

# ROUVEN ESSIG

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## EDUCATION

- **Rutgers University**—Department of Physics and Astronomy  
*PhD in Physics - October 2008* *Advisor: Professor Scott Thomas*  
*Thesis: Physics Beyond the Standard Model: Supersymmetry, Dark Matter, LHC Phenomenology*
- **University of the Witwatersrand, South Africa**—Department of Physics and Mathematics  
*BSc - Dec. 2000, BSc (Hons) in Physics - Dec 2001, BSc (Hons) in Mathematics - June 2002*

## RESEARCH INTERESTS

- **Theoretical Particle Physics**, including *Novel Terrestrial, Astrophysical, and Cosmological Probes for Dark Matter and New Forces, Direct and Indirect Detection of Dark Matter, LHC Phenomenology, Higgs-boson Physics, Physics Beyond the Standard Model*

## NOTABLE AWARDS

- **2021** *New Horizons in Physics Prize*
- **2020** *Fellow, American Physical Society*
- **2019** *Simons Investigator*
- **2015** *American Physical Society's Henry Primakoff Award for Early-Career Particle Physics*
- **2013** *Alfred P. Sloan Research Fellow*
- **2012** *Department of Energy Early Career Award*

## APPOINTMENTS

- **Since 2021** *Professor, Yang Inst. for Theoretical Physics, Stony Brook Univ., NY.*
- **09/2016-12/2020** *Associate Professor, YITP, Stony Brook Univ., NY.*
- **10/2011-08/2016** *Assistant Professor, YITP, Stony Brook Univ., NY.*
- **10/2011-08/2012** *Visitor, Inst. for Advanced Study, Princeton, NJ.*
- **10/2008-09/2011** *Postdoc Research Assoc., SLAC National Accelerator Lab., Stanford Univ., CA*
- **2004-2008** *Graduate Assistant, Physics & Astronomy & NHETC, Rutgers Univ., NJ.*
- **2002, 2003** *Teaching Assistant, Physics & Astronomy, Rutgers Univ., NJ.*

## PROFESSIONAL MEMBERSHIP IN EXPERIMENTAL COLLABORATIONS

- **Co-spokesperson** of the [SENSEI](#) Collaboration (Sub-Electron Noise Skipper-CCD Experimental Instrument), a direct-detection experiment to probe sub-GeV dark matter interacting with electrons, using a 100 g silicon Skipper-CCD detector.
- **Co-spokesperson** of the [A' Experiment \(APEX\)](#) at Jefferson Laboratory: an electron-beam fixed-target experiment at Jefferson Lab, which will search a “dark photon”.
- **Member** of the [OSCURA](#) Collaboration, a larger version of SENSEI using a 10 kg silicon Skipper-CCD detector.

- Member of the *Low Background Electron Counting Apparatus (LBECA)* Collaboration, a direct-detection experiment to probe sub-GeV dark matter interacting with electrons, using a  $\sim 100$  kg xenon detector.
- Member of the *Heavy Photon Search (HPS)* Collaboration, an electron-beam fixed-target experiment at Jefferson Lab, which will also search for a dark photon

## GRANTS AND FUNDING AWARDED

2021-2025	<i>US-Israel BSF</i>	Co-PI
2020-2024	<i>DoE, HEP Theory</i>	PI
2019-2023	<i>Subaward from FNAL (for OSCURA)</i> <i>Primary Sponsor: DoE, HEP, Dark Matter New Initiatives</i>	Co-PI
2019-2024	<i>Simons Investigator</i>	PI
2017-2023	<i>Heising-Simons Foundation (for SENSEI)</i>	Co-PI
2018-2020	<i>Subaward from Purdue (for LBECA)</i> <i>Primary Sponsor: DoE, HEP, Detector R&amp;D</i>	Co-PI
2017-2020	<i>DoE, HEP Theory</i>	PI
2017-2021	<i>US-Israel BSF</i>	Co-PI
2016-2018	<i>Jefferson Lab (for APEX)</i>	PI
2014-2016	<i>DoE, HEP Intensity Frontier (for APEX)</i>	PI
2012-2017	<i>DoE, Early Career Award</i>	PI
2012-2014	<i>Alfred P. Sloan Research Fellow</i>	PI

## PUBLICATIONS IN REFEREED JOURNALS

1. P. Du, D. Egana-Ugrinovic, R. Essig, G. Fragione, R. Perna, “Searching for ultra-light bosons and constraining black hole spin distributions with stellar tidal disruption events”, *Nature Commun.* **13** (2022) 1, 4626, [arXiv:2202.01215](#) [hep-ph, astro-ph.CO, astro-ph.HE, gr-qc].
2. K. V. Berghaus, R. Essig, Y. Hochberg, Y. Shoji, M. Sholapurkar, “Phonon background from gamma rays in sub-GeV dark matter detectors”, *Phys. Rev. D* **106** (2022) [arXiv:2112.09702](#) [hep-ph, astro-ph.CO, hep-ex]. **\* Selected as PRD Editor’s Suggestion \***
3. M. A. Buen-Abad, R. Essig, D. McKeen, Y. Zhong, “Cosmological Constraints on Dark Matter Interactions with Ordinary Matter”, *Phys. Rept.* **961** (2022) [arXiv:2107.12377](#) [astro-ph.CO, hep-ph].
4. The SENSEI Collaboration, L. Barak, I. M. Bloch, A. Botti, M. Cababie, G. Canelo, L. Chaplinsky, F. Chierchie, M. Crisler, A. Drlica-Wagner, R. Essig, J. Estrada, E. Etzion, G. Fernandez Moroni, D. Gift, S. E. Holland, S. Munagavalasa, A. Orly, D. Rodrigues, A. Singal, M. Sofo Haro, L. Stefanazzi, J. Tiffenberg, S. Uemura, T. Volansky, T.-T. Yu, “SENSEI: Characterization of Single-Electron Events Using a Skipper-CCD”, *Phys. Rev. Applied* **17** (2022) 1, 014022, [arXiv: 2106.08347](#) [physics.ins-det, astro-ph.CO, astro-ph.IM, hep-ex].
5. D. Egana-Ugrinovic, R. Essig, D. Gift, M. LoVerde, “The Cosmological Evolution of Self-interacting Dark Matter”, *JCAP* **05** (2021) 013 [arXiv:2102.06215](#) [astro-ph.CO].
6. P. Du, D. Egana-Ugrinovic, R. Essig, M. Sholapurkar, “Sources of Low-Energy Events in Low-Threshold Dark Matter Detectors”, *Phys. Rev. X* **12** (2022), [arXiv:2011.13939](#) [hep-ph, astro-ph.CO, astro-ph.IM, hep-ex, quant-ph].

