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A Model for Axions Producing Extended gamma-ray Emission from Neutron Star J0108-1431 BIJAN BERENJI, California State University, Los Angeles, Department of Physics and Astronomy — Axions are hypothetical particles proposed to solve the strong CP problem in QCD and may constitute a significant fraction of the dark matter in the Universe. Axions are expected to be produced in neutron stars and subsequently decay, producing gamma-rays detectable by the Fermi Large Area Telescope (Fermi-LAT). Considering that light axions may travel a long range before they decay into gamma rays, neutron stars may appear as a spatially-extended source of gamma rays. We extend our previous search for gamma rays from axions, based on a point source model, to consider the neutron star as an extended source of gamma rays. present including the fundamental astrophysics and relativistic, extended gamma-ray emission from axions around neutron stars. A Monte Carlo simulation of the LAT gives us an expectation for the extended angular profile and spectrum. We predict a mean angular spread of 0.8 degrees with energies in the range 30-200 MeV. We consider projected sensitivities for mass limits on axions from J0108-1431, a neutron star at a distance of 240 pc, arange not probed by observations before. Based on the extended angular profile of the source, the expected sensitivity of the 95% CL upper limit on the axion mass from J0108-1431 is >10 meV.

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