



## A Short Remark on Vortex as Fluid Particle from Neutrosophic Logic perspective

(Towards “fluidicle” or “vorticle” model of QED.)

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### Abstract

In a previous paper in this journal (IJNS), it is mentioned about a possible approach to re-describe QED without *renormalization* route. As it is known that in literature, there are some attempts to reconcile vortex-based fluid dynamics and particle dynamics. Some attempts are not quite as fruitful as others. As a follow up to previous paper, the present paper will discuss two theorems for developing unification theories, and then point out some new proposals including by Simula (2020) on how to derive Maxwell equations in superfluid dynamics setting; this could be a new alternative approach towards “*fluidicle*” or “*vorticle*” model of QED. Further research is recommended in this new direction.

**Keywords:** Neutrosophic logic, Vortex-based fluid dynamics, Fluidicle, Vorticle, QED, Renormalization, Maxwell-Proca equations.

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### 1. Introduction

In literature, there are some attempts to reconcile between vortex-based fluid dynamics and particle dynamics, see [15-21]. Some attempts are not quite fruitful as others, concerning describing classical electrodynamics.

This paper will continue our previous article, suggesting that it is possible to find a way out of the infinity problem in QED without renormalization route [14]. As in the previous paper [14], the role of neutrosophic Logic (developed by one of us, FS) here is to find a third way or intermediate solution between point particle and vortex, that is why it is suggested here a combined term: “*vorticle*” (from vortex and particle), or it may be called: “*fluidicle*” (from fluidic particle). These new words vorticle and fluidicle are intended to capture the essence of “middle way” representing the Neutrosophic Logic view.

Here three possible approaches by Tapio Simula, Lehnert’s RQED, and also Carl Krafft, will also be discussed.

The present paper will point out some new papers including by Simula [7] on how to derive Maxwell equations in superfluid dynamics setting, this could be a new alternative approach towards “fluidicle” or “vorticle” model of QED.

## **2. A short review of progress QED theories in literature and two new theorems.**

There are some progress in the literature of QED, beyond what is called “*renormalization*” route, for instance by Daywitt, using a 7-dimensional spacetime and spinor wave [22-24].

Other developments have been made by Prof. Bo Lehnert, which he calls: revised Quantum Electrodynamics. There are numerous possible ways to develop QED-like theories, and not only that some theoreticians have gone further to develop Unification Theories, SuperUnification, and even Theory of Everything (TOE).

But almost all of them boiled down to mounting complexities and ever-increasing difficult technicalities, so it appears to be more direct approach to start with writing down two theorems as follows:

### **2.a. Two new theorems and a corollary**

Based on the above discussions, actually, it is suggested two theorems and a corollary over here:

*Theorem 1:*

The true unified theory between gravitation, particles, and electromagnetic (UTGPE) fields should be based on a consistent model of *vacuum*, preferably by a kind of ether fluid dynamics.

*Theorem 2:*

The true UTGPE, albeit it is quite difficult to find, shall be founded on no more than 3-dimensional space and 1-dimensional time (Newtonian space).

*Corollary:*

It should be possible and indeed relatively easy to find theoretical ways to unify four fundamental forces by increasing spacetime dimensionality. Supra dimensional spacetime is one character of *anti-realism* theory of UTGPE.

### 2.b. Implication.

Therefore, a good candidate of true UTGPE, or at least a unification of gravitation and electromagnetic field in a quantum sense, should be better off based on such characteristics, as a consistent combination between a quantum feature of electrodynamics theory and/or quantum or *sub-quantum*<sup>1</sup> model of aether fluid.

### 3. Three possible alternatives on QED

Allow us to begin this section with a quote from Sonin's book [1], which can be paraphrased as follows:

“The movement of vortices has been a region of study for over a century. During the old style time of vortex elements, from the late 1800s, many fascinating properties of vortices were found, starting with the outstanding Kelvin waves engendering along a disconnected vortex line (Thompson, 1880). The primary object of hypothetical investigations around then was a dissipationless immaculate fluid (Lamb, 1997). It was difficult for the hypothesis to find a shared opinion with try since any old style fluid shows goeey impacts. The circumstance changed after crafted by Onsager (1949) and Feynman (1955) who uncovered that turning superfluids are strung by a variety of vortex lines with quantized dissemination. With this revelation, the quantum time of vortex elements started.”

