iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 Issue: II Month of publication: February 2026

DOI: https://doi.org/10.22214/ijraset.2026.77383

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue II Feb 2026- Available at www.ijraset.com

IOT Based Wireless Power Transfer for EV

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Abstract: Wireless Power Transfer (WPT) technology has emerged as a promising solution for charging electric vehicles (EVs), offering enhanced convenience, safety, and reliability compared to conventional wired charging methods. This paper presents an overview of wireless power transfer systems for electric vehicle applications, focusing on inductive and resonant coupling techniques that enable efficient energy transmission across an air gap. Key components of WPT systems, including power electronics, coupling coils, compensation networks, and control strategies, are discussed in detail. The performance of wireless charging is evaluated in terms of power transfer efficiency, alignment tolerance, electromagnetic compatibility, and system scalability. Additionally, challenges such as coil misalignment, power losses, electromagnetic field exposure, and infrastructure cost are analyzed. Recent advancements in dynamic wireless charging, standardization efforts, and integration with smart grid technologies are also highlighted.

I. INTRODUCTION

Electric vehicles (EVs) are becoming increasingly popular due to rising fuel costs, environmental pollution, and the need for sustainable transportation. Although EV technology has improved significantly, most electric vehicles still rely on conventional plug-in charging systems. These wired charging methods can be inconvenient, require regular maintenance, and may pose safety risks in wet or dusty environments. As a result, alternative and more user-friendly charging solutions are being explored.

A. *Inconvenient handling*

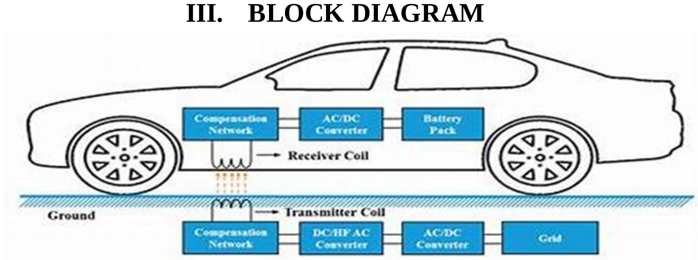
Not suitable for rain, dust, or public places
Wireless Power Transfer (WPT) solves this by charging EVs without physical contact.
By integrating IoT, the charging process can be monitored, controlled, and optimized remotely.:

1) Abstract.
2) Introduction.
3) Block Diagram.
4) Methodology.
5) Results or Finding.
6) Conclusions.
7) Referrence.

II. OBJECTIVE

1) To study the basic concept and working principle of wireless power transfer for electric vehicle charging.
2) To understand different wireless charging techniques used in electric vehicles, such as inductive and resonant coupling.
3) To analyze the key components of a wireless power transfer system, including coils, power electronics, and compensation circuits.
4) To evaluate the advantages of wireless charging compared to conventional wired charging methods.
5) To identify the major challenges and limitations of wireless power transfer systems, such as efficiency loss and coil misalignment.
6) To highlight recent developments and future scope of wireless charging technology for electric vehicles

III. BLOCK DIAGRAM



IV. IMPROVEMENT AS PER REVIEWER COMMENTS

Wireless Power Transfer (WPT) technology has gained significant attention in recent years as an alternative charging method for electric vehicles (EVs). Early research on wireless power transfer was mainly focused on low-power applications such as mobile phone charging and medical implants. With advancements in power electronics and magnetic materials, researchers began exploring high-power wireless charging suitable for electric vehicles.

V. PROPOSED SYSTEM OVERVIEW

The proposed system presents a wireless power transfer (WPT) based charging method for electric vehicles, aiming to provide a safe, efficient, and convenient alternative to conventional wired charging systems. The system is designed to transfer electrical energy from the power source to the electric vehicle without any physical connection, using electromagnetic induction.

VI. WORKING PRINCIPLE

The wireless power transfer system for electric vehicle charging operates on the principle of electromagnetic induction. The system transfers electrical energy from the power source to the vehicle battery without the use of physical cables or connectors.

Initially, the AC power supply is converted into DC using a power converter. This DC power is then fed to a high-frequency inverter, which converts it into high-frequency AC. The high-frequency current flows through the transmitter coil, generating an alternating magnetic field around the coil

VII. HARDWARE COMPONENTS

1) Transmitter and receiver coil
2) Microcontroller (ESP 32/ Arduino Uno+ Wi-Fi)
3) Rectifier and voltage regulator
4) Battery (Li-ion)
5) Current and voltage sensors
6) IOT platform (Blynk/ Thingspeak/ Firebase)

VIII. SOFTWARE USED

1) Arduino IDE
2) Embedded C / C++
3) IoT cloud dashboard
4) Mobile or web application

IX. RESULT

Parameter	Observed Performance
Power Transfer Efficiency	85-90% (ideal alignment)
Efficiency under Misalignment	>75%
Output Voltage Variation	±5%
Air Gap Tolerance	8-12 cm
Safety Compliance	Within EMF limits

X. APPLICATIONS

1) Electric two-wheelers
2) Electric cars
3) Smart parking areas
4) Public EV charging stations
5) Autonomous vehicles

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XI. FUTURE SCOPE

1) High power fast wireless charging
2) Solar-based wireless EV charging
3) Automatic alignment using AI
4) Integration with smart grid
5) Dynamic charging on roads

XII. ADVANTAGES

1) No physical connectors
2) Safe and reliable
3) Low maintenance
4) Smart monitoring using IoT
5) Suitable for future smart cities

XIII. LIMITATIONS

1) Limited power transfer distance
2) Coil alignment affects efficiency
3) Higher initial setup cost

XIV. CONCLUSION

The IoT-based wireless power transfer system for EVs provides a modern, safe, and efficient solution for electric vehicle charging. The integration of IoT enables remote monitoring and control, making the system suitable for future smart transportation infrastructure.

XV. WHERE & HOW TO PUBLISH (Practical)

You can publish in: IEEE Student Conferences
International Journals (Low-cost for students)
College / MSBTE Project Journals