

References for AxionLimits webpage

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1 Axion-photon

Haloscopes

- ABRACADABRA [1, 2]
- ADBC [3]
- ADMX [4, 5, 6, 7, 8]
- ADMX-Sidecar [9, 10]
- ADMX-SLIC [11]
- CAPP [12, 13, 14, 15, 16, 17, 18, 19, 20, 21]
- CAST-CAPP [22]
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- DANCE (projection) [67]
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- MADMAX (projection) [69]
- FLASH (projection) [70, 71]
- QUAX (projection) [72]
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- SRF heterodyne cavity (projection) [76]

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- CROWS [81]
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- HESS (PKS 2155-304) [122]
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- Neutron Stars (Battye et al. 2021) [134]
- Neutron stars (Foster et al. 2022) [135]
- Neutron Stars (Battye et al. 2023) [136]
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- PSR J0437-4715 polarisation [147]
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- SN1987A- γ, ν (high mass ALPs) [156, 157, 109]
- SN1987A (PVO) [158]
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- Solar basin (NuSTAR) [160]
- Solar basin (NuSTAR and SPHINX) [161]
- Super Star clusters [162]
- SPT [163]
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- Telescopes (MUSE) [165] (updated from: [166])
- Telescopes (VIMOS) [167]
- Telescopes (HST) [168, 169]
- Telescopes (JWST) [170]
- Telescopes (WINERED) [171, 172]

- Telescopes (eROSITA) [173]
- Fermi galactic SN (projection) [174]
- THESEUS (projection) [175]
- eROSITA (projection) [176]
- XRISM (projection) [177]
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- XMM-Newton (decaying DM ALPs) [179]

Cosmology

- Ionisation fraction, EBL, X-rays [180]
- BBN+ N_{eff} [181]
- Freeze in [182]
- Cosmic background [183]

2 Heavy ALP-photon coupling

- ATALS (PbPb) [184]
- BaBar [185]
- Beam dump [186, 187, 185, 188, 189]
- Belle II [190]
- BESIII [191]
- CMS (PbPb) [192]
- EuXFL [193]
- LEP [194]
- LHC (pp)[195]
- MiniBooNE [196]
- NOMAD [197]
- OPAL [195]
- PrimEx [198, 199]
- CONUS (projection) [200]
- DUNE (projection) [201]
- FASER LLP (projection) [202]

3 Axion-electron

- Electron g-2 [203]
- EDELWEISS [204]
- Fermionic axion interferometer [205]
- Magnon non-demolition [206]
- DarkSide-50 [207]
- GERDA [208]
- LUX [209]
- Old comagnetometers [210]
- Panda-X [211]
- Torsion pendulum (spin force) [212]
- Torsion pendulum (axion wind) [213]
- SuperCDMS [214]
- XENON1T [215, 216]
- XENONnT [217]
- XENON1T (Solar basin) [218]
- Red giants (ω Cen) [219]
- Solar neutrinos [220]
- Electron storage ring (projection) [221]
- Axion wind multilayer (projection) [222]
- Magnons (projection) [223]
- Polaritons (projection) [224]
- DARWIN (projection) [225]
- LZ (projection) [226]
- QUAX [227, 228]
- NV Centers (projection) [229]
- Superconductors (projection) [230]
- Semiconductors (projection) [231]
- Spin-orbit coupling (projection) [232]
- Torsion pendulum (projection) [233]
- YIG (projection) [223]
- White dwarf hint [234]
- Freeze-in irreducible axions [182]
- X-rays (1-loop decay) [235]

4 Axion-nucleon

Note: CASPER and nEDM limits account for stochastic correction reported in [236]

- Casimir effect (fifth force) [237]
- CASPER-ZULF-Comagnetometer [238]
- CASPER-ZULF-Sidechain [239]
- ChangE [240, 241]
- Hefei Spin-based amplifiers [242]
- nEDM (ultracold neutrons and mercury) [243]
- NASDUCK [244, 245]
- PSI HgM (nEDM) [246]
- K-3He comagnetometer (fifth force) [247]

- K-3He comagnetometer (dark matter) [248]
- Mainz-Krakow comagnetometers [249]
- JEDI [250]
- Old comagnetometers [210]
- Torsion balance [251]
- Neutron star cooling [252] (corrected from [253])
- SN1987A Cooling [254, 255]
- SNO (deuterium dissasociation) [256]
- Proton storage ring (projection) [257]
- Electrostatic storage ring (projection) [221]
- DM comagnetometer (projection) [210]
- CASPER-gradient (projection) [239]
- Superfluid helium-3 HPD (projection) [258]
- MnCO3 (projection) [259]

