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

LSW/Helioscopes

- ALPS [64]
- CAST [65, 66]
- CROWS [67]
- OSQAR [68]
- PVLAS [69]
- SAPPHIRES [70, 71]
- ALPS-II (projection) [72]
- IAXO (projection) [73]
- IAXO (Galactic SN) [74]
- WISPFI (projection) [75]

Astro

- Axion star explosions [76]
- Betelgeuse [77]
- BICEP/KECK [78]
- Black hole polarimetry [79]
- Breakthrough Listen (Doppler shifted radio line in MW) [80]
- Bullet Cluster (archival radio data) [81]
- Cosmic IR background (hint) [82]
- Chandra (Hydra) [83]
- Chandra (M87) [84]
- Chandra (NG7 1275) [85]
- Chandra (H1821+643) [86]
- CMB Anisotropies [87, 88]
- COBE/FIRAS+Planck spectral dist. [89]
- Diffuse gamma-rays [90]
- Diffuse SN ALPs [91] (see also [92])
- Distance ladder [93]
- Fermi-LAT (NGC 1275) [94]
- Fermi-LAT (Extragalactic SNe) [95]
- Fermi-LAT (Quasars) [96]
- Gamma-ray attenuation (ALP dark matter) [97]
- Globular clusters (R parameter) [98]
- Globular clusters (R_2 parameter) [99]
- HAWC (TeV Blazars) [100]
- HESS (PKS 2155-304) [101]
- INTEGRAL (ALP decay) [102]
- Leo T gas temperature [103]
- MAGIC (Perseus galaxy cluster) [104]
- Magnetic white dwarfs (X-rays) [105]
- Magnetic white dwarf (polarization) [106]
- MOJAVE [107]
- Mrk 421 (ARGO-YBJ+Fermi): [108]
- Mrk 421 (ARGO-YBJ+MAGIC): [109]
- Neutron Stars (Foster et al. 2020) [110]
- Neutron Stars (Darling 2020) [111]
- Neutron Stars (Battye et al. 2021) [112]
- Neutron stars (Foster et al. 2022) [113]
- Neutron Stars (Battye et al. 2023) [114]
- NuSTAR (decaying dark matter, recast from Sterile nu) [115, 116, 117]
- Planck cosmic birefringence [118]
- POLARBEAR [119]
- PPTA+QUIJOTE [120]
- Pulsar polarisation arrays (projection) [121]
- Pulsar polar cap [122]
- Red supergiant [123]
- Solar neutrinos [124]
- Stellar axion background [125]
- SN1987A-γ (ALP decay) [126, 127, 128]
- SN1987A-γ (low mass ALP conversion) [129, 127]
- SN1987A-γ,ν (high mass ALPs) [130, 131, 90]
- SN1987A (PVO) [132]
- Low-energy supernovae (ALP decay) [90]
- Solar basin (NuSTAR) [133]
- Solar basin (NuSTAR and SPHINX) [134]
- Star clusters [135]
- SPT [136]
- Telescopes (Haystack) [137]
- Telescopes (MUSE) [138] (updated from: [139])
- Telescopes (VIMOS) [140]
- Telescopes (HST) [141, 142]
- Telescopes (JWST) [143]
- Fermi galactic SN (projection) [144]
- THESEUS (projection) [145]
- WINERED (projection) [146]
- eROSITA (projection) [147]
- White dwarf initial-final mass relation [148]
- XMM-Newton (decaying DM ALPs) [149]

Cosmology

- Ionisation fraction, EBL, X-rays [150]
- BBN+$N_{\rm eff}$ [151]
- Freeze in [152]

2 Heavy ALP-photon coupling

- ATALS (PbPb) [153]
- BaBar [154]
- Beam dump [155, 156, 154, 157, 158]
- Belle II [159]
- BESIII [160]
- CMS (PbPb) [161]
- LEP [162]
- LHC (pp)[163]
- MiniBooNE [164]
- NOMAD [165]
- OPAL [163]
- PrimEx [166, 167]
- CONUS (projection) [168]
- DUNE (projection) [169]
- FASER LLP (projection) [170]

3 Axion-electron

- Electron g-2 [171]
- EDELWEISS [172]
- Fermionic axion interferometer [173]
- Magnon non-demolition [174]
- DarkSide-50 [175]
- GERDA [176]
- LUX [177]
- Old comagnetometers [178]
- Panda-X [179]
- Torsion pendulum (spin force) [180]
- Torsion pendulum (axion wind) [181]
- SuperCDMS [182]
- XENON1T [183, 184]
- XENONnT [185]
- XENON1T (Solar basin) [186]
- Red giants (ωCen) [187]
- Solar neutrinos [188]
- Electron storage ring (projection) [189]
- Axion wind multilayer (projection) [190]
- Magnons (projection) [191]
- Polaritons (projection) [192]
- DARWIN (projection) [193]
- LZ (projection) [194]
- QUAX [195, 196]
- NV Centers (projection) [197]
- Superconductors (projection) [198]
- Semiconductors (projection) [199]
- Spin-orbit coupling (projection) [200]
- Torsion pendulum (projection) [201]
- YIG (projection) [191]
- White dwarf hint [202]
- Freeze-in irreducible axions [152]
- X-rays (1-loop decay) [203]