7. I.M. Bloch, A. Caputo, R. Essig, D. Redigolo, M. Sholapurkar, T. Volansky, "Exploring New Physics with O(keV) Electron Recoils in Direct Detection Experiments", *JHEP* **01** (2021) 178, [arXiv:2006.14521](#) [hep-ph, hep-ex].
8. The SENSEI Collaboration, L. Barak, I. M. Bloch, M. Cababie, G. Canelo, L. Chaplinsky, F. Chierchie, M. Crisler, A. Drlica-Wagner, R. Essig, J. Estrada, E. Etzion, G. Fernandez Moroni, D. Gift, S. Munagavalasa, A. Orly, D. Rodrigues, A. Singal, M. Sofo Haro, L. Stefanazzi, J. Tiffenberg, S. Uemura, T. Volansky, T.-T. Yu, "SENSEI: Direct-Detection Results on sub-GeV Dark Matter from a New Skipper-CCD", *Phys. Rev. Lett.*, **125**, 171802, [arXiv:2004.11378](#) [astro-ph.CO, hep-ex, hep-ph, physics.ins-det]. \* **Selected as PRL Editor's Suggestion** \*
9. J. H. Chang, R. Essig, A. Reinert, "Light(ly)-coupled Dark Matter in the keV Range: Freeze-In and Constraints", *JHEP* **03** (2021) 141, [arXiv:1911.03389](#) [hep-ph, astro-ph.CO].
10. R. Essig, J. Pradler, M. Sholapurkar, T.-T. Yu, "On the relation between Migdal effect and dark matter-electron scattering in atoms and semiconductors", *Phys. Rev. Lett.*, **124** (2020) 2, 021801, [arXiv:1908.10881](#) [hep-ph].
11. R. Essig, J. Feng, K. Zurek (Editors), "Illuminating Dark Matter", *Astrophys. Space Sci. Proc.* **56** (2019).
12. R. Essig, Jesús Pérez-Ríos, H. Ramani, O. Slone, "Direct Detection of Spin-(In)dependent Nuclear Scattering of Sub-GeV Dark Matter Using Molecular Excitations", *Phys. Rev. Research* **1**, 033105 (2019), [arXiv:1907.07682](#) [hep-ph, astro-ph.CO].
13. T. Emken, R. Essig, C. Kouvaris and M. Sholapurkar, "Direct Detection of Strongly Interacting Sub-GeV Dark Matter via Electron Recoils," *JCAP* **09** (2019) 070, [arXiv:1905.06348](#) [hep-ph, astro-ph.CO].
14. The SENSEI Collaboration, O. Abramoff, L. Barak, I.M. Bloch, L. Chaplinsky, M. Crisler, Dawa, A. Drlica-Wagner, R. Essig, J. Estrada, E. Etzion, G. Fernandez, D. Gift, J. Taenzer, J. Tiffenberg, M. Sofo Haro, T. Volansky, T.-T. Yu, "SENSEI: Direct-Detection Constraints on Sub-GeV Dark Matter from a Shallow Underground Run Using a Prototype Skipper-CCD", *Phys. Rev. Lett.*, **122** (2019) no.16, 161801 [arXiv:1901.10478](#) [hep-ex, astro-ph.CO, hep-ph, physics.ins-det]. \* **Selected as PRL Editor's Suggestion** \*
15. J. H. Chang, D. Egana-Ugrinovic, R. Essig, C. Kouvaris, "Structure Formation and Exotic Compact Objects in a Dissipative Dark Sector", *JCAP* **03** (2019) 036, [arXiv:1812.07000](#) [hep-ph, astro-ph.GA, astro-ph.SR].
16. R. Essig, S. D. McDermott, H. Yu, Y. Zhong, "Constraining Dissipative Dark Matter Self-Interactions", accepted in *Phys. Rev. Lett.*, [arXiv:1809.01144](#) [hep-ph, astro-ph.CO, astro-ph.GA].
17. The HPS Collaboration, "Search for a Dark Photon in Electro-Produced  $e^+e^-$  Pairs with the Heavy Photon Search Experiment at JLab", *Phys. Rev. D* **98**, 091101(R), [arXiv:1807.11530](#) [hep-ex, hep-ph].
18. The SENSEI Collaboration, M. Crisler, R. Essig, J. Estrada, G. Fernandez, J. Tiffenberg, M. Sofo Haro, T. Volansky, T.-T. Yu, "SENSEI: First Direct-Detection Constraints on sub-GeV Dark Matter from a Surface Run", *Phys. Rev. Lett.* **121** 061803 (2018), [arXiv:1804.00088](#) [hep-ex, hep-ph, astro-ph.CO].

