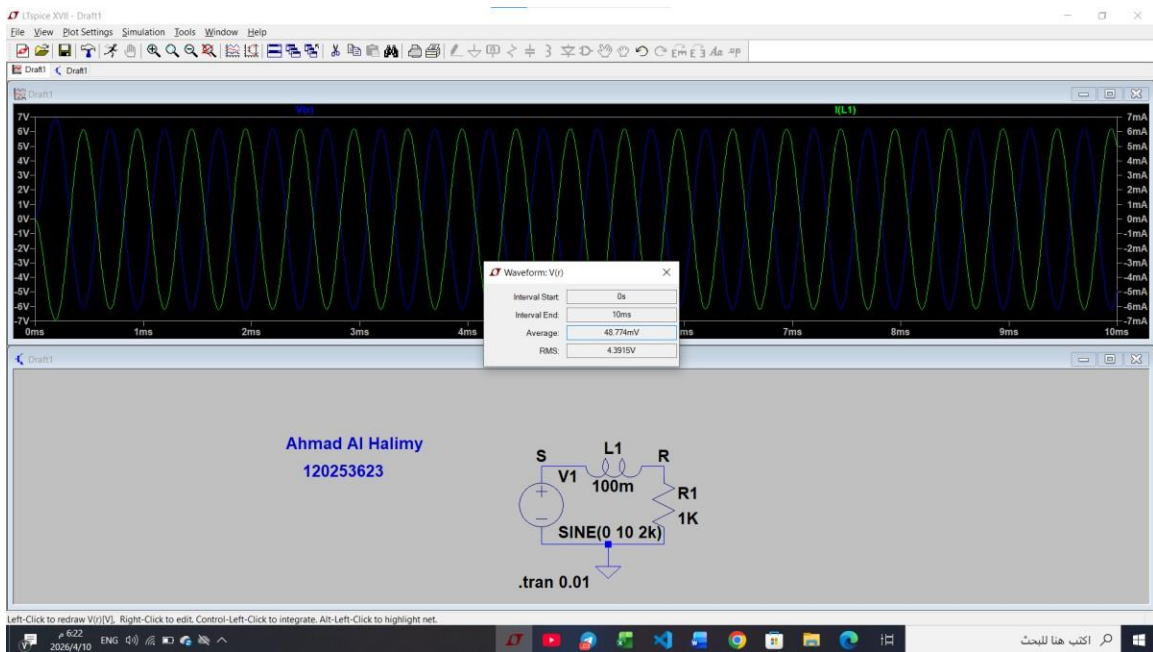
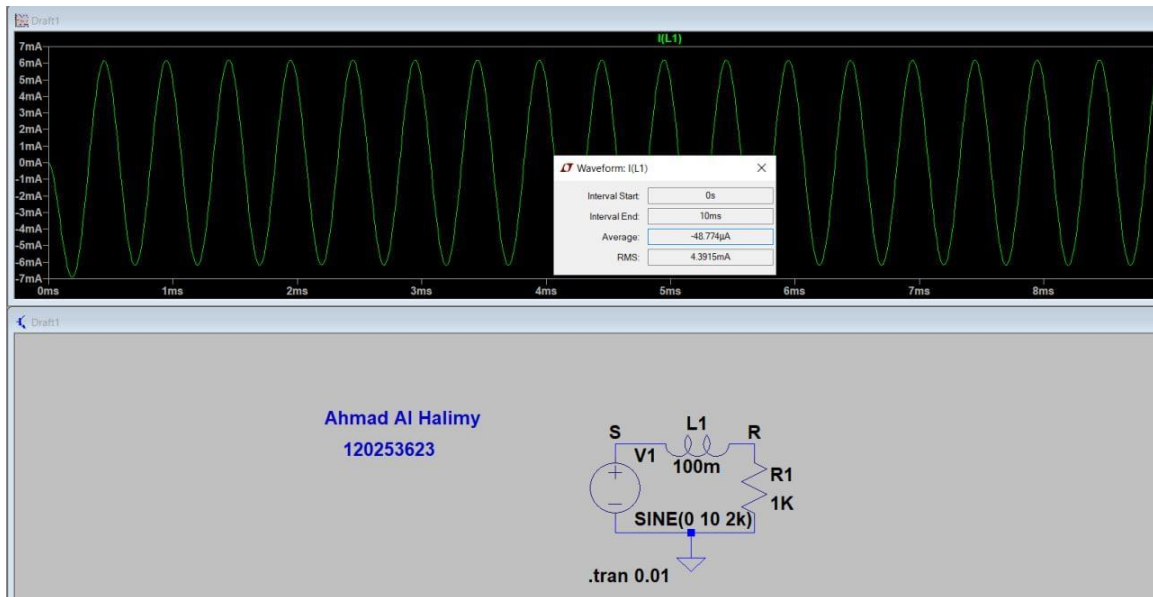
