

1 Axion-photon

Haloscopes

- ABRACADABRA [1, 2]
- ADMX [3, 4, 5, 6]
- ADMX-Sidecar [7, 8]
- ADMX-SLIC [9]
- CAPP [10, 11, 12, 13, 14, 15, 16, 17, 18, 19]
- CAST-CAPP [20]
- DANCE [21]
- BASE [22]
- GrAHal [23]
- HAYSTAC [24, 25, 26]
- LIDA [27]
- ORGAN [28, 29, 30]
- QUAX [31, 32, 33, 34]
- RADES [35]
- RBF [36]
- SHAFT [37]
- TASEH [38]
- SuperMAG [39]
- UF [40]
- UPLOAD-DOWNLOAD [41, 42]
- ABRACADABRA (projection) [43]
- ADBC (projection) [44]
- ADMX (projection) [45]
- aLIGO (projection) [46]
- ALPHA (projection) [47, 48]
- BabyIAXO-RADES (projection) [49]
- BRASS (projection) [50]
- BREAD (projection) [51]
- CADEX (projection) [52]
- DALI (projection) [53]
- DarkGEO (projection) [54]
- DM-Radio (projection) [55, 56]
- DANCE (projection) [57]
- LAMPOST (projection) [58]
- MADMAX (projection) [59]
- FLASH (projection) [60, 61]
- QUAX (projection) [62]
- ORGAN (projection) [28]
- TOORAD (projection) [63]
- Twisted Anyon Cavity (projection) [64]
- WISPLC (projection) [65]
- SRF heterodyne cavity (projection) [66]

LSW/Helioscopes

- ALPS [67]
- CAST [68, 69]
- CROWS [70]
- OSQAR [71]
- PVLAS [72]
- SAPPHIRES [73, 74]
- ALPS-II (projection) [75]
- IAXO (projection) [76]
- IAXO (Galactic SN) [77]
- WISPMI (projection) [78]

Astro

- 21 cm power spectrum (projection) [79]
- ATHENA (projection) [80]
- Axion star explosions [81]
- Betelgeuse [82]
- BICEP/KECK [83]
- Black hole polarimetry [84]
- Breakthrough Listen (Doppler shifted radio line in MW) [85]
- Bullet Cluster (archival radio data) [86]
- Cosmic IR background (hint) [87]
- Chandra (Hydra) [88]
- Chandra (M87) [89]
- Chandra (NG7 1275) [90]
- Chandra (H1821+643) [91]
- CMB Anisotropies [92, 93]
- COBE/FIRAS+Planck spectral dist. [94]
- Diffuse gamma-rays [95]
- Diffuse SN ALPs [96] (see also [97])
- Distance ladder [98]
- Fermi-LAT (NGC 1275) [99]
- Fermi-LAT (Extragalactic SNe) [100]
- Fermi-LAT (Quasars) [101]
- Gamma-ray attenuation (ALP dark matter) [102]
- Globular clusters (R parameter) [103]
- Globular clusters (R_2 parameter) [104]
- GW170817 (Fermi) [105]
- GW170817 [106]
- HAWC (TeV Blazars) [107]
- HESS (PKS 2155-304) [108]
- INTEGRAL (ALP decay) [109]
- Leo T gas temperature [110]
- M82 (NuSTAR) [111]
- MAGIC (Perseus galaxy cluster) [112]
- Magnetic white dwarfs (X-rays) [113]
- Magnetic white dwarf (polarization) [114]
- MOJAVE [115]
- Mrk 421 (ARGO-YBJ+Fermi): [116]
- Mrk 421 (ARGO-YBJ)+MAGIC: [117]
- Neutron Stars (Foster et al. 2020) [118]
- Neutron Stars (Darling 2020) [119]
- Neutron Stars (Battye et al. 2021) [120]
- Neutron stars (Foster et al. 2022) [121]
- Neutron Stars (Battye et al. 2023) [122]
- NuSTAR (decaying dark matter, recast from Sterile ν) [123, 124, 125]
- Planck cosmic birefringence [126]
- POLARBEAR [127, 128]
- PPTA+QUIJOTE [129]
- Pulsar polarisation arrays (projection) [130]
- Pulsar polar cap [131]
- PSR J0437-4715 polarisation [132]
- Red supergiant [133]
- Solar neutrinos [134]
- Stellar axion background [135]
- SN1987A- γ (ALP decay) [136, 137, 138]
- SN1987A- γ (low mass ALP conversion) [139, 137]
- SN1987A- γ, ν (high mass ALPs) [140, 141, 95]
- SN1987A (PVO) [142]
- Sgr A* [143]
- Low-energy supernovae (ALP decay) [95]
- Solar basin (NuSTAR) [144]
- Solar basin (NuSTAR and SPHINX) [145]
- Super Star clusters [146]
- SPT [147]
- Telescopes (Haystack) [148]
- Telescopes (MUSE) [149] (updated from: [150])
- Telescopes (VIMOS) [151]
- Telescopes (HST) [152, 153]
- Telescopes (JWST) [154]
- Telescopes (WINERED) [155, 156]

