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

LSW/Helioscopes

- ALPS [61]
- CAST [62, 63]
- CROWS [64]
- OSQAR [65]
- PVLAS [66]
- SAPPHIRES [67, 68]
- ALPS-II (projection) [69]
- IAXO (projection) [70]
- IAXO (Galactic SN) [71]
- WISPFI (projection) [72]

Astro

- Axion star explosions [73]
- Betelgeuse [74]
- BICEP/KECK [75]
- Breakthrough Listen (Doppler shifted radio line in MW) [76]
- Bullet Cluster (archival radio data) [77]
- Cosmic IR background (hint) [78]
- Chandra (Hydra) [79]
- Chandra (M87) [80]
- Chandra (NG7 1275) [81]
- Chandra (H1821+643) [82]
- CMB Anisotropies [83, 84]
- COBE/FIRAS+Planck spectral dist. [85]
- Diffuse gamma-rays [86]
- Diffuse SN ALPs [87] (see also [88])
- Distance ladder [89]
- Fermi-LAT (NGC 1275) [90]
- Fermi-LAT (Extragalactic SNe) [91]
- Fermi-LAT (Quasars) [92]
- Gamma-ray attenuation (ALP dark matter) [93]
- Globular clusters (R parameter) [94]
- Globular clusters (R_2 parameter) [95]
- HAWC (TeV Blazars) [96]
- HESS (PKS 2155-304) [97]
- INTEGRAL (ALP decay) [98]
- Leo T gas temperature [99]
- Magnetic white dwarfs (X-rays) [100]
- Magnetic white dwarf (polarization) [101]
- MOJAVE [102]
- Mrk 421 (ARGO-YBJ+Fermi): [103]
- Mrk 421 (ARGO-YBJ+MAGIC): [104]
- Neutron Stars (Foster et al. 2020) [105]
- Neutron Stars (Darling 2020) [106]
- Neutron Stars (Battye et al. 2021) [107]
- Neutron stars (Foster et al. 2022) [108]
- Neutron Stars (Battye et al. 2023) [109]
- NuSTAR (decaying dark matter, recast from Sterile nu) [110, 111, 112]
- Planck cosmic birefringence [113]
- POLARBEAR [114]
- PPTA+QUIJOTE [115]
- Pulsar polarisation arrays (projection) [116]
- Pulsar polar cap [117]
- Red supergiant [118]
- Solar neutrinos [119]
- Stellar axion background [120]
- SN1987A-γ (ALP decay) [121, 122, 123]
- SN1987A-γ (low mass ALP conversion) [124, 122]
- SN1987A-γ,ν (high mass ALPs) [125, 126, 86]
- SN1987A (PVO) [127]
- Low-energy supernovae (ALP decay) [86]
- Solar basin (NuSTAR) [128]
- Solar basin (NuSTAR and SPHINX) [129]
- Star clusters [130]
- SPT [131]
- Telescopes (Haystack) [132]
- Telescopes (MUSE) [133] (updated from: [134])
- Telescopes (VIMOS) [135]
- Telescopes (HST) [136, 137]
- Fermi galactic SN (projection) [138]
- THESEUS (projection) [139]
- WINERED (projection) [140]
- eROSITA (projection) [141]
- White dwarf initial-final mass relation [142]
- XMM-Newton (decaying DM ALPs) [143]

Cosmology

- Ionisation fraction, EBL, X-rays [144]
- BBN+$N_{\rm eff}$ [145]
- Freeze in [146]

2 Heavy ALP-photon coupling

- ATALS (PbPb) [147]
- BaBar [148]
- Beam dump [149, 150, 148, 151, 152]
- Belle II [153]
- BESIII [154]
- CMS (PbPb) [155]
- LEP [156]
- LHC (pp)[157]
- MiniBooNE [158]
- NOMAD [159]
- OPAL [157]
- PrimEx [160, 161]
- CONUS (projection) [162]
- DUNE (projection) [163]
- FASER LLP (projection) [164]

3 Axion-electron

- EDELWEISS [165]
- Magnon non-demolition [166]
- DarkSide-50 [167]
- GERDA [168]
- LUX [169]
- Panda-X [170]
- SuperCDMS [171]
- XENON1T [172, 173]
- XENONnT [174]
- XENON1T (Solar basin) [175]
- Red giants (ωCen) [176]
- NV Centers (projection) [177]
- Solar neutrinos [178]
- Magnons (projection) [179]
- Polaritons (projection) [180]
- DARWIN (projection) [181]
- LZ (projection) [182]
- QUAX [183, 184]
- Semiconductors (projection) [185]
- White dwarf hint [186]
- Freeze-in irreducible axions [146]
- X-rays (1-loop decay) [187]

