Design of a Complete WPT System Using Circuital Approach

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The Wireless Power Transmission (WPT) technology is already a reality. Different models of equipment for charging cell phones or car batteries wireless through inductive coupling are available at affordable prices. The major challenge of current research is to increase the distance of operation, maintain a good power transfer and an elevated efficiency. Now a days, one of the most promising technology is to use planar coils printed over dielectric substrates operating in strong resonant coupling. Planar coils can achieve all challenges required by WPT with the advantage of to lead to flexible, compact and inexpensive systems.

The design of an efficient WPT system and its correct approximation by a circuital model requires that the coil parameters R, L and C are carefully determined. In this work a mathematical methodology is presented in order to determine a circuital approach for an complete WPT system composed by a transmission (TX) and a receiver (RX) units. Each unit is constituted by a one turn square coil, Drive Coil (DC), inductively coupled with a nine turns square coil, Main Coil (MC). The inductance calculation proposed in this work includes the self-inductance of the DC and MC plus the mutual inductance between DC / MC and TX / RX using an approach in the Maxwell method. The Figure 1 presents the total inductance values for a single MC (a), single TX or RX units (b) and for the complete WPT system (c). Data from Proposed Approach (PA) were compared with those obtained from Advanced Design System (ADS) software.

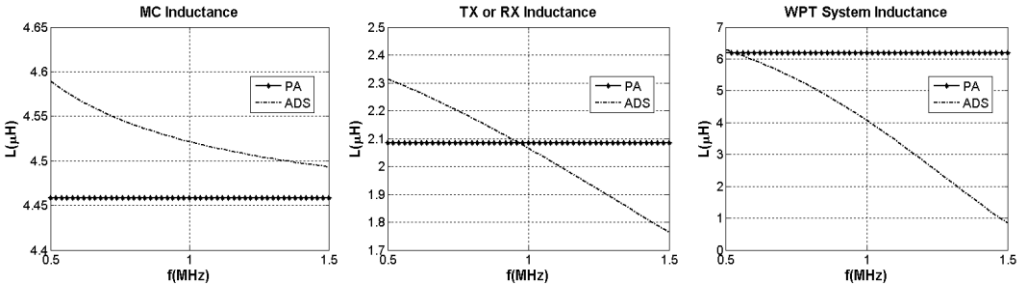

Fig. 1 (a) MC coil inductance; (b) TX or RX unit inductance (c) WPT system inductance

The full work will present a more detailed analysis of R, L and C parameters, including measurement data, as well as an analysis of the WPT system efficiency.