Experimental verification of the wave model of the genetic coding

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INTRODUCTION

Close Corporation SERVET is a multifunctional commercial enterprise, which develops new technologies and produces equipment in the fields of housing and public utilities, environmental protection and health care, nature management and mining operations.

During past two years our company has been involved in research and development programs in the sphere of medical diagnostics and treatment, manufacturing new drugs and medical equipment, intended for timely detecting infectious diseases and identifying qualitative and quantitative characteristics of infectious agents both in a human organism and in other environments (water, soil, foodstuff, premises, etc).

Having completed a long research work containing different aspects of physics, virology and microbiology, we came to an obvious conclusion, that the physio-chemical properties (characteristics) of various pathogens (viruses, bacteria etc.) are strictly specific for each stage of their development in an organism or environment. Our experiments stem from the notion that a DNA generates a certain radiation, a so-called wave genetic code, which is unique for every type of DNA. So it is assumed that a DNA type can be identified by its wave genetic code. The ideas and theoretical models for the wave genetic code are known well enough [1] but they lack an experimental verification.

The research results enabled us to work out an operating model for a unique medical device for complex noninvasive and aliquot-free express diagnostics (i.e. without blood test and/or laboratory sampling of human tissue) for viruses and infectious disease agents. The model is based on the comparison of the electromagnetic radiation of a human with the electronic analogues of disease agents (virus and bacterium characteristics) stored into the device database. The device is called Intest Diagnostics Unit (for more details, see [2]).

For the moment we have managed to do the following:

1) to obtain the licenses of the Russian Federation №2190350 Method of Noninvasive Express Diagnostics (Appendix 2) and №2190349 Device for Noninvasive Express Diagnostics (Appendix 3);
2) to start the licensing procedure in the EU and the USA;
3) to develop a set of design documents needed for a large-scale production of Intest Diagnostics Units;
4) to develop a special software for visualizing and analysing the qualitative and quantitative diagnostic results;
5) to produce four production sample devices of Intest Diagnostic Unit;
6) to start registering Intest Diagnostics Unit in Health Ministry of the Russian Federation;
The experiments, presented in this contribution, confirm the ideas of “the wave genetic code” and also demonstrate that the DNA molecules can keep memory of an external electromagnetic field. We studied the spectra of stimulated Brillouin scattering (SBS), and the spectra of superluminescence of the pathogens themselves (hepatitis C, rabbit pox, salmonella, etc.), and their isolated DNA in different colloidal solutions (water, saline solution, alcohol). Also, the radiation from the objects under virus testing was analyzed by MNOS (metal-nitride-oxide-semiconductor) transistors, which compared this radiation and the own radiation of the viruses under study. Checking the unique characteristics of the field was based also on spectral analysis of the modulated laser light, and analysing the MNOS structures with electron-optical moire, followed by subsequent mathematical processing.

TESTED MODEL
The following theoretical propositions were checked:
- the possibility of creating the condition for the excitation of the basic (allocated) collective Freilich mode due to the coherent resonant interaction of the electromagnetic radiation and Freilich-oscillator;
- the possibility of modulating laser in the infrared range, that is, the possibility of "writing down" the information about the wave genetic code on laser radiation.

It was found that the information about the wave genetic code remains intact after the conversion of the modulated signal into another frequency range.
EXCITATION OF FROLISH MODES

The possibility of creating the conditions for the excitation of the basic (allocated) collective Freilich mode due to the coherent resonant interaction of the electromagnetic radiation with Freilich-oscillator has been investigated. Within the limits of concepts of laser physics it is a matter of creating the inverse population between the quantum levels of the allocated oscillatory mode. Hence, it boils down to obtaining superfluorescence and laser generation with the use as working bodies the molecules of DNA, RNA, protein as well as such structures as ribosomes, polyribosomes and chromosomes.

The Freilich-mode [1] is modelled as a two-level quantum system (where level 1 is the basic condition, 2 - the top one), this system is raised by the resonant peak-modulated electric field (For. 1):

$$E(t) = E_0 g(t) \cos \omega t$$  

(For. 1)

where $E_0$ - an intensity amplitude of the field, $g(t)$ - a factor of modulation,

$w = w_{21}$ ($w_{21}$ - the frequency of the transition from the excited level to the ground level).

