References for AxionLimits webpage

Ciaran A. J. O'Hare

ARC Centre of Excellence for Dark Matter Particle Physics
The University of Sydney, Camperdown, NSW 2006, Australia

1 Axion-photon

Haloscopes

- ABRACADABRA [1, 2]
- ADMX [3, 4, 5, 6]
- ADMX-Sidecar [7, 8]
- ADMX-SLIC [9]
- CAPP [10, 11, 12, 13]
- BASE [14]
- GrAHal [15]
- HAYSTAC [16, 17]
- ORGAN [18, 19]
- QUAX [20, 21]
- RADES [22]
- RBF [23]
- SHAFT [24]
- TASEH [25]
- SuperMAG [26]
- UF [27]
- UPLOAD-DOWNLOAD [28]
- ABRACADABRA (projection) [29]
- ADBC (projection) [30]
- ADMX (projection) [31]
- aLIGO (projection) [32]
- ALPHA (projection) [33]
- BRASS (projection) [34]
- BREAD (projection) [35]
- CADEx (projection) [36]
- DM-Radio (projection) [37, 38]
- DANCE (projection) [39]
- LAMPOST (projection) [40]
- MADMAX (projection) [41]
- FLASH (projection) [42, 43]
- QUAX (projection) [44]
- ORGAN (projection) [18]
- TOORAD (projection) [45]
- WISPLC (projection) [46]
- SRF heterodyne cavity (projection) [47]

LSW/Helioscopes

- ALPS [48]
- CAST [49, 50]
- CROWS [51]
- OSQAR [52]
- PVLAS [53]
- SAPPHIRES [54]
- ALPS-II (projection) [55]
- IAXO (projection) [56]
- IAXO (Galactic SN) [57]

Astro

- Betelgeuse [58]
- Breakthrough Listen (Doppler shifted radio line in MW) [59]
- Breakthrough Listen (Neutron stars) [60]
- Bullet Cluster (archival radio data) [61]
- Cosmic IR background (hint) [62]
- Chandra (Hydra) [63]
- Chandra (M87) [64]
- Chandra (NG7 1275) [65]
- Chandra (H1821+643) [66]
- Chandra (Magnetic white dwarfs) [66]
- COBE/FIRAS+Planck spectral dist. [67]
- Diffuse SN ALPs [68] (see also [69])
- Distance ladder [70]
- Fermi-LAT (NGC 1275) [71]
- Fermi-LAT (Extragalactic SNe) [72]
- Globular clusters (R parameter) [73]
- Globular clusters (R_2 parameter) [74]
- HAWC (TeV Blazars) [75]
- HESS (PKS 2155-304) [76]
- Leo T gas temperature [77]
- Magnetic white dwarf polarization [78]
- Mrk 421 (ARGO-YBJ+Fermi): [79]
- Neutron Stars (Foster et al.) [80]
- Neutron Stars (Darling) [81]
- Neutron Stars (Battye et al.) [82]
- Solar neutrinos [83]
- SN1987A-γ [84]
- SN1987A-γ (low mass ALPs) [85]
- SN1987A-γ,ν (high mass ALPs) [86]
- Low-energy supernovae (ALP decay) [87]
- Solar basin (NuSTAR) [88]
- Star clusters [89]
- Telescopes (Haystack) [90]
- Telescopes (MUSE) [91]
- Telescopes (VIMOS) [92]
- Telescopes (HST) [93]
- Fermi galactic SN (projection) [94]
- THESEUS (projection) [95]
- eROSITA (projection) [96]
- White dwarf initial-final mass relation [97]
- XMM-Newton (decaying DM ALPs) [98]

Cosmology

- Ionisation fraction, EBL, X-rays [99]
- BBN+$N_{\rm eff}$ [100]

2 Axion-electron

- EDELWEISS [101]
- Magnon non-demolition [102]
- GERDA [103]
- LUX [104]
- Panda-X [105]
- SuperCDMS [106]
- XENON1T [107, 108]
- XENONnT [in prep.]
- XENON1T (Solar basin) [109]
- Red giants (ωCen) [110]
- Solar neutrinos [111]
- Magnons (projection) [112]
- Polaritons (projection) [113]
- DARWIN (projection) [114]
- LZ (projection) [115]
- QUAX [116, 117]
- Semiconductors (projection) [118]
- White dwarf hint [119]
- X-rays (1-loop decay) [120]

3 Axion-nucleon

Note: CASPEr and nEDM limits account for stochastic correction reported in [121]

- CASPEr-ZULF-Comagnetometer [122]
- CASPEr-ZULF-Sidechain [123]
- nEDM (ultracold neutrons and mercury) [124]
- NASDUCK [125]
- K-3He comagnetometer [126]
- Old comagnetometers [127]
- Torsion balance [128]
- Neutron star cooling [129] (corrected from [130])
- SN1987A Cooling [131]
- SNO (deuterium dissasociation) [132]
- Proton storage ring (projection) [133]
- DM comagnetometer (projection) [127]
- CASPEr-wind (projection) [123]

