

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

- Fermi-LAT (NGC 1275) [91]
- Fermi-LAT (Extragalactic SNe) [92]
- Fermi-LAT (Quasars) [93]
- Gamma-ray attenuation (ALP dark matter) [94]
- Globular clusters (R parameter) [95]
- Globular clusters (R_2 parameter) [96]
- HAWC (TeV Blazars) [97]
- HESS (PKS 2155-304) [98]
- INTEGRAL (ALP decay) [99]
- Leo T gas temperature [100]
- Magnetic white dwarfs (X-rays) [101]
- Magnetic white dwarf (polarization) [102]
- MOJAVE [103]
- Mrk 421 (ARGO-YBJ+Fermi): [104]
- Mrk 421 (ARGO-YBJ+MAGIC): [105]
- Neutron Stars (Foster et al. 2020) [106]
- Neutron Stars (Darling 2020) [107]
- Neutron Stars (Battye et al. 2021) [108]
- Neutron stars (Foster et al. 2022) [109]
- Neutron Stars (Battye et al. 2023) [110]
- NuSTAR (decaying dark matter, recast from Sterile nu) [111, 112, 113]
- Planck cosmic birefringence [114]
- POLARBEAR [115]
- PPTA+QUIJOTE [116]
- Pulsar polarisation arrays (projection) [117]
- Pulsar polar cap [118]
- Red supergiant [119]
- Solar neutrinos [120]
- Stellar axion background [121]
- SN1987A- γ (ALP decay) [122, 123, 124]
- SN1987A- γ (low mass ALP conversion) [125, 123]
- SN1987A- γ, ν (high mass ALPs) [126, 127, 87]
- SN1987A (PVO) [128]
- Low-energy supernovae (ALP decay) [87]
- Solar basin (NuSTAR) [129]
- Solar basin (NuSTAR and SPHINX) [130]
- Star clusters [131]
- SPT [132]
- Telescopes (Haystack) [133]
- Telescopes (MUSE) [134] (updated from: [135])
- Telescopes (VIMOS) [136]
- Telescopes (HST) [137, 138]
- Fermi galactic SN (projection) [139]
- THESEUS (projection) [140]
- WINERED (projection) [141]
- eROSITA (projection) [142]
- White dwarf initial-final mass relation [143]
- XMM-Newton (decaying DM ALPs) [144]

Cosmology

- Ionisation fraction, EBL, X-rays [145]
- BBN+ N_{eff} [146]
- Freeze in [147]

2 Heavy ALP-photon coupling

- ATALS (PbPb) [148]
- BaBar [149]
- Beam dump [150, 151, 149, 152, 153]
- Belle II [154]
- BESIII [155]
- CMS (PbPb) [156]
- LEP [157]
- LHC (pp)[158]
- MiniBooNE [159]
- NOMAD [160]
- OPAL [158]
- PrimEx [161, 162]
- CONUS (projection) [163]
- DUNE (projection) [164]
- FASER LLP (projection) [165]

3 Axion-electron

- EDELWEISS [166]
- Magnon non-demolition [167]
- DarkSide-50 [168]
- GERDA [169]
- LUX [170]
- Panda-X [171]
- SuperCDMS [172]
- XENON1T [173, 174]
- XENONnT [175]
- XENON1T (Solar basin) [176]
- Red giants (ω Cen) [177]
- NV Centers (projection) [178]
- Solar neutrinos [179]
- Magnons (projection) [180]
- Polaritons (projection) [181]
- DARWIN (projection) [182]
- LZ (projection) [183]
- QUAX [184, 185]
- Semiconductors (projection) [186]
- White dwarf hint [187]
- Freeze-in irreducible axions [147]
- X-rays (1-loop decay) [188]

4 Axion-nucleon

Note: CASPER and nEDM limits account for stochastic correction reported in [189]

