Ferrite material in wireless power transfer systems: performances prediction and EMC assessment

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Wireless power transfer (WPT) systems based on magnetic coupling has been widely studied in their circuital configurations in many papers. Maximum efficiency and power has been defined in [1] and also conditions for power transfer in the load independent regimes and coupling independent regimes has been demonstrated [2,3,4]. Many experiments has been presented starting from [5] where the coupling takes place between coils surrounded by air. Usually no shielding is considered in order to demonstrate the possible performances of the system. On the contrary the practical implementation of wireless power system need to be compliant to the electromagnetic compatibility (EMC) regulation to meet the market demands. One of the most commonly used material for shielding is ferrite [6], which due to its magnetic properties and eventually losses can efficiently shield low frequency magnetic field usually adopted in the WTP systems. The main application of the ferrite is in the shielding and in the enhancing of the Q factors of the coils that has to reach values of several hundred in the KHz frequency range [7,8,9]. We will present in the paper some examples of WPT coils on ferrite designed in order to enhance Q factors and some shielding structure to keep emission field below the EMC levels and to allow practical installations of the coils.

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