IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

Volume 12, Issue 4, April 2023

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.317

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|

||Volume 12, Issue 4, April 2023||

|DOI:10.15662/IJAREEIE.2022.1204030 |

Solar Base E-Vehicle Charging Station

Umesh Ashok Surum[1], Ramji Eknath Budhar[2] , Dipak Laxman Sonawane[3], Aadesh Dilip Chaure[4], Yogesh Anil Jadhav[5]

Student, Dept of Electrical Engineering, MIT Polytechnic Yeola, Maharashtra, India[1,2,3,4]

Lecturer, Dept of Electrical Engineering, MIT Polytechnic Yeola, Maharashtra, India [5]

ABSTRACT: While electric vehicles are generally seen as clean vehicles, they are not completely clean because the production of electricity might generate emissions as well. This paper on a solar powered electric vehicle charging station is a working solution to close the gap in achieving a truly renewable and clean vehicle. The currently scenario of today solar energy ecosystem is that, it is highly unstructured and localized. There are about 50 solar power plants in India but none of them are connect in a manner that there would be a method to perform analytical analysis of the solar energy produced. This paper aims to finding a possible method to connect the solar powered electric vehicle charging station and to perform analytical operations to increase efficiency of Solar Energy.

KEYWORDS: Batteries, Energy storage, Solar energy, Solar panel, Charging station, Solar powered plants.

I. INTRODUCTION

One major trend in energy usage that is expected for future smart grids is the emergence of battery electrical vehicles as the future mode of transport. Over the past few years, Electric Vehicles (EV) have gained importance because of their appeal as a credible alternative to gas-powered vehicles. With EVs expected to be a major source of transportation in the future, there has been meaningful discussion around their adoption including those for policymakers. However, EVs requires charging station that enables them to “fuel up” its batteries similar to gasoline powered cars. While EVs are pollution free, the electricity used to charge their batteries may be drawn from traditional power plants, decreasing their appeal as an environment-friendly mode of transport.Many countries currently use coal, oil and natural gas for its energy. Fossil fuels are non-renewable; they bring on finite resources that will become too expensive or too environmentally damaging to retrieve. Solar energy is constantly replenished and will never run out. Solar energy is renewable energy and it is mostly called "clean energy" or "green power" because it doesn't pollute the air does not result in carbon emission. Recently, there is a move towards designing solar-powered EV charging stations that provide clean electricity. Our paper is all about the charging station design, working and uses with the disadvantages of the system .Every station is composed of a plug that becomes attached to a vehicle, supplying it with electric power to charge the vehicles. With the reduction in solar costs and improvement in solar efficiency building, solar-powered EV charging station presents a great opportunity to greenify our transportation need, making electric vehicles end-to-end environmentally positive. Charging stations are also called electric vehicle supply equipment and are provided in municipal parking locations by electric utility companies. Currently, the deficiencies of the electric vehicles are the cost of buying and operating the vehicle and also the limited distance capacity of one-time charging. Within the next few years, Electrified vehicles are destined to become an important component of the transport field. Therefore, the charging infrastructure should be developed at the same time. Among this substructure, Charging stations PV-assisted are attracting a substantial interest due to increased environmental consciousness, reduced cost and rise in efficiency of the photovoltaic module. - Few years ago electric vehicles were invented in India to reduce the excess use of fossil fuel and to reduce the harmful emissions emitted from the electric vehicles. But in order to run this electric vehicles the fuel required for running vehicle was electric energy which is obtain from grid but the grid energy is also limited and it is not easily available hence it was the main disadvantage but due to the development of the charging stations this effect was also neglected hence the charging station is very efficient. Fast charging stations will be needed to facilitate longer EV travel distances, including inter-regional trips. They should be placed in larger cities where there is a concentrated population of EV drivers so stations can also be used by local residents. The planning for fast charging stations should be coordinated at the State level and attempt to align with regular routes for government or private fleets of EVs. Electric vehicle smart charging station which is the promising alternative and environmentally sustainable solution to meet up the energy crisis. As worlds resources are diminishing, govt. agencies and nongovernment organization are pushing greener solution through the use of renewable energy sources, as electric power must become less dependent on fossils fuel and transportation must become more electric to decrease carbon emission and mitigate climate change. Hence in order to reduce the pollution through the motor vehicles, electric vehicles are being invented and in order to