4 Axion-nucleon

Note: CASPEr and nEDM limits account for stochastic correction reported in [204]

- Casimir effect (fifth force) [205]
- CASPEr-ZULF-Comagnetometer [206]
- CASPEr-ZULF-Sidechain [207]
- ChangE [208, 209]
- Hefei Spin-based amplifiers [210]
- nEDM (ultracold neutrons and mercury) [211]
- NASDUCK [212, 213]
- PSI HgM (nEDM) [214]
- K-3He comagnetometer (fifth force) [215]
- K-3He comagnetometer (dark matter) [216]
- JEDI [217]
- Old comagnetometers [178]
- Torsion balance [218]
- Neutron star cooling [219] (corrected from [220])
- SN1987A Cooling [221, 222]
- SNO (deuterium dissasociation) [223]
- Proton storage ring (projection) [224]
- Electrostatic storage ring (projection) [189]
- DM comagnetometer (projection) [178]
- CASPEr-gradient (projection) [207]
- Superfluid helium-3 HPD (projection) [225]
- MnCO3 (projection) [226]

5 Axion-EDM

- Axinovae [227]
- Beam EDM [228]
- BBN (dark matter) [229]
- CASPEr-electric [230]
- nEDM [211]
- HfF$^+$ [231]
- JEDI [217]
- Rb/Quartz [232]
- SN1987A [233]
- *Planck*+BAO thermal axion bound [234]
- CASPEr-electric (projection) [235]
- Storage Ring EDM (projection) [235]
- Polarisation haloscope (projection) [236]

6 Axion-top

Axion-top coupling limits originally compiles in Ref. [237]

7 Axion mass versus f_a

- BBN (dark matter) [229]
- Beam EDM [228]
- Binary pulsars and Solar core constraint on $\bar{\theta}$ [238]. I include minor numerical corrections made by [239, 240].
- GW170817 [241]
- HfF$^+$ [231]
- Rb/Quartz [232]
- JEDI [217]
- nEDM [211]
- Tritium decay [242]
- Piezoaxionic effect (projection) [243]
- *Planck*+BAO thermal axion bound [234]
- SN1987A [233]
- Neutron stars (projection) [238].
- NS-NS and NS-BH Inspirals (projection) [238].
- White dwarfs [244]
- Polarisation haloscope (projection) [236]

7.1 Black hole superradiance

- Baryakhtar et al. [245] (just Stellar mass BHs)
- Mehta et al. [245] (Stellar mass and SMBHs)
- Stott [246]
- Ünal et al. [247] (Quasars)
- Cardoso et al. [248] (dark photon)

8 Axion theory predictions

8.1 Post-inflation QCD axion

- Ballesteros et al. [249]
- Buschmann et al. 2020 [250]
- Buschmann et al. 2021 [251]
- Bonati et al. [252]
- Borsanyi et al. [253]
- Berkowitz et al. [254]
- Dine et al. [255]
- Petreczky et al. [256]
- Fleury & Moore [257]
- Klaer & Moore [258]
- Gorghetto et al. [259]
- Saikawa et al. [73]

8.2 Other dark matter predictions

- ALP Cogenesis [260]
- Early matter domination [261]
- Post-inflation ALP misalignment [262, 263]
- Trapped misalignment ($\mathcal{Z}_\mathcal{N}$ axion) [239]

9 CP-violating couplings

Combined constraints [264]

Scalar-nucleon

- Red giants [265]
- MICROSCOPE [266].
- Eot-Wash [267, 268, 269]
- Irvine [270]. Corrected to 2σ limit by [271]
- HUST [272, 273, 274, 275].
- Stanford [276]
- IUPUI [277].
- Wuhan [271]

Pseudoscalar-electron

- Red giants [265]
- Eot-wash [278]
- e^+e^- Penning trap [279]
- NIST [280]
- SMILE [281]
- QUAX [282, 283, 284]
- Washington [180, 285].
- XENON1T [286]
- ACME (projection) [287]
- Magnon (projection) [192]
- QUAX (projection) [282].