The feasibility of such modes and their dependence on the modulation of radiation were checked. As seen from equation (7), the spectrum of pulsations of diagonal matrix elements besides Rabi frequency includes also Stokes and anti-Stokes combinational frequencies (For. 2):

$$v_{\Omega} = \Omega_0 \pm n\nu (n = 1, 2, ... )$$  

(For. 2)

Suppose the following condition is satisfied (For. 3) for a definite n:

$$\Omega_0 = n\nu; \quad \Omega_{01} = \frac{\Omega_0}{\nu} = n$$  

(For. 3)

Then, as appears from (7), the constant component of the probabilities disappears, so that the inversion of level population densities looks like (For. 4):

$$\Delta \rho = \langle \rho_{22} \rangle - \langle \rho_{11} \rangle = -J_n(\gamma)$$  

(For. 4)

The effect of inversion ($\Delta \rho > 0$) is realised the following condition (For. 5):

$$J_n(\gamma) < 0$$  

(For. 5)

If the modulation depth parameter ($\gamma$) is in the range, where values of Bessel function ($J_n$)are negative, the mode of system overexcitation is realised (containing the information about biomacromolecular and permolecular structures).

Thus, by selecting a modulation mode it is possible to cause Freilich mode, i.e. the appearance of Stokes and anti-Stokes combinational frequencies.

So, it suffices to check out the Stokes and anti-Stokes excitation in a solution containing DNA, along with the registration of the intensity distribution of the laser modulation that causes excitation in the solution.

DESCRIPTION OF EXPERIMENTS

The experiment was carried out as follows. Biological objects under study (table 1) were dissolved in a physiological saline at a concentration of a pathogen from 1 to 107 omv/(1-7 ltds50). The radiation was passed through the air at three different wavelengths. Semiconductor lasers with wavelengths of 670 nm, 870 nm and 1013 nm and a high-stable power were used as a source of radiation to stimulate fluorescence.
The radiation of the lasers was consistently fed to the spectrum analyzer and further into the computer memory (Fig. 1). A high degree of averaging was chosen for the stability of the results. Each result was recorded twice with an interval of at least five minutes. Optical waveguides were used to deliver the output radiation to the environment. The spectral resolution equaled 0.5 nm. A plane-parallel cuvette with viruses was irradiated in series at wavelengths of 1017, 810, 670 nm. However, to choose the most informative wavelength and reduce the possibility of second sort error at processing the results, we recorded the spectra of the second harmonicas for 810 nm and 670 nm lasers, namely, 1620 nm and 1340 nm, accordingly. The radiation, delivered to the cell, was not focused and had the density below the Brillouin scattering threshold.

At the beginning of each series of experiments, in addition to the spectra, which carry information, there were recorded also the spectra of laser radiation and that of radiation passing through a clean cuvette. The results were stored in a computer memory, while the subsequent processing of the spectra was carried out using a specialized software package for the statistical processing of experimental data.

An analyzer of optical spectrum Agilent 86140B (USA) was used to register spectra and fluorescence intensities. The sensitivity of the device was 69 dBm. The measurements were taken in a transparent quartz cuvette with a plane-parallel surfaces in red and infrared ranges. The optical path length of the cuvette was 3 mm, while its temperature was stabilized at +37°C throughout the experiments. The superluminescence was registered in a range from 600 nm to 1600 nm, yet a more careful attention was given to the spectral area from 780 nm to 840 nm, because the previous experiments and literary data testify to the greatest fluorescence intensity of carbon nanotubes in this range of optical spectrum. The intensity of fluorescence was changed 1 time per min.
RESULTS AND DISCUSSION

Fig. 2. Dependence of Stokes and anti-Stokes components on laser modulation for rabbit pox viruses with active agents of $10^9$ OOE/ml: a - laser spectrum, b - rabbit pox virus.

