**A**

**Project Report**

**On**

# FAULT DETECTION IN POWER SYSTEM BY USING IoT

*Submitted to*

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, ANANTHAPURAMU**

*In Partial Fulfillment of the Requirements for the Award of the Degree of*

**BACHELOR OF TECHNOLOGY**

**In**

**ELECTRICAL & ELECTRONICS ENGINEERING**

**Submitted By**


**NAGA SAI CHAITANYA.M – 15691A0236**

**VEERESH KUMAR.A – 15691A0277**

**SREEKANTH REDDY.N – 16699A0213**

**GURUNADHA.G – 17690A0224**

**Under the Guidance of**

**Dr. A.V.PAVAN KUMAR,**

**Sr. Asst. Professor,**
**Department of Electrical & Electronics Engineering.**


**MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE**
**(UGC – AUTONOMOUS)**


**(Affiliated to JNTUA, Ananthapuramu, Approved by AICTE, New Delhi)**
**AN ISO 9001:2008 Certified Institution**
**P.B.No. 14, Angallu, Madanapalle – 517325, Chittoor Dist., Andhra Pradesh, India.**

**2016 – 2020**

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## DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

# BONAFIDE CERTIFICATE

This is to certify that the project work entitled **"FAULT DETECTION IN POWER SYSTEM USING IoT"** is a bonafide work carried out by

**NAGA SAI CHAITANYA.M - (15691A0236)**
**VEERESH KUMAR.A - (15691A0277)**
**SREEKANTH REDDY.N - (16699A0213)**
**GURUNADHA.G - (17690A0224)**

Submitted in partial fulfillment of the requirement for the award of **Bachelor of Technology** in the stream of **Electrical & Electronics Engineering** in **Madanapalle Institute of Technology and Science,** Madanapalle**,** affiliated to **Jawaharlal Nehru Technological University, Ananthapuramu** during the academic year 2019-2020.

Project Guide
**Dr. A.V PAVAN KUMAR,**
**Sr. Asst. Professor,**
**Department of EEE.**

Head of the Department
**Dr. LAKSHMANAN.S.A,**
**Head of the Department,**
**Department of EEE.**

Submitted for the university examination held on:

**Internal Examiner** **External Examiner**

| | |
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| | Ph:08571-280255,28090 fax:08571-280433<br>MADANAPLLE INSTITUTE OF TECHNOLOGY AND SCIENCE<br>(UGC ATONOMOUS INSTITUTION)<br>An engineering college sponsored by RATAKONDA RANGA REDDY EDUCATIONAL ACADEMY,<br>(Approved by AICTE,New Delhi and Affiliated to J.N.T.U.A, Anantapuramu),<br>An ISO 9001:2008 certified institution,<br>Madanapalle, Chittoor (Dist), A.P. |


## DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

# ORIGINALITY CERTIFICATE

This is to certify that the project report titled **"FAULT DETECTION IN POWER SYSTEM USING IoT" Submitted by NAGA SAI CHAITANYA.M (15691A0236), VEERESH KUMAR.A (15691A0277),**
**SREEKANTH REDDY.N (16699A0213), GURUNADHA.G (17690A0224)** has been evaluated using turnitin software for originally check. The similarity index is found to be which is verified and approved for submission.

Head of the Department
**Dr. LAKSHMANAN.S.A,**
**Departments of EEE.**

# DECLARATION

We hereby declare that the results embodied in this project **"FAULT DETECTION IN POWER SYSTEM USING IoT"** by us under the guidance of **Dr. A.V PAVAN KUMAR**, Sr.Asst. Professor, Dept. of EEE in partial fulfillment of the award of **Bachelor of Technology** in **Electrical & Electronics Engineering** from **Jawaharlal Nehru Technological University, Ananthapuramu** and we have not submitted the same to any other University/Institute for award of any other degree.

**Date :**

**Place :**

## PROJECT ASSOCIATES

**NAGA SAI CHAITANYA.M - (15691A0236)**

**VEERESH KUMAR.A - (15691A0277)**

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# ACKNOWLEDGEMENTS

The project reported here has been carried out in the **Department of Electrical & Electronics Engineering, Madanapalle Institute of Technology & Science.** We are greatly indebted to many persons for helping us complete this project work.

First and foremost, we would like to express our sense of gratitude and indebtedness to our guide **Dr. A.V PAVAN KUMAR,** Sr.Asst Professor, Department of EEE, for his inspiring guidance, encouragement, and untiring effort throughout the course of this project work. His timely help and painstaking efforts made it possible to present the work contained in this thesis.

We sincerely thank the **Management** of Madanapalle Institute of Technology and Science for providing excellent infrastructure and lab facilities that helped me to complete this project.

We sincerely thank **Dr. C. Yuvaraj,** Principal and **Dr. LAKSHMANAN.S.A**, Head of the Department, EEE for their kind support and concern regarding our academic requirements.

We would like to thank **Dr. Hira Singh Sachdev**, Sr. Assistant Professor & Project Coordinator, for his valuable suggestions and encouragement provided during the project reviews.

We express our thankfulness to the faculty and staff members of the Electrical Engineering Department for their continuous encouragement and suggestions.

We would like to express our greatest admiration to **all our family members, friends** and **relatives** for their positive encouragement that they showered on us throughout this project work.

Above all, we would like to thank **The Almighty God** for the wisdom and perseverance that he has been bestowed upon us during this project work, and indeed, throughout our life.

**NAGA SAI CHAITANYA.M - (15691A0236)**
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**K. SREEKANTH REDDY.N - (16699A0213)**
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## Table of Contents

# ABSTRACT

The main theme of this project is to get fault detection in power system using IoT based. Which type of fault is occurred in power system and the power system is a network which consists generation, transmission and distribution system. It uses the form of energy and converts it into electrical energy. The power system includes the devices connected to the system like generator, motor, transformer, CB, conductor, etc

Generation is the process of generating electric power from sources of primary energy. Power transmission is the bulk movement of electrical energy from a generation. Electric power distribution is the final stage in the delivery of electric power, it carries electricity from the transmission system to individual consumers. Often several customers are supplied from one transformer through secondary distribution lines. In this major project we diagnosis fault like L-L and L-G only at load side. the parameters of voltage and current values sets at normal range to the current and voltage sensors ,if any parameters of its values changes beyond normal range values with respect to that sensors and get notify which type of fault is occurred in power system. A fault in an electric power system can be defined as any abnormal condition of the system that involves the electrical failure of the equipment, such transformers, generators, busbars, etc. The faults in power system causes over current, under voltage, unbalance of the phases, reversed power and high voltage surges. This results in the interruption of the normal operation of the network, failure of equipment’s, electrical fires.

# CHAPTER 1: INTRODUCTION

Power systems all over the world are experiencing huge and rapid expansion. End users who are very sensitive to power outages are demanding reliable and uninterrupted supply of electric power. On the other side, the appearances of large generations and highly interconnected systems are making early fault detection and rapid equipment isolation the most important functions to maintain system stability. One of the factors that hinder the continuous supply of electricity and power is a fault in the power system. Power lines encounter various faults due to tree contact, animal contact or other natural causes such as thunderstorms. These faults cannot be avoided, since they occur because of natural reasons which humans cannot control. It is very important to have protection system that can detect any abnormal flow of current in the power system, identifies the type of fault and accurately locates the position of the fault in the power system. The automatic location of the fault can greatly enhance the systems reliability because faster the power is restored, more money and time is saved. Conventional algorithms based on deterministic computations and well-defined model of power lines, are resulting in the late detection and inaccurate results. Conventional distance relays consider power swing as a fault. Such malfunctioning could lead to serious disturbance of power system stability.

In our project we have used IoT(Internet of Things) in order to get notified about the type of fault which has occurred.

Generally, IoT is a thing-to-thing network on the basis of Internet that can connect every object through information sense devices, exchange information and communicate with each other, to identify, track, monitor and manage the object In power industry, IoT can realize intelligent application oriented smart grid, taking advantage of multi-type sensors and RFID devices, communication networks and combining information processing methods. IoT can greatly improve the capacities of information perception and exchange, and can be extensively applied in every

link of power grid, including generator, transmission, transformation, distribution and consumption. So every part of smart grid is integrated seamlessly.
much attention of industry, academia and governments. Because of its strong capacities of information perception and collection, IoT can acquire accurate status information of the objects and provide plentiful multi-source information related with faults for diagnosis by deploying multi-type sensors and utilizing RFID devices. So, multi-source symptom information can be guaranteed. Information fusion is an information processing method for uncertain problems. It can lower the uncertainty, describe the objects more comprehensive, and get more precise and reliable diagnosis results by processing multi-source information than the method based on single-source information. A new fault diagnosis method for PE based on IoT is proposed in this paper. This method makes full use of the redundant and complementary of on-line monitoring and patrol information, which are derived from IoT, and fuses the information with the help of some intelligent algorithms, which makes the diagnosis results more reliable, and the maintenance work will become more convenient.

**Definition:** The power system is a network which consists of generation, distribution and transmission system. It uses the form of raw energy (like coal and diesel) and converts it into electrical energy. The power system includes the devices connected to the system like the synchronous generator, motor, transformer, circuit breaker, transmission line etc.

The power plant, transformer, transmission line, substations, distribution line, and distribution transformer are the six main components of the power system. The power plant generates the power which can be step-up or step-down through the transformer for transmission.
The transmission line transfers the power to the various substations. The power is transferred to the distribution transformer through substation, which step-down the power to the appropriate value which is suitable for the consumers.



a.

# Structure of Power System

The power system is the complex enterprise that may be subdivided into the following sub-systems. The subsystems of the power system are explained below in details.

