



## Wireless Charging of E-vehicle from Solar PV with Class E Inverter

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**Abstract-** In this paper Wireless charging of E-vehicle the wireless charging can eliminates the need for physical cables and connectors, making the charging process more convenient and hassle-free. In this project work, solar photovoltaic based Class-E inverters are used because the class E inverter is employed to provide high efficiency, frequency and low-cost operation. The results show that the proposed system provides high power transfer efficiency and can effectively charge electric vehicles wirelessly using renewable energy sources. The system is operating entirely through automation, there will be an zero manual controls compare than to existing prototype. By using sensor and switching devices the automation is carried out with the help of microcontrollers.

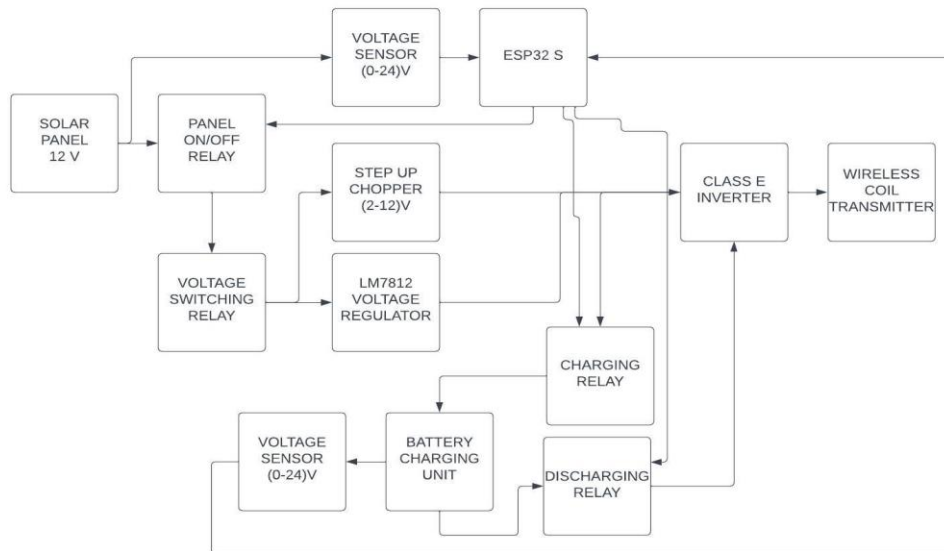
**Keywords-** Solar PV, Battery Swap, Class E Inverter, Voltage Sensors, Automation, IOT (Internet of Things)

### 1.INTRODUCTION

Wireless charging of electric vehicles (EVs) using solar energy and a class E inverter is an innovative and sustainable way to power up EVs. Solar energy is a renewable and clean source of energy . These panels convert sunlight into electrical energy, which can then be used to charge the batteries of EVs. Wireless charging of electric vehicles (EVs) using solar energy has becomes increasingly popular as an environmentally friendly. The use of a Class E inverter in this process offers several advantages over other types of inverters .Firstly, a Class E inverter is a resonant inverter that

operates at high frequencies, typically above 1 MHz .This allows for efficient energy transfer from the solar panels to the EV battery without the need for large and expensive transformers. The high frequency also means that the charging process is faster than traditional charging methods. There is a little literature on the use of electric scooters (e-scooter) in urban environments as a new element in micro mobility, but there are studies that show the e-scooter's ability to replace the conventional private vehicles in short urban trajectories. Several reasons explain the increase in the number of e-scooters in cities. E-scooters represent a cheap and independent mobility system with easy parking, and can often share lanes initially intended only for bicycles. Sharing has spread too many types of vehicles and free-floating scooter sharing could help improve the situations previously identified, and move us towards a more sustainable urban mobility. Most of the advantages identified for e-bikes also are valid for e-scooters. Some common disadvantages of free-floating floats, like the battery recharging and the relocation trips, are analyzed. To propose a control design and power management for a PV wireless charging station for HEV (hybrid Electric vehicle) by use of renewable source.

