International Journal of Applied Engineering and Technology ISSN: 2277-212X
An Open Access, Online International Journal Available at http://www.cibtech.org/jet.htm
2022, Vol.12, pp.228-233/Pavithra
Research Article

WIRELESS CHARGING OF ELECTRIC VEHICLES & MONITORING THROUGHIOT

P. Pavithra [1], P. Sakthivel[2], A. Santhosh[3,], S.J. Subash[4], V.R. Sri Balaji[5]
[1]*Department of Electronics & Communication Engineering, Anjalai AmmalMahalingam Engineering College, Kovilvenni, Thiruvarur*
**Author for Correspondence: ppavisathis@gmail.com*

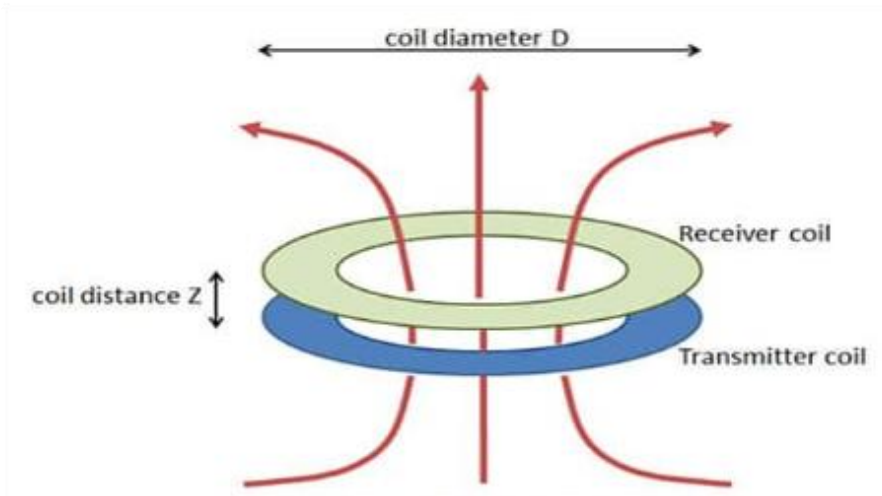
ABSTRACT
Wireless power transmission (WPT) is popular and gaining technology finding it application in various fields. In that to charge ELECTRIC VEHICLES (EVs) as wireless and automatic without having any physical contact and optimizing the efficiency of power. The main goal is to transmit power using resonance coupling and to build the charging systems & transfer information through Internet Of Things (IOT). The system deal with an AC source, transmission coil, reception coil, convertor and electric load which are battery. And also the basic functions of the Battery Management System (BMS) are to monitor and control the battery processes. This includes the charging and discharging cycle, thereby ensuring the battery health and minimizing the risk of battery damage by ensuring that optimized energy is being delivered to power the vehicle. This includes the voltage, current, and temperature during both charging and discharging situations. It estimates parameters such as the power, State of Charge (SoC), Stateof Health (SoH) and ensures healthiness based on the measurement. Internet of Things (IoT) plays a major role in monitoring and control as it enables the remote data logging facility for battery parameters, conditions and parking system.

