ISSN: 0975-3583,0976-2833 VOL8,ISSUE04,2017

# AUTOMATIC CHARGING OF MOBILE PHONE USING WIRELESS METHODS

**V.Satheeswaran[1], D. Jerish Solomon[2] and N. Suresh Kumar[3] J. Ashok[4] and M. Jeganathan[5]**

[1-3]Assistant Professor, Department of Electronics and Communication Engineering, Nehru Institute of Technology, Coimbatore 641 105.

[4]Dean, Dhanalakshmi srinivasan School of Architecture, Perambalur - 621113.

[5]Associate Professor, Designed Environment and Research Institute (DEAR Institute) Trichy- 621 213.

satheesw@gmail.com jegann1978@gmail.com

## ABSTRACT

The electronic technology has developed to a larger extend such that the power consumption of the electronic equipments has reduced drastically. As the conventional energy resources are on their decline, identification of alternate energy resources that provide unlimited energy in a safer manner is of at most importance. Now-a-days the usage of mobile phones has increased following an increase in the power consumption. The main problem being addressed by the mobile industry is the drainage of power in batteries. Moreover accessing the mobile charger while travelling is tedious. This paper proposes a method for charging mobile phones automatically, when the charge gets drained. Enormous amount of RF energy is available in the atmosphere. The proposed model is designed to utilize this RF energy. By connecting to a hotspot device, the RF energy can be accessed, converted to DC and then boosted. The output is fed to the mobile battery and can be extended to GSM 900MHz. Thus the effective utilization of RF energy is done for charging of mobile phones without data loss with an efficiency of 36%.

***Keywords:*** RF Energy, Efficiency, GSM

## INTRODUCTION

**Power Transmission:** It is the movement of energy from its place of generation to a location where it is applied to perform useful work .Power is defined formally as units of energy per unit time. Power transmission is usually performed per overhead lines as this is the most economical way to do so. Underground transmission by high-voltage cables is chosen in crowded urban areas and in High-Voltage Direct Current (HVDC) submarine connections. It refers to transfer of energy from the transmitter side to the receiver side. Depending upon the mode of transfer, power transmission is of two types: a. Wired Transmission b. Wireless Transmission.

**Mobile Communication:** It is a communication network (either private or public) which does not depend on any physical connection between two communication entities and have flexibility to be mobile during communication. The current GSM and CDMA technologies offer mobile

ISSN: 0975-3583,0976-2833 VOL8,ISSUE04,2017

communication. The theory of operation of mobile phone in general is that, the data is frequency modulated at the transmitter side and is being transmitted over the channel. At the receiver side, that is at the mobile phone, all the higher frequency components are being eliminated using appropriate filters. This eliminated frequency can be used for the purpose of charging the mobile phones by converting the RF signals to Direct Current, which will be sufficient to charge the mobile phone. The supporting factor is that the mobile phones will be in contact with its nearby six towers, and it will be locked with the tower which provides more strength of signals. Thus even-though the mobile phone is in an idle condition, it will be receiving the RF signals. (Vasanthy and Jeganathan 2007, Vasanthy et.al., 2008, Raajasubramanian et.al., 2011, Jeganathan et.al., 2012, 2014, Sridhar et.al., 2012, Gunaselvi et.al., 2014, Premalatha et.al., 2015, Seshadri et.al., 2015, Shakila et.al., 2015, Ashok et.al., 2016, Satheesh Kumar et.al., 2016).