5 Axion-EDM

- Axinovae [260]
- Beam EDM [261]
- BBN (dark matter) [262]
- CASPER-electric [263]
- nEDM [243]
- HfF^+ [264]
- I_2^+/Ca^+ [265]
- JEDI [250]
- Rb/Quartz [266]
- SN1987A [267]
- *Planck*+BAO thermal axion bound [268]
- CASPER-electric (projection) [269]
- Storage Ring EDM (projection) [269]
- Polarisation haloscope (projection) [270]

6 Axion-top

Axion-top coupling limits originally compiled in Ref. [271, 272]

7 Axion mass versus f_a

- BBN (dark matter) [262]
- Beam EDM [261]
- Binary pulsars and Solar core constraint on $\bar{\theta}$ [273]. I include minor numerical corrections made by [274, 275].
- GW170817 [276]
- HfF^+ [264]
- Rb/Quartz [266]
- JEDI [250]
- nEDM [243]
- Tritium decay [277]
- Piezoaxionic effect (projection) [278]
- *Planck*+BAO thermal axion bound [268]
- SN1987A [267]
- Neutron stars (projection) [273].
- NS-NS and NS-BH Inspirals (projection) [273].
- White dwarfs [279]
- Polarisation haloscope (projection) [270]
- Neutron star cooling [280]

7.1 Black hole superradiance

- Baryakhtar et al. [281] (just Stellar mass BHs)
- Mehta et al. [281] (Stellar mass and SMBHs)
- Stott [282]
- Ünal et al. [283] (Quasars)
- Hoof et al. [284]
- Cardoso et al. [285] (dark photon)

8 Axion theory predictions

8.1 Post-inflation QCD axion

- Ballesteros et al. [286]
- Buschmann et al. 2020 [287]
- Buschmann et al. 2021 [288]
- Bonati et al. [289]
- Borsanyi et al. [290]
- Berkowitz et al. [291]
- Dine et al. [292]
- Petreczky et al. [293]
- Fleury & Moore [294]
- Klaer & Moore [295]
- Gorghetto et al. [296]
- Saikawa et al. (2019) [88]

- Saikawa et al. (2024) [297]
- Beyer et al. (2023) [298]
- Kim et al. (2024) [299]

8.2 Other dark matter predictions

- ALP Cogenesis [300]
- Early matter domination [301]
- Post-inflation ALP misalignment [302, 303]
- Trapped misalignment (\mathcal{Z}_N axion) [274]

9 CP-violating couplings

Combined constraints [304]

Scalar-nucleon

- Red giants [305]
- MICROSCOPE [306].
- Eot-Wash [307, 308, 309]
- Irvine [310]. Corrected to 2σ limit by [311]
- HUST [312, 313, 314, 315].
- Stanford [316]
- IUPUI [317].
- Wuhan [311]

Pseudoscalar-electron

- Red giants [305]
- Eot-wash [318]
- e^+e^- Penning trap [319]
- NIST [320]
- SMILE [321]
- Perihelion shift [322]
- QUAX [323, 324, 325]
- Washington [212, 326].
- XENON1T [327]
- ACME (projection) [328]
- Magnon (projection) [224]
- QUAX (projection) [323].

Pseudoscalar-nucleon

- Neutron star cooling [252]
- Hefei (Earth) [329]
- Hefei (mm) [330]
- Washington [331]. Limit taken from [332].
- SMILE [321].
- Mainz [333]
- Moon/Sun [334]
- Yb trap (projection) [328]
- ARIADNE (projection) [335]
- CASPER-wind (projection) [269]
- DM comagnetometer (projection) [210]
- Fifth force Ne-Rb-K comagnetometer (projection) [336]

10 Scalars

Scalar-photon

- Globular clusters [118]
- Eot-Wash (EP) [337]
- Fifth force [338, 339, 340, 341]
- MICROSCOPE [306]
- AURIGA [342]
- BACON [343]
- Cs/Cav [344]
- DAMNED [345]
- Dy/Dy [346]
- Dy/Quartz [266]
- Dynamic Decoupling [347]
- GEO600 [348]
- LIGO O3 [349], see also [350]
- Holometer [351]
- H/Quartz/Sapphire [352]
- PTB (Yb+, Sr clock) [353]
- I₂ [354]
- Rb/Cs [355]
- Sr/Si [356]
- Yb/Sr [357]
- AEDGE (projection) [358]
- AION (projection) [358]
- DUAL (projection) [359]
- MAGIS (projection) [360]
- Nuclear clock (projection) [361]
- Mechanical Resonators (projection) [362]

