

1 Axion-photon

Haloscopes

- ABRACADABRA [1, 2]
- ADBC [3]
- ADMX [4, 5, 6, 7, 8]
- ADMX-Sidecar [9, 10]
- ADMX-SLIC [11]
- CAPP [12, 13, 14, 15, 16, 17, 18, 19, 20, 21]
- CAST-CAPP [22]
- DANCE [23]
- BASE [24]
- GrAHal [25]
- HAYSTAC [26, 27, 28]
- LIDA [29]
- ORGAN [30, 31, 32, 33]
- QUAX [34, 35, 36, 37]
- RADES [38, 39]
- RBF [40, 41]
- SHAFT [42]
- TASEH [43]
- SuperMAG [44, 45]
- UF [46, 47]
- UPLOAD-DOWNLOAD [48, 49]
- ABRACADABRA (projection) [50]
- ADBC (projection) [51]
- ADMX (projection) [52]
- aLIGO (projection) [53]
- ALPHA (projection) [54, 55]
- BabyIAXO-RADES (projection) [56]
- BRASS (projection) [57]
- BREAD (projection) [58]
- CADEx (projection) [59]
- DALI (projection) [60]
- DarkGEO (projection) [61]
- DM-Radio (projection) [62, 63]
- DANCE (projection) [64]
- LAMPOST (projection) [65]
- MADMAX (projection) [66]
- FLASH (projection) [67, 68]
- QUAX (projection) [69]
- ORGAN (projection) [30]
- TOORAD (projection) [70]
- Twisted Anyon Cavity (projection) [71]
- WISPLC (projection) [72]
- SRF heterodyne cavity (projection) [73]

LSW/Helioscopes

- ALPS [74]
- CAST [75, 76]
- CROWS [77]
- OSQAR [78]
- PVLAS [79]
- SAPPHIRES [80, 81]
- ALPS-II (projection) [82]
- IAXO (projection) [83]
- IAXO (Galactic SN) [84]
- WISPLC (projection) [85]

Astro

- 21 cm power spectrum (projection) [86]
- ATHENA (projection) [87]
- Axion star explosions [88]
- Betelgeuse [89]
- BICEP/KECK [90]
- Black hole polarimetry [91]
- Breakthrough Listen (Doppler shifted radio line in MW) [92]
- Bullet Cluster (archival radio data) [93]
- Cosmic IR background (hint) [94]
- Chandra (Hydra) [95]
- Chandra (M87) [96]
- Chandra (NG7 1275) [97]
- Chandra (H1821+643) [98]
- CMB Anisotropies [99, 100]
- COBE/FIRAS+Planck spectral dist. [101]
- Diffuse gamma-rays [102]
- Diffuse SN ALPs [103] (see also [104])
- Distance ladder [105]
- Fermi-LAT (NGC 1275) [106]
- Fermi-LAT (Extragalactic SNe) [107]
- Fermi-LAT (Quasars) [108]
- FIRAS [109]
- Gamma-ray attenuation (ALP dark matter) [110]
- Globular clusters (R parameter) [111]
- Globular clusters (R_2 parameter) [112]
- GW170817 (Fermi) [113]
- GW170817 [114]
- HAWC (TeV Blazars) [115]
- HESS (PKS 2155-304) [116]
- INTEGRAL (ALP decay) [117]
- Leo T gas temperature [118]
- M82 (NuSTAR) [119]
- MAGIC (Perseus galaxy cluster) [120]
- Magnetic white dwarfs (X-rays) [121]
- Magnetic white dwarf (polarization) [122]
- MOJAVE [123]
- Mrk 421 (ARGO-YBJ+Fermi): [124]
- Mrk 421 (ARGO-YBJ+MAGIC): [125]
- Neutron Stars (Foster et al. 2020) [126]
- Neutron Stars (Darling 2020) [127]
- Neutron Stars (Battye et al. 2021) [128]
- Neutron stars (Foster et al. 2022) [129]
- Neutron Stars (Battye et al. 2023) [130]
- NuSTAR (decaying dark matter, recast from Sterile nu) [131, 132, 133]
- NuSTAR (Sun) [134]
- Planck cosmic birefringence [135]
- POLARBEAR [136, 137]
- PPTA+QUIJOTE [138]
- Pulsar polarisation arrays (projection) [139]
- Pulsar polar cap [140]
- PSR J0437-4715 polarisation [141]
- Red supergiant [142]
- Solar neutrinos [143]
- Stellar axion background [144]
- SN1987A- γ (ALP decay) [145, 146, 147]
- SN1987A- γ (low mass ALP conversion) [148, 146, 149]
- SN1987A- γ, ν (high mass ALPs) [150, 151, 102]
- SN1987A (PVO) [152]
- Sgr A* [153]
- Low-energy supernovae (ALP decay) [102]
- Solar basin (NuSTAR) [154]
- Solar basin (NuSTAR and SPHINX) [155]
- Super Star clusters [156]
- SPT [157]
- Telescopes (Haystack) [158]
- Telescopes (MUSE) [159] (updated from: [160])
- Telescopes (VIMOS) [161]
- Telescopes (HST) [162, 163]
- Telescopes (JWST) [164]
- Telescopes (WINERED) [165, 166]