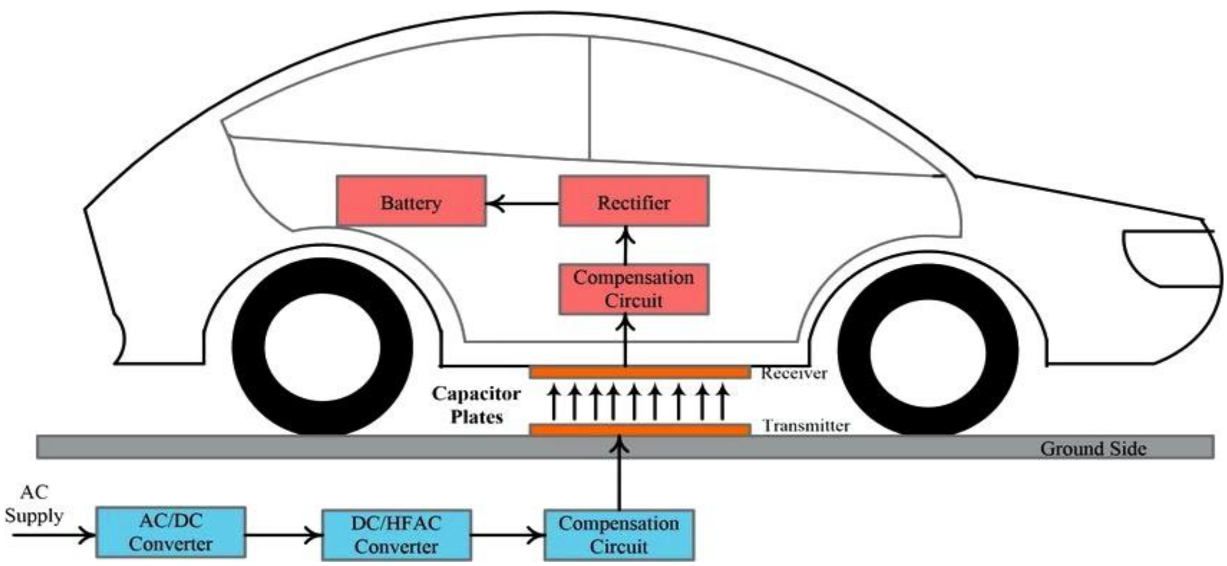
Keywords: *EV, Resonance coupling (RC), IOT, battery electric vehicles (BEV), ground assembly GA, vehicle assembly VA*

INTRODUCTION
Nowadays, electric vehicle (EV) is becoming popular since the fuel prices becoming more expensive. Due to these scenario, many vehicle manufacturer looking for alternatives of energy sources other than gas. The use of electrical energy sources may improve the environment since there are less pollution. In addition, EV produces great advantages in terms of energy saving and environmental protection.

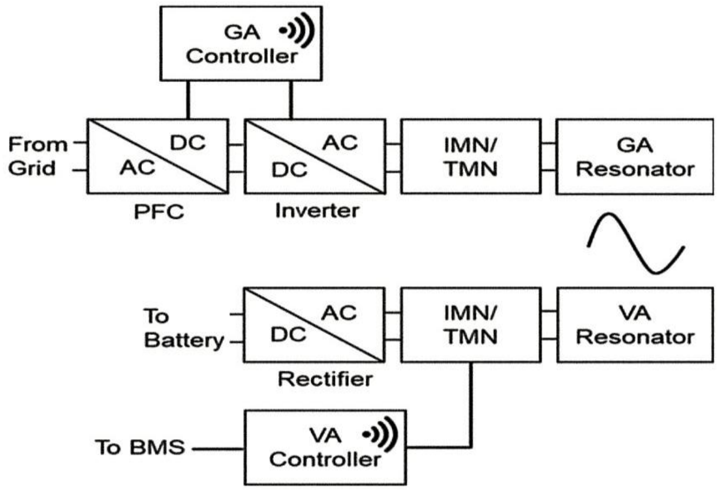
WIRELESS CHARGING OF EVs
Transportation is undergoing a dramatic change on several fronts as propulsion systems shift from gasoline to electric, driver assist systems move toward full autonomy and driverless vehicles, and more people, especially in dense urban areas, eschew vehicle ownership and utilize on-demand ride services. Electric vehicles, largely a curiosity in the past with limited options on the market, are becoming more popular and almost every major automaker will soonoffer full battery electric vehicles (BEV) or plug-in hybrid electric vehicles illustrates the projected growth of BEV sales, as a percentage of total vehicle sales, over the next few decades. These projections are bolstered by statements from several countries committing to eliminate sales of internal combustion vehicles in this same time frame. Along with the shift to battery powered vehicles comes the need to charge these vehicles from the power grid. The majority of EV charging will occur at home or a place of business, a natural choice since vehicles today areestimated to be idle 95% of the time, mostly at one of these locations. The need for periodic trips to a separate fueling station will disappear, rendered unnecessary by the ability to "re-fuel"in other ways. The predominant method for charging will be to plug into the AC grid with a Level 1 (120 V at 3.6 kW) or Level 2 (240 V at 7.7 Kw) charger. DC fast charging at much greater power levels is also an option as a range-extender for some situations, such as long distance travel, but the cost to build and operate these stations is a barrier that will limit this method to a small fraction of the total charging

landscape.





