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Axion Production in Highly Magnetized Astrophysical Plasmas

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Compact objects such as neutron stars possess some of the strongest electric and magnetic fields in the observed universe. Non-thermal electromagnetic emission from neutron stars is sourced in regions with accelerating electric fields, $\vec{E} \cdot \vec{B} \neq 0$. These regions are also very efficient axion factories. Once produced, axions may (1) convert to photons, giving rise to anomalous electromagnetic signatures, (2) remain gravitationally bound to the neutron star and form dense clouds that can grow over astrophysical timescales, or (3) propagate to Earth and imprint detectable signals in laboratory experiments. In this talk, I will provide an overview of recent work on probing axions with neutron stars, and discuss important next steps in this program.

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