Then it is possible find an expression that relates the topological and quantized vortices from the viewpoint of Bohr-Sommerfeld quantization rules, which seem to remind us to the Old Quantum Theory, albeit from a different perspective.

The quantization of circulation for nonrelativistic superfluid is given by [3]:

$$\oint v dr = N \frac{\hbar}{m_s} \quad (1)$$

Where  $N, \hbar, m_s$  represents the winding number, reduced Planck constant, and superfluid particle's mass, respectively [3]. And the total number of vortices is given by [44]:

$$N = \frac{\omega \cdot 2\pi r^2 m}{\hbar} \quad (2)$$

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<sup>1</sup> Added note: Robert N. Boyd has suggested his sub-quantum kinetic model of aether and also electron, using some features of Kelvin-Helmholtz vortex theorem. See for instance: V. Christiano, F. Smarandache & R.N. Boyd, Electron Model Based Helmholtz's Electron Vortex & Kolmogorov's Theory of Turbulence. *Prespacetime J.* vol. 10 (1), 2019. url: <https://prespacetime.com/index.php/pst/article/view/1516>

Some implications:

a. Simula's approach

Provided it is acceptable that there is a neat correspondence between quantized vortices in superfluid helium and Bohr-Sommerfeld quantization rules, now let us quote from abstract of a recent paper where Tapio Simula wrote, which can be rephrased as follows [7]:

“Right now, and electromagnetism have a similar starting point and are new properties of the superfluid universe, which itself rises up out of the hidden aggregate structure of progressively basic particles, for example, atoms. The Bose-Einstein condensate is identified as the tricky dull matter of the superfluid universe with vortices and phonons, separately, comparing to huge charged particles and massless photons.”[7]

In Simula's model, Maxwell equations can be re-derived right from superfluid vortices.

b. Lehnert's RQED

And one more approach is worthy to mention here. Instead of Simula's model of electromagnetic and gravitation fields in terms of superfluid vortices, we can also come up with a model of electrodynamics by Lehnert's RQED from Proca equations. As Proca equations can be used to describe the electromagnetic field of superconductor, we find it as a possible approach too.

Conventional electromagnetic theory based on Maxwell's equations and quantum mechanics has been successful in its applications in numerous problems in physics and has sometimes manifested itself in a good agreement with experiments. Nevertheless, as already stated by Feynman, there are unsolved problems which lead to difficulties with Maxwell's equations that are not removed by and not directly associated with quantum mechanics [20]. Therefore QED, which is an extension of Maxwell's equations, also becomes subject to the *typical shortcomings* of electromagnetic in its conventional form. This reasoning makes a way for Revised Quantum Electrodynamics as proposed by Bo Lehnert. [11-13]

In a series of papers, Bo Lehnert proposed a novel and revised version of Quantum Electrodynamics, which he calls as RQED. His theory is based on the hypothesis of a nonzero electric charge density in the vacuum, and it is based on *Proca-type* field equations [10, p. 23]:

$$\left(\frac{1}{c^2}\frac{\partial^2}{\partial t^2}-\nabla^2\right)A_\mu=\mu_0J_\mu,\mu=1,2,3,4 \quad (3)$$

Where

$$A_\mu=\left(A,\frac{i\phi}{c}\right) \quad (4)$$

With  $A$  and  $\phi$  standing for the magnetic vector potential and the electrostatic potential in three-space. In three dimensions, we got [20, p.23]:

$$\frac{\text{curl}B}{\mu_0} = \varepsilon_0(\text{div}E)C + \frac{\varepsilon_0\partial E}{\partial t}, \quad (5)$$

$$\text{curl}E = -\frac{\partial B}{\partial t}, \quad (6)$$

$$B = \text{curl}A, \text{div}B = 0, \quad (7)$$

$$E = -\nabla\phi - \frac{\partial A}{\partial t}, \quad (8)$$

$$\text{div}E = \frac{\bar{\rho}}{\varepsilon_0}. \quad (9)$$

These equations differ from the conventional form, by a nonzero electric field divergence equation (9) and by the additional space-charge current density in addition to displacement current at equation (5). The extended field equations (5)-(9) are easily found also to become invariant to a gauge transformation.[10, p.23]