4 Axion-nucleon

Note: CASPEr and nEDM limits account for stochastic correction reported in [188]

- Casimir effect (fifth force) [189]
- CASPEr-ZULF-Comagnetometer [190]
- CASPEr-ZULF-Sidechain [191]
- ChangE [192]
- Hefei Spin-based amplifiers [193]
- nEDM (ultracold neutrons and mercury) [194]
- NASDUCK [195, 196]
- PSI HgM (nEDM) [197]
- K-3He comagnetometer (fifth force) [198]
- K-3He comagnetometer (dark matter) [199]
- JEDI [200]
- Old comagnetometers [201]
- Torsion balance [202]
- Neutron star cooling [203] (corrected from [204])
- SN1987A Cooling [205, 206]
- SNO (deuterium dissasociation) [207]
- Proton storage ring (projection) [208]
- Electrostatic storage ring (projection) [209]
- DM comagnetometer (projection) [201]
- CASPEr-gradient (projection) [191]
- Superfluid helium-3 HPD (projection) [210]
- MnCO3 (projection) [211]

5 Axion-EDM

- Axinovae [212]
- Beam EDM [213]
- BBN (dark matter) [214]
- CASPEr-electric [215]
- nEDM [194]
- HfF$^+$ [216]
- JEDI [200]
- Rb/Quartz [217]
- SN1987A [218]
- *Planck*+BAO thermal axion bound [219]
- CASPEr-electric (projection) [220]
- Storage Ring EDM (projection) [220]
- Polarisation haloscope (projection) [221]

6 Axion mass versus f_a

- BBN (dark matter) [214]
- Beam EDM [213]
- Binary pulsars and Solar core constraint on $\bar{\theta}$ [222]. I include minor numerical corrections made by [223, 224].
- GW170817 [225]
- HfF$^+$ [216]
- Rb/Quartz [217]
- JEDI [200]
- nEDM [194]
- Piezoaxionic effect (projection) [226]
- *Planck*+BAO thermal axion bound [219]
- SN1987A [218]
- Neutron stars (projection) [222].
- NS-NS and NS-BH Inspirals (projection) [222].
- White dwarfs [227]
- Polarisation haloscope (projection) [221]

6.1 Black hole superradiance

- Baryakhtar et al. [228] (just Stellar mass BHs)
- Mehta et al. [228] (Stellar mass and SMBHs)
- Stott [229]
- Ünal et al. [230] (Quasars)
- Cardoso et al. [231] (dark photon)

7 Axion theory predictions

7.1 Post-inflation QCD axion

- Ballesteros et al. [232]
- Buschmann et al. 2020 [233]
- Buschmann et al. 2021 [234]
- Bonati et al. [235]
- Borsanyi et al. [236]
- Berkowitz et al. [237]
- Dine et al. [238]
- Petreczky et al. [239]
- Fleury & Moore [240]
- Klaer & Moore [241]
- Gorghetto et al. [242]
- Saikawa et al. [70]

7.2 Other dark matter predictions

- ALP Cogenesis [243]
- Early matter domination [244]
- Post-inflation ALP misalignment [245, 246]
- Trapped misalignment ($\mathcal{Z}_\mathcal{N}$ axion) [223]

8 CP-violating couplings

Combined constraints [247]

Scalar-nucleon

- Red giants [248]
- MICROSCOPE [249].
- Eot-Wash [250, 251, 252]
- Irvine [253]. Corrected to 2σ limit by [254]
- HUST [255, 256, 257, 258].
- Stanford [259]
- IUPUI [260].
- Wuhan [254]

Pseudoscalar-electron

- Red giants [248]
- Eot-wash [261]
- NIST [262]
- SMILE [263].
- QUAX [264, 265, 266]
- Washington [267, 268].
- XENON1T [269]
- Magnon (projection) [180]
- QUAX (projection) [264].

