Size of Electron: An Independent Method to the Same Result  
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While fiddling around with formulas, trying to find a self-contained magnetic property (by assuming that all magnetism is simply moving electric forces/fields), I came around a very intriguing result.

Assuming that a magnet is simply a bunch of self-contained orbiting currents around the edge of a cylinder, I decided to take a look at a single one of those loops. It is known that a spinning current (or charge) causes a magnetic field to form following equation (i), where “I” is the current and “a” is the radius of rotation.

(i)

Complimentarily, a moving particle, in a uniform perpendicular magnetic field, will rotate in a circular motion, following equation (ii), where “ω” is the angular speed, “q” is the charge, “B” is the magnetic field, and “m” is the mass.

(ii)

Thus expanding the magnetic field in equation (ii) gives us equation (iii).

(iii)

Putting that aside for now, let us focus on the current. In a circular motion, it could be imagined as a single charge in orbit. This charge would make a full rotation in “T” time (a period) and thus the current passing can be calculated (see equation iv).

(iv)

Now, returning to equation (iii), we can replace the current with our new expanded expression. This results in equation (v)

(v)

By dividing both side by the angular speed, the final equation we get is equation (vi), which moving the terms around, we can isolate the radius (equation vii).

(vi)

(vii)

Plugging in all the constants for a single electron, we get the following radius.

This result perplexed me, because after a quick web search, it turns out it is the calculated classical radius of the electron. However, their method of deriving it used electric potential energy and no magnetism whatsoever. They ended up with equation (viii)[[1]](#footnote-1).

(viii)

These two equations (vii and viii) are equivalent because by definition, “c” is given the equation (ix).

(ix)

1. <https://gravityandlevity.wordpress.com/2015/04/11/how-big-is-an-electron/> [↑](#footnote-ref-1)