

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]
- WISPMI (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_{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 (ω Cen) [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]

6 Axion mass versus f_a

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

6.1 Black hole superradiance

- Baryakhtar et al. [227] (just Stellar mass BHs)
- Mehta et al. [227] (Stellar mass and SMBHs)
- Stott [228]
- Ünal et al. [229] (Quasars)
- Cardoso et al. [230] (dark photon)

7 Axion theory predictions

7.1 Post-inflation QCD axion

- Ballesteros et al. [231]
- Buschmann et al. 2020 [232]
- Buschmann et al. 2021 [233]
- Bonati et al. [234]
- Borsanyi et al. [235]
- Berkowitz et al. [236]
- Dine et al. [237]
- Petreczky et al. [238]
- Fleury & Moore [239]
- Klaer & Moore [240]
- Gorghetto et al. [241]
- Saikawa et al. [70]

7.2 Other dark matter predictions

- ALP Cogenesis [242]
- Early matter domination [243]
- Post-inflation ALP misalignment [244, 245]
- Trapped misalignment (\mathcal{Z}_N axion) [222]

8 CP-violating couplings

Combined constraints [246]

Scalar-nucleon

- Red giants [247]
- MICROSCOPE [248].
- Eot-Wash [249, 250, 251]
- Irvine [252]. Corrected to 2σ limit by [253]
- HUST [254, 255, 256, 257].
- Stanford [258]
- IUPUI [259].
- Wuhan [253]

Pseudoscalar-electron

- Red giants [247]
- Eot-wash [260]
- NIST [261]
- SMILE [262].
- QUAX [263, 264, 265]
- Washington [266, 267].
- XENON1T [268]
- Magnon (projection) [180]
- QUAX (projection) [263].

Pseudoscalar-nucleon

- Neutron star cooling [203]
- Hefei (Earth) [269]
- Hefei (mm) [270]
- Washington [271]. Limit taken from [272].
- SMILE [262].
- Mainz [273]
- Moon/Sun [274]
- ARIADNE (projection) [275]
- CASPER-wind (projection) [220]
- DM comagnetometer (projection) [201]
- Fifth force Ne-Rb-K comagnetometer (projection) [276]

9 Scalars

Scalar-photon

- Globular clusters [95]
- Eot-Wash (EP) [277]
- Fifth force [278, 279, 280, 281]
- MICROSCOPE [248]
- AURIGA [282]
- BACON [283]
- Cs/Cav [284]
- DAMNED [285]
- Dy/Dy [286]
- Dy/Quartz [217]
- Dynamic Decoupling [287]
- GEO600 [288]
- LIGO O3 [289]
- Holometer [290]
- H/Quartz/Sapphire [291]
- PTB (Yb+, Sr clock) [292]
- I₂ [293]
- Rb/Cs [294]
- Sr/Si [295]
- Yb/Sr [296]
- AEDGE (projection) [297]
- AION (projection) [297]
- DUAL (projection) [298]
- MAGIS (projection) [299]
- Nuclear clock (projection) [300]
- Mechanical Resonators (projection) [301]

Scalar-electron

- Red giants [247]
- White dwarfs [302]
- Eot-Wash (EP) [277]
- Fifth force [278, 279, 280, 281]
- MICROSCOPE [248]
- AURIGA [282]
- Cs/Cav [284]
- DAMNED [285]
- GEO600 [288]
- Holometer [290]
- H/Quartz/Sapphire [291]
- I₂ [293]
- H/Si [295]
- Rb/Quartz [217]
- Yb/Cs [303]
- LIGO O3 [289]
- NANOGrav 15-year PTA [304]
- FOCOS (nuclear clock projection) [305]
- AEDGE (projection) [297]
- AION (projection) [297]
- DUAL (projection) [298]
- Optical microwave clock (projection) [306]
- Optical cavities [307]
- SrOH [308]
- Mechanical Resonators (projection) [301]
- IPTA (mock data) [309]

10 Vectors

B-L coupling

- Casimir [310, 311, 312]
- Eot-Wash (EP) [313]
- Eot-Wash (ISL) [314]
- MICROSCOPE [315]
- DM stability [316]
- Horizontal branch [247]
- Sun [247]
- Eot-Wash (DM) [317]
- LIGO (O1) [318]
- LIGO/VIRGO [318]
- LISA Pathfinder [319]
- PPTA [320]
- Asteroids (projection) [321]
- LISA (projection) [321]
- MAGIS (projection) [299]
- Optomechanical membranes (projection) [322]
- SKA (projection) [323]
- Torsion balance (projection) [323]
- STE-QUEST (projection) [324]

11 Dark photons

Combined constraints [325]

SM photon-DP transitions

- Coulomb [326, 327, 328, 329, 330],
- Plimpton & Lawton’s experiment [331, 330]
- Atomic spectroscopy [332]
- Atomic force microscopy (AFM) [330]
- Static magnetic field of the Earth [333, 334, 335]
- Static magnetic field of Jupiter [336, 335].
- ALPs [61]
- ALPS-II (projection) [337]
- SPring-8 [338]
- UWA-LSW [339, 340]
- ADMX-LSW [341]
- CROWS [64].
- DarkSRF [342]
- DarkSRF (projection) [343]
- TEXONO [344]
- Crab nebula [345]
- COBE and FIRAS [346]
- STAX (projection) [347]

Production in stars

- CAST [348]
- SHIPS [349]
- HINODE [350]
- New globular cluster bound [351]
- Old stellar bounds: Solar-L, HB and RG stars [352] (see also [353])
- Neutron stars [354]
- Solar neutrinos [355]
- XENON1T [356]

Dark matter cosmology/astro

- Arias et al. [244]
- Witte et al. [357, 358]
- Caputo et al. [359, 346],
- ISM [360],
- Leo T dwarf [361]
- Gas clouds [361, 362]

Dark matter experiments

- Reinterpreted axion limits [325]
- ALPHA [43]
- AMAILS [363]
- BRASS-p [364]
- BREAD (projection) [46]
- DarkSide-50 [167]
- DAMIC [365]
- Dark E-field Radio [366]
- DM Pathfinder [367]
- DOSUE-RR [368]
- FAST Radio antenna [369]
- FUNK [370]
- LAMPOST [371]
- LOFAR (solar corona) [372]
- MuDHI [373]
- ORGAN [374]
- ORPHEUS [375]
- QUALIPHIDE [376]
- Quantum cyclotron [377]
- SENSEI [378]
- SHUKET [379]
- SuperCDMS [380]
- SuperMAG [381, 382]
- SQuAD [383],
- SQMS [384],
- SUPAX [385]
- SRF scanning [386]
- Tokyo dish antennae experiments [387, 388, 389]
- WISPDMM [390]
- XENON(100,1T,nT) [185, 268, 391, 392, 356, 393].

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