- Telescopes (eROSITA) [157]
- Fermi galactic SN (projection) [158]
- THESEUS (projection) [159]
- eROSITA (projection) [160]
- XRISM (projection) [161]
- White dwarf initial-final mass relation [162]
- XMM-Newton (decaying DM ALPs) [163]

Cosmology

- Ionisation fraction, EBL, X-rays [164]
- BBN+ N_{eff} [165]
- Freeze in [166]

2 Heavy ALP-photon coupling

- ATALS (PbPb) [167]
- BaBar [168]
- Beam dump [169, 170, 168, 171, 172]
- Belle II [173]
- BESIII [174]
- CMS (PbPb) [175]
- LEP [176]
- LHC (pp)[177]
- MiniBooNE [178]
- NOMAD [179]
- OPAL [177]
- PrimEx [180, 181]
- CONUS (projection) [182]
- DUNE (projection) [183]
- FASER LLP (projection) [184]

3 Axion-electron

- Electron g-2 [185]
- EDELWEISS [186]
- Fermionic axion interferometer [187]
- Magnon non-demolition [188]
- DarkSide-50 [189]
- GERDA [190]
- LUX [191]
- Old comagnetometers [192]
- Panda-X [193]
- Torsion pendulum (spin force) [194]
- Torsion pendulum (axion wind) [195]
- SuperCDMS [196]
- XENON1T [197, 198]
- XENONnT [199]
- XENON1T (Solar basin) [200]
- Red giants (ω Cen) [201]
- Solar neutrinos [202]
- Electron storage ring (projection) [203]
- Axion wind multilayer (projection) [204]
- Magnons (projection) [205]
- Polaritons (projection) [206]
- DARWIN (projection) [207]
- LZ (projection) [208]
- QUAX [209, 210]
- NV Centers (projection) [211]
- Superconductors (projection) [212]
- Semiconductors (projection) [213]
- Spin-orbit coupling (projection) [214]
- Torsion pendulum (projection) [215]
- YIG (projection) [205]
- White dwarf hint [216]
- Freeze-in irreducible axions [166]
- X-rays (1-loop decay) [217]

4 Axion-nucleon

Note: CASPER and nEDM limits account for stochastic correction reported in [218]

- Casimir effect (fifth force) [219]
- CASPER-ZULF-Comagnetometer [220]
- CASPER-ZULF-Sidechain [221]
- ChangE [222, 223]
- Hefei Spin-based amplifiers [224]
- nEDM (ultracold neutrons and mercury) [225]
- NASDUCK [226, 227]
- PSI HgM (nEDM) [228]
- K-3He comagnetometer (fifth force) [229]
- K-3He comagnetometer (dark matter) [230]
- JEDI [231]
- Old comagnetometers [192]
- Torsion balance [232]
- Neutron star cooling [233] (corrected from [234])
- SN1987A Cooling [235, 236]
- SNO (deuterium dissasociation) [237]
- Proton storage ring (projection) [238]
- Electrostatic storage ring (projection) [203]
- DM comagnetometer (projection) [192]
- CASPER-gradient (projection) [221]
- Superfluid helium-3 HPD (projection) [239]
- MnCO₃ (projection) [240]

