

1 Axion-photon

Haloscopes

- ABRACADABRA [1, 2]
- ADMX [3, 4, 5]
- ADMX-Sidecar [6]
- ADMX-SLIC [7]
- CAPP [8, 9, 10]
- BASE [11]
- HAYSTAC [12, 13]
- ORGAN [14]
- QUAX [15, 16]
- RADES [17]
- RBF [18]
- SHAFT [19]
- UF [20]
- UPLOAD-DOWNLOAD [21]
- ABRACADABRA (projection) [22]
- ADBC (projection) [23]
- ADMX (projection) [24]
- aLIGO (projection) [25]
- ALPHA (projection) [26]
- BRASS (projection) [27]
- DM-Radio (projection) [28]
- DANCE (projection) [29]
- LAMPOST (projection) [30]
- MADMAX (projection) [31]
- KLASHER (projection) [32]
- ORGAN (projection) [14]
- TOORAD (projection) [33]

LSW/Helioscopes

- ALPS [34]
- CAST [35, 36]
- CROWS [37]
- OSQAR [38]
- PVLAS [39]
- ALPS-II (projection) [40]
- IAXO (projection) [41]
- IAXO (Galactic SN) [42]

Astro

- Chandra (Hydra) [43]
- Chandra (M87) [44]
- Chandra (NGC 1275) [45]
- Diffuse SN ALPs [46]
- Distance ladder [47]
- Fermi-LAT (NGC 1275) [48]
- Fermi-LAT (Extragalactic SNe) [49]
- HESS (PKS 2155-304) [50]
- Horizontal branch [51]
- Mrk 421 (ARGO-YBJ+Fermi): [52]
- Neutron Stars (Foster et al.) [53]
- Neutron Stars (Darling) [54]
- Neutron Stars (Battye et al.) [55]
- Solar neutrinos [56]
- SN1987A (decay) [57]
- SN1987A (gamma) [58]
- Star clusters [59]
- Telescopes (MUSE) [60]
- Telescopes (VIMOS) [61]
- Fermi galactic SN (projection) [62]
- THESEUS (projection) [63]
- eROSITA (projection) [64]

Cosmology

- Ionisation fraction, EBL, X-rays [65]
- BBN+ N_{eff} [66]

2 Axion-electron

- EDELWEISS [67]
- Magnon non-demolition [68]
- LUX [69]
- Panda-X [70]
- SuperCDMS [71]
- XENON1T [72, 73]
- XENON1T (Solar basin) [74]
- Red giants (ω Cen) [75]
- Solar neutrinos [76]
- Magnons (projection) [77]
- Polaritons (projection) [78]
- DARWIN (projection) [79]
- LZ (projection) [80]
- QUAX [81, 82]
- Semiconductors (projection) [83]
- White dwarf hint [84]

3 Axion-nucleon

Note: CASPER and nEDM limits account for stochastic correction reported in [85]

- CASPER-ZULF-Comagnetometer [86]
- CASPER-ZULF-Sidechain [87]
- nEDM (ultracold neutrons and mercury) [88]
- NASDUCK [89]
- K-3He comagnetometer [90]
- Old comagnetometers [91]
- Torsion balance [92]
- Hot Neutron Star (HESS J1731-347) [93]
- SN1987A Cooling [94]
- SNO (deuterium dissasociation) [95]
- Proton storage ring (projection) [96]
- DM comagnetometer (projection) [91]
- CASPER-wind (projection) [87]

4 Axion-EDM

- CASPER-electric [97]
- nEDM [88]
- SN1987A [98]
- CASPER-electric (projection) [99]
- Storage Ring EDM (projection) [99]

5 Axion mass versus f_a

- BBN [100]
- Binary pulsars and Solar core constraint on $\bar{\theta}$ [101]. I include minor numerical corrections made by [102, 103].
- GW170817 [104]
- nEDM [88]
- SN1987A [105]
- Neutron stars (projection) [101].
- NS-NS and NS-BH Inspirals (projection) [101].

6 CP-violating couplings

Combined constraints [106]

Scalar-nucleon

- Red giants [107]
- MICROSCOPE [108].
- Eot-Wash [109, 110, 111]
- Irvine [112]. Corrected to 2σ limit by [113]
- HUST [114, 115, 116, 117].
- Stanford [118]
- IUPUI [119].
- Wuhan [113]

Pseudoscalar-electron

- Red giants [107]
- Eot-wash [120]
- NIST [121]
- SMILE [122].
- QUAX [123, 124]
- Washington [125, 126].
- XENON1T [127]
- Magnon (projection) [78]
- QUAX (projection) [123].

Pseudoscalar-nucleon

- Neutron star cooling [93]
- Washington [128]. Limit taken from [129].
- SMILE [122].
- Mainz [130]
- ARIADNE (projection) [131]
- CASPEr-wind (projection) [99]
- DM comagnetometer (projection) [91]

7 Black hole superradiance

- Baryakhtar et al. [132] (just Stellar mass BHs)
- Mehta et al. [132] (Stellar mass and SMBHs)
- Stott [133]
- Cardoso et al. [134] (dark photon)

8 Dark photons

Combined constraints [135]

SM photon-DP transitions

- Coulomb [136, 137, 138, 139, 140],
- Plimpton & Lawton's experiment [141, 140]
- Atomic spectroscopy [142]
- Atomic force microscopy (AFM) [140]
- Static magnetic fields of the Earth [143]
- Static magnetic fields of the Jupiter [144].
- ALPs [34]
- SPring-8 [145]
- UWA-LSW [146, 147]
- ADMX-LSW [148]
- CROWS [37].
- TEXONO [149]
- Crab nebula [150]
- COBE and FIRAS [151]

Production in stars

- CAST [152]
- SHIP [153]
- HB and RG stars [154]
- Neutron stars [155]
- Solar neutrinos [156]

Dark matter cosmology/astro

- Arias et al. [157]
- Witte et al. [158, 159]
- Caputo et al. [160, 151],
- IGM [161],
- Leo T dwarf [162]
- Gas clouds [163]

Dark matter experiments

- Reinterpreted axion limits [135]
- DAMIC [164]
- Dark E-field Radio [165]
- DM Pathfinder [166]
- FUNK [167]
- SENSEI [168]
- SHUKET [169]
- SuperCDMS [170]
- SuperMAG [171, 172]
- SQuAD [173],
- Tokyo dish antennae experiments [174, 175, 176]
- WISPDMS [177]
- XENON1T/XENON100 [83, 127, 178, 179].

