4.4

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Aether density in free space. As will be shown in § 6.1 and 8.6, the dielectric permittivity of the vacuum ε_o is the density of the aether $\rho_э$ in matter-free space. This follows directly from the comparison of the energy of the electric field of the proton wep and the energy of the circular motion of the aether $w_к$ around the proton, identified with the electric field of the proton (in the presence of toroidal motion of the aether around the proton), since.

$$w_{ep} = \int_{r_p}^{\infty} \frac{\varepsilon_o E2}{2} dV; \qquad (4.1)$$

$$w_к = \int_{r_p}^{\infty} \frac{\rho_э v_к^2}{2} dV, \qquad (4.2)$$

Equation 4.1:
- This equation calculates the energy of the electric field around a proton (wep).
- It involves the electric field strength (E), the radius of the proton (rp), and an integral (∫) over space around the proton.
- The energy of the electric field is calculated by integrating the square of the electric field strength over space.

Equation 4.2:
- This equation calculates the energy associated with the circular motion of the aether around the proton (wк).
- It involves the velocity of the circular motion of the aether (vк), the radius of the proton (rp), and an integral (∫) over space around the proton.
- The energy of the aether's circular motion is calculated by integrating the square of the velocity over space.

The key conclusion is that εo (dielectric permittivity) is equal to ρэ (density of the aether) and both have a value of approximately 8.85 × 10^(-12) F-m^(-1) and 8.85 × 10^(-12) kg-m^(-3), respectively.

1. 8.85 × 10^(-12) F-m^(-1) is equal to 0.00000000000885 Farads per meter.
2. 8.85 × 10^(-12) kg-m^(-3) is equal to 0.00000000000885 kilograms per cubic meter.

In summary, equations 4.1 and 4.2 are used to calculate the energy associated with the electric field around a proton and the circular motion of the aether around the proton, respectively. The equivalence of dielectric permittivity (εo) and aether density (ρэ) is established, and their values are provided, consistent with historical theoretical perspectives.

(dielectric permittivity) εo = ρэ (ether density)

Higher density of the aether (ρэ) corresponds to a higher dielectric permittivity (ε), and thus, a greater ability of the medium to store electrical energy in an electric field.
Conversely, lower density of the aether (ρэ) would correspond to a lower dielectric permittivity (ε), and a reduced ability of the medium to store electrical energy in an electric field.

Equation 4.3: The equation states that the dielectric permittivity (εo) is equal to the density of the aether (ρэ) in a matter-free space, and both have a value of approximately 8.85 × 10^(-12) F-m^(-1) and 8.85 × 10^(-12) kg-m^(-3), respectively. This equation is presented as consistent with the views of O. Fresnel regarding the theory of the stationary ether.

Equation 4.6: This equation calculates the average nucleon density (ρp) of a proton. It uses the proton mass (mp) and the volume of the proton (Vp) to determine the density. The result is approximately 2.8 × 10^17 kg-m^(-3).

Equation 4.7: This equation estimates the lower limit of the density of an "amer" (element of ether) as ρa = 3 × 10^19 kg-m^(-3).

Equation 4.13: This equation calculates the ratio (kλ) of the free path length of an "amer" to its diameter. It involves the density of ether (ρe), the density of the "amer" (ρa), and other parameters. The result is approximately 1.6 × 10^30.

Equation 4.16: This equation calculates the pressure of the aether in free space (Pэ) based on the idea that the momentum transfer between two "amers" only occurs when they touch. It uses the inverse of the magnetic permeability of vacuum (Pμ), the mean free path length (λa), and the diameter of the "amer" (da) to calculate the pressure. The result is approximately 1.3 × 10^36 N-m^(-2).

Equation 4.17: This equation states that the energy content per unit volume of the ether (heat content energy, wэ) is equal to the pressure (Re) of the ether. The pressure is approximately 1.3 × 10^36 J-m^(-3).

