

# WIRELESS CHARGING OF MOBILE PHONES USING MICROWAVES

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**Abstract-** Mobile Phones are part of our life. It is the fastest and the easiest medium of communication. Battery life of mobile phone is always been a problem for manufacturers. People are complaining about their mobile's battery life, that they don't have long battery life and they have to charge their phone several times. In this paper a new idea is shown to charge your mobile phone anywhere you want without connecting its charger. This is done using microwaves. Microwaves are the radio waves which provide communication between two mobile phones. The microwave is sent with the message by the transmitter using antenna at the frequency of 2.45GHz. Here we are using Microwaves as the source of energy to charge the phone. We have to add a sensor, a rectenna circuit and a filer in our mobile phone to do the job. By adding these things we can charge our phone using microwave when we talk. So as we talk more we can charge more!!

## I. INTRODUCTION

### 1.1 Electromagnetic Spectrum

As we know that when light shone through the prism it is divided in all the colors which we called rainbow, and technically it is called visible spectrum. So light is made of photons. Photons are bundle of energy. Light is traveling at the speed of 3,00,000 km/hr So when light hit an object coming on its way it actually rebound from its surface. And it comes in to our eyes and we can see the object. But color of the object is seen by us is depend how much amount of energy is rebound as photons from the object. But some theory can't be explained by taking the light as the bunch of photos. So some physicians assume that it is some kind of wave. They define an electromagnetic sanctum of different wave lengths which is divided in two parts. One is electric field and the other is magnetic field.

### 1.1 Microwave Region

Microwaves are the Radio wave which has the wave length range of 1 cm to 1 meter. And the frequency is 300MHz to 300GHz.Each and every object on the earth absorb different amount of

microwave energy. Microwave oven converts this microwave energy in to the frequency which the food absorbs and gets energy from it and get worm. But the bowl containing the food do not get worm because its capacity of absorbing microwave frequency is different! Microwaves are good at carrying information from one place to other. As the microwave penetrates the solid material and also it do not have and effect of weather and rain etc. So it is useful to carry information. There are different frequency bans according to the range of frequencies shown:

### Designation Frequency range:

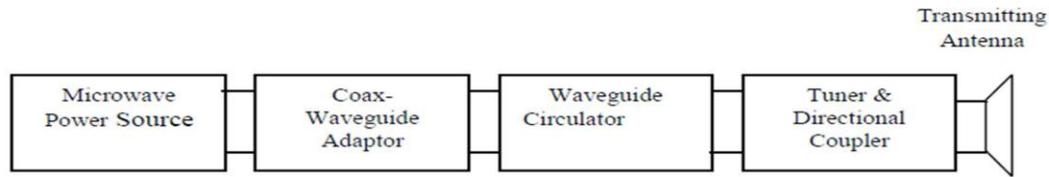
L Band 1 to 2 GHz  
S Band 2 to 4 GHz  
C Band 4 to 8 GHz  
X Band 8 to 12 GHz  
Ku Band 12 to 18 GHz  
K Band 18 to 26 GHz  
Ka Band 26 to 40 GHz  
Q Band 30 to 50 GHz  
U Band 40 to 60 GHz  
V Band 46 to 56 GHz  
W Band 56 to 100 GHz

We will use S Band for our experiment. As Industrial, Scientific and Medical (ISM) some bands are reserve for some specific purpose. So we can't use it. Here S band is freely available band which we can use for experiment.

## II. WIRELESS POWER TRASMISSION

Nikolas Tesla is the father of wireless electricity transmission. Who first transmitted electricity without wire. Magnetic induction is the main principle behind the wireless power transmission. As we put one coil carrying current through it, it creates a magnetic field near to it. And if we put other coil over there than it is induce by the first coil and it carry current from it! This is the simple principle behind it.

