

Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Search for a variation of the fine-structure constant around the supermassive Black Hole in our Galactic Center BENJAMIN ROBERTS, University of Queensland, A. HEES, SYRTE, Observatoire de Paris, T. DO, A. M. GHEZ, UCLA, S. NISHIYAMA, Miyagi University of Education, Japan, R. BENTLEY, A. K. GAUTAM, UCLA, S. JIA, UC Berkeley, T. KARA, Miyagi University of Education, Japan, J. R. LU, UC Berkeley, H. SAIDA, Daido University, Japan, S. SAKAI, UCLA, M. TAKAHASHI, Aichi University of Education, Japan, Y. TAKAMORI, National Institute of Technology, Japan — Searching for space-time variations of the constants of Nature is a promising way to search for new physics beyond General Relativity and the standard model motivated by unification theories and models of dark matter and dark energy. We propose a new way to search for a variation of the fine-structure constant using measurements of late-type evolved giant stars from the S-star cluster orbiting the supermassive black hole in our Galactic Center. A measurement of the difference between distinct absorption lines (with different sensitivity to the fine structure constant) from a star leads to a direct estimate of a variation of the fine structure constant between the star's location and Earth. Using spectroscopic measurements of 5 stars, we obtain a constraint on the relative variation of the fine structure constant below $1e-5$. This is the first time a varying constant of Nature is searched for around a black hole and in a high gravitational potential. This analysis shows new ways the monitoring of stars in the Galactic Center can be used to probe fundamental physics.

Benjamin Roberts
University of Queensland

Date submitted: 03 Feb 2020

Electronic form version 1.4