References

- [1] J. L. Ouellet et al., *First Results from ABRACADABRA-10 cm: A Search for Sub- μ eV Axion Dark Matter*, *Phys. Rev. Lett.* **122** (2019) 121802 [1810.12257].
- [2] C. P. Salemi et al., *The search for low-mass axion dark matter with ABRACADABRA-10cm*, 2102.06722.
- [3] S. J. Asztalos, G. Carosi, C. Hagmann, D. Kinion, K. van Bibber, M. Hotz, L. J. Rosenberg, G. Rybka, J. Hoskins, J. Hwang, P. Sikivie, D. B. Tanner, R. Bradley, J. Clarke and ADMX Collaboration, *SQUID-Based Microwave Cavity Search for Dark-Matter Axions*, *Phys. Rev. Lett.* **104** (2010) 041301 [0910.5914].
- [4] ADMX Collaboration, N. Du et al., *A Search for Invisible Axion Dark Matter with the Axion Dark Matter Experiment*, *Phys. Rev. Lett.* **120** (2018) 151301 [1804.05750].
- [5] ADMX Collaboration, T. Braine et al., *Extended Search for the Invisible Axion with the Axion Dark Matter Experiment*, *Phys. Rev. Lett.* **124** (2020) 101303 [1910.08638].
- [6] ADMX Collaboration, C. Boutan et al., *Piezoelectrically Tuned Multimode Cavity Search for Axion Dark Matter*, *Phys. Rev. Lett.* **121** (2018) 261302 [1901.00920].
- [7] N. Crisosto, P. Sikivie, N. S. Sullivan, D. B. Tanner, J. Yang and G. Rybka, *ADMX SLIC: Results from a Superconducting LC Circuit Investigating Cold Axions*, *Phys. Rev. Lett.* **124** (2020) 241101 [1911.05772].
- [8] S. Lee, S. Ahn, J. Choi, B. R. Ko and Y. K. Semertzidis, *Axion Dark Matter Search around 6.7 μ eV*, *Phys. Rev. Lett.* **124** (2020) 101802 [2001.05102].
- [9] J. Jeong, S. Youn, S. Bae, J. Kim, T. Seong, J. E. Kim and Y. K. Semertzidis, *Search for Invisible Axion Dark Matter with a Multiple-Cell Haloscope*, *Phys. Rev. Lett.* **125** (2020) 221302 [2008.10141].
- [10] CAPP Collaboration, O. Kwon et al., *First Results from an Axion Haloscope at CAPP around 10.7 μ eV*, *Phys. Rev. Lett.* **126** (2021) 191802 [2012.10764].
- [11] J. A. Devlin et al., *Constraints on the Coupling between Axionlike Dark Matter and Photons Using an Antiproton Superconducting Tuned Detection Circuit in a Cryogenic Penning Trap*, *Phys. Rev. Lett.* **126** (2021) 041301 [2101.11290].
- [12] HAYSTAC Collaboration, L. Zhong et al., *Results from phase 1 of the HAYSTAC microwave cavity axion experiment*, *Phys. Rev. D* **97** (2018) 092001 [1803.03690].
- [13] HAYSTAC Collaboration, K. M. Backes et al., *A quantum-enhanced search for dark matter axions*, *Nature* **590** (2021) 238 [2008.01853].
- [14] B. T. McAllister, G. Flower, E. N. Ivanov, M. Goryachev, J. Bourhill and M. E. Tobar, *The ORGAN Experiment: An axion haloscope above 15 GHz*, *Phys. Dark Univ.* **18** (2017) 67 [1706.00209].
- [15] D. Alesini et al., *Galactic axions search with a superconducting resonant cavity*, *Phys. Rev. D* **99** (2019) 101101 [1903.06547].
- [16] D. Alesini et al., *Search for invisible axion dark matter of mass $m_a = 43 \mu$ eV with the QUAX- $a\gamma$ experiment*, *Phys. Rev. D* **103** (2021) 102004 [2012.09498].
- [17] CAST Collaboration, A. A. Melcón et al., *First results of the CAST-RADES haloscope search for axions at 34.67 μ eV*, 2104.13798.
- [18] S. DePanfilis, A. C. Melissinos, B. E. Moskowitz, J. T. Rogers, Y. K. Semertzidis, W. U. Wuensch, H. J. Halama, A. G. Prodell, W. B. Fowler and F. A. Nezrick, *Limits on the abundance and coupling of cosmic axions at $4.5 < m_a < 5.0 \mu$ ev*, *Phys. Rev. Lett.* **59** (1987) 839.
- [19] A. V. Gramolin, D. Aybas, D. Johnson, J. Adam and A. O. Sushkov, *Search for axion-like dark matter with ferromagnets*, *Nature Phys.* **17** (2021) 79 [2003.03348].
- [20] C. Hagmann, P. Sikivie, N. S. Sullivan and D. B. Tanner, *Results from a search for cosmic axions*, *Phys. Rev. D* **42** (1990) 1297.
- [21] C. A. Thomson, B. T. McAllister, M. Goryachev, E. N. Ivanov and M. E. Tobar, *Upconversion Loop Oscillator Axion Detection Experiment: A Precision Frequency Interferometric Axion Dark Matter Search with a Cylindrical Microwave Cavity*, *Phys. Rev. Lett.* **126** (2021) 081803 [1912.07751]. [Erratum: Phys.Rev.Lett. 127, 019901 (2021)].
- [22] Abracadabra, <https://abracadabra.mit.edu/>.
- [23] H. Liu, B. D. Elwood, M. Evans and J. Thaler, *Searching for Axion Dark Matter with Birefringent Cavities*, *Phys. Rev. D* **100** (2019) 023548 [1809.01656].
- [24] I. Stern, *ADMX Status*, *PoS ICHEP2016* (2016) 198 [1612.08296].
- [25] K. Nagano, T. Fujita, Y. Michimura and I. Obata, *Axion Dark Matter Search with Interferometric Gravitational Wave Detectors*, *Phys. Rev. Lett.* **123** (2019) 111301 [1903.02017].
- [26] M. Lawson, A. J. Millar, M. Pancaldi, E. Vitagliano and F. Wilczek, *Tunable axion plasma haloscopes*, *Phys. Rev. Lett.* **123** (2019) 141802 [1904.11872].
- [27] Brass, <https://www1.physik.uni-hamburg.de/iexp/gruppe-horns/forschung/brass.html>.
- [28] Dmradio, https://indico.mit.edu/event/151/contributions/295/attachments/96/172/Dark%20Matter%20Radio_CambridgeAxions2021.pdf.
- [29] Y. Michimura, Y. Oshima, T. Watanabe, T. Kawasaki, H. Takeda, M. Ando, K. Nagano, I. Obata and T. Fujita, *DANCE: Dark matter Axion search with riNg Cavity Experiment*, *J. Phys. Conf. Ser.* **1468** (2020) 012032 [1911.05196].