### 2.BLOCK DIAGRAM FOR THE WIRELESS CHARGING STATION AND E-VEHICLE BATTERY CHARGIN



**Fig (a): Block Diagram of the Wireless Charging Station**

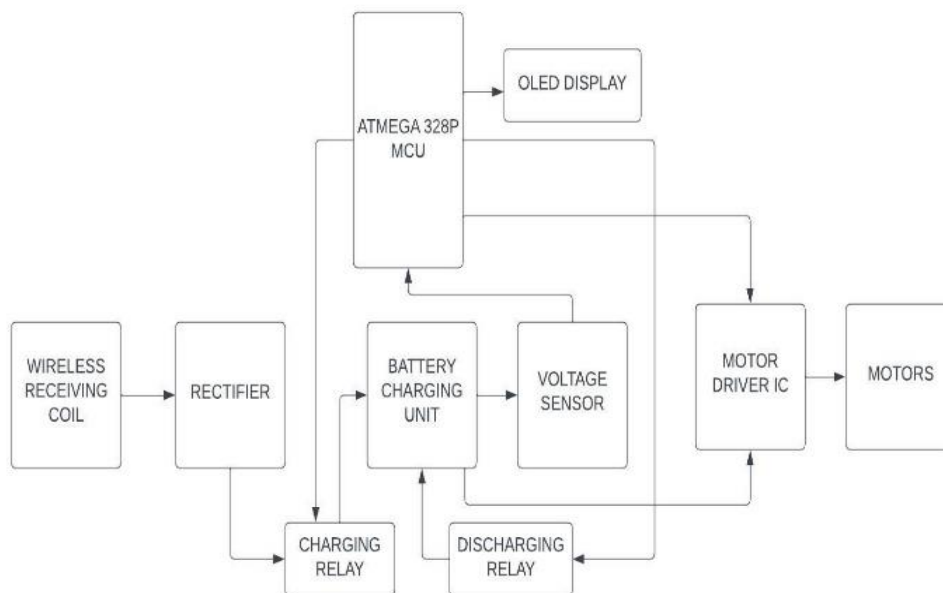
The voltage of solar panel is measured and send to the microcontroller and the voltage is very low during night time or rainy season the voltage may get reduced and so at that time the solar voltage is insufficient for charging the E-vehicle and then the voltage is cut off by the switching device .During low voltage production time the battery are used to charging the E-vehicle at the same time sufficient voltage is produced at the time the EVs are charged by solar energy and the batteries can get recharged.

The voltage is produced higher in temperature rise and so the inverter input voltage is regulated and it can be given as an input for Class E inverter The voltage production slightly low during the moderate temperature and

cloudy time at that moment the solar output voltage is boost by the step-up chopper.

Charging and discharging the battery by using switching devices with respect to controller action through the sensors data from the field .The switching device is used for switching the solar output to the voltage regulator or step-up chopper. The output of chopper is given to the Class E inverter and then finally wireless circuit by renewable energy source is created and eco-friendly the EVs get charged.

The receiving wireless coil is set up in the EVs and the output of the coil is rectified through bridge rectifiers. The voltage is given to the battery charging unit through the charging relay which is get turned on by the voltage of the battery is measured and then it can be turned on battery get charged .



