

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]
- CAST-CAPP [17]
- DANCE [18]
- BASE [19]
- GrAHal [20]
- HAYSTAC [21, 22, 23]
- LIDA [24]
- ORGAN [25, 26, 27]
- QUAX [28, 29, 30]
- RADES [31]
- RBF [32]
- SHAFT [33]
- TASEH [34]
- SuperMAG [35]
- UF [36]
- UPLOAD-DOWNLOAD [37, 38]
- ABRACADABRA (projection) [39]
- ADBC (projection) [40]
- ADMX (projection) [41]
- aLIGO (projection) [42]
- ALPHA (projection) [43, 44]
- BabyIAXO-RADES (projection) [45]
- BRASS (projection) [46]
- BREAD (projection) [47]
- CADEX (projection) [48]
- DALI (projection) [49]
- DM-Radio (projection) [50, 51]
- DANCE (projection) [52]
- LAMPOST (projection) [53]
- MADMAX (projection) [54]
- FLASH (projection) [55, 56]
- QUAX (projection) [57]
- ORGAN (projection) [25]
- TOORAD (projection) [58]
- Twisted Anyon Cavity (projection) [59]
- WISPLC (projection) [60]
- SRF heterodyne cavity (projection) [61]

LSW/Helioscopes

- ALPS [62]
- CAST [63, 64]
- CROWS [65]
- OSQAR [66]
- PVLAS [67]
- SAPPHIRES [68, 69]
- ALPS-II (projection) [70]
- IAXO (projection) [71]
- IAXO (Galactic SN) [72]
- WISPMI (projection) [73]

Astro

- Axion star explosions [74]
- Betelgeuse [75]
- BICEP/KECK [76]
- Black hole polarimetry [77]
- Breakthrough Listen (Doppler shifted radio line in MW) [78]
- Bullet Cluster (archival radio data) [79]
- Cosmic IR background (hint) [80]
- Chandra (Hydra) [81]
- Chandra (M87) [82]
- Chandra (NG7 1275) [83]
- Chandra (H1821+643) [84]
- CMB Anisotropies [85, 86]
- COBE/FIRAS+Planck spectral dist. [87]
- Diffuse gamma-rays [88]
- Diffuse SN ALPs [89] (see also [90])

- Distance ladder [91]
- Fermi-LAT (NGC 1275) [92]
- Fermi-LAT (Extragalactic SNe) [93]
- Fermi-LAT (Quasars) [94]
- Gamma-ray attenuation (ALP dark matter) [95]
- Globular clusters (R parameter) [96]
- Globular clusters (R_2 parameter) [97]
- HAWC (TeV Blazars) [98]
- HESS (PKS 2155-304) [99]
- INTEGRAL (ALP decay) [100]
- Leo T gas temperature [101]
- Magnetic white dwarfs (X-rays) [102]
- Magnetic white dwarf (polarization) [103]
- MOJAVE [104]
- Mrk 421 (ARGO-YBJ+Fermi): [105]
- Mrk 421 (ARGO-YBJ+MAGIC): [106]
- Neutron Stars (Foster et al. 2020) [107]
- Neutron Stars (Darling 2020) [108]
- Neutron Stars (Battye et al. 2021) [109]
- Neutron stars (Foster et al. 2022) [110]
- Neutron Stars (Battye et al. 2023) [111]
- NuSTAR (decaying dark matter, recast from Sterile nu) [112, 113, 114]
- Planck cosmic birefringence [115]
- POLARBEAR [116]
- PPTA+QUIJOTE [117]
- Pulsar polarisation arrays (projection) [118]
- Pulsar polar cap [119]
- Red supergiant [120]
- Solar neutrinos [121]
- Stellar axion background [122]
- SN1987A- γ (ALP decay) [123, 124, 125]
- SN1987A- γ (low mass ALP conversion) [126, 124]
- SN1987A- γ, ν (high mass ALPs) [127, 128, 88]
- SN1987A (PVO) [129]
- Low-energy supernovae (ALP decay) [88]
- Solar basin (NuSTAR) [130]
- Solar basin (NuSTAR and SPHINX) [131]
- Star clusters [132]
- SPT [133]
- Telescopes (Haystack) [134]
- Telescopes (MUSE) [135] (updated from: [136])
- Telescopes (VIMOS) [137]
- Telescopes (HST) [138, 139]
- Telescopes (JWST) [140]
- Fermi galactic SN (projection) [141]
- THESEUS (projection) [142]
- WINERED (projection) [143]
- eROSITA (projection) [144]
- White dwarf initial-final mass relation [145]
- XMM-Newton (decaying DM ALPs) [146]

Cosmology

- Ionisation fraction, EBL, X-rays [147]
- BBN+ N_{eff} [148]
- Freeze in [149]

2 Heavy ALP-photon coupling

- ATALS (PbPb) [150]
- BaBar [151]
- Beam dump [152, 153, 151, 154, 155]
- Belle II [156]
- BESIII [157]
- CMS (PbPb) [158]
- LEP [159]
- LHC (pp)[160]
- MiniBooNE [161]
- NOMAD [162]
- OPAL [160]
- PrimEx [163, 164]
- CONUS (projection) [165]
- DUNE (projection) [166]
- FASER LLP (projection) [167]