- [30] M. Baryakhtar, J. Huang and R. Lasenby, *Axion and hidden photon dark matter detection with multilayer optical haloscopes*, *Phys. Rev. D* **98** (2018) 035006 [[1803.11455](#)].
- [31] S. Beurthey et al., *MADMAX Status Report*, [2003.10894](#).
- [32] D. Alesini, D. Babusci, D. Di Gioacchino, C. Gatti, G. Lamanna and C. Ligi, *The KLASH Proposal*, [1707.06010](#).
- [33] J. Schütte-Engel, D. J. E. Marsh, A. J. Millar, A. Sekine, F. Chadha-Day, S. Hoof, M. Ali, K.-C. Fong, E. Hardy and L. Šmejkal, *Axion Quasiparticles for Axion Dark Matter Detection*, [2102.05366](#).
- [34] K. Ehret et al., *New ALPS Results on Hidden-Sector Lightweights*, *Phys. Lett. B* **689** (2010) 149 [[1004.1313](#)].
- [35] CAST Collaboration, S. Andriamonje et al., *An Improved limit on the axion-photon coupling from the CAST experiment*, *JCAP* **04** (2007) 010 [[hep-ex/0702006](#)].
- [36] CAST Collaboration, V. Anastassopoulos et al., *New CAST Limit on the Axion-Photon Interaction*, *Nature Phys.* **13** (2017) 584 [[1705.02290](#)].
- [37] M. Betz, F. Caspers, M. Gasior, M. Thumm and S. W. Rieger, *First results of the CERN Resonant Weakly Interacting sub-eV Particle Search (CROWS)*, *Phys. Rev. D* **88** (2013) 075014 [[1310.8098](#)].
- [38] OSQAR Collaboration, R. Ballou et al., *New exclusion limits on scalar and pseudoscalar axionlike particles from light shining through a wall*, *Phys. Rev. D* **92** (2015) 092002 [[1506.08082](#)].
- [39] F. Della Valle, A. Ejlli, U. Gastaldi, G. Messineo, E. Milotti, R. Pengo, G. Ruoso and G. Zavattini, *The PVLAS experiment: measuring vacuum magnetic birefringence and dichroism with a birefringent Fabry–Perot cavity*, *Eur. Phys. J. C* **76** (2016) 24 [[1510.08052](#)].
- [40] M. D. Ortiz et al., *Design of the ALPS II Optical System*, [2009.14294](#).
- [41] I. Shilon, A. Dudarev, H. Silva, U. Wagner and H. H. J. ten Kate, *The Superconducting Toroid for the New International AXion Observatory (IAXO)*, *IEEE Trans. Appl. Supercond.* **24** (2014) 4500104 [[1309.2117](#)].
- [42] S.-F. Ge, K. Hamaguchi, K. Ichimura, K. Ishidoshiro, Y. Kanazawa, Y. Kishimoto, N. Nagata and J. Zheng, *Supernova-scope for the Direct Search of Supernova Axions*, *JCAP* **11** (2020) 059 [[2008.03924](#)].
- [43] D. Wouters and P. Brun, *Constraints on Axion-like Particles from X-Ray Observations of the Hydra Galaxy Cluster*, *Astrophys. J.* **772** (2013) 44 [[1304.0989](#)].
- [44] M. C. D. Marsh, H. R. Russell, A. C. Fabian, B. P. McNamara, P. Nulsen and C. S. Reynolds, *A New Bound on Axion-Like Particles*, *JCAP* **12** (2017) 036 [[1703.07354](#)].
- [45] C. S. Reynolds, M. C. D. Marsh, H. R. Russell, A. C. Fabian, R. Smith, F. Tombesi and S. Veilleux, *Astrophysical limits on very light axion-like particles from Chandra grating spectroscopy of NGC 1275*, [1907.05475](#).
- [46] F. Calore, P. Carenza, M. Giannotti, J. Jaeckel and A. Mirizzi, *Bounds on axionlike particles from the diffuse supernova flux*, *Phys. Rev. D* **102** (2020) 123005 [[2008.11741](#)].
- [47] M. A. Buen-Abad, J. Fan and C. Sun, *Constraints on Axions from Cosmic Distance Measurements*, [2011.05993](#).
- [48] FERMI-LAT Collaboration, M. Ajello et al., *Search for Spectral Irregularities due to Photon–Axionlike-Particle Oscillations with the Fermi Large Area Telescope*, *Phys. Rev. Lett.* **116** (2016) 161101 [[1603.06978](#)].
- [49] M. Meyer and T. Petrushevska, *Search for Axionlike-Particle-Induced Prompt γ -Ray Emission from Extragalactic Core-Collapse Supernovae with the Fermi Large Area Telescope*, *Phys. Rev. Lett.* **124** (2020) 231101 [[2006.06722](#)]. [Erratum: *Phys. Rev. Lett.* **125**, 119901 (2020)].
- [50] H.E.S.S. Collaboration, A. Abramowski et al., *Constraints on axionlike particles with H.E.S.S. from the irregularity of the PKS 2155-304 energy spectrum*, *Phys. Rev. D* **88** (2013) 102003 [[1311.3148](#)].
- [51] A. Ayala, I. Domínguez, M. Giannotti, A. Mirizzi and O. Straniero, *Revisiting the bound on axion-photon coupling from Globular Clusters*, *Phys. Rev. Lett.* **113** (2014) 191302 [[1406.6053](#)].
- [52] H.-J. Li, J.-G. Guo, X.-J. Bi, S.-J. Lin and P.-F. Yin, *Limits on axionlike particles from Mrk 421 with 4.5-year period observations by ARGO-YBJ and Fermi-LAT*, *Phys. Rev. D* **103** (2021) 083003 [[2008.09464](#)].
- [53] J. W. Foster, Y. Kahn, O. Macias, Z. Sun, R. P. Eatough, V. I. Kondratiev, W. M. Peters, C. Weniger and B. R. Safdi, *Green Bank and Effelsberg Radio Telescope Searches for Axion Dark Matter Conversion in Neutron Star Magnetospheres*, *Phys. Rev. Lett.* **125** (2020) 171301 [[2004.00011](#)].
- [54] J. Darling, *New Limits on Axionic Dark Matter from the Magnetar PSR J1745-2900*, *Astrophys. J. Lett.* **900** (2020) L28 [[2008.11188](#)].
- [55] R. A. Battye, J. Darling, J. McDonald and S. Srinivasan, *Towards Robust Constraints on Axion Dark Matter using PSR J1745-2900*, [2107.01225](#).
- [56] N. Vinyoles, A. Serenelli, F. L. Villante, S. Basu, J. Redondo and J. Isern, *New axion and hidden photon constraints from a solar data global fit*, *JCAP* **2015** (2015) 015 [[1501.01639](#)].
- [57] J. Jaeckel, P. C. Malta and J. Redondo, *Decay photons from the axionlike particles burst of type II supernovae*, *Phys. Rev. D* **98** (2018) 055032 [[1702.02964](#)].
- [58] A. Payez, C. Evoli, T. Fischer, M. Giannotti, A. Mirizzi and A. Ringwald, *Revisiting the SN1987A gamma-ray limit on ultralight axion-like particles*, *JCAP* **02** (2015) 006 [[1410.3747](#)].
- [59] C. Dessert, J. W. Foster and B. R. Safdi, *X-ray Searches for Axions from Super Star Clusters*, *Phys. Rev. Lett.* **125** (2020) 261102 [[2008.03305](#)].
- [60] M. Regis, M. Taoso, D. Vaz, J. Brinchmann, S. L. Zoutendijk, N. F. Bouché and M. Steinmetz, *Searching for light in the darkness: Bounds on ALP dark matter with the optical MUSE-faint survey*, *Phys. Lett. B* **814** (2021) 136075 [[2009.01310](#)].

