Cuaderno Digital

July 3, 2022

1 Capacity from conductance measurements

Date: 2022-07-01

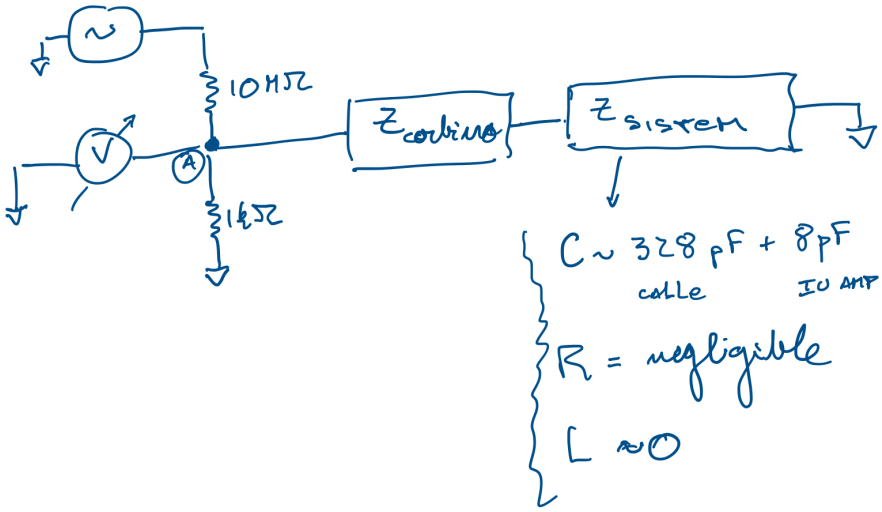


Figure 1: Experimental setup aproximation

We have already the value of capacity from the original measurments given by:

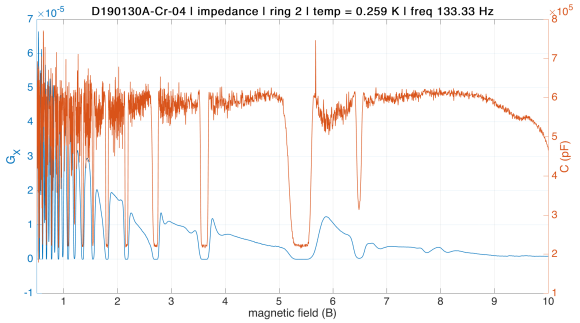
$$G = g_x + jg_y = \text{corbino conductance} \tag{1}$$

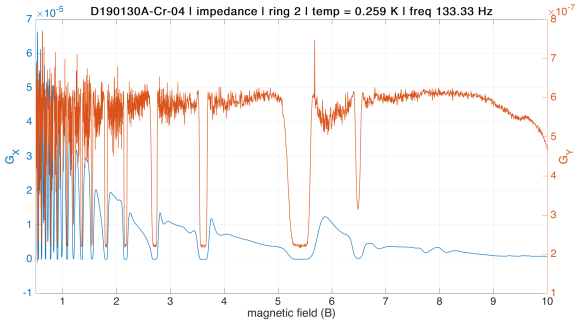
$$V_{in} = V_x + jV_y = \text{voltage input from the divider measured with one of the LIA} \tag{2}$$

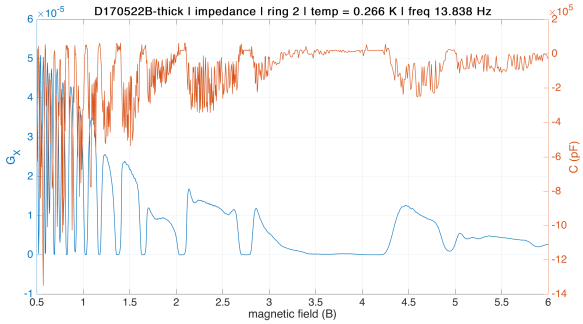
$$I_c = i_x + ji_y = \text{current on the Corbino measured with a LIA} \tag{3}$$