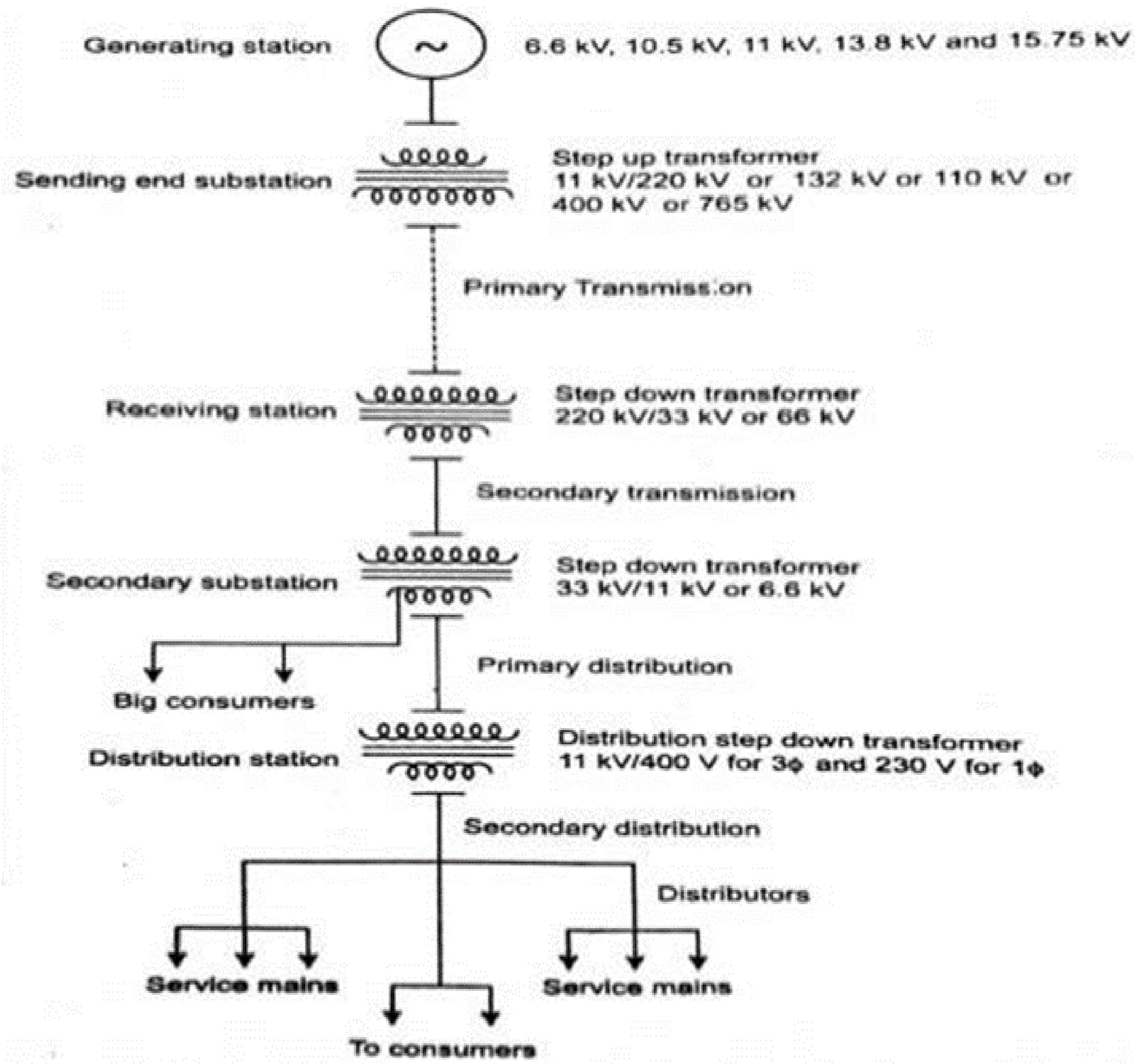



**Fig-1: Structure of Power System**

## Generating Substation

In generating station, the fuel (coal, water, nuclear energy, etc.) is converted into electrical energy. The electrical power is generated in the range of 11kV to 25kV, which is step-up for long distance transmission. The power plant of the generating substation is mainly classified into three types, i.e., thermal power plant, hydropower plant and nuclear power plant.

The generator and the transformer are the main components of the generating station. The generator converts the mechanical energy into electrical energy. The mechanical energy comes from the burning of coal, gas and nuclear fuel, gas turbines, or occasionally the internal combustion engine.

The transformer transfers the power with very high efficiency from one level to another. The power transfer from the secondary is approximately equal to the primary except for losses in the transformer. The step-up transformer will reduce losses in the line which makes the transmission of power over long distances.

## Transmission Substation

The transmission substation carries the overhead lines which transfer the generated electrical energy from generation to the distribution substations. It only supplies the large bulk of power to bulk power substations or very big consumers.

The transmission lines mainly perform the two functions

1. It transports the energy from generating stations to bulk receiving station.
2. It interconnects the two or more generating stations. The neighboring substations are also interconnected through the transmission lines.

The transmission voltage is operating at more than 66kv and is standardized at 69kv, 115KV, 138KV, 161KV, 230KV, 345KV, 500KV, and 765KV, line-to-line. The transmission line above 230KV is usually referred to as extra high voltage (EHV).

The high voltage line is terminated in substations which are called high voltage substations, receiving substations or primary substations. In high voltage substation, the voltage is step-down to a suitable value for the next part of flow toward the load. The very large industrial consumers may be served directly to the transmission system.

## Sub-transmission Substation

The portion of the transmission system that connects the high voltage substations through the step-down transformer to the distribution substations is called the sub- transmission system.

The sub-transmission voltage level ranges from 90 to 138KV. The sub-transmission system directly serves some large industries. The capacitor and reactor are located in the substations for maintaining the transmission line voltage.

The operation of the sub-transmission system is similar to that of a distribution system. Its differ from a distribution system in the following manner.

1. A sub-transmission system has a higher voltage level than a distribution system.
2. It supplies only bigger loads.

## Distribution Substation

The component of an electrical power system connecting all the consumers in an area to the bulk power sources is called a distribution system. The bulk power stations are connected to the generating substations by transmission lines. They feed some substations which are usually situated at convenient points near the load centers.



a.

The substations distribute the power to the domestic, commercial and relatively small consumers. The consumers require large blocks of power which are usually supplied at sub-transmission or even transmission system.

## Power System Faults

**What is a Fault?**

In electric power system, a fault may be defined as any abnormal electric current flow in the circuit.

**Types of Faults:**

There are mainly two types of faults in the electric power system. Those are

1. Symmetrical Faults
2. Unsymmetrical Faults

## 1. Symmetrical Faults:

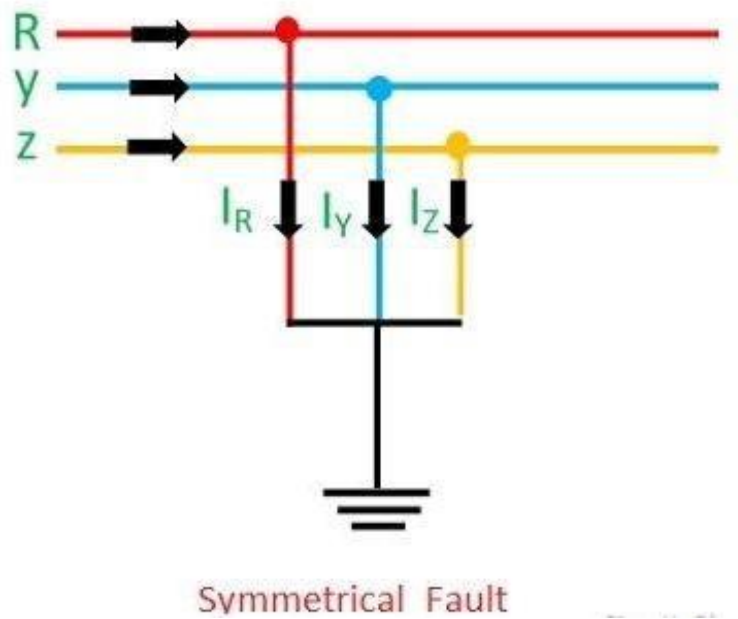



**Fig-2: Symmetrical Fault**

These are also called as Balanced Faults.

These types of faults are infrequent and most dangerous.

There are mainly two types of faults in Symmetrical Faults:

1. L-L-L Fault



a.

2. L-L-L-G Fault

**a) L-L-L Faults**

Whenever a Line-Line-Line gets short circuited a L-L-L Fault Occurs. Only 2-5% of power system faults are symmetrical faults. If these faults occur, the system remains balanced but results in severe damage to the electrical power system equipment.

**b) L-L-L-G Faults**

These are very common and less severe...
There are mainly three types namely line to ground (L-G), line to line (L- L), and double line to ground (LL-G) faults.

Whenever the three lines and ground get short-circuited a L-L-L-G Fault occurs.

## 2. Unsymmetrical Faults:

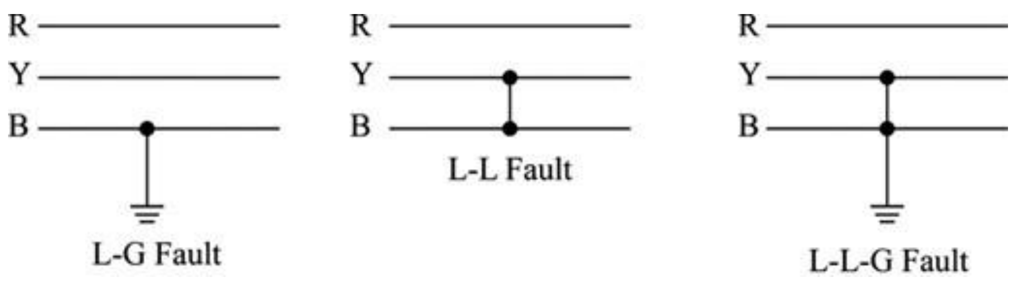



**Fig-3: Unsymmetrical Fault**

**a) Line-Ground Fault (L-G):**

This is the most common occurring fault. Whenever a line and ground gets connected an L-G fault occurs.

**b) Line-Line Fault (L-L):**

A line to line fault or unsymmetrical fault occurs when two



a.

conductors are short circuited.

## c) Line-Line-Ground Fault (L-L-G):

LLG (Line-Line-Ground) is an asymmetrical fault which is less severe than symmetrical fault.15 to 20 percent of faults are double line to ground and causes the two conductors to make contact with ground. These are also called unbalanced faults since their occurrence causes unbalance in the system.

Unsymmetrical faults are normal fault which means the three phase lines become unbalanced (unequal currents with unequal phase shifts in a three phase system.) and they do not have the

equal phase displacement each other's. The unbalance load occurs due to the presence of the short circuit or open circuit of the transmission or distribution lines. Coming to the types of faults, it occurs between line-to-ground or between lines. An unsymmetrical series fault is between phases or between phase-to-ground, whereas unsymmetrical shunt fault is an unbalanced in the line impedances.

Also it can occur either by natural disturbances or by manual errors. The natural disturbances are heavy wind speed, ice loading on the lines, lightening strokes and other natural disasters.

# CHAPTER 2: OBJECTIVES AND CIRCUIT DIAGRAM

## 2.1 Objectives:

There are mainly four objectives in the project.

1. **Study of Power System faults**
2. **Simulation of the power system faults**
3. **Hardware Implementation of the system**
4. **Testing of system.**

By now we have analyzed the problems associated with **Faults** and **Short Circuits.** As these will not only interrupt the power supply but also will damage the transmission lines and power grid leading to the loss of Consumer as well as supplier.

Therefore it is very important to find and locate the type of fault that has occurred. Our project essentially solves this problem by identifying the fault and getting notification about it.