Pseudoscalar-nucleon

- Neutron star cooling [203]
- Hefei (Earth) [270]
- Hefei (mm) [271]
- Washington [272]. Limit taken from [273].
- SMILE [263].
- Mainz [274]
- Moon/Sun [275]
- ARIADNE (projection) [276]
- CASPEr-wind (projection) [220]
- DM comagnetometer (projection) [201]
- Fifth force Ne-Rb-K comagnetometer (projection) [277]

9 Scalars

Scalar-photon

- Globular clusters [95]
- Eot-Wash (EP) [278]
- Fifth force [279, 280, 281, 282]
- MICROSCOPE [249]
- AURIGA [283]
- BACON [284]
- Cs/Cav [285]
- DAMNED [286]
- Dy/Dy [287]
- Dy/Quartz [217]
- Dynamic Decoupling [288]
- GEO600 [289]
- LIGO O3 [290]
- Holometer [291]
- H/Quartz/Sapphire [292]
- PTB (Yb+, Sr clock) [293]
- I_2 [294]
- Rb/Cs [295]
- Sr/Si [296]
- Yb/Sr [297]
- AEDGE (projection) [298]
- AION (projection) [298]
- DUAL (projection) [299]
- MAGIS (projection) [300]
- Nuclear clock (projection) [301]
- Mechanical Resonators (projection) [302]

Scalar-electron

- Red giants [248]
- White dwarfs [303]
- Eot-Wash (EP) [278]
- Fifth force [279, 280, 281, 282]
- MICROSCOPE [249]
- AURIGA [283]
- Cs/Cav [285]
- DAMNED [286]
- GEO600 [289]
- Holometer [291]
- H/Quartz/Sapphire [292]
- I_2 [294]
- H/Si [296]
- Rb/Quartz [217]
- Yb/Cs [304]
- LIGO O3 [290]
- NANOGrav 15-year PTA [305]
- FOCOS (nuclear clock projection) [306]
- AEDGE (projection) [298]
- AION (projection) [298]
- DUAL (projection) [299]
- Optical microwave clock (projection) [307]
- Optical cavities [308]
- SrOH [309]
- Mechanical Resonators (projection) [302]
- IPTA (mock data) [310]

10 Vectors

B-L coupling

- Casimir [311, 312, 313]
- Eot-Wash (EP) [314]
- Eot-Wash (ISL) [315]
- MICROSCOPE [316]
- DM stability [317]
- Horizontal branch [248]
- Sun [248]
- Eot-Wash (DM) [318]
- LIGO (O1) [319]
- LIGO/VIRGO [319]
- LISA Pathfinder [320]
- PPTA [321]
- Asteroids (projection) [322]
- LISA (projection) [322]
- MAGIS (projection) [300]
- Optomechanical membranes (projection) [323]
- SKA (projection) [324]
- Torsion balance (projection) [324]
- STE-QUEST (projection) [325]

11 Dark photons

Combined constraints [326]

SM photon-DP transitions

- Coulomb [327, 328, 329, 330, 331],
- Plimpton & Lawton's experiment [332, 331]
- Atomic spectroscopy [333]
- Atomic force microscopy (AFM) [331]
- Static magnetic field of the Earth [334, 335, 336]
- Static magnetic field of Jupiter [337, 336].
- ALPs [61]
- ALPS-II (projection) [338]
- SPring-8 [339]
- UWA-LSW [340, 341]
- ADMX-LSW [342]
- CROWS [64].
- DarkSRF [343]
- DarkSRF (projection) [344]
- TEXONO [345]
- Crab nebula [346]
- COBE and FIRAS [347]
- STAX (projection) [348]

Production in stars

- CAST [349]
- SHIPS [350]
- HINODE [351]
- New globular cluster bound [352]
- Old stellar bounds: Solar-L, HB and RG stars [353] (see also [354])
- Neutron stars [355]
- Solar neutrinos [356]
- XENON1T [357]

Dark matter cosmology/astro

- Arias et al. [245]
- Witte et al. [358, 359]
- Caputo et al. [360, 347],
- ISM [361],
- Leo T dwarf [362]
- Gas clouds [362, 363]

Dark matter experiments

- Reinterpreted axion limits [326]
- ALPHA [43]
- AMAILS [364]
- BRASS-p [365]
- BREAD (projection) [46]
- DarkSide-50 [167]
- DAMIC [366]
- Dark E-field Radio [367]
- DM Pathfinder [368]
- DOSUE-RR [369]
- FAST Radio antenna [370]
- FUNK [371]
- LAMPOST [372]
- LOFAR (solar corona) [373]
- MuDHI [374]
- ORGAN [375]
- ORPHEUS [376]
- QUALIPHIDE [377]
- Quantum cyclotron [378]
- SENSEI [379]
- SHUKET [380]
- SuperCDMS [381]
- SuperMAG [382, 383]
- SQuAD [384],
- SQMS [385],
- SUPAX [386]
- SRF scanning [387]
- Tokyo dish antennae experiments [388, 389, 390]
- WISPDMX [391]
- XENON(100,1T,nT) [185, 269, 392, 393, 357, 394].

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