, July 2017
- [11] (P) Gordon research Seminar/Conference (**short talk selected**), “*Light Stop, Heavy Higgs, and Heavy Gluino in Supersymmetric Standard Models with Extra Matters*”, HKUST, Hong-Kong, Jun. 2017
- [12] ECT* Baryon over antibaryon (**invited talk**), “*Proton Decay in SUSY GUTs*”, ECT*, Italy, July 2016
- [13] SUSY 2016, “*GUT Scale Threshold Effects on Proton Decay*”, Melbourne, Australia, July 2016
- [14] CETUP* Workshop on Neutrino Physics/Unification Session, “*Threshold Corrections to Dimension-Six Proton Decay Operators in SUSY $SU(5)$* ”, Lead-Deadwood South-Dakota, USA, June -July 2016
- [15] (P) KEK Theory Meeting (KEK-PH 2016), “*GUT Scale Threshold Effect on Proton Decay*”, KEK, Japan, Feb. 2016
- [16] Flavors of New Physics, “*GUT Scale Threshold Effect on Proton Decay*”, IQBRC/KEK Tokai Campus, Japan, Mar. 2015
- [17] (P) Flavor Physics and CP Violation (FPCP 2015), “*GUT Scale Threshold Effect on Proton Decay*”, Nagoya, Japan, Mar. 2015
- [18] (P) Sakata Memorial KMI Workshop on “Origin of Mass and Strong Coupling Gauge Theories” (SCGT15), “*GUT Scale Threshold Effect on Proton Decay*”, Nagoya, Japan, Mar. 2015
- [19] (P) Summer Institute 2014, “*Grand Unified Theory in High-scale Supersymmetry*”, Fuji-Yoshida, Japan, Aug. 2014
- [20] (P) KMI International Symposium 2013 on “Quest for the Origin of Particles and the Universe”, “*Decoupling Can Revive Minimal Supersymmetric $SU(5)$* ”, Nagoya, Japan, Dec. 2013
- [21] (P) International Workshop on Next generation Nucleon Decay and Neutrino Detectors (NNN 2013), “*Decoupling Can Revive Minimal Supersymmetric $SU(5)$* ”, Kavli IPMU, Japan, Nov. 2013
- [22] KEK Theory Meeting (KEK-PH2013 FALL), “*Decoupling Can Revive Minimal Supersymmetric $SU(5)$* ”, KEK, Japan, Oct. 2013

SEMINAR TALKS

- [1] “*Dark QCD and Asymmetric Dark Matter*”, Center for High-Energy Physics, Peking University, Sep. 2021
- [2] “*Maximally self-interacting dark matter: A composite asymmetric dark matter scenario*”, Nagoya University, Oct. 2020
- [3] “*Maximally self-interacting dark matter: A composite asymmetric dark matter scenario*”, Center for High-Energy Physics, Peking University, Sep. 2020
- [4] “*Supersymmetric Standard Models with Extra Matters*”, Institute for Basic Science, Oct. 2017

- [5] “*Next-Leading Order Corrections to Four-Fermi Operators in Supersymmetric Theories*”, University of Tokyo, Mar. 2017
- [6] “*Threshold Corrections to Dimension-Six Proton Decay Operators in SUSY $SU(5)$ GUTs.*”, **invited talk**, Osaka University, Nov. 2016
- [7] “*Nucleon Electric Dipole Moments in High-Scale Supersymmetric Models.*”, Jožef Stefan Institute, Mar. 2016
- [8] “*Threshold Corrections to Baryon Number Violating Operators in Supersymmetric $SU(5)$ GUTs.*”, **invited talk**, Tohoku University, Nov. 2015