

References for AxionLimits webpage

Ciaran A. J. O'Hare

ARC Centre of Excellence for Dark Matter Particle Physics
The University of Sydney, Camperdown, NSW 2006, Australia

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]
- DANCE [23]
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- HAYSTAC [26, 27, 28, 29, 30]
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- MADMAX [32]
- ORGAN [33, 34, 35, 36]
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- MADMAX (projection) [70]
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- QUAX (projection) [73]
- ORGAN (projection) [33]
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LSW/Helioscopes

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- Mrk 421 (ARGO-YBJ+MAGIC): [132]
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- Neutron Stars (Darling 2020) [134]
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- Neutron stars (Foster et al. 2022) [136]
- Neutron Stars (Battye et al. 2023) [137]
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- Planck cosmic birefringence [142]
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- PPTA+QUIJOTE [145]
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- Pulsar polar cap [147]
- PSR J0437-4715 polarisation [148]
- Red supergiant [149]
- Solar neutrinos [150]
- Stellar axion background [151]
- SN1987A- γ (ALP decay) [152, 153, 154]
- SN1987A- γ (low mass ALP conversion) [155, 153, 156]
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- SN1987A (PVO) [159]
- Sgr A* [160]
- Low-energy supernovae (ALP decay) [110]
- Solar basin (NuSTAR) [161]
- Solar basin (NuSTAR and SPHINX) [162]
- Super Star clusters [163]
- SPT [164]
- Telescopes (Haystack) [165]
- Telescopes (MUSE) [166] (updated from: [167])
- Telescopes (VIMOS) [168]
- Telescopes (HST) [169, 170]
- Telescopes (JWST) [171]
- Telescopes (WINERED) [172, 173]

- Telescopes (eROSITA) [174]
- Fermi galactic SN (projection) [175]
- THESEUS (projection) [176]
- eROSITA (projection) [177]
- XRISM (projection) [178]
- White dwarf initial-final mass relation [179]
- XMM-Newton (decaying DM ALPs) [180]

Cosmology

- Ionisation fraction, EBL, X-rays [181]
- BBN+ N_{eff} [182]
- Freeze in [183]
- Cosmic background [184]

2 Heavy ALP-photon coupling

- ATALS (PbPb) [185]
- BaBar [186]
- Beam dump [187, 188, 186, 189, 190]
- Belle II [191]
- BESIII [192, 193]
- CMS (PbPb) [194]
- EuXFL [195]
- LEP [196]
- LHC (pp)[197]
- MiniBooNE [198]
- NOMAD [199]
- OPAL [197]
- PrimEx [200, 201]
- GlueX [202]
- CONUS (projection) [203]
- DUNE (projection) [204]
- FASER LLP (projection) [205]

3 Axion-electron

- Electron g-2 [206]
- EDELWEISS [207]
- Fermionic axion interferometer [208]
- Magnon non-demolition [209]
- DarkSide-50 [210]
- GERDA [211]
- LUX [212]
- Old comagnetometers [213]
- Panda-X [214]
- Torsion pendulum (spin force) [215]
- Torsion pendulum (axion wind) [216]
- SuperCDMS [217]
- XENON1T [218, 219]
- XENONnT [220]
- XENON1T (Solar basin) [221]
- Red giants (ω Cen) [222]
- Solar neutrinos [223]
- Electron storage ring (projection) [224]
- Axion wind multilayer (projection) [225]
- Magnons (projection) [226]
- Polaritons (projection) [227]
- DARWIN (projection) [228]
- LZ (projection) [229]
- QUAX [230, 231]
- NV Centers (projection) [232]
- Superconductors (projection) [233]
- Semiconductors (projection) [234]
- Spin-orbit coupling (projection) [235]
- Torsion pendulum (projection) [236]
- YIG (projection) [226]
- White dwarf hint [237]
- Freeze-in irreducible axions [183]
- X-rays (1-loop decay) [238]

4 Axion-nucleon

Note: CASPEr and nEDM limits account for stochastic correction reported in [239]

- Casimir effect (fifth force) [240]
- CASPEr-ZULF-Comagnetometer [241]
- CASPEr-ZULF-Sidechain [242]
- Change [243, 244]
- Hefei Spin-based amplifiers [245]
- nEDM (ultracold neutrons and mercury) [246]
- NASDUCK [247, 248]
- PSI HgM (nEDM) [249]

- K-3He comagnetometer (fifth force) [250]
- K-3He comagnetometer (dark matter) [251]
- Mainz-Krakow comagnetometers [252]
- JEDI [253]
- Old comagnetometers [213]
- Torsion balance [254]
- Neutron star cooling [255] (corrected from [256])
- SN1987A Cooling [257, 258]
- SNO (deuterium dissasociation) [259]
- Proton storage ring (projection) [260]
- Electrostatic storage ring (projection) [224]
- DM comagnetometer (projection) [213]
- CASPEr-gradient (projection) [242]
- Superfluid helium-3 HPD (projection) [261]
- MnCO₃ (projection) [262]

