IN-RUSH CURRENT MITIGATION ON TOROIDAL TRANSFORMERS WITH SLOTTED CORE

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Degree of Master of Science

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Dissertation submitted in partial fulfillment of the requirements for the degree of Master of Science in Electrical Installation

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DECLARATION OF THE CANDIDATE AND SUPERVISORS

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Signature of the supervisor Date

(Prof. J.P. Karunadasa)

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ABSTRACT

When it comes to transformer industry, toroidal transformers plays a major role, especially in high-tech applications, as they outperform traditional laminated transformers. However, toroidal transformers have a much higher inrush current, especially compared to laminate transformers, which will be a major drawback at the high power applications.

Currently there are many options available outside the toroidal transformer to avoid this inrush problem, but reliability issues will still there when using external inrush controlling mechanisms. Traditional inrush current mitigation methods on transformers are not sufficient for toroidal transformers. These methods tend to reduce good performance as well as inrush current.

The proposed inrush current mitigation method using a transformer-based slotted core, significantly reduces the inrush current while protecting the excellent performance characteristics which is typical for toroidal transformers. In addition, it offers better control of the inrush current than traditional methods.

The proposed method is a slotted core which has a slot in the outer periphery.
That controls the saturation inductance and hence the inrush current.
At the end, the slotted core maintains high performance without compromising normal operation.

This document includes a practical development of slotted cores and as well as experimental tests of inrush current, and finally a new design tool for the optimized deigns.

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LIST OF ABBREVIATIONS

Abbreviation	Description
AC	Alternative Current
AISI	American Iron and Steel Institute
DC	Direct Current
EMI	Electro Magnetic Interference
GOSS	Grain Oriented Silicon Steel
H	Height
ID	Inner Diameter
IEC	International Electrotechnical Commission
MMF	Magneto Motive Force
MPL	Magnetic Path Length
NC	Nano Crystalline
NGOSS	Non Grain Oriented Silicon Steel
NTC	Negative Temperature Coefficient
OD	Outer Diameter
RMS	Root Mean Square

LIST OF APPENDICES