19. J. H. Chang, R. Essig, S. D. McDermott, “Supernova 1987A Constraints on Sub-GeV Dark Sectors, Millicharged Particles, the QCD Axion, and an Axion-like Particle”, *JHEP* **809** (2018) 051, [arXiv:1803.00993](#) [hep-ph, astro-ph.CO, astro-ph.GA, astro-ph.HE, hep-ex].
20. R. Essig, M. Sholapurkar, T. Yu, “Solar Neutrinos as a Signal and Background in Direct-Detection Experiments Searching for Sub-GeV Dark Matter With Electron Recoils”, accepted in *Phys. Rev. D*, [arXiv:1801.10159](#) [hep-ph,astro-ph.CO].
21. R. Essig, P. Meade, H. Ramani, Y. Zhong, “Higgs-Precision Constraints on Colored Naturalness”, *JHEP* **1709** (2017) 085, [arXiv:1707.03399](#) [hep-ph, hep-ex].
22. J. Tiffenberg, M. Sofo-Haro, A. Drlica-Wagner, R. Essig, Y. Guardincerri, S. Holland, T. Volansky, T. Yu, “Single-electron and single-photon sensitivity with a silicon Skipper CCD”, *Phys. Rev. Lett.* **119**, 131802 (2017), [arXiv:1706.00028](#) [physics.ins-det, astro-ph.CO, astro-ph.EP, astro-ph.IM, hep-ex].
23. R. Essig, T. Volansky, T. Yu, “New Constraints and Prospects for sub-GeV Dark Matter Scattering off Electrons in Xenon”, *Phys. Rev.* **D96**, 043017 (2017), [arXiv:1703.00910](#) [hep-ph, astro-ph.CO].
24. J.H. Chang, R. Essig, S.D. McDermott, “Revisiting Supernova 1987A Constraints on Dark Photons”, *JHEP* **1701** (2017) 107, [arXiv:1611.03864](#) [hep-ph, astro-ph.CO, astro-ph.HE].
25. R. Essig, J. Mardon, O. Slone, T. Volansky, “Detection of sub-GeV Dark Matter and Solar Neutrinos via Chemical-Bond Breaking”, *Phys. Rev.* **D95** 056011 (2017), [arXiv:1608.02940](#) [hep-ph, astro-ph.CO, hep-ex].
26. I.M. Bloch, R. Essig, K. Tobioka, T. Volansky, T. Yu, “Searching for Dark Absorption with Direct Detection Experiments”, *JHEP* **1706** (2017) 087, [arXiv:1608.02123](#) [hep-ph].
27. S. Derenzo, R. Essig, A. Massari, A. Soto, T. Yu, “Direct Detection of sub-GeV Dark Matter with Scintillating Targets”, *Phys. Rev.* **D96** (2017) 016026, [arXiv:1607.01009](#) [hep-ph, astro-ph.CO, hep-ex].
28. R. Essig, M. Fernandez-Serra, J. Mardon, A. Soto, T. Volansky, T. Yu, “Direct Detection of sub-GeV Dark Matter with Semiconductor Targets”, *JHEP* **1605** (2016) 046, [arXiv:1509.01598](#) [hep-ph, astro-ph.CO].
29. A. Massari, E. Izaguirre, R. Essig, A. Albert, E. Bloom, G.A. Gómez-Vargas, “Strong Optimized Conservative *Fermi*-LAT Constraints on Dark Matter Models from the Inclusive Photon Spectrum”, *Phys. Rev.* **D91** 083539 (2015), [arXiv:1503.07169](#) [hep-ph, astro-ph.CO, astro-ph.HE].
30. The Fermi LAT Collaboration, “Searching for Dark Matter Annihilation from Milky Way Dwarf Spheroidal Galaxies with Six Years of Fermi-LAT Data”, *Phys. Rev. Lett.* **115** (2015) 231301, [arXiv:1503.02641](#) [astro-ph.HE, hep-ex].
31. The Fermi LAT Collaboration, “Search for Gamma-Ray Emission from DES Dwarf Spheroidal Galaxy Candidates with Fermi-LAT Data”, *ApJ* **809** L4 (2015), [arXiv:1503.02632](#) [astro-ph, hep-ex].
32. D. Curtin, R. Essig, Y. Zhong, “Uncovering light scalars with exotic Higgs decays to  $b\bar{b}\mu^+\mu^-$ ”, *JHEP* **1506** (2015) 025, [arXiv:1412.4779](#) [hep-ph, hep-ex].
33. D. Curtin, R. Essig, S. Gori, J. Shelton, “Illuminating Dark Photons with High-Energy Colliders”, *JHEP* **02** (2015) 157, [arXiv:1412.0018](#) [hep-ph, hep-ex].
34. B. Echenard, R. Essig, Y. Zhong, “Projections for Dark Photon Searches at Mu3e”, *JHEP* **1501** (2015) 113 [arXiv:1411.1770](#) [hep-ph, hep-ex].

35. The HPS Collaboration, “The Heavy Photon Search Test Detector”, Nucl. Instrum. Meth. **A777** (2014) 91–101, [arXiv:1406.6115](#) [physics.ins-det].
36. B. Batell, R. Essig, Z. Surujon, “Strong Constraints on Sub-GeV Dark Sectors from SLAC Beam Dump E137,” *Phys. Rev. Lett.* **113**, 171802, [arXiv:1406.2698](#) [hep-ph].  
\* Selected as PRL Editor’s Suggestion and Featured in Science News \*
37. D. Curtin, R. Essig, S. Gori, P. Jaiswal, A. Katz, T. Liu, Z. Liu, D. McKeen, J. Shelton, M. Strassler, Z. Surujon, B. Tweedie, Y. Zhong, “Exotic Decays of the 125 GeV Higgs Boson”, *Phys. Rev.* **D90** (2014) 075004. [arXiv:1312.4992](#) [hep-ph, hep-ex].  
\* Selected as PRD Editor’s Suggestion \*
38. The Fermi LAT Collaboration, “Dark Matter Constraints from Observations of 25 Milky Way Satellite Galaxies with the Fermi Large Area Telescope,” *Phys. Rev.* **D89** (2014) 042001, [arXiv:1310.0828](#) [astro-ph.HE].
39. R. Essig, J. Mardon, M. Papucci, T. Volansky, Y. Zhong, “Constraining Light Dark Matter with Low-Energy  $e^+e^-$  Colliders”, *JHEP* **1311** (2013) 167, [arXiv:1309.4091](#) [hep-ph].
40. R. Essig, E. Kuflik, S. D. McDermott, T. Volansky, K. M. Zurek, “Constraining Light Dark Matter with Diffuse X-Ray and  $\Gamma$ -Ray Observations”, *JHEP* **1311** (2013) 193, [arXiv:1309.4091](#) [hep-ph].
41. The Fermi LAT Collaboration, “Search for Gamma-ray Spectral Lines with the Fermi Large Area Telescope and Dark Matter Implications,” *Phys. Rev.* **D88** (2013) 082002, [arXiv:1305.5597](#) [astro-ph.HE].
42. D. Curtin, R. Essig, B. Shuve, “Boosted Multijet Resonances and New Color-Flow Variables”, *Phys. Rev.* **D88** (2013) 034019, [arXiv:1210.5523](#) [hep-ph].
43. J. Dudek, R. Ent, R. Essig, K. Kumar, R. McKeown, C. Meyer, Z. E. Meziani, G. A. Miller, M. Pennington, D. Richards, L. Weinstein, G. Young, “Physics Opportunities with the 12 GeV Upgrade at Jefferson Lab”, *Eur. Phys. J.* **A48** (2012) 187, [arXiv:1208.1244](#) [hep-ex].
44. R. Essig, A. Manalaysay, J. Mardon, P. Sorensen, T. Volansky, “First Direct Detection Limits on sub-GeV Dark Matter from XENON10”, *Phys. Rev. Lett.* **109** (2012) 021301, [arXiv:1206.2644](#) [astro-ph, hep-ex, hep-ph].  
\* Selected as PRL Editor’s Suggestion and Featured in Physics \*
45. The Fermi LAT Collaboration (contact authors: E. Bloom, Y. Edmonds, R. Essig), “Fermi LAT Search for Dark Matter in Gamma-ray Lines and the Inclusive Photon Spectrum”, *Phys.Rev.* **D86** (2012) 022002, [arXiv:1205.2739](#) [astro-ph, hep-ex, hep-ph].
46. The Fermi LAT Collaboration, “Search for Dark Matter Satellites using the FERMI-LAT”, *Astrophys.J.* **747** (2012) 121, [arXiv:1201.2691](#) [astro-ph, hep-ex, hep-ph].
47. A. Altheimer et.al., “Jet Substructure at the Tevatron and LHC: New results, new tools, new benchmarks”, *J.Phys. G* **G39** (2012) 063001, [arXiv:1201.0008](#) [hep-ph, hep-ex].
48. R. Essig, E. Izaguirre, J. Kaplan, J.G. Wacker, “Heavy Flavor Simplified Models at the LHC”, *JHEP* **1201** (2012) 074, [arXiv:1110.6443](#) [hep-ph, hep-ex].
49. N. Craig, R. Essig, A. Hook, G. Torroba, “Phases of N=1 supersymmetric chiral gauge theories”, *JHEP* **1112** (2011) 074, [arXiv:1110.5905](#) [hep-th].
50. R. Essig, J. Mardon, T. Volansky, “Direct Detection of sub-GeV Dark Matter”, *Phys.Rev.* **D85** (2012) 076007, [arXiv:1108.5383](#) [hep-ph,hep-ex].

