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A Matlab Based Fault Analysis of TL

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Abstract*: Nowadays the demand of electricity or power are increases day by day this result to transmit more power by growing the transmission line capacity from one place to the other place. But during the transmission some faults are occurred in the system, such as LL fault (line to line), LG fault (single line to ground) and LLG fault (double line to ground). These faults affect the power system equipment's which are connected to it. The main aim of this paper is to analysis of numerous faults and also classifies the effect of the fault in transmission line along with bus system which is connected to transmission line. After that, numerous effects on bus system due to different faults are shown such as voltage, current, power along with the voltage and current output in terms of waveforms.

Keywords*: Transmission Line (TL), Single Line to Ground (LG), Double line to Ground (LLG), Line to Line (LL)

I. INTRODUCTION

The different categories of fault arises in power system then in the procedure of TL fault analysis, determination of bus voltage and the rms line current are possible.[2] However referring with the power system the terms bus voltage and rms current of line are very essential. In case of three phase power system mainly two faults occurs, three phase balance fault and unbalance fault on transmission line of power system, such as line to ground fault, double line to ground fault and double line fault. The transmission line fault analysis helps to select and develop a better for protection purpose. For the protection of TL we place the circuit breakers and its rating is depends on triple line fault. The reason behind is that the triple line fault current is very high as compare to other fault current. Hence by using MATLAB simulation in computer, the analysis of transmission line fault can be easily carried out. The main purpose of this paper is to study the general fault types which are balance and balance faults of transmission line in the power system. Also to perform the analysis and obtain the result of various parameters (voltage, current, etc) from simulation on fault using MATLAB.

II. TL FAULT

TL should transmit power over the required distance economically and satisfy the electrical and mechanical requirements prescribed in particular cases. It would be necessary to transmit a certain amount of power, as a given power factor, over a given distance and be within the limit of given the regulation, efficiency and losses. The lines should stand the weather conditions of the locality in which they are laid. This would involve wind pressures and temperature variation at the places and the lines should be designed for the corresponding mechanical loading. The regulation would give the voltage drop between the sending-end and the receiving-end. The possibility of a corona formation and corresponding loss would be another consideration. The charging current of the line depends on the capacity of the line and should not exceed the limit. As far as the general requirements of transmission lines are concerned, the lines should have enough capacity to transmit the required power, should maintain 3 continuous supplies without failure, and should be mechanically strong so that there are no failures due to mechanical breakdowns also.[3]

A. Causes of Faults

1) Faults are causes by breaking of conductor or failure of insulation.
2) Sudden change in load
3) Overloading
4) Mechanical defect
5) Lack of maintenance
6) Overheating of stator and rotor
7) Lightning stroke
8) Overvoltage
9) Under frequency
10) Loss of excitation

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B. Minimization of Faults

1) Improved system Design
2) Improved Quality of Components
3) Better and Adequate protective Relaying
4) Better operation and Maintenance

III.FAULT ANALYSIS

Electricity produced by a power plant is delivered to load centres and electricity consumers through TL held by huge transmission towers. [5] During normal operation, a power system is in a balanced condition. Abnormal scenarios occur due to faults. Faults in a power system can be created by natural events such as falling of a tree, wind, and an ice storm damaging a transmission line, and sometimes by mechanical failure of transformers and other equipment in the system. A power system can be analysed by calculating system voltages and currents under normal and abnormal scenarios [1]. A fault is defined as flow of a large current which could cause equipment damage. If the current is very large, it might lead to interruption of power in the network. Moreover, voltage level will change, which can affect equipment insulation. Voltage below its minimum level could sometimes cause failure to equipment. It is important to study a power system under fault conditions in order to provide system protection. [4]
Fault is defined as defect in its electrical circuits due to which the flow of current is diverted from the intended path. In 3 phase transmission line fault is classified into three categories.

A. Symmetrical Faults

A three phase (3ϕ) Fault is called a symmetrical fault. In 3ϕ fault all the three phases are short circuited. Here the voltage and currents remains balanced in the power system even after the fault condition. This is the most severe type of fault which involves largest fault currents.
There may be two situations: -

1) All the 3 phases may be short circuited to the ground (LLLG)
2) Without involving the ground (LLL)