Equation 4.18: This equation calculates the average speed of thermal motion of an "amer" in free space (ua) based on the energy content of a unit volume of ether (wэ) and the density of ether (ρe). The result is approximately 5.4 × 10^23 m-s^(-1).

Equation 4.19: This equation calculates the speed of the first sound (v1), which is the propagation velocity of longitudinal disturbances in the ether. It involves the average speed of thermal motion of an "amer" (ua) and constants. The result is approximately 4.34 × 10^23 m-s^(-1).

Equation 4.20: This equation states the speed of the second sound (v2), which is the speed of propagation of temperature waves in the ether, equivalent to the speed of light. It is given as 3 × 10^8 m-s^(-1).

Equation 4.21: This equation relates dynamic viscosity (η) to the transverse pressure in the boundary layer of a viscous gas. It resembles Newton's equation for the motion of a viscous fluid. The equation involves various differential quantities and parameters.

Equation 4.22: This equation calculates dynamic viscosity (η) using the Reynolds number (Re), which is related to the density (ρe), the thickness of the boundary layer (δ), the velocity difference (Δv), and length differences (Δx and dx).

Equation 4.23: This equation defines the boundary layer thickness (δ) as the difference between the effective radius of interaction of nucleons in a deuterium nucleus (rn) and the proton radius (rp).

Equation 4.25: This equation calculates dynamic viscosity (η) using the pressure of the aether (Pэ), the thickness of the boundary layer (δ), and the velocity difference (Δv).

Equation 4.26: This equation defines kinematic viscosity (χ) as the ratio of dynamic viscosity (η) to density (ρ).

Equation 4.27: This equation calculates the value of kinematic viscosity (χ) using the previously determined values of dynamic viscosity (η) and density (ρe).

Equation 4.28: This equation states that the diffusivity (a) for a normal viscous compressible gas is approximately equal in magnitude to the kinematic viscosity (χ).

Equation 4.29: This equation calculates the average free path length of "amers" outside the substance (λa) using the kinematic viscosity (χ), the average speed of thermal motion of an "amer" (u), and constants.

Equation 4.30: This equation determines the diameter of an "amer" (da) using the previously calculated values of the average free path length (λa) and a constant (kλ).

Equation 4.31: This equation calculates the cross-sectional area of an "amer" (σa) using its diameter (da).

Equation 4.32: This equation calculates the volume of an "amer" (Va) using its diameter (da).

Equation 4.33: This equation determines the number of "amers" in a unit volume of free ether (na) based on the inverse of the product of the average free path length (λa) and the cross-sectional area (σa).

Equation 4.34: This equation calculates the mass of an "amer" (ma) using the density of the ether (ρэ) and the number of "amers" in a unit volume (na).

Equation 4.35: This equation determines the density of the "amer" body (ρa) using the previously calculated values of the mass (ma) and volume (Va) of an "amer."

Equation 4.36: This equation calculates the temperature of the ether (T) using the mass of an "amer" (ma), the average speed of thermal motion (ua), and constants.

Equation 4.37: This equation finds the specific heat capacity of the ether at constant pressure (cP) using Boltzmann's constant (k), the number of degrees of freedom (N), and the mass of an "amer" (ma).

Equation 4.38: This equation calculates the specific heat capacity of the ether at constant volume (cV) using the previously determined value of cP and the number of degrees of freedom (N).

Equation 4.39: This equation calculates the heat transfer coefficient of free ether (kT) using various parameters, including density (ρэ), velocity (u), and constants.

Equation 4.40: This equation calculates the number of collisions (γa) that each "amer" in free ether experiences per unit of time. It uses the average speed of thermal motion (u) and the average free path length (λ) of the "amer." The result is approximately 7.3 × 10^37 collisions per second.

Equation 4.41: This equation calculates the total number of collisions (γэ) of "amers" in a unit volume of free ether. It combines the previously calculated value of γa with the number of "amers" in a unit volume (na). The result is approximately 4.2 × 10^140 collisions per second.