- Telescopes (eROSITA) [167]
- Fermi galactic SN (projection) [168]
- THESEUS (projection) [169]
- eROSITA (projection) [170]
- XRISM (projection) [171]
- White dwarf initial-final mass relation [172]
- XMM-Newton (decaying DM ALPs) [173]

Cosmology

- Ionisation fraction, EBL, X-rays [174]
- BBN+ N_{eff} [175]
- Freeze in [176]
- Cosmic background [177]

- K-3He comagnetometer (dark matter) [242]
- Mainz-Krakow comagnetometers [243]
- JEDI [244]
- Old comagnetometers [204]
- Torsion balance [245]
- Neutron star cooling [246] (corrected from [247])
- SN1987A Cooling [248, 249]
- SNO (deuterium dissasociation) [250]
- Proton storage ring (projection) [251]
- Electrostatic storage ring (projection) [215]
- DM comagnetometer (projection) [204]
- CASPER-gradient (projection) [233]
- Superfluid helium-3 HPD (projection) [252]
- MnCO₃ (projection) [253]

2 Heavy ALP-photon coupling

- ATALS (PbPb) [178]
- BaBar [179]
- Beam dump [180, 181, 179, 182, 183]
- Belle II [184]
- BESIII [185]
- CMS (PbPb) [186]
- EuXFL [187]
- LEP [188]
- LHC (pp)[189]
- MiniBooNE [190]
- NOMAD [191]
- OPAL [189]
- PrimEx [192, 193]
- CONUS (projection) [194]
- DUNE (projection) [195]
- FASER LLP (projection) [196]

5 Axion-EDM

- Axinovae [254]
- Beam EDM [255]
- BBN (dark matter) [256]
- CASPER-electric [257]
- nEDM [237]
- HfF⁺ [258]
- I_2^+/Ca^+ [259]
- JEDI [244]
- Rb/Quartz [260]
- SN1987A [261]
- *Planck*+BAO thermal axion bound [262]
- CASPER-electric (projection) [263]
- Storage Ring EDM (projection) [263]
- Polarisation haloscope (projection) [264]

3 Axion-electron

- Electron g-2 [197]
- EDELWEISS [198]
- Fermionic axion interferometer [199]
- Magnon non-demolition [200]
- DarkSide-50 [201]
- GERDA [202]
- LUX [203]
- Old comagnetometers [204]
- Panda-X [205]
- Torsion pendulum (spin force) [206]
- Torsion pendulum (axion wind) [207]
- SuperCDMS [208]
- XENON1T [209, 210]
- XENONnT [211]
- XENON1T (Solar basin) [212]
- Red giants (ω Cen) [213]
- Solar neutrinos [214]
- Electron storage ring (projection) [215]
- Axion wind multilayer (projection) [216]
- Magnons (projection) [217]
- Polaritons (projection) [218]
- DARWIN (projection) [219]
- LZ (projection) [220]
- QUAX [221, 222]
- NV Centers (projection) [223]
- Superconductors (projection) [224]
- Semiconductors (projection) [225]
- Spin-orbit coupling (projection) [226]
- Torsion pendulum (projection) [227]
- YIG (projection) [217]
- White dwarf hint [228]
- Freeze-in irreducible axions [176]
- X-rays (1-loop decay) [229]

6 Axion-top

Axion-top coupling limits originally compiles in Ref. [265]

