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]
- RADES [32]
- RBF [33]
- SHAFT [34]
- TASEH [35]
- SuperMAG [36]
- UF [37]
- UPLOAD-DOWNLOAD [38, 39]
- ABRACADABRA (projection) [40]
- ADBC (projection) [41]
- ADMX (projection) [42]
- aLIGO (projection) [43]
- ALPHA (projection) [44, 45]
- BabyIAXO-RADES (projection) [46]
- BRASS (projection) [47]
- BREAD (projection) [48]
- CADEx (projection) [49]
- DALI (projection) [50]
- DM-Radio (projection) [51, 52]
- DANCE (projection) [53]
- LAMPOST (projection) [54]
- MADMAX (projection) [55]
- FLASH (projection) [56, 57]
- QUAX (projection) [58]
- ORGAN (projection) [26]
- TOORAD (projection) [59]
- Twisted Anyon Cavity (projection) [60]
- WISPLC (projection) [61]
- SRF heterodyne cavity (projection) [62]

LSW/Helioscopes

- ALPS [63]
- CAST [64, 65]
- CROWS [66]
- OSQAR [67]
- PVLAS [68]
- SAPPHIRES [69, 70]
- ALPS-II (projection) [71]
- IAXO (projection) [72]
- IAXO (Galactic SN) [73]
- WISPFI (projection) [74]

Astro

- Axion star explosions [75]
- Betelgeuse [76]
- BICEP/KECK [77]
- Black hole polarimetry [78]
- Breakthrough Listen (Doppler shifted radio line in MW) [79]
- Bullet Cluster (archival radio data) [80]
- Cosmic IR background (hint) [81]
- Chandra (Hydra) [82]
- Chandra (M87) [83]
- Chandra (NG7 1275) [84]
- Chandra (H1821+643) [85]
- CMB Anisotropies [86, 87]
- COBE/FIRAS+Planck spectral dist. [88]
- Diffuse gamma-rays [89]
- Diffuse SN ALPs [90] (see also [91])
- Distance ladder [92]
- Fermi-LAT (NGC 1275) [93]
- Fermi-LAT (Extragalactic SNe) [94]
- Fermi-LAT (Quasars) [95]
- Gamma-ray attenuation (ALP dark matter) [96]
- Globular clusters (R parameter) [97]
- Globular clusters (R_2 parameter) [98]
- HAWC (TeV Blazars) [99]
- HESS (PKS 2155-304) [100]
- INTEGRAL (ALP decay) [101]
- Leo T gas temperature [102]
- MAGIC (Perseus galaxy cluster) [103]
- Magnetic white dwarfs (X-rays) [104]
- Magnetic white dwarf (polarization) [105]
- MOJAVE [106]
- Mrk 421 (ARGO-YBJ+Fermi): [107]
- Mrk 421 (ARGO-YBJ+MAGIC): [108]
- Neutron Stars (Foster et al. 2020) [109]
- Neutron Stars (Darling 2020) [110]
- Neutron Stars (Battye et al. 2021) [111]
- Neutron stars (Foster et al. 2022) [112]
- Neutron Stars (Battye et al. 2023) [113]
- NuSTAR (decaying dark matter, recast from Sterile nu) [114, 115, 116]
- Planck cosmic birefringence [117]
- POLARBEAR [118]
- PPTA+QUIJOTE [119]
- Pulsar polarisation arrays (projection) [120]
- Pulsar polar cap [121]
- Red supergiant [122]
- Solar neutrinos [123]
- Stellar axion background [124]
- SN1987A-γ (ALP decay) [125, 126, 127]
- SN1987A-γ (low mass ALP conversion) [128, 126]
- SN1987A-γ,ν (high mass ALPs) [129, 130, 89]
- SN1987A (PVO) [131]
- Low-energy supernovae (ALP decay) [89]
- Solar basin (NuSTAR) [132]
- Solar basin (NuSTAR and SPHINX) [133]
- Star clusters [134]
- SPT [135]
- Telescopes (Haystack) [136]
- Telescopes (MUSE) [137] (updated from: [138])
- Telescopes (VIMOS) [139]
- Telescopes (HST) [140, 141]
- Telescopes (JWST) [142]
- Fermi galactic SN (projection) [143]
- THESEUS (projection) [144]
- WINERED (projection) [145]
- eROSITA (projection) [146]
- White dwarf initial-final mass relation [147]
- XMM-Newton (decaying DM ALPs) [148]

