SJ

ELECTRONIC INDUSTRY STANDARD

OF THE PEOPLE'S REPUBLIC OF CHINA

FL 3971

SJ 20524-1995

Measuring methods for shielding effectiveness of materials

材料屏蔽效能的测试方法

Issued on: May 25, 1995 **Implemented on: December 01, 1995**

Issued by: **Ministry of Electronic Industry of the People's Republic of China**

Table of Contents

Measuring methods

for shielding effectiveness of materials

1 Scope

1.1 Subject content

This standard specifies the measuring methods of flat-plate type electromagnetic shielding material, such as non-conductive material coating or plating-layer, metal mesh, conductive film, conductive glass, and conductive dielectric plate against plane wave shielding effectiveness.

1.2 Applicable scope

This standard is applicable for measurement of flat-plate type electromagnetic shielding materials, such as metal film, non-conductive material coating or plating-layer, metal mesh, conductive film, and conductive glass, and conductive dielectric plate against plane wave shielding effectiveness.

2 Reference files

GB 6113-85 Electromagnetic Interference Measuring Instrument

GJB 72-85 Terminology of Electromagnetic Interference and Electromagnetic Compatibility

GJB/Z 25-90 Design Guideline on Earthing, Lapping and Shielding of Electronic Equipment and Facility

3 Definitions

Except for terms specified in this standard, other terms shall comply with GJB 72.

3.1 Shielding effectiveness (SE)

Under the same excitation level, the ratio of power or voltage received when there is or there is not shielding materials; it is expressed in logarithm. That is:

Where:

SE - shielding effectiveness, dB;

V_0 - received voltage without shielding materials;

V_1 - received voltage with shielding materials;

P_0 - received power without shielding materials;

P_1 - received power with shielding materials.

4 General requirements

4.1 Measurement condition

a. Ambient temperature: 23 ± 2°C;

b. Environmental relative humidity: 45% ~ 75%;

c. Atmospheric pressure: 86 ~ 106 kPa;

d. The samples shall be kept in the above-mentioned environment for 48 hours before test.

e. Environmental electromagnetic noise shall not have impact on measurement result.

4.2 Test equipment

4.2.1 Signal source

Frequency range: 1 MHz ~ 1.5 GHz;

Maximum output power: ≧ + 13 dBm;

Output impedance: 50 Ω;

Voltage standing wave ratio: < 2.0.

4.2.2 Electromagnetic interference measuring instrument

Working frequency range shall be consistent with the signal source phase; the measurement error shall meet the requirements of GB 6113.

4.2.3 Flange coaxial test device is shown in figure 1;

Frequency range: 5 KHz ~ 1.5 GHz;

measurement, shall be subject to this reading value. Therefore, compression force of each load sample are ensured to be the same, and repeatability of measurement is improved to avoid measurement error caused by difference pressure;

f. Measuring equipment applied in this standard must have enough dynamic range, which means the dynamic range of the measuring equipment shall be greater than the dynamic range of flange coaxial test device;

g. Before the load sample is measured, measurement shall be carried out to the reference sample; and measurement data shall be recorded as pass-through status data;

h. If there is standard sample, calibration shall be made to the flange coaxial test device by using standard sample. It can determine whether the entire system works in normal state. The standard sample is polyester film with single gold plating. The surface resistance is 5 + 2Ω per unit area. The shielding effectiveness is 32 ±3dB;

i. Because the background noise may affect the sensitivity of the receiver, therefore, when shielding materials with shielding effectiveness over 60 dB are measured, double layer shielding or semi-rigid cable shall be used;

j. Before the measurement is carried out, the testing personnel shall be specially trained and accumulate experience to ensure that the measurement results are correct and repeatable.

k. The measurement system shall be well grounded;

l. When measurement is carried out, measurement results shall be given at least at such frequency points at 30MHz, 50 MHz, 100 MHz, 300 MHz, 500 MHz, and 1GHz etc.

5.2 Measurement methods

When the flange coaxial testing device is used to measure shielding effectiveness of materials, the common measurement methods are: signal source/electromagnetic interference measuring instrument (interference receiver) measurement, tracking signal source/spectrum analyzer measurement, and network analyzer measurement.

5.2.1 Signal source/electromagnetic interference measuring instrument (interference receiver) measurement

a. Connect the measurement device according to figure 4, directly connect the signal source which meets requirements of 4.2.1 in this standard to one end of this device through 10dB attenuator, and the other end of this device shall be connected to the electromagnetic interference measuring instrument (interference receiver) by 10dB attenuator. Pay attention to make the measurement cable as short as possible during measurement;

A2 Specification and dimension of double shielding box measurement device

Double shielding box dimension: 180mm X 120 mm X 160 mm;

Sample dimension: (76.2 ± 3.2 mm) X (152. 4 ± 3.2 mm);

Sample thickness: ≦ 4 mm;

Frequency range: 1 ~ 30 MHz;

Dynamic range: 50 dB;

Connector: BNC.

vertical electric field component and the horizontal magnetic field component of the traverse measurement hole. Therefore, the double TEM cell is able to simulate high and low impedance field at the same time. The basic method of measurement is similar to other methods. It's the same that incident power P_0 and transmission power P_1 are respectively measured out by not adding and adding the sample to the window. The shielding effectiveness of the materials can be obtained based on formula (B1).

The features of this method are: because the field is built inside the waveguide room, the input power required is low and no electromagnetic interference will be caused to the surrounding equipment and personnel. The disadvantage is that it is rather difficult to install the fixed tested materials, especially it is much more difficult on how to reduce the contact resistance. Moreover, it is easy to produce leakage or ground loop, therefore the dynamic range is only 50 ~ 60 dB.

Additional information:

This standard shall be under the jurisdiction of China Electronics Standardization Institute.

This standard is drafted by China Electronics Standardization Institute.

Main drafters of this standard: Wang Qing, Jiang Quanxing, Zhang Linchang, Wu Fan, and Ma Fuhua.

_____ END _____