## 2.2 Circuit Diagram:

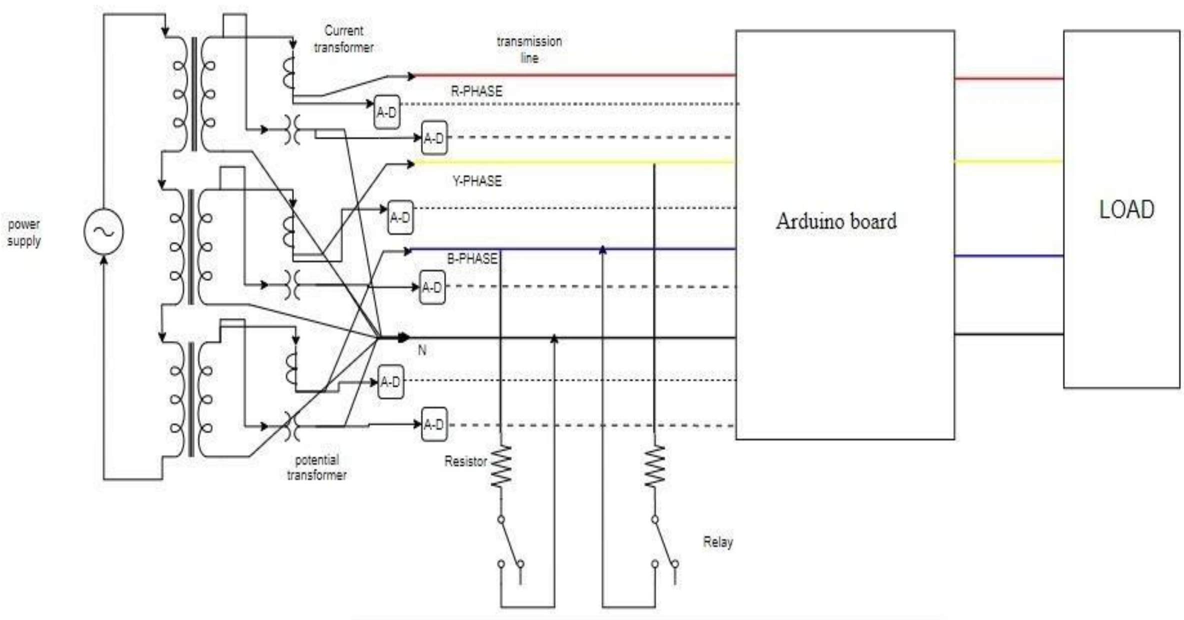


**Fig-4: Circuit Diagram**

## Components used:

1. 3 Single phase transformers of each rating 220v
2. 3 Step down transformers 220/12v.
3. 3 Current transformers
4. Arduino Board
5. Resistors of 1k ohm



a.

# CHAPTER 3 : SIMULATION

The simulation is performed in MATLAB for different kind of faults we have discussed. And the waveforms are studied for various faults.

The transformer used here is of 0.5KVA and step down transformer. It steps downs from 220v/110v

The below fig shows the MATLAB simulation of transmission system at L-G Fault condition.

## 3.1 . L-G Fault Simulation

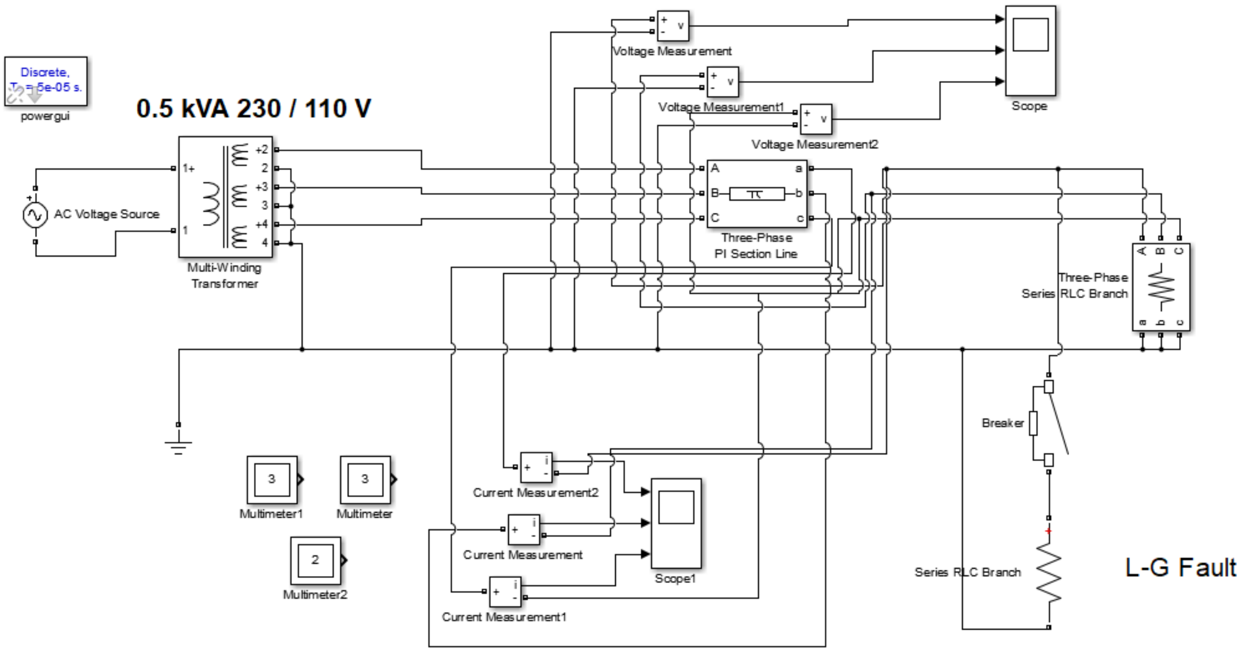



**Fig 5: Simulation of L-G Fault**

The above figure shows the simulation of L-G Fault.

In the above simulation AC source 230 V is connected to 0.5kVa 230/110V transformer where the secondary side is connected to load using three phase PI section line through transmission line of 10km.

The LG Fault is create through a switch and low value of resistance

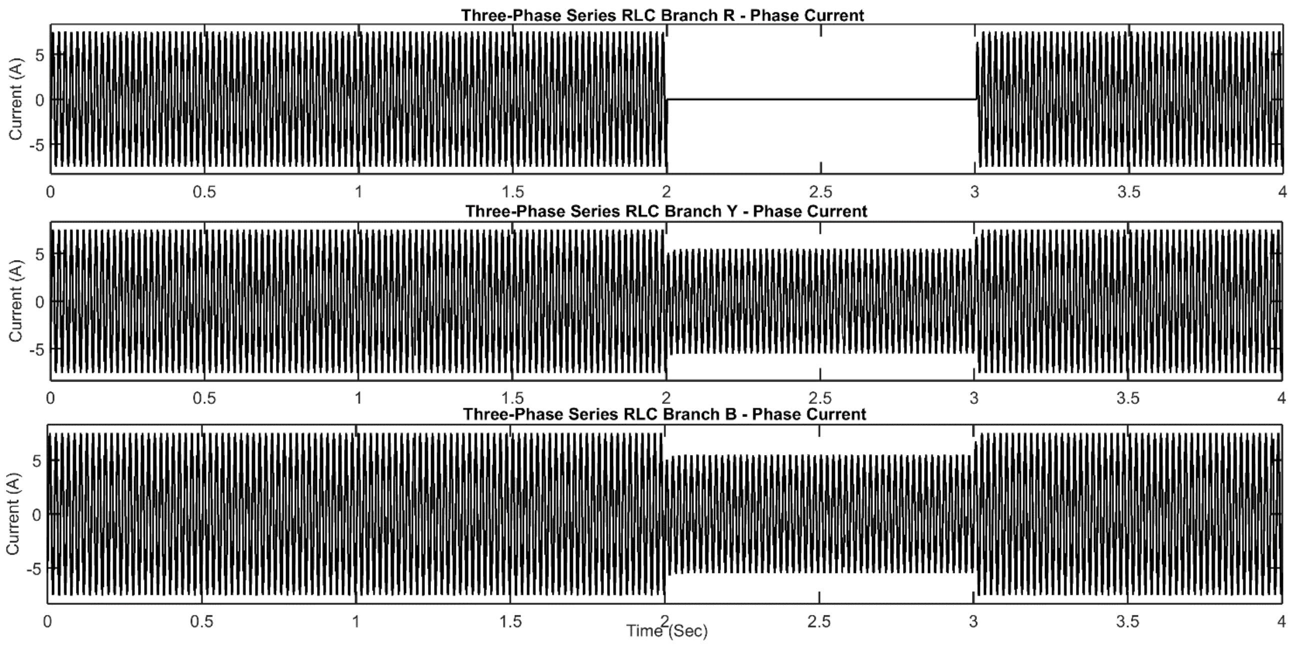



**Fig 6: Current waveform during LG Fault condition**

The above fig shows the load current and time relationship during L-G Fault condition each phase. We have observed that the fault has occurred between 2-3 secs. Current in R phase has become zero. Here the fault has occurred only in R-phase only. So we have observed that the remaining two phases Remained same.

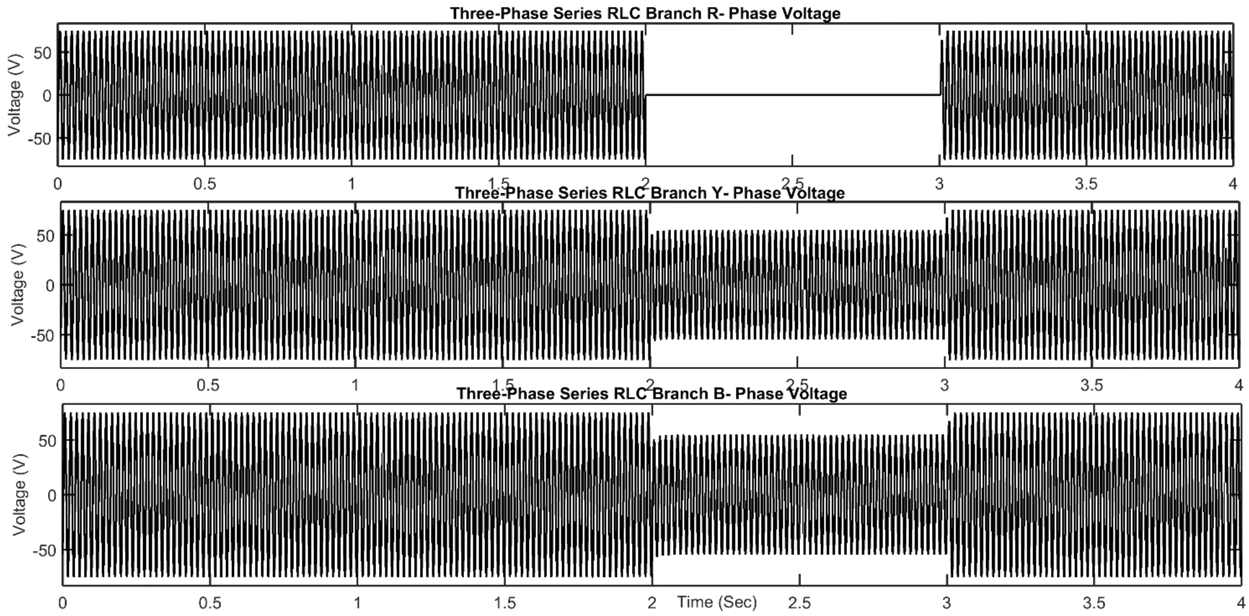



**Fig 7: Voltage waveforms during L –G Fault condition.**

The above fig shows the Voltage and time relationship during L-G Fault condition each phase. We have observed that the fault has occurred between 2-3 secs. Voltage became zero during fault condition.

