

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]
- ADMX [3, 4, 5, 6]
- ADMX-Sidecar [7, 8]
- ADMX-SLIC [9]
- CAPP [10, 11, 12, 13, 14, 15]
- CAST-CAPP [16]
- BASE [17]
- GrAHal [18]
- HAYSTAC [19, 20]
- ORGAN [21, 22]
- QUAX [23, 24, 25]
- RADES [26]
- RBF [27]
- SHAFT [28]
- TASEH [29]
- SuperMAG [30]
- UF [31]
- UPLOAD-DOWNLOAD [32]
- ABRACADABRA (projection) [33]
- ADBC (projection) [34]
- ADMX (projection) [35]
- aLIGO (projection) [36]
- ALPHA (projection) [37, 38]
- BRASS (projection) [39]
- BREAD (projection) [40]
- CADEX (projection) [41]
- DM-Radio (projection) [42, 43]
- DANCE (projection) [44]
- LAMPOST (projection) [45]
- MADMAX (projection) [46]
- FLASH (projection) [47, 48]
- QUAX (projection) [49]
- ORGAN (projection) [21]
- TOORAD (projection) [50]
- Twisted Anyon Cavity (projection) [51]
- WISPLC (projection) [52]
- SRF heterodyne cavity (projection) [53]

LSW/Helioscopes

- ALPS [54]
- CAST [55, 56]
- CROWS [57]
- OSQAR [58]
- PVLAS [59]
- SAPPHIRES [60, 61]
- ALPS-II (projection) [62]
- IAXO (projection) [63]
- IAXO (Galactic SN) [64]

Astro

- Betelgeuse [65]
- BICEP/KECK [66]
- Breakthrough Listen (Doppler shifted radio line in MW) [67]
- Breakthrough Listen (Neutron stars) [68]
- Bullet Cluster (archival radio data) [69]
- Cosmic IR background (hint) [70]
- Chandra (Hydra) [71]
- Chandra (M87) [72]
- Chandra (NG7 1275) [73]
- Chandra (H1821+643) [74]
- Chandra (Magnetic white dwarfs) [74]
- COBE/FIRAS+Planck spectral dist. [75]
- Diffuse gamma-rays [76]
- Diffuse SN ALPs [77] (see also [78])
- Distance ladder [79]
- Fermi-LAT (NGC 1275) [80]
- Fermi-LAT (Extragalactic SNe) [81]
- Fermi-LAT (Quasars) [82]
- Globular clusters (R parameter) [83]
- Globular clusters (R_2 parameter) [84]
- HAWC (TeV Blazars) [85]
- HESS (PKS 2155-304) [86]
- INTEGRAL (ALP decay) [87]
- Leo T gas temperature [88]
- Magnetic white dwarf polarization [89]
- MOJAVE [90]
- Mrk 421 (ARGO-YBJ+Fermi): [91]
- Mrk 421 (ARGO-YBJ+MAGIC): [92]
- Neutron Stars (Foster et al.) [93]
- Neutron Stars (Darling) [94]
- Neutron Stars (Battye et al.) [95]
- Planck cosmic birefringence [96]
- PPTA+QUIJOTE [97]
- Pulsar polarisation arrays (projection) [98]
- Pulsar polar cap [99]
- Red supergiant [100]
- Solar neutrinos [101]
- SN1987A- γ [102]
- SN1987A- γ (low mass ALPs) [103]
- SN1987A- γ, ν (high mass ALPs) [104]
- Low-energy supernovae (ALP decay) [76]
- Solar basin (NuSTAR) [105]
- Star clusters [106]
- SPT [107]
- Telescopes (Haystack) [108]
- Telescopes (MUSE) [109]
- Telescopes (VIMOS) [110]
- Telescopes (HST) [111]
- Fermi galactic SN (projection) [112]
- THESEUS (projection) [113]
- eROSITA (projection) [114]
- White dwarf initial-final mass relation [115]
- XMM-Newton (decaying DM ALPs) [116]

Cosmology

- Ionisation fraction, EBL, X-rays [117]
- BBN+ N_{eff} [118]
- Freeze in [119]

