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THE USE OF LASERS IN TECHNOLOGICAL METROLOGY, CONSTRUCTION AND CHEMICAL INDUSTRIES

Abstract
Infrared thermal rays of the spectrum with a length of S / >0.76 μm are invisible. As the temperature of a heated body is increased, its color changes, in which spectral energetic clarity, that is, waves of a certain length (clarity), quickly increases, as well as cumulative (integral) radiation increases significantly. The indicated properties of heated bodies are used to measure their temperature. Depending on these properties, radiation pyrometers are divided into quasimonochromatic (optical), spectral ratio (color), and full radiation (radiation) pyrometers. Theoretically, an absolute black body can be based on a phenomenon of light emission, in which the coefficient of light emission is taken to be equal to 1. If an object completely absorbs the energy of the light falling on it, this object is called an absolute black body. All real physical bodies have the ability to repel some of the Rays falling on them. Therefore, the absorption coefficient of light of an object is less than one, at the same time it depends on the nature of a particular object as well as its shallow States. In nature, there is no absolute black body, but in its objects that are close to the absolute black body.

Keywords: quantum, optical wave, amplifier, laser, metrology, measurement, accuracy.

Introduction

After the creation of quantum amplifiers operating in Radio waves and optical ranges, namely mazers and optical quantum amplifiers (lasers), it was possible to use electromagnetic radiations of atoms and molecules to represent the second [1,2].

Semiconductor quantum generators were subsequently created. Their main characteristics are their very compactness, the Highness of the useful work coefficient to the point of converging together. For comparison, we will show that the useful operating coefficient of gaseous and crystalline optical quantum generators, which are excited using light oil, does not exceed 1%.

Quantum amplifiers and generators are widely used in communication techniques, in the cretion of new technological processes of material processing, in medical machines.

They are being used as standards of Metrological repeatability and provide expression of the second in extremely high accuracy, serving to achieve the ethalonization of the unit of time.

In this context, quantum generators can be viewed as new types of clocks, i.e. "molecular clocks".

The discovery of lasers and mazers has opened up new opportunities for metrology in areas other than the ethalonization of time and repeatability. Lasers are being used as a powerful source of coherent radiation in high-resolution interference measurements of length, using which linear scales are being moved to high-resolution measuring instruments.

Materials and methods

This includes empirical methods such as modeling, fact, experiment, description and observation, as well as theoretical methods such as logical and historical methods, abstraction, deduction, induction, synthesis and analysis. The research materials are: scientific facts, the results of previous observations, surveys, experiments and tests; means of idealization and rationalization of the scientific approach.

Results and discussion:

Aser is a rare source of radiation, in which such properties as high monochromaticity, slight loss of light and a large impressive amount of transmission are successfully embodied. Therefore, it is being used as one of the best tools for measuring length, speed and optical recommendations of different environments in the structure of an optical electronic device.

A Laser Interferometer allows you to notice and measure everything that affects the length of the optical measurement shoulder in a very large diaposon. With it, it is possible to determine indicators such as linear measurements and derivatives from it - speed, acceleration, as well as the refractive index of the environment and the factors affecting it: pressure, temperature, amount of various impurities.

With the help of a Laser Interferometer, objects up to 1 m long can be automatically measured at an accuracy of 10-13 m.

The application of laser interferometers in metrology is therefore promising that high-length laser beams are not influenced by vibration, noise, external illumination and even by the fact that a certain amount of air is pollinated.

An example of using a laser interferometer is shown in Figure 1.

Excited nuclei, as is known, emit gamma rays from themselves, that is, photons of large energy. Conversely, when a photon is exposed, i.e. a photon is absorbed by a nucleus, the nucleus can excite if the Photon Energy is sufficient to transfer the nucleus from the lower energetic level to one of the higher energetic levels. This phenomenon was confirmed in 1958 by the German scientist R.Discovered by Messbauer, it is named after him.

The Messbauer effect is based on Resonance absorption of gamma-Quanta by nuclei, with an isomeric nucleus rather than a simple nucleus being obtained as a gamma-Quanta irradiator [2, 3].

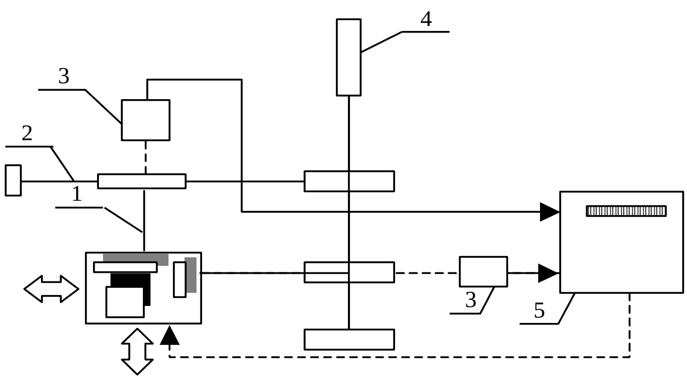

Fig. 1. Length measurement using Laser Interferometer:
1-measuring beam; 2-base beam; 3-Photo receiver; 4-laser; 5-electronic accounting device

The Messbauer effect is observed when energy is taken up by a full crystal.

