

Abstract Submitted  
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**Measuring the Axion's CP-violating Couplings**<sup>1</sup> JUNYI LEE,  
MICHAEL ROMALIS, Princeton Univ — Axions, which were first proposed in 1977  
to explain the strong CP problem in QCD, have also become well motivated can-  
didates for dark matter whose discovery would have far-reaching consequences. We  
describe an experiment to measure the CP-violating axion coupling constant  $g_p g_s$   
with both the neutron and electron using a  $^3\text{He-K}$  atomic co-magnetometer and a  
200 kg source mass. It will enable us to surpass, for the first time in a laboratory  
experiment, the current tightest constraints on  $g_p^N g_s^N$  derived by Raffelt<sup>2</sup> from as-  
trophysical observations by an order of magnitude. With an expected sensitivity of  
 $g_p^N g_s^N \sim 6 \times 10^{-33}$ , we would also exceed the current tightest laboratory constraints  
on  $g_p^N g_s^N$  at large distances from Youdin *et. al*<sup>3</sup> by 3 orders of magnitude.

<sup>1</sup>Supported by NSF PHY-1404325.

<sup>2</sup>G. Raffelt, Phys. Rev. D **86**, 015001 (2012).

<sup>3</sup>A. N. Youdin, D. Krause, Jr., K. Jagannathan, and L. R. Hunter, Phys. Rev. Lett.  
**77**, 11 (1996).

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