4 Axion-EDM

- Beam EDM [134]
- CASPEr-electric [135]
- nEDM [124]
- HfF^+ [136]
- SN1987A [137]
- *Planck*+BAO thermal axion bound [138]
- CASPEr-electric (projection) [139]
- Storage Ring EDM (projection) [139]

5 Axion mass versus f_a

- BBN [140]
- Beam EDM [134]
- Binary pulsars and Solar core constraint on $\bar{\theta}$ [141]. I include minor numerical corrections made by [142, 143].
- GW170817 [144]
- HfF^+ [136]
- nEDM [124]
- Piezoaxionic effect (projection) [145]
- SN1987A [137]
- Neutron stars (projection) [141].
- NS-NS and NS-BH Inspirals (projection) [141].

6 Axion theory predictions

6.1 Post-inflation QCD axion

- Ballesteros et al. [146]
- Buschmann et al. 2020 [147]
- Buschmann et al. 2021 [148]
- Bonati et al. [149]
- Borsanyi et al. [150]
- Berkowitz et al. [151]
- Dine et al. [152]
- Petreczky et al. [153]
- Fleury & Moore [154]
- Klaer & Moore [155]

6.2 Other dark matter predictions

- ALP Cogenesis [156]
- Early matter domination [157]
- Post-inflation ALP misalignment [158]
- Trapped misalignment ($\mathcal{Z}_N$ axion) [142]

7 CP-violating couplings

Combined constraints [159]

Scalar-nucleon

- Red giants [160]
- MICROSCOPE [161].
- Eot-Wash [162, 163, 164]
- Irvine [165]. Corrected to 2σ limit by [166]
- HUST [167, 168, 169, 170].
- Stanford [171]
- IUPUI [172].
- Wuhan [166]

Pseudoscalar-electron

- Red giants [160]
- Eot-wash [173]
- NIST [174]
- SMILE [175].
- QUAX [176, 177]
- Washington [178, 179].
- XENON1T [180]
- Magnon (projection) [113]
- QUAX (projection) [176].

Pseudoscalar-nucleon

- Neutron star cooling [130]
- Washington [181]. Limit taken from [182].
- SMILE [175].
- Mainz [183]
- ARIADNE (projection) [184]
- CASPEr-wind (projection) [139]
- DM comagnetometer (projection) [127]

8 Black hole superradiance

- Baryakhtar et al. [185] (just Stellar mass BHs)
- Mehta et al. [185] (Stellar mass and SMBHs)
- Stott [186]
- Ünal et al. [187] (Quasars)
- Cardoso et al. [188] (dark photon)

9 Dark photons

Combined constraints [189]

SM photon-DP transitions

- Coulomb [190, 191, 192, 193, 194],
- Plimpton & Lawton's experiment [195, 194]
- Atomic spectroscopy [196]
- Atomic force microscopy (AFM) [194]
- Static magnetic field of the Earth [197, 198, 199]
- Static magnetic field of Jupiter [200, 199].
- ALPs [48]
- SPring-8 [201]
- UWA-LSW [202, 203]
- ADMX-LSW [204]
- CROWS [51].
- TEXONO [205]
- Crab nebula [206]
- COBE and FIRAS [207]

Production in stars

- CAST [208]
- SHIP [209]
- HB and RG stars [210]
- Neutron stars [211]
- Solar neutrinos [212]

Dark matter cosmology/astro

- Arias et al. [158]
- Witte et al. [213, 214]
- Caputo et al. [215, 207],
- IGM [216],
- Leo T dwarf [217]
- Gas clouds [218]

Dark matter experiments

- Reinterpreted axion limits [189]
- BREAD (projection) [35]
- DAMIC [219]
- Dark E-field Radio [220]
- DM Pathfinder [221]
- DOSUE-RR [222]
- FAST Radio antenna [223]
- FUNK [224]
- LAMPOST [225]
- MuDHI [226]
- ORPHEUS [227]
- SENSEI [228]
- SHUKET [229]
- SuperCDMS [230]
- SuperMAG [231, 232]
- SQuAD [233],
- SQMS [234],
- Tokyo dish antennae experiments [235, 236, 237]
- WISPDMX [238]
- XENON(100,1T,nT) [118, 180, 239, 240, 241, 242].

References

[1] J. L. Ouellet et al., *First Results from ABRACADABRA-10 cm: A Search for Sub-μeV Axion Dark Matter*, *Phys. Rev. Lett.* **122** (2019) 121802 [1810.12257].

[2] C. P. Salemi et al., *Search for Low-Mass Axion Dark Matter with ABRACADABRA-10 cm*, *Phys. Rev. Lett.* **127** (2021) 081801 [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. Bartram et al., *Search for Invisible Axion Dark Matter in the 3.3–4.2 μeV Mass Range*, *Phys. Rev. Lett.* **127** (2021) 261803 [2110.06096].

