TAMUS 6664- Advancing Electric Vehicle Propulsion: High Power Rare-Earth-Free Electric Motor Development

Our proposed innovation aims to address these challenges by developing a high-power rare-earth-free brushless motor. This motor eliminates the need for brushes and slip rings, thereby reducing maintenance requirements and improving safety. The brushless WFSM concept is performed through the existing set of stator windings to create two independent magnetic flux 1) fundamental component which rotates synchronously with rotor flux 2) the modulated component which rotates asynchronously. The novel excitation method used in our design ensures efficient power transfer and high torque production, making it a viable alternative for the expanding EV market.

Anticipated Commercial Applications and Market Viability:

The primary target market for this technology is the EV industry, with an estimated >100K number of end users and value of >$10K for each end user. However, there is significant potential to extend this technology to aerospace, industrial machinery, marine vessels, and public transportation. The market potential is high, with end users such as Tesla, Rivian, Boeing, and Siemens. The proposed technology offers improved performance and reduced costs, addressing the high demand for sustainable and efficient powertrain solutions.

The proposed motor-drive technology addresses key industry challenges by eliminating reliance on rare-earth magnets, thereby reducing costs and supply chain dependencies. Despite significant interest, no current industrial solutions effectively implement brushless WFSM for EV applications without external exciters, due to the complexities of harmonic excitation. The Advanced Electric Machine and Power Electronics (EMPE) lab, with its extensive expertise in electric motor systems and state-of-the-art facilities, is well-positioned to advance and commercialize this innovative technology. Their recent patents and research further support the viability and technical readiness of this solution.