

# Is laser quantum generator?

F. F. Mende

<http://fmnauka.narod.ru/works.html>

[mende\\_fedor@mail.ru](mailto:mende_fedor@mail.ru)

## Abstract

In the scientific articles and the publications is said, that the laser is the quantum generator, which radiates light quanta. But this is not so, laser this is the usual phased array, in which the phasing of its elementary sources, which are the atoms or the molecules of work substance, is produced with the aid of the external resonator.

Lasers are considered as the quantum generators. It is known that the laser emission possesses high coherence and directivity. In radio engineering the principle of the construction of the radiating systems, which have high coherence and directivity, is well known. It consists in the use of a large quantity of elementary phased emitters, located in the determined order. Such systems are called the phased array (FA). Moreover, the greater the quantity of elementary sources it is used and the greater the dimensions of space, on which they are located, the greater the directivity and the radiated power can be obtained. For obtaining the high directivity the linear dimensions of system must be considerably more than the length of radiated wave.

In the work substance of laser also always is contained a huge quantity of elementary sources, which the atoms or the molecules of work substance are. If the discussion deals with the solid-state lasers, for example on the basis of ruby, then the radiating atoms, which are the atoms of chromium, it

is also located in the crystal of work substance in the strictly defined order. Arises question, which will be, if such atoms, which are been elementary sources, are synchronously excited by any means, moreover then so that their fluctuations would be phased in a specific manner. From a radio-technical point of view this system can give the very narrowly-directed emission, since. a quantity of emitters is very great, and the length of radiated wave is much less than the linear dimensions of working element. But arises the question, how it is possible to excite atoms. The collision excitation, when the work substance of laser they irradiate by short pulse from the flashbulb, is one of such methods. Consequently, this generator works according to all laws of electrodynamics and radio engineering, and there is nothing in it quantum, although the name in it very beautiful - two-level quantum generator.

But are known and the multilevel quantum generators, in which the quanta are thrown to higher levels, and emission occurs by the way of their lowering downward by the course of several levels. And these are already accurately quantum generators. But prosaic radio engineers here say that any they not quantum, simply speech go about the nonlinear parametric systems, in which, because of the nonlinear properties of medium, occurs either parametric strengthening or parametric generation. All these processes are described well by the so-called the Menli-Rou relationships.

So that would be understandable, the discussion deals with than, let us give an example of usual mechanical resonator, for example tuning fork. If we strike tuning fork, thus for a while rings, generating acoustic waves. Any oscillating process is characterized by this parameter as quality, the less the ohmic losses in the oscillatory system, the higher its quality. It is numerically equal to a quantity of oscillatory periods, plotted in that time interval, for which the amplitude of fluctuations decreases in  $e$  of times. This is usual classical by all intelligible approach. This process from a mathematical point of view can be examined differently, considering that

this is any mechanical, but quantum oscillator. And to consider that the excited tuning fork is had two energy levels: zero and upper (excited). In quantum mechanics it is considered that when we mechanically excite tuning fork, this mechanical resonator jumps over to the upper energy level. Quantum mechanics determines the lifetime at this upper level. It is exactly equal to that interval of time, which is necessary so that the amplitude of fluctuations in the mechanical resonator would decrease in  $e$  of times.

If we take one hundred million tuning forks and it is synchronously phased to excite them, it is on top of that correct to arrange them in the space, then it is possible to obtain the coherent, narrowly directed sonic ray. Such systems successfully are used in the sonars. And this entire process as before can be considered as the phased lattice of mechanical vibrators. Quantum mechanics considers that this system is two-level quantum generator. Certainly, this approach in common with physics has nothing, but it is the result of those scholastic mathematical approaches, which are so extended in contemporary physics.

In the ruby laser in the matrix of corundum the small percentage of aluminum atoms are substituted by the atoms of chromium. These atoms have strict attitude sensing and their resonance frequency. But if we excite this resonance, then atom chromiums will emit not acoustic, but electromagnetic waves. Further entire the same histories as with the tuning forks, only atoms of chromium in one cubic centimeter of the ruby not of one hundred millions, but ten into twenty second degree.

If on ceiling hang incandescent bulb, that it emit incoherent light. Why? But because the phases of the oscillations of all atoms, which vary as a result heating tungsten, are unphased and they are spontaneous. Therefore, if you want to teach laser coherent emission, then you must not only excite in atoms or tuning forks of fluctuation, but also excite them then so that their phases would be phased according to the specific law. Then you obtain coherent (laser) emission. Therefore the problem of developing of

laser consists not only the excitation of fluctuations in the separately undertaken atoms (for example the atoms of chromium in the ruby laser) but still and obtaining the correct phasing of their fluctuations with this excitation. If we this attain ourselves, then will learn the emission, which in quantum mechanics is called stimulated. External resonator for these purposes serves, where active material is placed. In this case one of the oscillating modes of external resonator must in the required order coincide with the resonance frequency of the atoms of active material. The phasing during irradiation of ruby by flashbulb occurs very simply. The light of flash excites incoherent fluctuations in the atoms of chromium, and external resonator selects from entire many excited atoms, only those, the phase of fluctuations of which coincides with the phase of fluctuations in the resonator itself. Therefore efficiency in ruby laser is low. Resonator fulfills those functions, which carry out the resonant circuit of your receiver with its tuning for the specific frequency. Therefore laser this is the usual correctly phased antenna array.

But moreover here the Menli–Rou relationship? These relationships work when in the nonlinear medium there is several resonances, let us say three resonances. In this medium such resonances are not independent and energy processes in them are connected. Moreover if we excite one of the resonances, then I will be excited and rest. If we compare the energy, stored up in each of the resonators examined, then it Budde is proportional to their resonance frequency. This quantum mechanics interprets as the presence on Wednesday of the energy levels of the proportional to frequency. But the processes of energy transfer of one resonance in another, which ensures the nonlinearity of medium, quantum mechanics interprets as the jumps from one energy level to another.

You see as all simply. But simply they do not know these elementary things of physics, simply thus they taught them, and with it drove into the head any scholastic diagrams, nothing general with physics having. Love

physics any super-natural pieces. That in them electrons in a completely inconceivable manner from the orbit in orbit jump over and mysterious quanta emit. That twins in the spacecraft, which are carried with the light speeds, on millions years live. But here the engineers in no way to this they believe!