The Physical Basis of the Quantum of Resistance is Relativistic Rotational Motion

Author: Preston Guynn
Date: March 13, 2024

Abstract

The physical basis of the quantum of resistance, also called the von Klitzing constant, is relativistic rotational motion. The result of the model matches the experimentally determined value to 12 significant digits.

Introduction

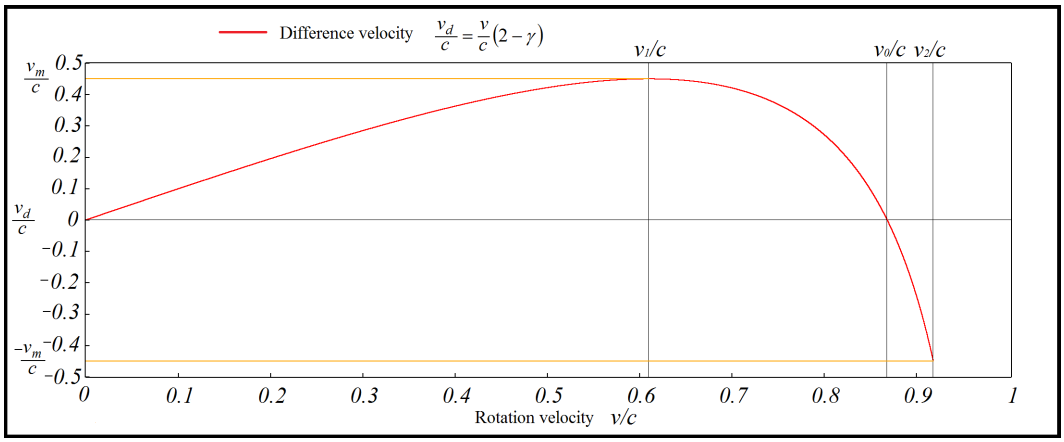

Figure 1. Difference velocity, which is rotation minus precession

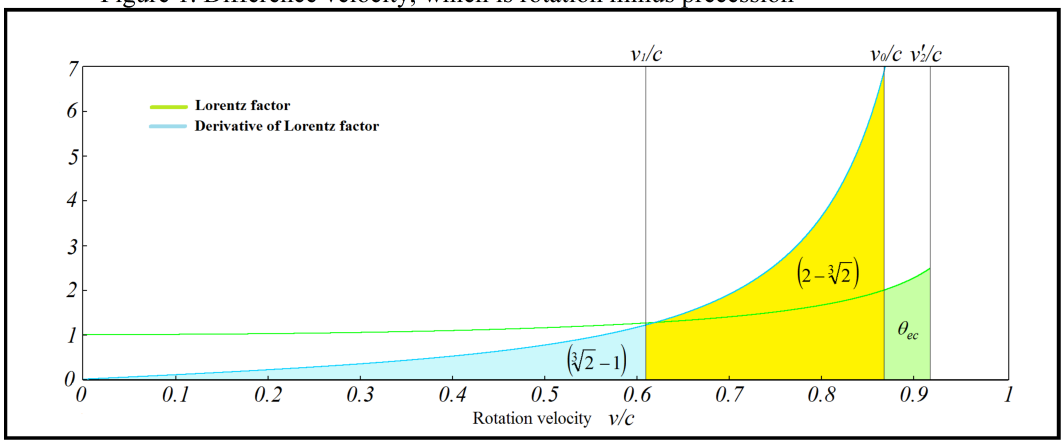

Figure 2. Areas under the curves of the Lorentz factor and its derivative

The equation for von Klitzing constant R_k is:

$$R_k = \frac{\left(2-\sqrt[3]{2}\right)^{\frac{3}{2}}}{\left(2-\sqrt[3]{2}\right)^3 + \frac{1}{2\pi}\int_{9\theta_{ec}}^{1} \frac{1}{(\theta)^{\frac{3}{2}}} d\theta \frac{c}{1\,\text{m/s}}} \left(\frac{c}{1\,\text{m/s}}\right)^2 10^{-7}\Omega \approx 25812.8074555\ \Omega \tag{1}$$

where $\theta_{ec} \approx 0.11059667926806$, and c is the speed of light. The result calculated above matches the CODATA recommended value of the von Klitzing constant[1] $R_k = 25812.8074555\ \Omega$ exactly, which is 12 significant digits. The graph above has 3 vertical lines delineating characteristics of relativistic rotational motion. The first vertical line is at the rotation velocity with the maximum value of rotation minus precession[2], v_m / c. The second vertical line is at the rotation velocity which has rotation minus precession equal to zero. The third vertical line is at the rotational velocity which has rotation minus precession equal to $-v_m / c$. Important relationships are,

$$\frac{v_g}{c} \equiv \frac{1}{2\pi}\int_{9\theta_{ec}}^{1} \frac{1}{(\theta)^{\frac{3}{2}}} d\theta \approx 7.39437964741\text{E-}4 \qquad \frac{v_m}{c} \equiv \frac{\left(2-\sqrt[3]{2}\right)^{\frac{3}{2}}}{\sqrt{2}} \approx 0.4501964643746 \qquad \frac{v_2'}{c} \equiv \frac{v_2}{c}\left(1 - \frac{\left(\sqrt[3]{2}-1\right)}{1-\frac{1}{\sqrt{3}}\frac{v_g}{c}} \frac{1\,\text{m/s}}{c}\right) \tag{2), (3), (4}$$

The area under the curves of the Lorentz factor and the derivative of the Lorentz factor express the physical relationships leading to the quantum of resistance. Taking the areas under the curves to the 3/2 power essentially finds the square root of the area, which is a length, and then cubes that length to get a volume. Changes in rotational velocity correspond to changes in volume, and the ratio of the changes determine the quantization R_k. Since the Lorentz factor applies from $v = 0$ to $v < c$, including the unit of measure of velocity of 1m / s, the adjustment from v_2 / c to v_2' / c shown in Eq 4, of less than 1 part in 10^9 is required. Much of this material has been discussed in previous reports shown in the references [3,4,5,6]. The current presentation is a single page compelling proof of the relativistic space time basis of the quantum of resistance.

References

1) CODATA Recommended values of the fundamental physical constants: 2014
J. Phys. Chem. Ref. Data 45, 043102 (2016); doi 10.1063/1.4954402, 57

2) Guynn P. L., viXra [v3] 2017-06-12 15:13:52, 'Electromagnetic Effects and Structure of Particles due to Special Relativity'

3) Guynn P. L., viXra [v1] 2018-10-27 15:02:10, 'Thomas Precession is the Basis for the Structure of Matter and Space'

4) Guynn P. L., viXra [v2] 2017-10-07 18:10:32, 'Electrostatic Force and Charge Structure'

5) Guynn P. L., viXra [v1] 2017-12-05 19:25:11, 'Proton/Electron Mass Ratio and Gravitational Constant Due to Special Relativity'

6) Guynn P. L., viXra [v1] 2024-02-17 01:38:06, 'The Physical Basis of the Fine Structure Constant in Relativistic Rotational Motion'