Foundations of Physics Letters, Vol. 8, No. 1, 1995

# PROPOSED WEBER POTENTIAL WITH ABSOLUTE VELOCITIES

J. P. Wesley

*Weiherdammstrasse 24*
*78176 Blumberg*
*Germany*

Received July 29, 1994

The Weber potential U is limited to relative velocities between charges V less than $\sqrt{2}c$ and fails when $V \rightarrow 2c$. If the relative velocity of action between charges is c, then U equals the root-mean-square average of the retarded and advanced Coulomb potential. But, if the velocity of action c is absolute, in agreement with light propagation, then $V \rightarrow 2c$ must be admissible. A potential W is proposed, involving absolute individual charge velocities, that permits $V \rightarrow 2c$ and yields W = U for small velocities.

Key words: electrodynamics, Weber potential, absolute velocities.

## 1. THE PROBLEM

Weber electrodynamics is based upon the velocity potential energy

$$U = (qq'/R)\left[1 - (dR/dt)^2/2c^2\right], \tag{1}$$

where the charge q is at $\mathbf{r}$ and the charge q' is at $\mathbf{r}'$, separated by the distance $\mathbf{R} = \mathbf{r} - \mathbf{r}'$, and

$$dR/dt = \mathbf{V}\cdot\mathbf{R}/R = (\mathbf{v} - \mathbf{v}')\cdot\mathbf{R}/R, \tag{2}$$

where $\mathbf{V}$ is the relative velocity between the charges, $\mathbf{v}$ is the velocity of q and $\mathbf{v}'$ is the velocity of q'. The success of Weber electrodynamics [1,2] warrants serious consideration, as well as possible speculation, concerning its apparent limitations and deficiencies.

Helmholtz [3] raised the objection that, when the relative velocity $|\mathbf{V}\cdot\mathbf{R}/R|$ exceeds $\sqrt{2}c$, the Weber potential U, Eq.(1), changes sign giving rise to nonphysical behavior. This objection was subsequently discounted by claiming that particle and charge velocities could never in fact exceed the velocity of light c. But, if this limit c pertains to the absolute velocity of an individual charge, then the relative velocity $V = |\mathbf{v} - \mathbf{v}'|$ is limited to 2c and can exceed $\sqrt{2}c$. If the claimed limit velocity c is suppose to be the relative velocity, then this claim conflicts with laboratory observations:

In a colliding beam accelerator beams of charged particles, travelling in opposite directions, each approaching the speed of light, presents the situation where the relative velocity approaches 2c (as determined by the individual velocities of each beam). The argument that individual charges cannot have absolute velocities greater than c, which is apparently true, is insufficient to resolve the Helmholtz objection.

Phipps [4] has proposed a variation of the Weber potential (1) given by

$$U_p = (qq'/R)\sqrt{1 - (dR/dt)^2/c^2} \, , \tag{3}$$

which reduces to Eq.(1) for small values of dR/dtc. Phipps claims to have thereby resolved the Helmholtz objection; but this form of Weber's potential (3), becoming imaginary when the relative velocity $|\mathbf{V}\cdot\mathbf{R}/R|$ exceeds c, would seem to make matters worse. The original Weber potential (1), being limited to relative velocities less than $\sqrt{2}c$, is closer to the empirically allowed limit of 2c.

The Helmholtz objection to Weber's original potential (1), as well as the difficulty with the Phipps potential (3). can be obviated by claiming the interaction between two moving charges goes to zero for relative velocities equal to or greater than $\sqrt{2}c$ or c. This resolution can be tested in the laboratory. Does the interaction between two charges go to zero in fact when the relative velocity exceeds $\sqrt{2}c$ or c? Considering absolute motion, as discussed below, it is predicted here that the interaction between moving charges does not vanish for relative velocities equal to or greater than $\sqrt{2}c$ or c, but will continue to exist up to the limit of 2c.

## 2. WEBER POTENTIAL FROM RELATIVE ACTION

The Coulomb potential may be postulated to arise from an action travelling between the two charges with the velocity of light c, where c is measured relative to a moving source charge. The Phipps form of the Weber potential is then given as the root-mean-square average of the retarded and advanced Coulomb potentials [1].

