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A PORTION OF VACUUM-STRUCTURE MASS, ENERGY AND WEIGHT

Stephen Arthur Langford
Langford Consulting, Danielson, Connecticut, USA

ABSTRACT

If a Vacuum Structure exists, then one might do well to assume that it has some measurable attributes. This paper adopts some definitions and related algebra to test whether that line of reasoning leads to any useful, new comprehension of Nature. Predicted Models for rest mass (m), energy (E), and weight (W), as well as models of Residuals thereto, are constructed for an assumed Vacuum Structure.

Keywords: Vacuum Structure, de Broglie, rest mass, energy, weight, RI, permittivity, permeability.

INTRODUCTION

Only if a Vacuum Structure exists would useful results be generated by this approach, so the concept itself of a Vacuum Structure is under direct test. This paper relates directly to another in this same issue by Langford (2021).

BACKGROUND

Some fundamental definitions, explanations, constants, related algebra, a statistical consideration, and a personal fact of life:

- Refractive indices (RIs) are often denoted by "n".
- Refractivity is defined to be "RI-1".
- An italicized vee (v, standing for "velocity") looks like the Greek letter nu (ν, not to be seen again in this paper).
- RI = $n = c/v$, $nv = c$, and $v = c/n$
- De Broglie wrote $\lambda = h/mv$. The symbol for mass (m) is herein colored red, in contradistinction to meters (m).
- SI units as defined by NIST on 20 May 2019 (Newell and Tiesinga, 2019, https://tinyurl.com/1d5x0znn) are used, wherein …
- Planck's constant (h) is defined exactly to be $6.62607015 \times 10^{-34}$ [J×s].
- Wavelengths (λ, nm) convert to meters (m); for example, 589.3 [nm] = 5.893×10^{-7} [m].
- The speed of light *in vacuo* is c = 299,792,458 [m/s].
- De Broglie's $\lambda = h/mv$ converts to $mv\lambda = h$, leading by substitution to $m = h/v\lambda = h/(c/n)\lambda$.
- Liquid refractive indices (RIs; unitless) were rounded to 6 significant places beyond the decimal point, yielding such as 1.234567.
- **Reader beware**: This author is not trained in several of the subjects at hand, has worked quickly and alone, and may inadvertently have made mistakes. Anything presented could be wrong. Constructive criticisms and factual corrections are sincerely solicited.

Corresponding author e-mail: gambist@gmail.com

The predicted models for the rest mass, energy, and weight and their corresponding Residual models

Relevant data are graphically presented (see Appendix), within six large figures. For the reader, it is convenient to show the data in figures as large as possible. One extra figure shown in the Appendix is for the following section, after which there is the section for discussions. So, let's introduce the figures.

Figure 1 shows the Predicted Model for Vacuum-Structure rest mass (m), for which the Surfer®16 statistical Grid Data Report is available online at https://tinyurl.com/2ke8vekp.

Figure 2 presents the Residuals Model for Vacuum-Structure rest mass (m) residuals, for which the Surfer®16 statistical Grid Data Report is available online at https://tinyurl.com/3xnsnpdd.

Figure 3 shows the Predicted Model for Vacuum-Structure Energy (E), for which the Surfer®16 statistical GridDataReport is available online at https://tinyurl.com/34eqnmbh.

Figure 4 shows the Residuals Model for Vacuum-Structure Energy (E) residuals, for which the Surfer®16 statistical Grid Data Report is available at https://tinyurl.com/158lgso0. This model came as "A complete surprise!" only because the author had not previously seen the same pattern for the model shown in Figure 2. For Figure 2, the author had first inadvertently again modeled the Predicted values instead of the Residual values for mass (m).

Figure 5 shows the Predicted Model for Vacuum-Structure Weight (*W*), for which the Surfer®16 statistical Grid Data Report is available online at https://tinyurl.com/34eqnmbh.

Figure 6 presents the Residuals Model for Vacuum-Structure Weight (*W*) residuals, for which the Surfer®16 statistical Grid Data Report is available online at https://tinyurl.com/14sgy383.

Energy residuals model with data-locations

Figure 7 presents the Residuals Model for Vacuum-Structure Energy (*E*) residuals, at reduced opacity; to permit viewing of an underlay showing data locations at yellow dots.