Here the fault has occurred only in R-phase only. So we have observed that the remaining two phases Remained same.

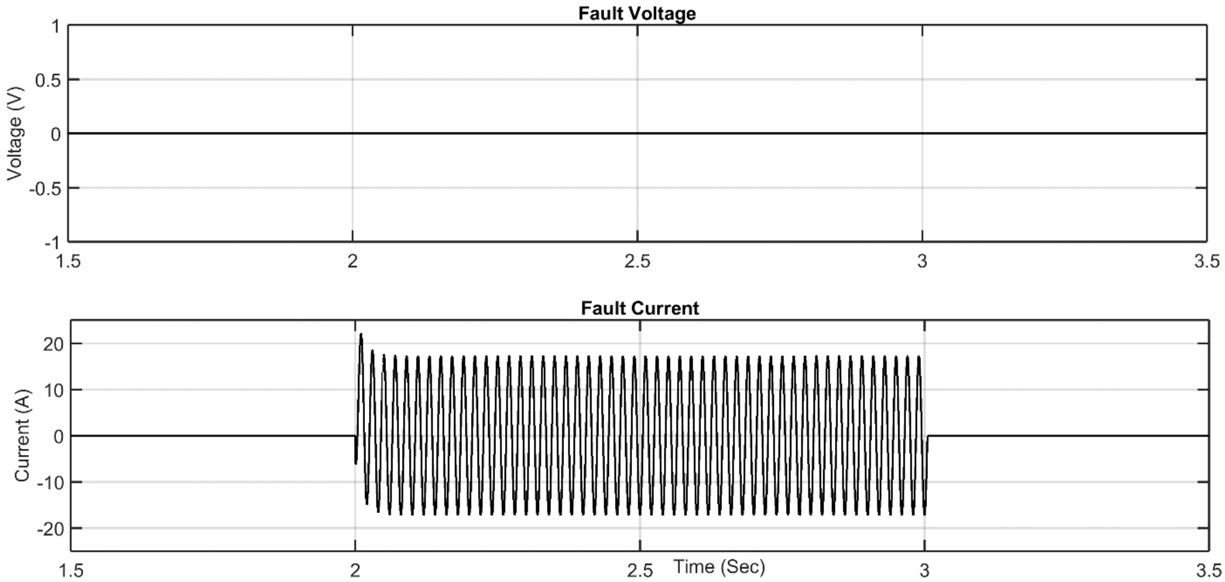



**Fig 8: Fault voltage and fault current during L-G Fault.**

The above fig shows fault voltage and current during the period of fault.

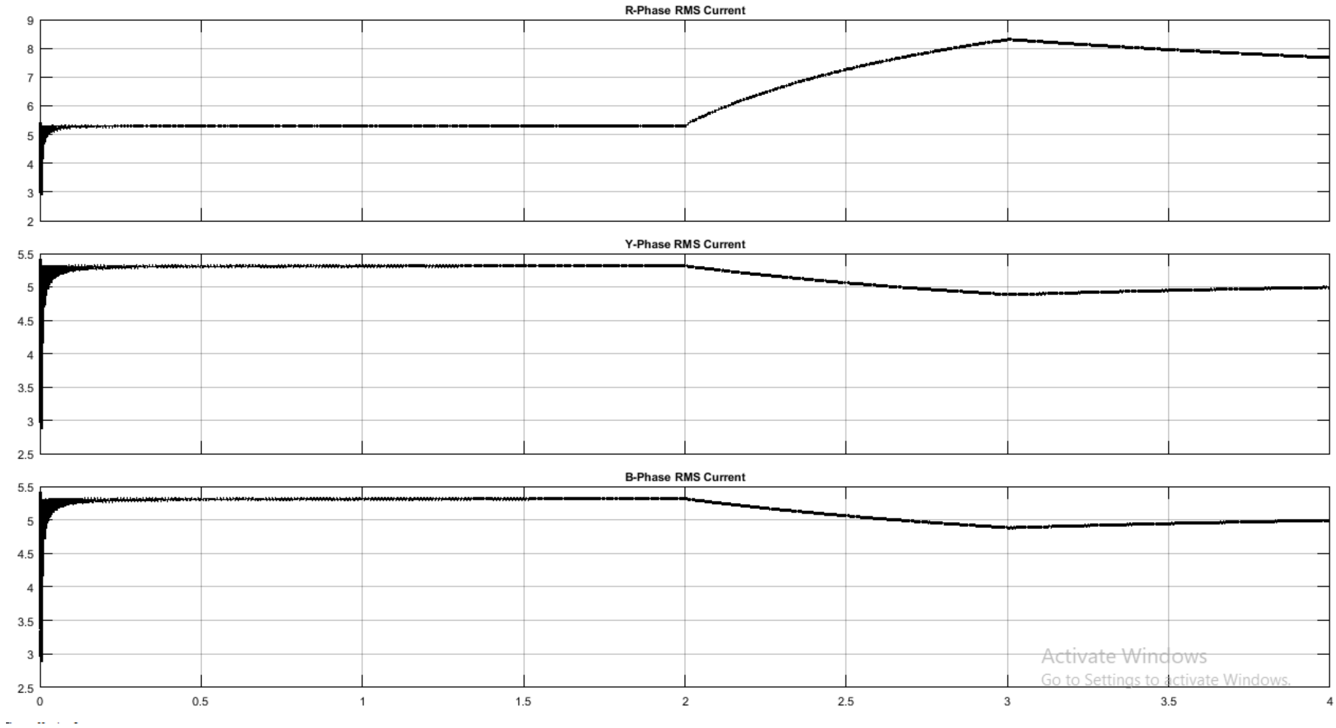



**Fig 9: RMS values of currents in each phase in L-G Fault**

From the above waveforms we can observe that RMS Current before fault is around 5A

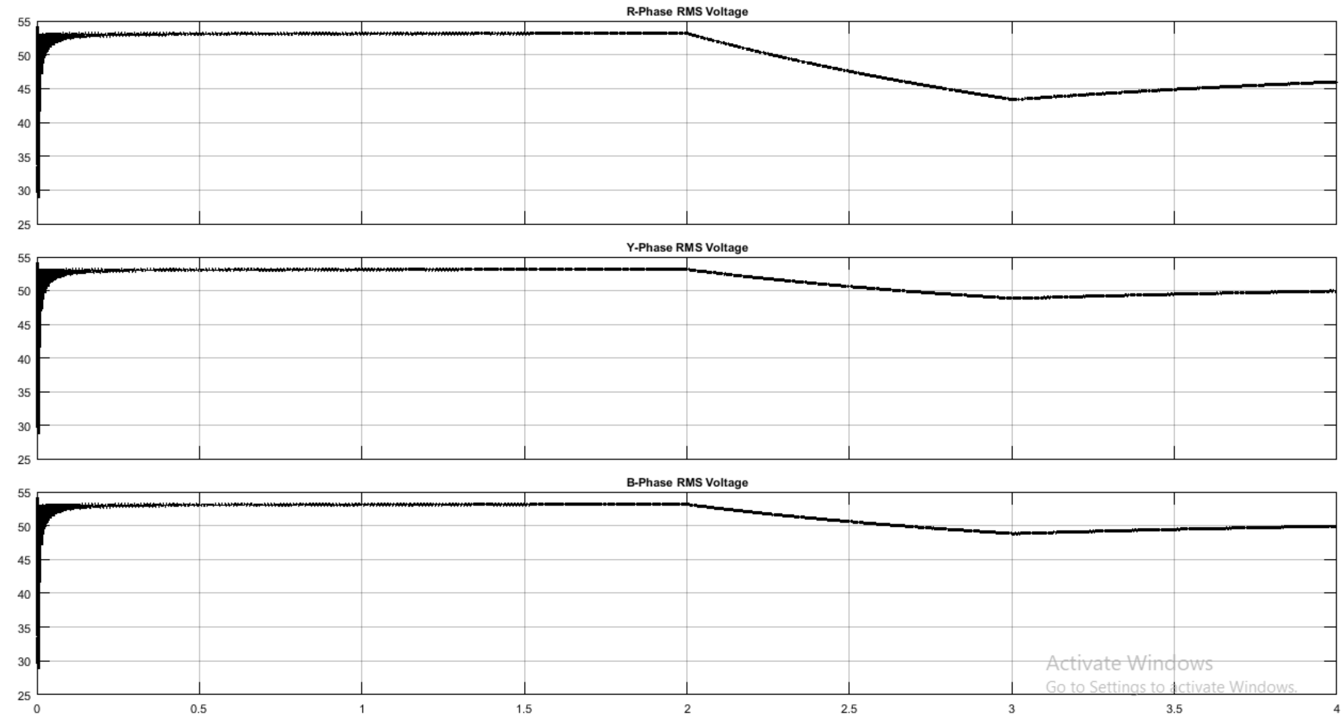



**Fig 10: RMS values of voltages in each phase in L-G Fault**

From the above waveforms we can observe that RMS Voltage before fault is around 55V.

## 3.2 Simulation of L-L-G Fault

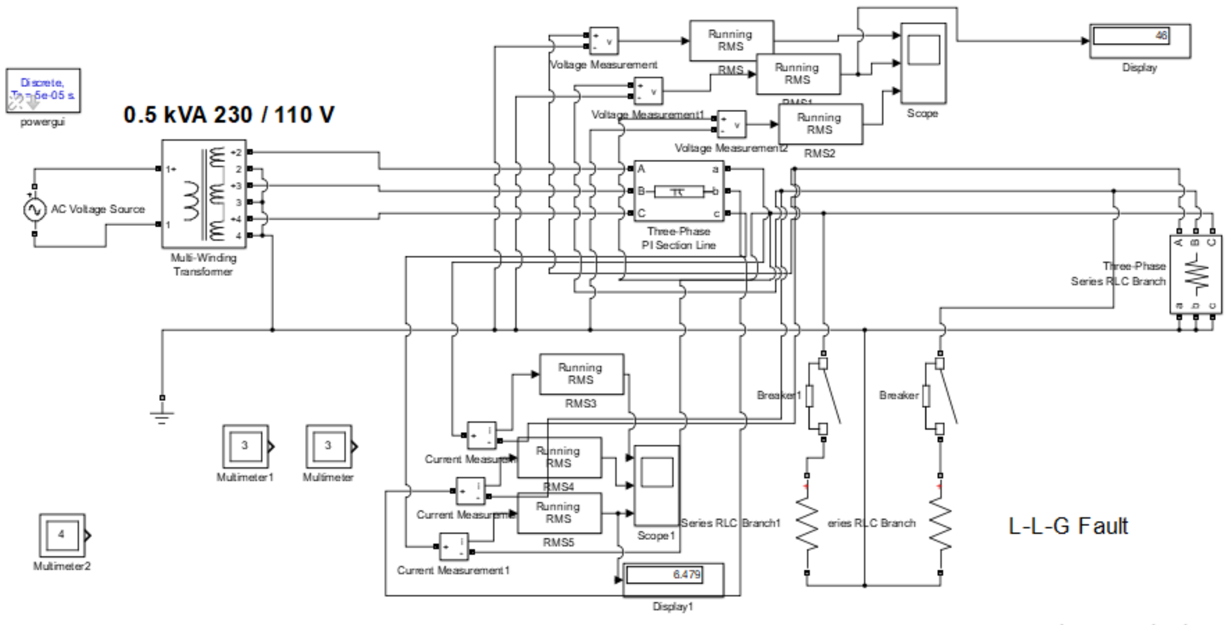



**Fig -11: L-L-G Fault Simulation**

The above figure shows the simulation of L-L-G Fault.

