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Name: **Dr. Naren Das (Principal Investigator)**

Department: **ECE**

Project Title: **Portable Nanowells based Highly Sensitive Biosensor Array for Early Detection of Cardiac Troponin.**

Funding Agency: **ANRF-PMECRG (Anusandhan National Research Foundation – Prime Minister Early Career Research Grant ANRF-PMECRG)**

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Fund Utilised.: **0**

Tenure: **3 Years**

Abstract:

The proposed project focuses on developing a portable and highly sensitive biosensor system for the early detection of cardiac troponin I (cTnI), an important biomarker used in diagnosing Acute Myocardial Infarction (AMI). Early diagnosis of AMI is extremely important because timely medical intervention can significantly reduce mortality and improve patient outcomes. However, currently available high-sensitivity diagnostic systems are mostly confined to centralized laboratories and require expensive equipment, while existing point-of-care devices often lack the sensitivity needed for accurate early-stage detection.

To overcome this challenge, the project proposes a novel Nanowell integrated Microelectrode Array platform that utilizes nanoscale wells to concentrate biomolecules and amplify electrochemical signals. By combining nanowell technology with Electrochemical Impedance Spectroscopy, the proposed device aims to achieve rapid, label free, and ultrasensitive detection of cTnI with a limit of detection below 1 pg/mL and a testing time of less than 15 minutes.

The research work is planned in three major phases over a duration of 36 months. The first phase includes fabrication of nanowell based microelectrodes and optimization of surface chemistry. The second phase focuses on development of a portable handheld potentiostat integrated with smartphone-based readout, while the final phase involves clinical validation using patient samples. The proposed technology has strong potential for affordable and accessible healthcare, especially in rural and resource-limited settings. The project also supports national initiatives such as “Make in India” by promoting indigenous development of advanced medical diagnostic devices.

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