

# Experimental Comparison of Active and Passive Battery Management Systems for E-bike battery application

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Studies have shown that without a proper battery management system (BMS), batteries in a battery pack degrade much faster and this in turn affects the lifespan of the entire battery pack. These battery management systems monitor the voltage levels of each battery cell in order to ensure that all cells are at the same charge level as well as prevent any battery cell from being charged above (or discharged below) its safe voltage limit. The DC2064A BMS with active flyback multi-core multi-winding topology and the BQ77PL900EVM BMS with passive charge shunt topology were examined in order to compare the differences in balancing time and balancing efficiency. Undervoltage and overvoltage tests were also performed on both boards in order to examine the robustness of the system. Using an oscilloscope it was possible to observe changes in voltage level for each board during different cases and these results compared. The DC2064A continually monitors each cell and provides active cell balancing by transferring charge directly from one cell to another when programmed with a cell balancing time as well as what cells to discharge and charge. However, the BQ77PL900EVM operates through passive cell balancing which occurs when a cell is charged above the overvoltage level. It was observed that excess charge above this level was dissipated through a resistor in the circuit. The BQ77PL900EVM also has a standalone feature which does not require a connection to a computer. The testing of different battery management systems is an important step in identification of the board that works best with an e-bike. Features like stand alone, over voltage protection and under voltage protection (much like the BQ77PL900EVM) would be best for an e-bike.