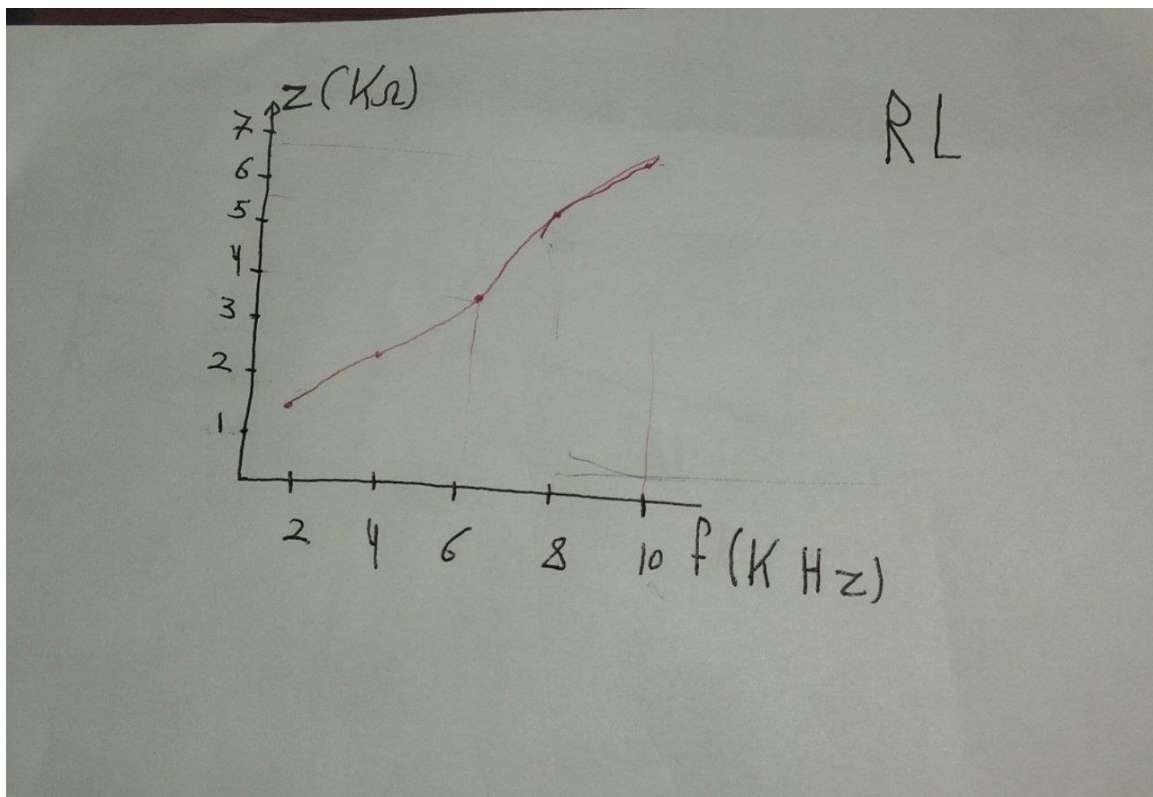