5 Axion-EDM

- Axinovae [263]
- Beam EDM [264]
- BBN (dark matter) [265]
- CASPEr-electric [266]
- nEDM [246]
- HfF⁺ [267]
- I_2^+/Ca^+ [268]
- JEDI [253]
- ONIX [269]
- Rb/Quartz [270]
- SN1987A [271]
- *Planck*+BAO thermal axion bound [272]
- CASPEr-electric (projection) [273]
- Storage Ring EDM (projection) [273]
- Polarisation haloscope (projection) [274]

6 Axion-top

Axion-top coupling limits originally compiled in Ref. [275, 276]

7 Axion mass versus f_a

- BBN (dark matter) [265]
- Beam EDM [264]
- Binary pulsars and Solar core constraint on $\bar{\theta}$ [277]. I include minor numerical corrections made by [278, 279].
- GW170817 [280]
- HfF⁺ [267]
- Rb/Quartz [270]
- JEDI [253]
- nEDM [246]
- Tritium decay [281]
- Piezoaxionic effect (projection) [282]
- *Planck*+BAO thermal axion bound [272]
- SN1987A [271]
- Neutron stars (projection) [277].
- NS-NS and NS-BH Inspirals (projection) [277].
- White dwarfs [283]
- Polarisation haloscope (projection) [274]
- Neutron star cooling [284]

7.1 Black hole superradiance

- Baryakhtar et al. [285] (just Stellar mass BHs)
- Mehta et al. [285] (Stellar mass and SMBHs)
- Stott [286]
- Ünal et al. [287] (Quasars)
- Hoof et al. [288]
- Cardoso et al. [289] (dark photon)

8 Axion theory predictions

8.1 Post-inflation QCD axion

- Ballesteros et al. [290]
- Buschmann et al. 2020 [291]
- Buschmann et al. 2021 [292]
- Bonati et al. [293]
- Borsanyi et al. [294]
- Berkowitz et al. [295]
- Dine et al. [296]
- Petreczky et al. [297]
- Fleury & Moore [298]
- Klaer & Moore [299]

- Gorghetto et al. [300]
- Saikawa et al. (2019) [89]
- Saikawa et al. (2024) [301]
- Beyer et al. (2023) [302]
- Kim et al. (2024) [303]

8.2 Other dark matter predictions

- ALP Cogenesis [304]
- Early matter domination [305]
- Post-inflation ALP misalignment [306, 307]
- Trapped misalignment ($\mathcal{Z}_{\mathcal{N}}$ axion) [278]

9 CP-violating couplings

Combined constraints [308]

Scalar-nucleon

- Red giants [309]
- MICROSCOPE [310].
- Eot-Wash [311, 312, 313]
- Irvine [314]. Corrected to 2σ limit by [315]
- HUST [316, 317, 318, 319].
- Stanford [320]
- IUPUI [321].
- Wuhan [315]

Pseudoscalar-electron

- Red giants [309]
- Eot-wash [322]
- e^+e^- Penning trap [323]
- NIST [324]
- SMILE [325]
- Perihelion shift [326]
- QUAX [327, 328, 329]
- Washington [215, 330].
- XENON1T [331]
- ACME (projection) [332]
- Magnon (projection) [227]
- QUAX (projection) [327].

Pseudoscalar-nucleon

- Neutron star cooling [255]
- Hefei (Earth) [333]
- Hefei (mm) [334]
- Washington [335]. Limit taken from [336].
- SMILE [325].
- Mainz [337]
- Moon/Sun [338]
- Yb trap (projection) [332]
- ARIADNE (projection) [339]
- CASPER-wind (projection) [273]
- DM comagnetometer (projection) [213]
- Fifth force Ne-Rb-K comagnetometer (projection) [340]

10 Scalars

Scalar-photon

- Globular clusters [119]
- Eot-Wash (EP) [341]
- Fifth force [342, 343, 344, 345]
- MICROSCOPE [310]
- AURIGA [346]
- BACON [347]
- Cs/Cav [348]
- DAMNED [349]
- Dy/Dy [350]
- Dy/Quartz [270]
- Dynamic Decoupling [351]
- GEO600 [352]
- LIGO O3 [353], see also [354]
- Holometer [355]
- H/Quartz/Sapphire [356]
- PTB (Yb+, Sr clock) [357]
- I₂ [358]
- Rb/Cs [359]
- Sr/Si [360]
- Yb/Sr [361]
- AEDGE (projection) [362]
- AION (projection) [362]
- DUAL (projection) [363]
- MAGIS (projection) [364]
- Nuclear clock (projection) [365]
- Mechanical Resonators (projection) [366]

