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WIRELESS POWER TRANSMISSION TO CHARGE A MOBILE

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Abstract: The convenience of wireless mobile charging technology and its potential to completely change how we power our gadgets have drawn a lot of attention in recent years. This abstract offers a brief overview of a cutting-edge wireless mobile charger system designed to enhance the user experience by eliminating the need for physical connectors and cables. The resonant inductive coupling and electromagnetic induction theories serve as the foundation for the wireless mobile charger. Its two main components are a receiver (compatible mobile device) and a transmitter (charging pad). When linked to a power source, the transmitter's coil produces an oscillating magnetic field. The receiver, which is part of the mobile device, also includes a coil. The coils in the transmitter and receiver resonate at the same frequency when the mobile device is put on the charging pad. This causes an electric current to be generated in the receiver's coil, which is then converted to DC power to charge the battery.

***Keywords*—Mobile chargers that operate wirelessly, wireless communication, cell phones, transmitters, receivers, Baseline Power Profile (BPP), Extended Power Profile (EPP), and Wireless Power Transmission (WPT).**

1. **Introduction**: These days, power is crucial for the way we live. That's challenging to stay alive despite power since humanity utilizes endless devices that require power. Electricity is typically transported between locations via wires or cables. However, a recent development known as Wireless Power Transmission (WPT) [1] has made it possible to transmit electrical power wirelessly between locations. The fundamental idea of WPT is to eradicate the hazardous use of wires while also removing the challenge of managing power cord organization. This kind of power from batteries is typically required for movable gadgets like smart phones, tablets, laptops, home robots, drones, and so on. Owing to their great applicability and quick growth, these portable gadgets are finding their way into our daily lives. In addition, the need for smart devices that can charge without a plug keeps rising. These devices allow users to wave goodbye to cables. Therefore, developing new technologies is required to do away with awkward cords and charges. Therefore, as a component of their course of work, the scientists at MIT came up with the word "WiTricity"[2], this is simply Wireless Electricity that allows electricity to be transmitted to a faraway place without the need for cables. In essence, WiTricity removes the requirement to own a separate charger for every gadget we use. This is the main benefit that this technology offers us. Just figuring out a place to store our portable electronics that charge naturally is sufficient. Without requiring users to use chargers or plug-in electrical wires, WiTricity makes certain that electricity-

hungry gadgets may charge on their own. In addition to being safer (because no cords are required), WiTricity is handier in that it eliminates the necessity for periodic battery changes or recharging and appears to be more dependable because the gadgets cannot run without electricity. Furthermore, as WiTricity uses fewer throwaway batteries, it can contribute to a more environmentally friendly atmosphere. Despite offering natural charging via wireless technology, WiTricity mostly needs modest charging ranges. Because of this, WiTricity is currently in the exploratory phase, with many studies being conducted to further its potential uses to potentially charge larger cars or apparatus and operate over greater distances. Therefore, the purpose of this study is to provide a unique way to charge mobile phones via WiTricity without the need for cable chargers. The ability to transport low-voltage electricity effectively over less distance is the relevance of this study. The idea put forward guarantees that cell phone users will be able to take their devices wherever even without the availability of charging points.

2. Literature Survey

From the topic "*A Literature survey of Wireless Power Transfer*" [3], 2016. Reem Shadid, Sima Noghanian saw a compass needle deflection when electric current flowed over a single wire a discovery that established the magnetic effect of electricity. From the topic "A Working Model for Mobile Charger using Wireless Power Transmission" [4], July 2018. Joe Louis Paul Ignatius, Sasirekha Sooraj established the relationship between the generated magnetic field and the electric current using his circuit law. From the topic "WIRELESS MOBILE CHARGER USINGINDUCTIVE COUPLING" [5], Puranam Revanth Kumar describe that Faraday's law, which was published stated that altering the magnetic flux might induce the electromagnetic force in a conductor. Heinrich Hertz established the existence of electromagnetic radiation. Tesla used two coils to successfully energies a light bulb that same year. Using electromagnetic waves, In 1895, Jagdish Bose succeeded in remotely striking a bell through a wall at a distance of 75 feet. From the topic *"Safety considerations of wireless charger for electric vehicles"* [6] Dec 31, Hai Jiang, Paul Brazis, Mahmood Tabaddor, Joseph Bablo said that Marconi transmitted a radio signal across a distance of 1.5 miles with success. Tesla accomplished 48 kilometers of wireless power transfer. In 1904, a prize was offered for the successful demonstration of an airship motor powered by energy communicated via space at least 100 feet away, with a horsepower of 0.1 (75 W). The high gain directional array antenna was developed by Yagi and Uda in 1926. After that, William Brown presented his paper on the potential for microwave power transfer and showed off a mock-up of a helicopter that could receive a microwave beam. Peter Glaser proposed that it would be possible to absorb the solar energy that is being communicated wirelessly, so demonstrating the theory of solar power satellite. In 1973, electrodynamics induction was used at Los Alamos National Laboratory to power the first passive system Radio Frequency Identification (RFID) [7] receivers from a few feet away. A linked magnetic resonance power source was revealed in 2007 by a Massachusetts Institute of Technology physics research team led by Professor Marin Soljacic . Using two 60 cm-diameter coils, Reem Shadid, Sima Noghanian , and Arash

