Sean MacBride

Jordan Peele

Logan Testa

Lab 6: Charge-to-mass ratio of an Electron

1. KEi + PEi = KEf + PEf
2. Starting equation for a coil with n turns at the distance halfway between the loops  
     
     
     
     
     
    For field from one coil. For both coils, multiply by 2 to get
4. Our average value for was 3.11x10^11 1.56x which is off by a factor of 2 from the accepted value, because of the error in , me is off by a factor of ~2 from the accepted value. We have not yet identified where this error is coming from.
5. Our 95% confidence interval was estimated to 2.06E-31 utilizing the propagation of error rule where:

x=1.59E-19 (calculated value of the charge of an electron by the class)

=6.00E-20 (calculated error in the charge of the electron calculations)

y= 3.11E+11 (calculated value for )

= 1.56E+10 (calculated error for )

Using the multiplication and division rule for propagation of uncertainty we obtain the relative uncertainty of z (). Where is the 95% confidence interval of the mass of the electron. So to get this we multiply the relative uncertainty of z by the average value calculated for z.

1. The relative uncertainty of the Millikan Oil Drop experiment was 3.77E-01, whereas our Thomson E/m experiment was uncertain by a factor of 2.50E-02, making the Oil Drop experiment more certain; or, the Thompson experiment was more uncertain, making it a more viable candidate for revisit if a more accurate measurement is desired.
2. The velocity of the electron is ~0.0003c, which is not enough to see significant deviations due to special relativity.