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|

||Volume 12, Issue 4, April 2023||

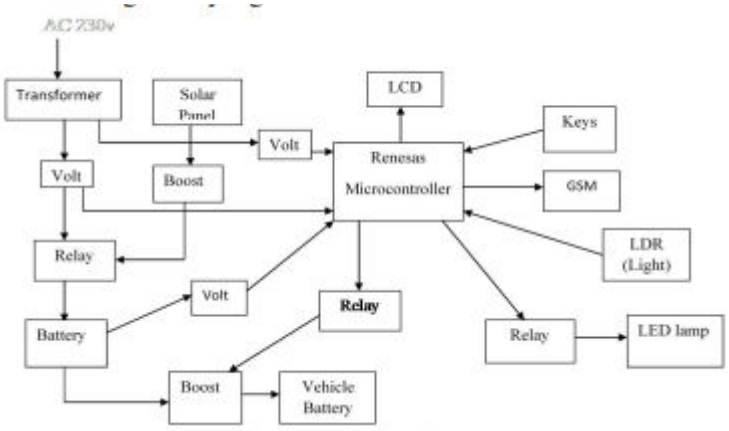
|DOI:10.15662/IJAREEIE.2022.1204030 |

run the electric vehicle the fuel required is the electricity which can be storable through the use of solar energy and run these electric vehicles through the electric vehicle smart charging station which is the promising alternative and environmentally sustainable solution to meet up to the energy crisis.

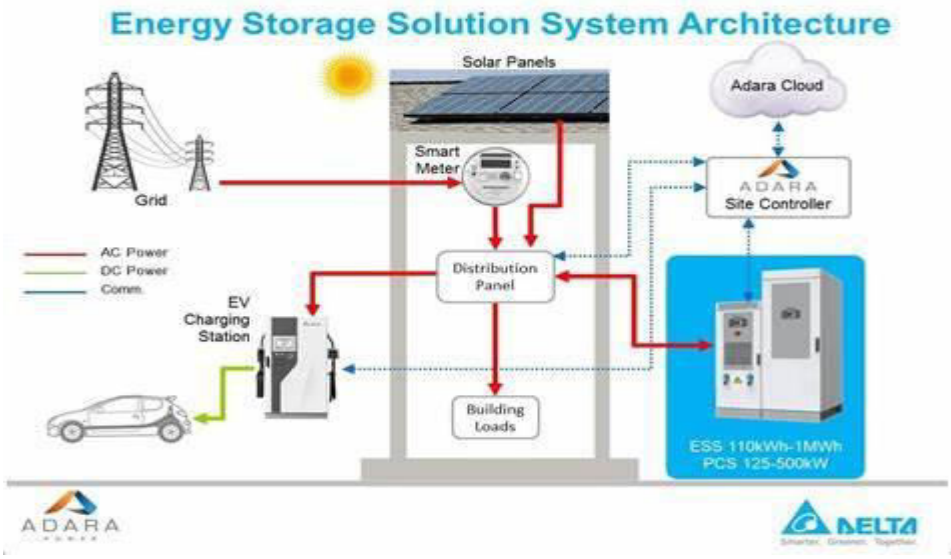
II. LITERATURE SURVEY

The consumption of energy in various countries has been growing rapidly. From the World Bank, according to survey CO2 emissions in 2013 &2014 were 4.988& 4.97 per capita. For transportation more than half of petrol is used the largest proportion sector will be fuel vehicles account. Automobile exhaust is main reason for the environmental pollution. To reduce greenhouse gas emissions the development of electric vehicles is very important driving time of 80% of vehicles is about 1 hr. per day is decided by the statistics & the energy stored is considered. For the safe charging protective system with vehicle is used & monitoring on the electrical activity to ensure safe & reliable discussing the limitations & the impacts of using fossil fuels researches have also be done. World population grows the demand of energy is increased. people's Quality of life will improve by the electrification of transportation & the use of solar powered charging stations. There are main three types of electric vehicle charging station ,Rapid , slow and fast charging station, depending on the speed , power output available to charge the electric vehicle, To charge the electric vehicle in fastest way, rapid charges are used. Fast charges are rated at 7 kW or 22 kW, charging time of electric vehicle is vary on the unit speed.

