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JJF

NATIONAL METROLOGY TECHNICAL SPECIFICATION OF THE PEOPLE'S REPUBLIC OF CHINA

JJF 1958-2021

Calibration Specification for Cesium Atomic Frequency Standards

铯原子频率标准校准规范

(English Translation)

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Introduction

This specification is based on JJF 1071-2010 "Rules for Compilation of National Metrology Calibration Specifications" and JJF 1059.1-2012 "Measurement Uncertainty Evaluation and Representation" written.

This specification is a revision of JJG492-2009 "Cesium Atomic Frequency Standard". Except for editorial changes, the main technical the changes are as follows.

---According to JJG2007-2015 "Time and Frequency Measuring Instruments", the frequency accuracy is changed to relative frequency deviation;

--- Increase the calibration content of reproducibility, second pulse jitter, second pulse phase adjustment range and resolution;

--- Delete Appendix A (the principles of two frequency standard comparators) in the original regulations.

Previous releases of this specification.

---JJG492-1987;

---JJG492-2009.

Caesium Atomic Frequency Standard Calibration Specification

1 Scope

This specification applies to the calibration of cesium atomic frequency standards.

2 Reference documents this specification references the following documents.

JJF 1001-2011 General Metrology Terms and Definitions JJF 1180 Terms and Definitions of Time and Frequency Measurement JJF 1206-2018 Specification for remote calibration of time and frequency standards JJG2007-2015 Time and frequency measuring instruments for dated references, only the dated version applies to this specification; for undated references the latest version (including all amendments) applies to this specification.

3 Overview

The cesium atomic frequency standard (hereinafter referred to as the cesium frequency standard) is a passive atomic frequency standard.

The basic principle is shown in Figure 1.The physical part is mainly a cesium atom resonator, and the cesium atom in the resonator is the energy level transition occurs under the action of the microwave excitation signal, and the frequency discrimination signal corresponding to the transition frequency of the cesium atom is output; the electronic part it is mainly composed of signal demodulation, frequency control, crystal oscillator, signal modulation, frequency synthesis and other parts.

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The frequency of the oscillator is locked to the transition frequency of the cesium atom. The crystal oscillator output frequency has the same level of phase as the atomic transition frequency.

For the frequency deviation and long-term stability characteristics, the output signal of the cesium frequency standard is generated after distribution and other processing, for external use.

use.

Fig.1 Basic working principle of cesium atomic frequency standard

The cesium frequency standard with second pulse (1PPS) output is also called cesium atomic clock or cesium clock, which is widely used in time-frequency, communication Information, navigation, aerospace, national defense and other scientific research, measurement fields.

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