Measuring and Mapping the Harvested Ambient RF Energy for Battery Free Applications

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Abstract

Introduction: The objective of this project is to find the amount of ambient RF energy available in a given location to power battery free products. This will be achieved by designing and building a novel instrument to measure the DC power level that can be harvested from the ambient RF signals (such as cellular signals, TV broadcasting waves, and WiFi signals) and log the result with the GPS coordinate of the measured location. This will be accomplished by creating a handheld, low cost, RF Power Harvester Meter which will record the RF Power Value and visually GeoMap it using the GPS coordinates.

Why is it Important?: Recent research efforts in ambient RF energy harvesting are being focused on designing ultra-low power battery free products and maximizing the efficiency of RF harvesting circuits. But the vital information that researchers lack in is how much RF energy is at a given geographical location and whether their product will be getting enough power to operate at that specific area of usage. By knowing the amounts of ambient RF energy that can be harvested at various geographical locations and geo-mapping them, researchers will be able to refine the power requirement goals of their design which will result in the wide spread deployment of their product developed using this technology.

Procedure:
First, the hardware portion of the RF Power Meter System had to be constructed. An Arduino microcontroller is used to house the different components of the device including the RF Power Detector chip, wideband antenna, Bluetooth Module, and connecting wires. The Arduino is able to capture the RF Power data from the RF Power Detector chip.
Next is the development of the Android Application. The App is able to communicate with the Arduino via Bluetooth and receive the captured RF Power data from it. This data is then displayed and stored. The data can also then be uploaded to the webserver (next step).