In the above simulation AC source 230 V is connected to 0.5kVa 230/110V transformer where the secondary side is connected to load using three phase PI section line through transmission line of 10km.

The L-L-G Fault is created through a switch and low value of resistance.

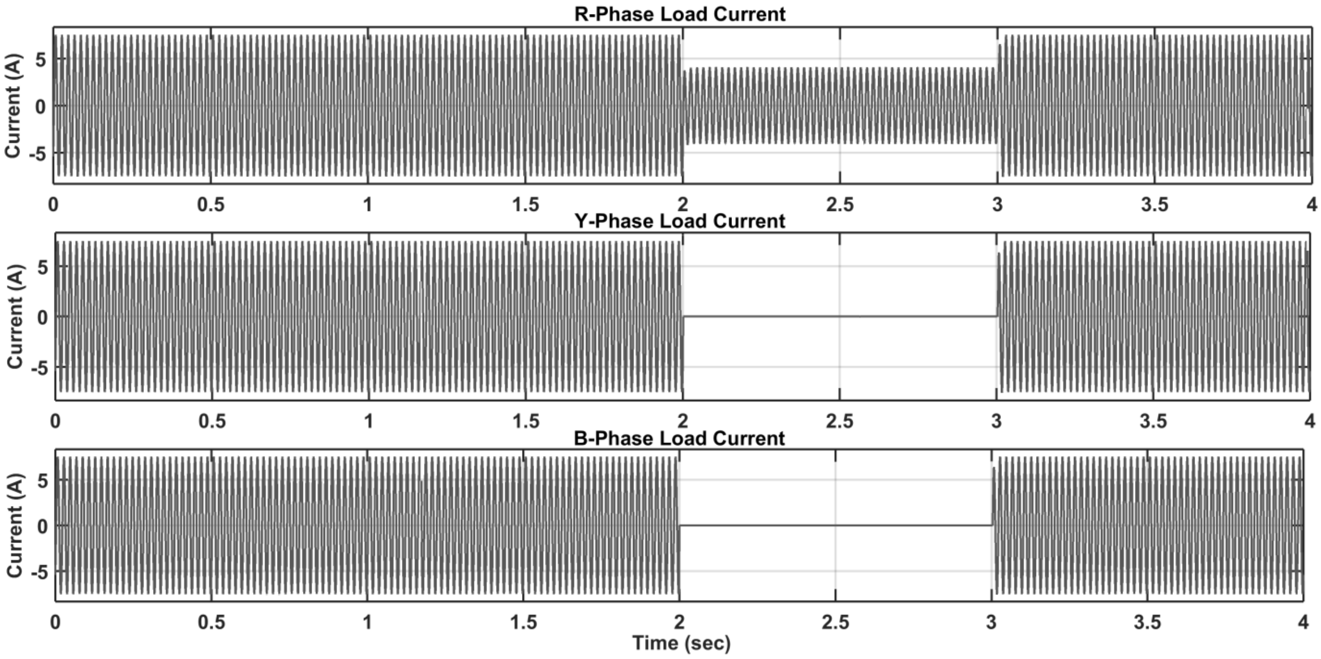



**Fig-12: Load current in L-L-G Fault condition.**

The above fig shows the current and time relationship during L-L-G Fault condition each phase.

We have observed that the fault has occurred between 2-3 secs.

Here the fault has occurred only in two phases(R-Y). We have observed that the current became zero in B And Y phases during fault period.

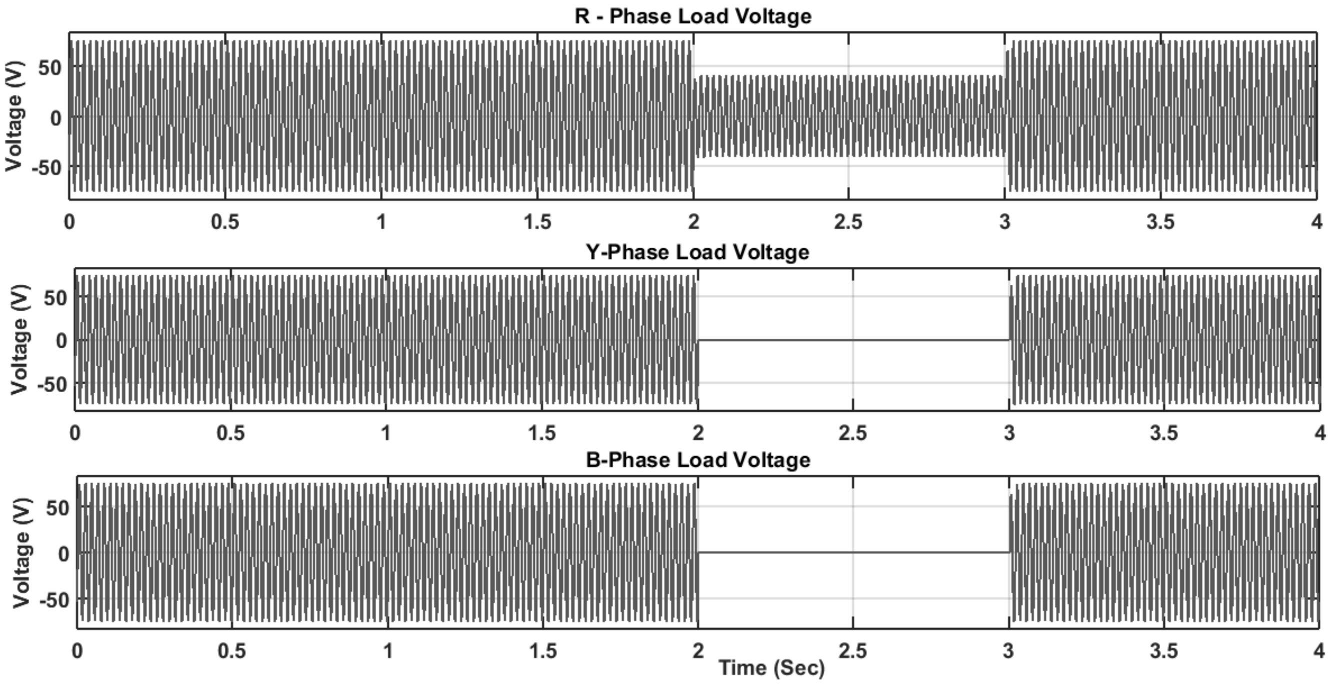



**Fig 13: Load voltage in L-L-G condition**

The above fig shows the load voltage and time relationship during L-L-G Fault condition in each phase.

We have observed that the fault has occurred between 2-3 secs. The voltage has became zero in Y and B phases.

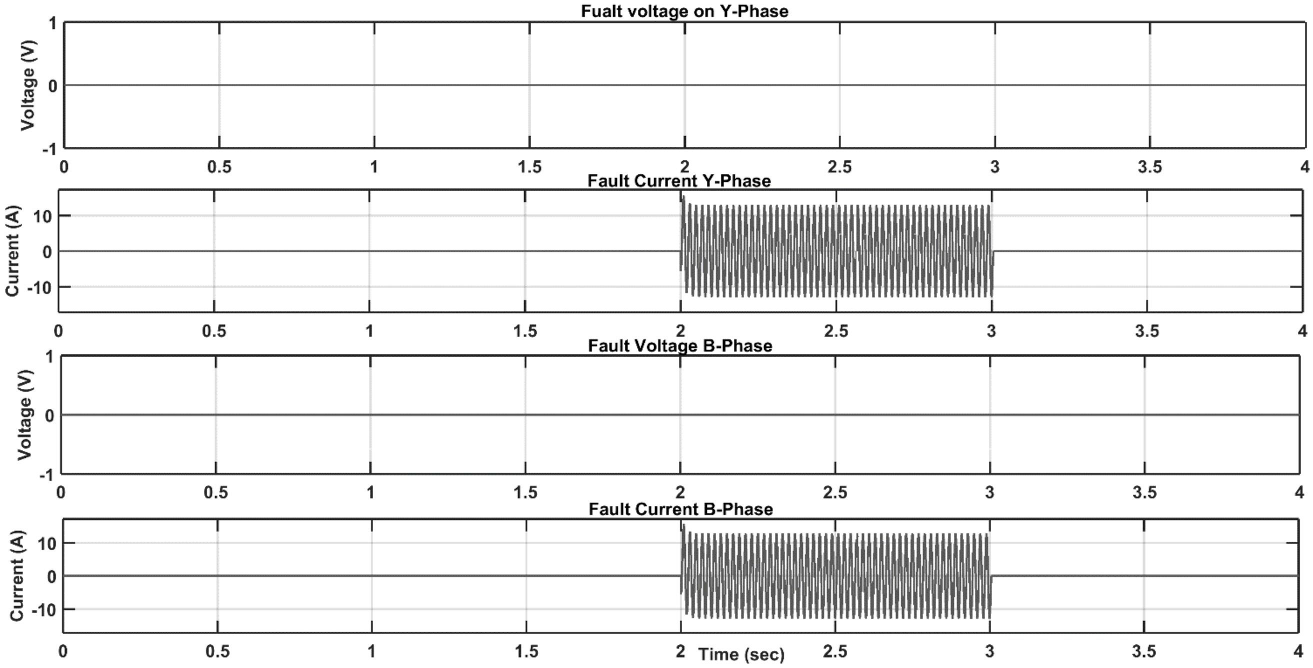



**Fig 14: Voltage and Current during L-L-G Fault**

The above waveform shows current and voltage at fault condition.

We have observed that voltage has become zero in Y-phase and B-phase during fault.

