Department of Electrical and Computer Engineering
North South University

Senior Design Project

Numerical Modeling of Noises in Phase Change Memory Nanoscale Devices

Tasneem Mazhar 2012497043

Faculty Advisor:

Dr. Nafisa Noor

Assistant Professor

ECE Department

Summer, 2023

LETTER OF TRANSMITTAL

December, 2023

To

Dr. Rajesh Palit
Chairman,
Department of Electrical and Computer Engineering
North South University, Dhaka

Subject: **Submission of Capstone Project Report on Numerical Modeling of Noises in Phase Change Memory Nanoscale Devices**

Dear Sir,

With due respect, we would like to submit our **Capstone Project Report** on the **Numerical Modeling of Noises in Phase Change Memory Nanoscale Devices** as a part of our BSc program. The report deals with PCM devices, which are emerging memory technologies. This project was beneficial to us in gaining experience in the practical field and applying it in real life. We tried to maximize our competence to meet all the dimensions required from this report.

We will be highly obliged if you kindly receive this report and provide your valuable judgment. It would be our immense pleasure if you find this report helpful and informative to have an apparent perspective.

Sincerely Yours,

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Tasneem Mazhar
ECE Department
North South University, Bangladesh

APPROVAL

Tasneem Mazhar (ID # 2012497043) from the Electrical and Computer Engineering Department of North South University has worked on the Senior Design Project titled *Numerical Modeling of Noises in Phase Change Memory Nanoscale Devices* under the supervision of Dr. Nafisa Noor as the partial fulfillment of the requirement for the degree of Bachelors of Science in Engineering. This work has been accepted as satisfactory.

Supervisor's Signature

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Dr. Nafisa Noor

Assistant Professor

Department of Electrical and Computer Engineering

North South University

Dhaka, Bangladesh.

Chairman's Signature

…….

Dr. Rajesh Palit

Professor

Department of Electrical and Computer Engineering

North South University

Dhaka, Bangladesh.

DECLARATION

It is to declare that this project is our original work. No part of this work has been submitted elsewhere, partially or entirely, for the award of any other degree or diploma. All project-related information will remain confidential and shall not be disclosed without the formal consent of the project supervisor. Relevant previous works presented in this report have been adequately acknowledged and cited. The plagiarism policy, as stated by the supervisor, has been maintained.

Student’s name & Signature

1. Tasneem Mazhar

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ACKNOWLEDGEMENTS

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ABSTRACT

Numerical Modeling of Noises in Phase Change Memory Nanoscale Devices

Phase Change Memory(PCM) is an emerging non-volatile memory technology and arguably the most mature resistive memory technology to date. One crucial challenge of PCM devices is noise, with the most common type of noise being 1/f noise, which affects the electrical properties of PCM devices. Our primary objective is to model this 1/f noise and study its origins. A comprehensive understanding of how various parameters like temperature, defects, and applied voltage affect noise is imperative for the further development of PCM devices. In our project, we try to extensively find the origin of this 1/f noise from current research, and finally, as a future goal, we will conduct our experiments to find the origins of this noise.