- Casimir effect (fifth force) [190]
- CASPER-ZULF-Comagnetometer [191]
- CASPER-ZULF-Sidechain [192]
- ChangE [193, 194]
- Hefei Spin-based amplifiers [195]
- nEDM (ultracold neutrons and mercury) [196]
- NASDUCK [197, 198]
- PSI HgM (nEDM) [199]
- K-3He comagnetometer (fifth force) [200]
- K-3He comagnetometer (dark matter) [201]
- JEDI [202]
- Old comagnetometers [203]
- Torsion balance [204]
- Neutron star cooling [205] (corrected from [206])
- SN1987A Cooling [207, 208]
- SNO (deuterium dissasociation) [209]
- Proton storage ring (projection) [210]
- Electrostatic storage ring (projection) [211]
- DM comagnetometer (projection) [203]
- CASPER-gradient (projection) [192]
- Superfluid helium-3 HPD (projection) [212]
- MnCO₃ (projection) [213]

5 Axion-EDM

- Axinovae [214]
- Beam EDM [215]
- BBN (dark matter) [216]
- CASPER-electric [217]
- nEDM [196]
- HfF⁺ [218]
- JEDI [202]
- Rb/Quartz [219]
- SN1987A [220]
- *Planck*+BAO thermal axion bound [221]
- CASPER-electric (projection) [222]
- Storage Ring EDM (projection) [222]
- Polarisation haloscope (projection) [223]

6 Axion-top

Axion-top coupling limits originally compiles in Ref. [224]

7 Axion mass versus f_a

- BBN (dark matter) [216]
- Beam EDM [215]
- Binary pulsars and Solar core constraint on $\bar{\theta}$ [225]. I include minor numerical corrections made by [226, 227].
- GW170817 [228]
- HfF⁺ [218]
- Rb/Quartz [219]
- JEDI [202]
- nEDM [196]
- Piezoaxionic effect (projection) [229]
- *Planck*+BAO thermal axion bound [221]
- SN1987A [220]
- Neutron stars (projection) [225].
- NS-NS and NS-BH Inspirals (projection) [225].
- White dwarfs [230]
- Polarisation haloscope (projection) [223]

7.1 Black hole superradiance

- Baryakhtar et al. [231] (just Stellar mass BHs)
- Mehta et al. [231] (Stellar mass and SMBHs)
- Stott [232]
- Ünal et al. [233] (Quasars)
- Cardoso et al. [234] (dark photon)

8 Axion theory predictions

8.1 Post-inflation QCD axion

- Ballesteros et al. [235]
- Buschmann et al. 2020 [236]
- Buschmann et al. 2021 [237]
- Bonati et al. [238]
- Borsanyi et al. [239]
- Berkowitz et al. [240]
- Dine et al. [241]
- Petreczky et al. [242]
- Fleury & Moore [243]
- Klaer & Moore [244]
- Gorghetto et al. [245]
- Saikawa et al. [71]

8.2 Other dark matter predictions

- ALP Cogenesis [246]
- Early matter domination [247]
- Post-inflation ALP misalignment [248, 249]
- Trapped misalignment ($\mathcal{Z}_{\mathcal{N}}$ axion) [226]

9 CP-violating couplings

Combined constraints [250]

Scalar-nucleon

- Red giants [251]
- MICROSCOPE [252].
- Eot-Wash [253, 254, 255]
- Irvine [256]. Corrected to 2σ limit by [257]
- HUST [258, 259, 260, 261].
- Stanford [262]
- IUPUI [263].
- Wuhan [257]

Pseudoscalar-electron

- Red giants [251]
- Eot-wash [264]
- NIST [265]
- SMILE [266].
- QUAX [267, 268, 269]
- Washington [270, 271].
- XENON1T [272]
- Magnon (projection) [181]
- QUAX (projection) [267].

Pseudoscalar-nucleon

- Neutron star cooling [205]
- Hefei (Earth) [273]
- Hefei (mm) [274]
- Washington [275]. Limit taken from [276].
- SMILE [266].
- Mainz [277]
- Moon/Sun [278]
- ARIADNE (projection) [279]
- CASPEr-wind (projection) [222]
- DM comagnetometer (projection) [203]
- Fifth force Ne-Rb-K comagnetometer (projection) [280]

10 Scalars

Scalar-photon

- Globular clusters [96]
- Eot-Wash (EP) [281]
- Fifth force [282, 283, 284, 285]
- MICROSCOPE [252]
- AURIGA [286]
- BACON [287]
- Cs/Cav [288]
- DAMNED [289]
- Dy/Dy [290]
- Dy/Quartz [219]
- Dynamic Decoupling [291]
- GEO600 [292]
- LIGO O3 [293]
- Holometer [294]
- H/Quartz/Sapphire [295]
- PTB (Yb+, Sr clock) [296]
- I₂ [297]
- Rb/Cs [298]
- Sr/Si [299]
- Yb/Sr [300]
- AEDGE (projection) [301]
- AION (projection) [301]
- DUAL (projection) [302]
- MAGIS (projection) [303]
- Nuclear clock (projection) [304]
- Mechanical Resonators (projection) [305]