DISCUSSION

Interestingly, for both mass (*m*, Fig. 2) and energy (*E*, Fig. 4) residuals, topological details appear predominantly at wavelengths lower than the nearby 589.3 nm Fraunhofer D line. But the D line cuts smack-dab through the center of Femic-mineral peaks in the Residuals Model of weight (*W*, Fig. 6). Why what seem to be spintronics affect mass (*m*) and energy (*E*), but not weight ($W = mg$), may be a very important point to ponder; because gravity is not a component of either de Broglie's $\lambda = h/mv$ or of Einstein's $E = mc^2$. The present author is unhappily incompetent to assess how all this might fit in with such factors as the Poynting vector, GEM Theory, the thought that gravity is a magnetic-field effect, and so on; perhaps the paper by Brandenburg and Kline (1998) [which is beyond the present author's expertise] will prove to be helpful to others.

Does this paper prove that a Vacuum Structure exists? That might be too bold an assertion, because from another perspective this work might well be seen to be a logical extension of the famous 1887 Michelson-Morley, two-slit experiment. Light going from an immersion liquid into various transparent solid particles emerges variously from each, according to each particle's internal properties and external shape. Isotropic fragments, such as glasses, pass rays refracted upon both entry and exit, according to Snell's Law at each interface. However, birefringent mineral fragments possess two (2) or three (3) different Principle Optic Directions (PODs; https://tinyurl.com/4kzgal1e); rays traversing those enter and exit at myriad possible angles and are additionally governed by Bragg's Law ($n\lambda = 2\ d \sin\theta$) (see, for instance, https://en.wikipedia.org/wiki/Bragg%27s_law) and too many other factors to elucidate here. Whether monochromatic light, even at powers low enough for a human observer's comfort, might induce anything like a Bose-Einstein condensate within some fragments, remains a pertinent question.

While some of the effects presented in this paper may be seen to be the result of taking the two-slit experiment to a ridiculously multitudinous extreme; the approach has the advantage of being able, over the visible-light range, to view composite RI effects displayed by heteroscedastic mixtures of transparent solids in the 1.4-1.8 (unitless) RI range, without necessarily needing to be at all concerned with mind-numbingly complicated details related to how any given ray of light might have passed through the sample mount. Though kurtotic effects are mapped in regions of high data density, the higher peaks being displayed where data locations are separated by nanometer fractions -- which tends to argue for such effects being merely a function of Ångström-scale "slit widths", so to say -- there are many areas in Figure 7, for instance, where data are extremely dense but no topological complications at all are displayed. And peaks of Weight (*W*) are displayed where no peaks at all exist in mass (*m*) or Energy (*E*) plots. Something in addition to probable slit effects seems to be involved.

Do any of the images presented here seem directly to map permittivity and permeability? I tend to believe that a Vacuum Structure is at least a useful concept, the actuality of which seems to be substantiated by these results. Though this work has been confined to usage of data locations created during this experiment, there is good reason for others to generalize the approach to a General Emmons Surface spanning all RIs (velocities) and EM wavelengths.

In yet another forthcoming paper, the present author will summarize how (*L*%+*E*%) probability levels (Langford, 2021) correlate with the work of Galileo, Newton, Einstein, Planck, and de Broglie; displaying how applications of Quantum Mechanical Theory mesh seamlessly with Real-World RI data, thus bridging at least some of the gap previously making Quantum Mechanics seem to be so very strange.

CONCLUSION

This short report presents Predicted and Residuals Models for rest mass (*m*), energy (*E*), and weight (*W*). Obtained graphical results have been concisely discussed.

ACKNOWLEDGEMENTS

Comprehensive acknowledgments are provided at https://tinyurl.com/qt20n48o.

REFERENCES

Brandenburg, IE. and Kline, JF. 1998. Application of the GEM theory of gravity-electro-magnetism unification to the problem of controlled gravity - Theory and experiment. 34th AIAA/ASME/SAE/ASEE Joint

Propulsion Conference and Exhibit Conference Paper (13-15 July 1998), Cleveland OH, USA. DOI: https://doi.org/10.2514/6.1998-3137, https://tinyurl.com/2al5wpqw, https://www.researchgate.net/publication/269054175.

Langford, SA. 2021. Refractive index, a key to better petrography and to fundamental laws of Nature; *m*, *E*, and *W* Vacuum-Structure rest-mass calculations. Canadian Journal of Pure and Applied Sciences. 15(1): In Press.

Newell DB. and Tiesinga, E. 2019. NIST Special Publication 330, The International System of Units (SI). Eds. Newell DB. and Tiesinga, E. NIST National Institute of Standards and Technology, US Department of Commerce. pp 138. DOI: https://doi.org/10.6028/NIST.SP.330-2019.