- [61] D. Grin, G. Covone, J.-P. Kneib, M. Kamionkowski, A. Blain and E. Jullo, *A Telescope Search for Decaying Relic Axions*, *Phys. Rev. D* **75** (2007) 105018 [[astro-ph/0611502](#)].
- [62] M. Meyer, M. Giannotti, A. Mirizzi, J. Conrad and M. A. Sánchez-Conde, *Fermi Large Area Telescope as a Galactic Supernovae Axionscope*, *Phys. Rev. Lett.* **118** (2017) 011103 [[1609.02350](#)].
- [63] C. Thorpe-Morgan, D. Malyshev, A. Santangelo, J. Jochum, B. Jäger, M. Sasaki and S. Saeedi, *THESEUS insights into axionlike particles, dark photon, and sterile neutrino dark matter*, *Phys. Rev. D* **102** (2020) 123003 [[2008.08306](#)].
- [64] A. Dekker, E. Peerbooms, F. Zimmer, K. C. Y. Ng and S. Ando, *Searches for sterile neutrinos and axionlike particles from the Galactic halo with eROSITA*, *Phys. Rev. D* **104** (2021) 023021 [[2103.13241](#)].
- [65] D. Cadamuro and J. Redondo, *Cosmological bounds on pseudo Nambu-Goldstone bosons*, *JCAP* **02** (2012) 032 [[1110.2895](#)].
- [66] P. F. Depta, M. Hufnagel and K. Schmidt-Hoberg, *Robust cosmological constraints on axion-like particles*, *JCAP* **05** (2020) 009 [[2002.08370](#)].
- [67] EDELWEISS Collaboration, E. Armengaud et al., *Searches for electron interactions induced by new physics in the EDELWEISS-III Germanium bolometers*, *Phys. Rev. D* **98** (2018) 082004 [[1808.02340](#)].
- [68] T. Ikeda, A. Ito, K. Miuchi, J. Soda, H. Kurashige and Y. Shikano, *Axion search with quantum nondemolition detection of magnons*, [2102.08764](#).
- [69] LUX Collaboration, D. S. Akerib et al., *First Searches for Axions and Axionlike Particles with the LUX Experiment*, *Phys. Rev. Lett.* **118** (2017) 261301 [[1704.02297](#)].
- [70] PANDAX Collaboration, C. Fu et al., *Limits on Axion Couplings from the First 80 Days of Data of the PandaX-II Experiment*, *Phys. Rev. Lett.* **119** (2017) 181806 [[1707.07921](#)].
- [71] SUPERCDMS Collaboration, T. Aralis et al., *Constraints on dark photons and axionlike particles from the SuperCDMS Soudan experiment*, *Phys. Rev. D* **101** (2020) 052008 [[1911.11905](#)]. [Erratum: *Phys.Rev.D* 103, 039901 (2021)].
- [72] XENON Collaboration, E. Aprile et al., *Light Dark Matter Search with Ionization Signals in XENON1T*, *Phys. Rev. Lett.* **123** (2019) 251801 [[1907.11485](#)].
- [73] XENON Collaboration, E. Aprile et al., *Excess electronic recoil events in XENON1T*, *Phys. Rev. D* **102** (2020) 072004 [[2006.09721](#)].
- [74] K. Van Tilburg, *Stellar basins of gravitationally bound particles*, *Phys. Rev. D* **104** (2021) 023019 [[2006.12431](#)].
- [75] F. Capozzi and G. Raffelt, *Axion and neutrino bounds improved with new calibrations of the tip of the red-giant branch using geometric distance determinations*, *Phys. Rev. D* **102** (2020) 083007 [[2007.03694](#)].
- [76] P. Gondolo and G. G. Raffelt, *Solar neutrino limit on axions and keV-mass bosons*, *Phys. Rev. D* **79** (2009) 107301 [[0807.2926](#)].
- [77] S. Chigusa, T. Moroi and K. Nakayama, *Detecting light boson dark matter through conversion into a magnon*, *Phys. Rev. D* **101** (2020) 096013 [[2001.10666](#)].
- [78] A. Mitridate, T. Trickle, Z. Zhang and K. M. Zurek, *Detectability of Axion Dark Matter with Phonon Polaritons and Magnons*, *Phys. Rev. D* **102** (2020) 095005 [[2005.10256](#)].
- [79] DARWIN Collaboration, J. Aalbers et al., *DARWIN: towards the ultimate dark matter detector*, *JCAP* **11** (2016) 017 [[1606.07001](#)].
- [80] LZ Collaboration, D. S. Akerib et al., *Projected sensitivities of the LUX-ZEPLIN (LZ) experiment to new physics via low-energy electron recoils*, [2102.11740](#).
- [81] N. Crescini et al., *Operation of a ferromagnetic axion haloscope at $m_a = 58 \mu\text{eV}$* , *Eur. Phys. J. C* **78** (2018) 703 [[1806.00310](#)]. [Erratum: *Eur.Phys.J.C* 78, 813 (2018)].
- [82] QUAX Collaboration, N. Crescini et al., *Axion search with a quantum-limited ferromagnetic haloscope*, *Phys. Rev. Lett.* **124** (2020) 171801 [[2001.08940](#)].
- [83] I. M. Bloch, R. Essig, K. Tobioka, T. Volansky and T.-T. Yu, *Searching for Dark Absorption with Direct Detection Experiments*, *JHEP* **06** (2017) 087 [[1608.02123](#)].
- [84] M. Giannotti, I. G. Irastorza, J. Redondo, A. Ringwald and K. Saikawa, *Stellar Recipes for Axion Hunters*, *JCAP* **10** (2017) 010 [[1708.02111](#)].
- [85] G. P. Centers et al., *Stochastic fluctuations of bosonic dark matter*, [1905.13650](#).
- [86] T. Wu et al., *Search for Axionlike Dark Matter with a Liquid-State Nuclear Spin Comagnetometer*, *Phys. Rev. Lett.* **122** (2019) 191302 [[1901.10843](#)].
- [87] A. Garcon et al., *Constraints on bosonic dark matter from ultralow-field nuclear magnetic resonance*, *Sci. Adv.* **5** (2019) eaax4539 [[1902.04644](#)].
- [88] C. Abel et al., *Search for Axionlike Dark Matter through Nuclear Spin Precession in Electric and Magnetic Fields*, *Phys. Rev. X* **7** (2017) 041034 [[1708.06367](#)].
- [89] I. M. Bloch, G. Ronen, R. Shaham, O. Katz, T. Volansky and O. Katz, *NASDUCK: New Constraints on Axion-like Dark Matter from Floquet Quantum Detector*, [2105.04603](#).
- [90] G. Vasilakis, J. M. Brown, T. W. Kornack and M. V. Romalis, *Limits on New Long Range Nuclear Spin-Dependent Forces Set with a K-He3 Comagnetometer*, *Phys. Rev. Lett.* **103** (2009) 261801 [[0809.4700](#)].
- [91] I. M. Bloch, Y. Hochberg, E. Kuflik and T. Volansky, *Axion-like Relics: New Constraints from Old Comagnetometer Data*, *JHEP* **01** (2020) 167 [[1907.03767](#)].
- [92] E. G. Adelberger, B. R. Heckel, S. A. Hoedl, C. D. Hoyle, D. J. Kapner and A. Upadhye, *Particle Physics Implications of a Recent Test of the Gravitational Inverse Square Law*, *Phys. Rev. Lett.* **98** (2007) 131104 [[hep-ph/0611223](#)].

