DYNAMIC WIRELESS ELECTRIC VEHICLE CHARGING SYSTEM

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Abstract - *Wireless Power Transfer(WPT) utilizing attractive reverberation is the innovation which could set human free from the irritating wires. Indeed, the WPT embraces a similar essential hypothesis which has just been created for something like 30 years with the term inductive power exchange. Recently WPT innovation is growing rapidly . At kilowatts control level, the exchange separate increments from a few millimeters to a few hundred millimeters with a lattice to stack proficiency above 90%. The makes the WPT very useful to the electric vehicle (EV) charging applications in both stationary and dynamic charging situations. This paper surveyed the advancements in the WPT territory material to EV remote charging. By presenting WPT in EVs, the snags of charging time, range, and cost can be effectively relieved. Battery innovation is never again pertinent in the mass market entrance of EVs. It is trusted that specialists could be supported by the cutting edge accomplishments, and push forward the further improvement of WPT just as the extension of EV.*

Key Words*: Wireless Power Transfer, Inductive Power Transfer, Dynamic charging, Electric Vehicle, Safety concerns.*

1. INTRODUCTION

Inductive Power Transfer (IPT) is the most well known technique to exchange vitality remotely and has pulled in significant consideration as of late. The Wireless Power Consortium (WPC) has built up a standard (Qi) for low power purchaser hardware, while, the Society of Car Engineers (SAE) is chipping away at a standard (J2954) to charge Electric Vehicles (EVs) remotely. SAE s current endeavors are just centered around exchanging capacity to the vehicles very still (static), though no work has been done as such far on building up the norms for exchanging capacity to the vehicles moving (dynamic). This paper shows the attractive plan of an IPT framework for a dynamic EV charging application, to persistently convey an inside the sidelong misalignment of ±200mm. The test approval of framework activity, in any case, was led at 5kW. The plan goes for circulating the expense and multifaceted nature of the framework between the essential and auxiliary side, while accomplishing a smooth power exchange profile.

2. NEED FOR WPT

In destiny the fuel like coal, petrol, diesel will vanish because those are non renewable supply of electricity. The transportation device can have obstacles in future. Therefore we go for electric vehicle for transportation purpose. Because of existing fuel vehicles greenhouse gases are increasing. Plug-in electric powered automobiles are environmental friendly transportation and decreased a few extent of greenhouse fuel. The use of EV is presently extended but there are a few battery associated troubles together with slower charging fee, low electricity storage potential, length, and weight . It is needed to decrease battery related troubles and for the development of EVs. because of charging related issues many consumers do not have purchase EVs as precedence basis To lessen battery related issues, ozone harming substances and to settling the attractive control radiation issue the possibility of remote power transfer(WPT) is develope. Many charging stations are built up at the aspect of avenue, when you consider that the user's journey, similarly distance by means of recharging their electric powered car. Consequently excessive capability battery isn't required and it is changed by using small battery, considering the fact that decreased the burden of battery.

3. WIRELESS POWER TRANSFER

The remote channel alludes to the genuine transmission of intensity, and not the handling of that control. The transmission of intensity happens in this framework through the attractive field made by a transmission curl in much the same way that a transformer works. Where the activity of this framework varies from a transformer is out yonder what's more, 'center of the attractive circuit. A standard transformer uses a ferromagnetic center that works as a channel for the attractive field, and the windings of the opposite sides are ordinarily inside a few millimeters of each other. Since this venture is transmitting power over a few feet of outdoors, the essential standard of transformer activity must be altered to accomplish control exchange. The answer for this issue is thunderous attractive acceptance. Any circuit contains inductive and capacitive components will reverberate at a thunderous recurrence given by (1)

3.2. EV WPT

$$f = \frac{1}{2\pi\sqrt{LC}} \qquad (1)$$

At the point when reverberation is accomplished, the impedance between the two curls is limited and along these lines current and voltage exchange is expanded exponentially. Moreover, objects that don't resound at the working recurrence will be adequately imperceptible to the full circuit, drawing no power from the attractive field To meet the goals of intensity exchange, we chosen a solitary layer helical loop structure. A helical loop makes both inductance and capacitance, and in this way exact figurings of curl geometry were required to accomplish reverberation at 8.5 MHz. For greatest control exchange, it is imperative that the attractive field is as could be expected under the circumstances while the electric field is limited; in different words, we need an expansive inductance and little capacitance. Since the curl itself makes a capacitance esteem on indistinguishable request of extent from the capacitance require for reverberation at our working recurrence, this framework has a physical cutoff for inductance, and thus a physical utmost for attractive field quality.