[7] ADMX Collaboration, C. Boutan et al., *Piezoelectrically Tuned Multimode Cavity Search for Axion Dark Matter*, *Phys. Rev. Lett.* **121** (2018) 261302 [1901.00920].

[8] C. Bartram et al., *Dark Matter Axion Search Using a Josephson Traveling Wave Parametric Amplifier*, 2110.10262.

[9] 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].

[10] S. Lee, S. Ahn, J. Choi, B. R. Ko and Y. K. Semertzidis, *Axion Dark Matter Search around 6.7 μeV*, *Phys. Rev. Lett.* **124** (2020) 101802 [2001.05102].

[11] 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].

[12] CAPP Collaboration, O. Kwon et al., *First Results from an Axion Haloscope at CAPP around 10.7 μeV*, *Phys. Rev. Lett.* **126** (2021) 191802 [2012.10764].

[13] Y. Lee, B. Yang, H. Yoon, M. Ahn, H. Park, B. Min, D. Kim and J. Yoo, *Searching for Invisible Axion Dark Matter with an 18 T Magnet Haloscope*, *Phys. Rev. Lett.* **128** (2022) 241805 [2206.08845].

[14] 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].

[15] T. Grenet, R. Ballou, Q. Basto, K. Martineau, P. Perrier, P. Pugnat, J. Quevillon, N. Roch and C. Smith, *The Grenoble Axion Haloscope platform (GrAHal): development plan and first results*, 2110.14406.

[16] 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].

[17] HAYSTAC Collaboration, K. M. Backes et al., *A quantum-enhanced search for dark matter axions*, *Nature* **590** (2021) 238 [2008.01853].

[18] 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].

[19] A. P. Quiskamp, B. T. McAllister, P. Altin, E. N. Ivanov, M. Goryachev and M. E. Tobar, *Direct search for dark matter axions excluding ALP cogenesis in the 63- to 67-μeV range with the ORGAN experiment*, *Sci. Adv.* **8** (2022) abq3765 [2203.12152].

[20] D. Alesini et al., *Galactic axions search with a superconducting resonant cavity*, *Phys. Rev. D* **99** (2019) 101101 [1903.06547].

[21] D. Alesini et al., *Search for invisible axion dark matter of mass $m_a = 43$ μeV with the QUAX–aγ experiment*, *Phys. Rev. D* **103** (2021) 102004 [2012.09498].

[22] CAST Collaboration, A. A. Melcón et al., *First results of the CAST-RADES haloscope search for axions at 34.67 μeV*, *JHEP* **21** (2020) 075 [2104.13798].

[23] 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 μev*, *Phys. Rev. Lett.* **59** (1987) 839.

[24] 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].

[25] H. Chang et al., *First Results from the Taiwan Axion Search Experiment with Haloscope at 19.6 μeV*, 2205.05574.

[26] A. Arza, M. A. Fedderke, P. W. Graham, D. F. Jackson Kimball and S. Kalia, *Earth as a transducer for axion dark-matter detection*, 2112.09620.

[27] C. Hagmann, P. Sikivie, N. S. Sullivan and D. B. Tanner, *Results from a search for cosmic axions*, *Phys. Rev. D* **42** (1990) 1297.

[28] 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)].

[29] *Abracadabra*, https://abracadabra.mit.edu/.

[30] 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].

[31] I. Stern, *ADMX Status*, *PoS* **ICHEP2016** (2016) 198 [1612.08296].

[32] 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].

[33] M. Lawson, A. J. Millar, M. Pancaldi, E. Vitagliano and F. Wilczek, *Tunable axion plasma haloscopes*, *Phys. Rev. Lett.* **123** (2019) 141802 [1904.11872].

[34] *Brass*, https://www1.physik.uni-hamburg.de/iexp/gruppe-horns/forschung/brass.html.

[35] J. Liu et al., *Broadband solenoidal haloscope for terahertz axion detection*, 2111.12103.

[36] B. Aja et al., *The Canfranc Axion Detection Experiment (CADEx): Search for axions at 90 GHz with Kinetic Inductance Detectors*, 2206.02980.

[37] *DMRadio*, https://indico.mit.edu/event/151/contributions/295/attachments/96/172/Dark%20Matter%20Radio_CambridgeAxions2021.pdf.

[38] DMRadio Collaboration, L. Brouwer et al., *DMRadio-m^3: A Search for the QCD Axion Below* 1 μeV, 2204.13781.

[39] 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].

[40] 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].

[41] S. Beurthey et al., *MADMAX Status Report*, 2003.10894.

[42] D. Alesini, D. Babusci, D. Di Gioacchino, C. Gatti, G. Lamanna and C. Ligi, *The KLASH Proposal*, 1707.06010.

[43] C. Gatti, *From KLASH to FLASH: A Proposal for a 100-300 MHz Haloscope*, https://indico.cern.ch/event/1115163/contributions/4685952/attachments/2393240/4091553/FLASH-100MHZHaloscopeWorkshop.pdf.

