DERIVATION OF SPECIAL THEORY OF RELATIVITY ONLY BY COULOMB AND BIOT-SAVART LAWS

Special theory of relativity can be derived from the Coulomb and Biot-Savart laws, on two conditions: that the observer cannot affect the experiment and that the magnetic field is not movable.

Imagine two infinite glassy vacuum pipes with sheaves of electrons, and the observer moving between the pipes. Since the observer cannot affect the experiment, the forces of repulsion between pipes are not dependent on the velocity of observer. Due to invariant of velocity it could be adopted that the electrons in pipes are in motion and that the observer is immobile. In this case the observer can detect the magnetic force too, but the total force cannot be changed <u>because there is an assumption that the observer cannot affect the experiment by observation</u>.

Thus, the next equation is valid:

$$\vec{F}_Q + \vec{F}_M = \vec{F}_{Q_0} \tag{1}$$

Whereas:

- F_Q - electrical force when the electrons are moving at the different velocity than observer,
- $\vec{F}_M$ - magnetic force when the electrons are moving at the different velocity than observer,
- F_{Q_0} - Electrical force when the electrons stand related to observer.

Here is the Biot-Savart law:

$$d\vec{B} = \frac{\mu}{4\cdot\pi}\cdot\frac{I\cdot d\vec{\ell}\times\hat{r}}{\vec{r}^2} \tag{2}$$

and

$$\vec{F} = \int_{\ell} I\cdot d\vec{\ell}\times\vec{B} \tag{3}$$

From the previous formula, the attractive force per unit of length of two parallel conductors can be obtained as:

$$F'_m = -\mu\cdot\frac{I^2}{2\cdot\pi\cdot r} = -\mu\cdot\frac{\left(\frac{dQ}{dt}\right)^2}{2\cdot\pi\cdot r} = -\mu\cdot\frac{\left(\frac{dQ}{d\ell}\cdot\frac{d\ell}{dt}\right)^2}{2\cdot\pi\cdot r} = -\mu\cdot\frac{Q'^2\cdot v^2}{2\cdot\pi\cdot r} \tag{4}$$

Attractive Coulomb's force per unit of length of two line's charged conductors is:

$$F'_q = \frac{Q'^2}{2\cdot\pi\cdot\varepsilon\cdot r} \tag{5}$$

The two previous formulas can be applied at (1) then we obtain:

$$-\mu \cdot \frac{Q'^2 \cdot v^2}{2 \cdot \pi \cdot r} + \frac{Q'^2}{2 \cdot \pi \cdot \varepsilon \cdot r} = \frac{{Q'_0}^2}{2 \cdot \pi \cdot \varepsilon \cdot r} \tag{6}$$

The next formula for the relativistic modification of charge per unit of length is directly derived from the previous one:

$$Q' = \frac{Q'_0}{\sqrt{1 - \varepsilon \cdot \mu \cdot v^2}} \tag{7}$$

After the integration on length of conductor formula for the relativistic modification of punctual charge is obtained:

$$Q = \frac{Q_0}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{8}$$

That is the relativity obtained from the Biot-Savart and Coulomb laws on the condition that observer is neutral.

Autodynamics

We could conclude that formula (6) is not quite correct. The classic electromagnetism says that in formulas for magnetic effects there is no correction for electric charges, i.e. we could not have to introduce relativistic correction in equation (4), so we obtain:

$$-\mu \cdot \frac{{Q_0'}^2 \cdot v^2}{2 \cdot \pi \cdot r} + \frac{Q'^2}{2 \cdot \pi \cdot \varepsilon \cdot r} = \frac{{Q'_0}^2}{2 \cdot \pi \cdot \varepsilon \cdot r} \tag{9}$$

Finally we obtain:

$$Q = Q_0 \cdot \sqrt{1 - \frac{v^2}{c^2}} \tag{10}$$

Autodynamics bring us ability to deal with the relativistic effects without time dilatations. On the other hand, the theory could not yield the correct formula for Cherenkov radiation and the Special Theory of Relativity is able to successfully yield correct result.

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