- [93] M. V. Beznogov, E. Rrapaj, D. Page and S. Reddy, *Constraints on Axion-like Particles and Nucleon Pairing in Dense Matter from the Hot Neutron Star in HESS J1731-347*, *Phys. Rev. C* **98** (2018) 035802 [[1806.07991](#)].
- [94] P. Carenza, T. Fischer, M. Giannotti, G. Guo, G. Martínez-Pinedo and A. Mirizzi, *Improved axion emissivity from a supernova via nucleon-nucleon bremsstrahlung*, *JCAP* **10** (2019) 016 [[1906.11844](#)]. [Erratum: JCAP 05, E01 (2020)].
- [95] A. Bhusal, N. Houston and T. Li, *Searching for Solar Axions Using Data from the Sudbury Neutrino Observatory*, *Phys. Rev. Lett.* **126** (2021) 091601 [[2004.02733](#)].
- [96] P. W. Graham, S. Hacıömeroğlu, D. E. Kaplan, Z. Omarov, S. Rajendran and Y. K. Semertzidis, *Storage ring probes of dark matter and dark energy*, *Phys. Rev. D* **103** (2021) 055010 [[2005.11867](#)].
- [97] D. Aybas et al., *Search for Axionlike Dark Matter Using Solid-State Nuclear Magnetic Resonance*, *Phys. Rev. Lett.* **126** (2021) 141802 [[2101.01241](#)].
- [98] P. W. Graham and S. Rajendran, *New Observables for Direct Detection of Axion Dark Matter*, *Phys. Rev. D* **88** (2013) 035023 [[1306.6088](#)].
- [99] D. F. Jackson Kimball et al., *Overview of the Cosmic Axion Spin Precession Experiment (CASPER)*, *Springer Proc. Phys.* **245** (2020) 105 [[1711.08999](#)].
- [100] K. Blum, R. T. D’Agnolo, M. Lisanti and B. R. Safdi, *Constraining Axion Dark Matter with Big Bang Nucleosynthesis*, *Phys. Lett. B* **737** (2014) 30 [[1401.6460](#)].
- [101] A. Hook and J. Huang, *Probing axions with neutron star inspirals and other stellar processes*, *JHEP* **06** (2018) 036 [[1708.08464](#)].
- [102] L. Di Luzio, B. Gavela, P. Quilez and A. Ringwald, *Dark matter from an even lighter QCD axion: trapped misalignment*, [2102.01082](#).
- [103] L. Di Luzio, B. Gavela, P. Quilez and A. Ringwald, *An even lighter QCD axion*, *JHEP* **05** (2021) 184 [[2102.00012](#)].
- [104] J. Zhang, Z. Lyu, J. Huang, M. C. Johnson, L. Sagunski, M. Sakellariadou and H. Yang, *First Constraints on Light Axions from the Binary Neutron Star Gravitational Wave Event GW170817*, [2105.13963](#).
- [105] G. G. Raffelt, *Astrophysical axion bounds*, *Lect. Notes Phys.* **741** (2008) 51 [[hep-ph/0611350](#)].
- [106] C. A. J. O’Hare and E. Vitagliano, *Cornering the axion with CP-violating interactions*, *Phys. Rev. D* **102** (2020) 115026 [[2010.03889](#)].
- [107] E. Hardy and R. Lasenby, *Stellar cooling bounds on new light particles: plasma mixing effects*, *JHEP* **02** (2017) 033 [[1611.05852](#)].
- [108] J. Bergé, P. Brax, G. Métris, M. Pernot-Borràs, P. Touboul and J.-P. Uzan, *MICROSCOPE Mission: First Constraints on the Violation of the Weak Equivalence Principle by a Light Scalar Dilaton*, *Phys. Rev. Lett.* **120** (2018) 141101 [[1712.00483](#)].
- [109] G. L. Smith, C. D. Hoyle, J. H. Gundlach, E. G. Adelberger, B. R. Heckel and H. E. Swanson, *Short range tests of the equivalence principle*, *Phys. Rev. D* **61** (2000) 022001.
