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Vehicle Electromagnetic Immunity - Power Line Magnetic Fields		

RATIONALE

This document has been determined to contain basic and stable technology which is not dynamic in nature.

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1. SCOPE

This SAE Standard specifies the test methods and procedures for testing passenger cars and commercial vehicles to magnetic fields generated by power transmission lines and generating stations.

SAE J551-1 specifies general information, definitions, practical use, and basic principles of the test procedure.

2. REFERENCES

2.1 Applicable Publications

The following publications form a part of this specification to the extent specified herein. Unless otherwise specified, the latest issue of SAE publications shall apply

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J551-1 Performance Levels and Methods of Measurement of Electromagnetic Compatibility of Vehicles, Boats (up to 15 m), and Machines (16.6 Hz to 18 GHz)

SAE J1812 Function Performance Status Classification for EMC Immunity Testing

3. DEFINITIONS

See SAE J551-1.

4. MEASUREMENT PHILOSOPHY

See SAE J551-1.

5. ESSENTIAL ELEMENTS OF FUNCTION PERFORMANCE STATUS CLASSIFICATION

See SAE J1812.

5.1 Test Signal and Test Method

See SAE J1812.

5.2 Functional Status Classification

See SAE J1812.

5.3 Region of Performance

See SAE J1812.

5.4 Test Signal Severity Level

See SAE J1812.

6. TEST FACILITY, TEST EQUIPMENT, FIELD LEVEL CHARACTERIZATION, AND TEST PROCEDURE

6.1 Test Facility

The magnetic (H)-field test shall be performed in an area large enough to accommodate the vehicle and two magnetic-field generating coils. A dynamometer may be used to allow the operation of the vehicle simulating the road usage.

6.2 Test Equipment

The instrumentation shall be immune to the generated magnetic fields at its test location. (Refer to Figure 1.)

6.2.1 Function Generator

Capable of producing 16 2/3, 50, 60, 150 and 180 Hz sinusoidal wave signals.

6.2.2 Audio Power Amplifier

16 2/3 Hz to 2500 Hz bandwidth minimum (approximately 2000 W). Should be capable of delivering power to the coil to generate the specified magnetic field intensities as shown in Figure A2

6.2.3 Current Monitor

16 2/3 Hz to 2500 Hz bandwidth minimum, True rms AC current meter (or rms Voltmeter for current probe or shunt transducers) required if used to measure current

6.2.4 Magnetic Field Intensity Monitor/Probe

16 2/3 Hz to 2500 Hz bandwidth with a measurement range of 0 to 50 micro Teslas (μT) minimum with DC rejection capability to remove the influence of earth's magnetic field.

6.2.5 Magnetic Field Coils

Three meter diameter minimum capable of generating the specific magnetic field levels.

6.3 Field Level Characterization

NOTE: Personnel should avoid prolonged exposure to magnetic fields. It is recommended that test personnel remain more than 1.5 coil radius away from the energized field coils.

6.3.1 Connect the setup according to Figure 1.

6.3.2 Select a coil spacing that can accommodate the vehicle being tested.

6.3.3 Characterize the 16 2/3, 50, 60, 150 and 180 Hz magnetic field without the vehicle present at 10 μT increments up to the desired test level for both the longitudinal and transverse axes (Figure 2).

NOTE: The user shall specify the test severity levels (s). Suggested test severity levels are included in Appendix A.

6.3.4 At each field level, record the coil separation distance and the RMS current through the magnetic coils.

NOTE: The field characterization may be performed in advance and the data kept on record. For a given coil separation distance, the field characterization data is constant. The characterization information obtained for a given coil separation may be applied to all subsequent tests which use that same coil separation.

Field characterization should be performed at least semi-annually.

