Design and Analysis of Wireless Power Transfer for Non-Metallic USB Connector

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Joshua S. Benjestorf ; Aldo W. Morales ; Sedig S. Agili **All Authors**

Abstract

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Abstract:
The Non-Metallic Connector (NMC) was introduced several years ago. In this new iteration, the NMC has been redesigned to accomplish data transfer with an optical interface and wireless power transfer with the use of micro-inductors. To demonstrate the wireless power transfer (WPT), an NMC for a USB flash drive is proposed. The challenge for the WPT design is to understand the geometric and physical constraints inside the connector housings (form factor). Equations for optimal power transfer performance in this miniature environment are presented followed by simulations that verify the efficient WPT. Initial measurements on the proposed WPT system also validate the concept.

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I. Introduction

Standard connectors for consumer electronics (CE) continue to be in demand. Even more in demand is the continued CE trend for smaller, thinner, and faster devices with longer battery life. Mobile devices like smartphones, laptops, and iPads need to be recharged and the method used for accomplishing this task has not changed. Standard connectors use metal-to-metal contacts that degrade signal and power quality over time. Over the life of the connector there will be multiple durability cycles, delamination, fretting corrosion, and debris build up on the contacts. As a result, contact resistance increases over the life of the connector which negatively impacts performance and efficiency [1] –[3]. These problems have even been the root cause of device failure in many cases. Tremendous resources are spent in an effort to try and mitigate these performance issues, but they are unavoidable and exist due to exposed metallic contacts that are open to the environment.

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