3 Axion-electron

- EDELWEISS [168]
- Magnon non-demolition [169]
- DarkSide-50 [170]
- GERDA [171]
- LUX [172]
- Panda-X [173]
- SuperCDMS [174]
- XENON1T [175, 176]
- XENONnT [177]
- XENON1T (Solar basin) [178]
- Red giants (ω Cen) [179]
- NV Centers (projection) [180]
- Solar neutrinos [181]
- Magnons (projection) [182]
- Polaritons (projection) [183]
- DARWIN (projection) [184]
- LZ (projection) [185]
- QUAX [186, 187]
- Semiconductors (projection) [188]
- White dwarf hint [189]
- Freeze-in irreducible axions [149]
- X-rays (1-loop decay) [190]

4 Axion-nucleon

Note: CASPER and nEDM limits account for stochastic correction reported in [191]

- Casimir effect (fifth force) [192]
- CASPER-ZULF-Comagnetometer [193]
- CASPER-ZULF-Sidechain [194]
- ChangE [195, 196]
- Hefei Spin-based amplifiers [197]
- nEDM (ultracold neutrons and mercury) [198]
- NASDUCK [199, 200]
- PSI HgM (nEDM) [201]
- K-3He comagnetometer (fifth force) [202]
- K-3He comagnetometer (dark matter) [203]
- JEDI [204]
- Old comagnetometers [205]
- Torsion balance [206]
- Neutron star cooling [207] (corrected from [208])
- SN1987A Cooling [209, 210]
- SNO (deuterium dissasociation) [211]
- Proton storage ring (projection) [212]
- Electrostatic storage ring (projection) [213]
- DM comagnetometer (projection) [205]
- CASPER-gradient (projection) [194]
- Superfluid helium-3 HPD (projection) [214]
- MnCO₃ (projection) [215]

5 Axion-EDM

- Axinovae [216]
- Beam EDM [217]
- BBN (dark matter) [218]
- CASPER-electric [219]
- nEDM [198]
- HfF⁺ [220]
- JEDI [204]
- Rb/Quartz [221]
- SN1987A [222]
- *Planck*+BAO thermal axion bound [223]
- CASPER-electric (projection) [224]
- Storage Ring EDM (projection) [224]
- Polarisation haloscope (projection) [225]

6 Axion-top

Axion-top coupling limits originally compiles in Ref. [226]

7 Axion mass versus f_a

- BBN (dark matter) [218]
- Beam EDM [217]
- Binary pulsars and Solar core constraint on $\bar{\theta}$ [227]. I include minor numerical corrections made by [228, 229].
- GW170817 [230]
- HfF⁺ [220]
- Rb/Quartz [221]
- JEDI [204]
- nEDM [198]
- Piezoaxionic effect (projection) [231]
- *Planck*+BAO thermal axion bound [223]
- SN1987A [222]
- Neutron stars (projection) [227].
- NS-NS and NS-BH Inspirals (projection) [227].
- White dwarfs [232]
- Polarisation haloscope (projection) [225]

7.1 Black hole superradiance

- Baryakhtar et al. [233] (just Stellar mass BHs)
- Mehta et al. [233] (Stellar mass and SMBHs)
- Stott [234]
- Ünal et al. [235] (Quasars)
- Cardoso et al. [236] (dark photon)

8 Axion theory predictions

8.1 Post-inflation QCD axion

- Ballesteros et al. [237]
- Buschmann et al. 2020 [238]
- Buschmann et al. 2021 [239]
- Bonati et al. [240]
- Borsanyi et al. [241]
- Berkowitz et al. [242]
- Dine et al. [243]
- Petreczky et al. [244]
- Fleury & Moore [245]
- Klaer & Moore [246]
- Gorghetto et al. [247]
- Saikawa et al. [71]

8.2 Other dark matter predictions

- ALP Cogenesis [248]
- Early matter domination [249]
- Post-inflation ALP misalignment [250, 251]
- Trapped misalignment ($\mathcal{Z}_{\mathcal{N}}$ axion) [228]

9 CP-violating couplings

Combined constraints [252]

Scalar-nucleon

- Red giants [253]
- MICROSCOPE [254].
- Eot-Wash [255, 256, 257]
- Irvine [258]. Corrected to 2σ limit by [259]
- HUST [260, 261, 262, 263].
- Stanford [264]
- IUPUI [265].
- Wuhan [259]

Pseudoscalar-electron

- Red giants [253]
- Eot-wash [266]
- e^+e^- Penning trap [267]
- NIST [268]
- SMILE [269]
- QUAX [270, 271, 272]
- Washington [273, 274].
- XENON1T [275]
- ACME (projection) [276]
- Magnon (projection) [183]
- QUAX (projection) [270].

