

**MUTUAL INTERACTION OF AC AND DC TRACTION  
SYSTEMS AND DESIGN INTEGRATED EARTHING  
SYSTEM**

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Degree of Master of Science in Electrical Installation

Department of Electrical Engineering

University of Moratuwa

Sri Lanka

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## DECLARATION

I declare that this is my own work, and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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The above candidate has carried out research for the Master's under our supervision.

Signature of the supervisor:

Date:

Prof. Asanka Rodrigo

## **ABSTRACT**

Electrical traction is more effective, more comfortable, and more cost-effective than diesel traction in railway systems. Since trains are a popular form of public transportation in Sri Lanka, having an effective and dependable electrified railway transit system will boost the service's capacity and draw more customers every day.

This study is based on the integration of AC and DC traction systems while fed from the same grid substation. The simulation model has been developed for the entire system by ETAP software and analysed the system with different scenarios and different conditions. The proposed railway electrification projects in Sri Lanka are considered for the Final results were gathered with the behaviour of the system according to the model.

Finally, the DC traction substation earth grid is designed considering the results of the analysis.

This simulation model can be used with some modifications for the actual design purposes and can mitigate the issues that arise after installation.

*Key words: Railway Electrification, DC traction power, AC traction power, ETAP software, load flow analysis*

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## **LIST OF ABBREVIATIONS**

AC- Alternative Current systems

CMR- Colombo Metropolitan Region

CEB-Ceylon Electricity Board

DC -Direct Current

ETAP-Electrical Transient Analyzer Program

MFT -Medium Frequency Transformer (MFT)

SLR - Sri Lanka Railway

TSS-Traction Sub Station