

## Axion dark matter (theory & experiment)

*Tuesday 26 August 2025 11:00 (30 minutes)*

We review the theory and experimental status of the axion as a solution to the strong-CP problem and a leading ultra-light, wave-like dark-matter candidate. We summarize the Peccei–Quinn mechanism, axion couplings, and cosmological production via misalignment. Astrophysical probes (stellar cooling, pulsar-timing arrays, and black-hole superradiance, etc) already set strong bounds across wide parameter ranges, informed by radio and millimeter-wave observations. In parallel, laboratory searches employ resonant cavities (including superconducting implementations), LC and broadband circuits, precision polarimetry and light-shining-through-walls experiments, and NMR-based and fifth-force techniques. These complementary approaches cover distinct mass–coupling windows yet leave substantial discovery space. Looking ahead, advances in quantum detection and coordinated sensor networks promise order-of-magnitude sensitivity gains and an expanded reach to higher masses and weaker couplings.

### Collaboration you are representing

**Author:** 舒, 菁

**Presenter:** 舒, 菁

**Session Classification:** Plenary session

**Track Classification:** Dark Matter and Its Detection