

## ABSTRACT

Electric motorcycles are environmentally friendly vehicles due to their nearly zero emission of exhaust gases, unlike conventional gasoline-powered motorcycles. Electric motorcycles rely on batteries as their energy storage medium, enabling the stored energy to be used when needed. To ensure continuous usability, the electric motorcycle's battery is charged whenever it is detected to be low [4]. However, a challenge arises in preparing an Battery Swap Charging Station while considering the safety of the electric system within Battery Swap Charging Station and the safety during battery charging. This is crucial to minimize the occurrence of current leakage and voltage that can result in battery damage, material loss, and even potential harm to SPBKLU users.

Therefore, we have designed an EV charging station equipped with features to determine the location of the charging station. This enables users of electric two-wheelers to receive real-time information about the presence of the charging station and includes an electrical protection system comprising Over Current Protection to limit input charging current, Overload Protection to prevent circuit damage when an electrical overload is detected, Overheat Protection to stop battery charging when the battery temperature is too high, and a Power Cut-Off Algorithm to cease battery charging once the battery fully charged.

In the testing of the electrical protection subsystem, over current protection is implemented using an SCT013 sensor and is designed with the use of resistors and capacitors. If it's found that the resistors available in the market don't match the coding, they can be recalibrated to align with the reference current, which is the kWh meter. Overload protection utilizes a ZMPT101B sensor and obtains a voltage value that closely approximates the reference voltage when subjected to a load such as the Gesits battery adapter. Location mapping is performed using the Ublox 6M GPS module with high accuracy, and during the testing of data transmission to Firebase, there was only 1 failure out of 22 attempts due to WiFi disconnection. Overheat protection employs a Thermocouple type K temperature sensor, and the sensor readings closely match the reference temperature obtained from a Digital Thermometer, with a difference of  $\pm 1^{\circ}\text{C}$ , and it functions as expected.

Keywords: Battery Swap Charging Station, Electric Motorcycle Battery, Electrical Protection.