



SURFACE VEHICLE RECOMMENDED PRACTICE

J551™-5

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Superseding J551-5 MAY2012

Performance Levels and Methods of Measurement of Magnetic and
Electric Field Strength from Electric Vehicles, 150 kHz to 30 MHz

RATIONALE

The SAE J551-5 document was originally created for the measurement of low frequency electric and magnetic fields to protect reception in assembly plants from machinery noise. The document has since over the years been plagiarized and misused in a way that has led to turmoil throughout the automotive industry.

Thus the International CISPR Committee has begun drafting CISPR 36 which will address low frequency measurements from alternative powertrain vehicles and be accepted and adopted globally in the community; the SAE J551-5 document is redundant and outdated in comparison.

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FOREWORD

This part of SAE J551 was initially included as an appendix to the historical broadband radiated noise test. It was published separately in June 1995, and is now in use in the industry as the standard method for electromagnetic emission testing of electric vehicles. As with all SAE standards, users are invited to comment on this document to the EMC Standards Committee.

1. SCOPE

This SAE Recommended Practice specifies measurement procedures and performance levels for magnetic and electric field emissions and conducted power mains emissions over the frequency range 150 kHz to 30 MHz, for vehicles incorporating electric propulsion systems, e.g., battery, hybrid, or plug-in hybrid electric vehicles.

Conducted emission measurements in this document are applicable only to battery-charging systems which utilize a switching frequency above 9 kHz, are mounted on the vehicle, and whose power is transferred by metallic conductors. Conducted emission requirements apply only during charging of the batteries from AC power lines.

Conducted and radiated emissions measurements of battery-charging systems that use an induction power coupling device are not covered by this document.

The measurement of electromagnetic disturbances for frequencies from 30 MHz to 1000 MHz is covered in CISPR 12.

2. REFERENCES

The following documents contain provisions which, through reference in this text, constitute provisions of this document. At the time of publication, the editions indicated were valid. All documents are subject to revision, and parties to agreements based on this document are encouraged to investigate the possibility of applying the most recent editions of the documents indicated as follows. Members of IEC and ISO maintain registers of currently valid International Standards.

2.1 Applicable Documents

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 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 J1772 SAE Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charge Coupler

2.1.2 CISPR PUBLICATIONS

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

CISPR 16-1-1 - CISPR Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus

CISPR 16-1-4 - CISPR Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Radiated disturbances

2.1.3 IEEE PUBLICATIONS

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org, or from IEEE, 445 Hoes Lane, Piscataway, NJ 08854-1331, Tel: 732-981-0060, www.ieee.org.

ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

ANSI C63.12 - American National Standard for Electromagnetic Compatibility Limits - Recommended Practice

2.1.4 UNITED STATES GOVERNMENT OFFICE OF THE FEDERAL REGISTER PUBLICATIONS

Available from US Government Printing Office, P.O. Box 371954, Pittsburgh, PA 15250-7954.

Code of Federal Regulations Title 47 - Telecommunications; Part 15 - Radio Frequency Devices

3. DEFINITIONS

For general definitions see SAE J551-1.

4. LIMITS OF DISTURBANCE

4.1 Radiated Emissions

The recommended performance levels for peak detector electric and magnetic field strengths are given in Table 1 and Table 2. The derivation of these limits from original legacy limits is documented in Appendix A, based on distance scaling and removal of bandwidth normalization. Average detector electric field emission limits are given in Table 3.

TABLE 1 - PEAK ELECTRIC FIELD EMISSION LIMITS

Frequency f (MHz)	Level dB(V/m)
0.15 to 4.77	$88.89 - 20\log_{10}(f)$
4.77 to 15.92	$116.05 - 60\log_{10}(f)$
15.92 to 20	$67.98 - 20\log_{10}(f)$
20 to 30	41.96

TABLE 2 - PEAK MAGNETIC FIELD EMISSION LIMITS

Frequency f (MHz)	Level dB(A/m)
0.15 to 4.77	$37.36 - 20\log_{10}(f)$
4.77 to 15.92	$64.52 - 60\log_{10}(f)$
15.92 to 20	$16.45 - 20\log_{10}(f)$
20 to 30	-9.57

TABLE 3 - AVERAGE ELECTRIC FIELD EMISSION LIMITS

Frequency f (MHz)	Level dB(V/m)
0.15 to 0.8	$59.37 - 20\log_{10}(f)$
0.8 to 4.77	61.37
4.77 to 15.92	$88.53 - 40\log_{10}(f)$
15.92 to 30	40.46

NOTE: In Tables 1-3, the frequency variable f is in MHz.