Scalar-electron

- Red giants [305]
- White dwarfs [363]
- Eot-Wash (EP) [337]
- Fifth force [338, 339, 340, 341]
- MICROSCOPE [306]
- AURIGA [342]
- Cavities [364]
- Cs/Cav [344]
- DAMNED [345]
- GEO600 [348]
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- H/Quartz/Sapphire [352]
- LIGO O3 [349], see also [350]
- I₂ [354]
- H/Si [356]
- Rb/Quartz [266]
- Yb/Cs [365]
- NANOGrav 15-year PTA [366]
- FOCOS (nuclear clock projection) [367]
- AEDGE (projection) [358]
- AION (projection) [358]
- DUAL (projection) [359]
- HELIOS (projection) [368]
- Optical microwave clock (projection) [369]
- Optical cavities [370]
- SrOH [371]
- Mechanical Resonators (projection) [362]
- IPTA (mock data) [372]

- Torsion balance (projection) [389]
- STE-QUEST (projection) [390]

11 Vectors

B-L coupling

- Casimir [373, 374, 375]
- Eot-Wash (EP) [376]
- Eot-Wash (ISL) [377]
- MICROSCOPE [378]
- DM stability [379]
- Horizontal branch [380]
- Red giant [380]
- Sun [380]
- Eot-Wash (DM) [381]
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- LIGO/VIRGO [382]
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- PPTA [385]
- POLONAISE [386]
- Asteroids (projection) [387]
- HELIOS (projection) [368]
- LISA (projection) [387]
- MAGIS (projection) [360]
- Optomechanical membranes (projection) [388]
- SKA (projection) [389]

12 Dark photons

Combined constraints [391]

SM photon-DP transitions

- Coulomb [392, 393, 394, 395, 396],
- Plimpton & Lawton's experiment [397, 396]
- Atomic spectroscopy [398]
- Atomic force microscopy (AFM) [396]
- Static magnetic field of the Earth [399, 400, 401]
- Static magnetic field of Jupiter [402, 401].
- Jupiter B-field/Juno mission [403]
- ALPs [77]
- ALPS-II (projection) [404]
- SPring-8 [405]
- UWA-LSW [406, 407]
- ADMX-LSW [408]
- CROWS [81].
- DarkSRF [409]
- DarkSRF (projection) [410]
- TEXONO [411]
- Crab nebula [412]
- COBE and FIRAS [413]
- STAX (projection) [414]

Production in stars

- CAST [415]
- SHIPS [416]
- HINODE [417]
- IAXO (modified for longitudinal mode) [418]
- New globular cluster bound [419]
- Old stellar bounds: Solar-L, HB and RG stars [380] (see also [420])
- Neutron stars [421]
- Solar neutrinos [422]
- XENON1T [423]

Dark matter cosmology/astro

- Dark matter, Arias et al. [302]
- Dark matter, Witte et al. [424, 425]
- COBE/FIRAS, Caputo et al. [426, 413]
- COBE/FIRAS with Spectral distortions [427, 428]
- ISM [429],
- Leo T dwarf [430]
- Gas clouds [430, 431]
- JWST [432]
- Parker Solar Probe [433]
- Planck + unWISE [434]
- INTEGRAL [435]

Dark matter experiments

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- AMAILS [437]
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- DOSUE-RR [444, 445]
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- FUNK [447]
- GigaBREAD [448]
- MADMAX [449]
- LAMPOST [450]
- LOFAR (solar corona) [451]
- MuDHI [452]
- ORGAN [453, 36]
- ORPHEUS [454]
- QUALIPHIDE [455]
- Quantum cyclotron [456]
- SENSEI [457]
- SHUKET [458]
- SuperCDMS [459]
- SuperMAG [460, 461, 48]

- SQuAD [462],
- SQMS [463],
- SUPAX [464]
- SRF scanning [465]
- Tokyo dish antennae experiments [466, 467, 468]
- WISPDMM [469]
- XENON(100,1T,nT) [470, 327, 471, 472, 423, 473].

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