Pseudoscalar-nucleon

- Neutron star cooling [219]
- Hefei (Earth) [288]
- Hefei (mm) [289]
- Washington [290]. Limit taken from [291].
- SMILE [281].
- Mainz [292]
- Moon/Sun [293]
- Perihelion shift [294]
- Yb trap (projection) [287]
- ARIADNE (projection) [295]
- CASPEr-wind (projection) [235]
- DM comagnetometer (projection) [178]
- Fifth force Ne-Rb-K comagnetometer (projection) [296]

10 Scalars

Scalar-photon

- Globular clusters [99]
- Eot-Wash (EP) [297]
- Fifth force [298, 299, 300, 301]
- MICROSCOPE [266]
- AURIGA [302]
- BACON [303]
- Cs/Cav [304]
- DAMNED [305]
- Dy/Dy [306]
- Dy/Quartz [232]
- Dynamic Decoupling [307]
- GEO600 [308]
- LIGO O3 [309]
- Holometer [310]
- H/Quartz/Sapphire [311]
- PTB (Yb+, Sr clock) [312]
- I_2 [313]
- Rb/Cs [314]
- Sr/Si [315]
- Yb/Sr [316]
- AEDGE (projection) [317]
- AION (projection) [317]
- DUAL (projection) [318]
- MAGIS (projection) [319]
- Nuclear clock (projection) [320]
- Mechanical Resonators (projection) [321]

Scalar-electron

- Red giants [265]
- White dwarfs [322]
- Eot-Wash (EP) [297]
- Fifth force [298, 299, 300, 301]
- MICROSCOPE [266]
- AURIGA [302]
- Cavities [323]
- Cs/Cav [304]
- DAMNED [305]
- GEO600 [308]
- Holometer [310]
- H/Quartz/Sapphire [311]
- I_2 [313]
- H/Si [315]
- Rb/Quartz [232]
- Yb/Cs [324]
- LIGO O3 [309]
- NANOGrav 15-year PTA [325]
- FOCOS (nuclear clock projection) [326]
- AEDGE (projection) [317]
- AION (projection) [317]
- DUAL (projection) [318]
- HELIOS (projection) [327]
- Optical microwave clock (projection) [328]
- Optical cavities [329]
- SrOH [330]
- Mechanical Resonators (projection) [321]
- IPTA (mock data) [331]

11 Vectors

B-L coupling

- Casimir [332, 333, 334]
- Eot-Wash (EP) [335]
- Eot-Wash (ISL) [336]
- MICROSCOPE [337]
- DM stability [338]
- Horizontal branch [265]
- Sun [265]
- Eot-Wash (DM) [339]
- LIGO (O1) [340]
- LIGO/VIRGO [340]
- LISA Pathfinder [341, 342]
- PPTA [343]
- Asteroids (projection) [344]
- HELIOS (projection) [327]
- LISA (projection) [344]
- MAGIS (projection) [319]
- Optomechanical membranes (projection) [345]
- SKA (projection) [346]
- Torsion balance (projection) [346]
- STE-QUEST (projection) [347]

12 Dark photons

Combined constraints [348]

SM photon-DP transitions

- Coulomb [349, 350, 351, 352, 353],
- Plimpton & Lawton's experiment [354, 353]
- Atomic spectroscopy [355]
- Atomic force microscopy (AFM) [353]
- Static magnetic field of the Earth [356, 357, 358]
- Static magnetic field of Jupiter [359, 358].
- Jupiter B-field/Juno mission [360]
- ALPs [64]
- ALPS-II (projection) [361]
- SPring-8 [362]
- UWA-LSW [363, 364]
- ADMX-LSW [365]
- CROWS [67].
- DarkSRF [366]
- DarkSRF (projection) [367]
- TEXONO [368]
- Crab nebula [369]
- COBE and FIRAS [370]
- STAX (projection) [371]

Production in stars

- CAST [372]
- SHIPS [373]
- HINODE [374]
- IAXO (modified for longitudinal mode) [375]
- New globular cluster bound [376]
- Old stellar bounds: Solar-L, HB and RG stars [377] (see also [378])
- Neutron stars [379]
- Solar neutrinos [380]
- XENON1T [381]

Dark matter cosmology/astro

- Arias et al. [262]
- Witte et al. [382, 383]
- Caputo et al. [384, 370],
- ISM [385],
- Leo T dwarf [386]
- Gas clouds [386, 387]

Dark matter experiments

- Reinterpreted axion limits [348]
- ALPHA [46]
- AMAILS [388]
- BRASS-p [389]
- BREAD (projection) [49]
- Dandelion (projection) [**?**]
- DarkSide-50 [175]
- DAMIC [390]
- Dark E-field Radio [391]
- DM Pathfinder [392]
- DOSUE-RR [393, 394]
- FAST Radio antenna [395]
- FUNK [396]
- GigaBREAD [397]
- LAMPOST [398]
- LOFAR (solar corona) [399]
- MuDHI [400]
- ORGAN [401]
- ORPHEUS [402]
- QUALIPHIDE [403]
- Quantum cyclotron [404]
- SENSEI [405]
- SHUKET [406]
- SuperCDMS [407]
- SuperMAG [408, 409]
- SQuAD [410],
- SQMS [411],
- SUPAX [412]
- SRF scanning [413]
- Tokyo dish antennae experiments [414, 415, 416]
- WISPDMX [417]
- XENON(100,1T,nT) [418, 286, 419, 420, 381, 421].

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