- [110] D. J. Kapner, T. S. Cook, E. G. Adelberger, J. H. Gundlach, B. R. Heckel, C. D. Hoyle and H. E. Swanson, *Tests of the gravitational inverse-square law below the dark-energy length scale*, *Phys. Rev. Lett.* **98** (2007) 021101 [[hep-ph/0611184](#)].
- [111] J. Lee, E. Adelberger, T. Cook, S. Fleischer and B. Heckel, *New Test of the Gravitational $1/r^2$ Law at Separations down to 52 μm* , *Phys. Rev. Lett.* **124** (2020) 101101 [[2002.11761](#)].
- [112] J. K. Hoskins, R. D. Newman, R. Spero and J. Schultz, *Experimental tests of the gravitational inverse square law for mass separations from 2-cm to 105-cm*, *Phys. Rev. D* **32** (1985) 3084.
- [113] J. Ke, J. Luo, C.-G. Shao, Y.-J. Tan, W.-H. Tan and S.-Q. Yang, *Combined Test of the Gravitational Inverse-Square Law at the Centimeter Range*, *Phys. Rev. Lett.* **126** (2021) 211101.
- [114] L.-C. Tu, S.-G. Guan, J. Luo, C.-G. Shao and L.-X. Liu, *Null Test of Newtonian Inverse-Square Law at Submillimeter Range with a Dual-Modulation Torsion Pendulum*, *Phys. Rev. Lett.* **98** (2007) 201101.
- [115] S.-Q. Yang, B.-F. Zhan, Q.-L. Wang, C.-G. Shao, L.-C. Tu, W.-H. Tan and J. Luo, *Test of the Gravitational Inverse Square Law at Millimeter Ranges*, *Phys. Rev. Lett.* **108** (2012) 081101.
- [116] W.-H. Tan et al., *Improvement for Testing the Gravitational Inverse-Square Law at the Submillimeter Range*, *Phys. Rev. Lett.* **124** (2020) 051301.
- [117] W.-H. Tan, S.-Q. Yang, C.-G. Shao, J. Li, A.-B. Du, B.-F. Zhan, Q.-L. Wang, P.-S. Luo, L.-C. Tu and J. Luo, *New Test of the Gravitational Inverse-Square Law at the Submillimeter Range with Dual Modulation and Compensation*, *Phys. Rev. Lett.* **116** (2016) 131101.
- [118] A. A. Geraci, S. J. Smullin, D. M. Weld, J. Chiaverini and A. Kapitulnik, *Improved constraints on non-Newtonian forces at 10 microns*, *Phys. Rev. D* **78** (2008) 022002 [[0802.2350](#)].
- [119] Y.-J. Chen, W. Tham, D. Krause, D. Lopez, E. Fischbach and R. Decca, *Stronger Limits on Hypothetical Yukawa Interactions in the 30–8000 nm Range*, *Phys. Rev. Lett.* **116** (2016) 221102 [[1410.7267](#)].
- [120] B. R. Heckel, E. Adelberger, C. Cramer, T. Cook, S. Schlamminger and U. Schmidt, *Preferred-Frame and CP-Violation Tests with Polarized Electrons*, *Phys. Rev. D* **78** (2008) 092006 [[0808.2673](#)].
- [121] D. J. Wineland, J. J. Bollinger, D. J. Heinzen, W. M. Itano and M. G. Raizen, *Search for anomalous spin-dependent forces using stored-ion spectroscopy*, *Phys. Rev. Lett.* **67** (1991) 1735.
- [122] J. Lee, A. Almasi and M. Romalis, *Improved Limits on Spin-Mass Interactions*, *Phys. Rev. Lett.* **120** (2018) 161801 [[1801.02757](#)].
- [123] N. Crescini, C. Braggio, G. Carugno, P. Falferi, A. Ortolan and G. Ruoso, *The QUAX- g_p g_s experiment to search for monopole-dipole Axion interaction*, *Nucl. Instrum. Meth. A* **842** (2017) 109 [[1606.04751](#)].