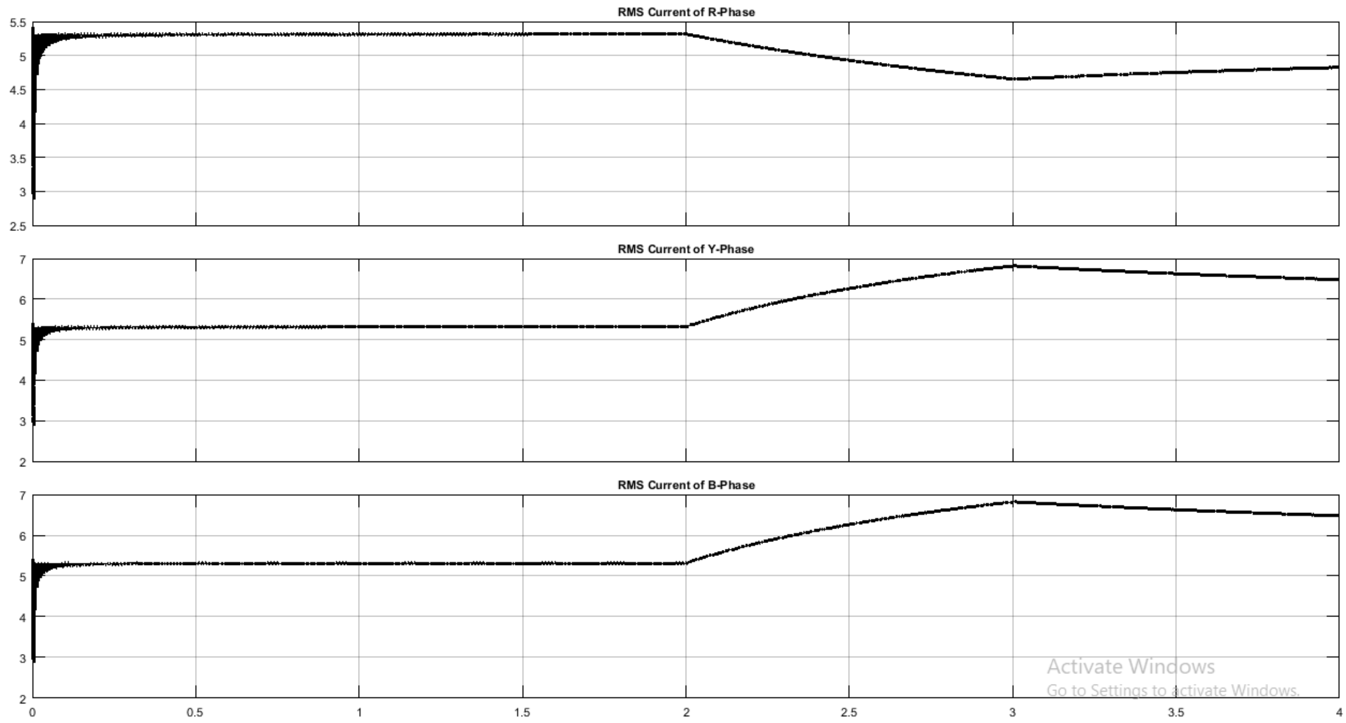
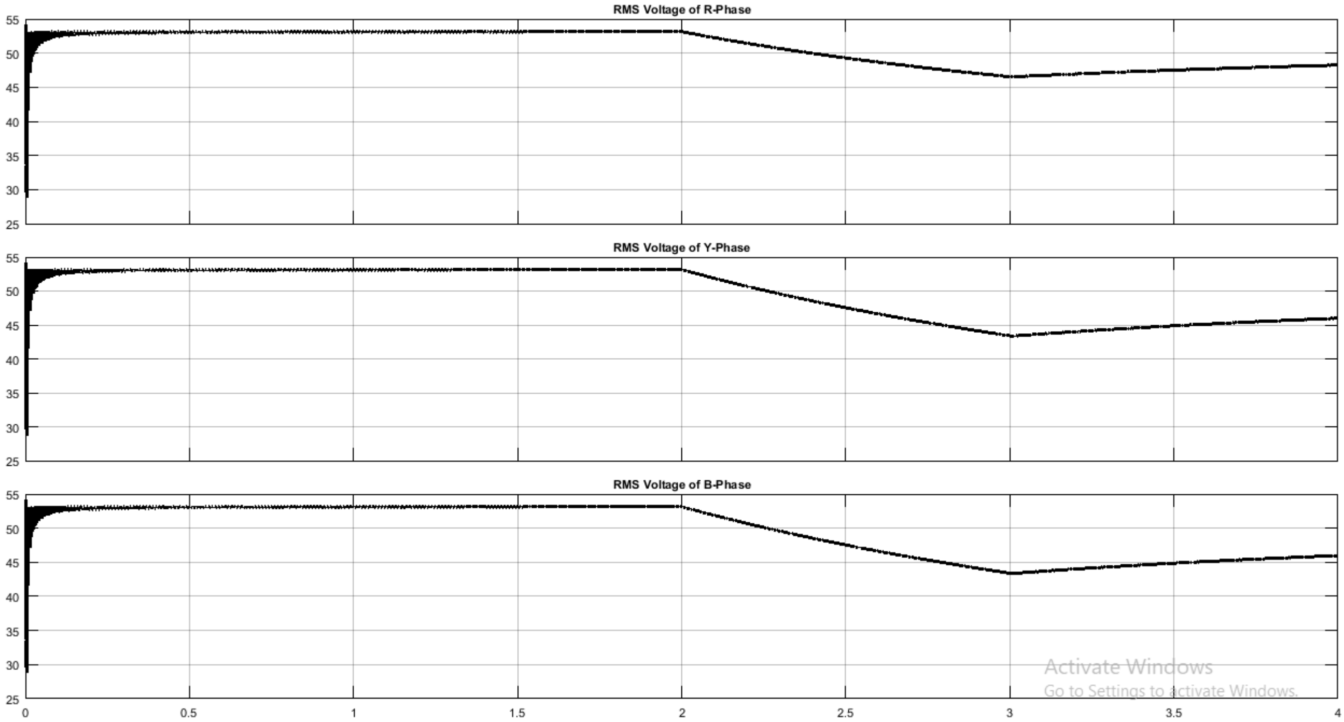



**Fig 15: RMS values of currents during L-L-G Fault.**

The above waveform shows RMS values of currents during L-L-G fault.

The RMS current is around 5.5A during normal condition.



Activate Windows
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**Fig 16: RMS values of voltages during L-L-G Fault.**

The above fig shows RMS vaules of voltage at each phase during L-L-G Fault condition.
The RMS Voltage before fault is around 54V and but after fault it got dropped to 46V and again it got back normal condition after some time.

Only Y and B phases differed very much compared to R phase.

# Simulation of L-L-L-G Fault

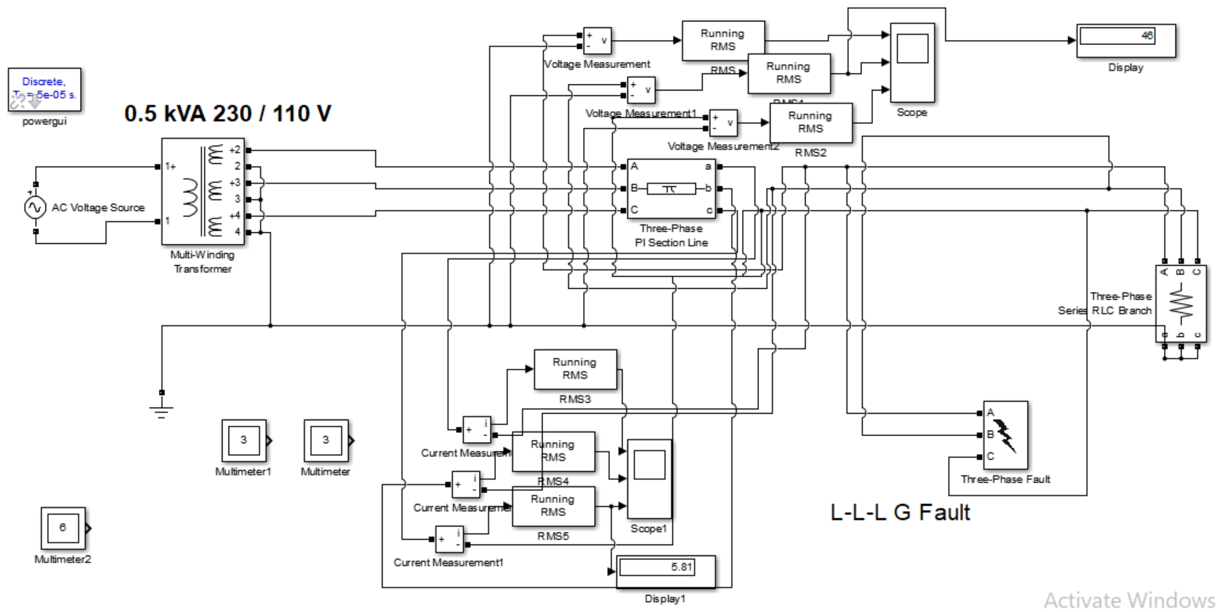


**Fig 17: Simulation of L-L-L-G Fault**

The above figure shows the simulation of L-L-L-G Fault.

In the above simulation AC source 230 V is connected to 0.5kVa 230/110V transformer where the secondary side is connected to load using three phase PI section line through transmission line of 10km.

The L-L-L-G Fault is created through a switch and low value of resistance.

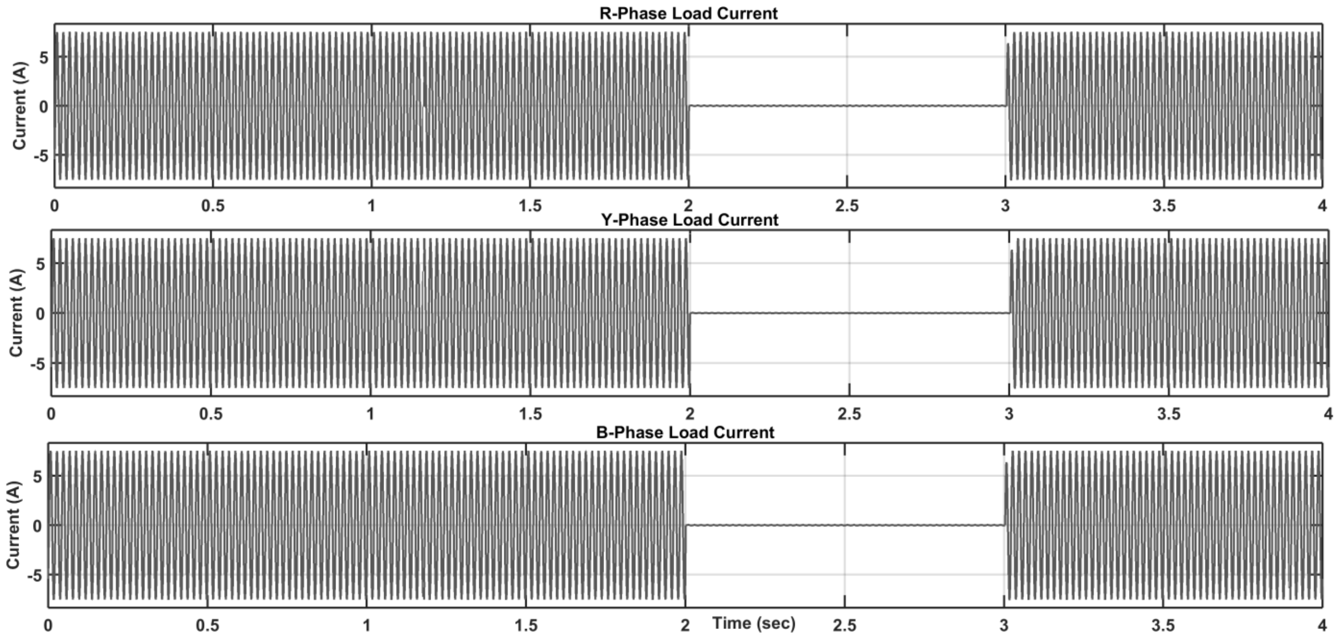


**Fig 18: Load current in L-L-L-G Fault**

The above fig shows the Current and Time relationship during L L L-G Fault condition each phase. The fault has occurred between 2-3 secs and current becomes zero during this condition.

