New novel physical constants metric and fine structure constant models demonstrate the intrinsic nature of vacuum space as a quantum medium

Emmanouil Markoulakis [1]*, Christian G. Wolf [2]

[1] *Department of Electronic Engineering, Computer Technology Informatics & Electronic Devices Laboratory, Hellenic Mediterranean University, Romanou 3, Chania 73133, Crete, Greece*
*Corresponding author E-mail: markoul@hmu.gr

[2]*CEO & Founder at forty-two times ten - Inh., Munich, Germany, cw@42x10.de*

Abstract

We hereby display two independent research-wise blind folded calculations of the fine structure constant using different angles in attacking the problem by two different novel models that however produced the same result which leads to the inescapable conclusion that 'empty' vacuum space must be intrinsically a quantized medium in nature.

Keywords: *Fine Structure Constant; Vacuum Energy; Vacuum Space; iSpace Metric Model; Von-Klitzing Constant; Planck-Resistance; Electron ½ Spin Fiber Model.*

1. Introduction

Using our separate calculations and exported novel, single metric units equations for the fine structure constant (FSC) $\alpha \approx 1/137$ exact predicted value by two different models, it is clearly demonstrated that vacuum space is intrinsically quantized and a medium in nature. Following, the FSC is calculated by the exported final equation from each of the two models.

1.1. Calculation of FSC using *iSpace* novel metric model as a result of a pure Ohm units ratio of electric resistance

The *iSpace* metric model represents a novel geometric model for space-time and QED based on geometrical constants like π (i.e. the Euklidean circular number 3.14...) and φ (i.e. the Golden-Ratio 1.61...), the basic V (Volt), A (Ampere), m (Meter) and s (Second) units, a very small magic prime number and the key ingredient of using a so called "changed distance definition". This model allows derivation of over 50 exact symbolic integer quantum geometric equations for important primary physical constants like e, h, α, m_e, R, G and Planck constants, usable and fully interchangeable between SI (i. e. MKS/A), *iSpace* and Planck units (or any other unit system, for that matter). The fit of these arbitrary precision integer geometric results to the officially recommended CODATA values normalized and averaged from experiment and theory is exact to the predictions, while at the same time using only very simple multiplicative equations. The *iSpace* metric model is implemented in Wolfram Mathematica s/w environment and can work out and export surprisingly first order equations describing most but all SI physical constants which allows for a deeper physical interpretation and understanding of mechanics of what these constants of nature actually represent on the most fundamental level.

Using the novel *iSpace* metric model and method [1-3], a compact exact equation in single metric Ohm resistance units for the FSC $\alpha \approx 1/137$ was exported:

$$\alpha = 2\pi \times \frac{\Omega_{Pl}}{\Omega_{QH}} \approx \frac{1}{137} \tag{1}$$

Where Ω_{Pl} = 29.9792458 Ω (exact value) is the Planck resistance of vacuum space [4] and Ω_{QH} = 25812.807... Ω the Quantum Hall resistance [5] [6] in SI Ohm units.
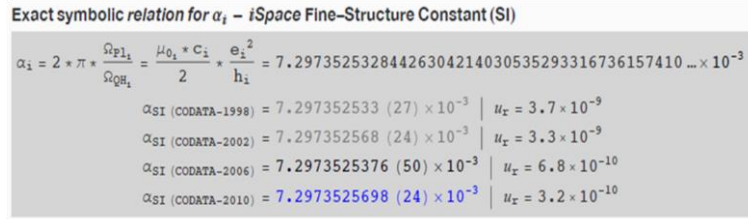
Fig. 1: The FSC α, Single Metric Ω Units (i.e., Ohm Units) As Exported by *iSpace* in Wolfram Mathematica [2].

1.2. Calculation of FSC using a novel fine structure constant model for the electron charge as a result of a pure weber units ratio of magnetic flux

