

ICS 43.020
CCS T 40

T

ASSOCIATION STANDARD

T/CSAE 151-2020

Electromagnetic compatibility test methods for electric vehicles (English Translation)

Issued on: August 7, 2020

Implemented on: January 1, 1970

Issued by: China Society of Automotive Engineers

Table of Contents

Foreword	
1 Scope	
2 Normative references	
3 Terms and definitions	
4 Abbreviations	
5 General test requirements	
6 Radiated emission test to protect the receiver outside the car	
7 Electromagnetic radiation test to protect human body	
8 Radio frequency conducted emission test along the AC power cord of the vehicle	
9 Vehicle harmonic current test along AC power line	
10 Vehicle voltage change, fluctuation and flicker test along the AC power line	
11 Low-frequency electromagnetic field emission test	
12 External radiation immunity test	
13 Immunity test of simulated vehicle transmitter	
14 Electrostatic discharge immunity test	
15 Immunity test of electric fast transient pulse group conducted by vehicle along power line/signal line	
16 Vehicle surge immunity test along AC power line	
Appendix A (informative appendix) Classification of functional importance and classification of functional levels	

1 Scope

This standard specifies the EMC performance requirements and test methods for complete electric vehicles.

This standard applies to pure electric vehicles, hybrid electric vehicles, fuel cell power vehicles and other electric vehicles that contain high-voltage electric drive systems.

Vehicle (or simply "vehicle"). This standard does not apply to trolleybuses and wireless charging vehicles.

2 Normative references

The following documents are indispensable for the application of this document. For dated reference documents, only the dated version applies to this article Pieces. For undated

reference documents, the latest version (including all amendments) is applicable to this document.

GB/T 4365 Electrotechnical terminology electromagnetic compatibility GB 14023 Limits and measurement methods of radio disturbance characteristics of vehicles, ships and internal combustion engines used to protect receivers outside vehicles GB 17625.1

Electromagnetic compatibility limit harmonic current emission limit (equipment input current per phase ≤ 16 A) GB 17625.2 The electromagnetic compatibility limit is generated in the public low-voltage power supply system for equipment with rated current ≤ 16 A per phase and unconditional access.

The limit of voltage change, voltage fluctuation and flicker GB/T 17625.7 The electromagnetic compatibility limit is caused by equipment with rated current ≤ 75 A and conditionally connected in the public low-voltage power supply system.

Limitations of voltage changes, voltage fluctuations and flicker GB/T 17625.8

Electromagnetic compatibility limit The input current per phase is greater than 16 A and less than or equal to 75 A. Equipment connected to the public low-voltage system Harmonic current limit GB/T 17626.4 Electromagnetic compatibility test and measurement technology Electrical fast transient pulse group immunity test GB/T 17626.5 Electromagnetic compatibility test and measurement technology surge (impact) immunity test GB/T 18387 Limits and measurement methods of electromagnetic field emission intensity of electric vehicles GB/T.19951 Test method for electrical disturbance caused by electrostatic discharge of road vehicles GB/T 29259 Road Vehicle Electromagnetic Compatibility Terminology GB/T 33012.2 Road Vehicles Test Method for Immunity of Narrowband Radiated Electromagnetic Energy Part 2: External Radiation Source Method GB/T 33012.3 Test method for immunity of road vehicles to narrow-band radiated electromagnetic energy. Part 3: Vehicle-mounted transmitter simulation method ECE R10 Uniform Provisions on Vehicle Electromagnetic Compatibility Certification EV-TEST (Electric Vehicle Evaluation) Management Rules China Automobile Health Index-Electromagnetic Radiation (EMR) Test and Evaluation Regulations in Vehicles

3 Terms and definitions

The following terms and definitions defined in GB/T 4365 and GB/T 29259 apply to this standard.

SOC (state of charge) the ratio of the remaining battery power to the battery capacity, usually expressed as a percentage.

4 Abbreviations

The following abbreviations apply to this document.

5.1 Test site

Low-frequency electromagnetic field emission test, radiation emission test to protect the receiver outside the car, immunity test outside the car, simulating the immunity of the vehicle transmitter the disturbance test and the electromagnetic radiation test to protect the human body must be carried out in a shielded room (ALSE) equipped with absorbing materials.

Note: The electromagnetic radiation test to protect the human body conducted in a shielded room (ALSE) equipped with absorbing materials may not include the rapid acceleration and rapid deceleration mode.

Electrostatic discharge immunity test, electric fast pulse group immunity test and surge immunity test need to be tested on the ground plane.

The electromagnetic radiation test to protect the human body can be carried out in the rapid acceleration and deceleration mode on the outdoor flat and dry road. The outdoor road slope should be at Between -2% and 2%, the magnetic induction intensity in the measurement site environment should be less than 10% of the limit specified in the test plan.

5.2 Test temperature and humidity

Test temperature in the laboratory. (23 ± 5) °C.

Relative humidity in the laboratory. (20%~80%) RH, electrostatic discharge test (20%~60%) RH.

5.3 Equipment

Measuring instruments and equipment should meet the relevant requirements and settings in the reference standards of each test item.

Transmitting tests need to use the receiver for measurement. The receiver can use the fast Fourier transform (FFT) mode, such as the FFT mode Try, the receiver bandwidth setting should be consistent with the step sweep mode.

Note: The residence time setting of FFT mode should consider the working cycle of the electrical and electronic components of the vehicle under test.

5.4 Test vehicle

The test vehicle and its internal electrical components can work normally. The vehicle is required to be kept dry.

If the vehicle needs to carry out the electromagnetic compatibility test in the charging mode, the power battery state of charge (SOC) should be maintained during the whole test

process 20% to 80% of the maximum SOC (the power battery may need to be discharged when executing the next frequency band). If the charging current can be adjusted, Then the emission test charging current should be set to at least 80% of its rated value, and the anti-interference test charging current should be set to at least its rated value.

Note: If allowed in the test plan, the emission test charging current can be set to 20% to 80% of the rated current.

5.5 Test plan and report

The detailed test plan should be drawn up and completed at least before the start of the test, which should at least include. test items, environmental requirements, test layout, Frequency range, antenna polarization, antenna position, limit, monitoring method, vehicle working mode, eligibility criteria, test report content, any deviation Special instructions and changes to the standard test.

Note: Some of the above terms may not correspond to all test items.

The test report shall issue a detailed test report in accordance with the requirements of the test plan. In addition to the content contained in the test plan, it should also include.

Test site, test equipment, test photos, and other related information that may affect test evaluation.

6.1 Test method

The test is carried out using the 10 m measuring distance test method.

If there are no other regulations, the method specified in GB 14023 shall be implemented in the full frequency band of 30 MHz~1000 MHz.

6.2.1 Limits of average detector

When the average (AV) detector is used for measurement, the limits are shown in Table 1 and Figure 1.

Table 1 Limits of average detector

6.3 Limits of quasi-peak detector

When using a peak (PK) detector/quasi-peak (QP) detector, the limits of the quasi-peak detector are shown in Table 2 and Figure 2.

Note: The measurement result of the peak detector is lower than the quasi-peak limit, which can be directly determined to meet the limit requirements.

Figure 2 Quasi-peak detector limit