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**Requirement and measurement methods of
electromagnetic compatibility for cellular mobile
telecommunication equipment - Part 18: 5G user
equipment and ancillary equipment**

蜂窝式移动通信设备电磁兼容性能要求和测量方法 第 18 部分：5G
用户设备和辅助设备

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Requirement and measurement methods of electromagnetic compatibility for cellular mobile telecommunication equipment - Part 18: 5G user equipment and ancillary equipment

1 Scope

This Part specifies electromagnetic compatibility requirements for 5G cellular mobile communication system user equipment and ancillary equipment, including measurement methods, frequency range, limits and performance criteria.

This Part is applicable to user equipment for portable and in-vehicle use, user equipment powered by a power source and used in a fixed location, as well as various data terminal equipment of 5G cellular communication system.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB 17625.1, *Electromagnetic compatibility - Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*

GB/T 17625.2, *Electromagnetic compatibility limits (EMC) - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection*

GB/T 17626.2, *Electromagnetic compatibility - Testing and measurement techniques - Electrostatic discharge immunity test*

GB/T 17626.3, *Electromagnetic compatibility - Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test*

GB/T 17626.4, *Electromagnetic compatibility - Testing and measurement techniques - Electrical fast transient/burst immunity test*

3.1.1 User Equipment (UE)

A device that can access mobile cellular services through one or more wireless interfaces. When this device accesses mobile cellular services, it can be stationary or mobile in the cellular service area. The device can provide services to one or more users at the same time.

3.1.2 Ancillary Equipment (AE)

A device connected to a wireless communication device that meets the following conditions at the same time:

- Connect with wireless communication equipment, so as to provide additional operating or control features, for example, extend operation or control to other locations;
- Cannot be used independently of wireless devices, otherwise user functions cannot be provided separately;
- The connected wireless communication device can still perform scheduled operations such as transmitting and/or receiving without this ancillary device (that is, ancillary equipment is not a subunit of the basic function of the main equipment).

3.1.3 Associated Measurement Equipment (AME)

A device that assists the UE to work, enables the UE to work normally and/or monitors the working status of the UE, for example, base station simulator. The associated measurement equipment can be placed in the test area or outside the test area. It should be placed outside the test area.

3.1.4 Channel Bandwidth

Single carrier transmission bandwidth configured in the cellular uplink and downlink. Channel bandwidth unit is MHz. It provides reference for radio frequency equipment of transmitter and receiver.

3.1.5 Enclosure Port

Physical boundary of the device. The electromagnetic field radiates or penetrates through the boundary. The physical boundary of the plug-in is defined by the host unit.

3.1.6 Traffic Mode

The user equipment is turned on and a connection is established with the radio resource control module.

information transmission. Spurious emission includes harmonic emission, parasitic emission, intermodulation products and frequency conversion products, except out-of-band emission.

3.1.14 Wired Network Port

The port is for the purpose of voice, data and signal transmission, and is directly connected to a single-user or multi-user communication network, for example, public telephone network, xDSL, Ethernet and similar networks.

3.1.15 Throughput

The maximum number of valid data bits that can be successfully received per second for the reference test channel in a specific environment.

3.1.16 Transient Phenomena

Harassment within a short time interval. It cannot be distinguished into two continuous stable states.

3.1.17 Vehicular Equipment

Equipment that is fixedly installed on the vehicle and powered by the vehicle's power system, or equipment used on a vehicle and equipped with a vehicle power adapter to use the vehicle power system for power supply.

3.1.18 Common-mode Absorption Device

Device installed on the cable leading out of the radiation emission measurement test space, so as to reduce compliance uncertainty.

3.2 Abbreviations

The following abbreviations apply to this document.

4.2 Test setup

4.2.1 General conditions

Same with 4.2.1 of YD/T 2583.2.

4.2.2 Test setup for transmitter input

Same with 4.2.2 of YD/T 2583.2.

4.2.3 Test setup for transmitter output

Same with 4.2.3 of YD/T 2583.2.

4.2.4 Test setup for receiver input

Same with 4.2.4 of YD/T 2583.2.

4.2.5 Test setup for receiver output

Same with 4.2.5 of YD/T 2583.2.

4.3 Narrowband response of receiver

When the receiver or the receiver of the receiver/transmitter is undergoing an immunity test, the narrowband response of discrete frequencies shall be determined by the following methods:

- During the immunity test (see 9.2 and 9.5), narrowband response and broadband phenomena may cause the equipment under test to fail the performance criteria specified in this document (see 6.2). In this case, the frequency of the interference signal shall be adjusted to determine whether it is a narrowband response or a broadband phenomenon;
- Offset the test frequency at $\pm 1 \times BW_{\text{channel}}$ MHz. Repeat the test. If the non-conformity disappears, this situation is a narrowband response;
- If the non-conformity does not disappear, it may be a narrowband response caused by another interference signal. In this case, offset the test frequency at $\pm 2 \times BW_{\text{channel}}$ MHz. Repeat the test. If the non-conformity has not disappeared, it is a broadband phenomenon, that is, the equipment under test fails the test.

Narrowband response shall be ignored.

4.4 Frequency band free from testing

4.4.1 General requirements

6 Performance criteria

6.1 General

The equipment under test shall meet the performance criteria specified in this section and 6.2 to 6.4.

The maintenance of the communication connection shall be assessed by an indicator. The indicator can be part of the test system or EUT.

If the EUT is a special equipment and the performance criteria in 6.2 to 6.4 do not apply, the equipment manufacturer shall give an EUT performance specification statement. The statement is included in the test and/or after the test. EUT acceptable performance level or performance degrades. Performance specification shall be recorded in the test report.

The performance criteria specification provided by the equipment manufacturer shall provide the same degree of immunity protection as this document.

