

	SURFACE VEHICLE STANDARD	SAE	J1113-3 AUG2010
		Issued	1995-11
		Cancelled	2010-08
Superseded by ISO 11452-7			
Conducted Immunity, 250 kHz to 400 MHz, Direct Injection of Radio Frequency (RF) Power			

RATIONALE

SAE J1113-3 is being cancelled in favor of ISO 11452-7.

FOREWORD

This SAE Standard expands on the method documented in SAE J1113 AUG87 to increase the frequency range of the test from the original 50 kHz to 100 MHz to the new 250 kHz to 400 MHz range. It also brings the test method into closer harmony with ISO 11452-7.

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1. SCOPE

This part of SAE J1113 specifies the direct RF power injection test method and procedure for testing electromagnetic immunity of electronic components for passenger cars and commercial vehicles. The electromagnetic disturbances considered in this part of SAE J1113 are limited to continuous, narrowband conducted RF energy.

This test method is applicable to all DUT leads except the RF reference ground. The test provides differential mode excitation to the DUT.

Immunity measurements of complete vehicles are generally only possible by the vehicle manufacturer. The reasons, for example, are high costs of a large absorber-lined chamber, preserving the secrecy of prototypes or the large number of different vehicle models. Therefore, for research, development, and quality control, a laboratory measuring method for components shall be applied by the manufacturer. This method is suitable over the frequency range of 250 kHz to 400 MHz.

This direct RF power injection test is particularly effective when used as part of the engineering development of the electronic component (at the prototype PCB level) where the line by line diagnostic capabilities of this test facilitate cost-effective circuit board level improvements in the RF immunity performance of the module or component

2. REFERENCES

2.1 Applicable Publications

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

2.1.1 SAE Publication

Available from SAE, 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 J1113-1 Electromagnetic Compatibility Measurement Procedures and Limits for Components of Vehicles, Boats (up to 15 m), and Machines (Except Aircraft) (50 Hz to 18 GHz)

2.1.2 ISO Publications

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ISO 7637-2 Road vehicles—Electrical disturbance by conduction and coupling

ISO 11452-7 Road vehicles—Electrical disturbances by narrowband radiated electromagnetic energy—Component test methods Part 7—Direct RF Power Injection

3. DEFINITIONS

See SAE J1113-1.

4. TEST CONDITIONS

See SAE J1113-1 for standard test temperature, test voltage, modulation, dwell time, and frequency step considerations.

4.1 Frequency Range

The upper frequency limit of the test is limited by resonances and parasitic capacitances to ground in the Broadband Artificial Network (BAN) and the leads from the BAN to the DUT. By using an appropriate BAN, a useful frequency range of 0.25 MHz to 400 MHz can be achieved. See Appendix A for more information on the construction of BANs.

4.2 Test Severity Level

The user should specify the test levels over the frequency range. Suggested test severity levels are included in Appendix B of this document.

These test severity levels are expressed in terms of equivalent root-mean-square (RMS) value of an unmodulated wave.

The power level is calibrated at the output of the DC blocking capacitor (Item 6 of Figure 1). The RF sampling device is used to control the RF power during the test. Mismatch between the 50 Ω coaxial transmission line and the load consisting of the BAN and the DUT lead is disregarded.

NOTE: The maximum input is equivalent to the level into the 50 Ω load. If the impedance of the DUT lead under test is very low, excessive power will not be injected into the lead.

5. TEST FACILITY DESCRIPTION AND SPECIFICATIONS

5.1 Power Injection System

Direct RF power injection is a technique which exposes the operating DUT to quantifiable RF power, while eliminating variables related to wiring harness length and routing, loads, and measuring equipment. RF is coupled into the DUT directly at its connector's pins, line by line.

The DUT is connected in the test set-up to perform its designated functions with only the necessary connections made through broadband artificial networks (BANs). The BAN is a device that presents a controlled impedance to isolate the DUT from sensors/loads over a specified frequency range while allowing the DUT to be interfaced to its sensors and loads. If the series inductance of the BAN inhibits data transfer on signal or bus lines, a reduced inductance (increased bandwidth) BAN is available for testing these lines with corresponding modifications to required test frequency ranges. For controller area network (CAN) lines, a common mode BAN with single point injection is used, refer to Appendix A. This BAN allows the test to be performed from 1 MHz to 250 MHz. A 470 pF DC blocking capacitor is used.

NOTE: The series impedance of the BAN may affect some input signal waveforms. In cases where distortion occurs, document the characteristics of the distortion in the test report.

The procedure can be used to predict the compatibility of components in the vehicle environment with respect to radiated and conducted RF energy, including conducted transient RF energy. The technique is especially useful as a means of isolating the susceptible circuits within a component and evaluating potential solutions.

5.2 Instrumentation

Figure 1 shows an example set-up of the direct RF power injection measurement system.

The spectrum analyzer or power meter shall be capable of measuring levels at the sampling device with a tolerance of ± 1.5 dB.

If necessary, this test shall be performed in a shielded room.

NOTE: A fuse device or a fixed attenuator (typically 10 dB) may be used to protect the spectrum analyzer input from a failure of the RF sampling device in a shorted mode. Any additional attenuation shall be factored into the calibration process.

5.3 Test Set-Up

At the high frequencies within the range of this test, it is necessary to keep the leads as short as possible. The maximum length of lead from the DUT to the BAN shall be 150 mm. Lengths over 120 mm can begin to affect the test results at higher frequencies and therefore should be avoided. When lengths over 120 mm are used, their lengths and positioning shall be documented in the test report. Care should be taken to separate the DUT leads from the loads and measuring instrument leads.