Yong Du

Institute of Theoretical Physics
Chinese Academy of Science
Beijing China 100190
Date of Birth: November 24, 1990
Citizenship: People's Republic of China

Email: yongdu@itp.ac.cn
Phone: +86-156-0076-3954
Website: yong-du.github.io

POSTDOC EXPERIENCE

Institute of Theoretical Physics, Chinese Academy of Science 2020-*present*
Postdoctoral researcher *Beijing, China*

VISITING EXPERIENCE

Institute of Theoretical Physics, Chinese Academy of Science 2019-2020
Visiting scholar (one month) *Beijing, China*

University of Pittsburgh 2018-2018
Visiting student (one month) *Pittsburgh, USA*

University of Massachusetts-Amherst 2014-2014
Visiting scholar (three months) *Amherst, USA*

EDUCATION

University of Massachusetts-Amherst 2015-2020
Ph.D. in Physics, 2020 *Amherst, USA*
Advisor: Michael J. Ramsey-Musolf

Nanjing University 2012-2015
Ph.D. candidate in Physics (Transferred to UMass-Amherst in 2015 fall) *Nanjing, China*
Advisor: Yeuk-Kwan Edna Cheung

Zhengzhou University 2008-2012
B.S. in Physics, 2012 *Zhengzhou, China*
Advisor: Er-Jun Liang

RESEARCH INTERESTS

Effective field theories; Multi-loop electroweak radiative corrections; Neutrino physics within and beyond the standard model; Dark matter production and detection; Collider physics.

WORK IN PROGRESS

6. **Yong Du**, M. Ramsey-Musolf, J. Zhou, "NNLO electroweak radiative corrections to neutron lifetime and CKM unitarity test"

   Project short description:

   Analytical two-loop electroweak radiative correction calculation and the impact on CKM unitarity test.

5. EF04 topical group report, "Electroweak Precision Physics and Constraining New Physics"

   Project short description:

   2022 Snowmass Summer Study from the EF04 topical group. **Role of YD**: Provide input from SMEFT 4-fermion and CPV global fit and benchmark UV model studies.

4. **Yong Du**, M. Peskin, J. Tian, "Maximal SMEFT Fits to e^+e^- Higgs Factory Data"

   Project short description:

   SMEFT global fit to the Higgs data at future lepton colliders.

3. **Yong Du**, "Impact of precision $N_{\rm eff}$ measurements on SMEFT 4-fermion global fit"

   Project short description:

   Investigate the impact of precision $N_{\rm eff}$ measurements on SMEFT 4-fermion global fit.

2. **Yong Du**, J.-H. Yu, "Feynman rules for $d \leq 8$ SMEFT in R_ξ gauge"

   Project short description:

   Automation of Feynman rule generation in general R_ξ gauge for SMEFT up to dim 8.

1. **Yong Du**, G. Li, H. Sun, J.-H. Yu, "Model independent constraints on dark matter-electron interactions"

   Project short description:

   Constrain sub-GeV dark matter-electron interactions in the (non-)relativistic dark-matter-electron EFT framework.

PUBLICATIONS

16. J. de Blas, **Yong Du**, C. Grojean, J. Gu, V. Miralles, M. Peskin, J. Tian, M. Vos, E. Vryonidou, "Global SMEFT Fits at Future Colliders", 2206.08326

15. ILC International Development Team,, "The International Linear Collider: Report to Snowmass 2021", 2203.07622

14. J.L. Feng *et al*, "The Forward Physics Facility at the High-Luminosity LHC", 2203.05090

13. Ruiyu Zhou, Ligong Bian, and **Yong Du**, "Electroweak Phase Transition and Gravitational Waves in the Type-II Seesaw Model", JHEP 08 (2022) 205

12. **Yong Du**, X.-X. Li, and J.-H. Yu, "Neutrino seesaw models at one-loop matching: Discrimination by effective operator", 2201.04646

11. **Yong Du**, F. Huang, H.-L. Li, Y.-Z. Li, and J.-H. Yu, "Revisiting Dark Matter Freeze-in and Freeze-out through Phase-Space Distribution", JCAP 04 (2022) 04, 012

10. L. A. Anchordoqui *et al*, "The Forward Physics Facility: Sites, Experiments, and Physics Potential", Phys.Rept. 968 (2022) 1-50

9. **Yong Du**, H.-L. Li, J. Tang, S. Vihonen and J.-H. Yu, "Exploring SMEFT Induced Non-Standard Interactions: From COHERENT to Neutrino Oscillations", Phys.Rev.D 105 (2022) 7, 075022

8. **Yong Du**, "Searching for new physics through neutrino non-standard interactions", 2105.06191

7. **Yong Du** and J.-H. Yu, "Neutrino non-standard interactions meet precision measurements of $N_{\rm eff}$", JHEP 05 (2021) 058

6. **Yong Du**, H.-L. Li, J. Tang, S. Vihonen and J.-H. Yu, "Non-standard interactions in SMEFT confronted with terrestrial neutrino experiments", JHEP 03 (2021) 019

