TITLE: A fuzzy logic based efficient and robust control of EVs with open-end winding induction motor drive	**AUTHOR:** Dr. Srinivasan Pradabane, Dr. Chandrasekhar Yammani **DATE:** 18-05-2022

Object under Investigation (*OuI*) "There is a need to develop an efficient drive system for EVs with fast, smooth, robust, and reliable control; hence an Open-End Winding Induction Motor (OWEIM) drive configuration"	**Test Objectives** Why is the test needed? What do we expect to find out? a) To develop a Field Oriented Control (FOC) for an OEWIM drive system for EV. b) To analyze the proposed FOC with and without fuzzy logic controller. c) To test the dynamic loading conditions of proposed drive configuration. d) To evaluate the performance indices of multilevel inverter system viz. voltage and current profiles, THD signature, and cost.	**System under Test** (*SuT*) Open-end winding induction motor, three level inverter, Fuzzy logic based controller
Function(s) under Investigation (*FuI*) "a) Examining the existing topology for EV drive system. b) Examining the existing control techniques for EV drive system. c) Evaluation of suitability/adaptability of proposed OEWIM drive to EV. d) Formulation of new/modified FOC based fuzzy logic controller to dual motor using three inverters.	**Purpose of Investigation** *(PoI)* There is a need to develop an efficient drive system for EVs with fast, smooth, robust, and reliable control; hence an Open-End Winding Induction Motor (OWEIM) drive configuration	**Functions under Test** (*FuT*) a) Examining the existing topology for EV drive system. b) Examining the existing control techniques for EV drive system. c) Evaluation of suitability/adaptability of proposed OEWIM drive to EV.

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<tr><td>e) Devising and experimentally validating the proposed schemes and analyze the improvements.”</td><td></td><td>d) Formulation of new/modified FOC based fuzzy logic controller to dual motor using three inverters.
e) Devising and experimentally validating the proposed schemes and analyze the improvements.</td></tr>
<tr><td>Domain under Investigation (Dul):
“Power Electronics, Inverters, induction motors, fuzzy-logic, Field Oriented Control”</td><td></td><td></td></tr>
<tr><td>Target metrics (TM)

a) Reduced power consumption for operating EV, which in turn reduces the pollution. This is highly inclined to the European Union Energy Policy.
b) Significant cost reduction due to less power rated equipments.
c) Profit maximization/operational cost minimization of EVs.
d) System loss minimization thereby improving the operational efficiency of EVs.
e) Improves the overall power system reliability by optimal scheduling of various power sources.
f) Offers energy efficient and effective use of renewable energy sources
g) Lesser operating voltage enhances the safety of the EVs.
h) Improves the EV manufacturing capacity, employment and healthy-competitiveness among the stake holders.</td><td>Test criteria (TCR)

Input voltage, output voltage, common mode voltage, input current, output current, FFT of voltages and currents, torque, speed, power, losses.

Quality attributes (QA)
a) Cheap running and maintenance cost of the EV.
b) Decarbonising the power generation as more than 75% of generated power is transferred to wheels in EVs.
c) Improved energy savings and reduced emission enhances the air quality index which enhances the quality of life of common public.
d) Improves the EV manufacturing capacity, employment and healthy-competitiveness among the stake holders.</td><td>Variability attributes (VA)
Input voltage, output voltage, common mode voltage, input current, output current, FFT of voltages and currents, torque, speed, power, losses.</td></tr>
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