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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 34574-2017

**Limits and measurements of electromagnetic emission for
high-speed train**

高速列车电磁发射限值与测量

(English Translation)

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Table of Contents

Foreword...	3
1 Scope...	4
2 Normative references...	4
3 Terms and definitions...	4
4 Limit requirements...	5
4.1 Requirements for electromagnetic emission limits in high-speed trains...	5
4.2 High-speed train's limit requirements for external electromagnetic emission ..	7
5 Measurement method...	9
5.1 General...	9
5.2 Internal measurement of high-speed train...	10
5.3 External emission measurement of high-speed train...	10
5.4 Test conditions...	13
5.5 Test environment...	14
6 Measurement technology...	15
6.1 Frequency range...	15
6.2 Measuring instruments and equipment...	16
6.3 Evaluation method...	16
6.4 Measurement procedure...	16
7 Reports...	17
References...	20

1 Scope

This standard specifies the limit requirements, measurement conditions, measurement methods, measurement techniques and evaluation methods of electromagnetic emissions from high-speed trains.

This standard is applicable to the measurement of magnetic field emission in the frequency range of 0 kHz ~ 20 kHz (not including 0) inside high-speed trains and the external emission of high-speed trains in the frequency range of 9 kHz

~ 1 GHz.

Electric locomotives, intercity and urban rail EMUs can be implemented with reference to this standard.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) is applicable to this standard.

GB/T 6113.101-2008 Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus (CISPR 16-1-1:2006,

IDT)

GB/T 27025 General requirements for the competence of testing and calibration laboratories (GB/T 27025-2008, ISO/IEC 17025:2005, IDT)

GB/T 32577-2016 Measurement procedures of magnetic field levels generated by electronic and electrical apparatus in the railway environment with respect to human exposure (IEC/TS 62597:2011, MOD)

3 Terms and definitions

The terms and definitions as defined in GB/T 32577-2016 as well as the following terms and definitions apply to this document.

In high-speed trains, due to the relatively low switching frequency of the traction converter and auxiliary converter (below a few kilohertz, the harmonic component above 20 kHz is small), the measurement frequency range is $0 < f$

≤ 20 kHz. In this frequency range, the magnetic field dominates and the electric field is relatively negligible, so only the measurement of the magnetic field emission limit is considered.

5.2.1 High-speed train's working area

Measurements shall be made to determine the emission of high-speed trains in the area under static and dynamic conditions.

It shall, under normal working conditions, measure the driver's cab and monitoring room staff (drivers and conductors) seats and other magnetic fields that may be irradiated, including control consoles, communication equipment, monitoring equipment and air-conditioning / heater positions, etc.

The measurement height is 0.9 m and 1.5 m above the floor; the horizontal measuring distance is 0.3 m from the wall or the minimum distance (not less than 0.3 m) that the staff (drivers and conductors) can reach.

5.2.2 High-speed train's public area

Measurements shall be made to determine the emission of high-speed trains under static and dynamic conditions.

The measurement shall be made in such positions as the transformers, power converters, reactors and auxiliary converters, etc. which are emission sources of high-speed trains that are most likely to be accessible by the publics (passengers). In this case, the height of the measurement from the floor is 0.3 m, 0.9 m, 1.5 m; the horizontal measurement distance from the wall is 0.3 m or the minimum distance (not less than 0.3 m) that the public (passengers) can reach.

5.3 External emission measurement of high-speed train

The external emission of high-speed trains under static and dynamic conditions shall be determined by measurement.

The magnetic field measurement of 9 kHz ~ 30 MHz shall satisfy: the distance from the geometric center of the loop antenna to the track centerline is 10 m, the height of the antenna from the track surface is 1 m ~ 2 m, the plane of the antenna shall be parallel to the track centerline, as shown in Figure 5.

train starts from a standstill and accelerates to the maximum speed at maximum acceleration; it idles and uses maximum electric braking to stop;

auxiliary circuits work, related equipment works normally.

The test shall minimize the impact of other rolling stock or high-speed trains. If there are different electric braking methods, they shall be tested separately.

5.4.2 Measurement conditions of external emissions of high-speed train

The test shall cover the emission that may be generated when all the equipment on the emission vehicle is working.

The test shall be carried out when the towing vehicle is static and slow-moving.

During the static test, the high-speed train is at a standstill; when there is no traction power output, the auxiliary circuit and all related equipment (such as air conditioner/heater, lighting, etc.) work normally.

During the slow-moving test, the speed shall be sufficient to avoid arcing or jumping in sliding contact; it shall be sufficient to implement electric braking.

When passing the antenna, the vehicle shall be 50 km/h $\pm$ 10 km/h; meanwhile it accelerates or decelerates at one third of the maximum traction.

If the traction static test is used instead of the slow test, the slow-moving limit shall be used.

The test report shall state the reason for using static traction test instead of slow-moving test.

5.5 Test environment

Any magnetic induction source outside and along the high-speed train may have an impact on the measurement results; the location of possible external sources shall be indicated in the operational route plan. During measurement preparation and measurement, special magnetic induction sources shall be considered.

When measuring external emissions, the test site shall meet the following requirements in the actual orbital environment as much as possible:

- There shall be no trees, fences, bridges, tunnels or vehicles within the minimum distance (30 m) from the measuring point;
- The measuring point shall be at the midpoint between the overhead line pillars, on the opposite side of the track (if it is a double track, on the side of the track being used);
- The minimum net length of overhead lines on both sides of the measuring

6.2.1 Low-frequency magnetic field measuring instruments and equipment

Measuring instruments and equipment shall meet the requirements of 5.3 of GB/T 32577-2016.

6.2.2 High-frequency electromagnetic field measuring instruments and equipment

The accuracy, peak and quasi-peak detection bandwidth of the emission measurement equipment shall meet the requirements of GB/T 6113.101-2008.

6.3.1 Low-frequency magnetic field inside the train

The method for evaluating and assessing the measurement data is negotiated and determined by the relevant parties in the test; the peak value of the measurement data is evaluated.

The measured value of occupational exposure shall be lower than the limit specified by the dotted line "- -" in Figure 1.

The measured value of public exposure at a height of 0.3 m from the floor of the carriage shall be lower than the limit specified by the solid line "___" in Figure

1.