

1 Axion-photon

Haloscopes

- ABRACADABRA [1, 2]
- ADBC [3]
- ADMX [4, 5, 6, 7]
- ADMX-Sidecar [8, 9]
- ADMX-SLIC [10]
- CAPP [11, 12, 13, 14, 15, 16, 17, 18, 19, 20]
- CAST-CAPP [21]
- DANCE [22]
- BASE [23]
- GrAHal [24]
- HAYSTAC [25, 26, 27]
- LIDA [28]
- ORGAN [29, 30, 31]
- QUAX [32, 33, 34, 35]
- RADES [36, 37]
- RBF [38, 39]
- SHAFT [40]
- TASEH [41]
- SuperMAG [42]
- UF [43, 44]
- UPLOAD-DOWNLOAD [45, 46]
- ABRACADABRA (projection) [47]
- ADBC (projection) [48]
- ADMX (projection) [49]
- aLIGO (projection) [50]
- ALPHA (projection) [51, 52]
- BabyIAXO-RADES (projection) [53]
- BRASS (projection) [54]
- BREAD (projection) [55]
- CADEX (projection) [56]
- DALI (projection) [57]
- DarkGEO (projection) [58]
- DM-Radio (projection) [59, 60]
- DANCE (projection) [61]
- LAMPOST (projection) [62]
- MADMAX (projection) [63]
- FLASH (projection) [64, 65]
- QUAX (projection) [66]
- ORGAN (projection) [29]
- TOORAD (projection) [67]
- Twisted Anyon Cavity (projection) [68]
- WISPLC (projection) [69]
- SRF heterodyne cavity (projection) [70]

LSW/Helioscopes

- ALPS [71]
- CAST [72, 73]
- CROWS [74]
- OSQAR [75]
- PVLAS [76]
- SAPPHIRES [77, 78]
- ALPS-II (projection) [79]
- IAXO (projection) [80]
- IAXO (Galactic SN) [81]
- WISPLC (projection) [69]

Astro

- 21 cm power spectrum (projection) [83]
- ATHENA (projection) [84]
- Axion star explosions [85]
- Betelgeuse [86]
- BICEP/KECK [87]
- Black hole polarimetry [88]
- Breakthrough Listen (Doppler shifted radio line in MW) [89]
- Bullet Cluster (archival radio data) [90]
- Cosmic IR background (hint) [91]
- Chandra (Hydra) [92]
- Chandra (M87) [93]
- Chandra (NGC 1275) [94]
- Chandra (H1821+643) [95]
- CMB Anisotropies [96, 97]
- COBE/FIRAS+Planck spectral dist. [98]
- Diffuse gamma-rays [99]
- Diffuse SN ALPs [100] (see also [101])
- Distance ladder [102]
- Fermi-LAT (NGC 1275) [103]
- Fermi-LAT (Extragalactic SNe) [104]
- Fermi-LAT (Quasars) [105]
- FIRAS [106]
- Gamma-ray attenuation (ALP dark matter) [107]
- Globular clusters (R parameter) [108]
- Globular clusters (R_2 parameter) [109]
- GW170817 (Fermi) [110]
- GW170817 [111]
- HAWC (TeV Blazars) [112]
- HESS (PKS 2155-304) [113]
- INTEGRAL (ALP decay) [114]
- Leo T gas temperature [115]
- M82 (NuSTAR) [116]
- MAGIC (Perseus galaxy cluster) [117]
- Magnetic white dwarfs (X-rays) [118]
- Magnetic white dwarf (polarization) [119]
- MOJAVE [120]
- Mrk 421 (ARGO-YBJ+Fermi): [121]
- Mrk 421 (ARGO-YBJ+MAGIC): [122]
- Neutron Stars (Foster et al. 2020) [123]
- Neutron Stars (Darling 2020) [124]
- Neutron Stars (Battye et al. 2021) [125]
- Neutron stars (Foster et al. 2022) [126]
- Neutron Stars (Battye et al. 2023) [127]
- NuSTAR (decaying dark matter, recast from Sterile nu) [128, 129, 130]
- NuSTAR (Sun) [131]
- Planck cosmic birefringence [132]
- POLARBEAR [133, 134]
- PPTA+QUIJOTE [135]
- Pulsar polarisation arrays (projection) [136]
- Pulsar polar cap [137]
- PSR J0437-4715 polarisation [138]
- Red supergiant [139]
- Solar neutrinos [140]
- Stellar axion background [141]
- SN1987A- γ (ALP decay) [142, 143, 144]
- SN1987A- γ (low mass ALP conversion) [145, 143, 146]
- SN1987A- γ, ν (high mass ALPs) [147, 148, 99]
- SN1987A (PVO) [149]
- Sgr A* [150]
- Low-energy supernovae (ALP decay) [99]
- Solar basin (NuSTAR) [151]
- Solar basin (NuSTAR and SPHINX) [152]
- Super Star clusters [153]
- SPT [154]
- Telescopes (Haystack) [155]
- Telescopes (MUSE) [156] (updated from: [157])
- Telescopes (VIMOS) [158]
- Telescopes (HST) [159, 160]
- Telescopes (JWST) [161]
- Telescopes (WINERED) [162, 163]