3.1. TYPES OF WPT

Close field WPT structures are of sorts: inductive, which utilize attractive territory coupling between leading curls, andcapacitive, which utilize electric zone coupling between directing plates to exchange vitality . For medium range exchange (wherein the separation between the transmitter and the recipient couplers is relating to the size of the couplers, as in EV charging), inductive WPT frameworks have been wanted.

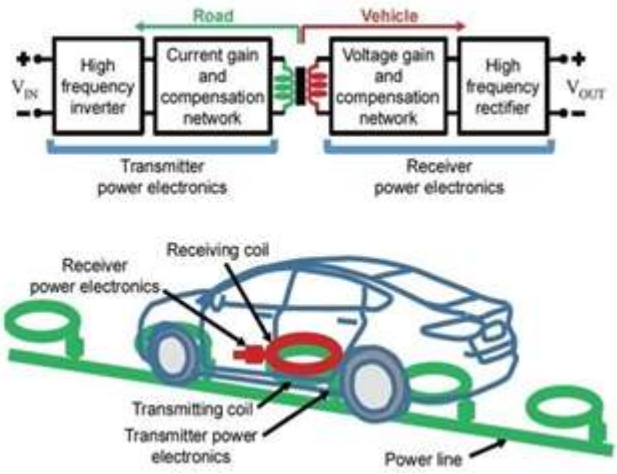

Fig-1: Model of WPT

4. INDUCTIVE POWER TRANSFER

For magnetic flux steerage and shielding, inductive WPT structures require ferrite cores, making them expensive and bulky. also, to limit losses inside the ferrites, the running frequencies of those structures are kept underneath one hundred kHz, resulting in massive coils and occasional energy transfer densities. The high cost and load power transfer capacity are specifically complex for dynamic WPT, as these systems need to have very high strength functionality to deliver enough electricity to the car for the duration of its very quick time passing over a charging coil. For these motives dynamic inductive WPT is but to grow to be commercially feasible, even though a few experimental structures had been proven.

4.1 ADVANTAGES

- Safe.
- Reliable.
- Low maintenance.
- Long product life.
- Magnetic field radiation problem is avoided.

