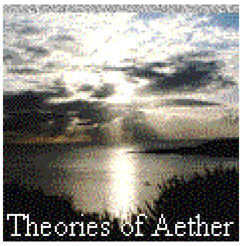

The nature of Charge

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The nature of Charge

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The basic continuity equation of Continuum Mechanics is given as :

$$d(rho)/dt + (rho)Div\ v = 0$$

Where rho is the field density, and v is the mean velocity. If the field is incompressible this simplifies to:

$$(rho)Div\ v = 0$$

Since with the incompressible assumption, there can be no change in density. We can further simplify the equation by removing density (dividing it from both sides) we then get:

$$Div\ v = 0$$

This definition requires infinite propagation speeds of any perturbations in such incompressible systems, eliminating any possibility of wave activity.

Conversely, in compressible mediums we see that (rho)Div v equals the time rate of change in the density d(rho)/dt. For the limit, as a volume element [s] go to zero, we get:

s(rho)Div v = s(d(rho)/dt)

This is based on the observation that for the two terms to sum to zero, and therefore must have opposite signs. This leads directly to:

mDiv v = dm/dt

And cannot be zero. This is an important finding, it describes a unique characteristic of all compressible systems. The result of this is a fixed finite propagation speed for any perturbations in the resulting continuum
, leading to standard acoustic behavior.

In general the physical consequences of this definition has been overlooked, due to an almost universal adoption of the 'assumption' of incompressibility, in evaluating the general behavior of such systems. This eliminates many higher order terms, greatly simplifying the equations, and generally doesn't introduce significant errors in the results obtained.

It does however eliminate this property and any resulting consequences from any such evaluations. As should be obvious, as a limit, this definition has a unique value fixed by the density and velocity of the constitute continuum.

So, what is the above equation saying? It appears to be saying that compressible medium will have a basic oscillation of density fluctuation occurring continuously. Moreover, given a generally uniform density and velocity, this fluctuation will have a distinctive frequency associated with this activity. This is clearly demonstrated by the relationship:

Div v = d/dt

When applied to the Continuum Mechanics of Electromagnetism where is this? There is a fundamental property that has remained undefined (and given arbitrary units), this is charge [q]. So, if we assign to charge the units [kg/sec] and assume it is a result of the definition above, what is the result?

In Coulomb's law, the force resulting from the interaction of two charges is given to be:

F = [1/4pi(eps)][qq/r^2]

Following our assumption we find that permitivitty [eps] must have units of density to get a result in units of force.

If we can associate permitivitty with density, we find that standard acoustic equation matches that given for light propagation exactly. In standard acoustics wave speed c is given by the relationship:

c^2 = Y/rho

Where Y is proportional to pressure and the specific heats in a gas, the bulk modulus of a liquid, or Young's modulus in a solid. For a solid we have the further complication of whether we are evaluating the compression

or shear . The relationship between
these two in a perfect elastic medium is that the shear wave travel at a speed Sqrt(3) time slower than the compression wave.

We can of course write the above equation in terms of inverse Y [u] (in the standard literature this is known as the coefficient of compressibility), in that case we get:

$$c^2 = 1/u(rho)$$

And as can be seen:

$$c^2 = 1/u(eps)$$

This provides us with confirmation that this definition is, at least, internally consistent for Coulomb's law and the Maxwell/Heavyside relationship to wave speed.

We can now look elsewhere for other possible correlations.

As shown above, Div v = nu (a the characteristic frequency in Hertz). With our definition, the charge to mass ratio would suggest that the mass, seen in matter, could be some sort of resulting stable manifestation of this harmonic oscillation in the field.

Exploring this idea, lets look at the thermal (as in black body) frequency which, given the above definitions, results from this relationship. Given:

$$E = h(nu) = 3kT$$

and, as defined,

$$nu = q/m.$$

We have:

$$E = hq/m = 3kT$$

And the resulting temperature T is

$$T = hq/3km$$

For the smallest stable elemental particle, the electron, this calculates to be 2.8 degrees Kelvin.

As defined, the property charge is of a form consistent with a simple harmonic oscillator. These have a unique mathematical form, which is:

$$nu = [1/2pi]Sqrt(A/m)$$

where A is called the 'spring constant'. And:

$$m(nu) = [1/2pi]Sqrt(Am)$$

which gives us to the requisite units kg/sec, and as stated above, to be correct, charge MUST take this form! It does:

$$q = [1/2pi]Sqrt(h[eps]c/Sqrt[3]) = 1.603815E-19 \text{ kg/sec}$$

But wait! This value isn't correct, elemental charge is given to be 1.60217E-19, not 1.603815E-19. We're off (high) by 1.001. But we've seen this value before, the 'theoretical' value for the electron's magnetic moment is:

$$qh/m4pi$$

and for an electron, is called the Bohr magnetron. But when we actually measure it, we get a value that is 1.001 times higher than the equation predicts. The difference is called the magnetic moment anomaly. When we use the value derived by our model, this difference practically vanishes.

Finally, a new correlation emerges, which is:

$$k = h/qc = 1.38E-23 \text{ m-sec}$$

and gives us units of impact d^p/dt^2 for temperature, just as one would expect.

Thus, there should be little doubt, given the preceding presentation, that the property we call charge is an inevitable result of field compressibility and inexorably connected to the wave properties of the continuum.

Moreover, given this definition, Permitivitty and Permeability which today have arbitrary definitions, become density and inverse energy density (pressure/modulus). This facilitates the conversion of all EM/QM properties into prosaic medium properties and results in a completely consistent system that will match all physical observations.

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