Novel Application of Microwave Power Transfer for the Recharging of Batteries in Biomedical Devices

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Implanted biomedical devices, such as pacemakers use batteries as power sources. These batteries run out over time and patients must undergo surgery to replace these batteries. Due to the high cost and complications this surgery poses to patients, it is desirable to decrease the number of replacement surgeries a patient must undergo in their lifetime. In this study, we perform a proof of concept to test the application of microwave power transmission for recharging batteries in implanted biomedical devices. We developed a circuit that rectified, filtered, and amplified the voltage of a received 1.575GHz signal. We applied this circuit to our receiver and ran a physical experiment in which a signal of 25dbm was transmitted through 1.5cm of Pigskin and collected by the new receiver on the opposing side. This resulted in an open circuit voltage of 4.220V, which is high enough to power a linear recharge circuit for Lithium Ion batteries found in modern Pacemakers and Implantable Pulse Generators. We modeled our method in a Multi-physics 3d Full Wave Simulation Platform, Sim4Life, and found that it presented a Max SAR of 0.897 W/kg. Overall we have developed a receiver with a higher transmission efficiency than previous methods that can recharge batteries in implanted Biomedical devices and meets FDA regulations for radiation exposure.

Awards Won:

Third Award of $1,000