References for AxionLimits webpage

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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, 17, 18]
- CAST-CAPP [19]
- DANCE [20]
- BASE [21]
- GrAHal [22]
- HAYSTAC [23, 24, 25]
- LIDA [26]
- ORGAN [27, 28, 29]
- QUAX [30, 31, 32, 33]
- RADES [34]
- RBF [35]
- SHAFT [36]
- TASEH [37]
- SuperMAG [38]
- UF [39]
- UPLOAD-DOWNLOAD [40, 41]
- ABRACADABRA (projection) [42]
- ADBC (projection) [43]
- ADMX (projection) [44]
- aLIGO (projection) [45]
- ALPHA (projection) [46, 47]
- BabyIAXO-RADES (projection) [48]
- BRASS (projection) [49]
- BREAD (projection) [50]
- CADEx (projection) [51]
- DALI (projection) [52]
- DarkGEO (projection) [53]
- DM-Radio (projection) [54, 55]
- DANCE (projection) [56]
- LAMPOST (projection) [57]
- MADMAX (projection) [58]
- FLASH (projection) [59, 60]
- QUAX (projection) [61]
- ORGAN (projection) [27]
- TOORAD (projection) [62]
- Twisted Anyon Cavity (projection) [63]
- WISPLC (projection) [64]
- SRF heterodyne cavity (projection) [65]

LSW/Helioscopes

- ALPS [66]
- CAST [67, 68]
- CROWS [69]
- OSQAR [70]
- PVLAS [71]
- SAPPHIRES [72, 73]
- ALPS-II (projection) [74]
- IAXO (projection) [75]
- IAXO (Galactic SN) [76]
- WISPFI (projection) [77]

Astro

- Axion star explosions [78]
- Betelgeuse [79]
- BICEP/KECK [80]
- Black hole polarimetry [81]
- Breakthrough Listen (Doppler shifted radio line in MW) [82]
- Bullet Cluster (archival radio data) [83]
- Cosmic IR background (hint) [84]
- Chandra (Hydra) [85]
- Chandra (M87) [86]
- Chandra (NG7 1275) [87]
- Chandra (H1821+643) [88]
- CMB Anisotropies [89, 90]
- COBE/FIRAS+Planck spectral dist. [91]
- Diffuse gamma-rays [92]
- Diffuse SN ALPs [93] (see also [94])
- Distance ladder [95]
- Fermi-LAT (NGC 1275) [96]
- Fermi-LAT (Extragalactic SNe) [97]
- Fermi-LAT (Quasars) [98]
- Gamma-ray attenuation (ALP dark matter) [99]
- Globular clusters (R parameter) [100]
- Globular clusters (R_2 parameter) [101]
- HAWC (TeV Blazars) [102]
- HESS (PKS 2155-304) [103]
- INTEGRAL (ALP decay) [104]
- Leo T gas temperature [105]
- MAGIC (Perseus galaxy cluster) [106]
- Magnetic white dwarfs (X-rays) [107]
- Magnetic white dwarf (polarization) [108]
- MOJAVE [109]
- Mrk 421 (ARGO-YBJ+Fermi): [110]
- Mrk 421 (ARGO-YBJ+MAGIC): [111]
- Neutron Stars (Foster et al. 2020) [112]
- Neutron Stars (Darling 2020) [113]
- Neutron Stars (Battye et al. 2021) [114]
- Neutron stars (Foster et al. 2022) [115]
- Neutron Stars (Battye et al. 2023) [116]
- NuSTAR (decaying dark matter, recast from Sterile nu) [117, 118, 119]
- Planck cosmic birefringence [120]
- POLARBEAR [121, 122]
- PPTA+QUIJOTE [123]
- Pulsar polarisation arrays (projection) [124]
- Pulsar polar cap [125]
- PSR J0437-4715 polarisation [126]
- Red supergiant [127]
- Solar neutrinos [128]
- Stellar axion background [129]
- SN1987A-γ (ALP decay) [130, 131, 132]
- SN1987A-γ (low mass ALP conversion) [133, 131]
- SN1987A-γ,ν (high mass ALPs) [134, 135, 92]
- SN1987A (PVO) [136]
- Sgr A* [137]
- Low-energy supernovae (ALP decay) [92]
- Solar basin (NuSTAR) [138]
- Solar basin (NuSTAR and SPHINX) [139]
- Super Star clusters [140]
- SPT [141]
- Telescopes (Haystack) [142]
- Telescopes (MUSE) [143] (updated from: [144])
- Telescopes (VIMOS) [145]
- Telescopes (HST) [146, 147]
- Telescopes (JWST) [148]
- Telescopes (WINERED) [149, 150]
- Telescopes (eROSITA) [151]
- Fermi galactic SN (projection) [152]
- THESEUS (projection) [153]
- eROSITA (projection) [154]
- XRISM (projection) [155]
- White dwarf initial-final mass relation [156]
- XMM-Newton (decaying DM ALPs) [157]