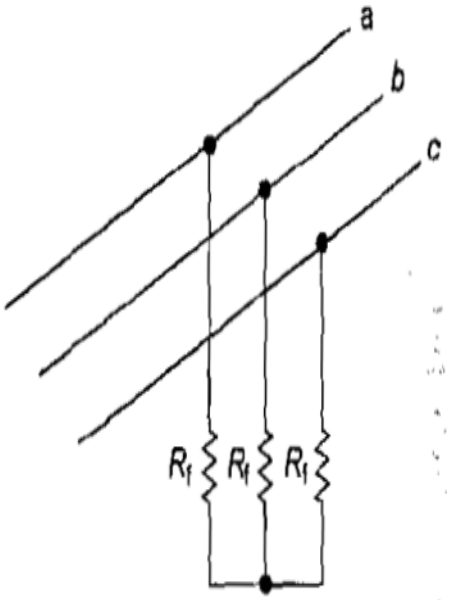

Fig. 1 LLL Fault

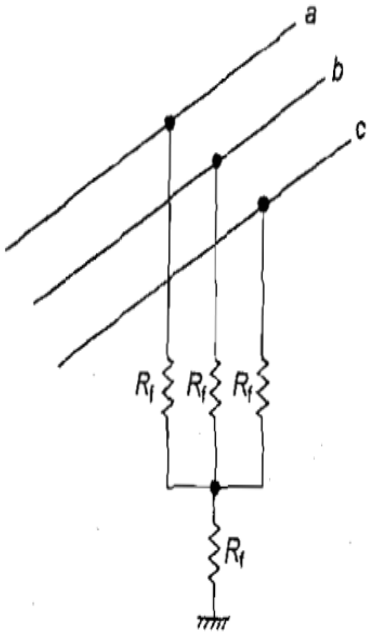

Fig. 2 LLLG Fault

C. Unsymmetrical Faults

1) Single Line to Ground Fault (LG)
2) Double Line to Ground Fault (LLG)
3) Line to Line Fault (LL)

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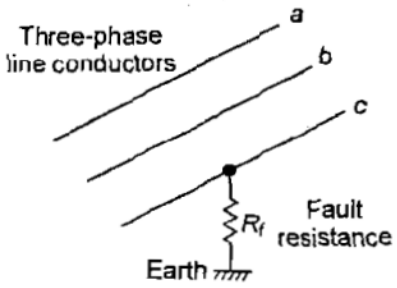

Fig. 3 LG Fault

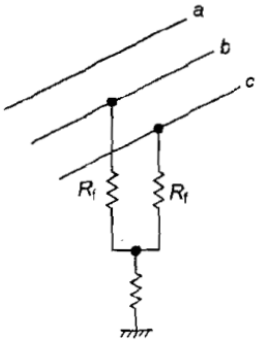

Fig. 4 LLG Fault

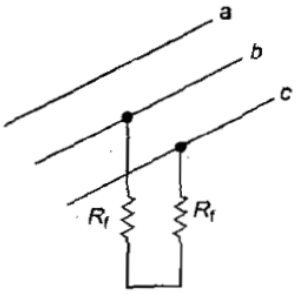

Fig. 5 LL Fault

D. Open circuit Faults

The fault is caused by a break in the conducting path such fault occurs when one or more phase conductor break or a cable joint or a joint on the overhead line fails. Such situations may also arise when circuit breakers or isolators open but fail to close one or more phases.

IV. RESULT

The three phase TL system with load and without load is simulated through MATLAB. In first stage when the load is not considered the output voltage is more than in input voltage. In the second stage when the load is considered then output voltage is less than input voltage.