# circuit 1: RL CIRCUIT



| Phase ( $\phi$ ) | $Z=V_S/I_S$ ( $\Omega$ ) | $V_S$ (V) | $V_L$ (V) | $V_R$ (V) | $I_S$ (mA) | Frequency (kHz) |
|------------------|--------------------------|-----------|-----------|-----------|------------|-----------------|
| 51.5°            | 1602.8 $\Omega$          | 7.0367V   | 5.498 V   | 4.3915V   | 4.3915mA   | 2               |
| 68.5°            | 2715.0 $\Omega$          | 6.9704V   | 6.480 V   | 2.5675V   | 2.5675mA   | 4               |
| 75.5°            | 3981.7 $\Omega$          | 6.9167V   | 6.695 V   | 1.7372V   | 1.7372mA   | 6               |
| 79.2°            | 5340.3 $\Omega$          | 6.9042V   | 6.782 V   | 1.2928V   | 1.2928mA   | 8               |
| 81.4°            | 6661.6 $\Omega$          | 6.9105V   | 6.832 V   | 1.0374V   | 1.0374mA   | 10              |



## . Conclusion for (RL) Circuit

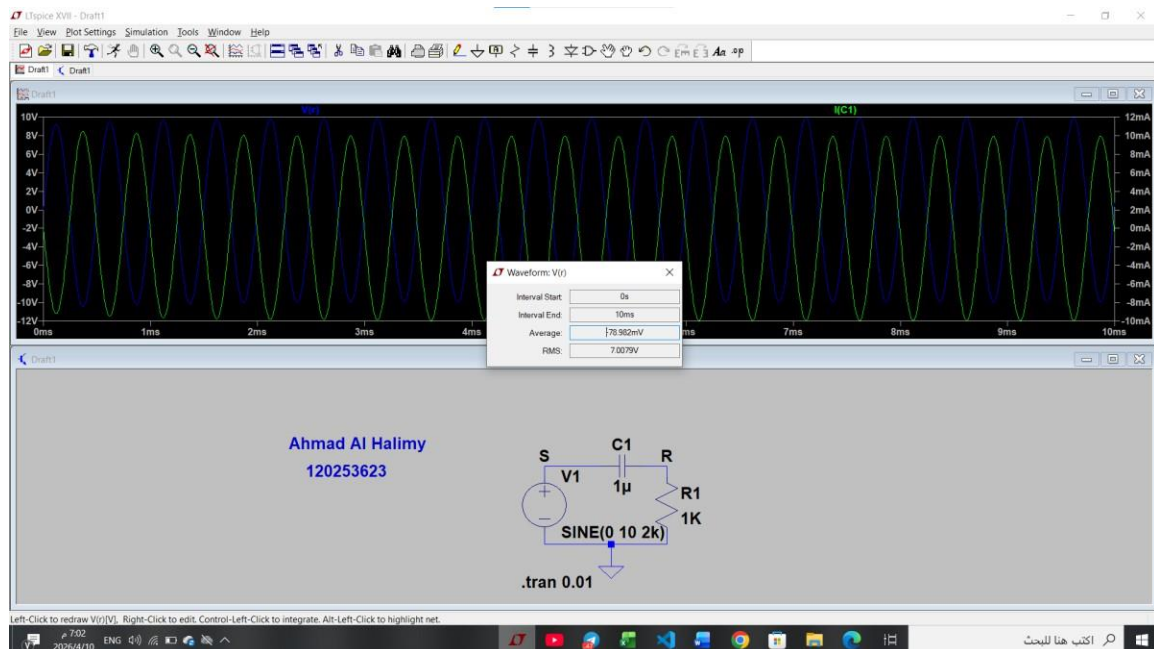
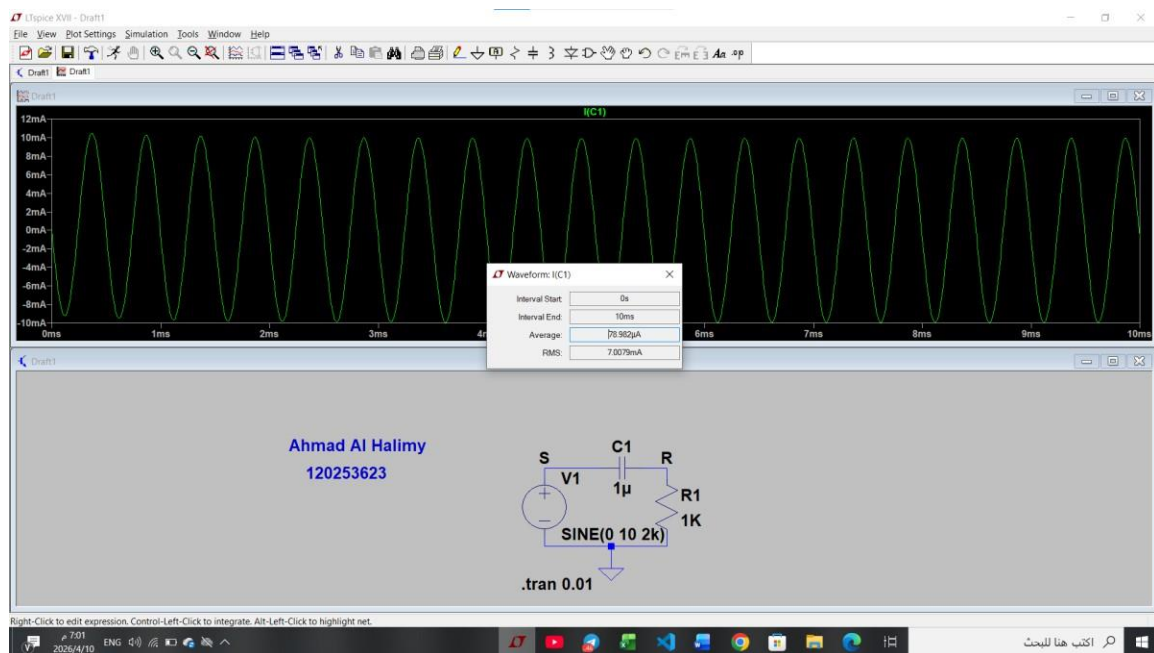
### Observation:

