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

Postdoctral 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 GRANT/FELLOWSHIP

Research Grant Jan. 2023 -

National Natural Science Foundation of China (Research Fund for International Scientists)

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 — fall semester 2013–2015
Aichi Medical University

Teaching Assistant

· Mathematics for Physics (G30: for students studying abroad) — fall semester 2015
Department of Physics, Nagoya University

· Mathematics for Physics — fall semester 2013
Department of Physics, Nagoya University

AWARDS

Travel Awards

· Overseas Dispatching for Young Scientists, Nagoya, Japan — March 2016

Student Awards

· Exemption from Refund of a Scholar Loan (JASSO) — March 2016

· Exemption from Refund of a Scholar Loan (JASSO) — March 2014

PUBLICATIONS

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

Under-Reviewed Manuscripts

[1] Ayuki Kamada, **Takumi Kuwahara**, and Ami Patel.
"*Quantum Theory of Dark Matter Scattering*"
arXiv:2303.17961

[2] **Takumi Kuwahara** and Shurun Yuan.
"*Dark Vector Mesons at LHC Forward Detector Searches*"
arXiv:2303.03736

Peer-Reviewed Publications

[1] Ayuki Kamada, Shin Kobayashi, and **Takumi Kuwahara**.
"*Perturbative Unitarity of Strongly Interacting Massive Particle Models*"
arXiv:2210.01393, doi:10.1007/JHEP03(2022)176, JHEP 03 (2022) 176

[2] 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

[3] 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.

[4] 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.

[5] 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.

[6] 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.

[7] Wataru Kuramoto, **Takumi Kuwahara**, and Ryo Nagai.
"*Renormalization Effects on Electric Dipole Moments in Electroweakly InteractingMassive Particle Models*"
arXiv:1902.05360, doi:10.1103/PhysRevD.99.095024, Phys.Rev. D99 (2019) no.9, 095024

[8] 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

[9] 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

[10] 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

[11] 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

[12] 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

[13] 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

[14] 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

[15] 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

[16] 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 Compeletions 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*", Victria, 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] "*Quantum Theory of Dark Matter Scattering*", Nagoya University, May. 2023

[2] "*Dark Hadrons at the LHC Lifetime Frontie*r", Jinan University, Apr. 2023

[3] "*Quantum Theory of Dark Matter Scattering*", Guangzhou Campus, Sun-Yet-Sen University, Apr. 2023

[4] "*Quantum Theory of Dark Matter Scattering*", TianQin Center, Sun-Yet-Sen University, Apr. 2023

[5] "*Unitarizing Dark Pion SIMPs*", TianQin Center, Sun-Yet-Sen University, Apr. 2023

[6] "*Dark QCD and Asymmetric Dark Matter*", Center for High-Energy Physics, Peking University, Sep. 2021

[7] "*Maximally self-interacting dark matter: A composite asymmetric dark matter scenario*", Nagoya University, Oct. 2020

[8] "*Maximally self-interacting dark matter: A composite asymmetric dark matter scenario*", Center for High-Energy Physics, Peking University, Sep. 2020

[9] "*Supersymmetric Standard Models with Extra Matters*", Institute for Basic Science, Oct. 2017

[10] "*Next-Leading Order Corrections to Four-Fermi Operators in Supersymmetric Theories*", University of Tokyo, Mar. 2017

[11] "*Threshold Corrections to Dimension-Six Proton Decay Operators in SUSY SU(5) GUTs.*", **invited talk**, Osaka University, Nov. 2016

[12] "*Nucleon Electric Dipole Moments in High-Scale Supersymmetric Models.*", Jožef Stefan Institute, Mar. 2016

[13] "*Threshold Corrections to Baryon Number Violating Operators in Supersymmetric SU(5) GUTs.*", **invited talk**,Tohoku University, Nov. 2015