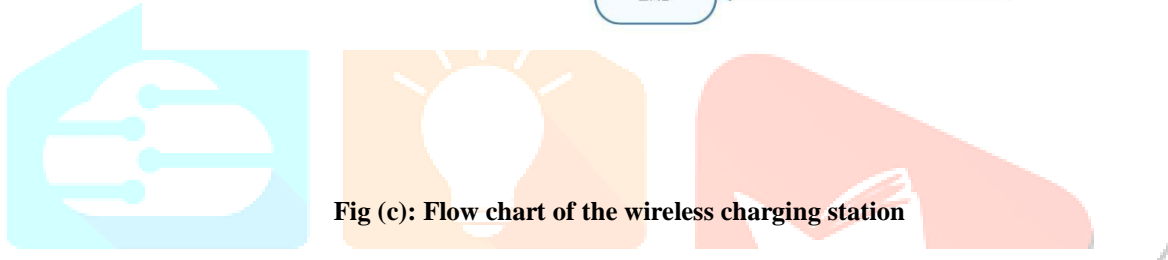
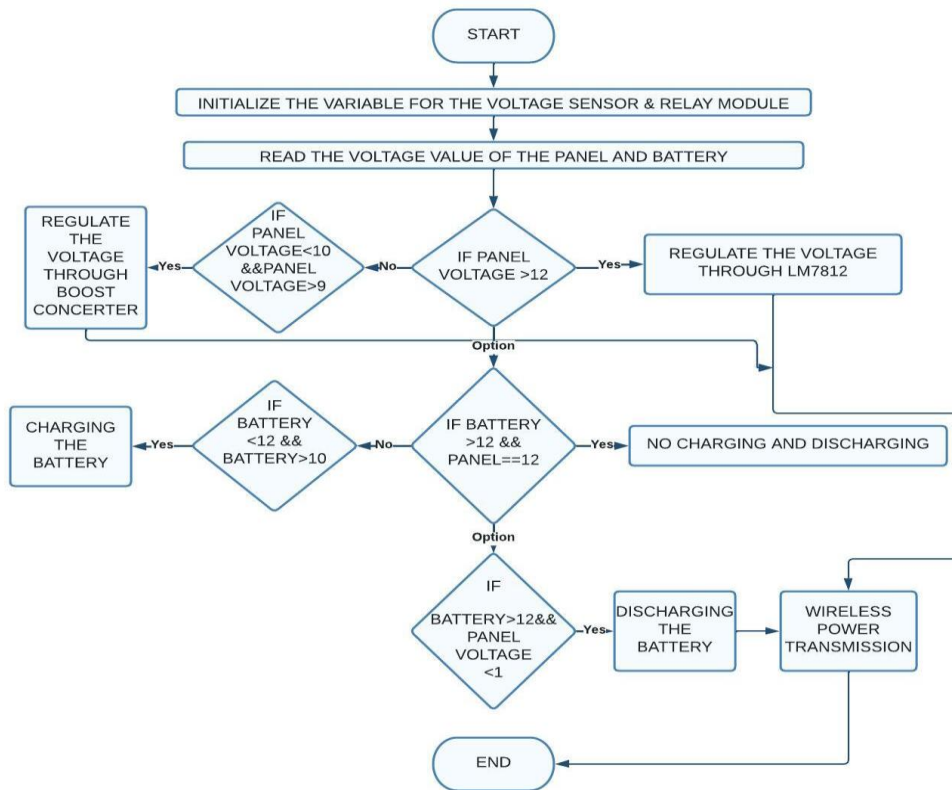
**Fig(b): Block Diagram of the E-Vehicle for charging the battery**

The voltage is enough amount to drive the EVs and the discharging relay is turned on and the motors are rotated through the motor driver IC. The controller is used to collecting the data from the battery and the specific action is carried out and then display current voltage status in OLED. And the E-vehicle model or prototype is designed and then E-vehicle charging task is completed.

