#ref #hw

1 | Induced current lab

the data

1.1 | Analysis

1. ex 1 This experiment consisted of moving a magnet with the north side pointed down horizontally over a coil of wire connected to a current sensor. Current is induced by the moving magnet and the changing magnetic flux it causes. Since the magnet is moving horizontally over the coil, the flux (and therefore the magnitude of the current) will increase until the magnet passes the center, when it will start decreasing. The sign or direction of the current will also flip once the magnet passes the center. The predicted graph I drew looked like: Which was reasonably similar to the experimental data. Pasted image 20211207215729.png||300 #### ex 2 $B = \frac{\mu_0 I}{2\pi r}$ where $\mu_0 = 4\pi \cdot 10^{-7} Tm/A$ $r = 1/2in$ THIS MIGHT BE WRONG

   percent error calculation $\delta = \left| \frac{v_A - v_E}{v_E} \right| \cdot 100$%

   2-0.3A, expected: $B = 4.88 \cdot 10^{-6} T$ or 0.00488 mT base value: -0.098 measured: -0.0129 out: 0.0031 36.47 %err *

   2-0.5A expected: 0.00792 mt base value: 0.0012 measured: 0.0112 out: 0.01 26.26 %err **

   no measured current, so instead we take the ratio of the two $\frac{\mu_0}{2\pi r}$s, and then compare to the ratio of measured B.

   2-1R expected: 0.0315 mT/A out: 0.0476 mT

   2-3R expected: 0.0105 mT/A out: 0.0168 mT

   ratio expected: 3 ratio out: 2.8

   percent err: 7.14

2. ex 3 equation: $B_x = \frac{\mu_0 I R^2}{2\sqrt{x^2 + R^2}^3}$

   3 loops R = 0.0396875m

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   x = 0.0127m expected: 1.368×10⁻⁵ T/A (teslas per ampere) out: 0.175720210916mt

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   x = 0.028575m expected: 8.4615×10⁻⁶ T/A (teslas per ampere) out: 0.100390622756mt

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   ratio expected: 1.61 ration out: 1.75 percent err: 8

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   x = 0.01m i: 0.45 expected: 0.00381 mT (milliteslas) baseline: -0.00345458976653 out: (0.0237670893125 - 0.00345458976653)/3 (for loops) = 0.00677083 percent err: 43.72%

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    i: 0.52 expected: 0.0044 mT (milliteslas) baseline: 0.00100097654013 out: (0.0278930657828 - 0.00100097654013) / 3 = 0.00896403 percent err: 103.72%

3. ex 4 $B = \mu n l$ 8 coils

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    i = 0.21A expected: 0.141 mT (milliteslas) out: 0.077 mT percent err: 83.11% **/ i = 0.527A n = 533.28/m expected: 0.3532 mT (milliteslas) out: 0.18mt percent err: 96.22% /** expected: 0.0523 mT (milliteslas) out: 0.053 mT