[44] A. Rettaroli, *Probing the axion-photon interaction with QUAX experiment: status and perspectives*, https://agenda.infn.it/event/20431/contributions/137687/attachments/82511/108428/Rettaroli_Patras2021_compressed.pdf.

[45] J. Schütte-Engel, D. J. E. Marsh, A. J. Millar, A. Sekine, F. Chadha-Day, S. Hoof, M. N. Ali, K.-C. Fong, E. Hardy and L. Šmejkal, *Axion quasiparticles for axion dark matter detection*, *JCAP* **08** (2021) 066 [2102.05366].

[46] Z. Zhang, O. Ghosh and D. Horns, *WISPLC: Search for Dark Matter with LC Circuit*, 2111.04541.

[47] A. Berlin, R. T. D'Agnolo, S. A. R. Ellis and K. Zhou, *Heterodyne broadband detection of axion dark matter*, *Phys. Rev. D* **104** (2021) L111701 [2007.15656].

[48] K. Ehret et al., *New ALPS Results on Hidden-Sector Lightweights*, *Phys. Lett. B* **689** (2010) 149 [1004.1313].

[49] 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].

[50] CAST Collaboration, V. Anastassopoulos et al., *New CAST Limit on the Axion-Photon Interaction*, *Nature Phys.* **13** (2017) 584 [1705.02290].

[51] 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].

[52] 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].

[53] 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].

[54] SAPPHIRES Collaboration, K. Homma et al., *Search for sub-eV axion-like resonance states via stimulated quasi-parallel laser collisions with the parameterization including fully asymmetric collisional geometry*, 2105.01224.

[55] M. D. Ortiz et al., *Design of the ALPS II Optical System*, 2009.14294.

[56] 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].

[57] 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].

[58] M. Xiao, K. M. Perez, M. Giannotti, O. Straniero, A. Mirizzi, B. W. Grefenstette, B. M. Roach and M. Nynka, *Constraints on Axionlike Particles from a Hard X-Ray Observation of Betelgeuse*, *Phys. Rev. Lett.* **126** (2021) 031101 [2009.09059].

[59] A. Keller, S. O'Brien, A. Kamdar, N. Rapidis, A. Leder and K. van Bibber, *A Model-Independent Radio Telescope Dark Matter Search*, 2112.03439.

[60] J. W. Foster, S. J. Witte, M. Lawson, T. Linden, V. Gajjar, C. Weniger and B. R. Safdi, *Extraterrestrial Axion Search with the Breakthrough Listen Galactic Center Survey*, 2202.08274.

[61] M. H. Chan, *Constraining the axion-photon coupling using radio data of the Bullet Cluster*, *Sci. Rep.* **11** (2021) 20087 [2109.11734].

[62] K. Kohri and H. Kodama, *Axion-Like Particles and Recent Observations of the Cosmic Infrared Background Radiation*, *Phys. Rev. D* **96** (2017) 051701 [1704.05189].

[63] 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].

[64] 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].

[65] 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*, *Astrophys. J.* **890** (2020) 59 [1907.05475].

[66] J. S. Reynés, J. H. Matthews, C. S. Reynolds, H. R. Russell, R. N. Smith and M. C. D. Marsh, *New constraints on light Axion-Like Particles using Chandra Transmission Grating Spectroscopy of the powerful cluster-hosted quasar H1821+643*, 2109.03261.

[67] B. Bolliet, J. Chluba and R. Battye, *Spectral distortion constraints on photon injection from low-mass decaying particles*, *Mon. Not. Roy. Astron. Soc.* **507** (2021) 3148 [2012.07292].

[68] F. Calore, P. Carenza, C. Eckner, T. Fischer, M. Giannotti, J. Jaeckel, K. Kotake, T. Kuroda, A. Mirizzi and F. Sivo, *3D template-based Fermi-LAT constraints on axion-like particles*, 2110.03679.

[69] 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].

[70] M. A. Buen-Abad, J. Fan and C. Sun, *Constraints on Axions from Cosmic Distance Measurements*, 2011.05993.

[71] 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].

[72] 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)].

[73] 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].

[74] M. J. Dolan, F. J. Hiskens and R. R. Volkas, *Advancing Globular Cluster Constraints on the Axion-Photon Coupling*, 2207.03102.

[75] S. Jacobsen, T. Linden and K. Freese, *Constraining Axion-Like Particles with HAWC Observations of TeV Blazars*, 2203.04332.

[76] 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].

[77] D. Wadekar and Z. Wang, *Strong constraints on decay and annihilation of dark matter from heating of gas-rich dwarf galaxies*, 2111.08025.

[78] C. Dessert, D. Dunsky and B. R. Safdi, *Upper limit on the axion-photon coupling from magnetic white dwarf polarization*, 2203.04319.

[79] 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].

[80] 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].