## LITERATURE SURVEY

It describes an integration scheme for RF energy harvesting that can harvest energy from the ambient surroundings at the downlink frequency range of GSM 900 band. The system design consists of a single wideband Patch antenna, a pi matching network, a voltage doubler circuit [1]. This paper describes a RF harvesting scheme for generating a small amount of electrical power to drive partial circuits in wireless communication. A modified form of existing CMOS based voltage doubler circuit to acheive 160% increase in output voltage power [2]. Various Wireless Power Transmissions (WPT) are applied to charge an Electric Vehicle (EV). An inductive coupling WPT and resonance coupling WPT are often used. We proposed a WPT via microwave (microwave power transmission; MPT) for the wireless charging of the EV. We, Kyoto University, developed two types of the wireless charging of the EV with microwave. One is short distance system which has been developed from 2003. A microwave transmitter put on a road or a parking place and a microwave receiver put on a body of the EV. This is similar system to an inductive coupling WPT or a resonance coupling WPT. The other is mid distance system which has been developed from 2010. There is no coupling between a transmitter and a receiver. In this paper, we describe merits and demerits of both MPT systems [3]. This paper describes an integration scheme for RF energy harvesting. The scheme includes a resonant voltage boosting network, which provides high amplitude swing from a small signal and a rectifier that produces DC voltage where Design issues are addressed. Testing circuits are implemented in a Silicon-on-Glass technology. The Simulation results show that a DC voltage of 0.8 V can be achieved at -20dB input energy level at 868.3 MHz ISM band. This would correspond to a potential working distance of 10 meters [4]. This paper explores optimization techniques for wireless power transfer using high Q resonant inductive coupling. Using Grover's formula to calculate the mutual inductance between inclined coil configurations, and flux linkages to analyze the circuit performance, an equivalent circuit model is developed to match the theoretical response of the system to the experimental results. Furthermore, an optimal coil design is achieved to ensure maximum power transfer to the load. Finally, additional methods to transfer power wirelessly are

ISSN: 0975-3583,0976-2833 VOL8,ISSUE04,2017

explored including radio frequency (RF) to DC conversion techniques, as well as additional circuit components including FSK techniques for data communication to improve efficiency and reduce emissions associated with wired device charging [5]. While low data rate passive sensors operate with little energy there is a need for moderate to high data rate distributed sensors for infrastructure monitoring and other applications. Such sensors will require their batteries or onboard capacitors to be charged when depleted for proper operation. A Circularly Polarized (CP) microstrip patch antenna that can function as a WLAN antenna in the 5.15-5.35 GHz and as a rectenna at 5.5 GHz [6]. (Manikandan et.al., 2016, Sethuraman et.al., 2016, Senthil Thambi et.al., 2016).

## EXISTING SYSTEM

The existing circuit consists passes the incoming AC power waveform from a standard electrical outlet through an AC-DC rectifier. This DC signal is then distributed to a low-dropout (LDO) regulator that is suitable for use with the multi-point control unit (MCU). The LDO is ideal for use here because it draws less current than a typical DC-DC converter and is capable of handling high voltages in order to maintain a constant output voltage for the MCU. The MCU at the transmitter also reads data from the RF receiver that is in communication with the RF transmitter at the receiver in order to control the switch S1 and the DC-DC converter.

