

ICS 17.100
CCS A 53



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

GB/T 43740-2024

**Requirements and test methods for the performance of atom
gravimeters**

原子重力仪性能要求和测试方法

Issued on: March 15, 2024

Implemented on: October 1, 2024

**Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC**

Table of Contents

1 Scope	1
2 Normative references	1
3 Terms and Definitions	1
4 Composition and classification of atomic gravimeters	2
5 Performance requirements	4
13 Reference	15

Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part

1. Structure and drafting rules for standardization documents" Drafting. Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents. This document was proposed and coordinated by the National Technical Committee on Quantum Computing and Measurement Standardization (SAC/TC578). This document was drafted by: China Institute of Metrology, Zhejiang University of Technology, Huazhong University of Science and Technology, Precision Measurement Science and Technology of the Chinese Academy of Sciences Technology Innovation Institute, University of Science and Technology of China, Beijing Great Wall Metrology and Testing Technology Institute of China Aviation Industry Corporation, China Space Technology Research Institute, KUST Guodun Quantum Technology Co., Ltd. The main drafters of this document are: Zhuang Wei, Lin Qiang, Hu Zhongkun, Wang Jin, Chen Shuai, Wang Yu, Leng Hanyang, Liu Chang, Wu Shuqing and Xiao Yi. Atomic gravimeter performance requirements and test methods

1 Scope

China's national requirements and test methods for atom gravimeters. An atom gravimeter measures gravitational acceleration by dropping a cloud of laser-cooled atoms and using an interferometer built from laser pulses to read how far they fall - the atoms themselves are the test mass and the ruler is the wavelength of light, so the measurement is absolute and traceable to atomic constants rather than to a calibrated spring. That distinguishes it from the relative gravimeters used in surveying, which drift and must be tied to a reference. The applications are geophysical and increasingly practical: mapping subsurface density for mineral and hydrocarbon exploration, monitoring groundwater and magma movement, detecting tunnels and voids, and providing the gravity reference that inertial navigation

needs. Specifying its performance means fixing how sensitivity, stability, accuracy and the systematic errors are measured, which is not obvious for an instrument this new.

This document specifies the performance requirements of atomic gravimeters and describes the test methods for the performance of atomic gravimeters. This document is applicable to the performance evaluation and testing of different atomic gravimeters.

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document. For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document.

GB/T 23717.2-2009 Mechanical vibration and shock Vibration and shock in buildings containing sensitive equipment Part

3 Terms and definitions

The following terms and definitions apply to this document.

3.1 Atomic gravimeter An instrument that measures the absolute value of gravitational acceleration based on the principle of atomic matter wave interference.

Note. Atomic gravimeter is also called atomic interferometer gravimeter, atomic interferometer absolute gravimeter, quantum gravimeter, etc.

3.2 A non-negative parameter that characterizes the accuracy of atomic gravimeters in measuring gravitational acceleration.

Note. The unit is meter per second squared (m/s^2). [Source: JJF1001-2011, 5.18, modified]

3.3 Short-term sensitivity Parameters that characterize the ability of an atomic gravimeter to respond to changes in gravitational acceleration.

Note. This is used to measure the short-term (e.g. less than 100

s) measurement noise of an atomic gravimeter, and its unit is meter per second squared Hertz square root [$\text{m}/(\text{s}^2 \cdot \text{Hz})$].

3.4 Long-term stability Parameter that characterizes the ability of an atomic gravimeter to keep its metrological properties constant over time.

Note. It is used to measure the changes of atomic gravimeter over a long period of time (such as more than 100 seconds). It is related to the measurement time and the unit is meter per second squared (m/s^2).

3.5 Characterize the consistency of the measurement results of the atomic gravimeter when it turns on and off multiple times to measure the gravitational acceleration at a certain point.

Note. The unit is meter per second squared (m/s^2).

3.6 Resolution Characterizes the smallest change in gravitational acceleration that an atomic gravimeter can measure.

chinastandards.org · PREVIEW