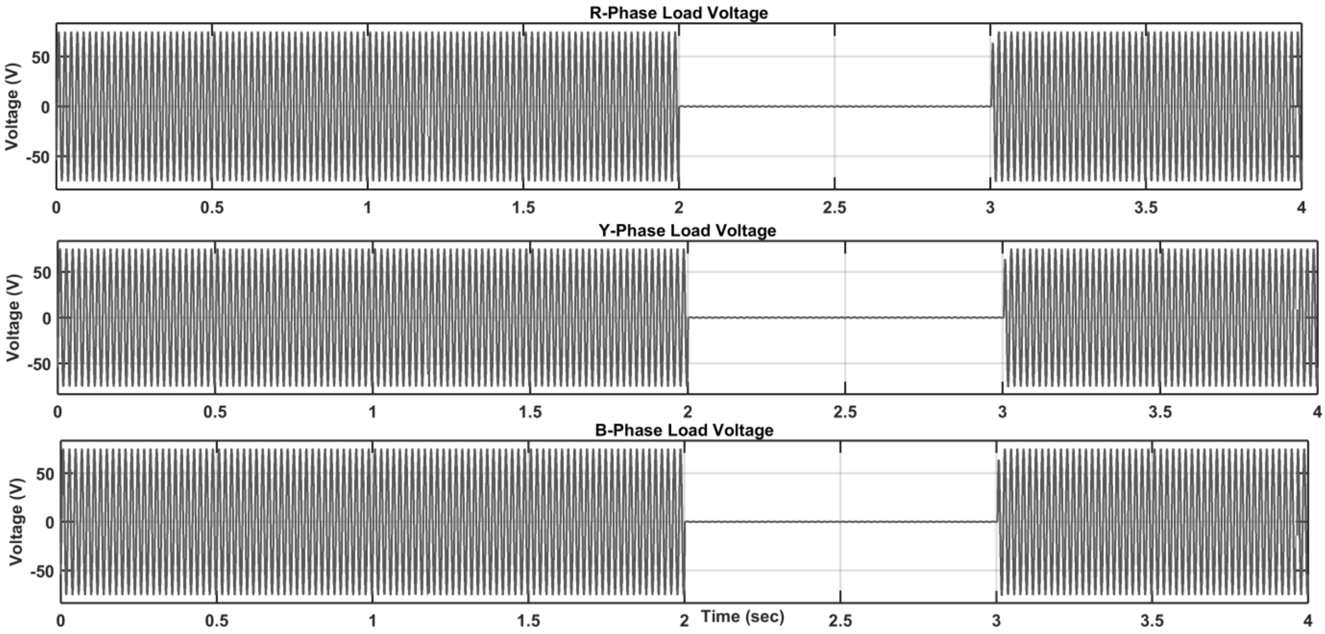


**Fig 19: Load voltage in L-L-L-G Fault**

The above fig shows the Voltage and Time relationship during L L L-G Fault condition each phase.

The fault has occurred between 2-3 secs and current becomes zero during this condition.

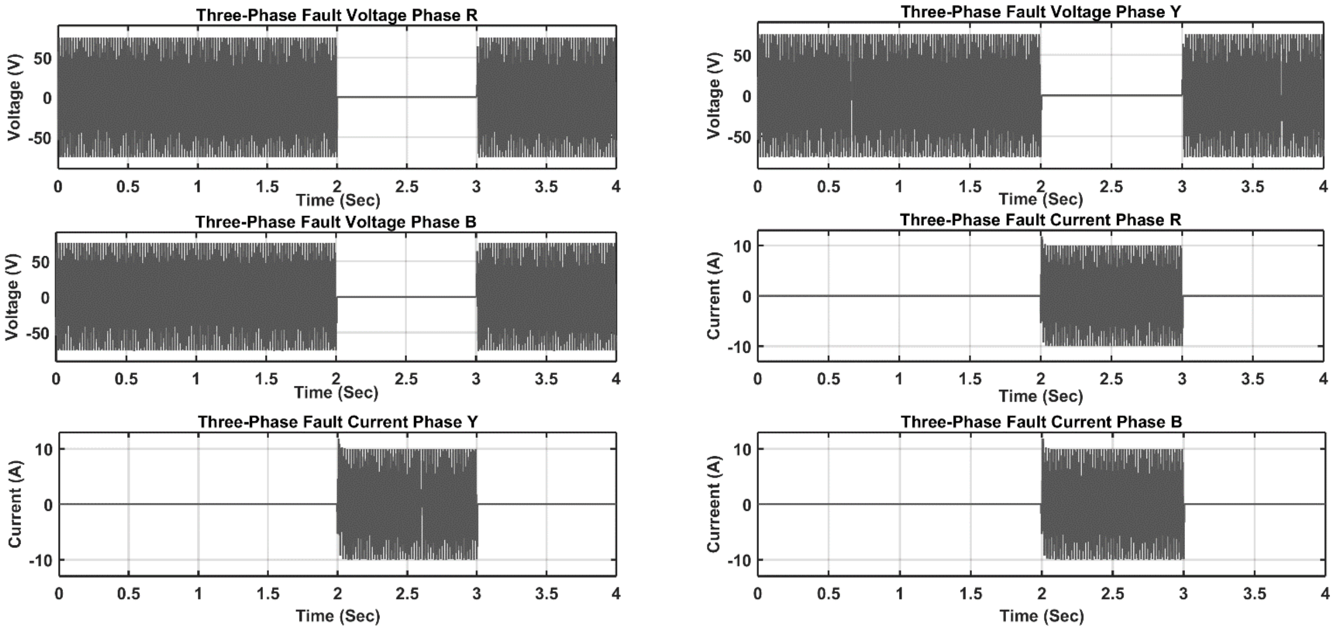


**Fig 20: Fault voltage and current during L-L-L-G Fault**

The above waveforms shows fault voltage across each phase during L-L-L-G Fault

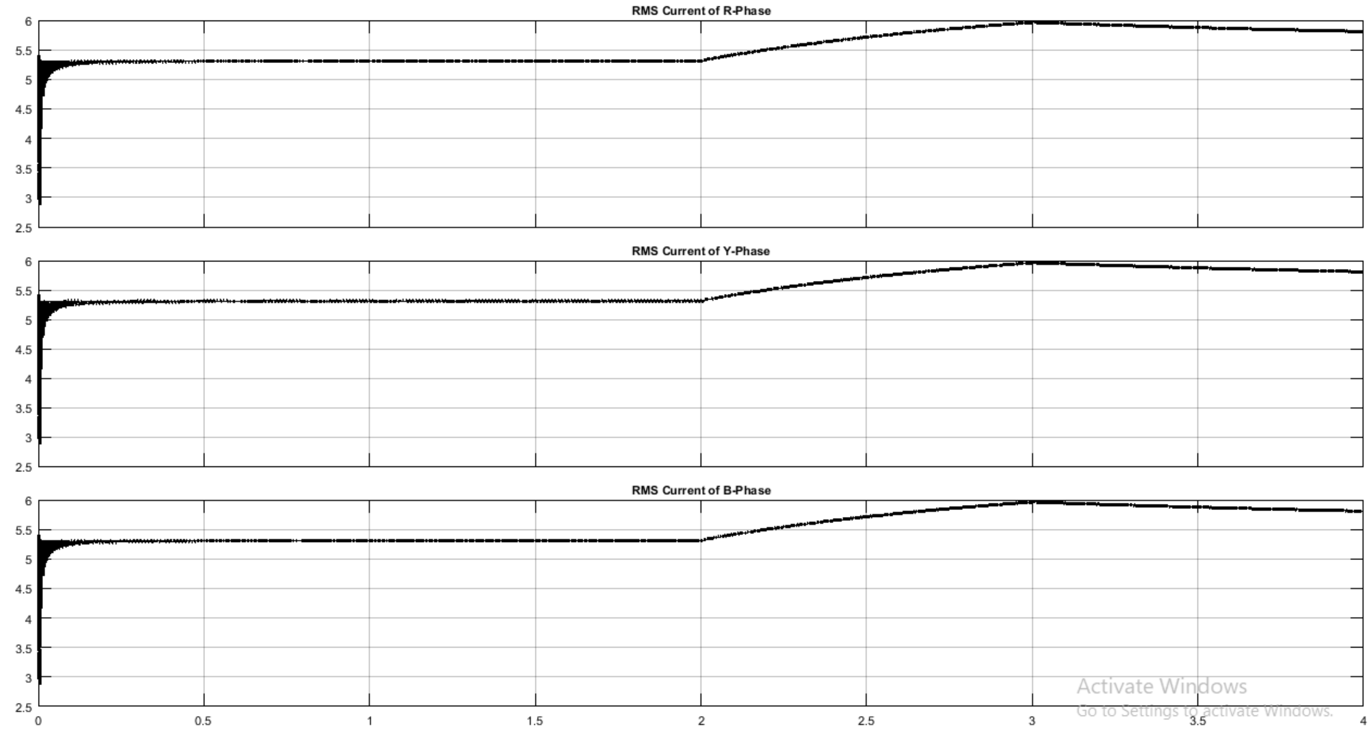


**Fig 21: RMS values of currents in phase during L-L-L-G Fault**

The above fig shows RMS vaules of curent at each phase during L-L-L-G Fault condition. As it is a L-L-L-G Fault all the phases gets affected by the fault.

The RMS current before fault is around 5.4A and but after fault it got hiked to 6A and again it got back normal condition after some time.