Cosmology

- Ionisation fraction, EBL, X-rays [149]
- BBN+$N_{\rm eff}$ [150]
- Freeze in [151]

2 Heavy ALP-photon coupling

- ATALS (PbPb) [152]
- BaBar [153]
- Beam dump [154, 155, 153, 156, 157]
- Belle II [158]
- BESIII [159]
- CMS (PbPb) [160]
- LEP [161]
- LHC (pp)[162]
- MiniBooNE [163]
- NOMAD [164]
- OPAL [162]
- PrimEx [165, 166]
- CONUS (projection) [167]
- DUNE (projection) [168]
- FASER LLP (projection) [169]

3 Axion-electron

- Electron g-2 [170]
- EDELWEISS [171]
- Magnon non-demolition [172]
- DarkSide-50 [173]
- GERDA [174]
- LUX [175]
- Old comagnetometers [176]
- Panda-X [177]
- Torsion pendulum (spin force) [178]
- Torsion pendulum (axion wind) [179]
- SuperCDMS [180]
- XENON1T [181, 182]
- XENONnT [183]
- XENON1T (Solar basin) [184]
- Red giants (ωCen) [185]
- Solar neutrinos [186]
- Electron storage ring (projection) [187]
- Axion wind multilayer (projection) [188]
- Magnons (projection) [189]
- Polaritons (projection) [190]
- DARWIN (projection) [191]
- LZ (projection) [192]
- QUAX [193, 194]
- NV Centers (projection) [195]
- Superconductors (projection) [**?**]
- Semiconductors (projection) [**?**]
- Spin-orbit coupling (projection) [**?**]
- Torsion pendulum (projection) [197]
- White dwarf hint [198]
- Freeze-in irreducible axions [151]
- X-rays (1-loop decay) [199]

4 Axion-nucleon

Note: CASPEr and nEDM limits account for stochastic correction reported in [200]

- Casimir effect (fifth force) [201]
- CASPEr-ZULF-Comagnetometer [202]
- CASPEr-ZULF-Sidechain [203]
- ChangE [204, 205]
- Hefei Spin-based amplifiers [206]
- nEDM (ultracold neutrons and mercury) [207]
- NASDUCK [208, 209]
- PSI HgM (nEDM) [210]
- K-3He comagnetometer (fifth force) [211]
- K-3He comagnetometer (dark matter) [212]
- JEDI [213]
- Old comagnetometers [176]
- Torsion balance [214]
- Neutron star cooling [215] (corrected from [216])
- SN1987A Cooling [217, 218]
- SNO (deuterium dissasociation) [219]
- Proton storage ring (projection) [220]
- Electrostatic storage ring (projection) [187]
- DM comagnetometer (projection) [176]
- CASPEr-gradient (projection) [203]
- Superfluid helium-3 HPD (projection) [221]
- MnCO3 (projection) [222]

5 Axion-EDM

- Axinovae [223]
- Beam EDM [224]
- BBN (dark matter) [225]
- CASPEr-electric [226]
- nEDM [207]
- HfF$^+$ [227]
- JEDI [213]
- Rb/Quartz [228]
- SN1987A [229]
- *Planck*+BAO thermal axion bound [230]
- CASPEr-electric (projection) [231]
- Storage Ring EDM (projection) [231]
- Polarisation haloscope (projection) [232]

