Four Quadrants Integrated Transformers for Dual-input Isolated DC-DC Converters - DTU Orbit (13/04/2019)

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A common limitation of power coupling effect in some known multiple-input dc-dc converters has been addressed in many literatures. In order to overcome this limitation, a new concept for decoupling the primary windings in the integrated multiple-winding transformers based on 3-dimensional (3D) space orthogonal flux is proposed in this letter. And thus a new geometry core and relative winding arrangements are proposed in accordance with the orthogonal flux decoupling technology. Due to the four secondary windings are arranged in a quadratic pattern at the base core plate with the two perpendicular primary windings, a name of “four quadrants integrated transformers” (FQIT) is therefore given to the proposed construction. Since the two primary windings are uncoupled, the FQIT allows the two input power stages to transfer the energy into the output load simultaneously or at any timemultiplexing scheme, which can optimize the utilization of input sources, simplify the system structure and reduce the overall cost, so they are attractive for the hybrid renewable power system. Section IV initiates a discussion for the advantages of the FQIT. In order to verify the feasibility of the FQIT in multiple-input converter, a dualinput isolated boost dc-dc converter with the FQIT is designed and tested. The results have excellently demonstrated that the two input power stages can be operated independently and the correctness of all the analysis in the letter.

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