Cosmology

- Ionisation fraction, EBL, X-rays [158]
- BBN+$N_{\rm eff}$ [159]
- Freeze in [160]

2 Heavy ALP-photon coupling

- ATALS (PbPb) [161]
- BaBar [162]
- Beam dump [163, 164, 162, 165, 166]
- Belle II [167]
- BESIII [168]
- CMS (PbPb) [169]
- LEP [170]
- LHC (pp)[171]
- MiniBooNE [172]
- NOMAD [173]
- OPAL [171]
- PrimEx [174, 175]
- CONUS (projection) [176]
- DUNE (projection) [177]
- FASER LLP (projection) [178]

3 Axion-electron

- Electron g-2 [179]
- EDELWEISS [180]
- Fermionic axion interferometer [181]
- Magnon non-demolition [182]
- DarkSide-50 [183]
- GERDA [184]
- LUX [185]
- Old comagnetometers [186]
- Panda-X [187]
- Torsion pendulum (spin force) [188]
- Torsion pendulum (axion wind) [189]
- SuperCDMS [190]
- XENON1T [191, 192]
- XENONnT [193]
- XENON1T (Solar basin) [194]
- Red giants (ωCen) [195]
- Solar neutrinos [196]
- Electron storage ring (projection) [197]
- Axion wind multilayer (projection) [198]
- Magnons (projection) [199]
- Polaritons (projection) [200]
- DARWIN (projection) [201]
- LZ (projection) [202]
- QUAX [203, 204]
- NV Centers (projection) [205]
- Superconductors (projection) [206]
- Semiconductors (projection) [207]
- Spin-orbit coupling (projection) [208]
- Torsion pendulum (projection) [209]
- YIG (projection) [199]
- White dwarf hint [210]
- Freeze-in irreducible axions [160]
- X-rays (1-loop decay) [211]

4 Axion-nucleon

Note: CASPEr and nEDM limits account for stochastic correction reported in [212]

- Casimir effect (fifth force) [213]
- CASPEr-ZULF-Comagnetometer [214]
- CASPEr-ZULF-Sidechain [215]
- ChangE [216, 217]
- Hefei Spin-based amplifiers [218]
- nEDM (ultracold neutrons and mercury) [219]
- NASDUCK [220, 221]
- PSI HgM (nEDM) [222]
- K-3He comagnetometer (fifth force) [223]
- K-3He comagnetometer (dark matter) [224]
- JEDI [225]
- Old comagnetometers [186]
- Torsion balance [226]
- Neutron star cooling [227] (corrected from [228])
- SN1987A Cooling [229, 230]
- SNO (deuterium dissasociation) [231]
- Proton storage ring (projection) [232]
- Electrostatic storage ring (projection) [197]
- DM comagnetometer (projection) [186]
- CASPEr-gradient (projection) [215]
- Superfluid helium-3 HPD (projection) [233]
- MnCO3 (projection) [234]

5 Axion-EDM

- Axinovae [235]
- Beam EDM [236]
- BBN (dark matter) [237]
- CASPEr-electric [238]
- nEDM [219]
- HfF$^+$ [239]
- JEDI [225]
- Rb/Quartz [240]
- SN1987A [241]
- *Planck*+BAO thermal axion bound [242]
- CASPEr-electric (projection) [243]
- Storage Ring EDM (projection) [243]
- Polarisation haloscope (projection) [244]

