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Clifford Algebras and Waves in Plasmas: Dirac type Integral-Differential Equations

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Geometric Algebras were developed almost 150 year ago. Especially, Clifford Algebra was developed in order to provide an alternative way of formulating Maxwell's Equations of Classical Electromagnetism. One major application in Classical Electromagnetism is the propagation of electromagnetic waves in magnetized plasmas that are inherently anisotropic due to the presence of a guiding magnetic field. This subject is a major field of research in the realm of magnetic fusion. On the other hand, the recent developments in the field of the quantum computers and the advances already achieved in the field of quantum computation techniques to be applied in quantum computer simulators or even in the existing rudimentary quantum computers, poses a challenge in efforts to reformulate the relevant Maxwell's Equations in a form that could render the latter apropriate for quantum computation. We will demonstrate how the Clifford Algebra can render the problem in hand in a Dirac-type of equation on a multi dimentional object and/or a spinorial object that can be handled via quantum computational techniques very efficiently and, most importantly, at a speed that surpasses state-of-the-art classical supercomuters