The graph shows a clear **linear increase** in the total impedance ( $Z$ ) as the frequency increases.

## Explanation:

This behavior occurs because the inductor's opposition to current (inductive reactance) is **directly proportional** to the frequency. At higher frequencies, the inductor becomes the dominant component, making it harder for the current to flow, which results in a higher total impedance for the circuit

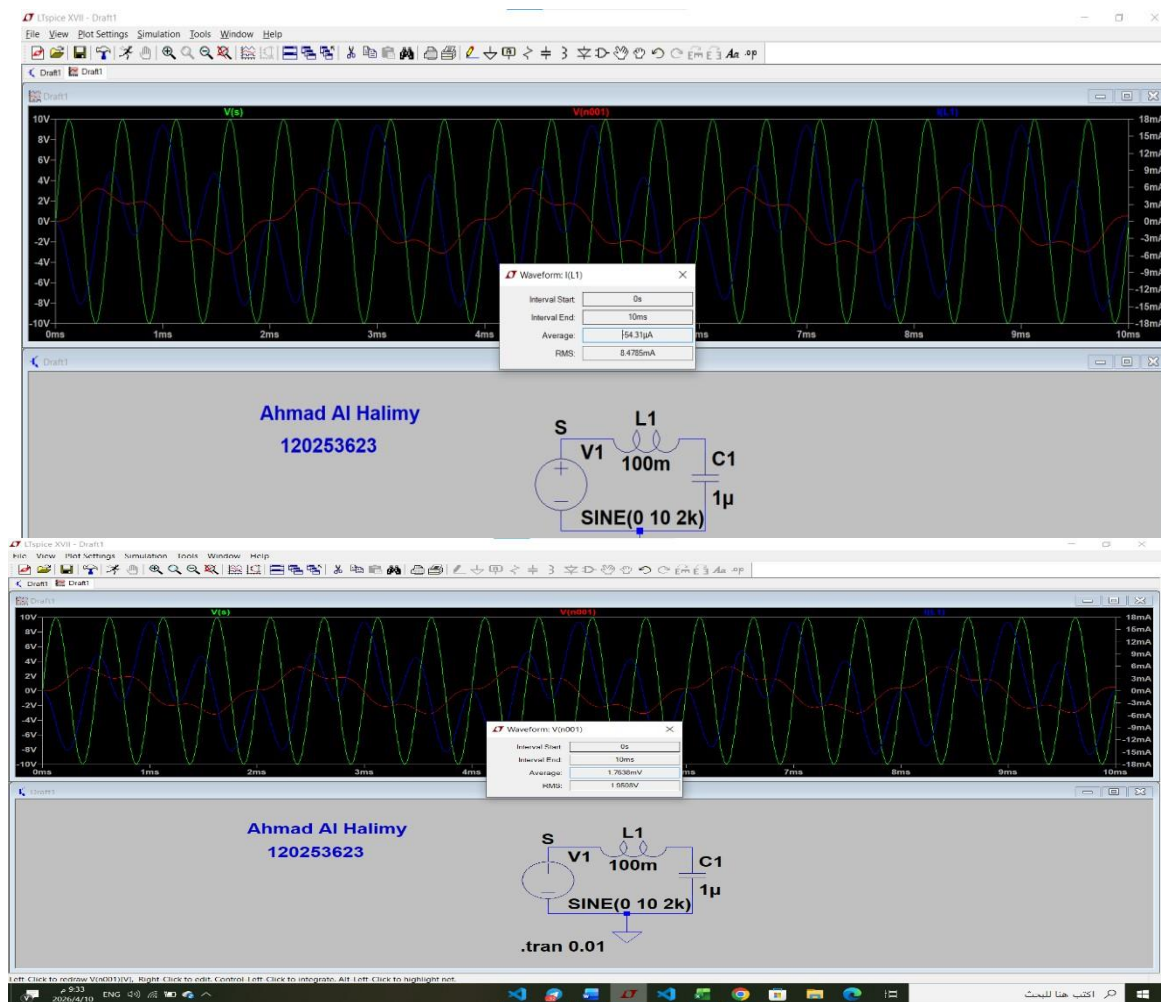
## Circuit 2: RC CIRCUIT



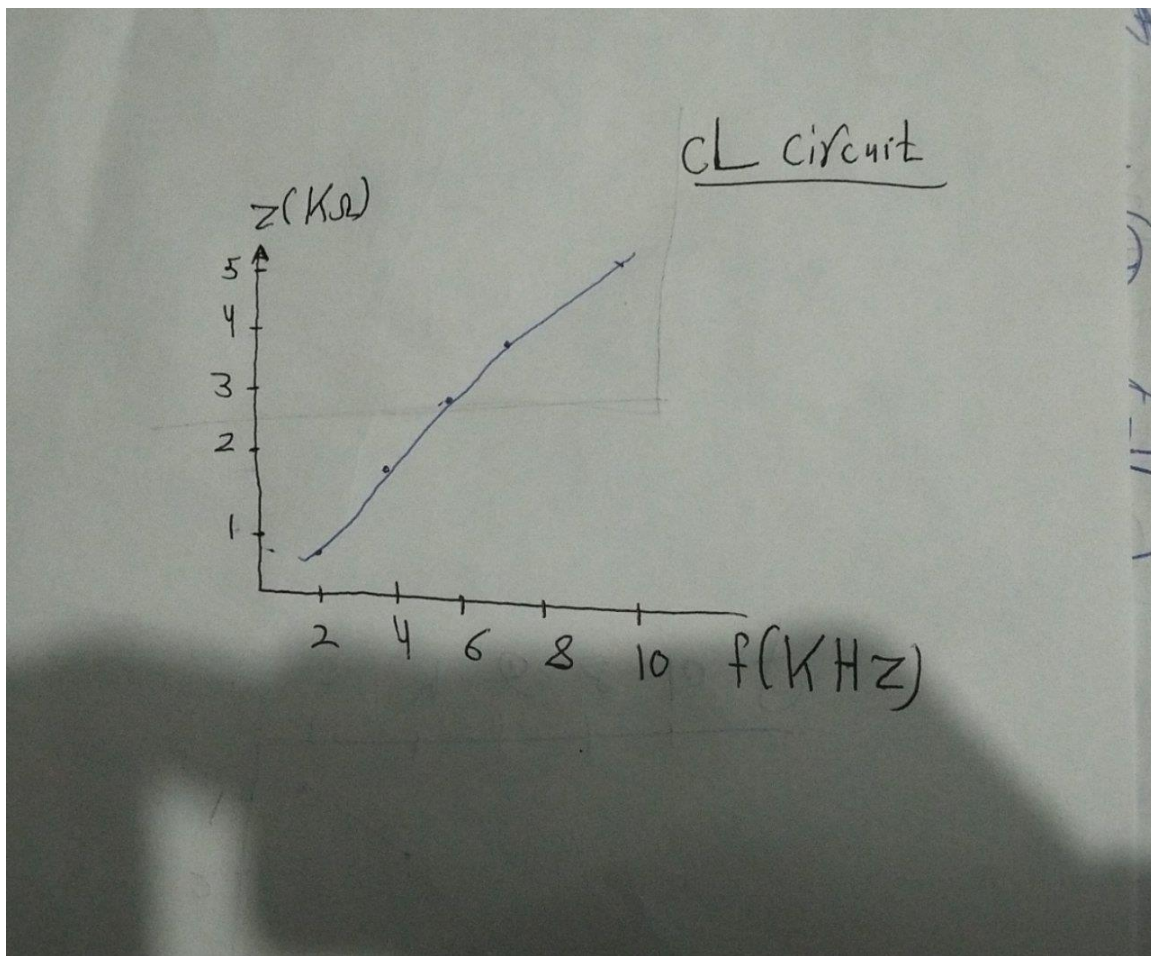
| G                | F                           | E         | D         | C         | B          | A                   |
|------------------|-----------------------------|-----------|-----------|-----------|------------|---------------------|
| Phase ( $\phi$ ) | $Z=V_S/I_S$<br>( $\Omega$ ) | $V_S$ (V) | $V_C$ (V) | $V_R$ (V) | $I_S$ (mA) | Frequenc<br>y (kHz) |
| 0.24'            | 104.109                     | £.0367V   | 0.0288V   | 70079V    | £.0079mA   | 2                   |
| 2.59'            | 100102û                     | 6.9681V   | 0.315V    | 6.961V    | 6.961mA    | 4                   |
| 1.69'            | 1000.43û                    | 6.9183V   | 0.204V    | 6.9153V   | 6.9153mA   | 6                   |
| 1.22'            | 1000.23û                    | 6.9101V   | 0.147V    | 6.9085V   | 6.9085mA   | 8                   |
| 0.93'            | 1000.13û                    | 6.9179V   | 0.112V    | 6.917V    | 6.917mA    | 10                  |



