CPE 1150

Lab Number: 4

Parallel

AC Circuit

Analysis

Team member:

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Conclusion:

Results are unverifiable, nothing agrees. The measured phase shift vs calculated. ohms law vs current divider. The only constant is the issues are the same with 2 lab setups. The fluctuating voltage was better at my home lab though. I realize the resonance frequency was potentially obtainable in this setup.

Measurement based calculations:

initial measurements table:

|  |  |  |
| --- | --- | --- |
| R1 | R3 | R4 |
| 544Ω | 10.0Ω | 10.0Ω |

|  |  |  |
| --- | --- | --- |
| L1 | L2 | C1 |
| 4.51mH | 10.23mH | 32.1nF |

XL=2πfL j =2π \*5000\*(4.51+10.23) \*10-3

XL = 463.0707J

This was due to not having a 15mh inductor, but I was able to get closer to the 15mH value with a 4.7mH inductor and 10mH inductor.

XC = ­ =  = -991.619J

calculated impedances

|  |  |  |  |
| --- | --- | --- | --- |
| R1 | L1 | C1 | Ztotal |
| 544Ω | 463.0707J | -991.619J |  |

Total current data:

|  |  |  |
| --- | --- | --- |
| VR3 | VR1 | Itotal |
| 63.00m V | Null forgot | 13.66<-32.05o mA |

total current data:

Chart, line chart

Description automatically generated

Branch current measurements

|  |  |  |  |
| --- | --- | --- | --- |
| VR3 | VR4 | IL | IC |
| 104 mV | 128mV | 2.246<-90o | 1.291<90o |  |

inductor measurement:

Chart

Description automatically generated

capacitor measurement:

Chart, line chart

Description automatically generated

Constant source voltage was not obtainable during the lab. The home lab measured values where better. The resistor was farther down in error range though.

Prelab:

XL=2πfL = 471.238

XC = ­ = 964.575

=

Z total = 478.415<31.31o

Table 1: reactance calculations

|  |  |  |  |
| --- | --- | --- | --- |
| R1 | L1 | C1 | Z t |
| 560<0o | 471.238<90o | 964.575<-90o | 478.415<31.31o |

­source

DC current divider:

I target = I source\* (DC chapter current divider R changed to Z

I resistor = 6.271mA<-31.31o\*

AC current divider:

I target =

Table 2 && 3: current per parallel element (peak values)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Method of calculation | It | IR1 | IL1 | I­C1 |
| Current divider  (DC chapter) | 6.271mA<-31.31o | 0.1347nA<90o | 0.1347nA<90o | 4.686mA<49.92o |
| Ohms law  (V/Z branch = I) | 6.271mA<-31.31o | 5.357mA | 6.366mA<-90o | 2.894mA<-90o |
| Current divider  (AC chapter) | 6.271mA<-31.31o | 5.311mA<62.62o | 6.312mA<-27.38O | 2.738<-27.38o |