7 Axion mass versus f_a

- BBN (dark matter) [256]
- Beam EDM [255]
- Binary pulsars and Solar core constraint on $\bar{\theta}$ [266]. I include minor numerical corrections made by [267, 268].
- GW170817 [269]
- HfF⁺ [258]
- Rb/Quartz [260]
- JEDI [244]
- nEDM [237]
- Tritium decay [270]
- Piezoaxionic effect (projection) [271]
- *Planck*+BAO thermal axion bound [262]
- SN1987A [261]
- Neutron stars (projection) [266].
- NS-NS and NS-BH Inspirals (projection) [266].
- White dwarfs [272]
- Polarisation haloscope (projection) [264]
- Neutron star cooling [273]

7.1 Black hole superradiance

- Baryakhtar et al. [274] (just Stellar mass BHs)
- Mehta et al. [274] (Stellar mass and SMBHs)
- Stott [275]
- Ünal et al. [276] (Quasars)
- Hoof et al. [277]
- Cardoso et al. [278] (dark photon)

4 Axion-nucleon

Note: CASPER and nEDM limits account for stochastic correction reported in [230]

- Casimir effect (fifth force) [231]
- CASPER-ZULF-Comagnetometer [232]
- CASPER-ZULF-Sidechain [233]
- Change [234, 235]
- Hefei Spin-based amplifiers [236]
- nEDM (ultracold neutrons and mercury) [237]
- NASDUCK [238, 239]
- PSI HgM (nEDM) [240]
- K-3He comagnetometer (fifth force) [241]

8 Axion theory predictions

8.1 Post-inflation QCD axion

- Ballesteros et al. [279]
- Buschmann et al. 2020 [280]
- Buschmann et al. 2021 [281]
- Bonati et al. [282]
- Borsanyi et al. [283]
- Berkowitz et al. [284]
- Dine et al. [285]
- Petreczky et al. [286]
- Fleury & Moore [287]
- Klaer & Moore [288]
- Gorghetto et al. [289]
- Saikawa et al. (2019) [83]

- Saikawa et al. (2024) [290]
- Beyer et al. (2023) [291]
- Kim et al. (2024) [292]

8.2 Other dark matter predictions

- ALP Cogenesis [293]
- Early matter domination [294]
- Post-inflation ALP misalignment [295, 296]
- Trapped misalignment (\mathcal{Z}_N axion) [267]

9 CP-violating couplings

Combined constraints [297]

Scalar-nucleon

- Red giants [298]
- MICROSCOPE [299].
- Eot-Wash [300, 301, 302]
- Irvine [303]. Corrected to 2σ limit by [304]
- HUST [305, 306, 307, 308].
- Stanford [309]
- IUPUI [310].
- Wuhan [304]

Pseudoscalar-electron

- Red giants [298]
- Eot-wash [311]
- e^+e^- Penning trap [312]
- NIST [313]
- SMILE [314]
- Perihelion shift [315]
- QUAX [316, 317, 318]
- Washington [206, 319].
- XENON1T [320]
- ACME (projection) [321]
- Magnon (projection) [218]
- QUAX (projection) [316].

Pseudoscalar-nucleon

- Neutron star cooling [246]
- Hefei (Earth) [322]
- Hefei (mm) [323]
- Washington [324]. Limit taken from [325].
- SMILE [314].
- Mainz [326]
- Moon/Sun [327]
- Yb trap (projection) [321]
- ARIADNE (projection) [328]
- CASPER-wind (projection) [263]
- DM comagnetometer (projection) [204]
- Fifth force Ne-Rb-K comagnetometer (projection) [329]

10 Scalars

Scalar-photon

- Globular clusters [112]
- Eot-Wash (EP) [330]
- Fifth force [331, 332, 333, 334]
- MICROSCOPE [299]
- AURIGA [335]
- BACON [336]
- Cs/Cav [337]
- DAMNED [338]
- Dy/Dy [339]
- Dy/Quartz [260]
- Dynamic Decoupling [340]
- GEO600 [341]
- LIGO O3 [342], see also [343]
- Holometer [344]
- H/Quartz/Sapphire [345]
- PTB (Yb+, Sr clock) [346]
- I₂ [347]
- Rb/Cs [348]
- Sr/Si [349]
- Yb/Sr [350]
- AEDGE (projection) [351]
- AION (projection) [351]
- DUAL (projection) [352]
- MAGIS (projection) [353]
- Nuclear clock (projection) [354]
- Mechanical Resonators (projection) [355]

