

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]
- SHAFT [39]
- TASEH [40]
- SuperMAG [41]
- UF [42]
- UPLOAD-DOWNLOAD [43, 44]
- ABRACADABRA (projection) [45]
- ADBC (projection) [46]
- ADMX (projection) [47]
- aLIGO (projection) [48]
- ALPHA (projection) [49, 50]
- BabyIAXO-RADES (projection) [51]
- BRASS (projection) [52]
- BREAD (projection) [53]
- CADEx (projection) [54]
- DALI (projection) [55]
- DarkGEO (projection) [56]
- DM-Radio (projection) [57, 58]
- DANCE (projection) [59]
- LAMPOST (projection) [60]
- MADMAX (projection) [61]
- FLASH (projection) [62, 63]
- QUAX (projection) [64]
- ORGAN (projection) [29]
- TOORAD (projection) [65]
- Twisted Anyon Cavity (projection) [66]
- WISPLC (projection) [67]
- SRF heterodyne cavity (projection) [68]

LSW/Helioscopes

- ALPS [69]
- CAST [70, 71]
- CROWS [72]
- OSQAR [73]
- PVLAS [74]
- SAPPHIRES [75, 76]
- ALPS-II (projection) [77]
- IAXO (projection) [78]
- IAXO (Galactic SN) [79]
- WISPLC (projection) [80]

Astro

- 21 cm power spectrum (projection) [81]
- ATHENA (projection) [82]
- Axion star explosions [83]
- Betelgeuse [84]
- BICEP/KECK [85]
- Black hole polarimetry [86]
- Breakthrough Listen (Doppler shifted radio line in MW) [87]
- Bullet Cluster (archival radio data) [88]
- Cosmic IR background (hint) [89]
- Chandra (Hydra) [90]
- Chandra (M87) [91]
- Chandra (NGC 1275) [92]
- Chandra (H1821+643) [93]
- CMB Anisotropies [94, 95]
- COBE/FIRAS+Planck spectral dist. [96]
- Diffuse gamma-rays [97]
- Diffuse SN ALPs [98] (see also [99])
- Distance ladder [100]
- Fermi-LAT (NGC 1275) [101]
- Fermi-LAT (Extragalactic SNe) [102]
- Fermi-LAT (Quasars) [103]
- FIRAS [104]
- Gamma-ray attenuation (ALP dark matter) [105]
- Globular clusters (R parameter) [106]
- Globular clusters (R_2 parameter) [107]
- GW170817 (Fermi) [108]
- GW170817 [109]
- HAWC (TeV Blazars) [110]
- HESS (PKS 2155-304) [111]
- INTEGRAL (ALP decay) [112]
- Leo T gas temperature [113]
- M82 (NuSTAR) [114]
- MAGIC (Perseus galaxy cluster) [115]
- Magnetic white dwarfs (X-rays) [116]
- Magnetic white dwarf (polarization) [117]
- MOJAVE [118]
- Mrk 421 (ARGO-YBJ+Fermi): [119]
- Mrk 421 (ARGO-YBJ+MAGIC): [120]
- Neutron Stars (Foster et al. 2020) [121]
- Neutron Stars (Darling 2020) [122]
- Neutron Stars (Battye et al. 2021) [123]
- Neutron stars (Foster et al. 2022) [124]
- Neutron Stars (Battye et al. 2023) [125]
- NuSTAR (decaying dark matter, recast from Sterile nu) [126, 127, 128]
- Planck cosmic birefringence [129]
- POLARBEAR [130, 131]
- PPTA+QUIJOTE [132]
- Pulsar polarisation arrays (projection) [133]
- Pulsar polar cap [134]
- PSR J0437-4715 polarisation [135]
- Red supergiant [136]
- Solar neutrinos [137]
- Stellar axion background [138]
- SN1987A- γ (ALP decay) [139, 140, 141]
- SN1987A- γ (low mass ALP conversion) [142, 140, 143]
- SN1987A- γ,ν (high mass ALPs) [144, 145, 97]
- SN1987A (PVO) [146]
- Sgr A* [147]
- Low-energy supernovae (ALP decay) [97]
- Solar basin (NuSTAR) [148]
- Solar basin (NuSTAR and SPHINX) [149]
- Super Star clusters [150]
- SPT [151]
- Telescopes (Haystack) [152]
- Telescopes (MUSE) [153] (updated from: [154])
- Telescopes (VIMOS) [155]
- Telescopes (HST) [156, 157]
- Telescopes (JWST) [158]
- Telescopes (WINERED) [159, 160]

