Torque and Core Loss Characterization of a Variable-Flux Permanent-Magnet Machine

Background

- PMSM with rare-earth permanent magnets are widely employed in electric and hybrid electric drivetrains.
- The cost of rare-earth magnets is increasing rapidly as well as the supply and resources are limited.
- AlNiCo magnets can operate at high temperatures and at flux densities close to rare-earth permanent magnets.
- PMSMs with AlNiCo magnets with controllable demagnetization can provide efficiencies and torque densities as good as rare-earth PMSMs.

Laboratory Prototype
(a) Rotor geometry, (b) Prototyped rotor
Objective

- To obtain torque for different rotor angles and motor currents to improve torque-to-current ratio at various magnetization levels.
- A precise quantification of core losses over an extensive frequency and flux density range.
- Comparison of the measured torque and core loss with the simulated results from Magneforce and MotorSolve.