Scalar-electron

- Red giants [298]
- White dwarfs [356]
- Eot-Wash (EP) [330]
- Fifth force [331, 332, 333, 334]
- MICROSCOPE [299]
- AURIGA [335]
- Cavities [357]
- Cs/Cav [337]
- DAMNED [338]
- GEO600 [341]
- Holometer [344]
- H/Quartz/Sapphire [345]
- LIGO O3 [342], see also [343]
- I₂ [347]
- H/Si [349]
- Rb/Quartz [260]
- Yb/Cs [358]
- NANOGrav 15-year PTA [359]
- FOCOS (nuclear clock projection) [360]
- AEDGE (projection) [351]
- AION (projection) [351]
- DUAL (projection) [352]
- HELIOS (projection) [361]
- Optical microwave clock (projection) [362]
- Optical cavities [363]
- SrOH [364]
- Mechanical Resonators (projection) [355]
- IPTA (mock data) [365]

- Torsion balance (projection) [381]
- STE-QUEST (projection) [382]

11 Vectors

B-L coupling

- Casimir [366, 367, 368]
- Eot-Wash (EP) [369]
- Eot-Wash (ISL) [370]
- MICROSCOPE [371]
- DM stability [372]
- Horizontal branch [373]
- Red giant [373]
- Sun [373]
- Eot-Wash (DM) [374]
- LIGO (O1) [375]
- LIGO/VIRGO [375]
- LISA Pathfinder [376, 377]
- PPTA [378]
- Asteroids (projection) [379]
- HELIOS (projection) [361]
- LISA (projection) [379]
- MAGIS (projection) [353]
- Optomechanical membranes (projection) [380]
- SKA (projection) [381]

12 Dark photons

Combined constraints [383]

SM photon-DP transitions

- Coulomb [384, 385, 386, 387, 388],
- Plimpton & Lawton's experiment [389, 388]
- Atomic spectroscopy [390]
- Atomic force microscopy (AFM) [388]
- Static magnetic field of the Earth [391, 392, 393]
- Static magnetic field of Jupiter [394, 393].
- Jupiter B-field/Juno mission [395]
- ALPs [74]
- ALPS-II (projection) [396]
- SPring-8 [397]
- UWA-LSW [398, 399]
- ADMX-LSW [400]
- CROWS [77].
- DarkSRF [401]
- DarkSRF (projection) [402]
- TEXONO [403]
- Crab nebula [404]
- COBE and FIRAS [405]
- STAX (projection) [406]

Production in stars

- CAST [407]
- SHIPS [408]
- HINODE [409]
- IAXO (modified for longitudinal mode) [410]
- New globular cluster bound [411]
- Old stellar bounds: Solar-L, HB and RG stars [373] (see also [412])
- Neutron stars [413]
- Solar neutrinos [414]
- XENON1T [415]

Dark matter cosmology/astro

- Arias et al. [295]
- Witte et al. [416, 417]
- Caputo et al. [418, 405],
- ISM [419],
- Leo T dwarf [420]
- Gas clouds [420, 421]
- JWST [422]
- Parker Solar Probe [423]
- Planck + unWISE [424]
- INTEGRAL [425]

Dark matter experiments

- Reinterpreted axion limits [383]
- APEX [426]
- ALPHA [55]
- AMAILS [427]
- BRASS-p [428]
- BREAD (projection) [58]
- Dandelion (projection) [429]
- DarkSide-50 [201]
- DAMIC [430]
- Dark E-field Radio [431, 432]
- DM Pathfinder [433]
- DOSUE-RR [434, 435]
- FAST Radio antenna [436]
- FUNK [437]
- GigaBREAD [438]
- MADMAX [439]
- LAMPOST [440]
- LOFAR (solar corona) [441]
- MuDHI [442]
- ORGAN [443, 33]
- ORPHEUS [444]
- QUALIPHIDE [445]
- Quantum cyclotron [446]
- SENSEI [447]
- SHUKET [448]
- SuperCDMS [449]
- SuperMAG [450, 451, 45]

- SQuAD [452],
- SQMS [453],
- SUPAX [454]
- SRF scanning [455]
- Tokyo dish antennae experiments [456, 457, 458]
- WISPDMM [459]
- XENON(100,1T,nT) [460, 320, 461, 462, 415, 463].

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