III. BLOCK DIAGRAM



CONNECTION DIAGRAM OF CHARGING STATION



| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|

||Volume 12, Issue 4, April 2023||

|DOI:10.15662/IJAREEIE.2022.1204030 |

HARDWARE DESCRIPTION

Solar Panel- Solar panels and electric cars are a match made in heaven – when you install a solar energy system on your home, you can use it to both power your home and charge your electric car for emissions-free transportation. The cost of solar is falling rapidly, and companies from Tesla to Nissan are manufacturing electric cars for your daily use. Now, the ability to install a solar PV system large enough to power both your home and your car is an option within reach. But even with incentives and rebates available for both technologies, most homeowners still can't afford to install solar and buy an electric car at the same time. Luckily, it's easy to install a solar energy system today that takes your future electricity consumption into account, if you take a few additional factors into consideration. **Charge Controller** - The Charge Controller is a switching device that can connect and disconnect the charger to the battery and it will take control over charging and to stop charging at the correct voltage. This will protect the batteries from damage from overcharging and regulate the power going from the solar panels to the batteries. A microcontroller in the circuit will read the level of the batteries and then cut off the source of the solar panels to the batteries, once it sees the battery is at the fully charged state. If this was not in place, the solar panels would keep feeding the batteries energy and the batteries would become overheated and damage the internal components. The advantage to have a microcontroller in the system is that it will open a variety of features to add to the system. For example the microcontroller will be programmed to control and display the battery level of the system. It will ensure that there is enough power to charge devices by displaying the gauge on a 7 segment LCD. If there is insufficient power, it will prevent the system from being used until sufficient power has been reached. The microcontroller will also be used in aiding solar efficiency by controlling the solar tracker, as mentioned previously. **Battery:-** The team has selected two deep cycle batteries to power the system. Each battery is a 12V and has a 35 Amp-hour capacity. Batteries for PV system batteries generally have to discharge a smaller current for a longer period of time, such as at night or during a power outage, while being charged during the day. Deep cycle batteries are designed for the purpose of discharging to a lower capacity, between 50% and 80%, than a conventional battery. The most commonly used deep-cycle batteries are lead-acid batteries and nickel-cadmium batteries, both of which have pros and cons. The deepcycle batteries are able to be easily charged and discharged many times and can last for several years due to the thicker plate materials utilized. Batteries in PV systems can also be very dangerous because of the energy they store and the acidic electrolytes they contain, so you'll need a well-ventilated, nonmetallic enclosure for them.Each battery is a 12V and has a 35 Amp-hour capacity. Batteries for PV system batteries generally have to discharge a smaller current for a longer period of time, such as at night or during a power outage, while being charged during the day. Deep cycle batteries are designed for the purpose of discharging to a lower capacity, between 50% and 80%, than a conventional battery. The most commonly used deep-cycle batteries are lead-acid batteries and nickel-cadmium batteries, both of which have pros and cons. The deepcycle batteries are able to be easily charged and discharged many times and can last for several years due to the thicker plate materials utilized. Batteries in PV systems can also be very dangerous because of the energy they store and the acidic electrolytes they contain, so you'll need a well-ventilated, nonmetallic enclosure for them. **Inverter circuit-** An inverter is an integral component in the solar station' design. It will convert the DC voltage generated from the solar panels to an AC voltage. The team will be testing two designs by using special ICs or several pairs of transistors and diodes. An inverter can produce square wave, modified sine wave, pulsed sine wave, or sine wave depending on circuit design, demonstrated in Figure 2. The two dominant commercialized waveform types of inverters as of 2007 are modified sine wave and sine wave. There are two basic designs for producing household plug-in voltage from a lower voltage DC source, the first of which uses a switching boost converter to produce a higher-voltage DC and then converts to AC. The second method converts DC to AC at battery level and uses a line-frequency transformer to create the output voltage. **A. RENESAS** 64-PIN It has General-purpose register 8 bits × 32 registers (8 bits × 8 registers × 4 banks), ROM 512 KB, RAM: 32 KB, Data flash memory: 8 KB ,On-chip high-speed on-chip oscillator and also it has On-chip single-power-supply flash memory and On-chip debug function.

B. LCD A liquid crystal display is a flat panel display and an electronic visual display, based on Liquid Crystal Technology. A liquid crystal display consists of an array of little segments that can be handled to present information. Liquid crystals display do not emits light directly instead they can use light modification techniques. LCD's are used in various range of applications, including computer monitors, televisions , instrument panels, aircraft cockpit displays, signage, etc. They are common in customer devices such as video players, clocks, watches, calculators, and telephones.
Relay The relay is an electrically controlled switch. Current flowing through the coil of the relay generates a magnetic field which attached a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and nearly have double throw switch contacts as shown in the diagram. Relays permit one circuit to switch a second circuit which can be completely different from the first.

