Lab 4 - Results: Phasors and AC Power

*ECE209: Fundamentals of Electrical Engineering*

|  |  |  |
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| Name | Student ID | CCID |
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# 2.2 Individual Components

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **V** = *5 VPEAK* | | **Resistor –** 1000Ω | **Capacitor -** 100nF | **Inductor** - 10mH |
|  | **freq** | ***(Hz)*** | **5,000** | **1,592** | **15,916** |
| **Scope** | **period** | *(μs)* |  |  |  |
| **V** (ref) | *(VRMS)* |  |  |  |
| **I** | *(mA**RMS)* |  |  |  |
| **tI** (phase) | *(μs)* |  |  |  |
| **PAVG** | *(mW)* |  |  |  |
| **PMAX** | *(mW)* |  |  |  |
| **PMIN** | *(mW)* |  |  |  |
| **Calcs** | **ϕI** | *(°)* |  |  |  |
| **I** *(lead/lag)* **V** | *(-)* | *in-phase* |  |  |
| **Z** | *(Ω)* |  |  |  |
| **P** | *(mW)* |  |  |  |
| **Q** | *(mVAR)* |  |  |  |
| **S** | *(mVA)* |  |  |  |
| **PF** | *(-)* |  |  |  |

# 2.3 Series RLC

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **VS** = *4.243 VPEAK*, **C** = *100 nF*, **L** = *10 mH*, **R** = *470 Ω* | | | | | | |
|  | **freq** | ***(Hz)*** | **2,500** | **5,000** | **10,000** | **20,000** |
| **Setup 1** | **period** | *(μs)* |  |  |  |  |
| **VR** (ref) | *(VRMS)* |  |  |  |  |
| **IR = IS** | *(mARMS)* |  |  |  |  |
| **VS** | *(VRMS)* |  |  |  |  |
| **tVS** (phase) | *(μs)* |  |  |  |  |
| **PAVG** | *(mW)* |  |  |  |  |
| **PMAX** | *(mW)* |  |  |  |  |
| **PMIN** | *(mW)* |  |  |  |  |
| **2** | **VC** | *(VRMS)* |  |  |  |  |
| **tVC** (phase) | *(μs)* |  |  |  |  |
| **3** | **VL** | *(VRMS)* |  |  |  |  |
| **tVL** (phase) | *(μs)* |  |  |  |  |
| **Calcs** | **ϕVR = ϕIS** | *(°)* | *Reference = 0°* | | | |
| **ϕVS** | *(°)* |  |  |  |  |
| **ϕVC** | *(°)* |  |  |  |  |
| **ϕVL** | *(°)* |  |  |  |  |
| **Z** | *(Ω)* |  |  |  |  |
| **P** | *(mW)* |  |  |  |  |
| **Q** | *(mVAR)* |  |  |  |  |
| **S** | *(mVA)* |  |  |  |  |
| **PF** | *(-)* |  |  |  |  |
| **IS** *(lead/lag)* **VS** | *(-)* |  |  |  |  |

# 2.4 Parallel RC

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1. **VS** = *4.243 VPEAK*, **C** = *220 nF*, **R** = *2.2 kΩ* | | | | | |
|  | 1. **freq** | 1. ***(Hz)*** | 1. **250** | 1. **500** | 1. **1000** |
| 1. **Setup 1** | 1. **period** | 1. *(ms)* |  |  |  |
| 1. **VS = VR** (ref) | 1. *(VRMS)* |  |  |  |
| 1. **IS** | 1. *(mARMS)* |  |  |  |
| 1. **tIS** (phase) | 1. *(μs)* |  |  |  |
| 1. **IR** | 1. *(mARMS)* |  |  |  |
| 1. **PAVG** | 1. *(mW)* |  |  |  |
| 1. **PMAX** | 1. *(mW)* |  |  |  |
| 1. **PMIN** | 1. *(mW)* |  |  |  |
| **2** | 1. **IC** | 1. *(mARMS)* |  |  |  |
| 1. **tIC** (phase) | 1. *(μs)* |  |  |  |
| 1. **Calcs** | 1. **θVS = θIR** | 1. *(°)* | 1. *Reference = 0°* | | |
| 1. **θIS** | 1. *(°)* |  |  |  |
| 1. **θIC** | 1. *(°)* |  |  |  |
| 1. **Z** | 1. *(Ω)* |  |  |  |
| 1. **P** | 1. *(mW)* |  |  |  |
| 1. **Q** | 1. *(mVAR)* |  |  |  |
| 1. **S** | 1. *(mVA)* |  |  |  |
| 1. **PF** | 1. *(-)* |  |  |  |
| **IS** *(lead/lag)* **VS** | *(-)* |  |  |  |

# Plots

The following pages have been left for you to include the plots that you are required to create as part of your post-lab.

To create your plots you can use whichever software you would like (Excel, Matlab, etc), export your plot as an image and import it into your Lab 3 - Results sheet in the appropriate place.

Your plots should include:

* A Plot title
* Label your axes and show what unit of measure is used.
* Include a marking for your data points.
* Include a line between your data points in the same series.
* Include a legend.
* Make sure your scales are appropriate and visible.

# Individual Components - Phasor Diagram

< Insert your 3 phasor diagrams here >

Create a phasor diagram for the voltage and current for each individual component that you measured in section 2.2. (3 total). Don’t worry about the scales of the phasors just make sure to label the voltage, current and angle with their magnitudes.

# Series RLC Circuit - Phasor Diagram

< Insert your 4 phasor diagrams here >

Create a phasor diagram for the series RLC circuit that you measured in section 2.3. Include the following signals: VR(ref), VS, VL, VC and IS. Use VR as you reference signal (0°). You need to make 1 phasor diagram for each frequency (4 total).

# Series RLC Circuit - Power Triangle

< Insert your 4 power triangle plots here >

Create a power triangle plot for the series RLC circuit that you measured in section 2.3. Include the following signals: P, Q and S. You need to make 1 power triangle plot for each frequency (4 total).

# Parallel RC Circuit - Phasor Diagram

< Insert your 3 phasor diagrams here >

Create a phasor diagram for the parallel RC circuit that you measured in section 2.4. Include the following signals: VS(ref), IS, IR, and IC. Use VS as you reference signal (0°). You need to make 1 phasor diagram for each frequency (3 total).

# Parallel RC Circuit - Power Triangle

< Insert your 3 power triangle plots here >

Create a power triangle plot for the parallel RC circuit that you measured in section 2.4. Include the following signals: P, Q and S. You need to make 1 power triangle plot for each frequency (3 total).