Using a novel toy model (see fig. 2) of the FSC α [7] , for a possible EM flux charge manifold for the free electron at rest namely, "A ½ spin fiber model for the electron" [8] , a compact single metric Weber magnetic flux units equation was analytically derived (see Appendix I&IV reference [28] inside [8], https://tinyurl.com/bduwf4ee, https://tinyurl.com/3jkpptjw):
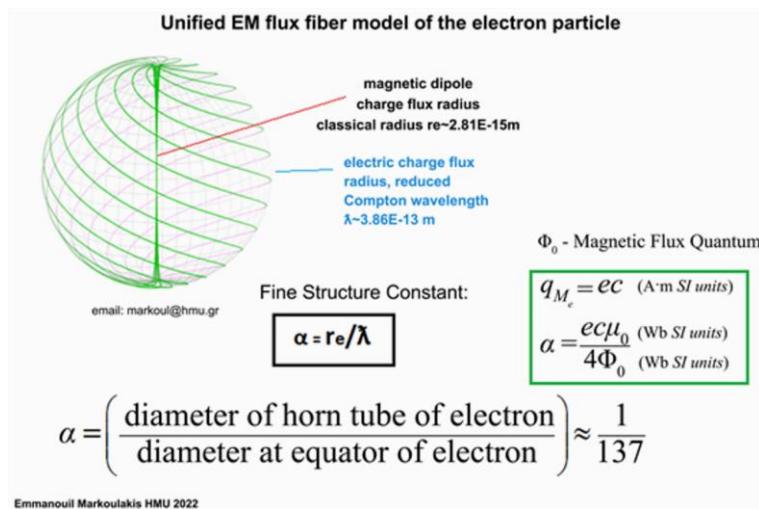
$$\alpha = \frac{ec\mu_0}{4\Phi_0} \approx \frac{1}{137} \tag{2}$$

Where e the absolute value of the electron elementary charge, c the speed of light, μ_0 the permeability of vacuum space and Φ_0 the magnetic flux quantum [9]. Both numerator and denominator of eq. (2) result to single metric Weber (Wb) magnetic flux units.

This simplified first order eq. (2) for the FSC in conjunction with the already known in the literature eq. (3) for the FSC:

$$\alpha = \frac{r_e}{\lambdabar} \tag{3}$$

Where r_e is the classical radius of the electron [10] and $\lambdabar$ the reduced-Compton wavelength for the electron [11], allowed the construction of the EM flux manifold for the electron charge shown in fig.2 where the magnetic flux quantity ratio at the center of the tube formation to the spherical surface of the manifold is controlled by the eq.(3) radii ratio as shown in fig. 2.

Fig. 2: Electromagnetic Flux Charge Manifold Fiber Model of the Electron [8] [12].

Animation: https://www.horntorus.com/particle-model/greensphere.html.

Therefore, the FSC α is now reduced and physically interpreted as an intrinsic geometric proportionality constant [8] [12] of the electron elementary charge manifold in vacuum space.

2. Discussion

It was shown in the previous sections that we reached the same exact prediction for the FSC value using two completely different models and exported final equations. However, even more importantly comparing the two exported single unit ratio compacted equations from these two separate models we can recognize that they are physically correlated allowing as for an in depth physical interpretation of what is actually the physical meaning of the FSC and how it is ultimately interlinked and dependent to vacuum space which is strongly inferred by this research that it possesses intrinsically a quantized energy therefore the vacuum being actually a medium which distortions are manifested as the electromagnetic force and possible also weak force in our Universe.
Specifically, in section 1.2, the magnetic flux on the numerator of the analytically derived novel eq. (2) [8] (see also in fig. 2 right hand equation) which is the flux through the horn tube at the center of the manifold, we see is ≈137 times less than the flux at the surface of

the spheroid which flow (i.e. flux) is controlled by the known in the literature eq. (3) (see also the left hand equation in fig. 2). Thus, the diameter of the horn tube r_e classical radius of the electron is ≈137 times less than the diameter of the whole spheroid at the equator hence the reduced-Compton wavelength λ of the electron.

This however has now an even deeper physical interpretation when comparing with the novel eq. (1) given by the *iSpace* metric model in section 1.1. We observe that this magnetic flux ratio of eq. (2) is ultimately depended on and correlated to the two vacuum energy displacement resistances ratio $2\pi \times \Omega_{PI}/\Omega_{QH}$ (see eq. 1) where the denominator has ≈137 larger resistance than the numerator therefore ≈137 times larger magnetic flux distortion is generated on the spherical surface of the manifold than the inner straight flux at its center.

