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of

Stray magnetic field distributed around a PMSM


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Abstract: In this work, the low frequency electromagnetic emission from permanent magnet synchronous motors is studied. The main objective is to provide a safety region for humans in the vicinity of these motors, especially as these motors are now being used widely in inhabited areas, where high flux densities are expected. In this study, a new proposed equivalent magnetic circuit is used to estimate the stray fields at the surface of the motor. The analysis showed that the emission of the stray field in the radial direction depends on the permeability of the stator body. Low values of permeability may result in very high stray flux emissions with levels that require shielding to protect people in the surrounding areas. Relatively far away from the stator (e.g. 50 cm for the tested motor), the flux is normally at a low level and should not pose a threat to life. The traced waveforms of the magnetic field showed that waveforms similar to the heartbeat may result, which constitutes a threat to people with pacemakers. In addition, the traced waveform of the x-sensor (radial component) provided important information that could be used to estimate the rotor position of the motor.

Key Words: Magnetic field measurement, permanent magnet synchronous motor, stray electromagnetic field, magnetic exposure, rotor position

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