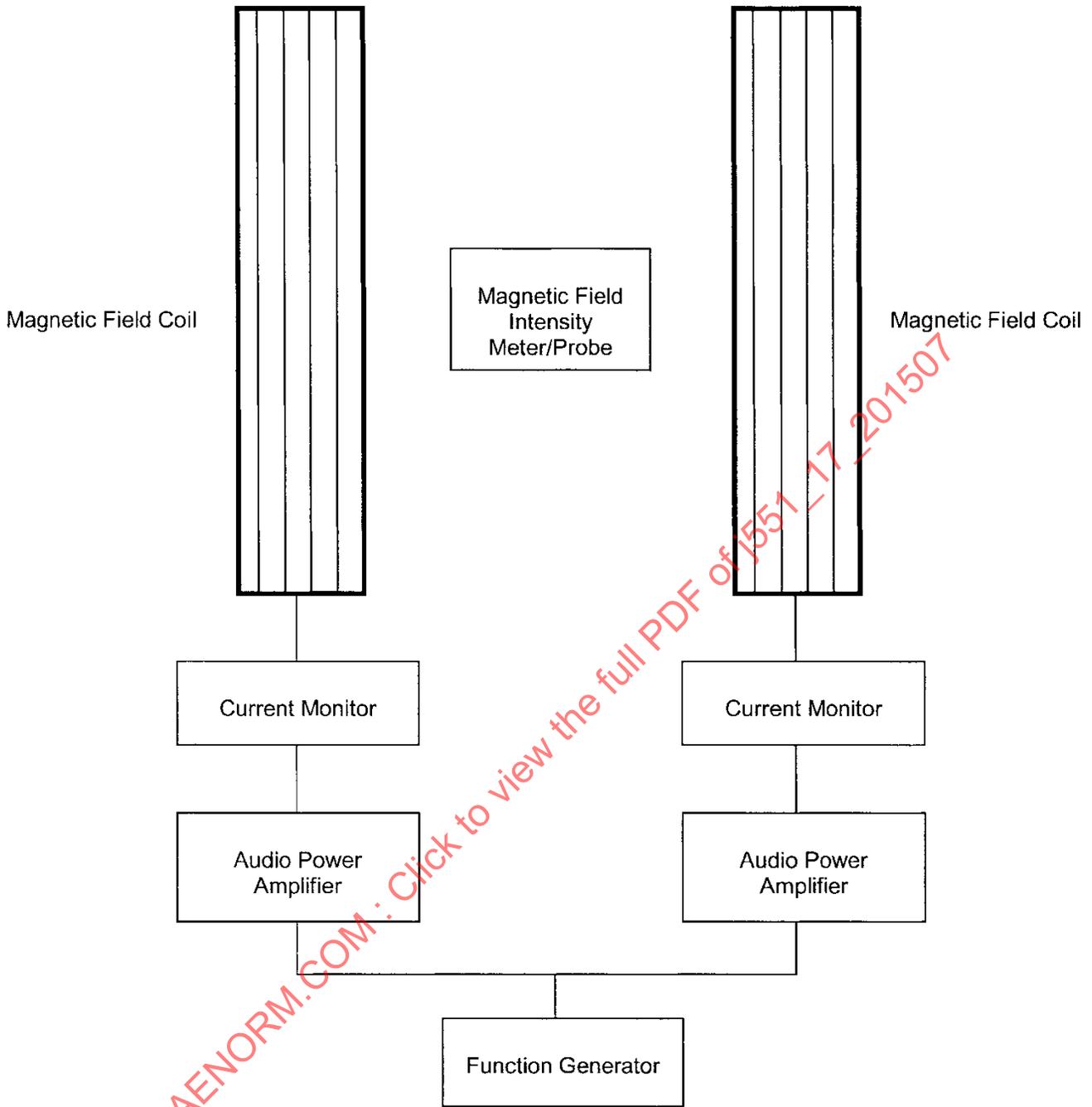


FIGURE 1 - MAGNETIC FIELD CHARACTERIZATION SETUP

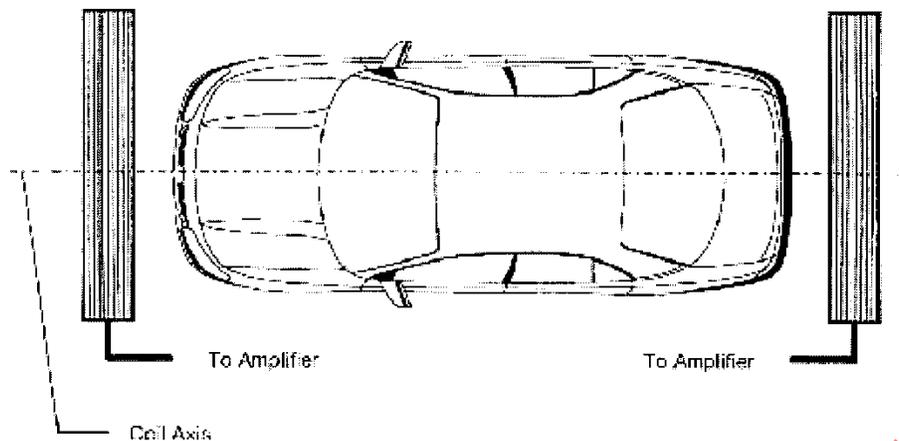


Figure 2A - Typical coil Positions (Longitudinal)

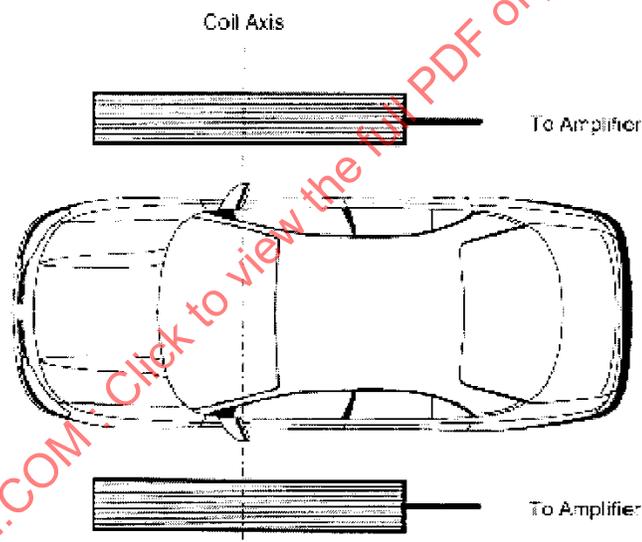


FIGURE 2B - TYPICAL COIL POSITIONS (TRANSVERSE)

6.4 Test Procedure

- 6.4.1 The coils can initially be placed on either the longitudinal (Figure 2A) or the transverse (Figure 2B) axis of the vehicle.
- 6.4.2 The coils shall be oriented to produce additive magnetic fields. The coils shall be coaxial, with the field measured on the axis at the midpoint between the coils.
- 6.4.3 Place the vehicle between the magnetic coils. Using the field characterization data from 6.3.3 apply the current corresponding to the specified test level to the magnetic field coils for one of the axes (see Figure 2A Longitudinal and Figure 2B Transverse).
- 6.4.4 At each field level and frequency, expose the Vehicle for a minimum of 30 s.