6 Axion-top

Axion-top coupling limits originally compiles in Ref. [233]

7 Axion mass versus f_a

- BBN (dark matter) [225]
- Beam EDM [224]
- Binary pulsars and Solar core constraint on $\bar{\theta}$ [234]. I include minor numerical corrections made by [235, 236].
- GW170817 [237]
- HfF$^+$ [227]
- Rb/Quartz [228]
- JEDI [213]
- nEDM [207]
- Piezoaxionic effect (projection) [238]
- *Planck*+BAO thermal axion bound [230]
- SN1987A [229]
- Neutron stars (projection) [234].
- NS-NS and NS-BH Inspirals (projection) [234].
- White dwarfs [239]
- Polarisation haloscope (projection) [232]

7.1 Black hole superradiance

- Baryakhtar et al. [240] (just Stellar mass BHs)
- Mehta et al. [240] (Stellar mass and SMBHs)
- Stott [241]
- Ünal et al. [242] (Quasars)
- Cardoso et al. [243] (dark photon)

8 Axion theory predictions

8.1 Post-inflation QCD axion

- Ballesteros et al. [244]
- Buschmann et al. 2020 [245]
- Buschmann et al. 2021 [246]
- Bonati et al. [247]
- Borsanyi et al. [248]
- Berkowitz et al. [249]
- Dine et al. [250]
- Petreczky et al. [251]
- Fleury & Moore [252]
- Klaer & Moore [253]
- Gorghetto et al. [254]
- Saikawa et al. [72]

8.2 Other dark matter predictions

- ALP Cogenesis [255]
- Early matter domination [256]
- Post-inflation ALP misalignment [257, 258]
- Trapped misalignment ($\mathcal{Z}_\mathcal{N}$ axion) [235]

9 CP-violating couplings

Combined constraints [259]

Scalar-nucleon

- Red giants [260]
- MICROSCOPE [261].
- Eot-Wash [262, 263, 264]
- Irvine [265]. Corrected to 2σ limit by [266]
- HUST [267, 268, 269, 270].
- Stanford [271]
- IUPUI [272].
- Wuhan [266]

Pseudoscalar-electron

- Red giants [260]
- Eot-wash [273]
- e^+e^- Penning trap [274]
- NIST [275]
- SMILE [276]
- QUAX [277, 278, 279]
- Washington [178, 280].
- XENON1T [281]
- ACME (projection) [282]
- Magnon (projection) [190]
- QUAX (projection) [277].

Pseudoscalar-nucleon

- Neutron star cooling [215]
- Hefei (Earth) [283]
- Hefei (mm) [284]
- Washington [285]. Limit taken from [286].
- SMILE [276].
- Mainz [287]
- Moon/Sun [288]
- Yb trap (projection) [282]
- ARIADNE (projection) [289]
- CASPEr-wind (projection) [231]
- DM comagnetometer (projection) [176]
- Fifth force Ne-Rb-K comagnetometer (projection) [290]

10 Scalars

Scalar-photon

- Globular clusters [98]
- Eot-Wash (EP) [291]
- Fifth force [292, 293, 294, 295]
- MICROSCOPE [261]
- AURIGA [296]
- BACON [297]
- Cs/Cav [298]
- DAMNED [299]
- Dy/Dy [300]
- Dy/Quartz [228]
- Dynamic Decoupling [301]
- GEO600 [302]
- LIGO O3 [303]
- Holometer [304]
- H/Quartz/Sapphire [305]
- PTB (Yb+, Sr clock) [306]
- I_2 [307]
- Rb/Cs [308]
- Sr/Si [309]
- Yb/Sr [310]
- AEDGE (projection) [311]
- AION (projection) [311]
- DUAL (projection) [312]
- MAGIS (projection) [313]
- Nuclear clock (projection) [314]
- Mechanical Resonators (projection) [315]