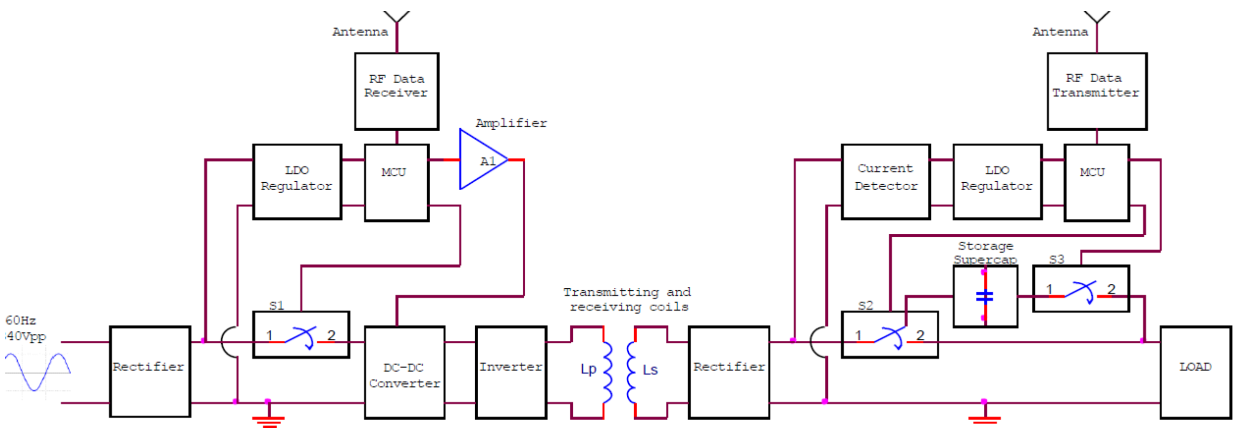


Fig 1: WPT using inductive coupling

**Low- Dropout Regulator:** A low-dropout or LDO regulator is a DC linear voltage regulator which can regulate the output voltage even when the supply voltage is very close to the output voltage. The advantages of a low dropout voltage regulator over other DC to DC regulators include lower switching noise (as no switching takes place), smaller device size and greater design simplicity (usually consists of a reference, an amplifier, and a pass element).

ISSN: 0975-3583,0976-2833 VOL8,ISSUE04,2017

A significant disadvantage is that, unlike switching regulators, linear DC regulators must dissipate power across the regulation device in order to regulate the output voltage.

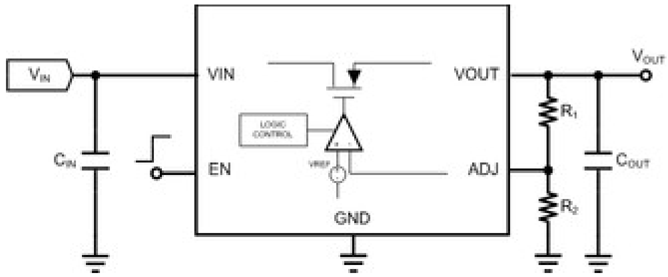


Fig 2: Schematic of a low-dropout regulator

**PROPOSED SYSTEM**

The charging of mobile phones is done by converting the available RF energy in to DC energy. For this purpose, Bluetooth/Mobile hotspot is being used as the transmitter part for the project. The signal is being received through an antenna system and is fed to the CC2595 EVM kit, which do the amplification work. The amplified output is fed to the voltage doubler circuit. The final output from the doubler circuit is used for the charging of mobile phones.

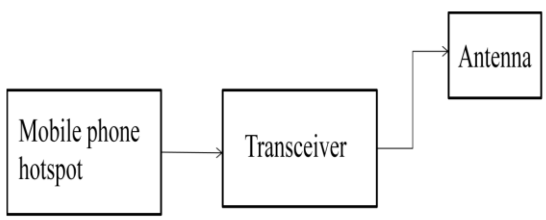


Fig 3: Transmitter Block Diagram

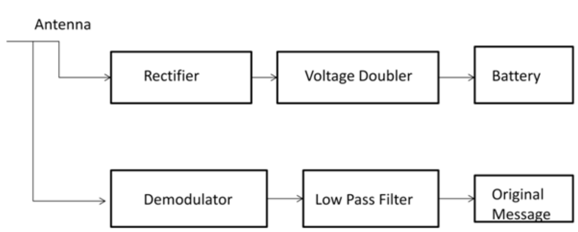


Fig 4: Receiver Block Diagram

ISSN: 0975-3583,0976-2833 VOL8,ISSUE04,2017

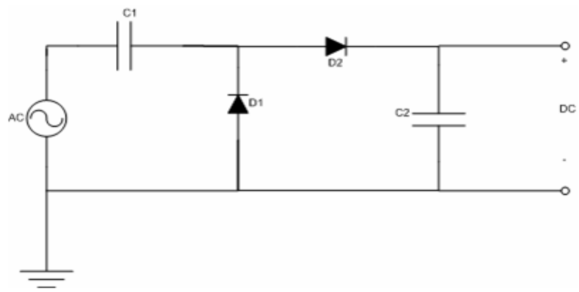


Fig 5: Voltage Doubler Circuit

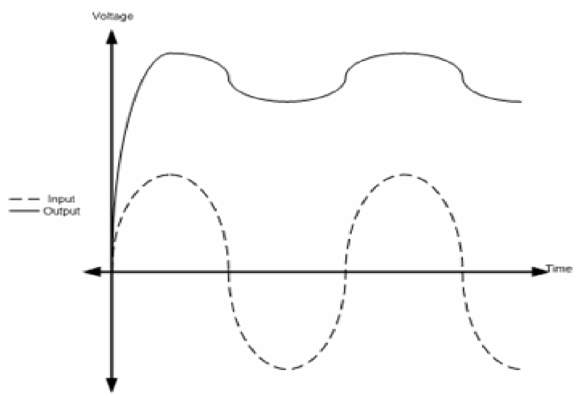


Fig 6: Voltage Doubler Waveform

Each independent stage, with its dedicated voltage doubler circuit, can be seen as a battery with open circuit output voltage VO and internal resistance RO. When n of these circuits are put in series and connected to a load of RL, the output voltage will be given by equation.