### 1.2 Wireless Power Transmission System



William C. Brown demonstrated how power can be transfer through space using microwaves. The concept of wireless power transmission is shown in the block diagram. Here as we can see there are two part. One is transmitting part and the other is the Receiving part. At the transmitting end there is one microwave power source which is actually producing microwaves. Which is attach to the Coax-Waveguide and here Tuner is the one which match the impedance of the transmitting antenna and the microwave source. Directional Coupler helps the signal to propagate in a particular direction. It spread the Microwaves in a space and sent it to the receiver side. Receiver side

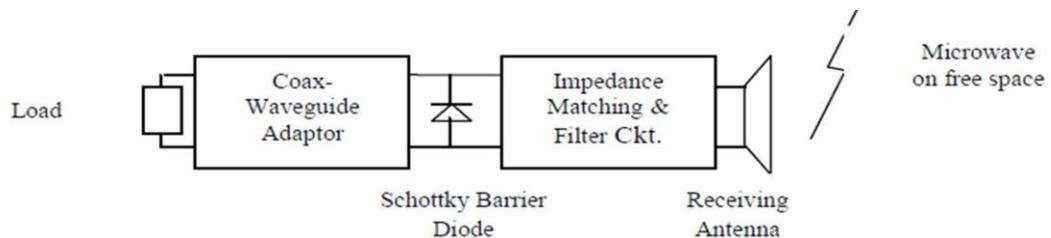
It generates the Microwave by the interaction of the steam of elections and the magnetic field.

### 2.2.2 Transmitting Antenna

There are many kind of slotted wave guide antenna available. Like parabolic dish antenna, microstrip patch antenna are the popular type of transmitting antenna.

### 2.2.3 Rectenna

A **rectenna** is a **rectifying antenna**, a special type of antenna that is used to convert microwave energy into direct current electricity. A simple rectenna element consists of a dipole antenna with an RF



Impedance matching circuit receives the microwave signal through Rectenna circuit. This circuit is nothing but the combination of filter circuit and the schottky Diode. Which actually convert our microwave in to the DC power!

diode connected across the dipole elements. The current induced by the microwaves in the antenna is rectified by the diode. Which powers a load connected across the diode. Schottky diodes are used because they have low voltage drop and high speed so that they have low power loss.

## 2.2 Components of wireless power transmission system

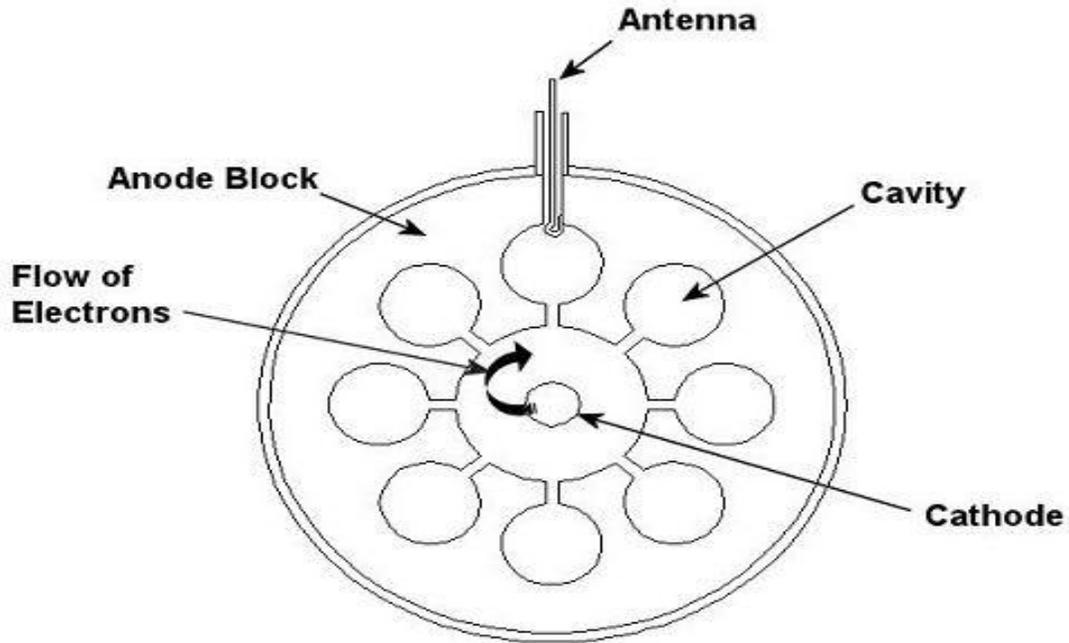
The important components of this system are Microwave generator, Transmitting antenna, and the receiving antenna.