51. The APEX Collaboration, S.Abrahamyan et.al., “Search for a new gauge boson in the  $A'$  Experiment (APEX)”, *Phys. Rev. Lett.* **107** 191804 (2011), [arXiv:1108.2750](#) [hep-ex, hep-ph].
52. N. Craig, R. Essig, A. Hook, G. Torroba, “New dynamics and dualities in supersymmetric chiral gauge theories”, *JHEP* **1109** (2011) 046, [arXiv:1106.5051](#) [hep-th].
53. D. Alves et.al. (Editors: R. Essig, M. Lisanti, P. Schuster, T. Tait, N. Toro, and J. Wacker), “Simplified Models for LHC New Physics Searches”, *J. Phys. G: Nucl. Part. Phys.* **39** (2012) 105005, [arXiv:1105.2838](#) [hep-ph, hep-ex].
54. J. Aleksic et.al., “Searches for Dark Matter annihilation signatures in the Segue 1 satellite galaxy with the MAGIC-I telescope”, *JCAP* **1106:035** (2011), [arXiv:1103.0477](#) [astro-ph].
55. R. Essig, R. Harnik, J. Kaplan, N. Toro, “Discovering New Light States at Neutrino Experiments”, *Phys.Rev.* **D82** (2010) 113008, [arXiv:1008.0636](#) [hep-ph].
56. R. Essig, N. Sehgal, L.E. Strigari, M. Geha, J.D. Simon, “Indirect Dark Matter Detection Limits from the Ultra-Faint Milky Way Satellite Segue 1”, *Phys.Rev.* **D82** (2010) 123503, [arXiv:1007.4199](#) [astro-ph, hep-ph].
57. G. Amelino-Camelia et.al., “Physics with the KLOE-2 experiment at the upgraded  $DA\phi NE$ ”, *Eur.Phys.J.* **C68** (2010) 619-681, [arXiv:1003.3868](#) [hep-ex].
58. The Fermi LAT Collaboration, “Fermi LAT Search for Photon Lines from 30 to 200 GeV and Dark Matter Implications”, *Phys. Rev. Lett.* **104** 091302 (2010), [arXiv:1001.4836](#) [astro-ph].
59. R. Essig, P. Schuster, N. Toro, B. Wojtsekhowski, “An Electron Fixed Target Experiment to Search for a New Vector Boson  $A'$  Decaying to  $e^+e^-$ ”, *JHEP* **02** (2011) 009, [arXiv:1001.2557](#) [hep-ph, hep-ex].
60. N. Craig, R. Essig, S. Franko, S. Kachru, G. Torroba, “Dynamical Supersymmetry Breaking, with Flavor”, *Phys.Rev.* **D81** (2010) 075015, [arXiv:0911.2467](#) [hep-th, hep-ph].
61. J.D. Bjorken, R. Essig, P. Schuster, N. Toro, “New Fixed-Target Experiments to Search for Dark Gauge Forces”, *Phys. Rev.* **D80**, 075018 (2009), [arXiv:0906.0580](#) [hep-ph].
62. R. Essig, P. Schuster, N. Toro, “Probing Dark Forces and Light Hidden Sectors at Low-Energy  $e^+e^-$  Colliders”, *Phys. Rev.* **D80**, 015003 (2009), [arXiv:0903.3941](#) [hep-ph].
63. R. Essig, N. Sehgal, L.E. Strigari, “Bounds on Cross-sections and Lifetimes for Dark Matter Annihilation and Decay into Charged Leptons from Gamma-ray Observations of Dwarf Galaxies”, *Phys. Rev.* **D80**, 023506 (2009), [arXiv:0902.4750](#) [hep-ph].
64. R. Essig, J.-F. Fortin, K. Sinha, G. Torroba, M.J. Strassler, “Metastable supersymmetry breaking and multitrace deformations of SQCD”, *JHEP* **0903** (2009) 043, [arXiv:0812.3213](#) [hep-th].
65. R. Essig, “Direct Detection of Non-Chiral Dark Matter”, *Phys. Rev.* **D78**, 015004 (2008), [arXiv:0710.1668](#) [hep-ph].
66. R. Essig, J.-F. Fortin, “The Minimally Tuned Minimal Supersymmetric Standard Model”, *JHEP* **0804** (2008) 073, [arXiv:0709.0980](#) [hep-ph].
67. R. Essig, K. Sinha, G. Torroba, “Meta-stable Dynamical Supersymmetry Breaking near Points of Enhanced Symmetry”, *JHEP* **0709** (2007) 032, [arXiv:0707.0007](#) [hep-th].
68. R. Essig, “Implications of the CERN LEP Higgs Bounds for the MSSM Stop Sector”, *Phys. Rev.* **D75**, 095005 (2007), [arXiv:hep-ph/0702104](#).