2 Heavy ALP-photon coupling

- ATALS (PbPb) [120]
- BaBar [121]
- Beam dump [122, 123, 121, 124, 125]
- Belle II [126]
- BESIII [127]
- CMS (PbPb) [128]
- LEP [129]
- LHC (pp)[130]
- NOMAD [131]
- OPAL [130]
- PrimEx [132]
- CONUS (projection) [133]
- DUNE (projection) [134]
- FASER LLP (projection) [135]

3 Axion-electron

- EDELWEISS [136]
- Magnon non-demolition [137]
- GERDA [138]
- LUX [139]
- Panda-X [140]
- SuperCDMS [141]
- XENON1T [142, 143]
- XENONnT [in prep.]
- XENON1T (Solar basin) [144]
- Red giants (ω Cen) [145]
- Solar neutrinos [146]
- Magnons (projection) [147]
- Polaritons (projection) [148]
- DARWIN (projection) [149]
- LZ (projection) [150]
- QUAX [151, 152]
- Semiconductors (projection) [153]
- White dwarf hint [154]
- Freeze-in irreducible axions [119]
- X-rays (1-loop decay) [155]

4 Axion-nucleon

Note: CASPER and nEDM limits account for stochastic correction reported in [156]

- CASPER-ZULF-Comagnetometer [157]
- CASPER-ZULF-Sidechain [158]
- nEDM (ultracold neutrons and mercury) [159]
- NASDUCK [160, 161]
- PSI HgM [162]
- K-3He comagnetometer (fifth force) [163]
- K-3He comagnetometer (dark matter) [164]
- JEDI [165]
- Old comagnetometers [166]
- Torsion balance [167]
- Neutron star cooling [168] (corrected from [169])
- SN1987A Cooling [170]
- SNO (deuterium dissasociation) [171]
- Proton storage ring (projection) [172]
- DM comagnetometer (projection) [166]
- CASPER-wind (projection) [158]

5 Axion-EDM

- Beam EDM [173]
- BBN (dark matter) [174]
- CASPER-electric [175]
- nEDM [159]
- HfF⁺ [176]
- JEDI [165]
- Rb/Quartz [177]
- SN1987A [178]
- *Planck*+BAO thermal axion bound [179]
- CASPER-electric (projection) [180]
- Storage Ring EDM (projection) [180]

6 Axion mass versus f_a

- BBN (dark matter) [174]
- Beam EDM [173]
- Binary pulsars and Solar core constraint on $\bar{\theta}$ [181]. I include minor numerical corrections made by [182, 183].
- GW170817 [184]
- HfF⁺ [176]
- Rb/Quartz [177]
- JEDI [165]
- nEDM [159]
- Piezoaxionic effect (projection) [185]
- SN1987A [178]
- Neutron stars (projection) [181].
- NS-NS and NS-BH Inspirals (projection) [181].
- White dwarfs [186]

6.1 Black hole superradiance

- Baryakhtar et al. [187] (just Stellar mass BHs)
- Mehta et al. [187] (Stellar mass and SMBHs)
- Stott [188]
- Ünal et al. [189] (Quasars)
- Cardoso et al. [190] (dark photon)

7 Axion theory predictions

7.1 Post-inflation QCD axion

- Ballesteros et al. [191]
- Buschmann et al. 2020 [192]
- Buschmann et al. 2021 [193]
- Bonati et al. [194]
- Borsanyi et al. [195]
- Berkowitz et al. [196]
- Dine et al. [197]
- Petreczky et al. [198]
- Fleury & Moore [199]
- Klaer & Moore [200]

7.2 Other dark matter predictions

- ALP Cogenesis [201]
- Early matter domination [202]
- Post-inflation ALP misalignment [203]
- Trapped misalignment (\mathcal{Z}_N axion) [182]

8 CP-violating couplings

Combined constraints [204]

Scalar-nucleon

- Red giants [205]
- MICROSCOPE [206].
- Eot-Wash [207, 208, 209]
- Irvine [210]. Corrected to 2σ limit by [211]
- HUST [212, 213, 214, 215].
- Stanford [216]
- IUPUI [217].
- Wuhan [211]

Pseudoscalar-electron

- Red giants [205]
- Eot-wash [218]
- NIST [219]
- SMILE [220].
- QUAX [221, 222]
- Washington [223, 224].
- XENON1T [225]
- Magnon (projection) [148]
- QUAX (projection) [221].