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Nejadpak of the University of North Dako Department of Electrical Engineering were able to power a 60W light bulb with 40% efficiency over a two-meter distance . An experiment by the MIT group that involved wireless powering a light bulb at 75% efficiency over a shorter distance was replicated by Intel in 2008Dr. Rim, a nuclear and quantum engineering professor at KAIST University, and his colleagues used inductive power transfer in 2015 to move power to a distance of 3-5 metre, with an efficiency of 29%, 16%, and 8% for 3 metres, 4 metre, and 5 metre, respectively. Twenty kHz transmissions were used. Reference provides an overview of wireless power transfer research from 2001 to 2013, citing over 50 works. The most productive author is Fuand Imura The top four countries that are actively working in this field are the US, China, Japan, and South Korea.

3. Simulation and Parameter

Table 1: Required Components

SL NO.	COMPONENT	TYPE	RANGE
1	Zener-Diode	1N5221B	
2	Oscillator	555	
3	Voltage Regulator	7805	
4	Battery	Battery	12V
5	Transistor	BC547	
6	Bridge	BRIDGE	
7	Electrolytic-Capacitor	CAP-ELEC	(4 nos) 100uF, 22uF, 220uF(2 nos)
8	Capacitor	CAPACITOR	(8 Nos) 0.1uF(2 nos), 180nF, 12nF, 0.01uF(4 nos), 470pF
9	Inductor	INDUCTOR	180uH, 195uH, 220uH
10	HEXFET MOSFET	IRF540N	
11	Light Emitting Diode (LED)	LED	
12	Regulator	MC34063	
13	Resistor	RESISTOR	(10nos)1k(2 nos),3.3k(2 nos),1.5k(2 nos),4.7k,0.33s,0.68,6.8k

3.1 Design and Simulation:

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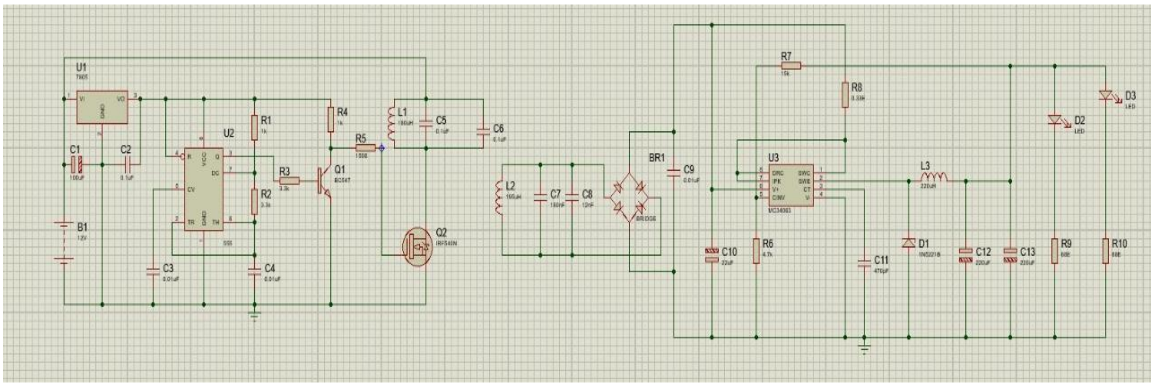

Figure 1: Circuit Diagram of transmitter

A Wireless mobile charger eliminates the need for physical connections by transferring power from the charging pad to a compatible device via electromagnetic fields. A transmitter coil is located in the charging pad and a receiver coil is located in the mobile device in this charger's design. These coils are typically aligned to optimize power transfer efficiency. In the charging pad, a power source generates an oscillating magnetic field when connected to an alternating current. This magnetic field induces a voltage in the receiver coil of the mobile device, converting it back into electric current to charge the battery. Simulation plays a crucial role in refining the charger's design. Finite Element Analysis (FEA) [8] simulates the electromagnetic fields, ensuring the alignment of coils maximizes power transfer. Additionally, thermal simulations assess heat dissipation to prevent overheating during prolonged use. Optimizing the design through simulation ensures efficient power transfer, minimal energy loss, and safe operating temperatures. It's a dynamic process involving iterative adjustments based on simulation results to create a reliable and effective wireless mobile charger.