5. **Yong Du**, "Collider probes of real triplet scalar dark matter", PoS LHCP2020 (2021) 232

4. **Yong Du**, F. Huang, H.-L. Li and J.-H. Yu, "Freezing-in Dark Matter from Secret Neutrino Interactions", JHEP 12 (2020) 207

3. C.-W. Chiang, G. Cottin, **Yong Du**, K. Fuyuto and M. J. Ramsey-Musolf, "Collider Probes of Real Triplet Scalar Dark Matter", JHEP 01 (2021) 198

2. **Yong Du**, A. Freitas, H.H. Patel and M. J. Ramsey-Musolf, "Parity-Violating Møller Scattering at Next-to-Next-to-Leading Order: Closed Fermion Loops", Phys.Rev.Lett. 126 (2021) 13, 131801

1. **Yong Du**, A. Dunbrack, M. J. Ramsey-Musolf and J.-H. Yu, "Type-II Seesaw Scalar Triplet Model at a 100 TeV pp Collider: Discovery and Higgs Portal Coupling Determination", JHEP 1901 (2019) 101.

TALKS

27. Higgs Potential 2022
Peking University, Beijing, China
Plenary talk: **Gravitational wave searches of the type-II seesaw model**

26. Seattle Snowmass Summer Meeting 2022
University of Washington, WA, USA
Invited parallel talk: **SMEFT fit for 4-fermion and CP-violating interactions**

25. Energy Frontier Workshop
Brown University, RI, USA
Invited summary talk as an early career representative: **EF04 proposal for summary plots/tables**

24. Energy Frontier Workshop
Brown University, RI, USA
Invited talk: **SMEFT fits for CP-violating and four-fermion processes**

23. 4th Forward Physics Facility Meeting
(*virtual*)
Parallel talk: **4-fermion operators and their UV completion at FASERν**

22. PKU HEP Seminar and Workshop
Peking University, Beijing, China
Invited talk: **Neutrino non-standard interactions in EFTs: Low-energy experiments**

21. EF04 Topical Group Community Meeting
(*virtual*)
Invited talk: **Global fit for 4-fermion operators & operators at Z-pole**

20. The 2021 International Workshop on the High Energy Circular Electron Positron Collider (CEPC 2021)
Nanjing University, Jiangsu, China
Invited talk: **Global fit with operators in W/Z-pole and 4-fermion**

19. 49th SLAC Summer Institute (SSI 2021)
SLAC, CA, USA (*virtual*)
Poster presentation: **Constraining neutrino non-standard interactions from low energy neutrino experiments**

18. 2021 Meeting of the Division of Particles and Fields of the American Physical Society (DPF21, July 2021)
Florida State University, FL, USA (*virtual*)
Parallel talk: **Neutrino non-standard interactions revisited in effective field theories**

17. The 28th International Workshop on Weak Interactions and Neutrinos (WIN2021, June 2021)
University of Minnesota, MN, USA (*virtual*)
Poster presentation: **Implications on the UV from neutrino non-standard interactions in the EFT approach**

16. Phenomenology 2021 Symposium (May 2021)
University of Pittsburgh, PA, USA (*virtual*)
Parallel talk: **Implications on new physics from neutrino non-standard interactions in the EFT framework**

15. Higgs and Effective Field Theory 2021 (HEFT 2021, April 2021)
University of Science and Technology of China, Hefei, China
Plenary talk: **Exploring the ultraviolet from neutrino oscillations and $N_{\mathbf{eff}}$ in the EFT framework**

14. Beyond Standard Model: From Theory to Experiment, (BSM-2021, March 2021)
Zewail City of Science and Technology & Sabancı University (*virtual*)
Parallel talk: **Searching for new physics through neutrino non-standard interactions**

13. The XIX International Workshop on Neutrino Telescopes, (NeuTel2021, February 2021)
INFN Sezione di Padova & Physics and Astronomy Department of Padova University (*virtual*)
Parallel talk: **Constraints on neutrino non-standard interactions: From neutrino oscillations to precision cosmology**

12. The 6th China LHC Physics Workshop (CLHCP2020, November 2020)
Tsinghua University, Beijing, China (*virtual*)
Parallel talk: **Discovery of the real and complex triplet models at the LHC and future colliders**

11. SLAC Summer Institute 2020 (SSI 2020, August 2020)
    SLAC, CA, USA (*virtual*)
    Poster presentation: **Freeze-in Dark Matter from Secret Neutrino Interactions**

10. The XXIX International Conference on Neutrino Physics and Astrophysics (Neutrino 2020, June-July 2020)
    Chicago, Illinois USA (*virtual*)
    Poster presentation: **Freeze-in Dark Matter from Secret Neutrino Interactions**

9. The Seventh Dark Matter@LHC 2020 Workshop (DM@LHC, June 2020)
    DESY, Hamburg, Germany (*virtual*)
    Plenary talk: **Probing the real triplet scalar dark matter at colliders**