- Telescopes (eROSITA) [161]
- Fermi galactic SN (projection) [162]
- THESEUS (projection) [163]
- eROSITA (projection) [164]
- XRISM (projection) [165]
- White dwarf initial-final mass relation [166]
- XMM-Newton (decaying DM ALPs) [167]

Cosmology

- Ionisation fraction, EBL, X-rays [168]
- BBN+ N_{eff} [169]
- Freeze in [170]

- JEDI [236]
- Old comagnetometers [197]
- Torsion balance [237]
- Neutron star cooling [238] (corrected from [239])
- SN1987A Cooling [240, 241]
- SNO (deuterium dissasociation) [242]
- Proton storage ring (projection) [243]
- Electrostatic storage ring (projection) [208]
- DM comagnetometer (projection) [197]
- CASPER-gradient (projection) [226]
- Superfluid helium-3 HPD (projection) [244]
- MnCO₃ (projection) [245]

2 Heavy ALP-photon coupling

- ATALS (PbPb) [171]
- BaBar [172]
- Beam dump [173, 174, 172, 175, 176]
- Belle II [177]
- BESIII [178]
- CMS (PbPb) [179]
- EuXFL [180]
- LEP [181]
- LHC (pp)[182]
- MiniBooNE [183]
- NOMAD [184]
- OPAL [182]
- PrimEx [185, 186]
- CONUS (projection) [187]
- DUNE (projection) [188]
- FASER LLP (projection) [189]

5 Axion-EDM

- Axinovae [246]
- Beam EDM [247]
- BBN (dark matter) [248]
- CASPER-electric [249]
- nEDM [230]
- HfF⁺ [250]
- I_2^+/Ca^+ [251]
- JEDI [236]
- Rb/Quartz [252]
- SN1987A [253]
- *Planck*+BAO thermal axion bound [254]
- CASPER-electric (projection) [255]
- Storage Ring EDM (projection) [255]
- Polarisation haloscope (projection) [256]

3 Axion-electron

- Electron g-2 [190]
- EDELWEISS [191]
- Fermionic axion interferometer [192]
- Magnon non-demolition [193]
- DarkSide-50 [194]
- GERDA [195]
- LUX [196]
- Old comagnetometers [197]
- Panda-X [198]
- Torsion pendulum (spin force) [199]
- Torsion pendulum (axion wind) [200]
- SuperCDMS [201]
- XENON1T [202, 203]
- XENONnT [204]
- XENON1T (Solar basin) [205]
- Red giants (ω Cen) [206]
- Solar neutrinos [207]
- Electron storage ring (projection) [208]
- Axion wind multilayer (projection) [209]
- Magnons (projection) [210]
- Polaritons (projection) [211]
- DARWIN (projection) [212]
- LZ (projection) [213]
- QUAX [214, 215]
- NV Centers (projection) [216]
- Superconductors (projection) [217]
- Semiconductors (projection) [218]
- Spin-orbit coupling (projection) [219]
- Torsion pendulum (projection) [220]
- YIG (projection) [210]
- White dwarf hint [221]
- Freeze-in irreducible axions [170]
- X-rays (1-loop decay) [222]

6 Axion-top

Axion-top coupling limits originally compiles in Ref. [257]

7 Axion mass versus f_a

- BBN (dark matter) [248]
- Beam EDM [247]
- Binary pulsars and Solar core constraint on $\bar{\theta}$ [258]. I include minor numerical corrections made by [259, 260].
- GW170817 [261]
- HfF⁺ [250]
- Rb/Quartz [252]
- JEDI [236]
- nEDM [230]
- Tritium decay [262]
- Piezoaxionic effect (projection) [263]
- *Planck*+BAO thermal axion bound [254]
- SN1987A [253]
- Neutron stars (projection) [258].
- NS-NS and NS-BH Inspirals (projection) [258].
- White dwarfs [264]
- Polarisation haloscope (projection) [256]