The main characteristic new features of the present theory can be summarized as follows [10, p.24]:

- a. The hypothesis of a nonzero electric field divergence in the vacuum introduces an additional degree of freedom, leading to new physical phenomena. The associated nonzero electric charge density thereby acts somewhat like a hidden variable.
- b. This also abolishes the symmetry between the electric and magnetic fields, and then the field equations obtain the character of intrinsic linear symmetry breaking.
- c. The theory is both Lorentz and gauge invariant.
- d. The velocity of light is no longer a scalar quantity but is represented by a velocity vector of the modulus  $c$ .
- e. Additional results: Lehnert is also able to derive the mass of Z boson and Higgs-like boson.[21] These would pave an alternative way to new physics beyond Standard Model.

Now it should be clear that Lehnert's RQED is a good alternative theory to QM/QED, and therefore it is also interesting to ask whether this theory can also explain some phenomena related to LENR and UDD reaction of Homlid (as argued by Celani *et al*).[8]

A recent paper [8] presented arguments in favor of extending RQED to become a fluidic Maxwell-Proca equations, as follows:

Now it appears possible to arrive at fluidic Maxwell-Proca equations, as follows [8]

$$\nabla \cdot \vec{E} = \frac{\rho}{\varepsilon_0} - \kappa^2 \phi, \quad (10)$$

$$\nabla \cdot \vec{B} = 0, \quad (11)$$

$$\dot{B} = -\nabla \times E - \nabla \times (\hat{\beta} \nabla \times H_0), \quad (12)$$

$$\varepsilon_0 \mu_0 \dot{E} = \nabla \times B - \mu_0 j - \kappa^2 A - (\hat{\sigma} E_0 + \rho_e v + \hat{\gamma} \nabla T) - \nabla \times (\hat{a} \nabla \times E_0), \quad (13)$$

where:

$$\nabla \phi = -\frac{\partial \vec{A}}{\partial t} - \vec{E}, \quad (14)$$

$$\vec{B} = \nabla \times \vec{A}, \quad (15)$$

$$\kappa = \frac{mc_0}{\hbar}. \quad (16)$$

Since according to Blackledge, the Proca equations can be viewed as a *unified wavefield* model of electromagnetic phenomena [7], therefore the fluidic Maxwell-Proca equations can be considered as a *unified wavefield* model for electrodynamic of superconductor.

Now, having defined Maxwell-Proca equations, it is possible to write down *fluidic* Maxwell-Proca-Hirsch equations using the same definition, as follows:

$$(\square_\alpha^2 - \kappa^2)(F - F_0) = \frac{1}{\lambda_L^2}(F - F_0), \quad (17)$$

And

$$(\square_\alpha^2 - \kappa^2)(J - J_0) = \frac{1}{\lambda_L^2}(J - J_0), \quad (18)$$

where

$$\square_\alpha^2 = \nabla^{\alpha 2} - \frac{1}{c^2} \frac{\partial^{\alpha 2}}{\partial t^2}. \quad (19)$$

In literature, the above fluidic Maxwell-Proca-Hirsch equations have never been presented elsewhere before. Provided the above equations can be verified with experiments, they can be used to describe electrostatics of superconductors.

c. Krafft's approach

A third approach of describing elementary particles from aether vortices perspective is discussed by Carl F. Krafft [9]. See for example:

