

# Berkeley Axion Workshop 2025

Wednesday 7 May 2025 - Friday 9 May 2025



## Book of Abstracts



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## **Opening Remarks**

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## **New Technologies for Axion Detection**

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## **Solar Axions with the International Axion Observatory (IAXO) and BabyIAXO**

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**QCD Axion Dark Matter Searches with HAYSTAC, ALPHA, and RAY**

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**The Superconducting Heterodyne Approach to Axion Detection**

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**“Hybrid-Superconducting” Cavities with ADMX Sidecar**

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## **Hunting for QCD Axion Dark Matter with the Princeton Axion Search**

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### **Kinetic/Acoustic Misalignment and baryon asymmetry**

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### **ARIADNE: Recent Progress and Future Outlook**

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### **Magnet technologies for GUT-scale axion searches**

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### **The Piezoaxionic Effect: dark matter detection and new forces**

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### **A Loophole in the Isocurvature Bound on the QCD Axion**

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## **Observation of the Axion quasiparticle**

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## **DMRadio-m3: a proposed QCD axion search**

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**TBA**

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## **Detecting meV axions: Broadband Reflector Experiment for Axion Detection (BREAD)**

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We present BREAD (Broadband Reflector Experiment for Axion Detection). BREAD is a novel, scalable approach to detect meV axions using a dish antenna in high-field solenoid magnets. Several orders of axion mass around the meV range are particularly well motivated by the post-inflationary symmetry breaking scenario for the QCD axion. We present first results with BREAD prototypes, including the world's first search for axion-like particles with a dish antenna, and discuss future avenues for increasing sensitivity and mass range.

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## **Axions and String Theory: General Remarks**

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## **Simons Foundation Vision for Dark Matter and Axions**

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## **The Dark Wave Lab: A Proposal for Shared Magnet and Cryogenic Facilities for Axion Searches at Fermilab**

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## **String Compactifications with Many Axions**

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## **Axion dark matter explains the formation of supermassive black holes at cosmic dawn**

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## **Testing unification and heterotic strings with axions**

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In this talk I will discuss axion couplings to gauge bosons in 4-dimensional Grand Unified Theories and in heterotic String Theory. The topological nature of these couplings allows them to be matched from the UV to the IR, and the ratio of the anomaly with photons and gluons for any axion is fixed by unification. I will show that this implies that there is a single axion —the QCD axion —with an anomalous coupling to photons. Other light axion-like particles can couple to photons by mixing with the QCD axion, and necessarily lie to the right of the QCD line prediction in the mass-coupling plane. As a result, a discovery of an axion to the left of the QCD line can rule out simple GUTs and most of the studied heterotic string compactifications. (Based on: 2206.07053 and 2410.03820)

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## **Imperfect Axions**

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## **Axion Signatures from Supernovae and Neutron Stars Mergers: A Full-Sky Search with GALAXIS**

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## **Indirect probes of QCD axion with Fast Radio Burst Timing**

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## **Echoes of Axion Dark Matter and Axion Stars**

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## **A quantum protocol for observing superradiant interactions of cosmic relics**

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