Novel approach for obtaining an exponentially increased microwave signal.

Abstract: Microwave engineering encourages us to study several mathematical equations. These equations are obtained after differentiation or integration. The voltage and current are complex quantities, containing real and imaginary part. The real part is the amplitude part of voltage/ current . The imaginary part gives information about the phase. In any mathematical equations a lot of information is embedded. The only thing is to explore the information .This paper focuses on exploring such information about microwave voltage.

Keywords: microwave voltage, microwave current, novel, complex quantities, real , imaginary.

Introduction

The study of Transmission lines is very important in microwave engineering. This is because the transmission line circuit really defines the microwave circuit. In a transmission line R,L,C G i.e Resistance,Inductance,Capacitance and Conductance are of extreme importance. The R and L are in series, C and G are in parallel.As a microwave circuit is depicted by a transmission line,the transmission line equations can be Applied to a microwave circuit.

The procedure to arrive at transmission line voltage and current is stated as:

1. The circuit composed of resistance R and inductance L in series is drawn. Then Capacitance C and G are drawn. They are in parallel.
2. The loops of series R-L and parallel C-G are drawn as per the distance between sender and receiver.
3. The Kirchoff's voltage law is applied to central loop.
4. The equations have partial derivative as transmission line is assumed to travel in Positive Z direction and the other variable is time variable.
5. The equations for voltage in partial derivative format are integrated and voltage equation is developed.
6. The voltage equation is as under:

$$V = V_+ e^{-j\gamma z} + V_- e^{+j\gamma z} \quad \text{--------- EQ. 1}$$

7. The current equation is obtained after applying kirchoff's current law to the central loop and after integrating those equations.
8. The current equation Is as given:
9. $$I = I_+ e^{-j\gamma z} + I_- e^{+j\gamma z} \quad \text{———— EQ.2}$$
10. The first equation states that the total transmission line voltage is the sum of voltage in the positive z direction and voltage in the negative z direction. The second equation also states the same about total transmission line current .

11. In our approach either of the two equations can be used, but we will use voltage equation.

12. The approach is suggested on the basis of mathematical theory behind microwave signal propagation.

Methodology

The first voltage equation gives us the information that the total voltage wave equation is the sum of two terms. The first term is composed of voltage in the positive z direction and having exponential decaying nature. This is the voltage we measure using microwave bench. The second term is composed of voltage in the negative z direction and having exponentially increasing nature. It is this voltage we are interested in measuring practically. In measuring this we should decide about positive Z direction and negative Z direction.

When we measure voltage in positive direction it is exponentially decaying. But if we measure the voltage in negative Z direction, it is exponentially increasing. So we can get abundant voltage and signal in negative Z direction. This is proposed system. It is just an idea that is proposed. Experimentation is yet to be done.

Analysis of the proposed system:

In the system first negative z direction is to be identified. The direction in which signal flows in microwave bench towards right of the microwave source is positive z direction. Then the direction in which signal will flow towards left of microwave source is negative z direction. We propose to do experimentation in negative Z direction**.** The negative z direction is opposite to positive z direction. Experimentation is therefore proposed in negative z direction. Microwave voltage can then be obtained as exponentially increasing nature.

Conclusions:

In the negative z direction, voltage increases exponentially hence we can get microwave voltage in exponentially increasing form.

Generally microwave voltage is obtained in positive z direction which is exponentially decreasing.

Conclusions for the experimentation:

1. Entire experimentation should be changed for this experiment.
2. In positive z direction klystron tube as source is used but in negative z direction it is doubtful whether we can use it.

3. Gunn diode if used as a source it cannot produce desirable output in negative z direction. Some modification is required in microwave bench.
4. Hence some elements of microwave bench should be changed.
5. The propagation is normally in positive z direction , hence entire 180 degrees shift is required for the bench to be in negative z direction.
6. The microwave bench to be in negative z direction, some rotation circuit and balancing circuit will be required.
7. Thus rotation circuit with the help of microwave components is to be built and connected.
8. Balancing circuit to be built with microwave components and connected.
9. Then exponentially increasing signal can be obtained in negative z direction.

References:

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2. “Microwave components and circuits” Rizzi.