5. BLOCK DIAGRAM

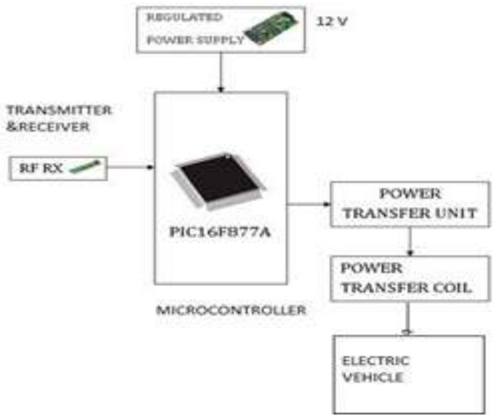

Fig-2:Road side unit

5.1. RFID

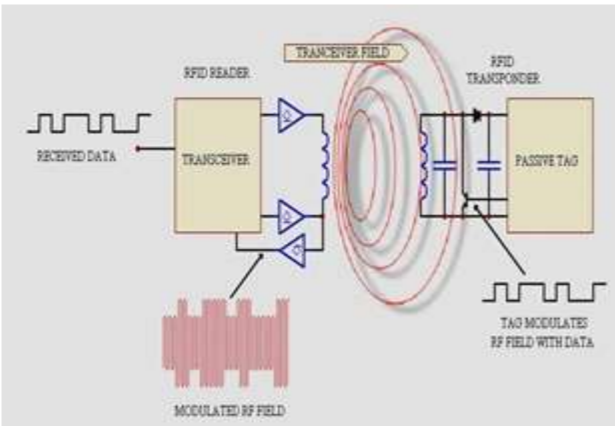

Fig-4:Model of RFID

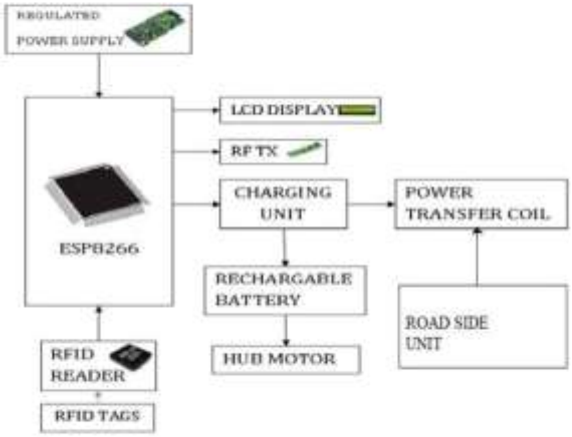

Fig-3:EV unit

Indicated is a RFID handset that speaks with a detached Tag. Aloof labels have no power wellspring of their very own and rather get control from the episode electromagnetic field. Usually the core of each tag is a microchip. At the point when the Tag enters the created RF field it can draw enough power from the field to get to its interior memory and transmit its put away data. At the point when the transponder Tag attracts control along these lines the resultant connection of the RF fields causes the voltage at the handset reception apparatus to drop in esteem. This impact is used by the Tag to impart its data to the peruser. The Tag can control the measure of intensity drawn from the field and by doing as such it can tweak the voltage detected at the Transceiver as per the bit example it wishes to transmit.

5.2 RF MODULE-TRANSMITTER AND RECEIVER

The RF module, because the name indicates, operates at radio frequency. The corresponding frequency variety varies among 30 kHz & 300 GHz. on this RF device, the virtual records is represented as versions within the amplitude of service wave. This type of modulation is known as Amplitude Shift Keying (ASK).

Transmission thru RF is better than IR (infrared) due to many reasons. First of all, signals via RF can tour through larger distances making it appropriate for lengthy range programs. also, while IR on the whole operates in line-of- sight mode, RF signals can tour even when there's an obstruction between transmitter & receiver. Next, RF transmission is greater sturdy and dependable than IR transmission. RF verbal exchange uses a selected frequency not like IR signals which are suffering from other IR emitting resources.

This RF module comprises of an RF Transmitter and an RF Receiver. The transmitter/receiver (Tx/Rx) pair operates at a frequency of 434 MHz. An RF transmitter receives serial records and transmits it wirelessly through RF through its antenna related at pin4. The transmission happens at the fee of 1Kbps - 10Kbps.The transmitted information is obtained by way of an RF receiver working at the same frequency as that of the transmitter.

6. PROPOSED SYSTEM

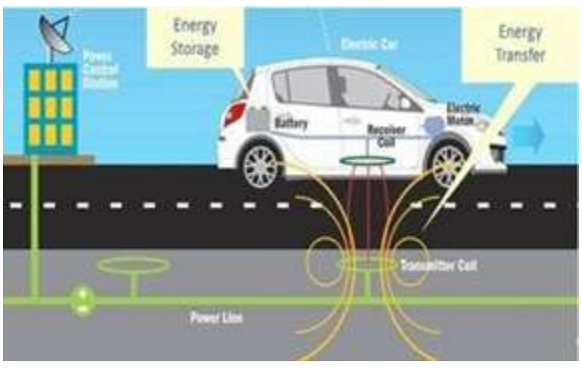

Fig-5:Proposed Model

This paper detailed the magnetic design of a system capable of delivering 15kW of power to a moving vehicle continuously along the length of the track, while allowing a lateral misalignment of ±200mm from the centre of the track.

The decision of essential and optional cushion topologies was made dependent on present alternatives for stationary frameworks however concentrated on limiting the expense of the ground framework by utilizing a straightforward essential track topology. The utilization of a multicoil optional empowered ceaseless power exchange while exhibiting how such a framework can help maintain a strategic distance from quick power beats as the vehicle moves over the track.