$$V_{out} = \frac{nV_0}{nR_0 + R_L} R_L = V_0 \frac{1}{\frac{R_0}{R_L} + \frac{1}{n}}$$

From the equation, we know that the output voltage $V_{out}$ is determined by the addition of $R_0/R_L$ and 1/n if $V_0$ is fixed. With $V_O$, $R_O$, and $R_L$ all constants, we can see from the equation that as n increases, the increase in output voltage will be less each time. At some point, the voltage gained will be negligible.

ISSN: 0975-3583,0976-2833 VOL8,ISSUE04,2017

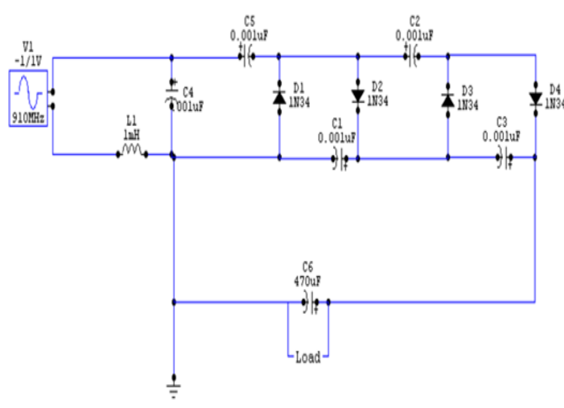


Fig 7: Software Implementation of Receiver Circuit Diagram

It shows the entire receiver circuit of the project that comprises of the antenna part, Voltage doubler (Charge Pump) part and the load part which is the mobile unit.

Fig 8: Hardware Implementation of Antenna Side

## RESULTS AND DISCUSSION

The simulation results shows that for low input range of voltage and current an amplified voltage and current output is obtained. The below table summarizes the hardware implementation results for low frequency operation.

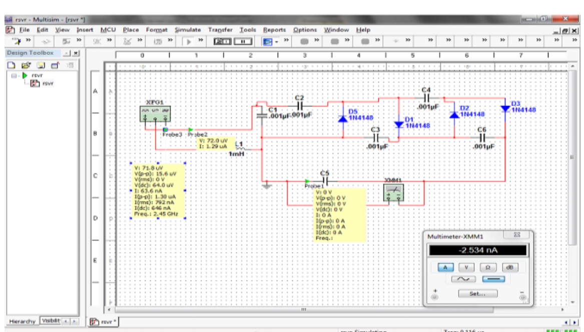

Fig 8: Simulation Result

ISSN: 0975-3583,0976-2833 VOL8,ISSUE04,2017

Input Voltage: 0.6V

| Sl. No | Frequency | Output Voltage |
|---|---|---|
| 1 | 100 KHz | 0.08V |
| 2 | 200 KHz | 0.15V |
| 3 | 500 KHz | 0.27V |
| 4 | 600 KHz | 0.32V |
| 5 | 800 KHz | 0.42V |
| 6 | 1 MHz | 0.50V |

In a similar manner on increasing the frequency range from MHz to GHz the output power level increases gradually.

## CONCLUSION AND FUTURE WORK

The main objective of this work is to charge a mobile phone automatically when its charge gets drained. Through this project it is proved that the charging of mobile phones can be achieved by accessing the available RF power. The simulation result and the hardware implementation for low frequency result shows that in future this RF source is going to be an alternate source for energy. In future it is possible to use RF energy as a source for many low power devices. The simulation result and the hardware implementation result shows that in future this RF source is going to be an alternate source for energy and can be used for charging low power electronic gadgets and are efficient upto 36% which is equivalent to the energy obtained from solar cells.

