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Searching for Axions with Neutron Stars CHRISTOPHER DESSERT, Lawrence Berkeley National Laboratory — Axions are a generic expectation in many extensions of the Standard Model. Neutron stars have long been a stringent probe of axions through observations of their cooling. Axions can be created within the hot core of the neutron star and escape the star due to their weak interactions with matter. However, the emitted axions can then be detected in X-ray observations if they convert into an X-ray photon on the way to Earth, for example in the magnetosphere of the star. Here I present a summary of recent works searching for evidence of these particles from X-ray observations of nearby neutron stars knonwn as the Magnificent Seven. In particular, I focus on the recent discovery of an X-ray excess from the Magnificent Seven. This excess is consistent with the axion-nucleon bremsstrahlung expectation for an axion with the product of photon and nucleon couplings $g_{a\gamma\gamma} \times g_{ann} \in (2 \times 10^{-21}, 10^{-18})$ GeV^{-1} and mass $m_a < 2 \times 10^{-5}$ eV. Furthermore, I discuss a new axion production channel inside neutron stars via synchrotron emission off of neutrons and muons, and discuss the implications of this channel for the Magnificent Seven excess.

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