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Wireless power transfer to a small, remote control boat

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ABSTRACT

Over the past few decades, researchers have explored and implemented methods of wireless power transmission to operate devices that traditionally have been powered using plug-in power supplies and batteries. It is with this objective in mind that we built a boat, which is powered wirelessly from a field of harvestable energy. This project sought to develop a wirelessly powered remote control boat to be a proof of concept for the idea of wireless power transfer. Our criteria for success is that the boat should receive sufficient power to run anywhere in a 2.5 meter squared area. Having defined the field in which power will be required by our boat, we will fill this field with microwave RF energy. Finally, using a rectifying antenna, or rectenna, the energy will be harvested and delivered to the boat's motors. We first developed three different topologies for our motor boat. For each boat, we made the minimization of power consumption a priority, while still maintaining speed and control. Operating between 100 and 200 milliwatts, each of the three topologies has a unique advantages and disadvantages with respect to its power consumption, speed, and controllability, and each has the ability to be powered wirelessly. From here, we plan to combine the rectenna with the boat, and deliver the power to our system. We will then characterize the radiation pattern of our power-receiving monopole antenna, and quantify the efficiencies of our various rectifier topologies.

KEYWORDS

Wireless, power, transfer, WPT, rectifying, antenna, rectenna, SSP, microwave, MPT, magnetic, resonance, coupling, contactless