

Solar-Powered Signal Generation for Energy Harvester Applications

The goal of this project is to design a 915 MHz RF transmitter powered by solar cells, instead of utility power, and has the capacity to store backup power for times with low levels of insolation. The system will be built for 24/7 operation. The operation frequency of 915 MHz was chosen since it was used in the Panduit wireless energy project completed in 2016-2017. In addition, the transmitter may be used to power charge pumps designed for 915 MHz operation by another senior project. This wireless powering system has potential applications for powering remote sensors and controllers. The output power of the transmitter will be limited to a maximum of 1 Watt for licensing and safety reasons. The system will run with a variable duty cycle operation as opposed to continuous operation.

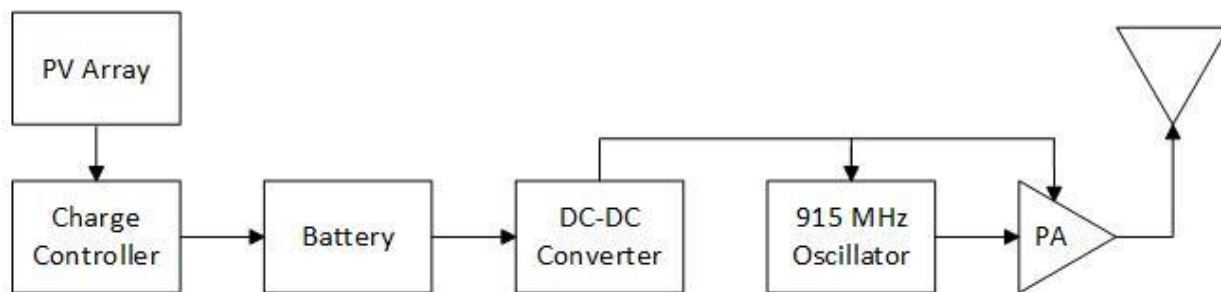


Figure 1.1: Block Diagram of Solar-Powered Signal Generation for Energy Harvester Applications Design

The block diagram is shown in Fig. 1.1. Incident solar radiation is converted to DC power by the PV array. The important parameters for the PV array are voltage, current, and power outputs as a function of insolation. The array connects to the charge controller which interfaces to the battery. The important parameters for the charge controller are input and output voltage, current, efficiency, power, and how well it can regulate these parameters. The battery specifications are capacity, voltage, current, and power (steady state and peak). The values of the parameters for these 3 subsystems will be determined in consideration of the RF subsystem requirements. These include supply voltage and current for both the oscillator and power amplifier (PA) as well as the duty cycle of the RF transmission.