The future enhancements of this work are Television Digital set top box can be used as a power source; a 24*7 solar power system can be implemented for this purpose.

## REFERENCES

1. Abu Sadat Md. Sayem and Habiba Afrin,"Wireless Power Transfer via Strongly Coupled Magnetic Resonance (2008)", IEEE T . Ind . Electron., 58(1): Page No:313-342.
2. Andrey P. Smakhtin and Valentin V. Rybakov ,"Comparative analysis of wireless systems as alternative to high voltage power lines for global terrestrial power transmission, IEEE IAS 2008".
3. Benjamin Waters,"High Q Resonant Coupling and RF-DC Conversion for Wireless Power Transfer in the EPE supported conference Poland, August 2009."

ISSN: 0975-3583,0976-2833 VOL8,ISSUE04,2017


4. Brown, W. C.,"Beamed microwave power transmission and its application to space", In the IEEE Trans. Microwave Theory Tech., vol. 40, no. 6, 1992, Page No:1239-1250 in September 2008.
5. Brown , W .C and L. Geng , "The History Of Power Transmission By Radio Waves", IEEE Trans . MTT, Vol.32,No.9,1984,Page No:1230-1242 in 2006.
6. Jabbar H,"RF Energy Harvesting System and Circuits for charging of Mobile Devices", Consumer Electronics,IEEE,Vol.56,issue.1,2011.47
7. J.G.Macias Montero, A.Akhnoukh, L.C.N.deVreede,and J.N.Burghartz,"An Integration Scheme for RF Power Harvesting", in the International Electronics and Motion Conference, Slovenia 2009.
8. M.Din,C.K.Chakrabartgy,A,BinIsmail,K.K.A.Devi,and W.Y.Chen,"Design of RF Energy Harvesting System For Energizing Low Power Devices", Progress in Electromagnetic Research, Vol.132, Page No:49-69, 2012.
9. Shinohara , Uji Kubo . y and Tonomura ,"Wireless charging for electric vehicle with microwaves".
10. Transmission Djuradj Budimir1 and Aleksandar Marincic ,"Research Activities and Future Trends of Microwave Wireless Power" in the proceeding of IEEE International conference , Chengdu china, April 21-24, 2008
11. Vasanthy M and M. Jeganathan. 2007. Ambient air quality in terms of NOx in and around Ariyalur, Perambalur DT, Tamil Nadu. Jr. of Industrial pollution Control., 23(1):141-144.
12. Vasanthy. M ,A.Geetha, M. Jeganathan,and A.Anitha. 2007. A study on drinking water quality in Ariyalur area. J.Nature Environment and Pollution Technology. 8(1):253-256.
13. Ramanathan R ,M. Jeganathan, and T. Jeyakavitha. 2006. Impact of cement dust on azadirachtain dicaleaves – ameasure of air pollution in and Around Ariyalur. J. Industrial Pollution Control. 22 (2): 273-276.
14. Vasanthy M and M. Jeganathan. 2007. Ambient air quality in terms of NOx in and around Ariyalur, Perambalur DT, Tamil Nadu. Pollution Research., 27(1):165-167.
15. Vasanthy M and M. Jeganathan. 2008.Monitoring of air quality in terms of respirable particulate matter – A case study. Jr. of Industrial pollution Control.,24(1):53 - 55.