8. The Seventh Workshop of the LHC LLP Community (LHC LLP, May 2020)
    CERN (*virtual*)
    Plenary talk: **Collider probes of real triplet scalar dark matter**

7. The Eighth Annual Large Hadron Collider Physics (LHCP2020, May 2020)
    International Conference Centre of Sorbonne Universite, Paris, France (*virtual*)
    Theory poster presentation in the "Dark Sector BSM": **Collider probes of real triplet scalar dark matter**

6. Phenomenology 2020 Symposium (May 2020)
    University of Pittsburgh, PA, USA (*virtual*)
    Parallel talk: **Collider probes of real triplet scalar dark matter**

5. LoopFest XVIII (August 2019)
    Fermilab, IL, USA
    Plenary talk: **Two-loop fermionic contributions to polarized Moller scattering asymmetries**

4. Opportunities at Future High Energy Colliders (June-July 2019)
    IFT, Madrid, Spain
    Plenary talk: **Type-II seesaw scalar triplet at a 100 TeV *pp* collider**

3. Phenomenology 2019 Symposium (May 2019)
    University of Pittsburgh, PA, USA
    Parallel talk: **Type-II seesaw scalar triplet at a 100 TeV *pp* collider**

2. Seminar talk (April 2019)
    University of Massachusetts-Amherst, MA, USA
    Minimal dark matter at a 100 TeV collider

1. Seminar talk (November 2018)
    University of Massachusetts-Amherst, MA, USA
    Type-II seesaw scalar triplet at a 100 TeV *pp* collider

CODING PROJECTS

- In **Mathematica**

  `EBR2loop` Symbolically evaluate multi-scale 2-loop Feynman integrals based on method of regions.

`smeftFit` SMEFT global/individual fit.

`FA2Spinor` Convert `FeynArts` output into spinor product form in the massless case.

`EFT2Neff` Precision $N_{\rm eff}$ calculation including EFT operators up to dimension 7 (based on `nudec_BSM`).

`UVBuilder` UV completion of any EFT operator for any topology (**on-going**, based on `GroupMath`, `qgraf`).

`feyn4smeft` Feynman rule calculation for SMEFT up to dimension 8 (**on-going**, based on `FeynRules`).

- In **Python**:

`wimpDM` Boltzmann equation solver for WIMPy dark matter relic density calculation.

`DMeEFT` Bounds on (non-)relativistic sub-GeV dark matter-electron EFTs (**on-going**, based on `DarkARC`).

SKILLS

- **Programming skills**:

Languages	`Mathematica`, `Python`, `c++`, `bash`, `reduce`
Boltzmann solver	`CLASS`, `PRIMAT`, `PArthENoPE`, `MicrOMEGAs`
MCMC	`MadGraph`, `CalcHEP`, `LanHEP`, `MontePython`
Loop tools	`PackageX`, `FIRE`, `COLLIER`, `FeynCalc`, `LoopTools`, `AIR`, `TARCER`, `LiteRed`, `qgraf`
HEP tools	`FeynArts`, `FeynRules`, `Delphes`, `Pythia`, `ROOT`, `Wilson`, `SuperTracer`, `CEvNS`

- **Languages skills:**

Mandarin	Native proficiency.
English	Full professional proficiency.

SELECTED TEACHING

- PHY811: Field Theory I (Grader)
- PHY605: Methods of Mathematical Physics (Grader)
- PHY424: Quantum Mechanics (Grader)
- PHY281: Computational Physics (Grader)

GRANTS

- Graduate Student Travel Grant, Department of Physics, University of Massachusetts-Amherst, $600 (2019).
- National University Student Innovation Program, Ministry of Education of the People's Republic of China, RMB 40000 (PI 2010 - 2012).

AWARDS

- **2013**, Freshman Scholarship for Graduate Students, Nanjing University (Top 5)
- **2011**, National English Contest for College Students, Zhengzhou University
- **2011**, First-class scholarship, Zhengzhou University
- **2010**, National Computer Examination Certificate, Zhengzhou University
- **2010**, National Endeavor Fellowship, Zhengzhou University
- **2009**, Second-class scholarship, Zhengzhou University
- **2009**, Merit Student, Zhengzhou University

REFERENCES

Ayres Freitas	Pittsburgh Particle-physics Astro-physics & Cosmology Center Department of Physics & Astronomy, University of Pittsburgh, Pittsburgh, PA 15260, USA Phone: 1-412-624-9060 Email: afreitas@pitt.edu
Michael Ramsey-Musolf	Amherst Center for Fundamental Interactions, Department of Physics, University of Massachusetts-Amherst, Amherst, MA 01003, USA Phone: 1-413-545-0320 Email: mjrm@physics.umass.edu
Jiang-Hao Yu	Institute of Theoretical Physics, Chinese Academy of Science, Beijing 100190, P.R. China, No. 19A Yuquan Road, Beijing 100049, P.R. China Phone: 86-010-62551799 Email: jhyu@itp.ac.cn