## PAPERS UNDER REVIEW

1. C. Blanco, R. Essig, M. Fernandez-Serra, H. Ramani, O. Slone, “Dark Matter Direct Detection with Quantum Dots”, *submitted to PRD* [arXiv:2208.05967](https://arxiv.org/abs/2208.05967) [hep-ph, astro-ph.CO, cond-mat.mes-hall, hep-ex, quant-ph].
2. A.M. Botti, S. Uemura, G. Fernandez Moroni, L. Barak, M. Cababie, R. Essig, J. Estrada, E. Etzion, D. Rodrigues, N. Saffold, M. Sofo Haro, J. Tiffenberg, T. Volansky, “Constraints on the electron-hole pair creation energy and Fano factor below 150 eV from Compton scattering in a Skipper-CCD”, *submitted to PRA* [arXiv:2202.03924](https://arxiv.org/abs/2202.03924) [(physics.ins-det, astro-ph.IM, hep-ex].

## COMMUNITY & WHITE PAPERS, CONFERENCE PROCEEDINGS

1. R. Essig, Y. Kahn, S. Knapen, A. Ringwald, N. Toro, “Snowmass2021 Theory Frontier: Theory Meets the Lab”, *Contribution to 2022 Snowmass Summer Study* [arXiv:2203.10089](https://arxiv.org/abs/2203.10089) [hep-ph, hep-ex].
2. R. Essig, G. K. Giovanetti, N. Kurinsky, D. McKinsey, K. Ramanathan, “Snowmass2021 Cosmic Frontier: The landscape of low-threshold dark matter direct detection in the next decade”, *Contribution to 2022 Snowmass Summer Study* [arXiv:2203.08297](https://arxiv.org/abs/2203.08297) [hep-ph, astro-ph.CO, hep-ex].
3. The HPS Collaboration, “The Heavy Photon Search Experiment”, *Contribution to 2022 Snowmass Summer Study* [arXiv:2203.08324](https://arxiv.org/abs/2203.08324) [hep-ex].
4. The Oscura Collaboration, “The Oscura Experiment”, [arXiv:2202.10518](https://arxiv.org/abs/2202.10518) [astro-ph.IM].
5. A. Fuss et.al., “EXCESS workshop: Descriptions of rising low-energy spectra”, *SciPost Phys. Proc.* **9** (2022) 001, [arXiv:2202.05097](https://arxiv.org/abs/2202.05097) [astro-ph.IM, physics.ins-det].
6. N. Ávalos, H. Arnaldi, I. Artola, X. Bertou, E. Estrada, M. Gómez Berisso, M.B. Lovino, M. Mantiñan, M. Sofo Haro, J. Tiffenberg, J. Estrada, T-T. Yu, R. Essig, T. Emken, “Skipper CCDs for the search of a daily modulation of Dark Matter signal in the DMSQUARE experiment”, *J. Phys. Conf. Ser.* **2156** (2021) 012074, TAUP 2021.
7. The LBECA Collaboration, A. Bernstein, M. Clark, R. Essig, M. Fernandez-Serra, A. Kopec, R.F. Lang, J. Long, K. Ni, S. Pereverzev, J. Qi, P. Sorensen, Y. Wei, J. Xu, J. Ye, C. Zhen, “LBECA: A Low Background Electron Counting Apparatus for Sub-GeV Dark Matter Detection”, *Proceedings of the TAUP 2019 Conference*, [arXiv:2001.09311](https://arxiv.org/abs/2001.09311) [physics.ins-det, hep-ex].
8. Basic Research Needs Workshop for Dark Matter Small Projects New Initiatives (incl. R.Essig as Direct Detection Panel Co-Lead), Report of the DoE’s HEP Workshop on Dark Matter.
9. MATHUSLA Collaboration, “Long-Lived Particles at the Energy Frontier: The MATHUSLA Physics Case” , [arXiv:1806.07396](https://arxiv.org/abs/1806.07396) [hep-ph].
10. Community White Paper (incl. R.Essig as Co-Convener), “US Cosmic Visions: New Ideas in Dark Matter 2017: Community Report”, [arXiv:1707.04591](https://arxiv.org/abs/1707.04591) [hep-ph].
11. D. Akerib et.al. (incl. R.Essig as Organizer and Editor), “Dark Sectors 2016 Workshop: Community Report”, [arXiv:1608.08632](https://arxiv.org/abs/1608.08632) [hep-ph].
12. S. Alekhin et.al., “A facility to Search for Hidden Particles at the CERN SPS: the SHiP physics case”, CERN-SPSC-2015-017, [arXiv:1504.04855](https://arxiv.org/abs/1504.04855) [hep-ph].

13. K. Babu, J. Butler, B. Casey, A. de Gouvea, R. Essig et.al. “Planning the Future of U.S. Particle Physics (Snowmass 2013): Chapter 2: Intensity Frontier”, *Snowmass Proceedings*, [arXiv:1401.6077](https://arxiv.org/abs/1401.6077) [hep-ex].
14. New Particles Working Group, “New Particles Working Group Report of the Snowmass 2013 Community Summer Study”, *Snowmass Proceedings*, [arXiv:1311.0299](https://arxiv.org/abs/1311.0299) [hep-ex].
15. R. Essig, J. A. Jaros, W. Wester et.al., “Dark Sectors and New, Light, Weakly-Coupled Particles”, Working Group Summary, *Snowmass Proceedings*, [arXiv:1311.0029](https://arxiv.org/abs/1311.0029) [hep-ph].
16. Higgs Working Group, “Higgs Working Group Report of the Snowmass 2013 Community Planning Study”, *Snowmass Proceedings*, [arXiv:1310.8361](https://arxiv.org/abs/1310.8361) [hep-ex].
17. WIMP Dark Matter Direct Detection Working Group, “Snowmass CF1 Summary: WIMP Dark Matter Direct Detection”, *Snowmass Proceedings*, [arXiv:1310.8327](https://arxiv.org/abs/1310.8327) [hep-ex].
18. E. Bloom et.al. (including R. Essig) (on behalf of the Fermi-LAT Collaboration), “Search of the Earth Limb Fermi Data and Non-Galactic Center Region Fermi Data for Signs of Narrow Lines,” *Proceedings of Fermi Symposium: Monterey, CA*, [arXiv:1303.2733](https://arxiv.org/abs/1303.2733) [astro-ph.HE].
19. A. Aefsky et.al. (Co-conveners for Working group “New light, weakly-coupled particles” include R. Essig), “Fundamental Physics at the Intensity Frontier”, [arXiv:1205.2671](https://arxiv.org/abs/1205.2671) [astro-ex, hep-ph].
20. R. Essig, K. Sinha, G. Torroba, “Enhanced symmetry points and metastable supersymmetry breaking along pseudo-runaway directions”, *SUSY07 proceedings, Karlsruhe, Germany, 26 Jul - 1 Aug 2007*, [arXiv:0710.4311](https://arxiv.org/abs/0710.4311) [hep-th].