### 2.2.1 Microwave Generator

## III. DESIGN

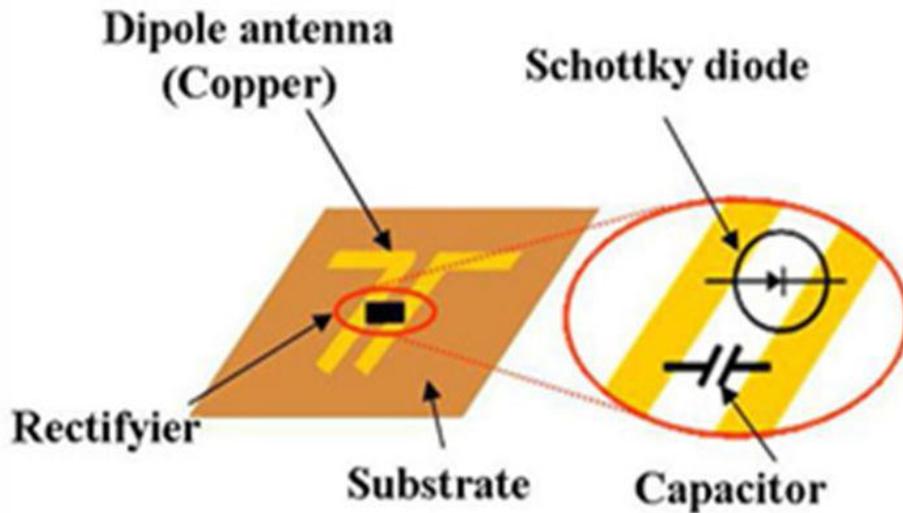
### 3.1 Transmitter design

A magnetron is a diode vacuum tube.



Filament in the tube act as the cathode. Magnetron is actually act as a oscillator to produce microwaves. It can be done by putting magnet between the

resonating chambers which is the center of the oscillator. These resonating chambers are called the anode of the magnetron. When electrons come out



from the cathode it direct towards the Anode. As it pass through the magnetic field it start circulating in the resonating cavity and start producing waves according to its frequency. And the generated RF signal flow outside chamber.

### **3.2 Receiver design**

We have to add a sensor and a Recteen at the receiver side. As we have seen that recteena actually convert the Microwave in to the DC power. Rectenna are very powerful to convert the Microwave in to the electricity. Actually the size of rectenna can be reduce using the Nano technology. Another important part is the Sensor. As we know we are going to charge the phone while a person is talking. So here sensor is used to detect wither the phone is using microwaves or not.

### **3.3 The Process of Rectification**

Microwave can travel through the media but it also lose some energy. So our key objective is to rectify the circuit our objective is to rectify the waves at the low cost. And also we have to make the detection more sensitive. As we know that bridge rectification is more efficient than the single diode. And we use the shotky diode to get the batter impedance.

### **3.4 Sensor Circuitry**

The sensor circuit is used to find whether the mobile phone using the microwaves for message transferring or not! So here we can use any Frequency to Voltage converter to do our job. Here in India the operating frequency of the GSM is 900 MHz to 1800 MHz. We can use LM2907 for F to V conversion. It actually acts as a switch to trigger out rectenna circuit on or off. So when our phone is receiving microwave signal it make the recteen circuit on and charge the battery.