This result may also be derived by simply examining the effect of the velocity of action on the separation distance R. In particular, the retarded distance R(ret) and the advanced distance R(adv) are functions of the distance at earlier and later times; thus,

$$R(ret) = R\{t - R(ret)/c\}, \quad R(adv) = R\{t + R(adv)/c\}. \tag{4}$$

Expanding to all powers in the small quantities R(ret)/c and R(adv)/c yields

$$R(ret) = R/[1 + (dR/dt)/c], \quad R(adv) = R/[1 - (dR/dt)/c]. \tag{5}$$

If the effective distance between two charges suitable for the Coulomb potential is taken to be the root-mean-square average of the retarded and advanced distances, the Coulomb potential becomes from Eqs.(5)

$$qq'/R(effective) = qq'/\sqrt{R(ret)R(adv)} = (qq'/R)\sqrt{1 - (dR/dt)^2/c^2}\ , \tag{6}$$

which is the Phipps potential $U_p$, Eq.(3), which reduces to the original Weber potential U, Eq.(1), for dR/dtc small.

This derivation of the Weber potential, assuming a velocity of action c relative to a moving source charge, involves only the relative position and relative velocity of the two charges. The effect of the universe or absolute space is not involved.

## 3. WEBER POTENTIAL FROM ABSOLUTE ACTION

If the action that gives rise to the Coulomb and Weber potentials is assumed to have the characteristics of the propagation of light, then the velocity of action c should be taken with respect to absolute space or the stationary ether and not with respect to a moving source charge. If the action had the velocity c relative to a source charge, this would correspond to the ballistic or Ritz theory for light, where the velocity of light is suppose to be c relative to the moving source. But the ballistic theory is wrong; it does not fit the relevant observations [5].

The oneway velocity of energy propagation of light is c with respect to absolute space or the stationary ether. This fact is established [6] from the observed oneway velocity of energy propagation of light $c^*$ that depends upon the absolute velocity of the observer $\mathbf{v}$ such that

$$c^* = c - \mathbf{v}. \tag{7}$$

The evidence is provided by the observations of Roemer (and Halley) [7], Bradley [8], Sagnac [9], Michelson-Gale [10], Conklin [11] (for the 2.7°K cosmic background anisotropy), and Marinov's [12] two experiments.

A potential valid in absolute space should then have the following properties:

1) It should reduce to the original Weber potential for small absolute velocities of the individual charges.

2) When one charge, moving away from the other, approaches the absolute speed c, the charge, tending to outrun the action, should not interact with the other charge; and the potential should go to zero.

3) For two charges receding from each other, each with a large absolute velocity less than c, the potential should not vanish until the relative velocity equals 2c.

A proposed potential that fits these three conditions, where R is the instantaneous separation distance, is

$$W = \frac{qq'}{R}\sqrt{1 - \left(\frac{\mathbf{v}\cdot\mathbf{R}}{cR}\right)^2}\sqrt{1 - \left(\frac{\mathbf{v}'\cdot\mathbf{R}}{cR}\right)^2}\left[1 + \frac{(\mathbf{v}\cdot\mathbf{R})(\mathbf{v}'\cdot\mathbf{R})}{c^2R^2}\right] \tag{8}$$

where $\mathbf{v}$ and $\mathbf{v}'$ are the individual absolute velocities of the charges q and q'. When q recedes from q' with the absolute velocity of light, $\mathbf{v}\cdot\mathbf{R}/R \rightarrow c$, or q' recedes from q eith the absolute velocity of light, $\mathbf{v}'\cdot\mathbf{R}/R \rightarrow -c$, then $W = 0$. When both $|\mathbf{v}\cdot\mathbf{R}/R|$ and $|\mathbf{v}'\cdot\mathbf{R}/R|$ are large, but each less than c, W does not vanish. In this case the relative velocity may have any value up to the maximum admissible, $|(\mathbf{v}-\mathbf{v}')\cdot\mathbf{R}/R| \rightarrow 2c$. Expanding Eq.(8) for W to second powers in velocities/c yields

$$W = \frac{qq'}{R}\left[1 - \frac{(\mathbf{v}\cdot\mathbf{R})^2}{2c^2R^2} - \frac{(\mathbf{v}'\cdot\mathbf{R})^2}{2c^2R^2} + \frac{(\mathbf{v}\cdot\mathbf{R})(\mathbf{v}'\cdot\mathbf{R})}{c^2R^2}\right], \tag{9}$$

which is seen to be the Weber potential upon substituting Eq.(2) into (1).