## OTHER PAPERS

1. The BDX Collaboration, “Dark matter search in a Beam-Dump eXperiment (BDX) at Jefferson Lab – 2018 update to PR12-16-001”, [arXiv:1910.03532](https://arxiv.org/abs/1910.03532) [physics.ins-det, hep-ex].
2. MATHUSLA Collaboration, “MATHUSLA: A Detector Proposal to Explore the Lifetime Frontier at the HL-LHC”, [arXiv:1901.04040](https://arxiv.org/abs/1901.04040) [hep-ex,astro-ph.CO,hep-ph,nucl-ex].
3. The BDX Collaboration, “Dark Matter Search in a Beam-Dump eXperiment (BDX) at Jefferson Lab”, [arXiv:1607.01390](https://arxiv.org/abs/1607.01390) [hep-ph].
4. HPS: Heavy Photon Search, “A Proposal to Search for Massive Photons at Jefferson Laboratory”, submitted to Jefferson Laboratory Sept. 2010.
5. R. Essig, J. Kaplan, P. Schuster, N. Toro, “On the Origin of Light Dark Matter Species”, [arXiv:1004.0691](https://arxiv.org/abs/1004.0691) [hep-ph, astro-ph].

## INVITED COLLOQUIA

- Florida State University, FL (Oct. 2022)
- University of Albany, NY (Nov. 2020)
- University of Toronto, Toronto, Canada (January 2020)
- American Physics Society Colloquium, Ridge, NY (June 2019)
- Kavli Institute for Cosmological Physics, University of Chicago, Chicago IL (March 2019)
- Stony Brook University, Stony Brook, NY (Feb. 2019)
- Yale University, New Haven, CT (Sept. 2018)
- Argonne National Laboratory (Physics Division), IL (Feb 2018, cancelled due to weather)

- New York University, New York, NY (Sept. 2017)
- Brookhaven National Laboratory, Brookhaven, NY (May 2017)
- Physics Division Research Progress Meeting (RPM) LBL, Berkeley, CA (May 2017)
- U. of Oregon, Eugene, OR (May 2017)
- Carnegie Mellon & U. of Pittsburgh (joint colloquium), Pittsburgh, PA (Feb. 2017)
- U. of California, Irvine, CA (Nov. 2016)
- CERN Theory, CERN, Geneva (Sept. 2016)
- U. of Cincinnati, OH (April 2015)
- U. of Montreal, Canada (Jan. 2014)
- Penn State U., PA (Sept. 2013)
- Brown U., RI (Sept. 2012)
- Tel Aviv U., Israel (June 2012)
- Brookhaven National Lab, NY (Feb. 2012)
- Stony Brook U., NY (Nov. 2011)
- York U., Canada (May 2011)
- Rutgers U., NJ (Feb. 2011)
- McMaster U., Canada (Feb. 2011)

## INVITED SEMINARS, TALKS, AND CONFERENCES

- Dark Pollica, Pollica Summer Workshop on Dark Matter, Pollica, Italy (June 2022)
- PASCOS, Symposium on Particle Physics, String Theory, and Cosmology, online (June 2021)
- PPC 2021: 14th International Conference on Interconnections between Particle Physics and Cosmology, online (May 2021)
- Identification of Dark Matter, "IDM2020", online (July 2020)
- Light Dark Matter search at Accelerators, Venice, Italy (Nov. 2019)
- Cosmic Controversies, KICP, Chicago, IL (Oct. 2019)
- Next Frontiers in the Search for Dark Matter, GGI, Florence, Italy (Sept. 2019)
- Joint U. Maryland and Johns Hopkins Seminar, U. Maryland, MD (Sept. 2019)
- Strong-DM 2019, Searches, Theories, Results, Opportunities, and New Ideas for sub-GeV Dark Matter, ESI, Vienna, Austria (Aug. 2019)
- Dark Matter Identification: Connecting Theory and Signature Space, MITP, Mainz, Germany (April 2019)
- New Directions in the Search for Light Dark Matter Particles, Fermilab, IL (June 2019)
- 31st Recontres de Blois, Blois, Loire Valley, France (June 2019)
- U Penn, High Energy Theory seminar, Philadelphia PA (Feb 2019)
- KITP Conference, Santa Barbara CA (May 2018)
- Aspen Winter Conference, Aspen CO (March 2018)
- PPC 2017: XI International Conference on Interconnections between Particle Physics and Cosmology, Corpus Christi, TX (May 2017)
- MC4BSM, SLAC National Accelerator Laboratory, Menlo Park, CA (May 2017)
- New York University, New York, NY (March 2017)