6 Axion-top

Axion-top coupling limits originally compiles in Ref. [245]

7 Axion mass versus f_a

- BBN (dark matter) [237]
- Beam EDM [236]
- Binary pulsars and Solar core constraint on $\bar{\theta}$ [246]. I include minor numerical corrections made by [247, 248].
- GW170817 [249]
- HfF$^+$ [239]
- Rb/Quartz [240]
- JEDI [225]
- nEDM [219]
- Tritium decay [250]
- Piezoaxionic effect (projection) [251]
- *Planck*+BAO thermal axion bound [242]
- SN1987A [241]
- Neutron stars (projection) [246].
- NS-NS and NS-BH Inspirals (projection) [246].
- White dwarfs [252]
- Polarisation haloscope (projection) [244]

7.1 Black hole superradiance

- Baryakhtar et al. [253] (just Stellar mass BHs)
- Mehta et al. [253] (Stellar mass and SMBHs)
- Stott [254]
- Ünal et al. [255] (Quasars)
- Cardoso et al. [256] (dark photon)

8 Axion theory predictions

8.1 Post-inflation QCD axion

- Ballesteros et al. [257]
- Buschmann et al. 2020 [258]
- Buschmann et al. 2021 [259]
- Bonati et al. [260]
- Borsanyi et al. [261]
- Berkowitz et al. [262]
- Dine et al. [263]
- Petreczky et al. [264]
- Fleury & Moore [265]
- Klaer & Moore [266]
- Gorghetto et al. [267]
- Saikawa et al. (2019) [75]
- Saikawa et al. (2024) [268]

8.2 Other dark matter predictions

- ALP Cogenesis [269]
- Early matter domination [270]
- Post-inflation ALP misalignment [271, 272]
- Trapped misalignment ($\mathcal{Z}_\mathcal{N}$ axion) [247]

9 CP-violating couplings

Combined constraints [273]

Scalar-nucleon

- Red giants [274]
- MICROSCOPE [275].
- Eot-Wash [276, 277, 278]
- Irvine [279]. Corrected to 2σ limit by [280]
- HUST [281, 282, 283, 284].
- Stanford [285]
- IUPUI [286].
- Wuhan [280]

Pseudoscalar-electron

- Red giants [274]
- Eot-wash [287]
- e^+e^- Penning trap [288]
- NIST [289]
- SMILE [290]
- Perihelion shift [291]
- QUAX [292, 293, 294]
- Washington [188, 295].
- XENON1T [296]
- ACME (projection) [297]
- Magnon (projection) [200]
- QUAX (projection) [292].

Pseudoscalar-nucleon

- Neutron star cooling [227]
- Hefei (Earth) [298]
- Hefei (mm) [299]
- Washington [300]. Limit taken from [301].
- SMILE [290].
- Mainz [302]
- Moon/Sun [303]
- Yb trap (projection) [297]
- ARIADNE (projection) [304]
- CASPEr-wind (projection) [243]
- DM comagnetometer (projection) [186]
- Fifth force Ne-Rb-K comagnetometer (projection) [305]

10 Scalars

Scalar-photon

- Globular clusters [101]
- Eot-Wash (EP) [306]
- Fifth force [307, 308, 309, 310]
- MICROSCOPE [275]
- AURIGA [311]
- BACON [312]
- Cs/Cav [313]
- DAMNED [314]
- Dy/Dy [315]
- Dy/Quartz [240]
- Dynamic Decoupling [316]
- GEO600 [317]
- LIGO O3 [318]
- Holometer [319]
- H/Quartz/Sapphire [320]
- PTB (Yb+, Sr clock) [321]
- I_2 [322]
- Rb/Cs [323]
- Sr/Si [324]
- Yb/Sr [325]
- AEDGE (projection) [326]
- AION (projection) [326]
- DUAL (projection) [327]
- MAGIS (projection) [328]
- Nuclear clock (projection) [329]
- Mechanical Resonators (projection) [330]