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Appendix 1. All the aforementioned Figures for the corresponding models.

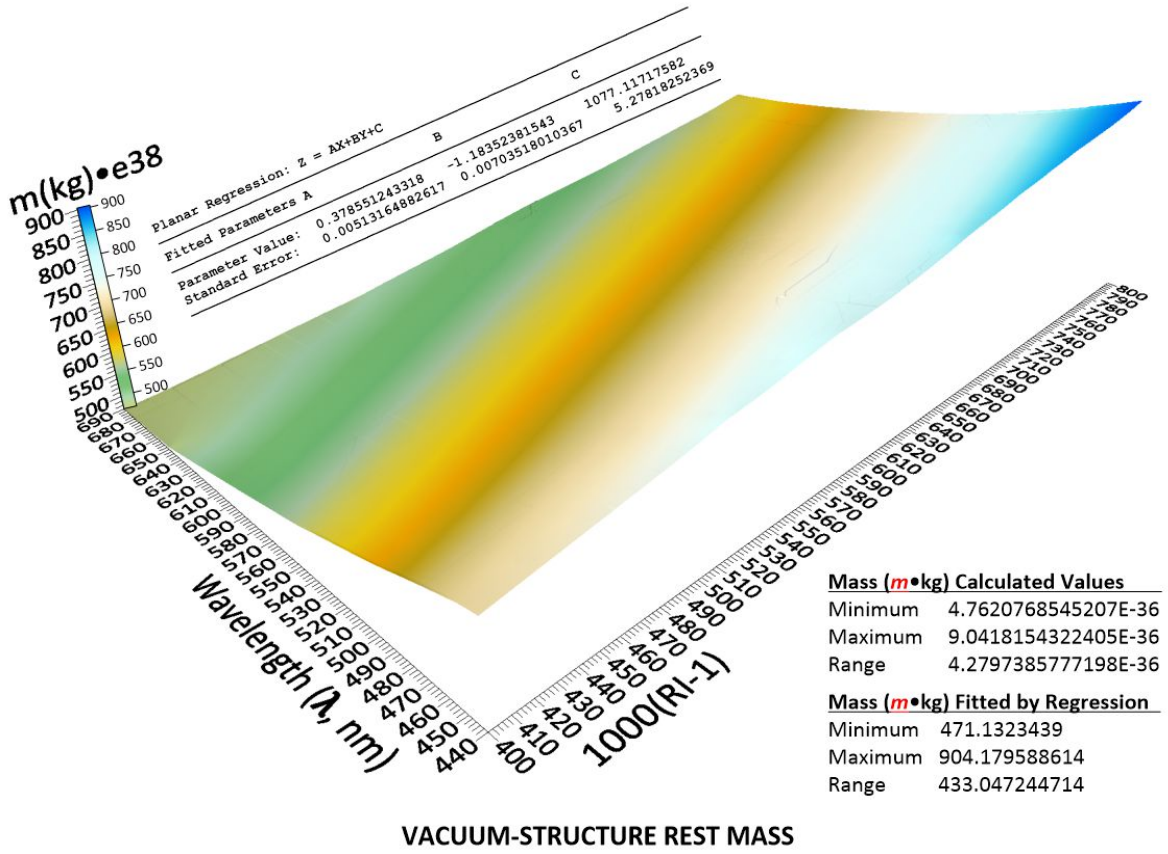

Fig. 1. The Vacuum-Structure predicted rest mass (*m*).

