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Acoustic Noise and Vibration Comparison of Switched Reluctance Motors made of High Silicon Steel, Amorphous Iron, and 0.2mm Silicon Steel

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Three switched reluctance type test motors were fabricated with different iron cores. These iron cores are the high silicon (6.5%) steel, the amorphous iron and the 0.2mm thickness silicon steel. Three machines were designed with the identical design, basically aimed for a generator in hybrid vehicles.

If the electromagnetic forces acting to the stator teeth are the main cause of the acoustic noise generation, as generally considered, the amorphous iron may be rather salient as the saturated flux density is low, thus, the electromagnetic forces are low.

Acoustic noise has been measured and compared. The Young's modulus is not identical, thus, acoustic noise was measured at various rotational speeds.

It was found that the high silicon steel machine has obviously reduced acoustic noise with respect to the other two machines. The reduction of the acoustic noise may be caused by the significantly low magnetostriction of the high silicon steel.

The measured magnetostriction was several times and about 30 times in the conventional silicon steel and the amoruphous iron, respectively, of that in high silicon steel.

In addition, the acoustic noise in generator operation has been measured. The shaft torque was set to 10Nm, that is identical to the motor operation. It is found that the acoustic noise is reduced about 5dB with respect to the motor operation.

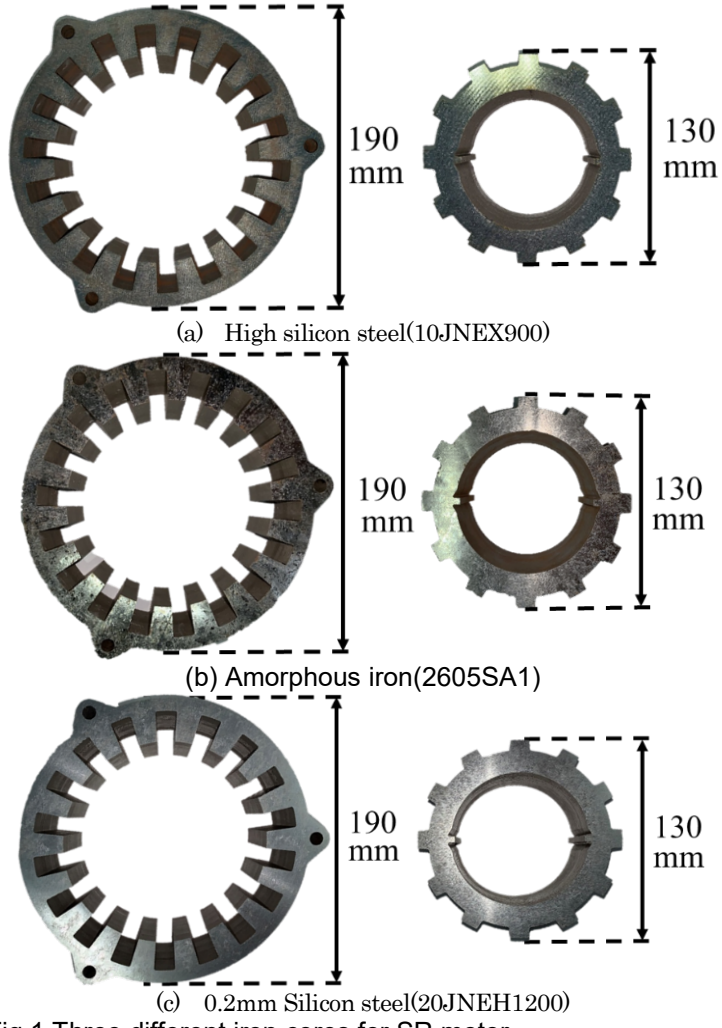

Fig.1 Three different iron cores for SR motor.