- [124] N. Crescini, C. Braggio, G. Carugno, P. Falferi, A. Ortolan and G. Ruoso, *Improved constraints on monopole-dipole interaction mediated by pseudo-scalar bosons*, *Phys. Lett. B* **773** (2017) 677 [[1705.06044](#)].
- [125] W. Terrano, E. Adelberger, J. Lee and B. Heckel, *Short-range spin-dependent interactions of electrons: a probe for exotic pseudo-Goldstone bosons*, *Phys. Rev. Lett.* **115** (2015) 201801 [[1508.02463](#)].
- [126] S. A. Hoedl, F. Fleischer, E. G. Adelberger and B. R. Heckel, *Improved Constraints on an Axion-Mediated Force*, *Phys. Rev. Lett.* **106** (2011) 041801.
- [127] XENON Collaboration, E. Aprile et al., *Light Dark Matter Search with Ionization Signals in XENON1T*, *Phys. Rev. Lett.* **123** (2019) 251801 [[1907.11485](#)].
- [128] B. Venema, P. Majumder, S. Lamoreaux, B. Heckel and E. Fortson, *Search for a coupling of the Earth's gravitational field to nuclear spins in atomic mercury*, *Phys. Rev. Lett.* **68** (1992) 135.
- [129] M. Safronova, D. Budker, D. DeMille, D. F. J. Kimball, A. Derevianko and C. Clark, *Search for New Physics with Atoms and Molecules*, *Rev. Mod. Phys.* **90** (2018) 025008 [[1710.01833](#)].
- [130] K. Tullney et al., *Constraints on Spin-Dependent Short-Range Interaction between Nucleons*, *Phys. Rev. Lett.* **111** (2013) 100801 [[1303.6612](#)].
- [131] A. Arvanitaki and A. A. Geraci, *Resonantly Detecting Axion-Mediated Forces with Nuclear Magnetic Resonance*, *Phys. Rev. Lett.* **113** (2014) 161801 [[1403.1290](#)].
- [132] M. Baryakhtar, M. Galanis, R. Lasenby and O. Simon, *Black hole superradiance of self-interacting scalar fields*, *Phys. Rev. D* **103** (2021) 095019 [[2011.11646](#)].
- [133] M. J. Stott, *Ultralight Bosonic Field Mass Bounds from Astrophysical Black Hole Spin*, [2009.07206](#).
- [134] V. Cardoso, O. J. C. Dias, G. S. Hartnett, M. Middleton, P. Pani and J. E. Santos, *Constraining the mass of dark photons and axion-like particles through black-hole superradiance*, *JCAP* **03** (2018) 043 [[1801.01420](#)].
- [135] A. Caputo, A. J. Millar, C. A. J. O'Hare and E. Vitagliano, *Dark photon limits: a cookbook*, [2105.04565](#).
- [136] A. S. Goldhaber and M. M. Nieto, *Photon and Graviton Mass Limits*, *Rev. Mod. Phys.* **82** (2010) 939 [[0809.1003](#)].
- [137] E. R. Williams, J. E. Faller and H. A. Hill, *New experimental Test of Coulomb's Law: A Laboratory Upper Limit on the Photon Rest Mass*, *Phys. Rev. Lett.* **26** (1971) 721.
- [138] D. F. Bartlett and S. Loegl, *Limits on an Electromagnetic Fifth Force*, *Phys. Rev. Lett.* **61** (1988) 2285.
- [139] L.-C. Tu, J. Luo and G. T. Gillies, *The Mass of the Photon*, *Rept. Prog. Phys.* **68** (2005) 77.
- [140] D. Kroff and P. C. Malta, *Constraining Hidden Photons via Atomic Force Microscope Measurements and the Plimpton-Lawton Experiment*, *Phys. Rev. D* **102** (2020) 095015 [[2008.02209](#)].
- [141] S. J. Plimpton and W. E. Lawton, *A Very Accurate Test of Coulomb's Law of Force Between Charges*, *Phys. Rev.* **50** (1936) 1066.
- [142] J. Jaeckel and S. Roy, *Spectroscopy as a Test of Coulomb's Law: A Probe of the Hidden Sector*, *Phys. Rev. D* **82** (2010) 125020 [[1008.3536](#)].
- [143] A. S. Goldhaber and M. M. Nieto, *Terrestrial and Extra-Terrestrial Limits on the Photon Mass*, *Rev. Mod. Phys.* **43** (1971) 277.
- [144] L. Davis, Jr., A. S. Goldhaber and M. M. Nieto, *Limit on the Photon Mass Deduced from Pioneer-10 Observations of Jupiter's Magnetic Field*, *Phys. Rev. Lett.* **35** (1975) 1402.
- [145] T. Inada, T. Namba, S. Asai, T. Kobayashi, Y. Tanaka, K. Tamasaku, K. Sawada and T. Ishikawa, *Results of a Search for Paraphotons with Intense X-ray Beams at SPring-8*, *Phys. Lett. B* **722** (2013) 301 [[1301.6557](#)].
- [146] R. Povey, J. Hartnett and M. Tobar, *Microwave Cavity Light Shining Through a Wall Optimization and Experiment*, *Phys. Rev. D* **82** (2010) 052003 [[1003.0964](#)].
- [147] S. R. Parker, J. G. Hartnett, R. G. Povey and M. E. Tobar, *Cryogenic Resonant Microwave Cavity Searches for Hidden Sector Photons*, *Phys. Rev. D* **88** (2013) 112004 [[1410.5244](#)].
- [148] ADMX Collaboration, A. Wagner et al., *A Search for Hidden Sector Photons with ADMX*, *Phys. Rev. Lett.* **105** (2010) 171801 [[1007.3766](#)].
- [149] M. Danilov, S. Demidov and D. Gorbunov, *Constraints on Hidden Photons Produced in Nuclear Reactors*, *Phys. Rev. Lett.* **122** (2019) 041801 [[1804.10777](#)].
- [150] H.-S. Zechlin, D. Horns and J. Redondo, *New Constraints on Hidden Photons using Very High Energy Gamma-Rays from the Crab Nebula*, *AIP Conf. Proc.* **1085** (2009) 727 [[0810.5501](#)].
- [151] A. Caputo, H. Liu, S. Mishra-Sharma and J. T. Ruderman, *Dark Photon Oscillations in Our Inhomogeneous Universe*, *Phys. Rev. Lett.* **125** (2020) 221303 [[2002.05165](#)].
- [152] J. Redondo, *Helioscope Bounds on Hidden Sector Photons*, *JCAP* **07** (2008) 008 [[0801.1527](#)].
- [153] M. Schwarz, E.-A. Knabbe, A. Lindner, J. Redondo, A. Ringwald, M. Schneide, J. Susol and G. Wiedemann, *Results from the Solar Hidden Photon Search (SHIPS)*, *JCAP* **08** (2015) 011 [[1502.04490](#)].
- [154] J. Redondo and G. Raffelt, *Solar Constraints on Hidden Photons Re-visited*, *JCAP* **08** (2013) 034 [[1305.2920](#)].
- [155] D. K. Hong, C. Sub Shin and S. Yun, *Cooling of young neutron stars and dark gauge bosons*, [2012.05427](#).

