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WIRELESS POWER TRANSMISSION AND DATA COMMUNICATION USING MODIFIED FREQUENCY METHOD

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ABSTRACT

Wireless power transfer is nothing but transferring the power from source to destination without use of wires. Motto is to transfer the power using wireless power transfer technique to ensure reliable power transmission with less maintenance cost. There are 3 major types of wireless power transfer viz. Short range method (Inductive coupling), Medium range method (Resonant coupling) and Long range method (Microwave power transfer). Simulation is done using SPICE simulator which shows that the proposed Modified Frequency Method (MFM) shows better performance when compare to inductive coupling and resonance method. Parameters such as transmission losses, conductor losses, long distance transmission are taken into account and comparative analysis is made which is well proved that the MFM method of transferring is seems to be good and also eco-friendly since it is reliable.

KEYWORDS: Wireless Power Transmission, Inductive and Resonance

In our present scenario of power transmission, wired transmission is most commonly adopted. In this transmission, much of this power is wasted due to transmission losses. The resistance of the wire used in the electrical grid distribution system causes a loss of 26-30% of the energy generated. This loss implies that our present system of electrical distribution is only 70-74% efficient. Alternate way of transmission is the need of the hour. Nowadays global scenario has changed a lot and there is tremendous development in every field. It is necessary to keep pace with the development of new power technology to arrest the decreasing trend in the development of power sector. The transmission of power without wires may be one noble alternative for electricity transmission and there exists many methods for wireless power transmission which has drawbacks such as, huge transmission losses, limitation of distance, investment cost and so on [1,2]. The proposed modified frequency method (MFM) of wireless transmission is simulated using SPICE simulator and its performance is compared with various parameters.

Existing system

The existing system of transferring a power is based on electromagnetic induction principle using which it is possible to transfer only up to limited distance. Transmission losses are would be huge high when we attempt to transmit over long distance.

Nikola Tesla

In 1890, tesla made an attempt and lit the lamp using inductive and capacitive coupling but his attempt tof power transmission for huge distance failed.

Modified Frquency Method (MFM)

In this work, given voltage is converted into frequency by radio frequency method which is being transmitted using transmitter to any destination. At the end, the received frequency is converted back to voltage . In order to avoid the theft of radio frequency signal during transmission, the concept of threading is used. The figure 1 shows the block diagram of modified frequency method of wireless power transmission. Stability of the power is ascertained and converted to frequency using MF converter and transmitted.

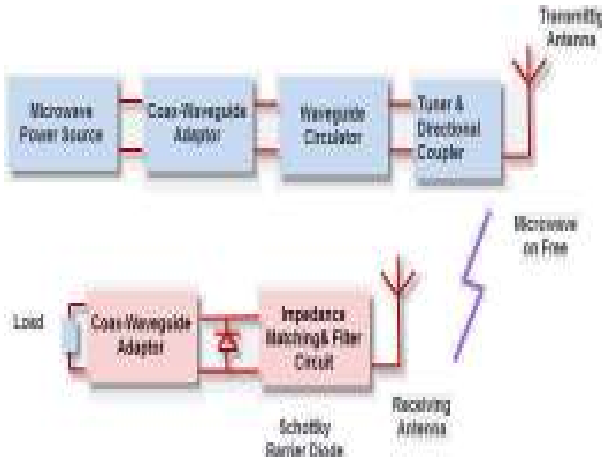

Figure 1: Block diagram of modified frequency method

The basic method of signal transmission is shown in the figure 2. Figure 3 & 4 details the circuit diagram of Frequency to voltage converter and vice versa.

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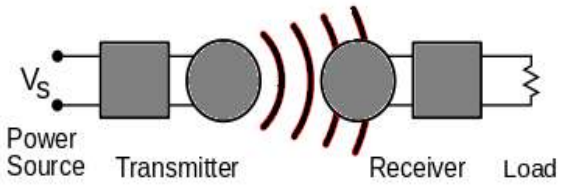

Figure 2: Illustration of signal transmission

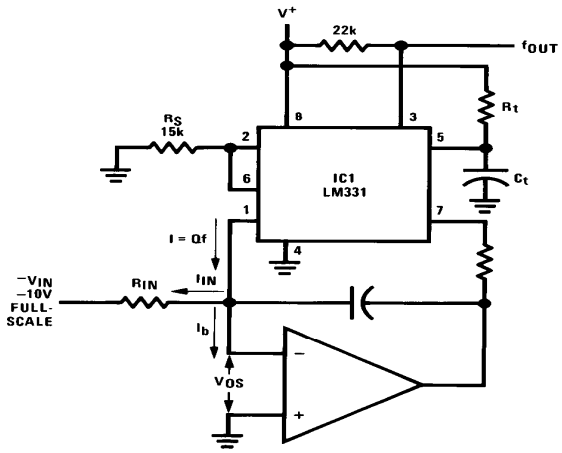

Figure 3: Circuit diagram of voltage to frequency converter

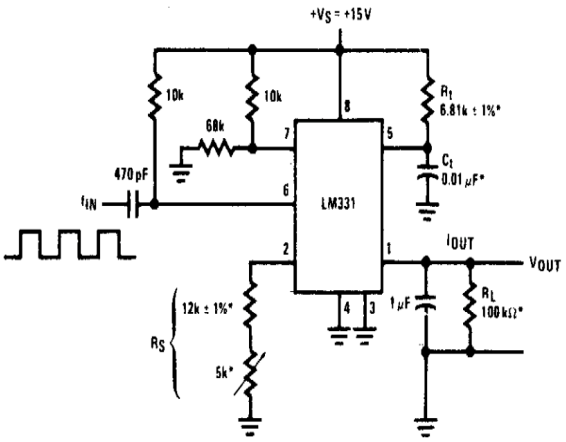

Figure 4: Frequency to voltage convertor

WORKING PRINCIPLE

Now a days we are using a wireless power transmission system as three sectors primary ,secondary and treasury . Primary is the power generation station, secondary is the transmission and treasury is receiving station. In this work, the new method of transferring the power in wireless mode using wide-range current-to-frequency converters is introduced.