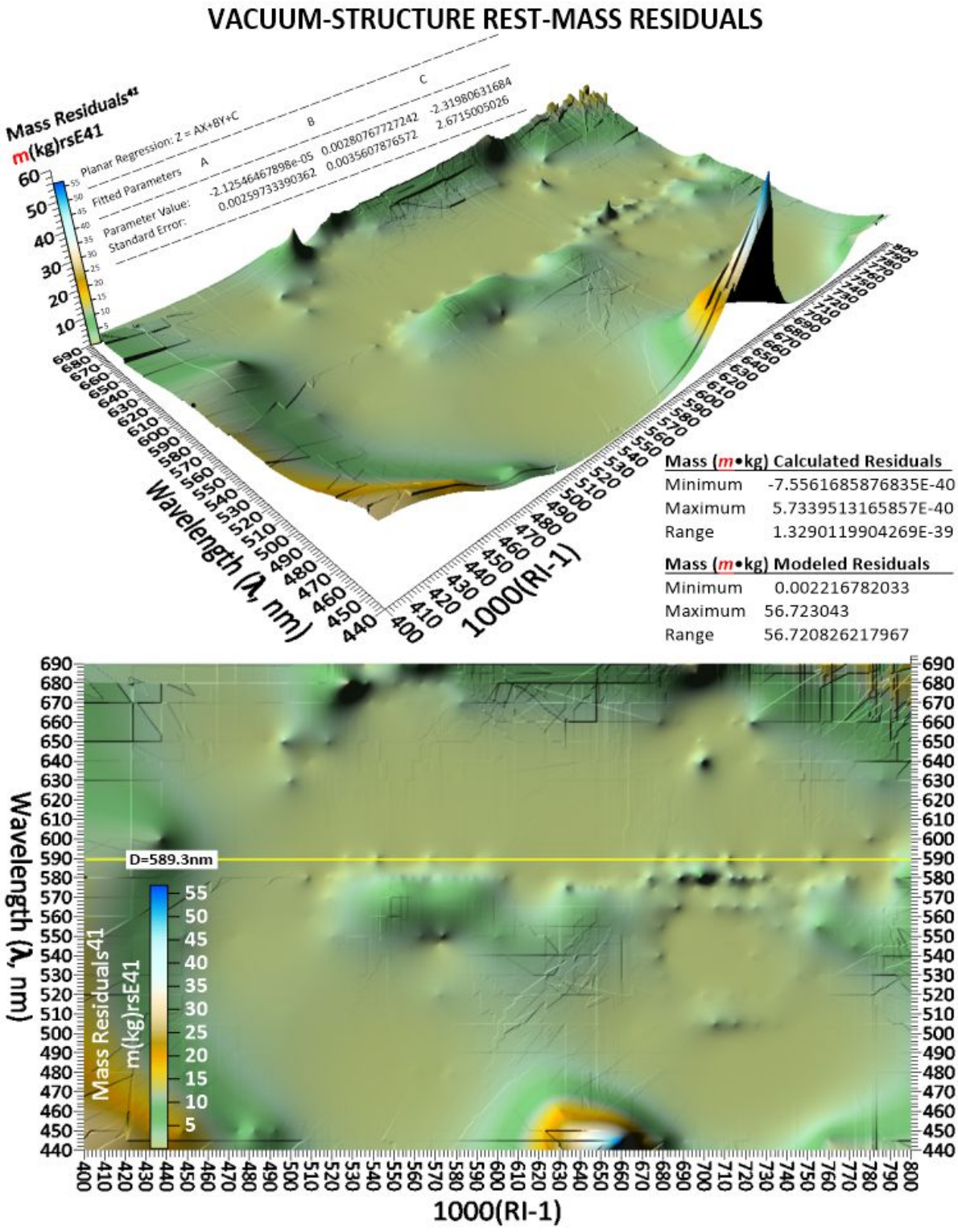

Fig. 2. The Vacuum-Structure Rest-Mass (*m*) Residuals.