Transformer A transformer is a device that carries the electrical energy from one circuit to another through inductively coupled conductors. A differing current in the first winding generates a varying magnetic flux in the

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|

||Volume 12, Issue 4, April 2023||

|DOI:10.15662/IJAREEIE.2022.1204030 |

transformer's core and thus a it flows magnetic field through the secondary winding. This varying magnetic field a differ electromotive force (EMF) in the secondary winding. This effect is known inductive coupling.

IV. DESIGN CONSIDERATION

A. Coil Resistance It is important to calculate the resistance of primary and secondary coils in Wireless Power Transmissions (WPTs), as they represent the main limitation for the power that can be transferred. Actually, if resistances were zero, the efficiency of the transformer would be 100%. Coil resistances generate joule effect, and this heat has to be remained at an acceptable level. Minimizing the joule losses is then a crucial point while designing WPTs, in terms of efficiency and transferable power. R = ρl A Where, l is length of the coil, A is area of the wire, ρ is resistivity of the coil.

B. Helix coil The arrangement of the helix coil (wire radius is not in scale with coil dimension). The turns are packed together in a rectangular section, having base b and height h, and their mean distance from the coil axis is Rm. The self-inductance of each coil can be formulated as LHelix = 0.31(Rm) 2 6Rm + 9h+ 10b

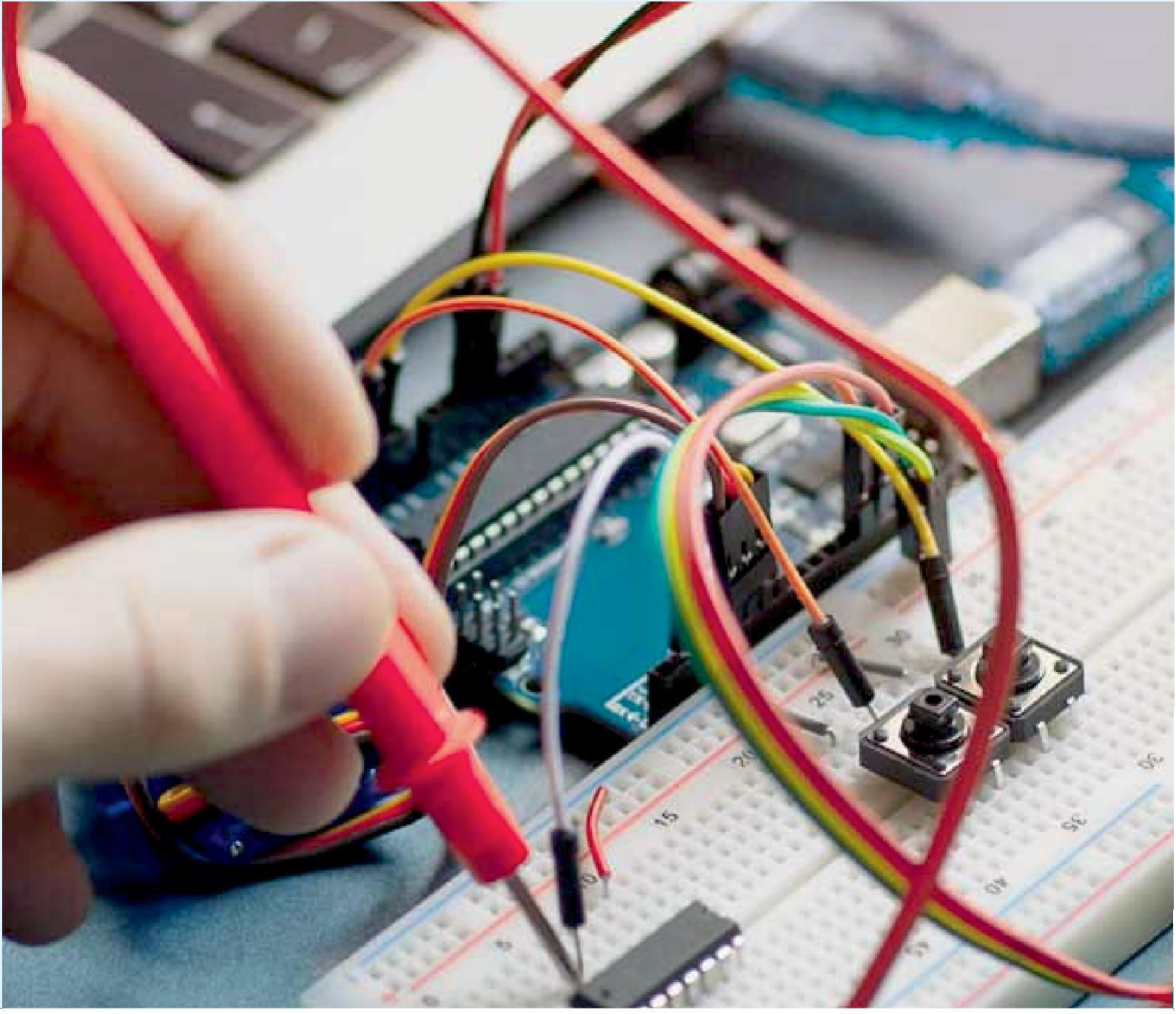
C. Quality factor The quality factor (Q - factor) is a measure or the performance or a coil, capacitor, inductor in terms of its losses and resonance bandwidth. In resonance circuit, sharpness of the resonance can be measured by a term Q – factor. Q = 2π ∗ Max. energy stored in the circuit Energy dissipated by the circuit in one period at resonance In series circuit, the quality factor is given by Q = ω0L R = 1 ω0CR = 1 R √ L C … … … (1)
In parallel circuit, it is given by Q = R ω0L = ω0RC = R√ C L … … … (2)
When the circuit applied act as a voltage amplifier, the voltage produced as resonance circuit will be very high compared to the input supply voltage. In series circuit, at resonance, the voltage across the inductor can be given by the equation VL = Vm R ω0L … … … (3)
We know that ω0L R is the quality factor (Q). So, equation 3 becomes, VL = VmQ … … … (4)
From the above equation, it is evident that the voltage across the inductor will be much larger than the input supply voltage. Hence this circuit can act as a voltage amplifier. The same concept can be applied for the voltage across the capacitor. By properly design the values or L & C in the resonance circuit, we can acquire higher voltages at high frequencies.