5 Axion-EDM

- Axinovae [241]
- Beam EDM [242]
- BBN (dark matter) [243]
- CASPEr-electric [244]
- nEDM [225]
- HfF⁺ [245]
- JEDI [231]
- Rb/Quartz [246]
- SN1987A [247]
- *Planck*+BAO thermal axion bound [248]
- CASPEr-electric (projection) [249]
- Storage Ring EDM (projection) [249]
- Polarisation haloscope (projection) [250]

6 Axion-top

Axion-top coupling limits originally compiles in Ref. [251]

7 Axion mass versus f_a

- BBN (dark matter) [243]
- Beam EDM [242]
- Binary pulsars and Solar core constraint on $\bar{\theta}$ [252]. I include minor numerical corrections made by [253, 254].
- GW170817 [255]
- HfF⁺ [245]
- Rb/Quartz [246]
- JEDI [231]
- nEDM [225]
- Tritium decay [256]
- Piezoaxionic effect (projection) [257]
- *Planck*+BAO thermal axion bound [248]
- SN1987A [247]
- Neutron stars (projection) [252].
- NS-NS and NS-BH Inspirals (projection) [252].
- White dwarfs [258]
- Polarisation haloscope (projection) [250]

7.1 Black hole superradiance

- Baryakhtar et al. [259] (just Stellar mass BHs)
- Mehta et al. [259] (Stellar mass and SMBHs)
- Stott [260]
- Ünal et al. [261] (Quasars)
- Cardoso et al. [262] (dark photon)

8 Axion theory predictions

8.1 Post-inflation QCD axion

- Ballesteros et al. [263]
- Buschmann et al. 2020 [264]
- Buschmann et al. 2021 [265]
- Bonati et al. [266]
- Borsanyi et al. [267]
- Berkowitz et al. [268]
- Dine et al. [269]
- Petreczky et al. [270]
- Fleury & Moore [271]
- Klaer & Moore [272]
- Gorghetto et al. [273]
- Saikawa et al. (2019) [76]
- Saikawa et al. (2024) [274]

8.2 Other dark matter predictions

- ALP Cogenesis [275]
- Early matter domination [276]
- Post-inflation ALP misalignment [277, 278]
- Trapped misalignment (\mathcal{Z}_N axion) [253]

9 CP-violating couplings

Combined constraints [279]

Scalar-nucleon

- Red giants [280]
- MICROSCOPE [281].
- Eot-Wash [282, 283, 284]
- Irvine [285]. Corrected to 2σ limit by [286]
- HUST [287, 288, 289, 290].
- Stanford [291]
- IUPUI [292].
- Wuhan [286]

Pseudoscalar-electron

- Red giants [280]
- Eot-wash [293]
- e^+e^- Penning trap [294]
- NIST [295]
- SMILE [296]
- Perihelion shift [297]
- QUAX [298, 299, 300]
- Washington [194, 301].
- XENON1T [302]
- ACME (projection) [303]
- Magnon (projection) [206]
- QUAX (projection) [298].

Pseudoscalar-nucleon

- Neutron star cooling [233]
- Hefei (Earth) [304]
- Hefei (mm) [305]
- Washington [306]. Limit taken from [307].
- SMILE [296].
- Mainz [308]
- Moon/Sun [309]
- Yb trap (projection) [303]
- ARIADNE (projection) [310]
- CASPEr-wind (projection) [249]
- DM comagnetometer (projection) [192]
- Fifth force Ne-Rb-K comagnetometer (projection) [311]

10 Scalars

Scalar-photon

- Globular clusters [104]
- Eot-Wash (EP) [312]
- Fifth force [313, 314, 315, 316]
- MICROSCOPE [281]
- AURIGA [317]
- BACON [318]
- Cs/Cav [319]
- DAMNED [320]
- Dy/Dy [321]
- Dy/Quartz [246]
- Dynamic Decoupling [322]
- GEO600 [323]
- LIGO O3 [324]
- Holometer [325]
- H/Quartz/Sapphire [326]
- PTB (Yb+, Sr clock) [327]
- I₂ [328]
- Rb/Cs [329]
- Sr/Si [330]
- Yb/Sr [331]
- AEDGE (projection) [332]
- AION (projection) [332]
- DUAL (projection) [333]
- MAGIS (projection) [334]
- Nuclear clock (projection) [335]
- Mechanical Resonators (projection) [336]