Scalar-electron

- Red giants [309]
- White dwarfs [367]
- Eot-Wash (EP) [341]
- Fifth force [342, 343, 344, 345]
- MICROSCOPE [310]
- AURIGA [346]
- Cavities [368]
- Cs/Cav [348]
- DAMNED [349]
- GEO600 [352]
- Holometer [355]
- H/Quartz/Sapphire [356]
- LIGO O3 [353], see also [354]
- I₂ [358]
- H/Si [360]
- Rb/Quartz [270]
- Yb/Cs [369]
- NANOGrav 15-year PTA [370]
- FOCOS (nuclear clock projection) [371]
- AEDGE (projection) [362]
- AION (projection) [362]
- DUAL (projection) [363]
- HELIOS (projection) [372]
- Optical microwave clock (projection) [373]
- Optical cavities [374]
- SrOH [375]
- Mechanical Resonators (projection) [366]
- IPTA (mock data) [376]

- SKA (projection) [394]
- Torsion balance (projection) [394]
- STE-QUEST (projection) [395]

11 Vectors

B-L coupling

- Casimir [377, 378, 379]
- Eot-Wash (EP) [380]
- Eot-Wash (ISL) [381]
- MICROSCOPE [382]
- DM stability [383]
- Horizontal branch [384]
- Red giant [384]
- Sun [384]
- Eot-Wash (DM) [385]
- KAGRA (DM) [386]
- LIGO (O1) [387]
- LIGO/VIRGO [387]
- LISA Pathfinder [388, 389]
- PPTA [390]
- POLONAISE [391]
- Asteroids (projection) [392]
- HELIOS (projection) [372]
- LISA (projection) [392]
- MAGIS (projection) [364]
- Optomechanical membranes (projection) [393]

12 Dark photons

Combined constraints [396]

SM photon-DP transitions

- Coulomb [397, 398, 399, 400, 401],
- Plimpton & Lawton's experiment [402, 401]
- Atomic spectroscopy [403]
- Atomic force microscopy (AFM) [401]
- Static magnetic field of the Earth [404, 405, 406]
- Static magnetic field of Jupiter [407, 406].
- Jupiter B-field/Juno mission [408]
- ALPs [78]
- ALPS-II (projection) [409]
- SPring-8 [410]
- UWA-LSW [411, 412]
- ADMX-LSW [413]
- CROWS [82].
- DarkSRF [414]
- DarkSRF (projection) [415]
- TEXONO [416]
- Crab nebula [417]
- COBE and FIRAS [418]
- STAX (projection) [419]

Production in stars

- CAST [420]
- SHIPS [421]
- HINODE [422]
- IAXO (modified for longitudinal mode) [423]
- New globular cluster bound [424]
- Old stellar bounds: Solar-L, HB and RG stars [384] (see also [425])
- Neutron stars [426]
- Solar neutrinos [427]
- XENON1T [428]

Dark matter cosmology/astro

- Blazars [429]
- Dark matter, Arias et al. [306]
- Dark matter, Witte et al. [430, 431]
- COBE/FIRAS, Caputo et al. [432, 418]
- COBE/FIRAS with Spectral distortions [433, 434]
- Lyman-alpha [435]
- ISM [436],
- Leo T dwarf [437]
- Gas clouds [437, 438]
- JWST [439]
- Parker Solar Probe [440]
- Planck + unWISE [441]
- INTEGRAL [442]

Dark matter experiments

- Reinterpreted axion limits [396]
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- BRASS-p [445]
- BREAD (projection) [62]
- Dandelion (projection) [446]
- DarkSide-50 [210]
- DAMIC [447]
- Dark E-field Radio [448, 449]
- DM Pathfinder [450]
- DOSUE-RR [451, 452]
- FAST Radio antenna [453]
- FUNK [454]
- GigaBREAD [455]
- MADMAX [456]
- LAMPOST [457]
- LOFAR (solar corona) [458]
- MuDHI [459]
- ORGAN [460, 36]
- ORPHEUS [461]
- QUALIPHIDE [462]
- Quantum cyclotron [463]
- SENSEI [464]
- SHUKET [465]
- SuperCDMS [466]
- SuperMAG [467, 468, 49]

- SQuAD [469],
- SQMS [470],
- SUPAX [471]
- SRF scanning [472]
- Tokyo dish antennae experiments [473, 474, 475]
- WISPDMM [476]
- XENON(100,1T,nT) [477, 331, 478, 479, 428, 480].

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