Pseudoscalar-nucleon

- Neutron star cooling [207]
- Hefei (Earth) [277]
- Hefei (mm) [278]
- Washington [279]. Limit taken from [280].
- SMILE [269].
- Mainz [281]
- Moon/Sun [282]
- Yb trap (projection) [276]
- ARIADNE (projection) [283]
- CASPER-wind (projection) [224]
- DM comagnetometer (projection) [205]
- Fifth force Ne-Rb-K comagnetometer (projection) [284]

10 Scalars

Scalar-photon

- Globular clusters [97]
- Eot-Wash (EP) [285]
- Fifth force [286, 287, 288, 289]
- MICROSCOPE [254]
- AURIGA [290]
- BACON [291]
- Cs/Cav [292]
- DAMNED [293]
- Dy/Dy [294]
- Dy/Quartz [221]
- Dynamic Decoupling [295]
- GEO600 [296]
- LIGO O3 [297]
- Holometer [298]
- H/Quartz/Sapphire [299]
- PTB (Yb+, Sr clock) [300]
- I₂ [301]
- Rb/Cs [302]
- Sr/Si [303]
- Yb/Sr [304]
- AEDGE (projection) [305]
- AION (projection) [305]
- DUAL (projection) [306]
- MAGIS (projection) [307]
- Nuclear clock (projection) [308]
- Mechanical Resonators (projection) [309]

Scalar-electron

- Red giants [253]
- White dwarfs [310]
- Eot-Wash (EP) [285]
- Fifth force [286, 287, 288, 289]
- MICROSCOPE [254]
- AURIGA [290]
- Cs/Cav [292]
- DAMNED [293]
- GEO600 [296]
- Holometer [298]
- H/Quartz/Sapphire [299]
- I₂ [301]
- H/Si [303]
- Rb/Quartz [221]
- Yb/Cs [311]
- LIGO O3 [297]
- NANOGrav 15-year PTA [312]
- FOCOS (nuclear clock projection) [313]
- AEDGE (projection) [305]
- AION (projection) [305]
- DUAL (projection) [306]
- HELIOS (projection) [314]
- Optical microwave clock (projection) [315]
- Optical cavities [316]
- SrOH [317]
- Mechanical Resonators (projection) [309]
- IPTA (mock data) [318]

11 Vectors

B-L coupling

- Casimir [319, 320, 321]
- Eot-Wash (EP) [322]
- Eot-Wash (ISL) [323]
- MICROSCOPE [324]
- DM stability [325]
- Horizontal branch [253]
- Sun [253]
- Eot-Wash (DM) [326]
- LIGO (O1) [327]
- LIGO/VIRGO [327]
- LISA Pathfinder [328, 329]
- PPTA [330]
- Asteroids (projection) [331]
- HELIOS (projection) [314]
- LISA (projection) [331]
- MAGIS (projection) [307]
- Optomechanical membranes (projection) [332]
- SKA (projection) [333]
- Torsion balance (projection) [333]
- STE-QUEST (projection) [334]

12 Dark photons

Combined constraints [335]

SM photon-DP transitions

- Coulomb [336, 337, 338, 339, 340],
- Plimpton & Lawton’s experiment [341, 340]
- Atomic spectroscopy [342]
- Atomic force microscopy (AFM) [340]
- Static magnetic field of the Earth [343, 344, 345]
- Static magnetic field of Jupiter [346, 345].
- ALPs [62]
- ALPS-II (projection) [347]
- SPring-8 [348]
- UWA-LSW [349, 350]
- ADMX-LSW [351]
- CROWS [65].
- DarkSRF [352]
- DarkSRF (projection) [353]
- TEXONO [354]
- Crab nebula [355]
- COBE and FIRAS [356]
- STAX (projection) [357]

Production in stars

- CAST [358]
- SHIPS [359]
- HINODE [360]
- New globular cluster bound [361]
- Old stellar bounds: Solar-L, HB and RG stars [362] (see also [363])
- Neutron stars [364]
- Solar neutrinos [365]
- XENON1T [366]

Dark matter cosmology/astro

- Arias et al. [250]
- Witte et al. [367, 368]
- Caputo et al. [369, 356],
- ISM [370],
- Leo T dwarf [371]
- Gas clouds [371, 372]

Dark matter experiments

- Reinterpreted axion limits [335]
- ALPHA [44]
- AMAILS [373]
- BRASS-p [374]
- BREAD (projection) [47]
- DarkSide-50 [170]
- DAMIC [375]
- Dark E-field Radio [376]
- DM Pathfinder [377]
- DOSUE-RR [378, 379]
- FAST Radio antenna [380]
- FUNK [381]
- GigaBREAD [382]
- LAMPOST [383]
- LOFAR (solar corona) [384]
- MuDHI [385]
- ORGAN [386]
- ORPHEUS [387]
- QUALIPHIDE [388]
- Quantum cyclotron [389]
- SENSEI [390]
- SHUKET [391]
- SuperCDMS [392]
- SuperMAG [393, 394]
- SQuAD [395],
- SQMS [396],
- SUPAX [397]
- SRF scanning [398]
- Tokyo dish antennae experiments [399, 400, 401]
- WISPDMS [402]
- XENON(100,1T,nT) [188, 275, 403, 404, 366, 405].

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