Scalar-electron

- Red giants [280]
- White dwarfs [337]
- Eot-Wash (EP) [312]
- Fifth force [313, 314, 315, 316]
- MICROSCOPE [281]
- AURIGA [317]
- Cavities [338]
- Cs/Cav [319]
- DAMNED [320]
- GEO600 [323]
- Holometer [325]
- H/Quartz/Sapphire [326]
- I₂ [328]
- H/Si [330]
- Rb/Quartz [246]
- Yb/Cs [339]
- LIGO O3 [324]
- NANOGrav 15-year PTA [340]
- FOCOS (nuclear clock projection) [341]
- AEDGE (projection) [332]
- AION (projection) [332]
- DUAL (projection) [333]
- HELIOS (projection) [342]
- Optical microwave clock (projection) [343]
- Optical cavities [344]
- SrOH [345]
- Mechanical Resonators (projection) [336]
- IPTA (mock data) [346]

- Torsion balance (projection) [362]
- STE-QUEST (projection) [363]

11 Vectors

B-L coupling

- Casimir [347, 348, 349]
- Eot-Wash (EP) [350]
- Eot-Wash (ISL) [351]
- MICROSCOPE [352]
- DM stability [353]
- Horizontal branch [354]
- Red giant [354]
- Sun [354]
- Eot-Wash (DM) [355]
- LIGO (O1) [356]
- LIGO/VIRGO [356]
- LISA Pathfinder [357, 358]
- PPTA [359]
- Asteroids (projection) [360]
- HELIOS (projection) [342]
- LISA (projection) [360]
- MAGIS (projection) [334]
- Optomechanical membranes (projection) [361]
- SKA (projection) [362]

12 Dark photons

Combined constraints [364]

SM photon-DP transitions

- Coulomb [365, 366, 367, 368, 369],
- Plimpton & Lawton's experiment [370, 369]
- Atomic spectroscopy [371]
- Atomic force microscopy (AFM) [369]
- Static magnetic field of the Earth [372, 373, 374]
- Static magnetic field of Jupiter [375, 374].
- Jupiter B-field/Juno mission [376]
- ALPs [67]
- ALPS-II (projection) [377]
- SPring-8 [378]
- UWA-LSW [379, 380]
- ADMX-LSW [381]
- CROWS [70].
- DarkSRF [382]
- DarkSRF (projection) [383]
- TEXONO [384]
- Crab nebula [385]
- COBE and FIRAS [386]
- STAX (projection) [387]

Production in stars

- CAST [388]
- SHIPS [389]
- HINODE [390]
- IAXO (modified for longitudinal mode) [391]
- New globular cluster bound [392]
- Old stellar bounds: Solar-L, HB and RG stars [354] (see also [393])
- Neutron stars [394]
- Solar neutrinos [395]
- XENON1T [396]

Dark matter cosmology/astro

- Arias et al. [277]
- Witte et al. [397, 398]
- Caputo et al. [399, 386],
- ISM [400],
- Leo T dwarf [401]
- Gas clouds [401, 402]

Dark matter experiments

- Reinterpreted axion limits [364]
- APEX [403]
- ALPHA [48]
- AMAILS [404]
- BRASS-p [405]
- BREAD (projection) [51]
- Dandelion (projection) [406]
- DarkSide-50 [189]
- DAMIC [407]
- Dark E-field Radio [408]
- DM Pathfinder [409]
- DOSUE-RR [410, 411]
- FAST Radio antenna [412]
- FUNK [413]
- GigaBREAD [414]
- LAMPOST [415]
- LOFAR (solar corona) [416]
- MuDHI [417]
- ORGAN [418]
- ORPHEUS [419]
- QUALIPHIDE [420]
- Quantum cyclotron [421]
- SENSEI [422]
- SHUKET [423]
- SuperCDMS [424]
- SuperMAG [425, 426]
- SQuAD [427],
- SQMS [428],
- SUPAX [429]
- SRF scanning [430]
- Tokyo dish antennae experiments [431, 432, 433]
- WISPDMM [434]
- XENON(100,1T,nT) [435, 302, 436, 437, 396, 438].

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