Scalar-electron

- Red giants [260]
- White dwarfs [316]
- Eot-Wash (EP) [291]
- Fifth force [292, 293, 294, 295]
- MICROSCOPE [261]
- AURIGA [296]
- Cavities [317]
- Cs/Cav [298]
- DAMNED [299]
- GEO600 [302]
- Holometer [304]
- H/Quartz/Sapphire [305]
- I_2 [307]
- H/Si [309]
- Rb/Quartz [228]
- Yb/Cs [318]
- LIGO O3 [303]
- NANOGrav 15-year PTA [319]
- FOCOS (nuclear clock projection) [320]
- AEDGE (projection) [311]
- AION (projection) [311]
- DUAL (projection) [312]
- HELIOS (projection) [321]
- Optical microwave clock (projection) [322]
- Optical cavities [323]
- SrOH [324]
- Mechanical Resonators (projection) [315]
- IPTA (mock data) [325]

11 Vectors

B-L coupling

- Casimir [326, 327, 328]
- Eot-Wash (EP) [329]
- Eot-Wash (ISL) [330]
- MICROSCOPE [331]
- DM stability [332]
- Horizontal branch [260]
- Sun [260]
- Eot-Wash (DM) [333]
- LIGO (O1) [334]
- LIGO/VIRGO [334]
- LISA Pathfinder [335, 336]
- PPTA [337]
- Asteroids (projection) [338]
- HELIOS (projection) [321]
- LISA (projection) [338]
- MAGIS (projection) [313]
- Optomechanical membranes (projection) [339]
- SKA (projection) [340]
- Torsion balance (projection) [340]
- STE-QUEST (projection) [341]

12 Dark photons

Combined constraints [342]

SM photon-DP transitions

- Coulomb [343, 344, 345, 346, 347],
- Plimpton & Lawton's experiment [348, 347]
- Atomic spectroscopy [349]
- Atomic force microscopy (AFM) [347]
- Static magnetic field of the Earth [350, 351, 352]
- Static magnetic field of Jupiter [353, 352].
- ALPs [63]
- ALPS-II (projection) [354]
- SPring-8 [355]
- UWA-LSW [356, 357]
- ADMX-LSW [358]
- CROWS [66].
- DarkSRF [359]
- DarkSRF (projection) [360]
- TEXONO [361]
- Crab nebula [362]
- COBE and FIRAS [363]
- STAX (projection) [364]

Production in stars

- CAST [365]
- SHIPS [366]
- HINODE [367]
- IAXO (modified for longitudinal mode) [368]
- New globular cluster bound [369]
- Old stellar bounds: Solar-L, HB and RG stars [370] (see also [371])
- Neutron stars [372]
- Solar neutrinos [373]
- XENON1T [374]

Dark matter cosmology/astro

- Arias et al. [257]
- Witte et al. [375, 376]
- Caputo et al. [377, 363],
- ISM [378],
- Leo T dwarf [379]
- Gas clouds [379, 380]

Dark matter experiments

- Reinterpreted axion limits [342]
- ALPHA [45]
- AMAILS [381]
- BRASS-p [382]
- BREAD (projection) [48]
- DarkSide-50 [173]
- DAMIC [383]
- Dark E-field Radio [384]
- DM Pathfinder [385]
- DOSUE-RR [386, 387]
- FAST Radio antenna [388]
- FUNK [389]
- GigaBREAD [390]
- LAMPOST [391]
- LOFAR (solar corona) [392]
- MuDHI [393]
- ORGAN [394]
- ORPHEUS [395]
- QUALIPHIDE [396]
- Quantum cyclotron [397]
- SENSEI [398]
- SHUKET [399]
- SuperCDMS [400]
- SuperMAG [401, 402]
- SQuAD [403],
- SQMS [404],
- SUPAX [405]
- SRF scanning [406]
- Tokyo dish antennae experiments [407, 408, 409]
- WISPDMX [410]
- XENON(100,1T,nT) [196, 281, 411, 412, 374, 413].

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