The Lorentz torque experiment

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The paradoxes have shown the deficiency of the Lorentz force law; the differential Ampere's force law has successfully solved all these paradoxes (See " Paradoxes and solutions about Lorentz force law")
http://pengkuanem.blogspot.com/2012/04/complete-study.html

It is however necessary to confirm by new experiments never carried out before. A success will show the flaw of the Lorentz force law and prove the new law experimentally. Below is the design of the experiment.

The suggested experiment makes 2 rectangular coils interact. The coil 1 is horizontal, the coil 2 is tilted at an angle with respect to the coil 1 (See the Figure 1). The magnetic force will create a torque on the 2 coils, which are calculated numerically.

The parameters for the calculation are as follow:

The dimensions of the horizontal coil:	lx=0.4 m, ly=0.8 m
The dimensions of the tilted coil:	lx=0.36 m, ly=0.144 m
The current in the 2 coils:	I=3000 A·turn

The torques in N·m predicted by the Lorentz force law and the differential Ampere's force law are the 2 curves drawn in the Figure 3. The torque varies with respect to the angle between the 2 coils. For angle between 0° and 180°, the torque predicted by the Lorentz force law draws a single-hump-shaped curve, whereas the prediction of the differential Ampere's force law draws a double-hump-shaped curve. The values of the predictions are very different. At 90°, the Lorentz force law predicts 1.2755 N·m, against 0.1877 N·m for the differential Ampere's force law.

The shapes of the curves are very distinguishable. If the measured data has a double-hump shape, the magnetic force follows the differential Ampere's force law; if the measured data has a single-hump shape, the magnetic force follows the Lorentz force law.

The quantity of wire is calculated here. The lengths of each turn of the 2 coils are:

$$l1=(0.4+0.8)*2=2.4 \text{ m}$$
$$l2=(0.36+0.144)*2=1.008 \text{ m}$$

For coils of 3 000 turns in each, the lengths of wire are:

$$L1 = 7\,200 \text{ m}$$
$$L2 = 3\,024 \text{ m}$$

The total length of wire needed is: 10 224 m

If we measure the force on the top of the coil 2, at angle 20°, the expected force is:

$$F_0 = 0.4450 \text{ N·m} / 0.072 \text{ m} = 6.18 \text{ N}$$

We can use currents of different values, coils with different number of turn. The expected forces at angle 20° with the corresponding currents, wire lengths are given in the Table 1.

The torque can be measured using diverse methods. In Figure 2 the torque on the coil 1 is measured by a force sensor, the signal of which is connected to the y connector of an oscilloscope. The angle between the 2 coils is measured by an angle sensor that is a force sensor on a spring which is pulled by the pulley fixed to the coil 2. The spring links the angle and the elastic force with a linear function. So, the spring's force signal which is linear to the angle is connected to the x connector of the oscilloscope.

The outcome of the experiment is the curve force-angle which will be drawn on the oscilloscope when the angle varies from 0° to 180° (see the Figure 2).

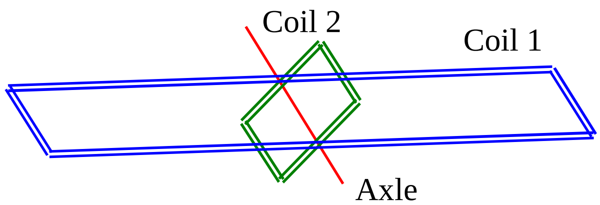

Figure 1

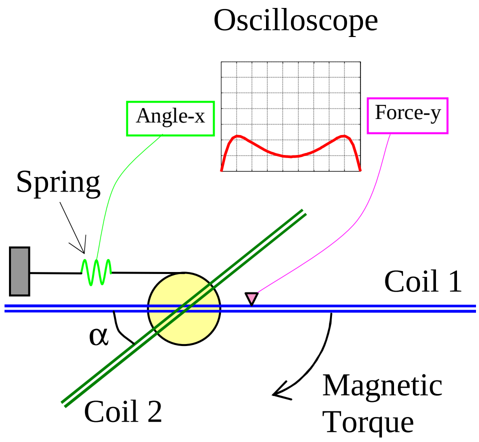

Figure 2

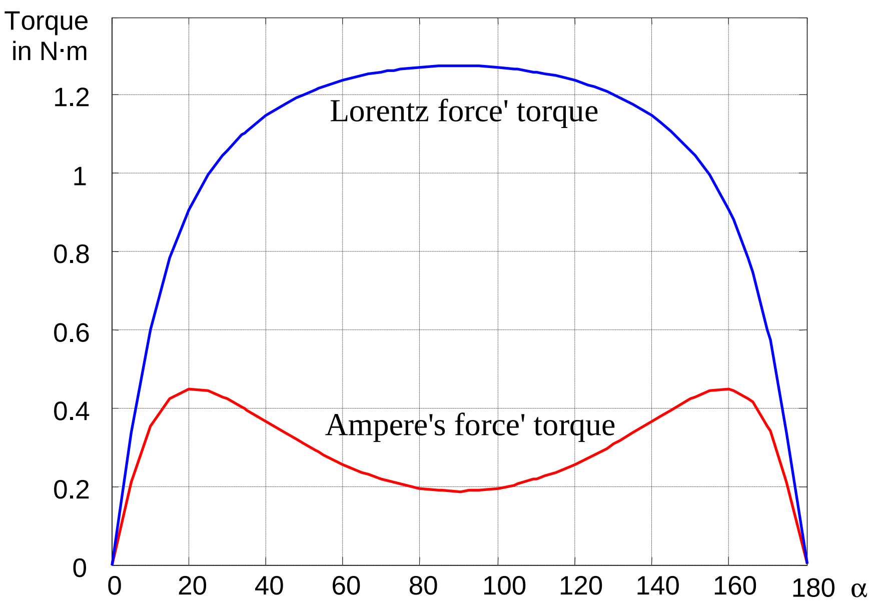

Figure 3

Turns	Current	Force for angle=20°			Wire length
	A	Newton	gram	pound	m
3000	1	6,18	630,18	1,39	10224
1000	1	0,69	70,02	0,15	3408
1000	2	2,75	280,08	0,62	3408
500	1	0,17	17,51	0,04	1704
500	2	0,69	70,02	0,15	1704
500	3	1,55	157,55	0,35	1704

Table 1