INNOVATION AND IMPACT

➢ Critical need for electrification of transportation systems.
➢ Need for significant improvements in terms of power density and efficiency.
➢ Proposed technology enables the development of very high-power density permanent magnet motors, which when coupled to an integrated SiC drive allows for an integrated system with an overall specific power beyond 12 kW/kg.

➢ Use of conventional Halbach arrays is cost prohibitive – AML has developed a novel manufacturing method for permanent magnets, PMWire™ allowing for inexpensive continuous flux directed Halbach arrays (PM-360™) to be manufactured.

➢ Enabling features to high power density drivetrain
  o Dual-Rotor Radial Flux Motor Configuration
  o AML PM-360™ – Continuously Changing Magnetization
  o AML “transparent” stator winding with direct cooling
  o FSU-CAPS SiC power converters
  o Shared cooling loop with heat rejection in propulsion stream

SiC INVERTER

➢ Multilevel topology suppressing the dv/dt and the bearing current to elongate the lifetime of the system
➢ Integration method increasing the power density and decreasing the stray inductances,
➢ Intelligent gate driver improving the reliability of the system
➢ A low-cost active surge voltage canceler will help ease cable and winding insulation caused by fast switching

MOTOR DETAILS

➢ Dual-Rotor configuration with air-core stator winding
➢ Dual-Rotor array system provides ideal field in the stator (high magnitude, radial)
➢ No iron is needed in the rotor or the stator
➢ Magnetic field is well contained in the motor
➢ “Transparent” stator winding allowing for direct cooling

➢ Technology for manufacturing of permanent magnets
➢ Lower Cost Manufacturing – mass produced, increased material yield
➢ Lower Cost End-Use Product – reduced number of PMs in an assembly
➢ Precise magnetization / magnetic flux direction
➢ Uses Existing Materials - Suitable for NdFeB and SmCo magnet materials