- Fermilab Astrophysics Seminar, Batavia, IL (March 2017)
- SuperCDMS Science Meeting (remote) (Dec 2016)
- Princeton Center for Theoretical Science, Non-WIMP DM Workshop, Princeton, NJ (Nov. 2016)
- Princeton Pheno & Vino, Princeton, NJ (Sept. 2016)
- Interplay between Particle and Astroparticle physics (IPA 2016), LAL, Orsay, France (Sept. 2016)
- Light Dark World conference, IBS, Daejeon, Korea (July 2016)
- 40th Johns Hopkins workshop on the “Theoretical and Experimental Frontier of Fundamental Interactions, Baltimore, MA (May 2016)
- Boston U. , Boston, MA (Nov. 2015)
- Berkeley Dark Matter Workshop, Berkeley, CA (June 2015)
- Invited Talk at APS April Meeting, Baltimore, MD (April 2015)
- 8th Sackler Conference in Theoretical Astrophysics, Harvard, Boston, MA (May 2014)
- Cornell, NY (April 2014)
- Invited talk at APS April Meeting, Savannah, GA (April 2014)
- Rutgers, NJ (April 2014)
- LHC Physics Center (LPC), Fermilab, IL (March 2014)
- US ATLAS Workshop on LHC Searches, LBNL, Berkeley, CA (Jan. 2014)
- BNL, NY (Dec. 2013)
- IPMU, Japan (Nov. 2013)
- Belle II Collaboration Meeting, KEK, Japan (Nov. 2013)
- PCTS, “The DM Paradigm: Current Status & Challenges”, Princeton NJ (Oct. 2013)
- Penn State seminar, PA (Sept. 2013)
- MKIDs workshop, Fermilab, IL (Aug. 2013)
- Plenary talk at Lepton-Photon 2013, San Francisco, CA (June 2013)
- Plenary talk at Pheno (Phenomenology Symposium), Univ. of Pittsburgh, PA (May 2013)
- U. Minnesota, Minneapolis (March 2013)
- Budker Inst. of Nuclear Physics (Jan. 2013)
- Informal Astrophysics Seminar, Institute for Advanced Study, Princeton, NJ (Sept. 2012)
- 8th Patras Workshop on Axions, WIMPs, and WISPs, Chicago, IL (July 2012)
- Weizmann Institute of Science, Israel (May 2012)
- U. of Delaware, DE (May 2012)
- Perimeter Institute, Canada (April 2012)
- McGill U., Canada (April 2012)
- Harvard U., MA (April 2012)
- Joint Experimental-Theoretical Seminar (Wine & Cheese), Fermilab, IL (Jan. 2012)
- JLab Hall A Fundamental Symmetries Workshop & Collaboration Meeting, VA (Dec. 2011)
- YITP, SUNY, Stony Brook, NY (March 2011)
- MIT, MA (March 2011)
- U. of Maryland, MD (Feb. 2011)

- Perimeter Institute, Canada (Feb. 2011)
- U.C. San Diego, CA (Jan. 2011)
- Caltech, CA (Jan. 2011)
- Princeton U., NJ (Jan. 2011)
- Boston U., MA (Nov. 2010)
- Los Alamos National Laboratory, NM (Nov. 2010)
- “Dark Matter: Direct Detection and Theoretical Developments”, Princeton, NJ (Nov. 2010)
- Johns Hopkins U., MD (Nov. 2010)
- U. Michigan, MI (Nov. 2010)
- U.C. Berkeley, CA (Nov. 2010)
- Gordon Research Conference on Photonuclear Reactions, Tilton, NH (Aug. 2010)
- Aspen Institute for Physics, Aspen, CO (July 2010)
- Cornell U., Ithaca, NY (March 2010)
- U. Oregon, Eugene, OR (March 2010)
- U. Texas, Austin, TX (Jan. 2010)
- Texas A & M U., TX (Jan. 2010)
- Fermi National Accelerator Laboratory, IL (Nov. 2009)
- “TeV Particle Astrophysics 2009”, SLAC National Accelerator Lab., CA (July 2009)
- U.C. Irvine, CA (May 2009)
- U.C. Davis, CA (May 2009)
- SLAC National Accelerator Laboratory, CA (May 2009)
- U.C. Berkeley, CA (April 2009)
- SLAC National Accelerator Laboratory, CA (Nov. 2008)
- “LHC from data to discovery”, Santa Fé, NM (July 2008)
- U.C. Davis, CA (Dec. 2007)
- U.C. Berkeley, CA (Dec. 2007)
- SLAC National Accelerator Laboratory, CA (Dec. 2007)
- U.C. Santa Cruz, CA (Dec. 2007)
- Los Alamos National Laboratory, NM (Nov. 2007)

## PROFESSIONAL SERVICE

- **Coordinator:**
  - *“High Energy Physics at the Sensitivity Frontier”*, KITP program, Santa Barbara, CA 3/2018–5/2018.
  - *“New Probes for Physics Beyond the Standard Model”*, KITP conference, Santa Barbara, CA 4/9/2018–4/12/2018.
- **Convener:**
  - Panel Co-Lead for the Direct Detection working group of the *DoE Basic Research Needs Workshop on Dark Matter Small Projects New Initiatives*, Maryland, Oct. 15-18, 2018.

