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## Operating Characteristics of Underwater Wireless Power Transfer for Maritime Applications Using Strong Copper Resonance Coupling Coils

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The wireless power transfer (WPT) technology based on strongly resonance coupled method realizes large power charging without any wires through the air. Recently, the WPT systems have started to be applied to the wireless charging for unmanned underwater vehicles (UUVs), power is the critical factor that often determines mission lifetime. Unlike many terrestrial vehicles, where batteries can be easily replaced or recharged, UUVs must either surface for battery replacement, or make watertight connections to safely recharge. In both cases, the solution typically requires human interaction, which increases the risk to both the vehicles and operators, as well as raising the total operating cost. One solution for increasing the operational lifetime of UUVs is the use of resonance coupled power transfer system to wirelessly recharge the vehicle batteries while the UUV itself remains submerged. While the commercial protocols for wireless power transfer are useful for many consumer applications, there are a number of challenges that limit their use for UUV charging in the maritime environment. To expediently charge a UUV, it is desirable to charge at higher power levels. The development of a functional underwater wireless power transfer system for charging UUVs is a complex process and requires an examination of many factors, including bio-fouling, thermal dissipation, power transfer, and communications between the transmitter and receiver. This paper focuses specifically on the wireless power transfer portion, and presents the fabrication and characterization of a power transfer system capable of delivering up to 120W to the load. The experimental setup used to demonstrate power transfer to a resistive load is then presented, followed by a discussion of the measured power transfer efficiency in both air and water using RF Power of 370kHz and 100kHz of 1KW rate. Finally, conclusions and future work are presented.

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