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NATIONAL STANDARD
OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 18387-2008
Replacing GB/T 18387-2001

Limits and Test Method of Electric and magnetic field Strength from Electric Vehicles, Broadband, 9 kHz to 30 MHz

电动车辆的电磁场发射强度的限值和测量方法，宽带，9kHz-30MHz

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Standardization Administration of the People's Republic of China

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FOREWORD

This Standard modifies and adopts the American Society of Automotive Engineers standard SAE J551-5 JAN2004 “Performance levels and methods of measurement of electric and magnetic field strength from electric vehicles”. Compared with SAE J551-5 JAN2004, the main technical differences and reasons are as follows:

- In Chapter 2 “Normative References”, this Standard cites GB/T 4365 to replace the terms and definitions of SAE J551-1; and cites GB/T 14023 to replace SAE J551-2; both of them contain the same technical contents and are interchangeable. Delete the following publications that are merely taken as references - “Federal Regulation No. 47 of the United States – Communications; Part 15 – Radio frequency equipment” and “IEEE std. 291”.
- In Section 4.2 “Conducted emissions limits”, delete the requirements of 250 μV limit for non-commercial areas. That is, the limits are unified, regardless of commercial or non-commercial areas.
- This Standard adds a new Annex A “Rod antenna calibration – The equivalent capacitance substitution method”. Derived from the version 2001 of this Standard, it is intended for guiding the accuracy of measurement. And it is same as the Annex A in SAE J551-5 DEC1997.

Compared with SAE J551-5 JAN 2004, the difference of chaptering is as follows:

- This Standard combines the Chapters 6, 7 and 8 of SAE J551-5 JAN2004 which are related to measurement method INTO Chapter 5 of this Standard. The corresponding sections are 5.4, 5.5, and 5.6 respectively.
- A new Annex A is added in this Standard.
- Annex B of this Standard corresponds to Annex A of SAE J551-5 JAN2004.

This Standard specifies the limits and measurement methods of electric and magnetic field strength from electric vehicles. The frequency range is 9 kHz ~ 30 MHz. It coordinates with the frequency range of 30MHz ~ 1,000 MHz specified in GB 14023 “Limits and methods of measurement of radio interference characteristics of vehicles, motorboats and spark ignition engine-driven devices”.

This Standard replaces the previous version GB/T 18387-2001 “Performance levels and methods of measurement of electric and magnetic field strength from electric vehicles, broadband, 9 kHz to 30 MHz”. Compared with the previous version, the main changes of this version are as follows:

- In Chapter 1, further clarify the applicable scope of this Standard;
- In Chapter 2, add the references: GB 9254, ANSI C63.4, and ANSI C63.12;
- In Chapter 4, there is significant change of the disturbance limits for radiated emissions (comparison between Figures 1 & 2 of this version AND Figures 1 & 2 of the prevision version).

Add Section 4.2 the limits of conducted emissions for battery-charging systems mounted on the vehicle (see Table 3);

- In Section 5.2 of Chapter 5, the distance for measurement of magnetic field specified is changed from 1 m ± 0.2 m (the previous version) TO 3 m ± 0.2 m (this version). Add new Section 5.3 “Requirements for measurement site of conducted emissions”. Sections 5.4 & 5.5 of this version correspond to Chapters 6 and 7 of the previous version respectively. Add new Section 5.6 “Measurement of battery-charging systems mounted on the vehicle”;
- In Annex A, Figure A.2 is added;
- Add new Annex B “Notes on conversion of limits for measurement distance from 10 m to 3 m”.

Annex A is normative. Annex B is informative.

This Standard was proposed by National Development and Reform Commission (NDRC).

This Standard shall be administrated by National Technical Committee on Motor Vehicles of Standardization Administration of China.

Drafting organization of this Standard: China Automotive Technology and Research Centre.

Main drafter of this Standard: Xu Li.

The previous edition replaced by this Standard:

- GB/T 18387-2001.

Limits and Test Method of Electric and magnetic field Strength from Electric Vehicles, Broadband, 9 kHz to 30 MHz

1 Scope

This Standard specifies the limits and test method of radiated emissions of electric and magnetic field from electric vehicles over the frequency range of 9 kHz ~ 30 MHz, and the limits and test method of conducted emissions over the frequency range of 450 kHz ~ 30 MHz.

Conducted emission measurements in this Standard are applicable only to battery-charging systems which utilize a switching frequency above 9 kHz, which are mounted on the vehicle, and of which the power is transferred by metallic conductors. Conducted emissions 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 Standard.

Note: GB 14023 shall govern, in the case of measurement of electromagnetic disturbances over the frequency range of 30 MHz ~ 1,000 MHz.

2 Normative References

The articles contained in the following documents have become part of this Standard when they are quoted herein. For the dated documents so quoted, all the modifications (excluding corrections) or revisions made thereafter shall not be applicable to this Standard. For the undated documents so quoted, the latest editions shall be applicable to this Standard.

GB/T 4365	Electromagnetic compatibility -- Terms [GB/T 4365-2003, IEC 60050 (161) : 1990 + Amd. 1:1997 + Amd. 2 : 1998, IDT]
GB/T 6113	Specifications of equipment for the measurement of radio disturbance and immunity [GB/T 6113-1995, idt CISPR 16-1 : 1993]
GB 9254	Information technology equipment – Radio disturbance characteristics –Limits and methods of measurement [GB/T 9254-1998, idt CISPR 22 : 1997]
GB/T 14023	Limits and methods of measurement of radio interference characteristics of vehicles, motorboats and spark ignition engine-driven devices [GB/T 14023-2006, CISPR 12 : 2005, IDT]
ANSI C63.4-1992	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz ~ 40 GHz
ANSI C63.12-1987	Electromagnetic compatibility limits – Recommended practice

$$L_{3m}^{E} = L_{10m}^{E} + 20\ \lg\left(\frac{10}{150\times10^{3}/\pi f}\right) + 40\ \lg\left(\frac{150\times10^{3}/\pi f}{10}\right)$$
$$= 154.4 - 40\ \lg\left(\frac{f}{9}\right) \qquad \text{(B.5)}$$

B.1.3 Conversion of limits when f > 15.92 MHz

Whereas both distances of measurement (i.e., 3 m and 10 m) fall within the far-field area, the conversion of limits presents a certain proportional relation with the distance:

$$L_{3m}^{E} = L_{10m}^{E} + 20\ \lg\left(\frac{10}{3}\right)$$
$$= 89.4 - 20\ \lg\left(\frac{f}{9}\right)$$
$$= 22.5$$
$$(15.92\ \text{MHz} < f \leqslant 20\ \text{MHz})$$
$$(20\ \text{MHz} < f \leqslant 30\ \text{MHz}) \qquad \text{(B.6)}$$

B.2 Limits for magnetic field

Likewise, the original recommended limits for magnetic field strength of peak impulse come from the technical paper of Georgia Institute of Technology, expressed in dB(μA/m/kHz), and assuming the measurement at a distance of 10 m:

$$L_{10m}^{M} = 23.6 - 20\ \lg\left(\frac{f}{14}\right)$$
$$= L_{10m}^{E} - 20\ \lg(Z_0) \qquad \text{(B.7)}$$

Where:

f – Expressed in kHz;

Z_0 = 377 Ω.

Whereas the boundary distance of near/far field is identical for electric and magnetic fields, assuming the measurement at a distance of 3 m, the limits for electric and magnetic fields may be correlated via the wave impedance of free space.

$$L_{3m}^{M} = L_{3m}^{E} - 51.5\ \text{dB}(\Omega) \qquad \text{(B.8)}$$

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