- Co-convenor of the *New Avenues in Direct Detection* working group of the *U.S. Cosmic Visions: New Ideas in Dark Matter* workshop, Univ. of Maryland, College Park, MD, March 23–25, 2017.
- Convenor of the *BSM Low Energy Experimental* session for DPF2015 (the American Physical Society’s Div. of Particle and Fields), Ann Arbor, MI, Aug. 4 – Aug. 8, 2015.
- Co-convenor of the *New light, weakly-coupled particles* subgroup of the Intensity Frontier group at “*Snowmass 2013*”, Minneapolis, MN, USA, Jul. 29 – Aug. 6, 2013. This resulted in a review of this subfield (see <http://arxiv.org/abs/1311.0029>) that served as input to the Particle Physics Project Prioritization Panel (“P5”), a subpanel of the High Energy Physics Advisory Panel (HEPAP).
- Co-convenor of the *New light, weakly-coupled particles* Working Group at the *Intensity Frontier Workshop*, Rockville, MD, USA, Nov. 30 – Dec. 2, 2011. This also resulted in a major review of the Intensity Frontier (see <http://arxiv.org/abs/1205.2671>).
- **Contributor** to several subgroups of “*Snowmass 2013*” (in addition to being a Co-convenor for one of them — see above) and “*Snowmass 2022*’.
- **Organizer:**
  - *Simons Symposium on Illuminating Dark Matter*, Krün, Germany, June 25–July 1, 2023.
  - Simons Center for Geometry and Physics **Workshop** and **Program** “*Lighting New Lighthouseposts for Dark Matter and Beyond the Standard Model*”, Feb. 27–March 24, 2023.
  - The “*EXCESS 2022 workshop*”, Feb. 15–17, 2022.
  - BNL workshop “*Dark Interactions: Perspectives from Theory & Experiment*”, Oct. 2–5, 2018.
  - *Simons Symposium on Illuminating Dark Matter*, Krün, Germany, May 13–19, 2018.
  - Workshop on “*Beyond WIMPs: From Theory to Detection*”, Simons Center for Geometry and Physics, Stony Brook, NY, March 27–29, 2017.
  - BNL workshop “*Dark Interactions: Perspectives from Theory & Experiment*”, Oct. 4–7, 2016.
  - SLAC workshop on “*Dark Sectors 2016*”, April 28–30, 2016.
  - Brookhaven Forum 2015, Oct. 7–9, 2015.
  - BNL workshop “*Dark Interactions: Perspectives from Theory & Experiment*”, Jun. 11–13, 2014.
  - Aspen Summer workshop “*New Particle Physics at the LHC and Its Connection to Dark Matter*”, Aug. 12–Sept. 9, 2012.
  - PCTS Workshop “*Hot Topics at Colliders: Exploring Hints for New Physics*”, Princeton, NJ, Apr. 27–Apr. 29, 2012.
  - SLAC workshop “*Topologies for Early LHC Searches*”, Sept. 22–25, 2010.
  - Jefferson Lab workshop “*Searching for a New Gauge Boson at JLab*”, Sept. 20–21, 2010.
  - SLAC workshop “*Searches for New Forces at the GeV-scale*”, Sept. 24–26, 2009.
- **International Advisory Committee:**
  - *NEPLES-2019, “New Physics at the Low Energy Scales”*, Seoul, Korea, Sept. 23–27, 2019.
  - *CYGNUS: 7th workshop on directional dark matter detection*, Roma, Italy, July 10–12, 2019.
  - *Light Dark Matter at Accelerators*, La Biodola - Isola d’Elba, Italy, May 24–28, 2017.

- *Dark Forces Searches at Colliders*, Frascati National Laboratories of INFN, Frascati, Italy, Oct. 16–19, 2012.
- *Light Dark Matter search @ Accelerators*, Camogli, Italy, June 24–26, 2015.
- Referee for international, peer-reviewed journals: *Physical Review D*, *Physical Review Letters*, *Journal of High Energy Physics*, *Journal of Cosmology and Astroparticle Physics*, *Physics Letters B*.
- Reviewer of numerous NSF, DOE, ISF, ERC, NSERC, NYUAD, ERC proposals.
- Reviewer for the DOE/SC CD-2/3 Review of SuperCDMS-SNOLAB, Jan. 24-26, 2017.
- Public talk “The Hunt for Dark Matter” given at:
  - Stony Brook Astronomy Open Night, Stony Brook, NY, Dec. 2013
  - Montauk Observatory Inc., Montauk Library, Montauk NY, March 2018
  - Astronom. Society of Long Island, Vanderbilt Planetarium, Centerport NY, Nov. 2018
- Program Director:
  - Theoretical Advanced Study Institute in Elementary Particle Physics (TASI) (summer school), “*Anticipating the Next Discoveries in Particle Physics*”, Boulder, CO, 2016.
- Lecturer at Summer/Winter Schools:
  - The “*School on Table-Top Experiments for Fundamental Physics*”, Perimeter Institute for Theoretical Physics, 09/19/2022–09/23/2022.
  - The 37th Advanced School in Theoretical Physics, “*New Ideas for Old Puzzles in Particle Physics*”, Jerusalem, 12/29/2019–01/09/2020.
  - Mainz Institute for Theoretical Physics Summer School, “*Towards the Next Quantum Field Theory of Nature*”, Mainz, Germany, 2018.
  - Prospects in Theoretical Physics (PITP), “*Particle Physics at the LHC and Beyond*”, Princeton, NJ, 2017.
  - Theoretical Advanced Study Institute in Elementary Particle Physics (TASI), “*Searching for New Physics at Small and Large Scales*”, Boulder, CO, 2012.
- Member: American Physical Society, American Association for the Advancement of Science

## UNIVERSITY TEACHING EXPERIENCE

- **Fall 2015, 2016, 2017, 2019-2022** Lecturer, Theoretical Particle Physics (PHY 612), SBU
- **Fall 2013-2014 & Spring 2016-2018, 2020-2021** Lecturer, Advanced Topics in Physics (PHY 680/PHY 613), Stony Brook Univ.
- **Spring 2012-2015** Lecturer, Nuclear and Particle Physics (PHY 431), SBU
- **Spring 2013** Recitation Instructor, Classical Physics II (PHY 132), SBU
- **2003** Course Assistant for General Physics 203 and 204, Rutgers Univ.
- **2002** Teaching Assistant for Extended Analytical Physics (a course for under prepared engineering physics students), Rutgers University

## ADVISING

### PhD Students

Andrea Massari	2012-2016
Yiming Zhong	2012-2016
Jae-Hyeok Chang	2016-2020
Mukul Sholapurkar	2017-2021
Daniel Gift	2018-2021
Cheng Zhen	2019-2021
Duncan Adams	2021 - present
Aman Singal	2021-present
Hailin Xu	2021 - present
Greg Suczewski	2022 - present

### Masters Students

Siddharth Vadnerkar (MA)	2017-2018
Ranit Das (MA)	2018-2019
Dawa (MA)	2018-2019
Luke Chaplinsky (MS (Instrumentation))	2018-2020
Sravan Munagavalasa (MS (Instrumentation))	2018-2020
Prakruth Adari (MA)	2021 - present
Ansh Desai (MA)	2021 - present

### Postdocs

David Curtin (now faculty at U Toronto)	2011-2014
Ze'ev Surujon (now at Soreq Research Center)	2012-2015
Samuel McDermott (now Schramm Fellow at Fermilab)	2013-2016
Tien-Tien Yu (now faculty at U Oregon)	2013-2016
Vardan Khachatryan (now postdoc at Cornell)	2016-2018
Kohsaku Tobioka (now faculty at Florida State)	2017-2018
Daniel Egana-Ugrinovic (now postdoc at Perimeter Institute)	2016-2019
Marco Farina (now at Bloomberg)	2017-2019
Peizhi Du	2019-2022
Kim Berghaus	2020-present
Mauro Valli	2021-present
Aditya Parikh	2022-present

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