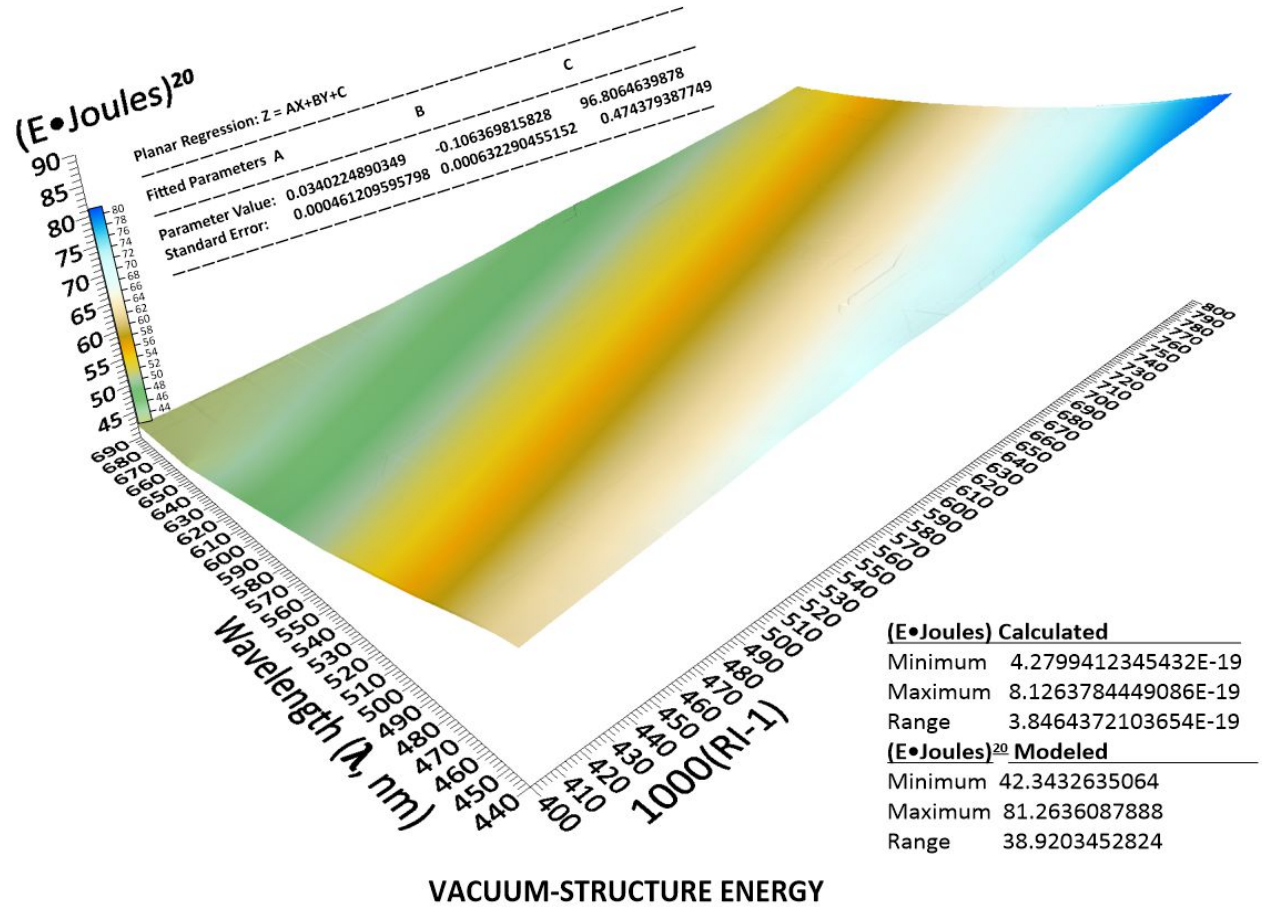

Fig. 3. The Vacuum-Structure predicted Energy (*E*).

