

Axion Production and Detection Using a Dual NMR-type Experiment

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Axions that couple to nuclear spins via the axial current interaction can be both *produced* and *detected* using nuclear magnetic resonance (NMR) techniques. In this scheme, nuclei driven by a real oscillating magnetic field in one device act as an axion source, which can drive NMR in a nearby spin-polarized sample interrogated with a sensitive magnetometer. The gradient of the generated axion field can be substantial, set by the inverse distance from the source. In the near zone, it reduces to the inverse of the source's geometric size. In this talk, I will present a calculation of the experimental sensitivity. As I will show, a pair of 10-centimeter-scale NMR devices operating over a one-hour integration time can already surpass existing astrophysical bounds on the axion-nucleon coupling, including those from star cooling. This setup is capable of probing a wide range of axion masses, up to values comparable to the inverse distance between the source and the sensor.

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