

# Admitting Photons Into The Dirac Equation

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## 1 Generalizing the Dirac Equation

The Dirac equation can be written

$$\nabla\psi i = p\psi, \tag{1}$$

where  $\psi \in G_{1,3}^+$ ,  $i$  is a constant unit bivector, and  $p$  is a vector, such that<sup>1</sup>

$$p\psi = m\psi\gamma_0. \tag{2}$$

A less restrictive constraint is just that

$$p^2 = m^2 \tag{3}$$

be constant. This admits a new class of null solutions, where  $m = 0$  but  $p\psi \neq 0$ . This paper aims to make sense of this new class of solutions.

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<sup>1</sup>See GAP 8.86