16. Vasanthy M, A.Geetha, M. Jeganathan, and M. Buvaneswari. 2008. Phytoremediation of aqueous dye solution using blue devil (Eichhornia crassipes). J. Current Science. 9 (2): 903-906.
17. Raajasubramanian D, P. Sundaramoorthy, L. Baskaran, K. Sankar Ganesh, AL.A. Chidambaram and M. Jeganathan. 2011. Effect of cement dust pollution on germination and growth of groundnut (*Arachis hypogaea* L.). IRMJ-Ecology. International Multidisciplinary Research Journal 2011, 1/1:25-30 : ISSN: 2231-6302: Available Online: http://irjs.info/.
18. Raajasubramanian D, P. Sundaramoorthy, L. Baskaran, K. Sankar Ganesh, AL.A. Chidambaram and M. Jeganathan. 2011. Cement dust pollution on growth and yield attributes of groundnut. (*Arachis hypogaea* L.). IRMJ-Ecology. International Multidisciplinary Research Journal 2011, 1/1:31-36.ISSN: 2231-6302. Available Online: http://irjs.info/
19. Jeganathan M, K. Sridhar and J.Abbas Mohaideen. 2012. Analysis of meterological conditions of Ariyalur and construction of wind roses for the period of 5 years from January 2002. J.Ecotoxicol.Environ.Monit., 22(4): 375-384.
20. Sridhar K, J.Abbas Mohaideen M. Jeganathan and P Jayakumar. 2012. Monitoring of air quality in terms of respirable particulate matter at Ariyalur, Tamilnadu. J.Ecotoxicol.Environ.Monit., 22(5): 401-406.
21. Jeganathan M, K Maharajan C Sivasubramaniyan and A Manisekar. 2014. Impact of cement dust pollution on floral morphology and chlorophyll of *healianthus annus* plant – a case study. J.Ecotoxicol.Environ.Monit., 24(1): 29-34.
22. Jeganathan M, C Sivasubramaniyan A Manisekar and M Vasanthy. 2014. Determination of cement kiln exhaust on air quality of ariyalur in terms of suspended particulate matter – a case study. IJPBA. 5(3): 1235-1243. ISSN:0976-3333.
23. Jeganathan M, S Gunaselvi K C Pazhani and M Vasanthy. 2014. Impact of cement dust pollution on floral morphology and chlorophyll of *healianthus annus.*plant a case study. IJPBA. 5(3): 1231-1234. ISSN:0976-3333.

ISSN: 0975-3583,0976-2833 VOL8,ISSUE04,2017


24. Gunaselvi S, K C Pazhani and M. Jeganathan. 2014. Energy conservation and environmental management on uncertainty reduction in pollution by combustion of swirl burners. J. Ecotoxicol. Environ.Monit., 24(1): 1-11.
25. Jeganathan M, G Nageswari and M Vasanthy. 2014. A Survey of traditional medicinal plant of Ariyalur District in Tamilnadu. IJPBA. 5(3): 1244-1248. ISSN:0976-3333.
26. Premalatha P, C. Sivasubramanian, P Satheeshkumar, M. Jeganathan and M. Balakumari.2015. Effect of cement dust pollution on certain physical and biochemical parameters of castor plant (*ricinus communis*). IAJMR.1(2): 181-185.ISSN: 2454-1370.
27. Premalatha P, C. Sivasubramanian, P Satheeshkumar, M. Jeganathan and M. Balakumari.2015. Estimation of physico-chemical parameters on silver beach marine water of cuddalore district. Life Science Archives. 1(2): 196-199.ISSN: 2454-1354.
28. Seshadri V, C. Sivasubramanian P. Satheeshkumar M. Jeganathan and Balakumari.2015. Comparative macronutrient, micronutrient and biochemical constituents analysis of *arachis hypogaea*. IAJMR.1(2): 186-190.ISSN: 2454-1370.
29. Seshadri V, C. Sivasubramanian P. Satheeshkumar M. Jeganathan and Balakumari.2015. A detailed study on the effect of air pollution on certain physical and bio chemical parameters of *mangifera indica* plant.Life Science Archives. 1(2): 200-203.ISSN: 2454-1354.
30. Shakila N, C. Sivasubramanian, P. Satheeshkumar, M. Jeganathan and Balakumari.2015. Effect of municipal sewage water on soil chemical composition- A executive summary. IAJMR.1(2): 191-195.ISSN: 2454-1370.
31. Shakila N, C. Sivasubramanian, P. Satheeshkumar, M. Jeganathan and Balakumari.2015. Bacterial enumeration in surface and bottom waters of two different fresh water aquatic eco systems in Ariyalur, Tamillnadu. Life Science Archives. 1(2): 204-207.ISSN: 2454-1354.
32. Ashok J, S. Senthamil kumar, P. Satheesh kumar and M. Jeganathan. 2016. Analysis of meteorological conditions of ariyalur district. Life Science Archives. 2(3): 579-585.ISSN: 2454-1354. DOI: 10.21276/lsa.2016.2.3.9.