# Circuit 3:



| G                | F               | E       | D        | C        | B        | A               |
|------------------|-----------------|---------|----------|----------|----------|-----------------|
| Phase ( $\phi$ ) | Z ( $\Omega$ )  | VS (V)  | VC (V)   | VL (V)   | IS (mA)  | Frequency (KHz) |
| +90°             | 829.9 $\Omega$  | 7.0367V | 1.9508V  | 8.9875 V | 8.4785mA | 2               |
| +90°             | 1745.6 $\Omega$ | 6.9702V | 904.04mV | 7.8742 V | 3.9924mA | 4               |
| +90°             | 2715.6 $\Omega$ | 6.9305V | 6.9305V  | 13.861 V | 2.553mA  | 6               |
| +90°             | 3793.5 $\Omega$ | 6.9226V | 398.65mV | 7.3213 V | 1.8248mA | 8               |
| +90°             | 4902.7 $\Omega$ | 6.926V  | 299.64mV | 7.2256 V | 1.4131mA | 10              |



### Conclusion

- Proportional Relationship:** The results demonstrate a **direct relationship** between the source frequency and the total impedance. The total impedance ( $Z$ ) increases significantly as the frequency rises, which is clearly reflected in the upward trend of the plotted curve.

- **Inductive Nature:** Since the operating frequencies used in this experiment are above the resonant frequency, the **inductive reactance** of the coil dominates the circuit's behavior. This explains the observed positive phase angles.
- **L-C Interaction:** Inductive and capacitive reactances act in opposition (with a  $180^\circ$  phase shift). Given that inductive reactance increases while capacitive reactance decreases with frequency, the net impedance follows the behavior of the inductor in this frequency range.
- **Voltage Distribution:** The total source voltage represents the phase difference between the inductor voltage and the capacitor voltage. This explains why the voltage across an individual component can be higher than the source voltage in circuits with negligible resistance.