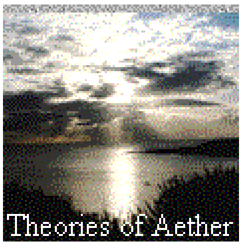

The Fine structure constant

-- Paul Stowe

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The Fine structure constant

UseNet Posting:
Subject: Re: Fine structure constant
Date: 17 Feb 2000 00:00:00 GMT
Approved: helbig@astro.rug.nl (sci.physics.research)
From: pstowe@ix.netcom.com(Paul Stowe)
To: sci.physics.research

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In  Matthew Nobes  writes:
>On 15 Feb 2000, Paul Stowe wrote:

>> And, an alternate theory to QED (classical Continuum Mechanics based)
>> suggests a variable FSC, given by the equation:
>>
>>                            ___
>>                  1        / 3  /       \2
>>                 --- = 2 /   -  | 2piMMA |
>>                 FSC     V   k  \        /
>>
>> Where MMA is the Magnetic Moment Anomaly (1.001165923) and k is the
>> dielectric constant of the bulk material in which its measurement is
>> made.  With air, k ~= 1.0006, thus we get:
>>
>>
>>            2Srt(3/1.0006)(2pi[1.001165923])^2 = 137.03523
>>
>> Accurate to 0.0005%.  The remaining inaccuracy can be attributed to
>> that of the measurement of k...
```

> I've still never seen a satisfactory justification of why you use
> k_{air} in the expression for the FSC of a single electron. It has
> been repeatedly pointed out that the very notion of a bulk dielectric
> constant relies on assumptions about the volume under consideration
> that are clearly false when applied to a single electrons. I again
> refer you to the derivation of the macroscopic Maxwell equations in
> Jackson's book, can you demonstrate where it is in error?

This goes back to how elemental charge is/was measured via the Millikan oil drop method. Note that the oil droplet and the gap between the capacitor plates (filled with air) are all of macroscopic dimensions. A charge is deposited on these oil droplets and the corresponding electrostatic force measured, and from this, the value of charge is computed.

As is given in the well known equation:

$$e^2 = 2ahEc$$

Where

- e = elemental charge
- a = alpha
- E = permitivitty = kE_o
- u = permeability = iu_o (i = magnetic susceptability)
- h = Planck's constant
- c = light speed

and can be re-written (substituting 1/Sqrt(Eu) as:

$$e^2 = 2ah \sqrt{\frac{E}{u}}$$

The equation I have is:

$$e' = eMMA = \frac{1}{2pi} \sqrt{h \sqrt{\frac{E}{3u}}}$$

But E & u are the permitivitty and permeability of the bulk medium containing the electrons. It should become immediately obvious what this equation suggests. Consider the so-called 'free electron gas' in metallic substances, if e is dependent on the bulk properties of the containing material, its value in Zinc will be different than say, in Copper. Thus, place these two dissimilar potentials in plane contact and the result will be ...
?

Now that the above equation (using k = 1.00059 Ref 2 Pg E-65) give a value of 1.6040458E-19 which, when divided by the MMA of 1.00116592308, gives 1.6021779E-19 which is accurate to less than 3 parts in ten million. Moreover, the MMA is naturally part of the above equation. In other words, the Bohr Magnetron when using the above formula is exactly:

$$mu\_B = \frac{he'}{4pim\_e}$$

This to my knowledge is new, and it has never been shown before that the MMA can be naturally integrated into a standard QM definition in this fashion.

To test this hypothesis the following experiment should be definitive.

Simply carefully repeat the Millikan Oil Drop experiment in a dielectric gas with a significantly different value than air. Neon for example has a k of 1.000127 (same Ref. & Page), this value seems too close to 1.00059 to obtain any significant variation. But perhaps someone can suggest a suitable atmosphere where the k value is at least an order of magnitude higher than air.

> Note also two measurements of \alpha from condensed matter
> experiments (i.e. not in air) [1]
>
> Quantum Hall effect: \alpha = 137.0359979 (32)
> AC Josephson effect: \alpha = 137.0359970 (77)
>
> which are (I presume) is substantial disagreement with your formula
> if I put a value of k in which corresponded to a condensed matter
> environment (I presume a semiconductor)

This depends upon how alpha was determined. If one simply assumes the standard value for elemental charge and computes, then this will not be noticed.

>[1] Peskin and Schroeder, page 198 (note they cite D. Yennie
>Rev. Mod. Phys. 59, 781 (1987) on this subject)

[2] "CRC Handbook of Physics and Chemistry 50th Edition"

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