

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]
- DANCE [17]
- BASE [18]
- GrAHal [19]
- HAYSTAC [20, 21, 22]
- ORGAN [23, 24]
- QUAX [25, 26, 27]
- RADES [28]
- RBF [29]
- SHAFT [30]
- TASEH [31]
- SuperMAG [32]
- UF [33]
- UPLOAD-DOWNLOAD [34, 35]
- ABRACADABRA (projection) [36]
- ADBC (projection) [37]
- ADMX (projection) [38]
- aLIGO (projection) [39]
- ALPHA (projection) [40, 41]
- BRASS (projection) [42]
- BREAD (projection) [43]
- CADEX (projection) [44]
- DALI (projection) [45]
- DM-Radio (projection) [46, 47]
- DANCE (projection) [48]
- LAMPOST (projection) [49]
- MADMAX (projection) [50]
- FLASH (projection) [51, 52]
- QUAX (projection) [53]
- ORGAN (projection) [23]
- TOORAD (projection) [54]
- Twisted Anyon Cavity (projection) [55]
- WISPLC (projection) [56]
- SRF heterodyne cavity (projection) [57]

LSW/Helioscopes

- ALPS [58]
- CAST [59, 60]
- CROWS [61]
- OSQAR [62]
- PVLAS [63]
- SAPPHIRES [64, 65]
- ALPS-II (projection) [66]
- IAXO (projection) [67]
- IAXO (Galactic SN) [68]

Astro

- Axion star explosions [69]
- Betelgeuse [70]
- BICEP/KECK [71]
- Breakthrough Listen (Doppler shifted radio line in MW) [72]
- Breakthrough Listen (Neutron stars) [73]
- Bullet Cluster (archival radio data) [74]
- Cosmic IR background (hint) [75]
- Chandra (Hydra) [76]
- Chandra (M87) [77]
- Chandra (NG7 1275) [78]
- Chandra (H1821+643) [79]
- CMB Anisotropies [80, 81]
- COBE/FIRAS+Planck spectral dist. [82]
- Diffuse gamma-rays [83]
- Diffuse SN ALPs [84] (see also [85])
- Distance ladder [86]
- Fermi-LAT (NGC 1275) [87]
- Fermi-LAT (Extragalactic SNe) [88]
- Fermi-LAT (Quasars) [89]
- Gamma-ray attenuation (ALP dark matter) [90]
- Globular clusters (R parameter) [91]
- Globular clusters (R_2 parameter) [92]
- HAWC (TeV Blazars) [93]
- HESS (PKS 2155-304) [94]
- INTEGRAL (ALP decay) [95]
- Leo T gas temperature [96]
- Magnetic white dwarfs (X-rays) [97]
- Magnetic white dwarf (polarization) [98]
- MOJAVE [99]
- Mrk 421 (ARGO-YBJ+Fermi): [100]
- Mrk 421 (ARGO-YBJ+MAGIC): [101]
- Neutron Stars (Foster et al.) [102]
- Neutron Stars (Darling) [103]
- Neutron Stars (Battye et al.) [104]
- Planck cosmic birefringence [105]
- POLARBEAR [106]
- PTA+QUIJOTE [107]
- Pulsar polarisation arrays (projection) [108]
- Pulsar polar cap [109]
- Red supergiant [110]
- Solar neutrinos [111]
- SN1987A- γ (ALP decay) [112, 113]
- SN1987A- γ (low mass ALP conversion) [114, 113]
- SN1987A- γ, ν (high mass ALPs) [115]
- Low-energy supernovae (ALP decay) [83]
- Solar basin (NuSTAR) [116]
- Solar basin (NuSTAR and SPHINX) [117]
- Star clusters [118]
- SPT [119]
- Telescopes (Haystack) [120]
- Telescopes (MUSE) [121]
- Telescopes (VIMOS) [122]
- Telescopes (HST) [123, 124]
- Fermi galactic SN (projection) [125]
- THESEUS (projection) [126]
- eROSITA (projection) [127]
- White dwarf initial-final mass relation [128]
- XMM-Newton (decaying DM ALPs) [129]

Cosmology

- Ionisation fraction, EBL, X-rays [130]
- BBN+ N_{eff} [131]
- Freeze in [132]