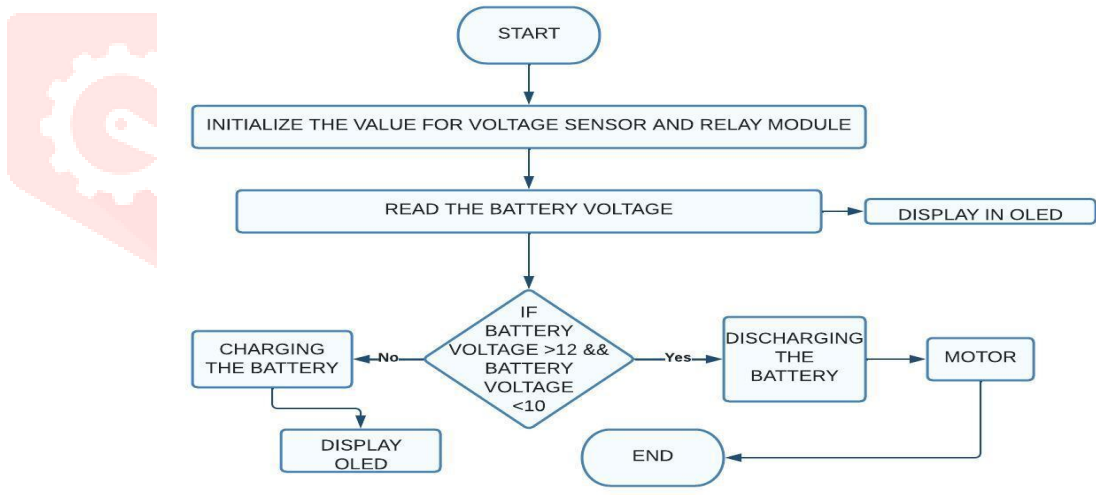
### 3.FLOW CHART FOR THE CHARGING STATION AND E-VEHICLE CHARGING UNIT

The Value of the panel voltage is can be measured through the voltage sensor which placed in nearby the solar panel if the panel voltage is greater than 12V at the moment the relay is turned on and LM7812 can regulate the panel voltage into 12V . Else if the panel voltage is 10V to 9V the voltage can be regulated by Boost converter which is used for boosting the solar voltage. Through the regulated voltage the battery can be charged through the charging module. And the Wireless power transmission is

carried out. If the battery voltage is greater than 12V and the panel regulated voltage is 12V at that moment there will be no charging and discharging of battery. If the battery voltage is less than 12V at the moment the battery can get charged through the charging module through regulated panel voltage. Similarly if the panel voltage very less than 5V at the moment panel is disconnected and battery voltage have sufficient amount of voltage to enhance the wireless power transmission. The E-vehicle's battery voltage is continuously sensed by the voltage sensor which is placed in near by the battery. The battery voltage is read and it can be displayed in the OLED which are all controlled by the microcontrollers. If the car battery voltage is less than 12 and it can be placed in the Wireless charging station the car should be placed in the wireless charging pad which having magnetic windings the car is can be get charge the voltage can be displayed in the OLED. The motors can be controlled by motor driver IC. The charging speed can be increased only by the charging station.



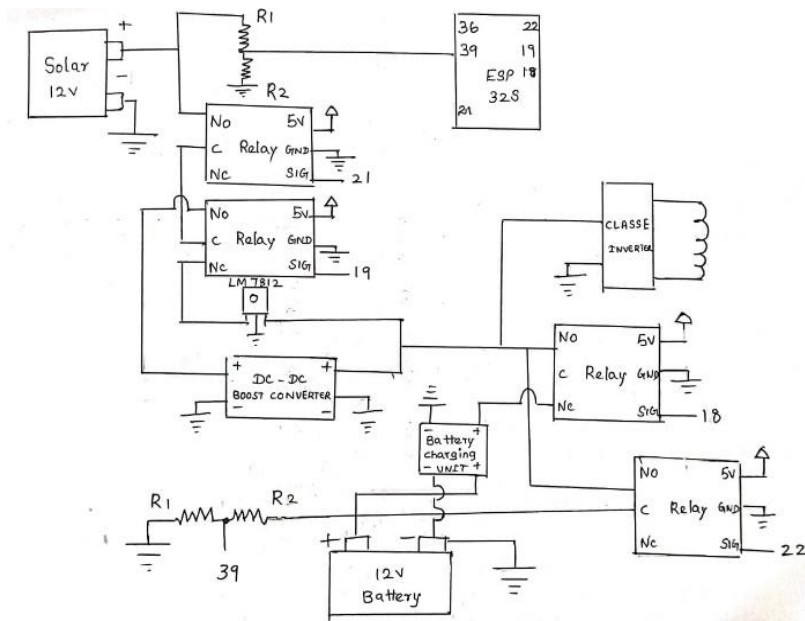
**Fig (c): Flow chart of the wireless charging station**



**Fig(d): Flow chart of the battery charging for E-Vehicle**

The frequency is directly proportional to the speed of charging. Frequency is only increased by the class E inverter.