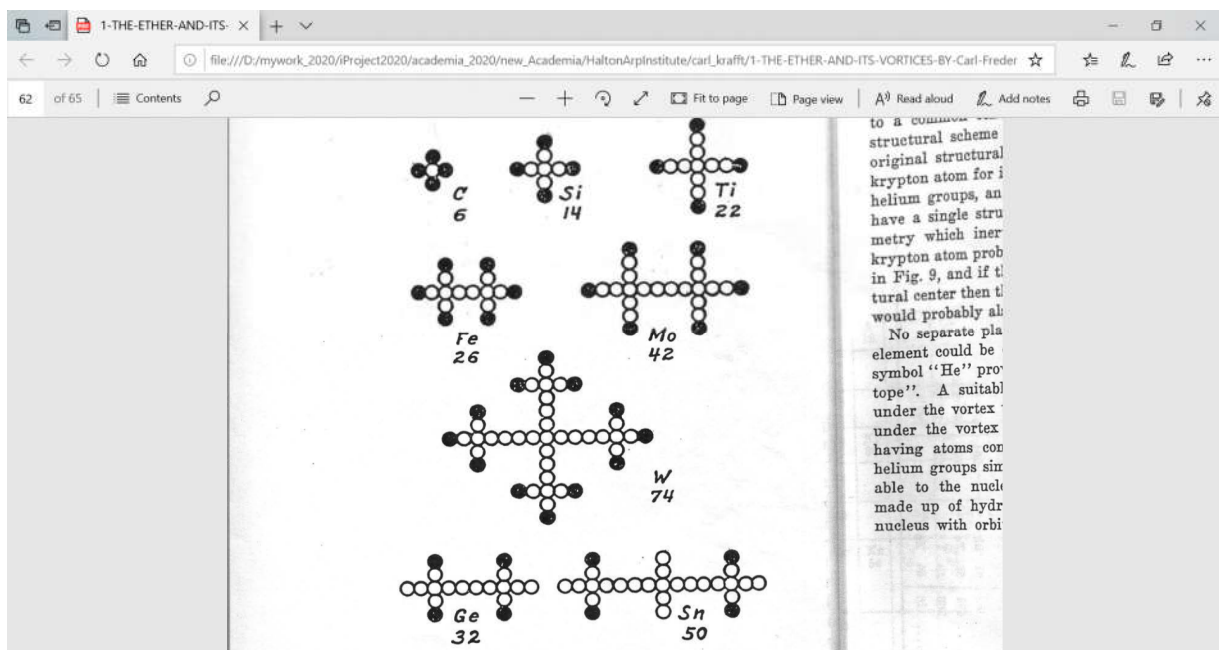


Figure 1. A few elementary particles, source: Carl Frederick Krafft [9]

#### 4. Concluding remarks

In this paper, continuing our previous article, it is argued that it is possible to find a way out of the infinity problem in QED without renormalization route [14]. As a follow up to previous paper, in the present paper, first of all, two theorems for developing unification theories have been discussed, along with pointing out some new proposals including by Simula (2020) on how to derive Maxwell equations in superfluid dynamics setting. This could be a new alternative approach towards “fluidicle” or “vorticle” model of QED.

Three possible approaches: Tapio Simula, Lehnert's RQED and also Carl F. Krafft, have also been discussed. Nonetheless it should be admitted that this article is not complete yet on possible ways to describe vortices or fluidic as an alternative to QED.

Hopefully this article will inspire further investigations in this line of thoughts.

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### References:

- [1] Edouard B. Sonin, "*Dynamics of quantised vortices in superfluids*", Cambridge: Cambridge University Press, 2016.
- [2] Kerson Huang, "*A superfluid Universe*", Singapore: World Scientific Publishing Co. Pte. Ltd., 2016.
- [3] Fischer, U, "Motion of quantized vortices as elementary objects", *Ann. Phys. (N.Y.)* 278, pp.62-85,1999.
- [4] Victor Christianto, Florentin Smarandache, Yunita Umniyati. A Derivation of Fluidic Maxwell-Proca Equations for Electrodynamics of Superconductors & Its Implication to Chiral Cosmology Model. *Prespacetime J.*, Vol 9, No 7 (2018), url: <https://prespacetime.com/index.php/pst/article/view/1471>; see also [4a] V. Christianto, F. Smarandache & R.N. Boyd, Electron Model Based Helmholtz's Electron Vortex & Kolmogorov's Theory of Turbulence. *Prespacetime J.* vol. 10 (1), 2019. url: <https://prespacetime.com/index.php/pst/article/view/1516>
- [5] F. Smarandache & V. Christianto, "Schrödinger Equation and the Quantization of Celestial Systems", *Prog. In Phys.* Vol.2, April 2006. url: <http://ptep-online.com/2006/PP-05-12.PDF>
- [6] Siavash H. Sohrab, "Turbulence and quantum mechanics from cosmos to Planck Scale," url: <http://www.mech.northwestern.edu/web/people/faculty/sohrab.php>
- [7] T. Simula, "Gravitational Vortex Mass in a Superfluid", arXiv: 2001.03302 (2020), see in particular section D. Ampere-Maxwell-like law.
- [8] Victor Christianto, Florentin Smarandache, Yunita Umniyati. Remark on Lehnert's Revised Quantum Electrodynamics (RQED) as an Alternative to Francesco Celani's et al's Maxwell-Clifford equations: with an Outline of Chiral Cosmology model and its role to CMNS. *JCMNS* vol. 31 (Feb. 2020), Publication of ICMNS, <http://www.iscmns.org>
- [9] Carl F. Krafft, "*The Ether and Its vortices*", Copyright: Ken L. Wheeler, pp. 60-61, 2014.
- [10] Bo Lehnert, "Mass-Radius Relations of Z and Higgs-like Bosons", *Progress in Physics*, Vol. 10 Issue 1, pp. 5-7, 2014. <http://ptep-online.com/2014/PP-36-02.PDF>
- [11] Bo Lehnert, "A way to Revised Quantum Electrodynamics", *Progress in Physics*, April 2012, Vol. 2, pp. 21-27. url: <http://ptep-online.com/2012/PP-29-05.PDF>