2 Heavy ALP-photon coupling

- ATALS (PbPb) [133]
- BaBar [134]
- Beam dump [135, 136, 134, 137, 138]
- Belle II [139]
- BESIII [140]
- CMS (PbPb) [141]
- LEP [142]
- LHC (pp)[143]
- NOMAD [144]
- OPAL [143]
- PrimEx [145, 146]
- CONUS (projection) [147]
- DUNE (projection) [148]
- FASER LLP (projection) [149]

3 Axion-electron

- EDELWEISS [150]
- Magnon non-demolition [151]
- GERDA [152]
- LUX [153]
- Panda-X [154]
- SuperCDMS [155]
- XENON1T [156, 157]
- XENONnT [158]
- XENON1T (Solar basin) [159]
- Red giants (ω Cen) [160]
- NV Centers (projection) [161]
- Solar neutrinos [162]
- Magnons (projection) [163]
- Polaritons (projection) [164]
- DARWIN (projection) [165]
- LZ (projection) [166]
- QUAX [167, 168]
- Semiconductors (projection) [169]
- White dwarf hint [170]
- Freeze-in irreducible axions [132]
- X-rays (1-loop decay) [171]

4 Axion-nucleon

Note: CASPER and nEDM limits account for stochastic correction reported in [172]

- Casimir effect (fifth force) [173]
- CASPER-ZULF-Comagnetometer [174]
- CASPER-ZULF-Sidechain [175]
- nEDM (ultracold neutrons and mercury) [176]
- NASDUCK [177, 178]
- PSI HgM (nEDM) [179]
- K-3He comagnetometer (fifth force) [180]
- K-3He comagnetometer (dark matter) [181]
- JEDI [182]
- Old comagnetometers [183]
- Torsion balance [184]
- Neutron star cooling [185] (corrected from [186])
- SN1987A Cooling [187]
- SNO (deuterium dissasociation) [188]
- Proton storage ring (projection) [189]
- DM comagnetometer (projection) [183]
- CASPER-gradient (projection) [175]
- Superfluid helium-3 HPD (projection) [190]

5 Axion-EDM

- Axinovae [191]
- Beam EDM [192]
- BBN (dark matter) [193]
- CASPER-electric [194]
- nEDM [176]
- HfF⁺ [195]
- JEDI [182]
- Rb/Quartz [196]
- SN1987A [197]
- *Planck*+BAO thermal axion bound [198]
- CASPER-electric (projection) [199]
- Storage Ring EDM (projection) [199]

6 Axion mass versus f_a

- BBN (dark matter) [193]
- Beam EDM [192]
- Binary pulsars and Solar core constraint on $\bar{\theta}$ [200].
I include minor numerical corrections made by [201, 202].
- GW170817 [203]
- HfF⁺ [195]
- Rb/Quartz [196]
- JEDI [182]
- nEDM [176]
- Piezoaxionic effect (projection) [204]
- *Planck*+BAO thermal axion bound [198]
- SN1987A [197]
- Neutron stars (projection) [200].
- NS-NS and NS-BH Inspirals (projection) [200].
- White dwarfs [205]

6.1 Black hole superradiance

- Baryakhtar et al. [206] (just Stellar mass BHs)
- Mehta et al. [206] (Stellar mass and SMBHs)
- Stott [207]
- Ünal et al. [208] (Quasars)
- Cardoso et al. [209] (dark photon)

7 Axion theory predictions

7.1 Post-inflation QCD axion

- Ballesteros et al. [210]
- Buschmann et al. 2020 [211]
- Buschmann et al. 2021 [212]
- Bonati et al. [213]
- Borsanyi et al. [214]
- Berkowitz et al. [215]
- Dine et al. [216]
- Petreczky et al. [217]
- Fleury & Moore [218]
- Klaer & Moore [219]
- Gorghetto et al. [220]
- Saikawa et al. [67]

7.2 Other dark matter predictions

- ALP Cogenesis [221]
- Early matter domination [222]
- Post-inflation ALP misalignment [223, 224]
- Trapped misalignment ($\mathcal{Z}_{\mathcal{N}}$ axion) [201]

8 CP-violating couplings

Combined constraints [225]

Scalar-nucleon

- Red giants [226]
- MICROSCOPE [227].
- Eot-Wash [228, 229, 230]
- Irvine [231]. Corrected to 2σ limit by [232]
- HUST [233, 234, 235, 236].
- Stanford [237]
- IUPUI [238].
- Wuhan [232]

Pseudoscalar-electron

- Red giants [226]
- Eot-wash [239]
- NIST [240]
- SMILE [241].
- QUAX [242, 243]
- Washington [244, 245].
- XENONIT [246]
- Magnon (projection) [164]
- QUAX (projection) [242].