- Telescopes (eROSITA) [164]
- Fermi galactic SN (projection) [165]
- THESEUS (projection) [166]
- eROSITA (projection) [167]
- XRISM (projection) [168]
- White dwarf initial-final mass relation [169]
- XMM-Newton (decaying DM ALPs) [170]

Cosmology

- Ionisation fraction, EBL, X-rays [171]
- BBN+ N_{eff} [172]
- Freeze in [173]

- JEDI [239]
- Old comagnetometers [200]
- Torsion balance [240]
- Neutron star cooling [241] (corrected from [242])
- SN1987A Cooling [243, 244]
- SNO (deuterium dissasociation) [245]
- Proton storage ring (projection) [246]
- Electrostatic storage ring (projection) [211]
- DM comagnetometer (projection) [200]
- CASPER-gradient (projection) [229]
- Superfluid helium-3 HPD (projection) [247]
- MnCO₃ (projection) [248]

2 Heavy ALP-photon coupling

- ATALS (PbPb) [174]
- BaBar [175]
- Beam dump [176, 177, 175, 178, 179]
- Belle II [180]
- BESIII [181]
- CMS (PbPb) [182]
- EuXFL [183]
- LEP [184]
- LHC (pp)[185]
- MiniBooNE [186]
- NOMAD [187]
- OPAL [185]
- PrimEx [188, 189]
- CONUS (projection) [190]
- DUNE (projection) [191]
- FASER LLP (projection) [192]

3 Axion-electron

- Electron g-2 [193]
- EDELWEISS [194]
- Fermionic axion interferometer [195]
- Magnon non-demolition [196]
- DarkSide-50 [197]
- GERDA [198]
- LUX [199]
- Old comagnetometers [200]
- Panda-X [201]
- Torsion pendulum (spin force) [202]
- Torsion pendulum (axion wind) [203]
- SuperCDMS [204]
- XENON1T [205, 206]
- XENONnT [207]
- XENON1T (Solar basin) [208]
- Red giants (ω Cen) [209]
- Solar neutrinos [210]
- Electron storage ring (projection) [211]
- Axion wind multilayer (projection) [212]
- Magnons (projection) [213]
- Polaritons (projection) [214]
- DARWIN (projection) [215]
- LZ (projection) [216]
- QUAX [217, 218]
- NV Centers (projection) [219]
- Superconductors (projection) [220]
- Semiconductors (projection) [221]
- Spin-orbit coupling (projection) [222]
- Torsion pendulum (projection) [223]
- YIG (projection) [213]
- White dwarf hint [224]
- Freeze-in irreducible axions [173]
- X-rays (1-loop decay) [225]

4 Axion-nucleon

Note: CASPER and nEDM limits account for stochastic correction reported in [226]

- Casimir effect (fifth force) [227]
- CASPER-ZULF-Comagnetometer [228]
- CASPER-ZULF-Sidechain [229]
- ChangE [230, 231]
- Hefei Spin-based amplifiers [232]
- nEDM (ultracold neutrons and mercury) [233]
- NASDUCK [234, 235]
- PSI HgM (nEDM) [236]
- K-3He comagnetometer (fifth force) [237]
- K-3He comagnetometer (dark matter) [238]