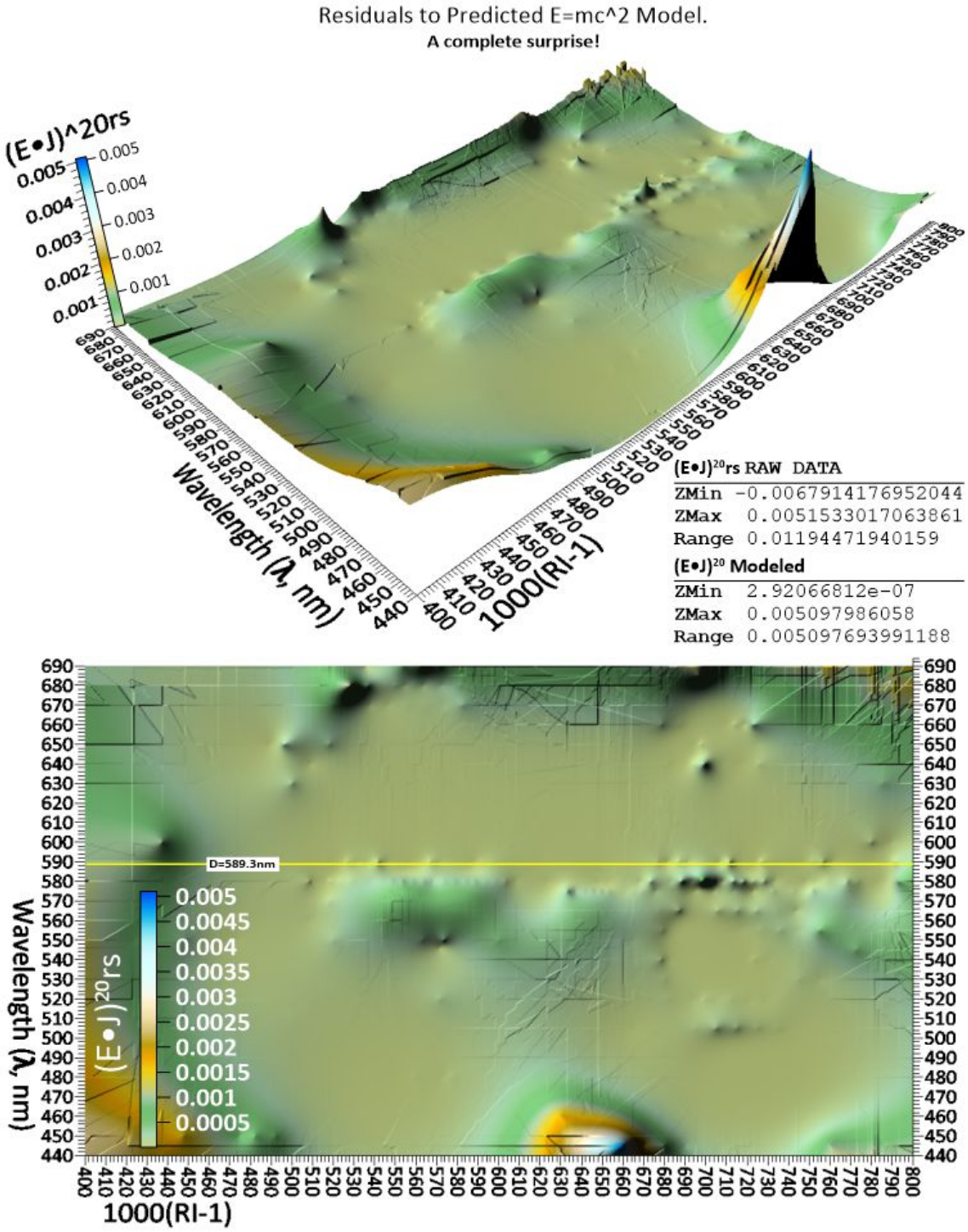

Fig. 4. The Vacuum-Structure Energy (E) Residuals.