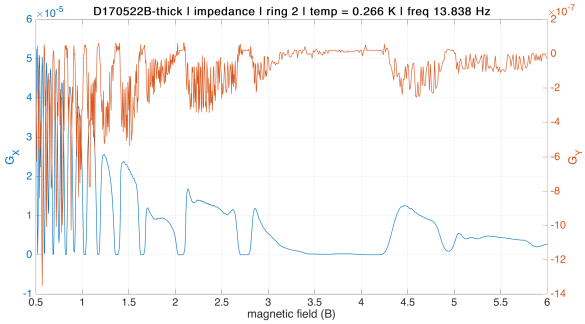
$$g_x + jg_y = \frac{(i_x V_x + i_y V_y) + j(i_y V_x - i_x V_y)}{V_x^2 + V_y^2} \tag{4}$$

$$\tag{5}$$









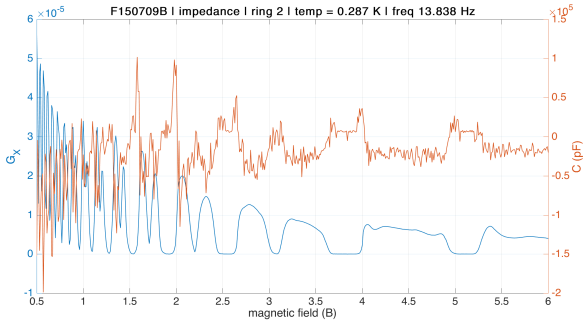
taking that $g_y = 1/\omega C = 1/2\pi f C$ and the usual capacity series summ, C_c is the Corbino's capacity and that C_s is the estimated system cpacity:

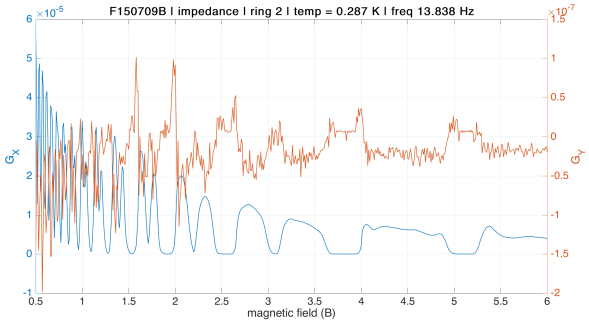
$$C_c = 1/\left(2\pi f g_y - \frac{1}{C_s}\right) \tag{6}$$

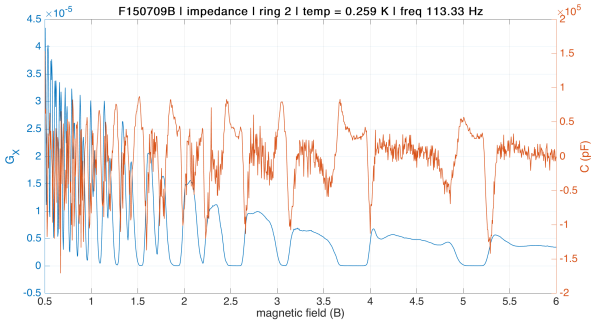
In the following figures, we just use the original calculated g_y and evaluate the new C_c

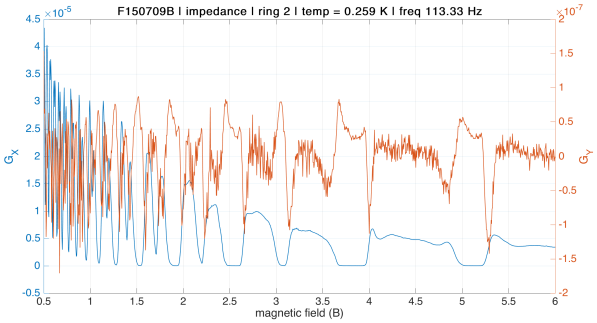
Duing that we get several results which I find kind of inconsitent, the main issue being that during the measurments, we were happy just by looking at a good G and having an almost zero outphase response. Now, we are trying to look at that, so some measurments will not be so good there. Probably the best way to go is to just look the ones we think seem to make more sense, and then look at the measurement particularities of those.

