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

JJG 954-2019

**Digital Electroencephalographs
(English Translation)**

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1 Scope

This regulation is applicable to the first verification, subsequent verification and use of digital EEG devices newly manufactured, in use and after repair.

In-use inspection, the digital EEG measurement module in other EEG measurement equipment can be implemented by reference.

This regulation does not apply to telemetry EEG, ambulatory EEG recorders, brain function monitors and special-purpose EEG measuring equipment.

2 Reference documents

This regulation refers to the following documents.

JJG 1043-2008 EEG machine OIMLR89.1990 Method and equipment used to verify the measurement performance of electroencephalograph for dated reference documents, only the dated version applies to this regulation; for undated references the latest version

(including all amendments) is applicable to this regulation.

3 Overview

The digital electroencephalogram (hereinafter referred to as the tested instrument) is a biological analog electrical signal generated by the activity of human brain tissue.

Input circuits, amplifiers, data acquisition and analog-to-digital converters are converted into digital quantities, and stored, replayed, displayed or printed.

Print out the time-domain EEG.

4.1 Voltage measurement

The maximum allowable error is calculated as $\pm 10 \times (1/U_1 U_{in})\%$ (where U_1 is the minimum value of the voltage measurement range, which is it is 5 times the voltage value in the highest sensitivity. For example. when the highest sensitivity of the tested instrument is $1\mu\text{V}/\text{mm}$, voltage measurement the minimum value of the range is $5\mu\text{V}$).

4.2 Time interval

The maximum allowable error is calculated as $\pm 5 \times (1/TI T_{in})\%$ (where TI is the minimum value of the time interval measurement range, the the value is 0.05s).

4.3 Amplitude-frequency characteristics

(1~60)Hz, the maximum allowable deviation is 5%~-10%.

4.4 Performance of low-pass filter (high-cut filter)

Should meet the requirements of $A_{0.9F_c} \geq 0.7 A_{10} \geq A_{1.1F_c}$.

4.5 High-pass filter (low-cut filter) performance

Should meet the requirements of $A_{0.9F_c} \leq 0.7 A_{10} \leq A_{1.1F_c}$.

4.6 Noise level

Not more than $3\mu\text{V}$ (peak-to-peak value).

4.7 Common mode rejection ratio

Each channel is not less than 1×10^4 (80dB).

4.8 Withstand polarization voltage

Add $\pm 300\text{mV}$ DC polarization voltage, the maximum allowable deviation of the amplitude is $\pm 5\%$.

5 General technical requirements

The inspected instrument should be marked with the manufacturer's name, model, factory number, and factory date, and the accessories should be complete. No shadow Mechanical damage to normal operation. The keyboard and mouse are in good contact, and can smoothly and continuously select points to measure on the displayed waveform.

6.1.1 Environmental conditions

- a) Ambient temperature. $(20 \pm 10)^{\circ}\text{C}$;
- b) Relative humidity. less than 80%;
- c) Power supply. $(220 \pm 11)\text{V}$, $(50 \pm 1)\text{Hz}$;
- d) The surrounding environment has no electromagnetic field interference that affects the normal operation of the digital EEG;
- e) There should be a good grounding device.

6.1.2 Measurement standards and supporting equipment

See Table 1 for measurement standards and supporting equipment.

6.3.1 Appearance and normality inspection

The appearance and normality inspection shall meet the requirements of Chapter 5.

6.3.2 Preparation and precautions before verification

6.3.2.1

In the verification, the instrument to be tested and the verification instrument must be well grounded.

6.3.2.2

The inspected instrument shall be warmed up according to the time specified in the instruction manual.

6.3.2.3

In order to obtain high measurement resolution, in the verification items that do not strictly specify the standard signal amplitude, in the displayed graph, under the condition that the

waveforms of adjacent channels do not affect the normal reading due to overlap, select the sensitivity of the tested instrument reasonably.

The amplitude of the standard signal of the verifier and the calibration instrument can make the displayed waveform amplitude as large as possible after recording, thereby reducing the measurement uncertainty.

6.3.3 Voltage measurement

6.3.3.1

The verification system is connected as shown in Figure 1.

6.3.3.2

Based on the bandwidth required to pass the EEG signal, reasonably select the time constant and the setting value of the low-pass filter (for example, the time constant is set to 1s, and the cut-off frequency of the low-pass filter is set to 70Hz).

6.3.3.3

A square wave with a period of 0.1s is output from the verifier to the tested instrument. Select a verification point in Table 3 and follow Table 3 Set the sensitivity S_n of the tested instrument and the output voltage of the tester. The recording speed can be adjusted appropriately to make the signal of each channel clear.

Record and store the standard signal of each channel on the tested instrument and replay it.

Number of cycles. Record and store standard signals on the tested instrument, and replay and display them.

6.3.4.4 Among the signals of each channel displayed in the playback, find the one with the largest time interval deviation to measure, and measure 2 the time interval between periodic continuous waveforms. Calculate the relative error ΔT_m of the time interval according to formula (2), which should meet the requirements of 4.2.

6.3.5 Amplitude-frequency characteristics

6.3.5.1

The verification system is connected according to Figure 1.

6.3.5.2

The time constant of the tested instrument is set to the maximum, and the low-pass filter and high-pass filter are set to "off" (if there is no "Off" block select the highest frequency block).