## 4. DISCUSSION AND SPECULATION

It may be noted that the proposed potential W, Eq.(8), goes to zero, not only when one charge recedes with the absolute velocity c from the other, but also when it approaches the other charge with the absolute velocity c. This behavior is empirically correct; as the original successful Weber potential (1), involving the square of the relative velocity, does not distinguish between approaching charges, $dR/dt = (\mathbf{v} - \mathbf{v}')\cdot\mathbf{R}/R < 0$, and receding charges, $dR/dt = (\mathbf{v} - \mathbf{v}')\cdot\mathbf{R}/R > 0$. But, if the Weber potential U, Eq.(1), or the proposed potential W, Eq.(8), is to be viewed as arising from a velocity of action c, then a mechanism other than kinematics must be envisioned as playing a role.

It appears that the rate Q that the action, such as "virtual photons", can be radiated or absorbed in the direction **R** must be a function of the absolute velocity of the charge **v**; thus,

$$Q = Q_o\sqrt{1 - (\mathbf{v}\cdot\mathbf{R}/cR)^2}\ , \tag{10}$$

where $Q_o$ is the rate when $\mathbf{v}\cdot\mathbf{R}/cR = 0$. The interaction between charges can, thus, be expected to go to zero when one charge nears the speed of light, whether it recedes or it approaches the other charge. This behavior is indicated by the two square root factors on the right of Eq.(8).

This speculation, indicated by Eq.(10), seems to be supported by the observed decreased probability or rate of emission of daughter particles from a rapidly moving radioactive particle with the velocity v governed by a similar formula,

$$Q = Q_o\sqrt{1 - v^2/c^2}. \tag{11}$$

The effect can be derived as a statistical mechanical effect [13]. The velocity v in Eq.(11) should be taken as the absolute velocity of the radioactive particle. This conclusion is supported by the ability to determine the absolute velocity of the solar system using Eq.(11) and the observed cosmic ray muon flux anisotropy [14].

## REFERENCES

1. J. P. Wesley, *Found. Phys. Lett.* 5, 597 (1993).
2. J. P. Wesley, *Found. Phys. Lett.* 3, 443, 471, 461 (1990).
3. H. Helmholtz, *Ueber die Erhaltung der Kraft* (Reimer, Berlin, 1847) p. 46.
4. T. E. Phipps, Jr., *Phys. Essays* 3, 414 (1990); *Apeiron* 8, 8 (1990).
5. J. P. Wesley, *Advanced Fundamental Physics* (Benjamin Wesley, 78176 Blumberg, Germany, 1991) pp. 81-85.
6. J. P. Wesley, loc. cit. pp. 45-121.
7. O. Roemer, *Phil. Trans.* **12**, 893 (1677); E. Halley, *Phil. Trans.* **18**, 237 (1694).
8. J. Bradley, *Lond. Phil. Trans.* 35, No. 406 (1728).
9. G. Sagnac, *Comptes Rendus* 157, 708 (1913).
10. A. Michelson and H. G. Gale, *Astrophys. J.* **61**, 137 (1925).
11. E. K. Conklin, *Nature* 222, 971 (1969).
12. S. Marinov, *Checkosl. J. Phys.* B24, 965 (1974); *Gen. Rel. Grav.* 12, 57 (1980); *Spec. Sci. Tech.* 3, 57 (1980).
13. J. P. Wesley, loc. cit. ref. 5 above, pp. 27-29.
14. C. Monstein and J. P. Wesley, a paper entitled "Solar System Velocity from Muon Flux Anisotropy" submitted for publication.