Holloway Paper Notes PhL 1.17.14

Some quick notes I took while reading the paper which I got with Jim's ID number! Later I studied the paper more and I think things are all understood here. The email from Kuester was very helpful.

Abstract: They will use some "quasi-static Green's" method. The claim the literature has errors.

I. Introduction. They note that skin effect eventually reduces L_i to zero since there is nothing stored inside, but I question that, since there is still a lot stored just under the surface?? Well, I guess all the B field really gets pushed out of the wire, OK.

Excuses given for spending tax dollars on this strange problem: important for lines on PC boards.

Then right into the problem. Refs given of others doing it.

They claim that as ω increases, odd things happen, and L_i in fact moves from the inside to the outside, I could imagine that based on the above comment. They ARE going to use a stored energy approach.

Ends with a summary of what is about to happen.

II. Formulation. My energy formulation is stated. Her writes B = curl A for just A_z. My A_z formula appears in (5) and (6). Strutt is quoted as computing integral (6). They are saying Strutt did not follow a simple path and they will just do the double integrals as I just did today in Maple. Big deal about the C in A_z going away in B, yup. Hague took this path but goofed up. They then write an energy formula in (13) just as I do it. They agree all the integrals cannot be done "in closed form" and involve "polylogarithms".

A. Limit small t/w. They just take this limit of the W_i and then compute energy. They finally end up with this result:

$$L_i = (\mu/6)(t/w)$$

My strip result is

$$L_i = (1/12)\,\mu_i\,(d/w)$$

so there is this factor of 2 to answer! I will check my strip thing later on. (I just checked it and I don't see why I get half their result! The meaning of d and w is clear.

III.

OK, I have reviewed this paper. I then sent Kuester an email asking if he could find my factor of 2. I sent him a few plots as well to show I am serious. I sent a 1 page PDF with my (1/12) fraction where he has a (1/6) fraction. This was a good exercise, maybe he will respond, maybe not.

He did respond and showed my stupid error.