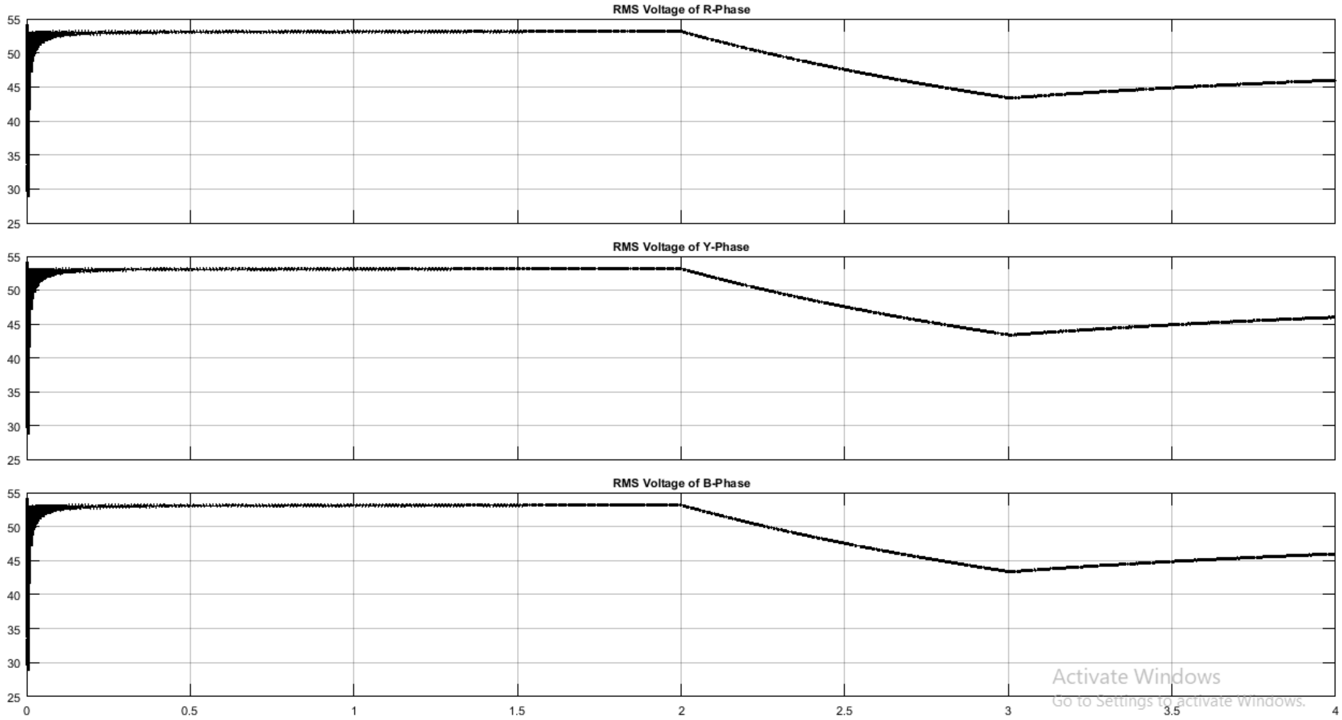


**Fig 22: RMS values of voltages in phase during L-L-L-G Fault**

The above fig shows RMS vaules of Voltage at each phase during L-L-L-G Fault condition.
As it is a L-L-L-G Fault all the phases gets affected by the fault.
The RMS voltage before fault is around 54V and but after fault it got reduced to 46V and again it got back normal condition after some time.

## SUMMARY

So far we have analyzed all the major faults wiz. L-G, L-L-G, L-L-L-G.
These type of faults are unsymmetrical and most severe will cause damage to system.
By the above simulation results(from graphs) we can predict which type of fault has occurred which is One of the objective of the project

By utlizing all the graphs and values we got by doing above simulations we can use it in the Implementation of Hardware.

# CHAPTER 4: HARDWARE IMPLEMENTATION

## 4.1 Testing of Transformer

The main transformer used in the project is a combination of 3 single phase transformers.

**Fig 23: Main Transformer**

We measured the secondary voltages for different input voltages and noted down the values.

| Input Voltage | R-Phase | Y-Phase | B-Phase |
|---|---|---|---|
| 10 | 9.56 | 9.5 | 9.58 |
| 30 | 29.95 | 29.07 | 29 |
| 100 | 95.3 | 95 | 94.6 |
| 230 | 218.8 | 218.9 | 220.5 |

The KVA rating of the transformer used is 0.5 KVA.

## 4.2 Current Measurement:

The next most important element used in this project is Current Transformers.


**Fig-24: Current Sensor**

It is used to produce an output in proportion to the current flowing through the primary winding as a result of a constant potential on the primary and also used for over current fault protection purpose.

### Calibration of C.T:

| Load | Primary side current(A) | Secondary side current(A) |
|---|---|---|
| 2 | 1.5 | 0.019 |
| 3 | 2.2 | 0.03 |
| 4 | 3 | 0.04 |
| 5 | 3.7 | 0.051 |
| 7 | 5.3 | 0.072 |

The maximum rating of CT is 5A.

By observing the above value we calculated the Transformer ratio of CT as k=0.013.

Current transformer is used to reduced the currents in power system which producing proportional current in the secondary windings that remains isolated from the main circuit.

## 4.3 Voltage Measurement:

A voltage sensor is a sensor is used to calculate and monitor the amount of voltage in an object. Voltage sensors can determine both the AC voltage or DC voltage level.

The input of this sensor can be the voltage whereas the output is the switches, analog voltage signal, a current signal, an audible signal, etc


**Fig-25: Voltage sensor**

The above voltage sensor model is used for voltage measurement.

The above voltage sensor takes DC input and sends the corresponding current to Arduino.

But its maximum input voltage should be less than or equal to 25v.

Therefore we employed three step down transformers each of 220v/12v.

Specifications of 12-0-12 500mA Center Tapped Transformer

1. Input Voltage: 230V AC
2. Output voltage: 12V,12V
3. Output Current: 500mA
4. Mounting: Vertical mount type

**Fig 26: Step down transformers**

## 4.4 AURDUINO UNO:

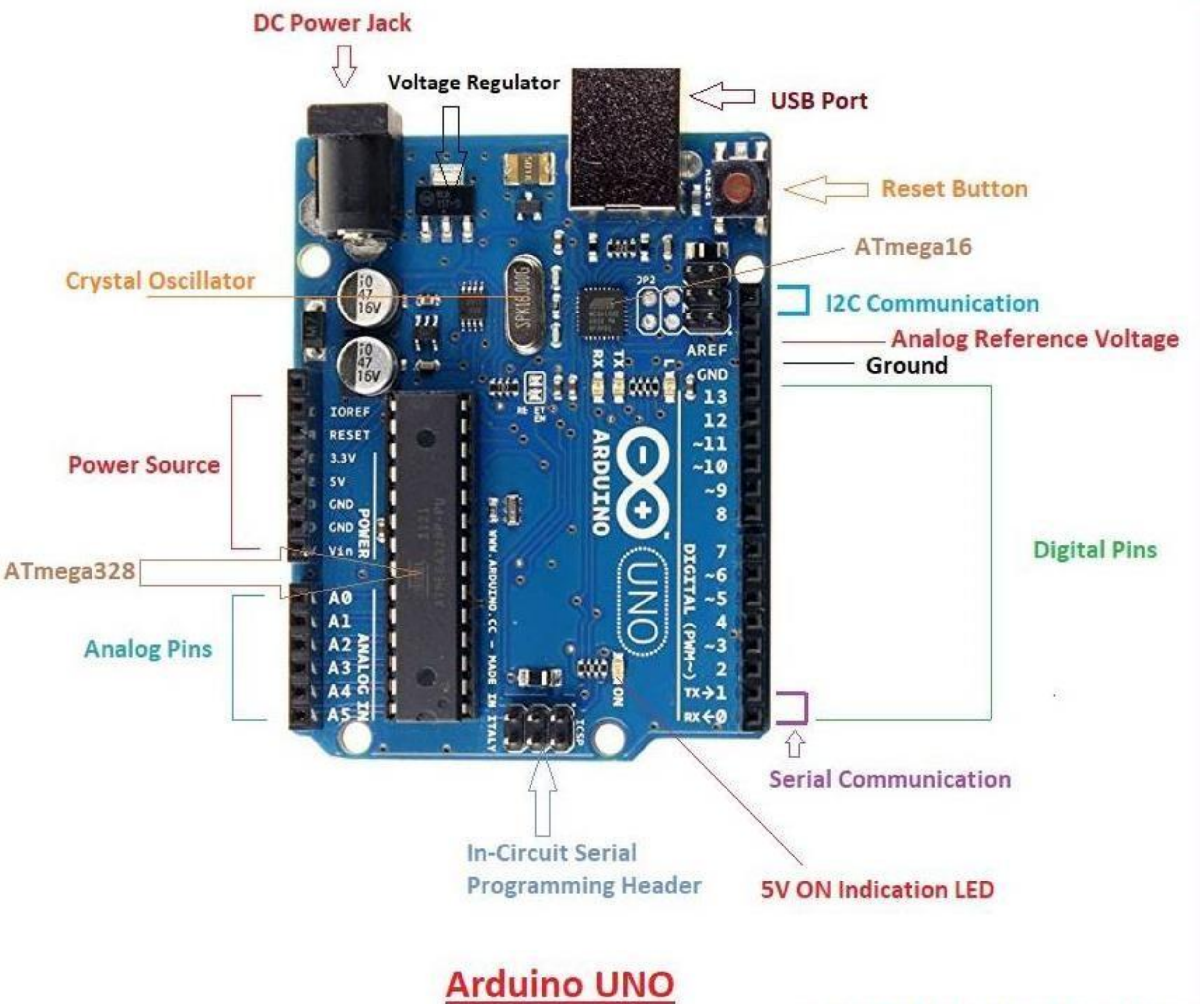


**Figure 27: Arduino UNO**

An Arduino is an open-source microcontroller development board. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on computer, used to write and upload computer code to the physical board. The board features an Atmel ATmega328 microcontroller operating at 5 V with 2Kb of RAM, 32 Kb of flash memory for storing programs and 1 Kb of EEPROM for storing parameters. The clock speed is 16 MHz, which translates to about executing about 300,000 lines of C source code per second. The board has 14 digital I/O pins and 6 analog input pins.

## POWER:

The Uno board can be controlled through the USB association or with an outer power supply. Outside (non-USB) force can come either from an AC-to-DC connector (divider wart) or battery. The board can work on an outside supply from 6 to 20 volts.

## MEMORY OF ARDUINO UNO:

The ATmega328 has 32 KB (with 0.5 KB involved by the bootloader). It likewise has 2 KB of SRAM and 1 KB of EEPROM (which can be perused and composed with the EEPROM.

## INPUT AND OUTPUT OFARDUINO UNO:

Arduino has 14 digital pins. They work at 5 volts. Every pin can give or get 20 mA as prescribed working condition and has an interior draw up resistor of 20-50k ohm. A greatest of 40mA is the worth that must not be surpassed on any I/O pin to maintain a strategic distance from perpetual harm to the microcontroller.

# CHAPTER-5: CONCLUSION

In this project an accurate method of fault detection and classification has been proposed. A good fault detection system provides an effective, reliable, fast and secure way of a relaying operation. This scheme can be extended for locating the exact location of fault and classification of fault on a series compensated lines**.**

In this project we have studied that how fault created and diagnosis that fault in power system. The result shown in this project is for Line-Line-Ground fault (L-L-G), Line-Ground fault(L-G) and L-L-L-G Fault by developing in simulation model with circuit diagrams and got output waveforms for each fault.

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