The transmitter component, which is powered by a 230V input AC supply. The input voltage is then decreased using a step-down transformer. A step-down converter is actually used to change the 230V AC supply into a 12V AC supply. The AC supply is then changed to a DC supply using a bridge rectifier. We use bridge rectifiers since we just require a DC source to charge our mobile devices. The voltage regulator is then employed to lessen the DC supply's repulsion. Ultimately, the transmitter coil receives the DC supply. The wireless power transmission coil would induct an alternating magnetic field inside the coil in order to transmit energy. The receiver coil makes up the receiver portion. The receiver coil's AC current is allowed to pass through filters and rectification in order to convert the AC to DC. The DC supply is then changed to 12V DC by admitting it to the DC regulator (7812). The transformer is then fed with a 12V DC input after that subsequently the mobile adapter is linked to the output. Since the DC supply is not very high, a mobile adaptor is used. With that adaptor, charging of the mobile phone is possible.

4. Result Analysis

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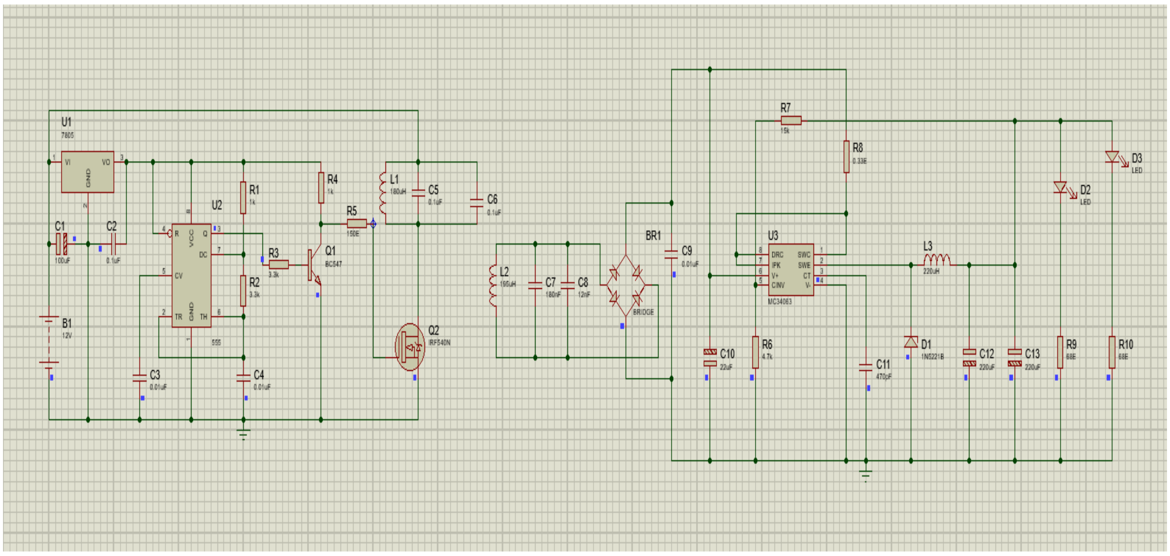

Figure 2: Circuit Diagram of receiver

Wireless chargers employ various technologies including Quick Charge and USB Power Delivery. The former utilizes commonly used connectors such as micro-USB and USB type A, reducing charging time by increasing current and voltage to transmit maximum energy. However, dedicated electronics are required on both the charger end and receiving device for implementation of this solution. On contrary, the latter relies on a diverse range of power delivery levels via its advanced USB Type-C connector without demanding any additional electronic components resulting in greater convenience during use. This technology can transfer up to 100 W power at varying voltages (5 V / 9 V /15V/20V) while allowing currents flowing through it with values reaching up-to- 5 ampere.

4. Conclusion:

Convenience-wise, wireless battery charging is quite advantageous because all consumers have to do is place the item that needs to be charged onto a mat or other surface for the charging to occur. We are positive that society will benefit from our contribution to this study in terms of its application in medical settings, decreased plug and socket wear, and convenience. One of the main issues with wireless battery charging systems is reduced efficiency, which may be brought on by resistive losses on the coil, stray coupling, and other components.

5. References

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