When testing the immunity of ancillary equipment, if there are no separate performance criteria, the performance criteria shall be carried out with the connected receiver or receiver/transmitter.

For portable equipment, when it is declared that the in-vehicle power system can be used for power supply, the relevant regulations for in-vehicle equipment shall also be met.

For portable equipment, when it is declared that AC/DC power can be used for power supply, it shall also meet the relevant regulations for fixed-use equipment.

The test shall be carried out in business mode. It shall also be carried out in idle mode to ensure that the transmitter does not malfunction.

6.2 Performance criteria (continuous phenomenon)

Before the test, a communication connection shall be established. The communication connection shall be maintained during the test.

For data transmission business model, in the test, data throughput (application layer throughput) shall not be less than 95% of the maximum throughput of the reference test channel. See Annex B for throughput test.

For voice business model, in the test, when using the audio breakthrough measurement method, when measuring the voice output level through an audio BPF with a center frequency of 1kHz and a bandwidth of 200Hz, the uplink and downlink voice output levels shall be at least 35dB lower than the reference

9 Method and level of immunity test

9.1 Electrostatic discharge immunity

9.1.1 Test method and level

The test is carried out according to GB/T 17626.2, in accordance with following requirements:

- For contact discharge, EUT shall be able to pass the test levels of $\pm 2\text{kV}$ and $\pm 4\text{kV}$;
- For air discharge, EUT shall be able to pass the test levels of $\pm 2\text{kV}$ $\pm 4\text{kV}$ and $\pm 8\text{kV}$.

9.1.2 Performance criteria

For performance criteria, see 6.3 of this Part.

9.2 Radio frequency electromagnetic field radiation immunity

9.2.1 Test method and level

The test is carried out according to GB/T 17626.3 and shall meet the following requirements:

- The test shall be carried out in the frequency range of 80MHz ~ 6GHz. The step size of frequency increase shall be 1% of the previous frequency. The dwell time of each frequency point shall not be shorter than the time required for EUT action and response, and it must not be shorter than 0.5s;
- The test field strength is 3V/m;
- The test signal is 80% amplitude modulated by a 1kHz sinusoidal audio signal;
- Except for the frequency bands free of testing of transmitters, receivers or receivers that are part of the transceiver;
- If the response of the receiver or the receiver as a part of the transceiver at discrete frequency points is a narrowband response, then this response is ignored;
- The test frequency of the narrowband response shall be recorded in the test report.

9.2.2 Performance criteria

For performance criteria, see 6.3 of this Part.

9.5 Conducted disturbance immunity of RF field sensing

9.5.1 Test method and level

This test item is suitable for AC power ports and signal/control ports with a connection cable exceeding 3m, wired network ports and DC power ports.

The test method is carried out according to GB/T 17626.6 and shall meet the following requirements:

- The test shall be carried out in the frequency range of 150kHz ~ 80MHz. In the frequency range of 150kHz ~ 5MHz, the step size of frequency increase shall be 50kHz. In the frequency range of 5MHz ~ 80MHz, the step size of frequency increase shall be 1% of the previous frequency. The dwell time of each frequency point shall not be shorter than the time required for EUT action and response, and it must not be shorter than 0.5s;
- The test level is 3V_{rms};
- The test signal is 80% amplitude modulated by a 1kHz sinusoidal audio signal.

9.5.2 Performance criteria

For performance criteria, see 6.2 of this Part.

9.6 Power frequency magnetic field immunity

9.6.1 Test method and level

This test item is suitable for EUT with magnetic field sensitive device (such as magnetic field sensor). For the test method, see GB/T 17626.8. Test magnetic field strength is 3A/m.

9.6.2 Performance criteria

For performance criteria, see 6.2 of this Part.

9.7 Immunity to voltage dips, short-term interruptions and voltage changes

9.7.1 Test method and level

9.7.1.1 AC power test method and level

Test according to GB/T 17626.11. The test levels are:

- When calibrating the reference level of the downlink voice output signal, do not use EUT. Adjust the output of 1kHz audio signal source. Make the SPL input to the ERP (downlink acoustic coupler, acoustic tube in Figure A.1) 0dBPa. The reading of the audio analyzer recorded at this time is used as the reference level of the downlink voice output signal;
- For equipment that uses an external loudspeaker for hands-free, the sound pressure of the external loudspeaker is usually higher than the sound pressure of the mobile station earpiece, so as to overcome the surrounding high noise level. When testing, the reference level value of the downlink voice output signal shall be increased, so as to compensate for the above difference in sound pressure. Or adjust the distance between the loudspeaker and the test microphone to achieve the required sound pressure level;
- During the calibration process, the instrument used cannot exceed its dynamic range.

Uplink calibration:

- When calibrating the reference level of the uplink voice output signal, use EUT. Adjust the output of 1kHz audio signal source to make the input SPL of MRP (defined in ITU-T P.64) -5dBPa. The reading of the audio analyzer (connected to SS in Figure A.1) recorded at this time is used as the reference level of the uplink voice output signal;
- When using hands-free, usually the reference level of the uplink voice output does not need to be adjusted. If the above calibration cannot be completed (such as a printed circuit card with headphones), the manufacturer shall specify the distance between the MRP and the microphone;
- During calibration, the EUT is installed on the artificial head (defined in ITU-T P.64). The earpiece of the EUT is located in the center of the artificial ear of the artificial head;
- During the calibration process, the instrument used cannot exceed its dynamic range.

A.2 Audio breakthrough test

During the test, the voice control software of EUT shall be set. Avoid the influence of noise and echo cancellation algorithms. If these algorithms cannot be disabled, the audio analyzer shall use the maximum hold detection method for measurement. Thus, the voice output signal level can be measured before the noise and echo cancellation algorithm takes effect.

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