WIRELESS CHARGING USING MAGNETIC RESONANCE:
Wireless charging systems for electric vehicles utilize a fundamental principle of electromagnetics, in which a time-varying magnetic field created by a coil on the ground induces a voltage in a second coil located on the vehicle. The addition of resonance to the coils, often denoted magnetic resonance, enables power to be efficiently delivered over the required vehicle ground clearances and parking variations using coil sizes compatible with integration on EVs



Block diagram of EVs wireless Charging, Where VA is vehicle assembly and GA is ground assembly.
The physical effect is that the mutual inductance, or equivalently the magnetic coupling, between the GA and VA resonator coils changes with the relative alignment of the coils. This affects the induced EMF on the VA coil, which can be expressed at the fundamental operatingfrequency as
Vind = ωMIGA
Where M is the mutual inductance, ω is the angular frequency of operation, and IGA is the GA resonator coil current. A reduction in M can be accommodated by either increasing the GA resonator coil current to compensate, requiring the VA to operate at a reduced induced voltage, or for best efficiency, a combination of both. The latter means that the GA must be able to produce a range of coil currents and the VA must be able to operate at full power over a range of induced voltages (or equivalently a range of magnetic fields).
The VA-side impedance matching and tuning should be able to properly load the VA resonator coil for efficient operation over the range of induced voltages it will experience for the output battery voltages it must drive. The impact of the VA resonator and load are captured in the impedance reflected from the VA side back to the GA coil,

$$Zrefl = \frac{\omega^2 M^2}{j\omega L}$$

VA+Z$_{VA}$

In LVA is the inductance of the VA resonator coil and is the impedance seen at the terminals of the VA coil looking toward the load. depends on the IMN/TMN, power level and battery voltage, and for optimum efficiency should also be adaptable to changes in . The ground side electronics and IMN/TMN must be designed to operate effectively over the range of reflected impedances that VAs will present.

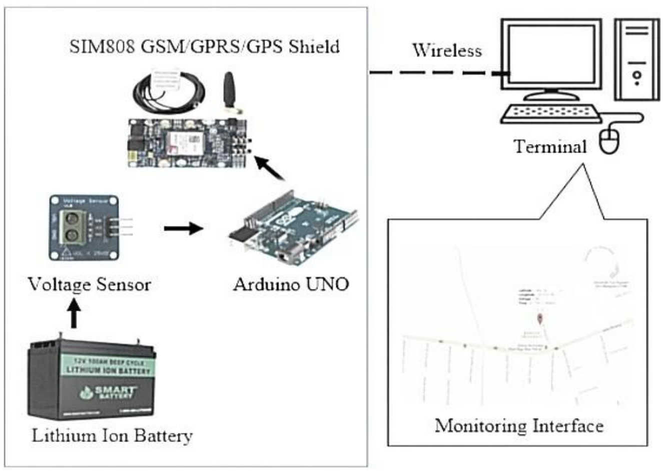
INTEROPERABILITY
A key aspect of the standards activities is to ensure that EV wireless charging systems are interoperable. It is certainly desirable that all EVs equipped with wireless charging be able to charge at any ground station, especially those deployed in public parking areas. However, a complete interoperability specification also enables ground side and vehicle side components to be separately designed, enabling companies to choose to focus on one side or the other rather than having to do a full system design. This allows automakers to focus only on systemsthat go on the vehicle, while other companies handle the grid connected equipment.
This magnetic compatibility is not sufficient, however, as there are numerous impedances, ZVA at the terminals of the VA coil that result in the same power delivery for the same induced voltage. The power

transferred to the VA coil is given by

$$P_{VA} = \frac{|V_{ind}^2|}{|Z_2^2|} Re[Z_2]$$

Where Z2 = ZVA+jωLVA is the VA impedance including the coil reactance.

