

Wireless Charger: Leading Technology

Geetanjali Sharma

Department of Electronics and Communication Engineering
GGSIU University New Delhi, India

Abstract— This paper proposes the need of wireless chargers in today's world and the need for further research and development in this field. This paper tells all possible developments that has been done till date since 1899. In 1899, the concept of wireless charging was tossed for the first time by Nikola Tesla. This paper also tells the future scope of wireless chargers and how it can aid environmental pollution in electronic vehicles. Wireless charger is a topic that promotes sustainable technological development, with easy principle of working and hence easy manufacturability. It is leading to a technological revolution as well as aiding environmental pollution.

Keywords: Wireless Chargers, Smartphones, Vehicles

I. INTRODUCTION

Nowadays no work can be completed without a smartphone which runs multiple power-hungry apps. But it needs to be charged multiple times a day. Instead of carrying a power bank it will be so much suitable for the consumers to have wireless chargers with them or to have wireless chargers in public areas like metro stations, bus stands, railway stations, inside the vehicles.

According to a study, almost 85% of families living in metropolitan cities owns at least one car, so many pollutants like CO, greenhouse gases, Sulphur dioxide etc. are emitted from car leading to air pollution. It's the need of the hour that sustainable technological development should be promoted for a greener earth and better future, it can be possible if we use electric vehicles and instead of having petrol pump, wireless charging stations can be created. It's not just a word because many companies like Mercedes-Benz, Audi, BMW, Toyota, etc. have developed electric cars with wireless charging technology.

Not just car and smartphones, laptops which are used by each employee of an organization can also be wirelessly charged while the person works on it. Dell is one of the leading manufacturers of laptops is working on this concept.

II. PRINCIPAL OF WORKING

This technology is not new, in 1899 Nikola Tesla tossed the concept of wireless charging by lighting 200 light bulbs with 100 billion watts of power over 25 miles away from a power source but due to lack of funding he was unable to work further on it. Even after 100 years we haven't employed this in our device and this field remains unexplored.

Wireless charging is also called as Inductive charging^[1] because of its working principle. Inductive charging (also known as wireless charging) uses electromagnetic field to transfer energy between two objects through induction. Energy is sent through an inductive coupling to an electrical device, which can then use that energy to charge batteries or run the device.

Induction chargers use an induction coil to create an alternating electromagnetic field from within a charging base,

and a second induction coil in the portable device takes power from the electromagnetic field and converts it back into electric current to charge the battery. The two induction coils in proximity combine to form an electrical transformer^[2]. In this configuration, the best results are achieved by operating the transmitter at a frequency that is slightly different from the resonant frequency of the receiver. Off-resonant operation gets you the highest amount of power at the best efficiency. This operating mode is called "inductive" as shown in Figure 1.

Greater distances between sender and receiver coils can be achieved when the inductive charging system uses coupling. When the distance between receiver and transmitter increases, the magnetic coupling between the coils decreases. Systems with a low coupling factor must operate at the resonant frequency of the receiver. This mode is called "resonant" as shown in Figure 2.

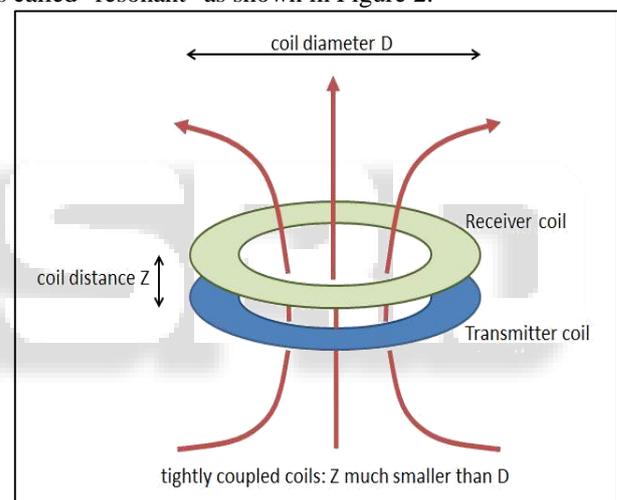


Fig. 1: Inductive Charging

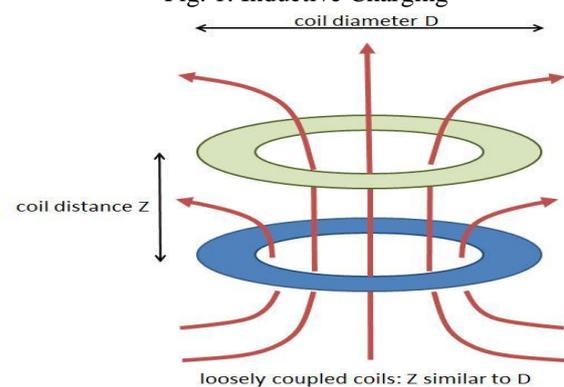


Fig. 2: Resonant Charging

III. WIRELESS CHARGERS IN SMARTPHONES

Many companies like WPC (Wireless Power Consortium)^[3], one of the leaders of Qi standard^[4] is using this technology. This organization has partnered with many other organizations to integrate its charging standard in furniture, airports, hotels and even cars.

Beside WPC, A4MP (Alliance for wireless power) and PMA (Power Matters Alliance) makes power mat. Qi is very popular with smartphones like Samsung galaxy S6. It uses the inductive charging technology. Not just Samsung, Apple's upcoming iPhones will also have wireless charging as they have joined the Wireless Power Consortium industry as shown in Figure 3.



Fig. 3: Samsung Galaxy S6 with wireless charger

Along with Samsung many other android handsets feature wireless charging like LG G4, Microsoft Lumia 1520, Blacberry Priv Z30, Google Nexus 6 and apple iPhone joining the list in near future.

IV. WIRELESS CHARGERS FOR VEHICLES

Not just smartphones and laptops, car manufacturers have also started to build wireless charging into some models like BMW in its 5 series, Audi has a Qi charger in its phone box system, Toyota also uses wireless chargers in its selective models.

Electronic vehicles [5] can also be wirelessly charged. Guess what its safe, convenient and reliable. BMW with Mercedes Benz is working on this technology to develop wireless charging system for its "i3" electric vehicle and i8 plug in hybrid. A prototype made by Qualcomm technologies [6] is already in use in BMW i8 safety car in Formula E electric vehicle race series as shown in Figure 4. Tesla is also on the way of introducing EV's with wireless charging. Infact it is working on charging electric busses by installing chargers at each stopping stations.



Fig. 4: Recardo using Qualcomm's wireless electronic vehicle charging technology (WVEC).

V. THE FUTURE OF WIRELESS CHARGING

The greatest benefit of this technology is that it can charge multiple devices simultaneously. It is cost effective and easy to manufacture as the basic principle is that of a transformer. With companies like Nucurrent [7] unveiling world's first 10W charging antenna and several charging products designed for wearables, this technology has a long way to go. It is an amazing invention of electric current. It will put back the conventional fossil fuel powered vehicle with clean, green, safe, silent and efficient vehicles. With wireless charging we can have a healthy future for our planet Earth.

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