Pseudoscalar-nucleon

- Neutron star cooling [186]
- Washington [247]. Limit taken from [248].
- SMILE [241].
- Mainz [249]
- ARIADNE (projection) [250]
- CASPER-wind (projection) [199]
- DM comagnetometer (projection) [183]

9 Scalars

Scalar-photon

- Globular clusters [92]
- Eot-Wash (EP) [251]
- Fifth force [252]
- MICROSCOPE [227]
- AURIGA [253]
- BACON [254]
- Cs/Cav [255]
- DAMNED [256]
- Dy/Dy [257]
- Dy/Quartz [196]
- Dynamic Decoupling [258]
- GEO600 [259]
- Holometer [260]
- H/Quartz/Sapphire [261]
- PTB (Yb+, Sr clock) [262]
- I₂ [263]
- Rb/Cs [264]
- Sr/Si [265]
- AEDGE (projection) [266]
- AION (projection) [266]
- DUAL (projection) [252]
- MAGIS (projection) [267]
- Nuclear clock (projection) [268]
- Mechanical Resonators (projection) [269]

Scalar-electron

- Red giants [226]
- White dwarfs [270]
- Eot-Wash (EP) [251]
- Fifth force [252]
- MICROSCOPE [227]
- AURIGA [253]
- Cs/Cav [255]
- DAMNED [256]
- GEO600 [259]
- Holometer [260]
- H/Quartz/Sapphire [261]
- I₂ [263]
- H/Si [265]
- Rb/Quartz [196]
- AEDGE (projection) [266]
- AION (projection) [266]
- DUAL (projection) [252]
- Optical microwave clock (projection) [252]
- Optical cavities [271]
- SrOH [272]
- Mechanical Resonators (projection) [269]
- IPTA (mock data) [273]

10 Vectors

B-L coupling

- Casimir [274, 275, 276]
- Eot-Wash (EP) [277]
- Eot-Wash (ISL) [278]
- MICROSCOPE [279]
- DM stability [280]
- Horizontal branch [226]
- Sun [226]
- Eot-Wash (DM) [281]
- LIGO (O1) [282]
- LIGO/VIRGO [282]
- Asteroids (projection) [283]
- LISA (projection) [283]
- MAGIS (projection) [267]
- Optomechanical membranes (projection) [284]
- SKA (projection) [285]
- Torsion balance (projection) [285]

11 Dark photons

Combined constraints [286]

SM photon-DP transitions

- Coulomb [287, 288, 289, 290, 291],
- Plimpton & Lawton's experiment [292, 291]
- Atomic spectroscopy [293]
- Atomic force microscopy (AFM) [291]
- Static magnetic field of the Earth [294, 295, 296]
- Static magnetic field of Jupiter [297, 296].
- ALPs [58]
- ALPS-II (projection) [298]
- SPring-8 [299]
- UWA-LSW [300, 301]
- ADMX-LSW [302]
- CROWS [61].
- DarkSRF [303]
- DarkSRF (projection) [304]
- TEXONO [305]
- Crab nebula [306]
- COBE and FIRAS [307]
- STAX (projection) [308]

Production in stars

- CAST [309]
- SHIPS [310]
- HINODE [311]
- HB and RG stars [312]
- Neutron stars [313]
- Solar neutrinos [314]
- XENON1T [315]

Dark matter cosmology/astro

- Arias et al. [223]
- Witte et al. [316, 317]
- Caputo et al. [318, 307],
- IGM [319],
- Leo T dwarf [320]
- Gas clouds [321]

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Dark matter experiments

- Reinterpreted axion limits [286]
- ALPHA []
- BREAD (projection) [43]
- DAMIC [322]
- Dark E-field Radio [323]
- DM Pathfinder [324]
- DOSUE-RR [325]
- FAST Radio antenna [326]
- FUNK [327]
- LAMPOST [328]
- LOFAR (solar corona) [329]
- MuDHI [330]
- ORGAN [331]
- ORPHEUS [332]
- QUALIPHIDE [333]
- Quantum cyclotron [334]
- SENSEI [335]
- SHUKET [336]
- SuperCDMS [337]
- SuperMAG [338, 339]
- SQuAD [340],
- SQMS [341],
- Tokyo dish antennae experiments [342, 343, 344]
- WISPDMS [345]
- XENON(100,1T,nT) [169, 246, 346, 347, 315, 348].

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