The peculiarity of isomeric nuclei is that they can stand in a relatively long excited state (from a few years to 10^{-8}s). This time will be approximately 10^{-23}s in ordinary cores. Therefore, the mutual difference in the energy of gamma-Quanta emitted by isomeric nuclei to zwazi is many times smaller than the scattering in the energies emitted by ordinary nuclei and does not exceed 10^{-12}.

Thus, the irradiated target emits gamma-Quanta, that is, the energy of the absorbed and emitted gamma-Quanta, in other words, the source of the radiation and the target repetitions are precisely matched (overlapped). In this sense, the source and Target are similar to clocks that show the same amount, with such systems forming a “core clock” [4]. The accuracy of such watches will not be less than 10^{-12}S [6].

The enormous importance of the Messbauer effect for science and technology is its extreme sensitivity to changes in magnitude in the target. When Gamma-quantum energy is changed from a trilion to a fraction, in some cases a thousand more times less than this, the resonance absorption or scattering of radiation is completely lost. Thus, engineers and scientists have acquired an extremely sensitive tool that records nuclear-irradiator or nuclear-absorbing energy changes [5].

Conclusion

It is known that the conditions of resonance absorption or scattering of gamma-Quanta are influenced by: the relative speed of movement of the source and absorber; the difference in the movements of the source and absorber; the difference in pressure acting on the source and absorber; the difference in gravitational potentials at the points where the source and absorber are located; the difference in Depending on the change in absorption or scattering levels of Gamma-Quanta, it is possible to obtain information about the quantitative change in the physical magnitude that caused this change, that is, to measure this physical magnitude [7].

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ЛАЗЕРДІ ТЕХНОЛОГИЯЛЫҚ МЕТРОЛОГИЯДА, ҚҰРЫЛЫС ЖӘНЕ ХИМИЯ ӨНДІРІСТЕРІНДЕ ҚОЛДАНУ

Түйін

Ұзындығы S / >0,76 мкм спектрдің инфрақызыл жылу сәулелері көрінбейді. Қыздырылған дененің температурасы жоғарылаған сайын оның түсі өзгереді, онда спектрлік энергетикалық айқындылық, яғни белгілі бір ұзындықтағы (айқындықтағы) толқындар тез артады, сонымен қатар кумулятивтік (интегралды) сәулелену айтарлықтай артады.. Қыздырылған денелердің көрсетілген қасиеттері олардың температурасын өлшеу үшін қолданылады. Осы қасиеттерге байланысты радиациялық пирометрлер квазимонохроматикалық (оптикалық), спектрлік қатынас (түс) және толық радиациялық (радиациялық) пирометрлерге бөлінеді. Теориялық тұрғыдан алғанда, абсолютті қара денені жарық шығару құбылысына негіздеуге болады, онда жарық шығару коэффициенті 1-ге тең болады. Егер зат оған түскен жарықтың энергиясын толығымен сіңірсе, онда бұл зат абсолютті қара дене деп аталады. Барлық нақты физикалық денелер Оларға түскен Сәулелердің бір бөлігін тойтару қабілетіне ие. Сондықтан объектінің жарық сіңіру коэффициенті біреуден аз, сонымен бірге ол белгілі бір объектінің табиғатына, сондай-ақ оның таяз Күйлеріне байланысты. Табиғатта абсолютті қара дене жоқ, бірақ оның қасиеттерінде абсолютті қара денеге жақын объектілер бар.

Кілттік сөздер: кванттық, оптикалық толқын, күшейткіш, лазер, метрология, өлшеу, дәлдік.

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ПРИМЕНЕНИЕ ЛАЗЕРОВ В ТЕХНОЛОГИЧЕСКОЙ МЕТРОЛОГИИ, СТРОИТЕЛЬСТВЕ И ХИМИЧЕСКОЙ ПРОМЫШЛЕННОСТИ

Аннотация

Инфракрасные тепловые лучи спектра длиной S/ >0,76 мкм невидимы. При повышении температуры нагретого тела изменяется его цвет, при котором быстро возрастает спектральная энергетическая четкость, то есть волны определенной длины (ясность), а также значительно увеличивается суммарное (интегральное) излучение. Указанные свойства нагретых тел используются для измерения их температуры. В зависимости от этих свойств пирометры излучения подразделяются на квазимонохроматические (оптические), пирометры спектрального отношения (цветные) и пирометры полного излучения (радиационные). Теоретически, абсолютно черное тело может быть основано на явлении излучения света, при котором коэффициент излучения света принимается равным 1. Если объект полностью поглощает энергию падающего на него света, этот объект называется абсолютно черным телом. Все реальные физические тела обладают способностью отражать часть падающих на них лучей. Поэтому коэффициент поглощения света объектом меньше единицы, при этом он зависит от природы конкретного объекта, а также от его поверхностных состояний. В природе не существует абсолютно черного тела, но есть объекты, близкие к абсолютно черному телу.

Ключевые слова: квант, оптическая волна, усилитель, лазер, метрология, измерение, точность.