Scalar-electron

- Red giants [274]
- White dwarfs [331]
- Eot-Wash (EP) [306]
- Fifth force [307, 308, 309, 310]
- MICROSCOPE [275]
- AURIGA [311]
- Cavities [332]
- Cs/Cav [313]
- DAMNED [314]
- GEO600 [317]
- Holometer [319]
- H/Quartz/Sapphire [320]
- I_2 [322]
- H/Si [324]
- Rb/Quartz [240]
- Yb/Cs [333]
- LIGO O3 [318]
- NANOGrav 15-year PTA [334]
- FOCOS (nuclear clock projection) [335]
- AEDGE (projection) [326]
- AION (projection) [326]
- DUAL (projection) [327]
- HELIOS (projection) [336]
- Optical microwave clock (projection) [337]
- Optical cavities [338]
- SrOH [339]
- Mechanical Resonators (projection) [330]
- IPTA (mock data) [340]

11 Vectors

B-L coupling

- Casimir [341, 342, 343]
- Eot-Wash (EP) [344]
- Eot-Wash (ISL) [345]
- MICROSCOPE [346]
- DM stability [347]
- Horizontal branch [348]
- Red giant [348]
- Sun [348]
- Eot-Wash (DM) [349]
- LIGO (O1) [350]
- LIGO/VIRGO [350]
- LISA Pathfinder [351, 352]
- PPTA [353]
- Asteroids (projection) [354]
- HELIOS (projection) [336]
- LISA (projection) [354]
- MAGIS (projection) [328]
- Optomechanical membranes (projection) [355]
- SKA (projection) [356]
- Torsion balance (projection) [356]
- STE-QUEST (projection) [357]

12 Dark photons

Combined constraints [358]

SM photon-DP transitions

- Coulomb [359, 360, 361, 362, 363],
- Plimpton & Lawton's experiment [364, 363]
- Atomic spectroscopy [365]
- Atomic force microscopy (AFM) [363]
- Static magnetic field of the Earth [366, 367, 368]
- Static magnetic field of Jupiter [369, 368].
- Jupiter B-field/Juno mission [370]
- ALPs [66]
- ALPS-II (projection) [371]
- SPring-8 [372]
- UWA-LSW [373, 374]
- ADMX-LSW [375]
- CROWS [69].
- DarkSRF [376]
- DarkSRF (projection) [377]
- TEXONO [378]
- Crab nebula [379]
- COBE and FIRAS [380]
- STAX (projection) [381]

Production in stars

- CAST [382]
- SHIPS [383]
- HINODE [384]
- IAXO (modified for longitudinal mode) [385]
- New globular cluster bound [386]
- Old stellar bounds: Solar-L, HB and RG stars [348] (see also [387])
- Neutron stars [388]
- Solar neutrinos [389]
- XENON1T [390]

Dark matter cosmology/astro

- Arias et al. [271]
- Witte et al. [391, 392]
- Caputo et al. [393, 380],
- ISM [394],
- Leo T dwarf [395]
- Gas clouds [395, 396]

Dark matter experiments

- Reinterpreted axion limits [358]
- ALPHA [47]
- AMAILS [397]
- BRASS-p [398]
- BREAD (projection) [50]
- Dandelion (projection) [399]
- DarkSide-50 [183]
- DAMIC [400]
- Dark E-field Radio [401]
- DM Pathfinder [402]
- DOSUE-RR [403, 404]
- FAST Radio antenna [405]
- FUNK [406]
- GigaBREAD [407]
- LAMPOST [408]
- LOFAR (solar corona) [409]
- MuDHI [410]
- ORGAN [411]
- ORPHEUS [412]
- QUALIPHIDE [413]
- Quantum cyclotron [414]
- SENSEI [415]
- SHUKET [416]
- SuperCDMS [417]
- SuperMAG [418, 419]
- SQuAD [420],
- SQMS [421],
- SUPAX [422]
- SRF scanning [423]
- Tokyo dish antennae experiments [424, 425, 426]
- WISPDMX [427]
- XENON(100,1T,nT) [428, 296, 429, 430, 390, 431].

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