7. EXPOSURE LIMIT BOUNDARY

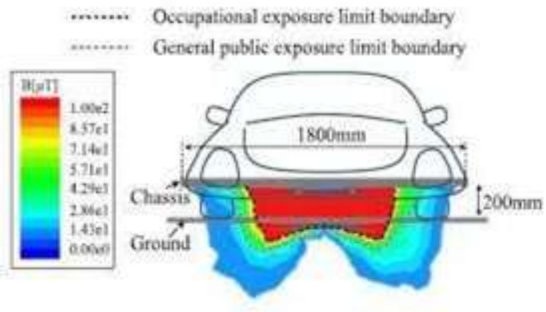

Fig-6:Distance range between road unit and EV unit

8. SAFE AND EFFICIENT POWER TRANSFER

The elements of the couplers in WPT frameworks can be diminished and the power exchange thickness quickened by planning the structures to work at better frequencies. In inductive frameworks the expansion in activated voltage with higher recurrence makes up for the diminished shared inductance of the littler loops.

9. SAFETY CONCERN

WPT avoids the electrocution threat from the traditional contact charging technique. however, whilst charging an EV battery wirelessly, there is a high-frequency magnetic subject current between the transmitting and receiving coils. The magnetic flux coupled among the two coils is the foundation for WPT, which can't be shielded. The massive air gap between the two coils reasons a high leakage flux. The frequency and amplitude of the leakage magnetic area ought to be elaborately managed to satisfy the safety rules. A safe place must continually be defined for a wirelessly charging EV. We have to make sure that the magnetic flux density need to meet the safety tips when people are in regular positions, which include standing outside a vehicle or sitting inside a automobile. Fortunately, a vehicle is normally made from metallic, that is a superb protective shielding.

10. CONCLUSION

This paper presented a design of wireless charging of electric cars. It is clear that automobile electrification is unavoidable because of surroundings and electricity associated troubles. Wireless charging will offer many benefits as compared with wired charging. Especially, when the roads are electrified with wireless charging capability, it will provide the foundation for mass market penetration for EV regardless of battery generation. With technology development, wireless charging of EV can be brought to fruition. Further studies in topology, manage, inverter design, and human safety are nevertheless needed in the close to term.

11. FUTURE SCOPE

a) ON ROAD CHARGING:

Powering while at the same time driving On- street/dynamic controlling of EVs is the condition of- workmanship advancement in future EV charging. The constrained scope of EVs can be counterbalanced by exchanging capacity to vehicles at stop lights (semi- dynamic charging)/while in movement. In such a situation, charge-cushions are rehashed over substantial inclusion of the roadways and vitality is exchanged for the span for which the vehicles are over the charge-cushion. On the other hand, circulated IPT frameworks propose having tracks out and about which are empowered by an inverter and such frameworks have generally discovered applications in programmed guided vehicles (AGV) and material taking care of framework dependent on conveyed IPT frameworks are likewise present. Another preferred standpoint of on-street charging is the capacity to charge EVs from efficient power vitality sources in the area. Broad research has been performed in the reproductions of roadway driving cycle with IPT framework with power levels differing from 10– 60 kW and inclusion from 10– 100%. A huge outcome acquired being that driving reach can be accomplished with 20kW power and half of street inclusion or 50kW and 20% inclusion, as found in Fig. 10 . What's more, for inclusion more noteworthy than half, an exceptionally high driving extent can be accomplished for power more prominent than 20 kW.

b) GREEN ENERGY HIGHWAY:

Some ongoing improvements in expressway based IPT frameworks incorporate the coordination of environmentally friendly power vitality sources, with self- mending streets with IPT empowered. Roadways that will convey EVs will move toward becoming vitality creating with a few advancements, for example, smaller scale wind generators and sunlight based roadways. This combined with IPT for charging EVs is the vision for future roadways. Likewise, a corresponding advancement in this field is the improvement of multi-recurrence IPT frameworks. Multi-recurrence control move can bring about multiplexing power between a few music accordingly spreading out outflows and preparing lower control per recurrence connect.

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