[81] J. Darling, *New Limits on Axionic Dark Matter from the Magnetar PSR J1745-2900*, *Astrophys. J. Lett.* **900** (2020) L28 [2008.11188].

[82] R. A. Battye, J. Darling, J. McDonald and S. Srinivasan, *Towards Robust Constraints on Axion Dark Matter using PSR J1745-2900*, 2107.01225.

[83] 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].

[84] 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].

[85] 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].

[86] A. Caputo, G. Raffelt and E. Vitagliano, *Muonic boson limits: Supernova redux*, *Phys. Rev. D* **105** (2022) 035022 [2109.03244].

[87] A. Caputo, H.-T. Janka, G. Raffelt and E. Vitagliano, *Low-Energy Supernovae Severely Constrain Radiative Particle Decays*, *Phys. Rev. Lett.* **128** (2022) 221103 [2201.09890].

[88] W. DeRocco, S. Wegsman, B. Grefenstette, J. Huang and K. Van Tilburg, *First indirect detection constraints on axions in the Solar basin*, 2205.05700.

[89] 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].

[90] B. D. Blout, E. J. Daw, M. P. Decowski, P. T. P. Ho, L. J. Rosenberg and D. B. Yu, *A Radio telescope search for axions*, *Astrophys. J.* **546** (2001) 825 [astro-ph/0006310].

[91] 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].

[92] 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].

[93] K. Nakayama and W. Yin, *Anisotropic cosmic optical background bound for decaying dark matter in light of the LORRI anomaly*, 2205.01079.

[94] 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].

[95] 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].

[96] 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].

[97] M. J. Dolan, F. J. Hiskens and R. R. Volkas, *Constraining axion-like particles using the white dwarf initial-final mass relation*, *JCAP* **09** (2021) 010 [2102.00379].

[98] J. W. Foster, M. Kongsore, C. Dessert, Y. Park, N. L. Rodd, K. Cranmer and B. R. Safdi, *Deep Search for Decaying Dark Matter with XMM-Newton Blank-Sky Observations*, *Phys. Rev. Lett.* **127** (2021) 051101 [2102.02207].

[99] D. Cadamuro and J. Redondo, *Cosmological bounds on pseudo Nambu-Goldstone bosons*, *JCAP* **02** (2012) 032 [1110.2895].

[100] P. F. Depta, M. Hufnagel and K. Schmidt-Hoberg, *Robust cosmological constraints on axion-like particles*, *JCAP* **05** (2020) 009 [2002.08370].

[101] 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].

[102] T. Ikeda, A. Ito, K. Miuchi, J. Soda, H. Kurashige and Y. Shikano, *Axion search with quantum nondemolition detection of magnons*, 2102.08764.

[103] GERDA Collaboration, M. Agostini et al., *First Search for Bosonic Superweakly Interacting Massive Particles with Masses up to 1 MeV/c^2 with GERDA*, *Phys. Rev. Lett.* **125** (2020) 011801 [2005.14184].

[104] 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].

[105] 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].

[106] 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)].

[107] XENON Collaboration, E. Aprile et al., *Light Dark Matter Search with Ionization Signals in XENON1T*, *Phys. Rev. Lett.* **123** (2019) 251801 [1907.11485].

[108] XENON Collaboration, E. Aprile et al., *Excess electronic recoil events in XENON1T*, *Phys. Rev. D* **102** (2020) 072004 [2006.09721].

[109] K. Van Tilburg, *Stellar basins of gravitationally bound particles*, *Phys. Rev. D* **104** (2021) 023019 [2006.12431].

[110] 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].

[111] P. Gondolo and G. G. Raffelt, *Solar neutrino limit on axions and keV-mass bosons*, *Phys. Rev. D* **79** (2009) 107301 [0807.2926].

[112] 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].

[113] 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].

[114] DARWIN Collaboration, J. Aalbers et al., *DARWIN: towards the ultimate dark matter detector*, *JCAP* **11** (2016) 017 [1606.07001].

[115] LZ Collaboration, D. S. Akerib et al., *Projected sensitivities of the LUX-ZEPLIN experiment to new physics via low-energy electron recoils*, *Phys. Rev. D* **104** (2021) 092009 [2102.11740].

[116] N. Crescini et al., *Operation of a ferromagnetic axion haloscope at $m_a = 58\,\mu eV$*, *Eur. Phys. J. C* **78** (2018) 703 [1806.00310]. [Erratum: Eur.Phys.J.C 78, 813 (2018)].

[117] QUAX Collaboration, N. Crescini et al., *Axion search with a quantum-limited ferromagnetic haloscope*, *Phys. Rev. Lett.* **124** (2020) 171801 [2001.08940].

[118] 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].

[119] M. Giannotti, I. G. Irastorza, J. Redondo, A. Ringwald and K. Saikawa, *Stellar Recipes for Axion Hunters*, *JCAP* **10** (2017) 010 [1708.02111].

[120] R. Z. Ferreira, M. C. D. Marsh and E. Müller, *Do direct detection experiments constrain axionlike particles coupled to electrons?*, 2202.08858.

