Curve shape of the magnetic torques

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In the article The Lorentz torque experiment
(http://pengkuanem.blogspot.com/2012/03/lorentz-torque-experiment.html)
I have given the design of an experiment that tests the predictions of the Lorentz force law and the differential Ampere's force law. The predicted outcome of the experiment is a single-humped curve for the Lorentz force law and double-humped curve for the differential Ampere's force law. This difference of curve's shape is dependent on the coil's dimension. To avoid the confusion that the curve is always single-humped for the Lorentz force law and double-humped for the differential Ampere's force law, I give here the numerical results for coils of 4 different dimensions. The calculation method is described in the article
Calculation of the Lorentz' Torque and the Ampere's torque
(http://pengkuanem.blogspot.com/2012/05/torque-calculation.html) .

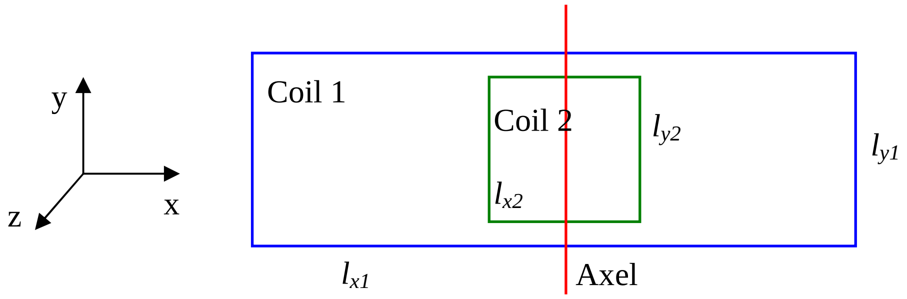

Figure 1

The Figure 1 shows the 2 coils that have length l_{x1} and l_{x2}, height l_{y1} and l_{y2}, respectively. The coil 2 turns about the axel and the torque on it varies with the angle between the 2 coils. For the configuration of the design in The Lorentz torque experiment, the dimensions are:

l_{x1} = 0.8 m and l_{y1} =0.4 m
l_{x2}= 0.144 m and ly2=0.36 m

The ratio of the lengths of the 2 coils is: $\frac{l_{x2}}{l_{x1}} = 0.18$

The numerical results are given in the following figures, where the curves for the Lorentz force law are in red and that for the differential Ampere's force law in green. We see the single-humped and double-humped curves.

The ratios are 0.01, 0.05, 0.18 and 0.5 respectively. The curve's shapes are different for the 4 ratio values. The curves are single-humped for low ratio value and double-humped for high ratio value. But the transition point is 0.18 for the Lorentz force law and 0.05 for the differential Ampere's force law.

So, Ration= 0.18 is the point where the difference of shape is maximum and it is this ratio I have chosen for the experiment.

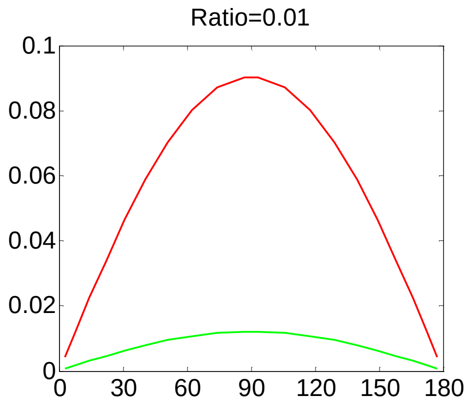

Figure 2

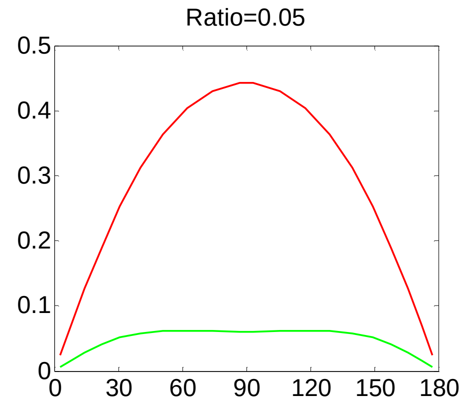

Figure 3

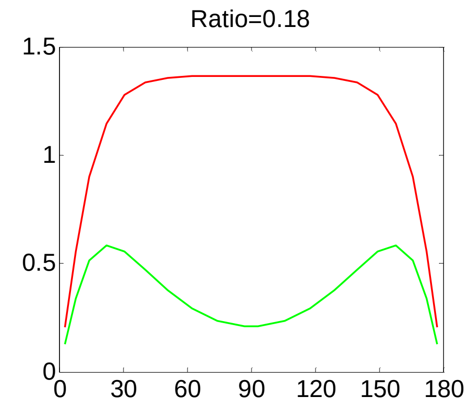

Figure 4

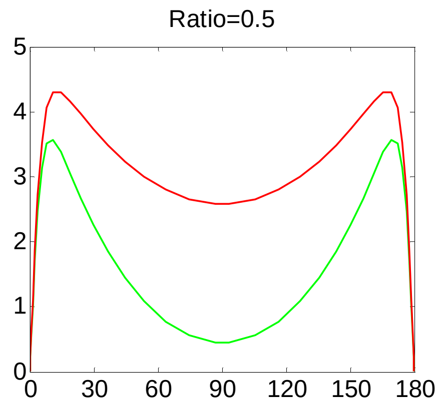

Figure 5

The difference between single-humped and double-humped shapes is due to the effect of the force between perpendicular currents. There is another way to show this effect, that of measuring the torque for very long coil 1. Indeed, for this coil, the vertical sides are so faraway that they do not exert force on each other, and if torque exists, it can only come from interaction between perpendicular current. The Figure 6 and Figure 7 shows a such case, where the torque from the differential Ampere's force is nearly 0 with respect to that from the Lorentz force.

The ratio between height and length of the coil 1 is 10: $\frac{l_{x1}}{l_{y1}} = 10$

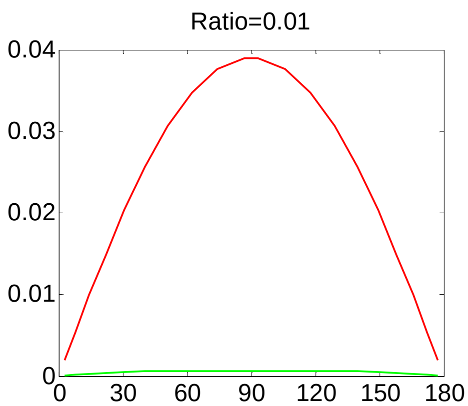

Figure 6

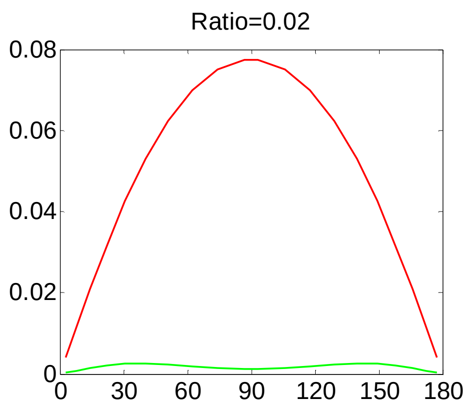

Figure 7