7.1 Black hole superradiance

- Baryakhtar et al. [265] (just Stellar mass BHs)
- Mehta et al. [265] (Stellar mass and SMBHs)
- Stott [266]
- Ünal et al. [267] (Quasars)
- Cardoso et al. [268] (dark photon)

4 Axion-nucleon

Note: CASPER and nEDM limits account for stochastic correction reported in [223]

- Casimir effect (fifth force) [224]
- CASPER-ZULF-Comagnetometer [225]
- CASPER-ZULF-Sidechain [226]
- ChangE [227, 228]
- Hefei Spin-based amplifiers [229]
- nEDM (ultracold neutrons and mercury) [230]
- NASDUCK [231, 232]
- PSI HgM (nEDM) [233]
- K-3He comagnetometer (fifth force) [234]
- K-3He comagnetometer (dark matter) [235]

8 Axion theory predictions

8.1 Post-inflation QCD axion

- Ballesteros et al. [269]
- Buschmann et al. 2020 [270]
- Buschmann et al. 2021 [271]
- Bonati et al. [272]
- Borsanyi et al. [273]
- Berkowitz et al. [274]
- Dine et al. [275]
- Petreczky et al. [276]
- Fleury & Moore [277]
- Klaer & Moore [278]
- Gorghetto et al. [279]
- Saikawa et al. (2019) [78]
- Saikawa et al. (2024) [280]

8.2 Other dark matter predictions

- ALP Cogenesis [281]
- Early matter domination [282]
- Post-inflation ALP misalignment [283, 284]
- Trapped misalignment (\mathcal{Z}_N axion) [259]

9 CP-violating couplings

Combined constraints [285]

Scalar-nucleon

- Red giants [286]
- MICROSCOPE [287].
- Eot-Wash [288, 289, 290]
- Irvine [291]. Corrected to 2σ limit by [292]
- HUST [293, 294, 295, 296].
- Stanford [297]
- IUPUI [298].
- Wuhan [292]

Pseudoscalar-electron

- Red giants [286]
- Eot-wash [299]
- e^+e^- Penning trap [300]
- NIST [301]
- SMILE [302]
- Perihelion shift [303]
- QUAX [304, 305, 306]
- Washington [199, 307].
- XENON1T [308]
- ACME (projection) [309]
- Magnon (projection) [211]
- QUAX (projection) [304].

Pseudoscalar-nucleon

- Neutron star cooling [238]
- Hefei (Earth) [310]
- Hefei (mm) [311]
- Washington [312]. Limit taken from [313].
- SMILE [302].
- Mainz [314]
- Moon/Sun [315]
- Yb trap (projection) [309]
- ARIADNE (projection) [316]
- CASPER-wind (projection) [255]
- DM comagnetometer (projection) [197]
- Fifth force Ne-Rb-K comagnetometer (projection) [317]

10 Scalars

Scalar-photon

- Globular clusters [107]
- Eot-Wash (EP) [318]
- Fifth force [319, 320, 321, 322]
- MICROSCOPE [287]
- AURIGA [323]
- BACON [324]
- Cs/Cav [325]
- DAMNED [326]
- Dy/Dy [327]
- Dy/Quartz [252]
- Dynamic Decoupling [328]
- GEO600 [329]
- LIGO O3 [330], see also [331]
- Holometer [332]
- H/Quartz/Sapphire [333]
- PTB (Yb+, Sr clock) [334]
- I₂ [335]
- Rb/Cs [336]
- Sr/Si [337]
- Yb/Sr [338]
- AEDGE (projection) [339]
- AION (projection) [339]
- DUAL (projection) [340]
- MAGIS (projection) [341]
- Nuclear clock (projection) [342]
- Mechanical Resonators (projection) [343]