[121] G. P. Centers et al., *Stochastic fluctuations of bosonic dark matter*, *Nature Commun.* **12** (2021) 7321 [1905.13650].

[122] T. Wu et al., *Search for Axionlike Dark Matter with a Liquid-State Nuclear Spin Comagnetometer*, *Phys. Rev. Lett.* **122** (2019) 191302 [1901.10843].

[123] A. Garcon et al., *Constraints on bosonic dark matter from ultralow-field nuclear magnetic resonance*, *Sci. Adv.* **5** (2019) eaax4539 [1902.04644].

[124] 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].

[125] NASDUCK Collaboration, I. M. Bloch, G. Ronen, R. Shaham, O. Katz, T. Volansky and O. Katz, *New constraints on axion-like dark matter using a Floquet quantum detector*, *Sci. Adv.* **8** (2022) abl8919 [2105.04603].

[126] 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].

[127] 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].

[128] 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 Sqaure Law*, *Phys. Rev. Lett.* **98** (2007) 131104 [hep-ph/0611223].

[129] M. Buschmann, C. Dessert, J. W. Foster, A. J. Long and B. R. Safdi, *Upper Limit on the QCD Axion Mass from Isolated Neutron Star Cooling*, *Phys. Rev. Lett.* **128** (2022) 091102 [2111.09892].

[130] 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].

[131] 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)].

[132] 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].

[133] 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].

[134] I. Schulthess et al., *New Limit on Axion-Like Dark Matter using Cold Neutrons*, 2204.01454.

[135] D. Aybas et al., *Search for Axionlike Dark Matter Using Solid-State Nuclear Magnetic Resonance*, *Phys. Rev. Lett.* **126** (2021) 141802 [2101.01241].

[136] T. S. Roussy et al., *Experimental Constraint on Axionlike Particles over Seven Orders of Magnitude in Mass*, *Phys. Rev. Lett.* **126** (2021) 171301 [2006.15787].

[137] P. W. Graham and S. Rajendran, *New Observables for Direct Detection of Axion Dark Matter*, *Phys. Rev. D* **88** (2013) 035023 [1306.6088].

[138] L. Caloni, M. Gerbino, M. Lattanzi and L. Visinelli, *Novel cosmological bounds on thermally-produced axion-like particles*, 2205.01637.

[139] D. F. Jackson Kimball et al., *Overview of the Cosmic Axion Spin Precession Experiment (CASPEr)*, *Springer Proc. Phys.* **245** (2020) 105 [1711.08999].

[140] 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].

[141] A. Hook and J. Huang, *Probing axions with neutron star inspirals and other stellar processes*, *JHEP* **06** (2018) 036 [1708.08464].

[142] L. Di Luzio, B. Gavela, P. Quilez and A. Ringwald, *Dark matter from an even lighter QCD axion: trapped misalignment*, *JCAP* **10** (2021) 001 [2102.01082].

[143] L. Di Luzio, B. Gavela, P. Quilez and A. Ringwald, *An even lighter QCD axion*, *JHEP* **05** (2021) 184 [2102.00012].

[144] J. Zhang, Z. Lyu, J. Huang, M. C. Johnson, L. Sagunski, M. Sakellariadou and H. Yang, *First Constraints on Nuclear Coupling of Axionlike Particles from the Binary Neutron Star Gravitational Wave Event GW170817*, *Phys. Rev. Lett.* **127** (2021) 161101 [2105.13963].

[145] A. Arvanitaki, A. Madden and K. Van Tilburg, *The Piezoaxionic Effect*, 2112.11466.

[146] G. Ballesteros, J. Redondo, A. Ringwald and C. Tamarit, *Unifying inflation with the axion, dark matter, baryogenesis and the seesaw mechanism*, *Phys. Rev. Lett.* **118** (2017) 071802 [1608.05414].

[147] M. Buschmann, J. W. Foster and B. R. Safdi, *Early-Universe Simulations of the Cosmological Axion*, *Phys. Rev. Lett.* **124** (2020) 161103 [1906.00967].

[148] M. Buschmann, J. W. Foster, A. Hook, A. Peterson, D. E. Willcox, W. Zhang and B. R. Safdi, *Dark matter from axion strings with adaptive mesh refinement*, *Nature Commun.* **13** (2022) 1049 [2108.05368].

[149] C. Bonati, M. D'Elia, M. Mariti, G. Martinelli, M. Mesiti, F. Negro, F. Sanfilippo and G. Villadoro, *Axion phenomenology and θ-dependence from $N_f = 2+1$ lattice QCD*, *JHEP* **03** (2016) 155 [1512.06746].

[150] S. Borsanyi et al., *Calculation of the axion mass based on high-temperature lattice quantum chromodynamics*, *Nature* **539** (2016) 69 [1606.07494].