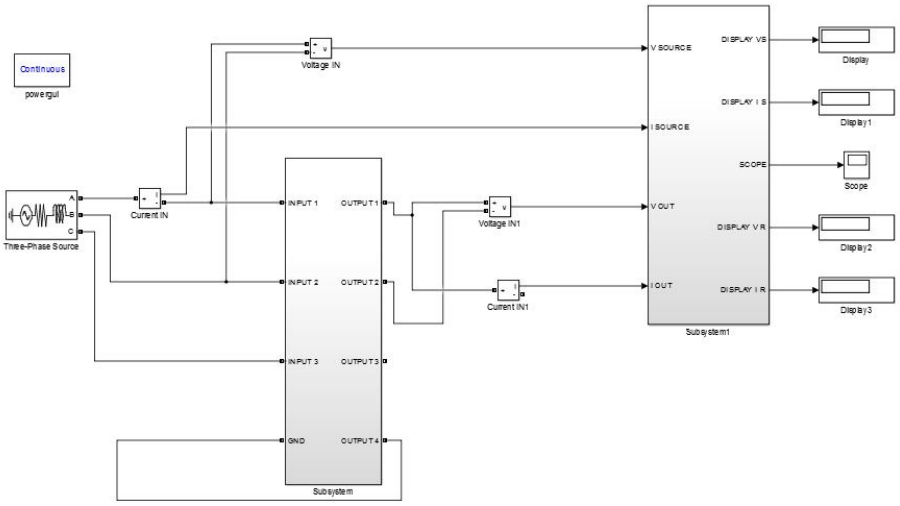

Fig. 6 Simulation of three Phase without Load

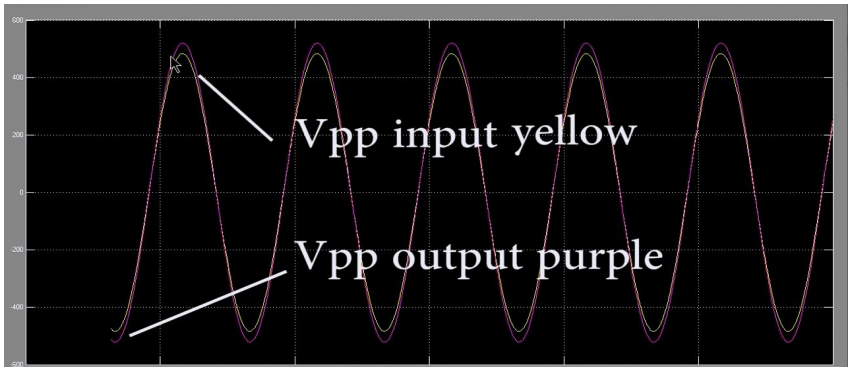

Fig. 7 Input Output Waveform of three Phase without Load

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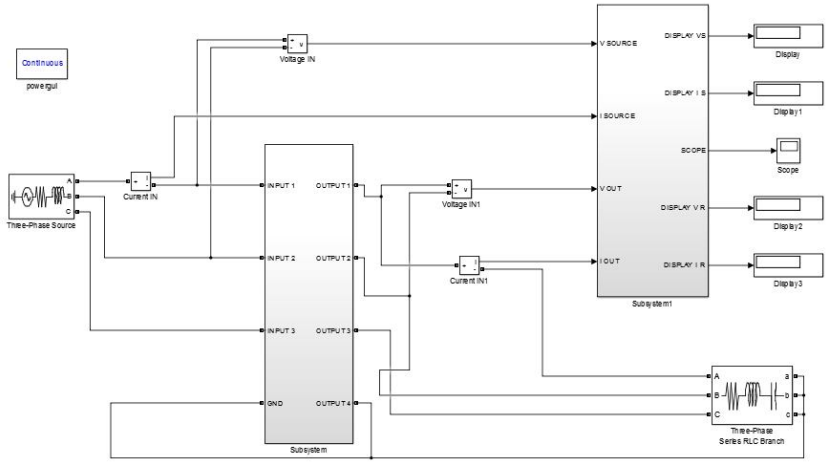


Fig. 8 Simulation of three Phase with RLC Load

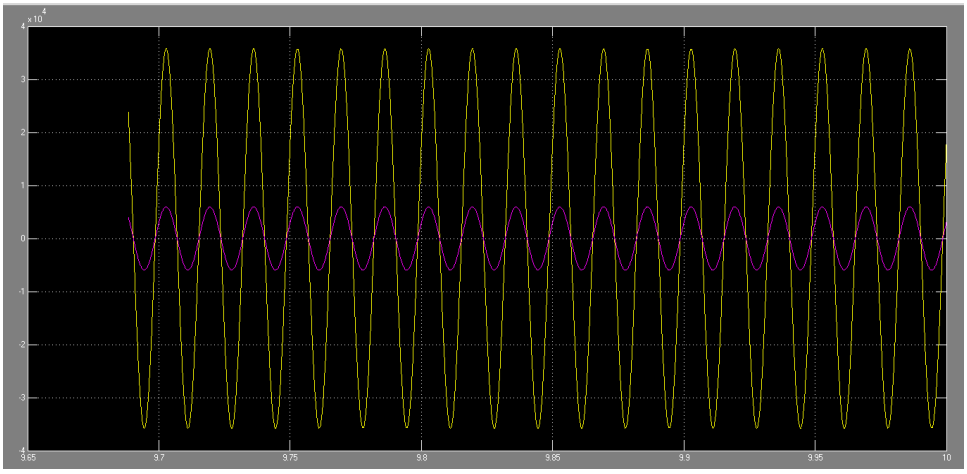


Fig. 9 Input Output Waveform of three Phase with RLC Load

V. CONCLUSIONS

The simulation and analysis of three phase fault to achieve results of the transmission line parameter is convenient by using MATLAB software. Single Line to Ground fault in transmission line is simulated. This system opens the way to redesign the bus system of the power system.

