

Accepted Manuscript

Classical tests of photons coupled to Weyl tensor in the Solar System

Gang Li, Xue-Mei Deng

PII: S0003-4916(17)30129-X
DOI: <http://dx.doi.org/10.1016/j.aop.2017.05.001>
Reference: YAPHY 67384

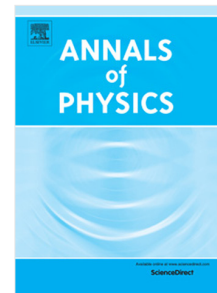
To appear in: *Annals of Physics*

Received date: 15 March 2017

Accepted date: 2 May 2017

Please cite this article as: G. Li, X.-M. Deng, Classical tests of photons coupled to Weyl tensor in the Solar System, *Annals of Physics* (2017), <http://dx.doi.org/10.1016/j.aop.2017.05.001>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Classical tests of photons coupled to Weyl tensor in the Solar System

Gang Li^{a,b}, Xue-Mei Deng^{a,*}

^aPurple Mountain Observatory, Chinese Academy of Sciences, Nanjing 210008, China

^bUniversity of Science and Technology of China, Chinese Academy of Sciences, Anhui 230026, China

Abstract

With the purpose of deeply understanding the fundamental interaction between the electromagnetic and gravitational fields, photons coupled to the Weyl tensor was proposed, which could be derived from the Maxwell equation with a Weyl correction. This correction with respect to general relativity in a 4-dimensional spacetime can be characterized by a coupling strength parameter α . By taking such a coupling into account, we investigate its effects on the classical tests in the Solar System, including the deflection of light, the gravitational time delay and the Cassini tracking experiment, and constrain the parameter α with new datasets. None of these works were done before and these data of the experiments are used for testing the photons coupled to the Weyl tensor for the first time. We find that the experimental upper bounds are $|\alpha| \lesssim 4 \times 10^{11} - 5 \times 10^{13} \text{ m}^2$, in which the strongest bound comes from the Cassini tracking. Therefore, it is expected that when more sophisticated frequency standards can be implemented in the spacecrafts tracking in the future, this bound on α will be reduced further.

Keywords: Solar system experiments, Gravitation, light propagation, Relativistic process, Astrometry

*Corresponding author at: Purple Mountain Observatory, Chinese Academy of Sciences, Nanjing 210008, China.

Email address: xmd@pmo.ac.cn (Xue-Mei Deng)

Download English Version:

<https://daneshyari.com/en/article/5495941>

Download Persian Version:

<https://daneshyari.com/article/5495941>

[Daneshyari.com](https://daneshyari.com)