BATTERY MONITORING THROUGH IOT:
Most EVs used rechargeable battery which is lithium ion battery. It is smaller to be compared with lead acid. In fact, it has a constant power, and energy's life cycle is 6 to 10 times greater compared with lead acid battery. Lithium ion battery life cycle can be shortened by some reasons such as overcharging and deep discharges. On the other hand, EV usually has limited range of travelling due to battery size and body structure. Now, an important reason that limits the application of EV is the safety of existing battery technology. For example, overcharging battery not only could significantly shorten the life of the battery, but also cause a serious safety accidents such as fire. Therefore, a battery monitoring system for EV that can notify the user about battery condition is necessary to prevent the stated problems.



Voltage Monitoring:
The mileage and performance of an Electric Vehicle depends on the capacity and proficiency ofits Battery Pack. To maintain the battery pack in full health is the responsibility of the Battery Management System (BMS). A BMS is a classy unit in an EV which does a lot of activity like checking the cells, balancing them and even shielding them from temperature changes. We have already learnt enough of it in this Battery Management System article. To do anything, the first step for the BMS would be to know the current status of the cells in the Lithium battery pack. This is done by measuring the voltage and current (sometimes temperature also) of the cells in the pack. Only with these two values the BMS could calculate the SOC or SOH and perform cell balancing etc. So calculating the voltage and current of cell is vital for any BMS circuit, be it a simple power bank or laptop battery or as difficult pack as EV/Solar batteries. In this article we will learn how we can measure the specific cell voltage of the cells used in a Lithium battery pack.

Battery Monitoring System:
User Interface The developed battery monitoring system is also consists of a web-based user interface. The user interface is capable to monitor multiple battery monitoring devices' locations, and the conditions of batteries. Therefore, the idea of the user interface has taken into consideration the situation where there is a need to monitor multiple batteries conditions.
Figure 11 shows the main page for the web-based user interface. A user needs to login prior touse the interface. The login page is built for a secure data handling, where user is required to key-in username and password.

MATERIALS AND METHODS:

We proposed by using the method of magnetic resonance coupling for transferring the power from GA to VA and monitoring the battery through IOT. Sender & Receiver coupler, AC & DC power, rectifier, Battery, Arduino UNO, Sensors like temperature sensors and Voltage sensors these are the main materials which used in this project.

TABULATION:

POSITION	INPUT	OUTPUT
Correct position	12VDC	5V
Wrong position	12VDC	4.5 to 3v(depend upon the position)

DISTANCE	INPUT	OUTPUT
10mm – 20mm	12VDC	5V
20mm-30mm	12VDC	4.5-4.9v
Above 30mm	12VDC	Below 4.5v (Depend upon the distance).

Battery	Volatage measurement result		Accuracy percentage
	Voltage sensor	**multimete**	
1.	**3.81**	**3.79**	**99.47**
2.	**9.98**	**9.91**	**99.29**
3.	**8.70**	**8.55**	**98.27**
4.	**1.25**	**1.23**	**98.40**
5.	**3.81**	**3.79**	**99.48**

REFERENCES

[1] Morgan Stanley Research, "On The Charge", August 2017 [Online]. Available: "https://www.docdroid.net/A5uNOPX/on-the-charge.pdf"
[2] http://money.cnn.com/2017/09/11/autos/countries-banning-diesel-gas cars/index.html
[3] https://www.reinventingparking.org/2013/02/cars-are-parked-95-of time-lets-check.html
[4] "Wireless Power Transfer for Light-Duty Plug-In/Electric Vehicles and Alignment Methodology J2954_201711," available from SAE International,

https://www.sae.org/standards/content/j2954_201711/
[5] S. Yonghua, Y. Yuexi, H. Zechun, "Present Status and Development Trend of Batteries for Electric Vehicles," Power System Technology, Vol. 35, No. 4, pp. 1-7, 2011.
[6] L. Xiaokang, Z. Qionghua, H. Kui, S. Yuehong, "Battery management system for electric vehicles," J.Huazhong Univ. Of Sci. & Tech. (Nature Science Edition). Vol. 35, No. 8, pp. 83-86, 2007.
[7] C. Piao, Q. Liu, Z. Huang, C. Cho, and X. Shu, "VRLA Battery Management System Based on LIN Bus for Electric Vehicle," Advanced Technology in Teaching, AISC163, pp. 753-763, 2011.