Scalar-electron

- Red giants [286]
- White dwarfs [344]
- Eot-Wash (EP) [318]
- Fifth force [319, 320, 321, 322]
- MICROSCOPE [287]
- AURIGA [323]
- Cavities [345]
- Cs/Cav [325]
- DAMNED [326]
- GEO600 [329]
- Holometer [332]
- H/Quartz/Sapphire [333]
- LIGO O3 [330], see also [331]
- I₂ [335]
- H/Si [337]
- Rb/Quartz [252]
- Yb/Cs [346]
- NANOGrav 15-year PTA [347]
- FOCOS (nuclear clock projection) [348]
- AEDGE (projection) [339]
- AION (projection) [339]
- DUAL (projection) [340]
- HELIOS (projection) [349]
- Optical microwave clock (projection) [350]
- Optical cavities [351]
- SrOH [352]
- Mechanical Resonators (projection) [343]
- IPTA (mock data) [353]

- Torsion balance (projection) [369]
- STE-QUEST (projection) [370]

11 Vectors

B-L coupling

- Casimir [354, 355, 356]
- Eot-Wash (EP) [357]
- Eot-Wash (ISL) [358]
- MICROSCOPE [359]
- DM stability [360]
- Horizontal branch [361]
- Red giant [361]
- Sun [361]
- Eot-Wash (DM) [362]
- LIGO (O1) [363]
- LIGO/VIRGO [363]
- LISA Pathfinder [364, 365]
- PPTA [366]
- Asteroids (projection) [367]
- HELIOS (projection) [349]
- LISA (projection) [367]
- MAGIS (projection) [341]
- Optomechanical membranes (projection) [368]
- SKA (projection) [369]

12 Dark photons

Combined constraints [371]

SM photon-DP transitions

- Coulomb [372, 373, 374, 375, 376],
- Plimpton & Lawton's experiment [377, 376]
- Atomic spectroscopy [378]
- Atomic force microscopy (AFM) [376]
- Static magnetic field of the Earth [379, 380, 381]
- Static magnetic field of Jupiter [382, 381].
- Jupiter B-field/Juno mission [383]
- ALPs [69]
- ALPS-II (projection) [384]
- SPring-8 [385]
- UWA-LSW [386, 387]
- ADMX-LSW [388]
- CROWS [72].
- DarkSRF [389]
- DarkSRF (projection) [390]
- TEXONO [391]
- Crab nebula [392]
- COBE and FIRAS [393]
- STAX (projection) [394]

Production in stars

- CAST [395]
- SHIPS [396]
- HINODE [397]
- IAXO (modified for longitudinal mode) [398]
- New globular cluster bound [399]
- Old stellar bounds: Solar-L, HB and RG stars [361] (see also [400])
- Neutron stars [401]
- Solar neutrinos [402]
- XENON1T [403]

Dark matter cosmology/astro

- Arias et al. [283]
- Witte et al. [404, 405]
- Caputo et al. [406, 393],
- ISM [407],
- Leo T dwarf [408]
- Gas clouds [408, 409]
- JWST [410]
- Parker Solar Probe [411]

Dark matter experiments

- Reinterpreted axion limits [371]
- APEX [412]
- ALPHA [50]
- AMAILS [413]
- BRASS-p [414]
- BREAD (projection) [53]
- Dandelion (projection) [415]
- DarkSide-50 [194]
- DAMIC [416]
- Dark E-field Radio [417]
- DM Pathfinder [418]
- DOSUE-RR [419, 420]
- FAST Radio antenna [421]
- FUNK [422]
- GigaBREAD [423]
- LAMPOST [424]
- LOFAR (solar corona) [425]
- MuDHI [426]
- ORGAN [427]
- ORPHEUS [428]
- QUALIPHIDE [429]
- Quantum cyclotron [430]
- SENSEI [431]
- SHUKET [432]
- SuperCDMS [433]
- SuperMAG [434, 435]
- SQuAD [436],
- SQMS [437],
- SUPAX [438]
- SRF scanning [439]
- Tokyo dish antennae experiments [440, 441, 442]
- WISPDMS [443]
- XENON(100,1T,nT) [444, 308, 445, 446, 403, 447].

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