V. CONCLUSION

Thus, by using this project the maximum power isderived from the solar panel through multiple axis and hence the power utilized from the grid source is reduced drastically in order to save nonrenewable power source. Additionally, the power generated from the solar panel and power consumption of the solar charge station is made available in the cloud server for monitoring and tracking purposes.

REFERENCES

[1] Sheridan, S. C., & Lee, C. C. (2018). Temporal trends in absolute and relative extreme temperature events across North America. Journal of Geophysical Research: Atmospheres, 123(21), 11-889.
[2] Arjun, K. G., Pruthviraj, B. G., Chethan, K. Y., & Rashmi, P. (2017, May). Design and implementation of peltier based solar powered portable refrigeration unit.In 2017 2nd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT) (pp. 1971-1974). IEEE. [3] Rokde, K., Patle, M., Kalamdar, T., Gulhane, R., & Hiware, R. (2017). Peltier based ecofriendly smart refrigerator for rural areas. International Journal, 7(5).
[4] Sonkhede, P. G., & Pathrikar, A. (2016). Portable thermoelectric refrigeration system for medical application. International Journal of Innovative Research in Computer and Communication Engineering, 4(3), 3190-3195.
[5] Anandakumar, H., & Umamaheswari, K. (2017). Supervised machine learning techniques in cognitive radio networks during cooperative spectrum handovers. Cluster Computing, 20(2), 1505-1515.
[6] S, D., & H, A. (2019). AODV Route Discovery and Route Maintenance in MANETs. 2019 5th International Conference on Advanced Computing & Communication Systems (ICACCS). doi:10.1109/icaccs.2019.8728456
[7] H. Anandakumar and K. Umamaheswari, An Efficient Optimized Handover in Cognitive Radio Networks using Cooperative Spectrum Sensing, Intelligent Automation & Soft Computing, pp. 1–8, Sep. 2017. doi:10.1080/10798587.2017.1364931
[8] Anandakumar, H., & Umamaheswari, K. (2017). An efficient optimized handover in cognitive radio networksusing cooperative spectrum sensing. Intelligent Automation & Soft Computing, 1- 8.



INNO SPACE
SJIF Scientific Journal Impact Factor

Impact Factor: 8.317

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

9940 572 462 6381 907 438 ijareeie@gmail.com

Scan to save the contact details