- [12] Bo Lehnert, "Higgs-Like Particle due to Revised Quantum Electrodynamics", *Progress in Physics*, Vol. 3, pp. 31-32, 2013. <http://ptep-online.com/2013/PP-34-10.PDF>
- [13] Bo Lehnert, "Potentialities of Revised Quantum Electrodynamics", *Progress in Physics*, Vol. 4, pp. 48-52, 2013. <http://ptep-online.com/2013/PP-35-07.PDF>
- [14] V. Christianto, R.N. Boyd & F. Smarandache, "Three Possible Applications of Neutrosophic Logic in Fundamental and Applied Sciences" *International Journal of Neutrosophic Science*, Vol. 1 no. 2, pp. 90-95, 2020.
- [15] Jeff D. Eldredge, Tim Colonius, and Anthony Leonard, "A Vortex Particle Method for Two-Dimensional Compressible Flow", *Journal of Computational Physics* 179, pp.371–399, 2002. doi:10.1006/jcph.2002.7060
- [16] ANDREA COLAGROSSI, GIORGIO GRAZIANI AND MARIO PULVIRENTI., "Particles for fluids: SPH versus vortex methods", *Mathematics and Mechanics of Complex Systems* 2(1):45-70, 2014.
- [17] Andrea Colagrossi, Emanuele Rossi & Salvatore Marrone. The Discrete Vortex Hydrodynamics method: similarities and differences with the SPH. *10th international SPHERIC workshop*. Parma, Italy, June, pp.16-18, 2015
- [18] O.S. Kotsur & G.A. Shcheglov, "VISCOUS FLUID SIMULATION WITH THE VORTEX ELEMENT METHOD", *31st Int. Council of Aeonaut. Science*, 2018.
- [19] Emanuele Rossi, Andrea Colagrossi, Benjamin Bouscasse and Giorgio Graziani, "Diffused Vortex hydrodynamics method", *Communications in Computational Physics* 18(18 2), 351-379, 2015.
- [20] HENRYK KUDELA AND ZIEMOWIT MIŁOSZ MALECHA, "VISCOUS FLOW MODELING USING THE VORTEX PARTICLES METHOD", *TASK QUARTERLY* 13 No 1–2, pp.15–32, 2008.
- [21] Peter O'Malley, "Trajectories of Inertial Particles and Fluid Elements", Haverford College, Haverford PA 19041. May 8th, 2008.
- [22] William C. Daywitt, "The Anomalous Magnetic Moment of the Electron and Proton Cores According to the Planck Vacuum Theory", *EJERS, EUROPEAN JOURNAL OF ENGINEERING RESEARCH AND SCIENCE*, VOL. 4, NO. 6, 2019.
- [23] William C. Daywitt, "The Seven-Dimensional Spacetime in the Planck Vacuum Theory and the Structure of the Electron and Proton Cores", *EJERS, EUROPEAN JOURNAL OF ENGINEERING RESEARCH AND SCIENCE*, VOL. 5, NO. 4, 2020
- [24] William C. Daywitt, "The Fine Structure Constant and Radiative Corrections for the Electron and Positron Cores as Viewed in the Planck Vacuum Theory", *EJERS, EUROPEAN JOURNAL OF ENGINEERING RESEARCH AND SCIENCE*, VOL. 5, NO. 5, MAY 2020