Scalar-electron

- Red giants [251]
- White dwarfs [306]
- Eot-Wash (EP) [281]
- Fifth force [282, 283, 284, 285]
- MICROSCOPE [252]
- AURIGA [286]
- Cs/Cav [288]
- DAMNED [289]
- GEO600 [292]
- Holometer [294]
- H/Quartz/Sapphire [295]
- I₂ [297]
- H/Si [299]
- Rb/Quartz [219]
- Yb/Cs [307]
- LIGO O3 [293]
- NANOGrav 15-year PTA [308]
- FOCOS (nuclear clock projection) [309]
- AEDGE (projection) [301]
- AION (projection) [301]
- DUAL (projection) [302]
- HELIOS (projection) [310]
- Optical microwave clock (projection) [311]
- Optical cavities [312]
- SrOH [313]
- Mechanical Resonators (projection) [305]
- IPTA (mock data) [314]

11 Vectors

B-L coupling

- Casimir [315, 316, 317]
- Eot-Wash (EP) [318]
- Eot-Wash (ISL) [319]
- MICROSCOPE [320]
- DM stability [321]
- Horizontal branch [251]
- Sun [251]
- Eot-Wash (DM) [322]
- LIGO (O1) [323]
- LIGO/VIRGO [323]
- LISA Pathfinder [324, 325]
- PPTA [326]
- Asteroids (projection) [327]
- HELIOS (projection) [310]
- LISA (projection) [327]
- MAGIS (projection) [303]
- Optomechanical membranes (projection) [328]
- SKA (projection) [329]
- Torsion balance (projection) [329]
- STE-QUEST (projection) [330]

12 Dark photons

Combined constraints [331]

SM photon-DP transitions

- Coulomb [332, 333, 334, 335, 336],
- Plimpton & Lawton’s experiment [337, 336]
- Atomic spectroscopy [338]
- Atomic force microscopy (AFM) [336]
- Static magnetic field of the Earth [339, 340, 341]
- Static magnetic field of Jupiter [342, 341].
- ALPs [62]
- ALPS-II (projection) [343]
- SPring-8 [344]
- UWA-LSW [345, 346]
- ADMX-LSW [347]
- CROWS [65].
- DarkSRF [348]
- DarkSRF (projection) [349]
- TEXONO [350]
- Crab nebula [351]
- COBE and FIRAS [352]
- STAX (projection) [353]

Production in stars

- CAST [354]
- SHIPS [355]
- HINODE [356]
- New globular cluster bound [357]
- Old stellar bounds: Solar-L, HB and RG stars [358] (see also [359])
- Neutron stars [360]
- Solar neutrinos [361]
- XENON1T [362]

Dark matter cosmology/astro

- Arias et al. [248]
- Witte et al. [363, 364]
- Caputo et al. [365, 352],
- ISM [366],
- Leo T dwarf [367]
- Gas clouds [367, 368]

Dark matter experiments

- Reinterpreted axion limits [331]
- ALPHA [44]
- AMAILS [369]
- BRASS-p [370]
- BREAD (projection) [47]
- DarkSide-50 [168]
- DAMIC [371]
- Dark E-field Radio [372]
- DM Pathfinder [373]
- DOSUE-RR [374, 375]
- FAST Radio antenna [376]
- FUNK [377]
- LAMPOST [378]
- LOFAR (solar corona) [379]
- MuDHI [380]
- ORGAN [381]
- ORPHEUS [382]
- QUALIPHIDE [383]
- Quantum cyclotron [384]
- SENSEI [385]
- SHUKET [386]
- SuperCDMS [387]
- SuperMAG [388, 389]
- SQuAD [390],
- SQMS [391],
- SUPAX [392]
- SRF scanning [393]
- Tokyo dish antennae experiments [394, 395, 396]
- WISPDMM [397]
- XENON(100,1T,nT) [186, 272, 398, 399, 362, 400].

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