33. Ashok J, S. Senthamil Kumar, P. Satheesh Kumar and M. Jeganathan. 2016. Analysis of meteorological conditions of cuddalore district. IAJMR.2 (3): 603-608.ISSN: 2454-1370. DOI: 10.21276/iajmr.2016.2.3.3.
34. Satheesh Kumar P, C. Sivasubramanian, M. Jeganathan and J. Ashok. 2016. South Indian vernacular architecture -A executive summary. IAJMR.2 (4): 655-661.ISSN: 2454-1370. DOI: 10.21276/iajmr.2016.2.3.3.
35. Satheesh Kumar P, C. Sivasubramanian, M. Jeganathan and J. Ashok. 2016. Green buildings - A review. Life Science Archives. 2(3): 586-590.ISSN: 2454-1354. DOI: 10.21276/lsa.2016.2.3.9.
36. Satheesh Kumar P, C. Sivasubramanian, M. Jeganathan and J. Ashok. 2016. Indoor outdoor green plantation in buildings - A case study. IAJMR.2 (3): 649-654.ISSN: 2454-1370. DOI: 10.21276/iajmr.2016.2.3.3.
37. Manikandan R, M. Jeganathan, P. Satheesh Kumar and J. Ashok. 2016. Assessment of ground water quality in Cuddalore district, Tamilnadu, India. Life Science Archives. 2(4): 628-636.ISSN: 2454-1354. DOI: 10.21276/lsa.2016.2.3.9.
38. Manikandan R, M. Jeganathan, P. Satheesh Kumar and J. Ashok. 2016. A study on water quality assessment of Ariyalur district, Tamilnadu, India. IAJMR.2 (4): 687-692.ISSN: 2454-1370. DOI: 10.21276/iajmr.2016.2.3.3.
39. Sethuraman G, M. Jeganathan, P. Satheesh Kumar and J. Ashok. 2016. Assessment of air quality in Ariyalur, Tamilnadu, India. Life Science Archives. 2(4): 637-640.ISSN: 2454-1354. DOI: 10.21276/lsa.2016.2.3.9.
40. Sethuraman G, M. Jeganathan, P. Satheesh Kumar and J. Ashok. 2016. A study on air quality assessment of Neyveli, Tamilnadu, India. IAJMR.2 (4): 693-697.ISSN: 2454-1370. DOI: 10.21276/iajmr.2016.2.3.3.
41. Malarvannan J, C. Sivasubramanian, R. Sivasankar, M. Jeganathan and M. Balakumari. 2016. Shading of building as a preventive measure for passive cooling and energy conservation – A case study. Indo – Asian Journal of Multidisciplinary Research (IAJMR): ISSN: 2454-1370. Volume – 2; Issue - 6; Year – 2016; Page: 906 – 910. DOI: 10.21276.iajmr.2016.2.6.10.

42. Malarvannan J, C. Sivasubramanian, R. Sivasankar, M. Jeganathan and M. Balakumari. 2016. Assessment of water resource consumption in building construction in tamilnadu, India. Life Science Archives (LSA) ISSN: 2454-1354 Volume – 2; Issue - 6; Year – 2016; Page: 827 – 831 DOI: 10.21276/lsa.2016.2.6.7.
43. Sivasankar R, C. Sivasubramanian, J. Malarvannan, M. Jeganathan and M. Balakumari. 2016. A Study on water conservation aspects of green buildings. Life Science Archives (LSA),ISSN: 2454-1354. Volume – 2; Issue - 6; Year – 2016; Page: 832 – 836, DOI: 10.21276/lsa.2016.2.6.8.
44. Ashok J , S. Senthamil Kumar , P. Satheesh Kumar and M. Jeganathan. 2016. Analysis and design of heat resistant in building structures. Life Science Archives (LSA), ISSN: 2454-1354. Volume – 2; Issue - 6; Year – 2016; Page: 842 – 847. DOI: 10.21276/lsa.2016.2.6.10.