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# THE USE OF LASERS IN METROLOGY

*Annotation: Quantum amplifiers and generators (lasers) are widely used in communication techniques, in metrology, in the creation of new technological J arrays 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 regard, quantum generators from the dice can be viewed as a new type of clock, that is, "molecular clocks".*

*Keywords: quantum, optical wave, amplifier, laser, metrology, measurement, accuracy,: quantum, optical wave, amplifier, laser, metrology, measurement, precision*

## 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%.

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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.

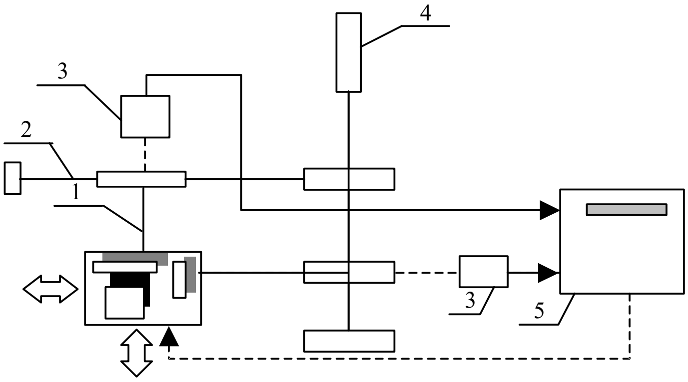


**Figure 1. Length measurement using Laser Interferometer:**
**1-measuring beam; 2-base beam; 3-Photo receiver; 4-laser; 5-electronic accounting device**

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].

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”. The accuracy of such watches will not be less than $10^{-12}$s [4].

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 [6].

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