[151] E. Berkowitz, M. I. Buchoff and E. Rinaldi, *Lattice QCD input for axion cosmology*, *Phys. Rev. D* **92** (2015) 034507 [1505.07455].

[152] M. Dine, P. Draper, L. Stephenson-Haskins and D. Xu, *Axions, Instantons, and the Lattice*, *Phys. Rev. D* **96** (2017) 095001 [1705.00676].

[153] P. Petreczky, H.-P. Schadler and S. Sharma, *The topological susceptibility in finite temperature QCD and axion cosmology*, *Phys. Lett. B* **762** (2016) 498 [1606.03145].

[154] L. Fleury and G. D. Moore, *Axion dark matter: strings and their cores*, *JCAP* **01** (2016) 004 [1509.00026].

[155] V. B. . Klaer and G. D. Moore, *The dark-matter axion mass*, *JCAP* **11** (2017) 049 [1708.07521].

[156] R. T. Co, L. J. Hall and K. Harigaya, *Predictions for Axion Couplings from ALP Cogenesis*, *JHEP* **01** (2021) 172 [2006.04809].

[157] N. Blinov, M. J. Dolan, P. Draper and J. Kozaczuk, *Dark matter targets for axionlike particle searches*, *Phys. Rev. D* **100** (2019) 015049 [1905.06952].

[158] P. Arias, D. Cadamuro, M. Goodsell, J. Jaeckel, J. Redondo and A. Ringwald, *WISPy Cold Dark Matter*, *JCAP* **06** (2012) 013 [1201.5902].

[159] C. A. J. O'Hare and E. Vitagliano, *Cornering the axion with CP-violating interactions*, *Phys. Rev. D* **102** (2020) 115026 [2010.03889].

[160] E. Hardy and R. Lasenby, *Stellar cooling bounds on new light particles: plasma mixing effects*, *JHEP* **02** (2017) 033 [1611.05852].

[161] 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].

[162] 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.

[163] 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].

[164] 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].

[165] 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.

[166] 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.

[167] 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.

[168] 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.

[169] W.-H. Tan et al., *Improvement for Testing the Gravitational Inverse-Square Law at the Submillimeter Range*, *Phys. Rev. Lett.* **124** (2020) 051301.

[170] 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.

[171] 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].

[172] 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].

[173] 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].

[174] 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.

[175] J. Lee, A. Almasi and M. Romalis, *Improved Limits on Spin-Mass Interactions*, *Phys. Rev. Lett.* **120** (2018) 161801 [1801.02757].

[176] 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].

[177] 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].

[178] 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].

[179] 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.

[180] XENON Collaboration, E. Aprile et al., *Light Dark Matter Search with Ionization Signals in XENON1T*, *Phys. Rev. Lett.* **123** (2019) 251801 [1907.11485].

[181] 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.

[182] 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].

[183] K. Tullney et al., *Constraints on Spin-Dependent Short-Range Interaction between Nucleons*, *Phys. Rev. Lett.* **111** (2013) 100801 [1303.6612].

[184] A. Arvanitaki and A. A. Geraci, *Resonantly Detecting Axion-Mediated Forces with Nuclear Magnetic Resonance*, *Phys. Rev. Lett.* **113** (2014) 161801 [1403.1290].

[185] 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].

[186] M. J. Stott, *Ultralight Bosonic Field Mass Bounds from Astrophysical Black Hole Spin*, 2009.07206.

[187] C. Ünal, F. Pacucci and A. Loeb, *Properties of ultralight bosons from heavy quasar spins via superradiance*, *JCAP* **05** (2021) 007 [2012.12790].

[188] 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].

[189] A. Caputo, A. J. Millar, C. A. J. O'Hare and E. Vitagliano, *Dark photon limits: A handbook*, *Phys. Rev. D* **104** (2021) 095029 [2105.04565].

[190] A. S. Goldhaber and M. M. Nieto, *Photon and Graviton Mass Limits*, *Rev. Mod. Phys.* **82** (2010) 939 [0809.1003].

[191] 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.

[192] D. F. Bartlett and S. Loegl, *Limits on an Electromagnetic Fifth Force*, *Phys. Rev. Lett.* **61** (1988) 2285.

[193] L.-C. Tu, J. Luo and G. T. Gillies, *The Mass of the Photon*, *Rept. Prog. Phys.* **68** (2005) 77.

[194] 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].

[195] S. J. Plimpton and W. E. Lawton, *A Very Accurate Test of Coulomb's Law of Force Between Charges*, *Phys. Rev.* **50** (1936) 1066.

[196] 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].

[197] A. S. Goldhaber and M. M. Nieto, *Terrestrial and Extra-Terrestrial Limits on the Photon Mass*, *Rev. Mod. Phys.* **43** (1971) 277.

[198] E. Fischbach, H. Kloor, R. A. Langel, A. T. Y. Liu and M. Peredo, *New geomagnetic limits on the photon mass and on long range forces coexisting with electromagnetism*, *Phys. Rev. Lett.* **73** (1994) 514.

