

# FINAL YEAR PROJECT REPORT

# WIRELESS CHARGER FOR ELECTRICAL VEHICLES

In fulfillment of the requirement For degree of BEE (Electronics)

# By

M. SAMEED BIN REYAZ SHAHJAHAN A.RAHEEM S. SAIF NAEEM 31012 BEE(ELECTRONICS)31034 BEE(ELECTRONICS)31048 BEE(ELECTRONICS)

# **SUPERVISED**

BY

# **DR. HAROON RASHEED**

BAHRIA UNIVERSITY (KARACHI CAMPUS) 2012-2016

#### ACKNOWLEDGEMENT

Each work accomplished is a joy, a feeling of fulfilment/achievement. However, a number of individuals dependably propel, scrutinize and admire a work with their target thoughts and conclusions. Henceforth we might want to utilize this opportunity to thank all who have directly or indirectly helped us in achieving this venture.

We wish to express our sincere gratitude to our humble project co-ordinator Dr Haroon Rasheed, HOD (Department of Electrical Engineering) who helped us by advising and guiding us to overcome the difficult and critical situations, without whom this project and research would not have been this extravagant.

We would like to use this opportunity to thank our family members, teachers and friends who contributed a lot by providing us with their invaluable ideas and proposals which has gone far in mitigating our rough edges and for being a great motivator and supporter.

### Wireless Charger for Electrical Vehicles

### ABSTRACT

The goal of this project was to do research and develop a prototype of the trending and developing Wireless Charger for Electrical Vehicles (EVs). The project deals with the wireless transmission of power over large distances. This report discusses various techniques and strategies involved and utilized to accomplish the project. Different stages along with detailed explanation of the project with graphs and MATLAB codes are listed in the report.

The research depicts a mechanism which has the ability to transfer power wirelessly, which adopts the basic theory of Inductive Power Transfer. The transferring distance increases from several millimetres to hundred and fifty millimetre with an amazing efficiency. This adaptive technique will prove to be a revolutionary change in the field of Electronics.

Recommendation for future improvement as well as the guide line for developing a wireless charger for electrical vehicle is included in the report.

### TABLE OF CONTENTS

	1
DECLARATION	iii
APPROVAL FOR SUBMISSION	v
ACKNOWLEDGEMENTS	viii
ABSTRACT	ix
TABLE OF CONTENTS	x
LIST OF TABLES	xiii
LIST OF FIGURES	xiv
LIST OF SYMBOLS / ABBREVIATIONS	xvi
LIST OF APPENDICES	xviii

### CHAPTER

1

2

INTR		1		
1.1	Backg	round		1
1.2	Proble	m Statements		1
1.3	Aims and Objectives			2
1.4	Scope	of Project		2
LITE	RATUR	E REVIEW		3
2.1	Wirele		3	
2.2	Wirele		4	
	2.2.1	Radiative Technology		5
	2.2.2	Non – Radiative Technology		5
	2.2.3	Resonant Inductive Coupling		6

Resonant Inductive Coupling 2.2.3

х

	DESIG	N AND	METHODOLOGY	9
	3.1	Basics o	f Wireless Charger for EV	9
		3.1.1	MOSFETs	9
		3.1.2	Transmitting and Receiving Coils (Inductors)	11
		3.1.3	Capacitors	12
	3.2	Designi	ng Wireless Charger	14
		3.2.1	Finding the Parameters	16
		3.2.2	Designing the Charger	17
		3.2.3	Designing the PWM Circuit	18
	IMPLN	MENTA	TION	21
	4.1	Core C	oncept.	21
	4.2	Core Bo	ody	22
	4.3	Transm	itting Side	22
		4.3.1	Circuitry	22
		4.3.2	Transmitting Coil	23
	4.4	Receivi	ng Side	23
		4.4.1	Receiving Coil.	23
		4.4.2	Rectification and Filtering.	24
		4.4.3	LOAD	24
	4.5	Prototy	pe	24
		4.5.1 Hardware		
		4.5.2	Simulated Design for 2kW Wireless Transmissio	on 27
				30
			D DISCUSSIONS	30
	5.1			
5.2			Based on Different Parameters	31
	1		Effect of Change in Inductance of 'L'	31
		5.2.2	Effect of Change in Capacitance	32
		5.2.3	Effect of Change in Mutual Inductance	35
		5.2.4	Effect of Change in Leakage Inductance of Coil	36
		5.2.5	Effect of Internal Resistance of Battery	38
		5.2.6	Efficiency of the System:	40

xi

6 CONCLUSION AND RECOMMENDATIONS	41
6.1 Conclusion	41
6.2 Recommendation	42
REFERENCES	43
APPENDICES	44
Technics a	
APPENDIX A: Graphs	44
A.1 Graph of Impedance of Prototype Implemented in Hardwa	re 44
A.2 Graph of Current against Frequency of Prototype	
Implemented in Hardware	45
A.3 Simulated Result of implemented Prototype	45
A.4 Graph of Impedance against frequency for the proposed	
2kW Wireless System	46
A.5 Graph of Current against Frequency of Proposed 2kW Hardwar	re 47
A.6 Simulated Input Parameters	47
A.7 Simulated Output:	48
1	
APPENDIX B: Computer Programme Listing	49
B.1 Code for generating PWM in C++ via Microcontroller:	• 49
B.1.1: For Simple Oscillator	49
B.1.2: For Full Bridge Inverter	49
B.2 Code for finding the parameters:	
D.2 Code for finding the parameters.	50