

(R) Immunity to Radiated Electromagnetic Fields—Bulk Current Injection (BCI) Method**TABLE OF CONTENTS**

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1. Scope

This SAE Standard defines a method for evaluating the immunity of automotive electrical/electronic devices to radiated electromagnetic fields coupled to the vehicle wiring harness. The method, called Bulk Current Injection (BCI), uses a current probe to inject RF onto the wiring harness in the frequency range of 1 to 400 MHz. BCI is one of a number of test methods that can be used to simulate the electromagnetic field.

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2. References

General information regarding this document, including definitions, references, and general safety considerations is found in SAE J1113-1.

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, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J1113-1—Electromagnetic Compatibility Measurement Procedures and Limits for Vehicle Components (Except Aircraft) (60 Hz To 18 GHz)

SAE J1812—Function Performance Status Classification for EMC Immunity Testing

2.1.2 IEEE PUBLICATION

Available from IEEE Customer Service 445 Hoes Lane, Piscataway, NJ 08855-1331 or standards.ieee.org/.

IEEE Std C95.1—IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz

2.1.3 ISO PUBLICATION

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002.

ISO 11452-4—Road vehicles—Electrical disturbances by narrowband radiated electromagnetic energy—Component test methods: Bulk current injection (BCI)

3. Definitions

See SAE J1113-1.

4. Measurement Philosophy

As a vehicle is driven near high power transmitting antennas or when a mobile transmitter is used on a vehicle, the radiated electric field couples, either directly or through the wiring harness, into electronic devices on the vehicle. In the frequency range of 1 to 400 MHz, coupling occurs mostly through the wiring harness. To simulate this coupling, BCI can be used. BCI provides a method of compatibility evaluation by inducing high-frequency current into the wiring harness. It is a non intrusive method since there is no galvanic connection to the wiring harness.

5. Function Performance Status Classification

See SAE J1812.

6. Test Equipment, Test Setup and Test Procedure

6.1 Test Equipment

6.1.1 RF SIGNAL GENERATOR

1 to 400 MHz.

6.1.2 BROADBAND POWER AMPLIFIER

1 to 400 MHz, 50 W minimum. The amplifier should be able to:

- a. Drive a load of any impedance mismatch without damage to itself
- b. Drive enough power into injection probe to meet specified injection levels

6.1.3 CURRENT INJECTION PROBE

1 to 400 MHz high power capability. More than one type of probe may be required to cover frequency range of interest.

6.1.4 CURRENT MONITORING PROBE

1 to 400 MHz. The monitor probe output voltage (V_{out}) should be converted to the induced current (I_{ind}) by the following relationship:

$$I_{ind} [dBmA] = V_{out} [dBmV] - Z_t [dB\Omega] \quad (Eq. 1)$$

where:

Z_t = Is the Current probe transfer impedance.

The transfer impedance of the current monitoring probes shall be verified and/or updated yearly.

6.1.5 SPECTRUM ANALYZER OR EQUIVALENT

(For use with monitoring probe.)

6.1.6 DIRECTIONAL COUPLER (OPTIONAL)

6.1.7 POWER METER

6.1.8 COMPUTER CONTROL (OPTIONAL)

6.1.9 INJECTION PROBE CALIBRATION FIXTURE

6.2 Test Setup

The test setup is shown in Figure 1.

NOTE 1—When a battery is used, a charging source may be required to maintain the specified supply voltage.

NOTE 2—Deviation of $\pm 50\text{mm}$ height dimension in region of probe to center the wire harness is acceptable.

6.2.1 The test shall be performed in a shielded room.

6.2.2 The ground plane requirements are specified in SAE J1113-1.

6.2.3 The grounding of the DUT and/or its outer case depends on its application in the vehicle. If the DUT will be grounded when installed in the vehicle, then it must be bonded to the ground plane in the bench test the same way it will be attached in the vehicle. If not, the DUT shall be placed on an insulated support.