0.1 Working towards a realization

Our major goal is to provide with an efficient solution that best meet the challenges in battery charging systems using wireless power transfer. Those challenges include:

1. Charging the battery as quickly as possible. Though batteries can store large amount of charge but unfortunately there is a limit to how fast a battery can be charged and this limit gets smaller with the size (capacity) of a battery. Smaller the battery, smaller the charging current limit will be and exceeding this limit will deteriorate battery's life. To overcome this difficulty we proposed adding a super capacitor in parallel with a battery. Even though super capacitors can hold less amount of charge compared to the same size battery but they can be charged much faster [?].

2. Providing long battery life with large charge to discharge ratio. In our scenario we want to make the charging interval as small as possible which requires a need to store as much charging current as possible in this short interval and that makes the addition of super capacitor an ideal solution to overcome the battery charging limitation. During the charging interval, super capacitor can store large amount of charging current and then later use this current to charge the battery with slow pace. Which provides long battery life in terms of large charge to discharge ratio.

3. Working out efficient protocol for sharing the available charge.

0.2 Protocols concerning environmental impact features

1 The proposed system design

The Figure The transmitter is powered up by a voltage source V_i of 12 Volts capable of delivering 400 milli-Amps of i_{in} current. i_c is the constant current that is consumed by the transmitter circuitry and i_s is the induction current which flows through the transmitter coil such that $i_{in} = i_c + i_s$. i_c is constant and depends on the transmitter inner circuitry power consumption, in our case $i_c = 100milli - Amps$. i_s depends on the distance between the two magnetically coupled coils, greater the distance smaller the i_s will be. Another factor that i_s could depend is on adding an iron core between the two coils, adding a core makes the magnetic coupling stronger and increases the i_s which enhances an overall efficiency of the system. The receiver circuit receives an induction voltage V_r, rectifies it through a rectifier containing a shotkey diode D_r and a capacitor C_r. A shotkey diode is used in order to have a good frequency response at the range of $300 - 400Khz$ the transmitter working frequency also shotkey has lower forward voltage drop. The rectified voltage is then fed to the voltage regulator that produces constant voltage $V_{reg} = 5Volts$.

1.1 Analysis

The Figure shows a low level schematic of the receiver and charging circuit which will be the main focus of our project. The induction current i_r induced by the transmitter through magnetic coupling will be the main source of charging current. The current i_c charges the super capacitor, i_b charges the battery and i_L is consumed by the load including resistor R_L and a light source. During the charge cycle $i_r = i_c + i_b + i_L$. Now in analysis lets first consider the efficiency η of the circuit. If P_o is the power consumed by the receiver and P_i is the power provided by the transmitter, ignoring small power drops across D_r and C_r then:

$$\eta = \frac{P_o}{P_i} \tag{1}$$

where $P_o = V_{reg} \times i_r$ and $P_i = V_i \times i_s$

1.2 The internet of things

2 Results

3 Conclusion