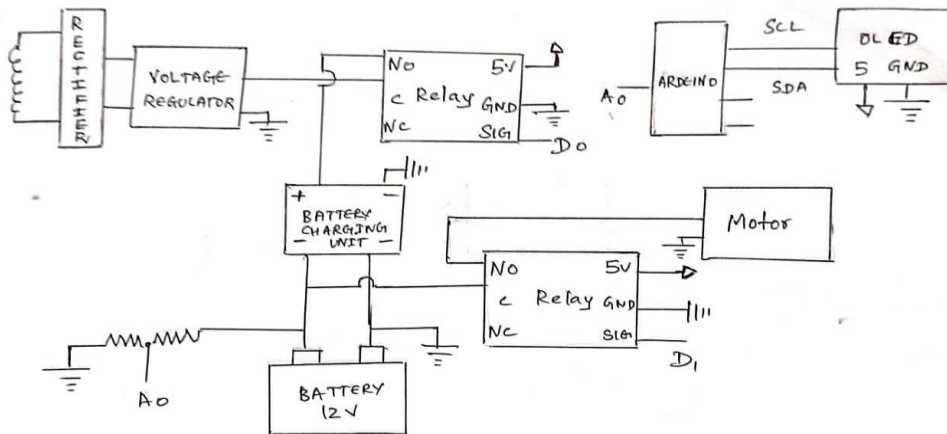
**4.CIRCUIT DIAGRAM**



**Fig(e): Circuit Diagram of the wireless charging station**

The Solar PV panel voltage has  $V_{oc}$  is 24V when the temperature rise and high thermal radiation at that moment the panel voltage is 24V . we doesn't need that voltage because our battery having capacity of 12V and Secondary battery rating can also 12V and so the voltage of panel can be regulated

through the LM7812 . Now the output from panel is regulated into 12V when the voltage switching is get turned ON. And also if the the voltage is less than 12V because sun set at the time the voltage is can be boosted through the Boost converter.



**Fig(f): Circuit Diagram of the E-Vehicle of the battery charging**

If the battery have an 12V it doesn't need to charge but the voltage is reduced and the battery can be charged through the battery charging module or unit. If the panel voltage goes to nearly 3V or 7V at the moment boosting is cannot be efficient and so we can swaping the battery into the circuit through the discharging relay and the power is

transmitted continuously without any interruption the process are all carried out automatically.

In the circuit diagram of the E-Vehicle charging unit having rectifier which rectifies the AC-DC because the tranmitted power is AC and so it can be rectified and the voltage is regulated to battery capacity.The car battery voltage is continuously

sensed through sensors if the voltage is less than 10V we should charge the car .And the Wireless charging station having pad the car sholud be placed in the pad and charging of vehicle is displayed through the OLED. And other controls and automation are carried out by the micro controller.

The above following diagram's are implemented in our prototype of the wireless charging of E-Vehicle from solar PV with class E inverter.

## 5.CONCLUSION

Wireless charging of electric vehicles using solar PV with a Class E inverter is a promising technology that can significantly reduce carbon emissions and increase the use of renewable energy. The use of a Class E inverter allows for efficient power transfer and Here Class E inverter are used and producing high frequency which used for charging station. from the solar panel to the vehicle battery, while the wireless charging technology eliminates the need for physical connections .The implementation of this technology can be beneficial for individuals and organizations looking to reduce their carbon footprint and improve the sustainability of their transportation . However, further research and development are needed to optimize the efficiency of the system and address potential safety concerns .

In conclusion, the combination of wireless charging, solar PV, and a Class E inverter has the potential to revolutionize the electric vehicle industry and accelerate the transition to a more sustainable and environmentally friendly transportation system.

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