[199] G. Marocco, *Dark photon limits from magnetic fields and astrophysical plasmas*, 2110.02875.

[200] 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.

[201] 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].

[202] 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].

[203] 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].

[204] ADMX Collaboration, A. Wagner et al., *A Search for Hidden Sector Photons with ADMX*, *Phys. Rev. Lett.* **105** (2010) 171801 [1007.3766].

[205] M. Danilov, S. Demidov and D. Gorbunov, *Constraints on Hidden Photons Produced in Nuclear Reactors*, *Phys. Rev. Lett.* **122** (2019) 041801 [1804.10777].

[206] 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].

[207] 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].

[208] J. Redondo, *Helioscope Bounds on Hidden Sector Photons*, *JCAP* **07** (2008) 008 [0801.1527].

[209] 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].

[210] J. Redondo and G. Raffelt, *Solar Constraints on Hidden Photons Re-visited*, *JCAP* **08** (2013) 034 [1305.2920].

[211] D. K. Hong, C. S. Shin and S. Yun, *Cooling of young neutron stars and dark gauge bosons*, *Phys. Rev. D* **103** (2021) 123031 [2012.05427].

[212] 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].

[213] S. D. McDermott and S. J. Witte, *Cosmological Evolution of Light Dark Photon Dark Matter*, *Phys. Rev. D* **101** (2020) 063030 [1911.05086].

[214] S. J. Witte, S. Rosauro-Alcaraz, S. D. McDermott and V. Poulin, *Dark Photon Dark Matter in the Presence of Inhomogeneous Structure*, *JHEP* **06** (2020) 132 [2003.13698].

[215] 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].

[216] S. Dubovsky and G. Hernández-Chifflet, *Heating up the Galaxy with Hidden Photons*, *JCAP* **12** (2015) 054 [1509.00039].

[217] D. Wadekar and G. R. Farrar, *Gas-rich dwarf galaxies as a new probe of dark matter interactions with ordinary matter*, *Phys. Rev. D* **103** (2021) 123028 [1903.12190].

[218] 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].

[219] 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].

[220] B. Godfrey et al., *Search for dark photon dark matter: Dark E field radio pilot experiment*, *Phys. Rev. D* **104** (2021) 012013 [2101.02805].

[221] 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].

[222] DOSUE-RR Collaboration, S. Kotaka et al., *Search for dark photon cold dark matter in the mass range 74–110 μeV/c^2 with a cryogenic millimeter-wave receiver*, 2205.03679.

[223] H. An, S. Ge, W.-Q. Guo, X. Huang, J. Liu and Z. Lu, *Direct detection of dark photon dark matter using radio telescopes*, 2207.05767.

[224] 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].

[225] J. Chiles et al., *First Constraints on Dark Photon Dark Matter with Superconducting Nanowire Detectors in an Optical Haloscope*, 2110.01582.

[226] L. Manenti, U. Mishra, G. Bruno, A. Di Giovanni, A. J. Millar, K. D. Morå, H. Roberts, P. Oikonomou, I. Sarnoff and F. Arneodo, *Search for dark photons using a multilayer dielectric haloscope equipped with a single-photon avalanche diode*, 2110.10497.

[227] R. Cervantes et al., *Search for 70 μeV Dark Photon Dark Matter with a Dielectrically-Loaded Multi-Wavelength Microwave Cavity*, 2204.03818.

[228] 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].

[229] 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].

[230] 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)].

[231] 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*, *Phys. Rev. D* **104** (2021) 095032 [2108.08852].

[232] M. A. Fedderke, P. W. Graham, D. F. J. Kimball and S. Kalia, *Earth as a transducer for dark-photon dark-matter detection*, *Phys. Rev. D* **104** (2021) 075023 [2106.00022].

[233] 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].

[234] R. Cervantes, C. Braggio, B. Giaccone, D. Frolov, A. Grasselino, R. Harnik, O. Melnychuk, R. Pilipenko, S. Posen and A. Romanenko, *Deepest Sensitivity to Wavelike Dark Photon Dark Matter with SRF Cavities*, 2208.03183.

[235] 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].

[236] 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].

[237] 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].

[238] L. H. Nguyen, A. Lobanov and D. Horns, *First results from the WISPDMX Radio Frequency Cavity Searches for Hidden Photon Dark Matter*, *JCAP* **10** (2019) 014 [1907.12449].

[239] XENON Collaboration, E. Aprile et al., *Excess Electronic Recoil Events in XENON1T*, *Phys. Rev. D* **102** (2020) 072004 [2006.09721].

[240] 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].

[241] XENON Collaboration, E. Aprile et al., *Emission of Single and Few Electrons in XENON1T and Limits on Light Dark Matter*, 2112.12116.

[242] H. An, M. Pospelov, J. Pradler and A. Ritz, *New Limits on Dark Photons from Solar Emission and keV Scale Dark Matter*, *Phys. Rev. D* **102** (2020) 115022 [2006.13929].