REFERENCES

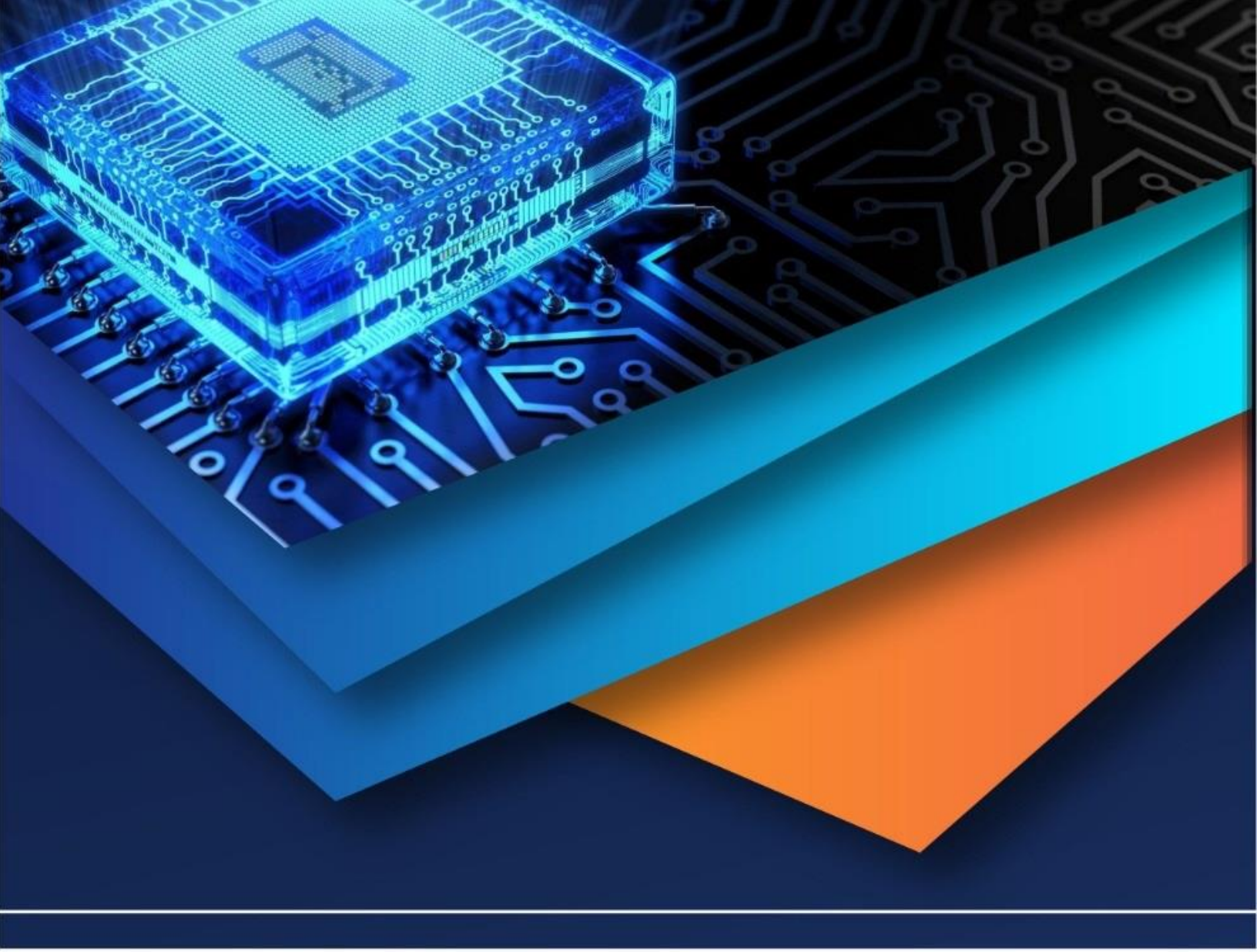
[1] Saket Saurabh, Md Irfan Ahmed, and Pallavi Soni, "Optimal Power System Analysis Using MATLAB", International Journal of Multidisciplinary Research and Modern Education (IJMRME) , vol. 3, Issue 1, pp. 432-436, June 2017.

[2] Ram Kumar, Md Irfan Ahmed, and Rizwan Ahmed, "Optimal Power System Using PSO Technique", International Journal of Multidisciplinary Research and Modern Education (IJMRME) , vol. 2, Issue 1, PP No. 159-165, 2015.

[3] Swapnil C. Naghate, Saurabh M. Dhuldhar, and Ashvini B. Nagdewate, "Transmission Line Fault Analysis By using MATLAB SIMULATION," International Journal of engineering Sciences and research Technology, pp. 330–334, Feb. 2015.

[4] Papiya Dutta, Ahad Esmaeilian, and Mladen Kezunovic, "Transmission-Line Fault Analysis Using Synchronized Sampling," IEEE TRANSACTIONS ON POWER DELIVERY, pp. 1-9.

[5] Prajakta V. Dhole, and Farina S. Khan, "Transmission Line Fault Analysis using Bus Impedance Matrix Method," International Journal of Engineering Research & Technology, vol. 4, Issue 3, pp. 948-954, March 2015.



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