

The Piezoaxionic Effect

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Axion dark matter (DM) constitutes an oscillating background that violates parity and time-reversal symmetries. Inside piezoelectric crystals, where parity is broken spontaneously, this axion background can result in a mechanical stress. We call this new phenomenon “the piezoaxionic effect”. When the frequency of axion DM matches the natural frequency of a bulk acoustic normal mode of the piezoelectric crystal, the piezoaxionic effect is resonantly enhanced and can be read out electrically via the piezoelectric effect. We also point out another, subdominant phenomenon present in all dielectrics, namely the “electroaxionic effect”. An axion background can produce an electric displacement field in a crystal which in turn will give rise to a voltage across the crystal. Near-future experimental setups that probe these two effects are applicable for axion masses between 10^{-11} eV and 10^{-7} eV, a challenging range for most other detection concepts.

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