Pseudoscalar-nucleon

- Neutron star cooling [169]
- Washington [226]. Limit taken from [227].
- SMILE [220].
- Mainz [228]
- ARIADNE (projection) [229]
- CASPER-wind (projection) [180]
- DM comagnetometer (projection) [166]

9 Scalars

Scalar-photon

- Globular clusters [84]
- Eot-Wash (EP) [230]
- Fifth force [231]
- MICROSCOPE [206]
- AURIGA [232]
- BACON [233]
- Cs/Cav [234]
- DAMNED [235]
- Dy/Dy [236]
- Dy/Quartz [177]
- Dynamic Decoupling [237]
- GEO600 [238]
- Holometer [239]
- H/Quartz/Sapphire [240]
- I₂ [241]
- Rb/Cs [242]
- Sr/Si [243]
- AEDGE (projection) [244]
- AION (projection) [244]
- DUAL (projection) [231]
- MAGIS (projection) [245]
- Nuclear clock (projection) [246]
- Mechanical Resonators (projection) [247]

Scalar-electron

- Red giants [205]
- Eot-Wash (EP) [230]
- Fifth force [231]
- MICROSCOPE [206]
- AURIGA [232]
- Cs/Cav [234]
- DAMNED [235]
- GEO600 [238]
- Holometer [239]
- H/Quartz/Sapphire [240]
- I₂ [241]
- H/Si [243]
- Rb/Quartz [177]
- AEDGE (projection) [244]
- AION (projection) [244]
- DUAL (projection) [231]
- Optical microwave clock (projection) [231]
- Optical cavities [248]
- SrOH [249]
- Mechanical Resonators (projection) [247]
- IPTA (mock data) [250]

10 Vectors

B-L coupling

- Casimir [251, 252, 253]
- Eot-Wash (EP) [230]
- Eot-Wash (ISL) [254]
- MICROSCOPE [255]
- DM stability [256]
- Horizontal branch [205]
- Sun [205]
- Eot-Wash (DM) [257]
- LIGO (O1) [258]
- LIGO/VIRGO [258]
- Asteroids (projection) [259]
- LISA (projection) [259]
- MAGIS (projection) [245]
- Optomechanical membranes (projection) [260]
- SKA (projection) [261]
- Torsion balance (projection) [261]

11 Dark photons

Combined constraints [262]

SM photon-DP transitions

- Coulomb [263, 264, 265, 266, 267],
- Plimpton & Lawton's experiment [268, 267]
- Atomic spectroscopy [269]
- Atomic force microscopy (AFM) [267]
- Static magnetic field of the Earth [270, 271, 272]
- Static magnetic field of Jupiter [273, 272].
- ALPs [54]
- SPring-8 [274]
- UWA-LSW [275, 276]
- ADMX-LSW [277]
- CROWS [57].
- TEXONO [278]
- Crab nebula [279]
- COBE and FIRAS [280]

Production in stars

- CAST [281]
- SHIP [282]
- HINODE [283]
- HB and RG stars [284]
- Neutron stars [285]
- Solar neutrinos [286]

Dark matter cosmology/astro

- Arias et al. [203]
- Witte et al. [287, 288]
- Caputo et al. [289, 280],
- IGM [290],
- Leo T dwarf [291]
- Gas clouds [292]

Dark matter experiments

- Reinterpreted axion limits [262]
- BREAD (projection) [40]
- DAMIC [293]
- Dark E-field Radio [294]
- DM Pathfinder [295]
- DOSUE-RR [296]
- FAST Radio antenna [297]
- FUNK [298]
- LAMPOST [299]
- MuDHI [300]
- ORGAN [301]
- ORPHEUS [302]
- QUALIPHIDE [303]
- Quantum cyclotron [304]
- SENSEI [305]
- SHUKET [306]
- SuperCDMS [307]
- SuperMAG [308, 309]
- SQuAD [310],
- SQMS [311],
- Tokyo dish antennae experiments [312, 313, 314]
- WISPDMS [315]
- XENON(100,1T,nT) [153, 225, 316, 317, 318, 319].

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