Please notice, that the calculated FSC α value in section 1.1, being a ratio of the vacuum Planck resistance Ω_{PI}, which is the vacuum resistance or inertia of straight line path vacuum energy displacement (i.e. the more resistance the more magnetic flux, thus vacuum space energy distortions are generated along the path), to the quantum Hall resistance Ω_{QH} which is the corresponding curved or circular path vacuum energy displacement resistance or inertia.

$$\alpha = ec\mu_0 / 4\Phi_0 = 2\pi \left(\Omega_{PI} / \Omega_{QH} \right) = 2\pi(29.97\ldots ohms / 25812.80\ldots ohms) \approx 1/137 \tag{4}$$

Therefore as demonstrated also by eq. 4, the two results and equations of sections 1.1 & 1.2 of the two separate models are 100% consistent with each other using single metric units each for magnetic flux or resistance allowing us to identify the deeper physical correlation and interpretation of the connection of the FSC of the electron with the intrinsic vacuum space energy at the Planck scale. Thus, that the electron is a distortion of the intrinsic vacuum energy in space which strongly infers that vacuum space is actually a medium.

3. Conclusion

We have used two new novel different formal expressions of minimal redundancy for the fine structure constant using single metric physical constant ratio units for calculating the exact predicted value known in the literature. The analysis of our results shown lead to the inescapable conclusion that the FSC strongly infers to the quantization of vacuum space and that it is intrinsically a medium for electromagnetism.

Declarations

Acknowledgements

References

[1] Christian G. Wolf, *iSpace* - Quick check of α and Φ0 from Markoulakis & Antonidakis, currently available via ResearchGate as technical "Method" preprint.

[2] Christian G. Wolf, *iSpace* - Exact Symbolic Equations for Physical Constants - SI Table, Conference: 12th International Mathematica Symposium - IMS 2015 (Prague); At: ISBN 978-80-01-05623-3; Volume: IMS 2015.as PDF Revision 2014-12-21-2355, ResearchGate DOI: 10.13140/2.1.4978.2566 detailed Wolfram Mathematica based *iSpace* calculations attached to main conference paper [3]

[3] Christian G. Wolf, *iSpace* - Deriving G from α, e, R_∞, μ_0 and Quantum of Gravitational Force F_g, Conference: 12th International Mathematica Symposium - IMS 2015 (Prague); At: ISBN 978-80-01-05623-3; Volume: IMS 2015., as PDF "Deriving G from alpha, e, R, mu0 and Fg - Paper.pdf" also available under original PDF Revision 2014-12-21-2355

[4] Planck Impedance, https://qudt.org/vocab/unit/PlanckImpedance (accessed February 2, 2023).

[5] F.M. Peeters, Quantum Hall Resistance in the Quasi-One-Dimensional Electron Gas, Phys. Rev. Lett. 61 (1988) 589. https://doi.org/10.1103/PhysRevLett.61.589.

[6] R. Ribeiro-Palau, F. Lafont, J. Brun-Picard, D. Kazazis, A. Michon, F. Cheynis, O. Couturaud, C. Consejo, B. Jouault, W. Poirier, F. Schopfer, Quantum Hall resistance standard in graphene devices under relaxed experimental conditions, Nat. Nanotechnol. 2015 1011. 10 (2015) 965–971. https://doi.org/10.1038/nnano.2015.192.

[7] Sommerfeld, Zur Quantentheorie der Spektrallinien, Ann. Phys. 356 (1916) 125–167. https://doi.org/10.1002/andp.19163561802..

[8] E. Markoulakis, E. Antonidakis, A ½ spin fiber model for the electron, Int. J. Phys. Res. 10 (2022) 1–17. Also available ResearchGate https://tinyurl.com/2p8df8wj. https://doi.org/10.14419/ijpr.v10i1.31874.

[9] B.S. Deaver, W.M. Fairbank, Experimental Evidence for Quantized Flux in Superconducting Cylinders, Phys. Rev. Lett. 7 (1961) 43. https://doi.org/10.1103/PhysRevLett.7.43.

[10] D.J. Griffiths, Introduction to Quantum Mechanics, in: Prentice Hall, New Jersey, 1995: p. 155.

[11] E.G. Haug, Relativistic Compton Wavelength, Eur. J. Appl. Phys. 4 (2022) 24–27. https://doi.org/10.24018/ejphysics.2022.4.4.190.

[12] E. Markoulakis, E. Antonidakis, E. Markoulakis, E. Antonidakis, Fine Structure Constant Model Demonstrates the Electron Elementary Charge of Having an Intrinsic Manifold, J. Appl. Math. Phys. 10 (2022) 2923–2939. https://doi.org/10.4236/jamp.2022.1010196.