

Abstract Submitted  
for the APR20 Meeting of  
The American Physical Society

**Implications of transformation properties of the source term in the classical Kaluza theory for modifications to the Maxwell equations<sup>1</sup>**

L.L. WILLIAMS, Konfluence Research Institute — Kaluza obtained a unification of general relativity (GR) and classical electromagnetism from the fact that their respective field equations and equations of motion follow from GR written in 5 dimensions (5D). An additional scalar field is necessitated by the 5D framework, and the full field equations were developed long after the theory was abandoned. To correct some errors in the English-language literature, in 2015 we used tensor algebra software to provide the first English-language description of the correct Kaluza vacuum field equations and their Lagrangian. In the present work, we consider the Kaluza source term in the field equations, and its covariance properties in 4D and 5D. A typical 5D fluid source term qualitatively reproduces the source terms in the 4D Einstein and Maxwell equations, matching the correspondence in the curvature terms. Yet the 5D source terms in various references were restricted to certain limits, or not made covariant in 5D. When standard covariance considerations are applied to the 5D Kaluza source term, intriguing modifications to the Maxwell equations emerge from the scalar field. One preliminary result is a saturation electric field from electrostatic sources, above which no additional added charge can increase the electric field strength.

<sup>1</sup>This material is based upon work supported by DARPA DSO under award Acquisition Services Directorate (AQD) number D19AP00017

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Date submitted: 26 Dec 2019

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