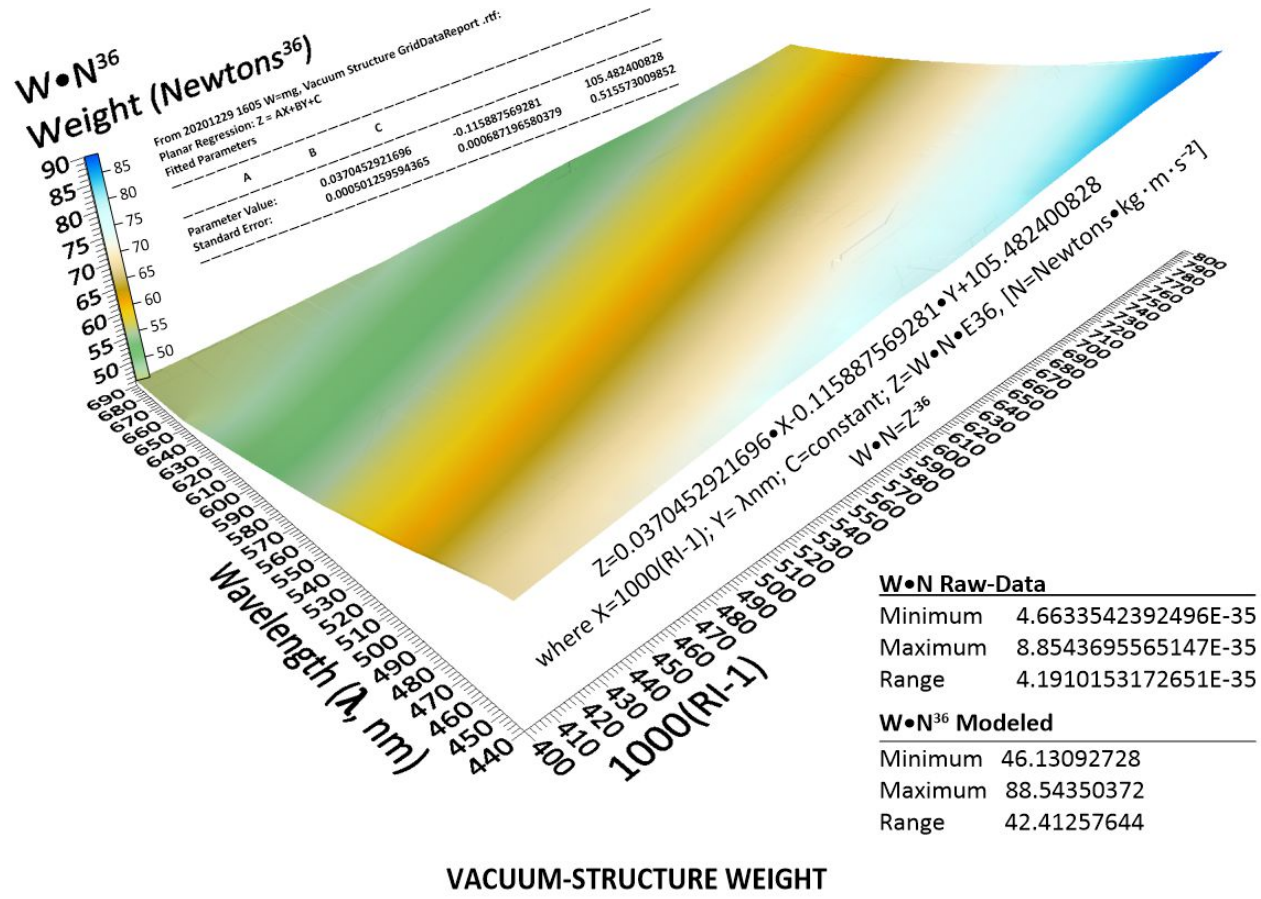

Fig. 5. The Vacuum-Structure Predicted Weight (*W*).

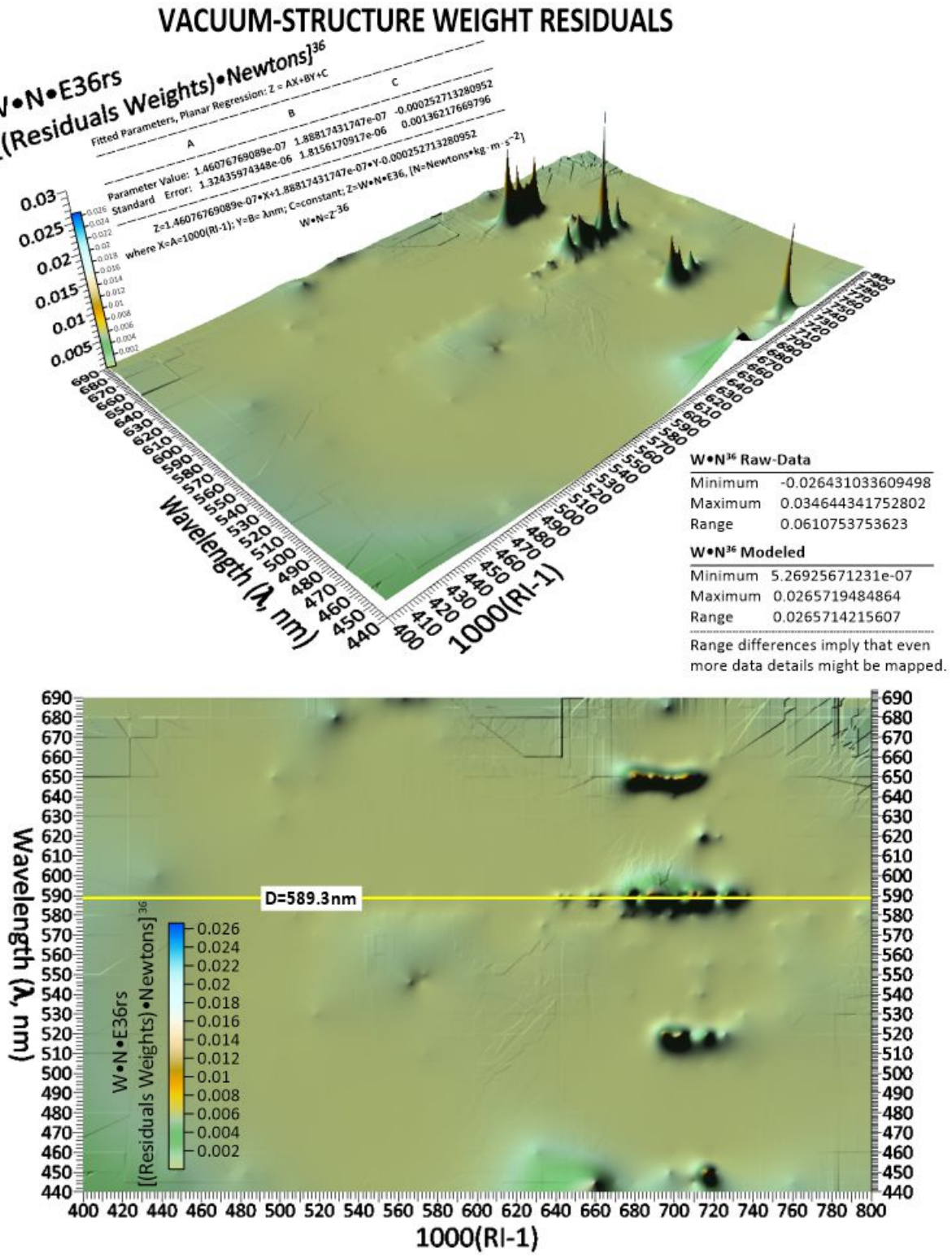

Fig. 6. The Vacuum-Structure Weight (*W*) Residual.