5 Axion-EDM

- Axinovae [249]
- Beam EDM [250]
- BBN (dark matter) [251]
- CASPER-electric [252]
- nEDM [233]
- HfF⁺ [253]
- I_2^+/Ca^+ [254]
- JEDI [239]
- Rb/Quartz [255]
- SN1987A [256]
- *Planck*+BAO thermal axion bound [257]
- CASPER-electric (projection) [258]
- Storage Ring EDM (projection) [258]
- Polarisation haloscope (projection) [259]

6 Axion-top

Axion-top coupling limits originally compiles in Ref. [260]

7 Axion mass versus f_a

- BBN (dark matter) [251]
- Beam EDM [250]
- Binary pulsars and Solar core constraint on $\bar{\theta}$ [261]. I include minor numerical corrections made by [262, 263].
- GW170817 [264]
- HfF⁺ [253]
- Rb/Quartz [255]
- JEDI [239]
- nEDM [233]
- Tritium decay [265]
- Piezoaxionic effect (projection) [266]
- *Planck*+BAO thermal axion bound [257]
- SN1987A [256]
- Neutron stars (projection) [261].
- NS-NS and NS-BH Inspirals (projection) [261].
- White dwarfs [267]
- Polarisation haloscope (projection) [259]

7.1 Black hole superradiance

- Baryakhtar et al. [268] (just Stellar mass BHs)
- Mehta et al. [268] (Stellar mass and SMBHs)
- Stott [269]
- Ünal et al. [270] (Quasars)
- Hoof et al. [271]
- Cardoso et al. [272] (dark photon)

8 Axion theory predictions

8.1 Post-inflation QCD axion

- Ballesteros et al. [273]
- Buschmann et al. 2020 [274]
- Buschmann et al. 2021 [275]
- Bonati et al. [276]
- Borsanyi et al. [277]
- Berkowitz et al. [278]
- Dine et al. [279]
- Petreczky et al. [280]
- Fleury & Moore [281]
- Klaer & Moore [282]
- Gorghetto et al. [283]
- Saikawa et al. (2019) [80]
- Saikawa et al. (2024) [284]
- Beyer et al. (2023) [285]
- Kim et al. (2024) [286]

8.2 Other dark matter predictions

- ALP Cogenesis [287]
- Early matter domination [288]
- Post-inflation ALP misalignment [289, 290]
- Trapped misalignment (\mathcal{Z}_N axion) [262]

9 CP-violating couplings

Combined constraints [291]

Scalar-nucleon

- Red giants [292]
- MICROSCOPE [293].
- Eot-Wash [294, 295, 296]
- Irvine [297]. Corrected to 2σ limit by [298]
- HUST [299, 300, 301, 302].
- Stanford [303]
- IUPUI [304].
- Wuhan [298]

Pseudoscalar-electron

- Red giants [292]
- Eot-wash [305]
- e^+e^- Penning trap [306]
- NIST [307]
- SMILE [308]
- Perihelion shift [309]
- QUAX [310, 311, 312]
- Washington [202, 313].
- XENON1T [314]
- ACME (projection) [315]
- Magnon (projection) [214]
- QUAX (projection) [310].

Pseudoscalar-nucleon

- Neutron star cooling [241]
- Hefei (Earth) [316]
- Hefei (mm) [317]
- Washington [318]. Limit taken from [319].
- SMILE [308].
- Mainz [320]
- Moon/Sun [321]
- Yb trap (projection) [315]
- ARIADNE (projection) [322]
- CASPER-wind (projection) [258]
- DM comagnetometer (projection) [200]
- Fifth force Ne-Rb-K comagnetometer (projection) [323]

10 Scalars

Scalar-photon

- Globular clusters [109]
- Eot-Wash (EP) [324]
- Fifth force [325, 326, 327, 328]
- MICROSCOPE [293]
- AURIGA [329]
- BACON [330]
- Cs/Cav [331]
- DAMNED [332]
- Dy/Dy [333]
- Dy/Quartz [255]
- Dynamic Decoupling [334]
- GEO600 [335]
- LIGO O3 [336], see also [337]
- Holometer [338]
- H/Quartz/Sapphire [339]
- PTB (Yb+, Sr clock) [340]
- I₂ [341]
- Rb/Cs [342]
- Sr/Si [343]
- Yb/Sr [344]
- AEDGE (projection) [345]
- AION (projection) [345]
- DUAL (projection) [346]
- MAGIS (projection) [347]
- Nuclear clock (projection) [348]
- Mechanical Resonators (projection) [349]