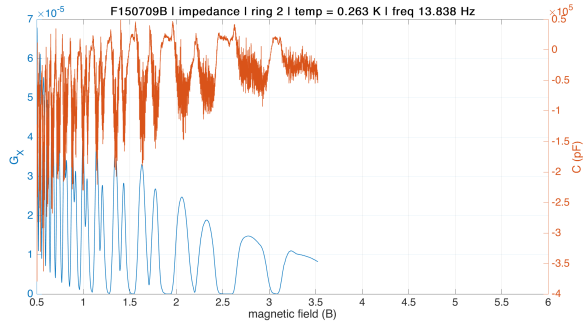
Examples of this measurements are given bellow

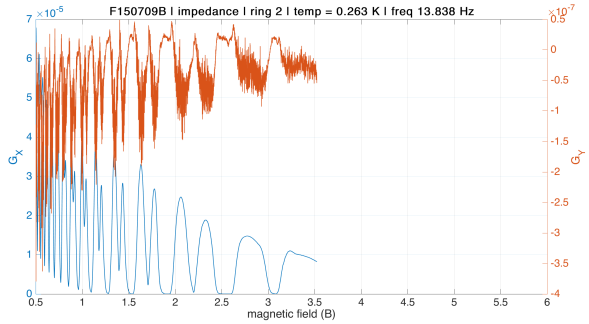

F150709B I impedance I ring 2 I temp = 0.287 K I freq 13.838 Hz
×10^-5
×10^5
G_X
C (pF)
magnetic field (B)

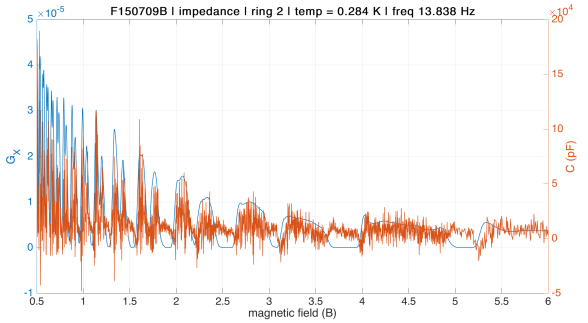

F150709B I impedance I ring 2 I temp = 0.287 K I freq 13.838 Hz
×10^-5
×10^-7
G_X
G_Y
magnetic field (B)

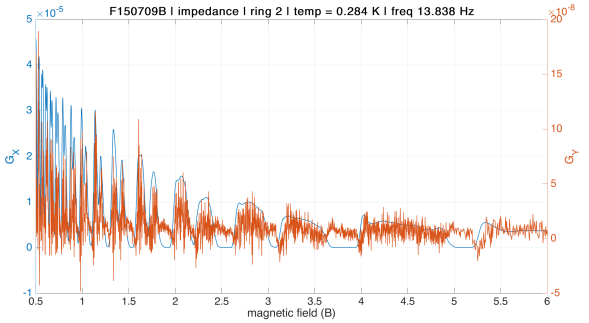

F150709B I impedance I ring 2 I temp = 0.259 K I freq 113.33 Hz
×10^-5
×10^5
G_X
C (pF)
magnetic field (B)


F150709B I impedance I ring 2 I temp = 0.259 K I freq 113.33 Hz
×10^-5
×10^-7
G_X
G_Y
magnetic field (B)


F150709B I impedance I ring 2 I temp = 0.263 K I freq 13.838 Hz
×10^-5
×10^5
G_X
C (pF)
magnetic field (B)


F150709B I impedance I ring 2 I temp = 0.263 K I freq 13.838 Hz
×10^-5
×10^-7
G_X
G_Y
magnetic field (B)


F150709B I impedance I ring 2 I temp = 0.284 K I freq 13.838 Hz
×10^-5
×10^4
G_X
C (pF)
magnetic field (B)


F150709B I impedance I ring 2 I temp = 0.284 K I freq 13.838 Hz
×10^-5
×10^-8
G_X
G_Y
magnetic field (B)