This application report discusses a Does an analog-to-digital converter cost you a lot if you need many bits of accuracy and dynamic range. Absolute accuracy better than 0.1% is likely to be expensive. But a capability for wide dynamic range can be quite inexpensive. Voltage-to-frequency (V-to-F) converters are becoming popular as a low-cost form of A-to-D conversion [3] because they can handle a wide dynamic range of signals with good accuracy. Most voltage-to-frequency (V-to-F) converters actually operate with an input current which is proportional to the voltage input. This current is integrated by an op amp, and a charge dispenser acts as the feedback path, to balance out the average input current.

FEATURES – IC LM331

Improved Performance in Existing Voltage-to-Frequency Conversion Applications. Split or Single-Supply Operation. Operates on Single 5-V Supply. Pulse Output Compatible With All Logic Forms. Excellent Temperature Stability: ±50 ppm/°C. Maximum Low Power Consumption: 15 mW Typical at 5 V. Wide Dynamic Range, 100 dB Minimum at 10-kHz Full Scale Frequency. Wide Range of Full Scale Frequency: 1 Hz to 100 kHz .

SIMULATION RESULT

Wireless Power Transmission system would completely eliminates the existing high-tension power transmission line cables, towers and sub stations between the generating station and consumers and facilitates the interconnection of electrical generation plants on a global scale. It has more freedom of choice of both receiver and transmitters. Even mobile transmitters and receivers can be chosen for the WPT system. The cost of transmission and distribution become less and the cost of electrical energy for the consumer also would be reduced. The power could be transmitted to the places where the wired transmission is not possible. Loss of transmission is negligible level in the Wireless Power Transmission; therefore, the efficiency of this method is very much higher than the wired transmission. Power is available at the retina as long as the WPT is operating. The power failure due to short circuit and fault on cables would never exist in the transmission and power theft would be not possible at all.

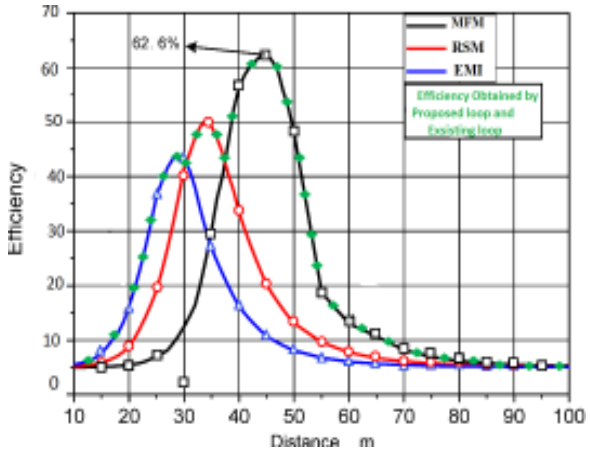

Figure 5: Efficiency comparison of different methods

Efficiency of Modified frequency method is compared with resonance and electromagnetic induction method is shown in figure 3. Table 1 details the efficiency obtained for the various methods along with the transmission distance.

Table 1: Efficiency and Distance comparison for different methods

Method	Distance(cm)	Efficiency
MFM	45	62.6%
RSM	35	50.0%
EMI	30	45%

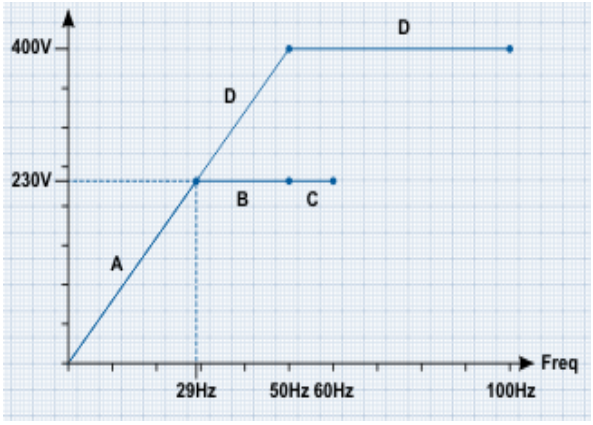

Figure 6: Transmission efficiency of MFM

Figure 2 shows the graphical representation of tranmission efficiency [7,8] of modified frequency method. The given input voltage is modified from 12V to 30 V and it is obtained with 29Hz , 230 V at the output for a distance of 45cm. Similarly for a three phase supply, given input voltage is modified from 25V to 40 V and it is obtained with 50Hz , 400 V at the output for a distance of 45 cm.

Table 2: Input and outout voltage comparison of MMF

Input voltage In volts	Output voltage In volts	Frequency In Hz
12V to 30 V	230 V	29 Hz
25V to 40 V	400 V	50 Hz

CONCLUSION

The novel method of wireless power tranmission using modified frequency method is simulated using SPICE software and its efficiency for varying tranmission distance is compared with the existing resonance and electromagnetic method. It is possible to transmit electrical energy economically without wires to any terrestrial distance. Wireless transmission of electricity has tremendous merits like high transmission integrity and low loss (90 – 97% efficient). It is possible to transmit anywhere in the globe and eliminate the need for an inefficient, costly, and capital intensive grid of cables, towers, and substations. Such booming wireless eco friendly transmission will minimize the E wastes drastically.

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