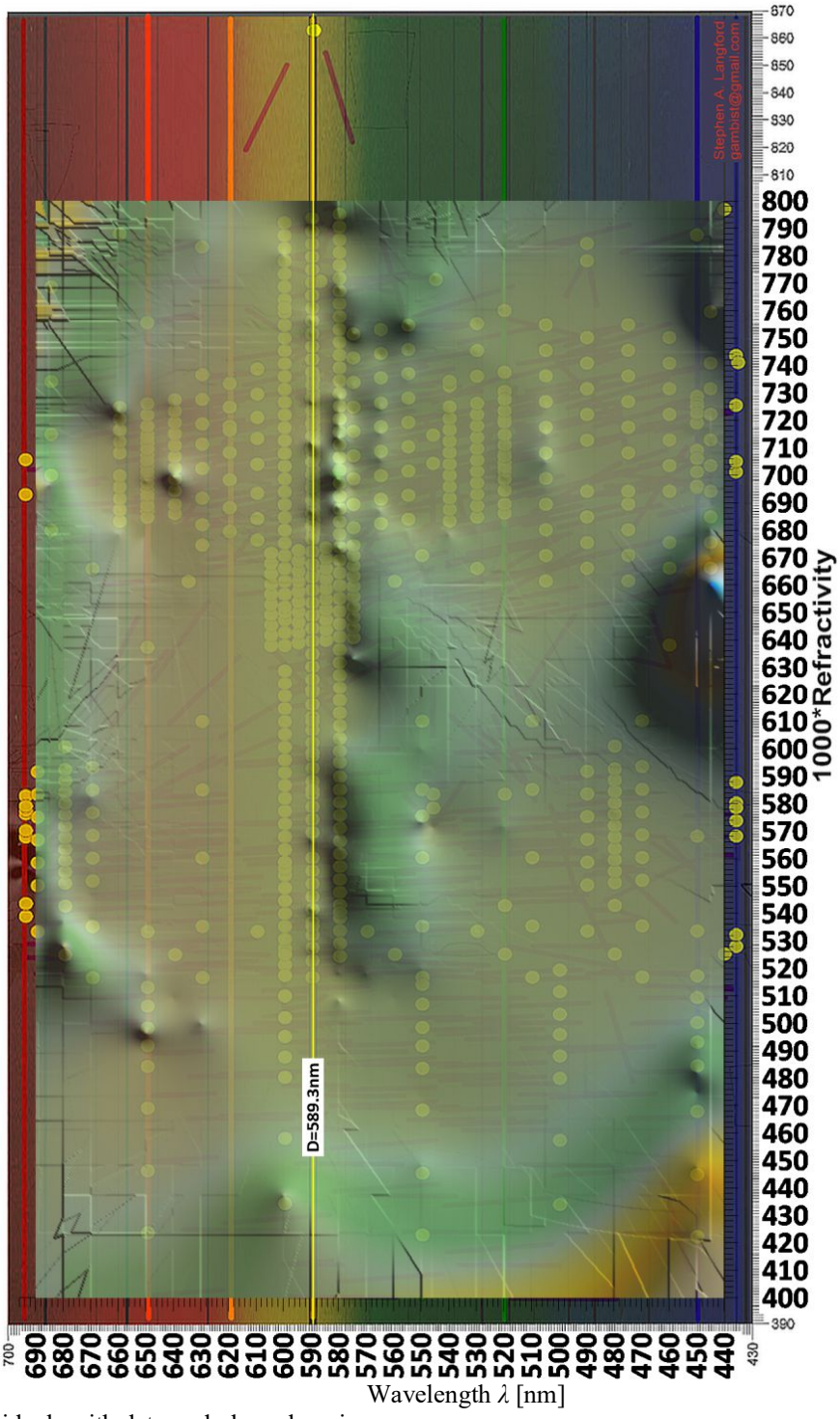

Fig. 7. $E = mc^2$ residuals with data underlay; plan view.