Scalar-electron

- Red giants [292]
- White dwarfs [350]
- Eot-Wash (EP) [324]
- Fifth force [325, 326, 327, 328]
- MICROSCOPE [293]
- AURIGA [329]
- Cavities [351]
- Cs/Cav [331]
- DAMNED [332]
- GEO600 [335]
- Holometer [338]
- H/Quartz/Sapphire [339]
- LIGO O3 [336], see also [337]
- I₂ [341]
- H/Si [343]
- Rb/Quartz [255]
- Yb/Cs [352]
- NANOGrav 15-year PTA [353]
- FOCOS (nuclear clock projection) [354]
- AEDGE (projection) [345]
- AION (projection) [345]
- DUAL (projection) [346]
- HELIOS (projection) [355]
- Optical microwave clock (projection) [356]
- Optical cavities [357]
- SrOH [358]
- Mechanical Resonators (projection) [349]
- IPTA (mock data) [359]

- Torsion balance (projection) [375]
- STE-QUEST (projection) [376]

11 Vectors

B-L coupling

- Casimir [360, 361, 362]
- Eot-Wash (EP) [363]
- Eot-Wash (ISL) [364]
- MICROSCOPE [365]
- DM stability [366]
- Horizontal branch [367]
- Red giant [367]
- Sun [367]
- Eot-Wash (DM) [368]
- LIGO (O1) [369]
- LIGO/VIRGO [369]
- LISA Pathfinder [370, 371]
- PPTA [372]
- Asteroids (projection) [373]
- HELIOS (projection) [355]
- LISA (projection) [373]
- MAGIS (projection) [347]
- Optomechanical membranes (projection) [374]
- SKA (projection) [375]

12 Dark photons

Combined constraints [377]

SM photon-DP transitions

- Coulomb [378, 379, 380, 381, 382],
- Plimpton & Lawton's experiment [383, 382]
- Atomic spectroscopy [384]
- Atomic force microscopy (AFM) [382]
- Static magnetic field of the Earth [385, 386, 387]
- Static magnetic field of Jupiter [388, 387].
- Jupiter B-field/Juno mission [389]
- ALPs [71]
- ALPS-II (projection) [390]
- SPring-8 [391]
- UWA-LSW [392, 393]
- ADMX-LSW [394]
- CROWS [74].
- DarkSRF [395]
- DarkSRF (projection) [396]
- TEXONO [397]
- Crab nebula [398]
- COBE and FIRAS [399]
- STAX (projection) [400]

Production in stars

- CAST [401]
- SHIPS [402]
- HINODE [403]
- IAXO (modified for longitudinal mode) [404]
- New globular cluster bound [405]
- Old stellar bounds: Solar-L, HB and RG stars [367] (see also [406])
- Neutron stars [407]
- Solar neutrinos [408]
- XENON1T [409]

Dark matter cosmology/astro

- Arias et al. [289]
- Witte et al. [410, 411]
- Caputo et al. [412, 399],
- ISM [413],
- Leo T dwarf [414]
- Gas clouds [414, 415]
- JWST [416]
- Parker Solar Probe [417]
- Planck + unWISE [418]
- INTEGRAL [419]

Dark matter experiments

- Reinterpreted axion limits [377]
- APEX [420]
- ALPHA [52]
- AMAILS [421]
- BRASS-p [422]
- BREAD (projection) [55]
- Dandelion (projection) [423]
- DarkSide-50 [197]
- DAMIC [424]
- Dark E-field Radio [425, 426]
- DM Pathfinder [427]
- DOSUE-RR [428, 429]
- FAST Radio antenna [430]
- FUNK [431]
- GigaBREAD [432]
- LAMPOST [433]
- LOFAR (solar corona) [434]
- MuDHI [435]
- ORGAN [436]
- ORPHEUS [437]
- QUALIPHIDE [438]
- Quantum cyclotron [439]
- SENSEI [440]
- SHUKET [441]
- SuperCDMS [442]
- SuperMAG [443, 444]

- SQuAD [445],
- SQMS [446],
- SUPAX [447]
- SRF scanning [448]
- Tokyo dish antennae experiments [449, 450, 451]
- WISPDMM [452]
- XENON(100,1T,nT) [453, 314, 454, 455, 409, 456].

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