- [156] N. Vinyoles, A. Serenelli, F. L. Villante, S. Basu, J. Redondo and J. Isern, *New Axion and Hidden Photon Constraints from a Solar Data Global Fit*, *JCAP* **10** (2015) 015 [[1501.01639](#)].
- [157] P. Arias, D. Cadamuro, M. Goodsell, J. Jaeckel, J. Redondo and A. Ringwald, *WISPy Cold Dark Matter*, *JCAP* **06** (2012) 013 [[1201.5902](#)].
- [158] S. D. McDermott and S. J. Witte, *Cosmological Evolution of Light Dark Photon Dark Matter*, *Phys. Rev. D* **101** (2020) 063030 [[1911.05086](#)].
- [159] S. J. Witte, S. Rosauero-Alcaraz, S. D. McDermott and V. Poulin, *Dark Photon Dark Matter in the Presence of Inhomogeneous Structure*, *JHEP* **06** (2020) 132 [[2003.13698](#)].
- [160] A. Caputo, H. Liu, S. Mishra-Sharma and J. T. Ruderman, *Modeling Dark Photon Oscillations in Our Inhomogeneous Universe*, *Phys. Rev. D* **102** (2020) 103533 [[2004.06733](#)].
- [161] S. Dubovsky and G. Hernández-Chifflet, *Heating up the Galaxy with Hidden Photons*, *JCAP* **12** (2015) 054 [[1509.00039](#)].
- [162] D. Wadekar and G. R. Farrar, *First Astrophysical Constraints on Dark Matter Interactions with Ordinary Matter at Low Relative Velocity*, [1903.12190](#).
- [163] A. Bhoonah, J. Bramante and N. Song, *Superradiant Searches for Dark Photons in Two Stage Atomic Transitions*, *Phys. Rev. D* **101** (2020) 055040 [[1909.07387](#)].
- [164] DAMIC Collaboration, A. Aguilar-Arevalo et al., *Constraints on Light Dark Matter Particles Interacting with Electrons from DAMIC at SNOLAB*, *Phys. Rev. Lett.* **123** (2019) 181802 [[1907.12628](#)].
- [165] B. Godfrey et al., *Search for Dark Photon Dark Matter: Dark E-Field Radio Pilot Experiment*, [2101.02805](#).
- [166] A. Phipps et al., *Exclusion Limits on Hidden-Photon Dark Matter near 2 neV from a Fixed-Frequency Superconducting Lumped-Element Resonator*, *Springer Proc. Phys.* **245** (2020) 139 [[1906.08814](#)].
- [167] FUNK EXPERIMENT Collaboration, A. Andrianavalomahefa et al., *Limits from the Funk Experiment on the Mixing Strength of Hidden-Photon Dark Matter in the Visible and Near-Ultraviolet Wavelength Range*, *Phys. Rev. D* **102** (2020) 042001 [[2003.13144](#)].
- [168] SENSEI Collaboration, L. Barak et al., *SENSEI: Direct-Detection Results on sub-GeV Dark Matter from a New Skipper-CCD*, *Phys. Rev. Lett.* **125** (2020) 171802 [[2004.11378](#)].
- [169] P. Brun, L. Chevalier and C. Flouzat, *Direct Searches for Hidden-Photon Dark Matter with the SHUKET Experiment*, *Phys. Rev. Lett.* **122** (2019) 201801 [[1905.05579](#)].
- [170] SUPERCDMS Collaboration, T. Aralis et al., *Constraints on dark photons and axionlike particles from the SuperCDMS Soudan experiment*, *Phys. Rev. D* **101** (2020) 052008 [[1911.11905](#)]. [Erratum: *Phys.Rev.D* 103, 039901 (2021)].
- [171] M. A. Fedderke, P. W. Graham, D. F. Jackson Kimball and S. Kalia, *Search for dark-photon dark matter in the SuperMAG geomagnetic field dataset*, [2108.08852](#).
- [172] M. A. Fedderke, P. W. Graham, D. F. J. Kimball and S. Kalia, *The Earth as a transducer for dark-photon dark-matter detection*, [2106.00022](#).
- [173] A. V. Dixit, S. Chakram, K. He, A. Agrawal, R. K. Naik, D. I. Schuster and A. Chou, *Searching for Dark Matter with a Superconducting Qubit*, *Phys. Rev. Lett.* **126** (2021) 141302 [[2008.12231](#)].
- [174] J. Suzuki, T. Horie, Y. Inoue and M. Minowa, *Experimental Search for Hidden Photon CDM in the eV mass range with a Dish Antenna*, *JCAP* **09** (2015) 042 [[1504.00118](#)].
- [175] S. Knirck, T. Yamazaki, Y. Okesaku, S. Asai, T. Idehara and T. Inada, *First Results from a Hidden Photon Dark Matter Search in the meV Sector Using a Plane-Parabolic Mirror System*, *JCAP* **11** (2018) 031 [[1806.05120](#)].
- [176] N. Tomita, S. Oguri, Y. Inoue, M. Minowa, T. Nagasaki, J. Suzuki and O. Tajima, *Search for Hidden-Photon Cold Dark Matter Using a K-Band Cryogenic Receiver*, *JCAP* **09** (2020) 012 [[2006.02828](#)].
- [177] L. H. Nguyen, A. Lobanov and D. Horns, *First results from the WISPDMMX Radio Frequency Cavity Searches for Hidden Photon Dark Matter*, *JCAP* **10** (2019) 014 [[1907.12449](#)].
- [178] XENON Collaboration, E. Aprile et al., *Excess Electronic Recoil Events in XENON1T*, *Phys. Rev. D* **102** (2020) 072004 [[2006.09721](#)].
- [179] I. M. Bloch, A. Caputo, R. Essig, D. Redigolo, M. Sholapurkar and T. Volansky, *Exploring New Physics with O(keV) Electron Recoils in Direct Detection Experiments*, *JHEP* **01** (2021) 178 [[2006.14521](#)].