Fig. 3. Dependence of the intensity-modulated laser beam on time.
Fig. 2 shows the dependence of Stokes and anti-Stokes components on the laser modulation for rabbit pox viruses with active agents $10^4$ OOE/ml.

- 1 no modulation - corresponds to spectral distribution 1 Fig 2;
- 2 modulation corresponds to spectral distribution 2 Fig 2;
- 3 modulation corresponds to spectral distribution 3 Fig 2;
- 4 modulation corresponds to spectral distribution 4 Fig 2.

On increasing the modulation depth, the peak shifted from the Stokes region to the anti-Stokes region, while the peak intensity increased, even at a constant virus concentration. In case 4, the peak intensity of anti-Stokes component exceeded the peak intensity, related to the laser source, but retained its logarithmic dependence on concentration [2]. If the radiation was fed into the solution not along the waveguide, but through the air, there appeared an intense laser pumping mode corresponding to the object luminescence. The results were presented in our paper [2], with all the experimental dependencies in good agreement with the dependence by formula 8. Fig. 4 displays the intensity distribution of the angles of Stokes and anti-Stokes components. The fact that the polarization of radiation depends weakly on modulation is mainly defined by the type of the object, as shown in our previous studies.

CHECKING INDIVIDUAL DNA CHARACTERISTICS

Individual characteristics of DNA were checked in two ways. In the first procedure the reference radiation of the laser source was recorded and then the direct scattering spectra were analysed. The experimental setup is the same as that in the diagram of Fig. 1. The problem was solved by the method of electron-optical moire with subsequent mathematical processing.

The scattering spectra of 31 cytopathogenic viruses and bacteria were studied, see Table 1.
Table 1. The list of infectious agents investigated with Intest diagnostic complex.

| VIRUSES | BACTERIA |
|---------|----------|
| 1. Herpes simplex – Virus | 17. Mycobacterium tuberculosis avium |
| 2. Herpes Zoster - Virus | 18. Mycobacterium tuberculosis bovis |
| 3. Herpes genitaler - Virus | 19. Mycoplasma hominis |
| 4. Epstein-Barr-Virus | 20. Neisseria gonorrhoeae |
| 5. Cytomegalovirus | 21. Neisseria meningitidis |
| 6. Hepatitis A - Virus | 22. Peptostreptococcus anaerobius |
| 7. Hepatitis B - Virus | 23. Proteus mirabilis |
| 8. Hepatitis C-Virus (Genotype 1B) | 24. Staphylococcus aureus |
| 9. Delta-hepatitis-Virus | 25. Streptococcus β-hemolytischer |
| 10. AIDS-Virus | 26. Streptococcus pneumoniae |
|  | BACTERIA |
| 11. Campylobacter jejuni | 27. Streptococcus viridans |
| 12. Chlamydia psittaci | 28. Candida albicans |
| 13. Chlamydia trachomatis | 29. Lamblia intestinalis |
| 14. Enterococcus | 30. Plasmodium malariae |
| 15. Helicobacter pylori | 31. Trichomonas vaginalis |
| 16. Mycobacterium tuberculosis hominis | |

DESCRIPTION OF EXPERIMENTS 1

The experiment was conducted in the same manner as in the previous case (see Fig. 1), except that radiation was fed to the cell along the waveguide, not through the air. The power of the laser source was doubled. In this case, Stokes and anti-Stokes components of stimulated Brillouin scattering is determined by internal factors.

RESULTS AND DISCUSSION 1

Fig. 5 presents the intensity distribution of a laser with a wavelength of \( \lambda = 0.81 \) mcm. The modulation rate was varied by changing the time of a filling factor from 0.0001 sec till 1 sec and the radiation intensity of a laser source. The spectra of several other objects are given here.
DESCRIPTION OF EXPERIMENTS 2

The second method is as follows:

For the elementary design type (with one source of radiation) the principal scheme of data recording (see Fig. 2) represents a device, which works as follows. From a monochromatic radiation source 1 radiation arrives at cell 2, containing the base medium and the object under study (viruses, microorganisms). Then, radiation arrives at unit 3 for recording and reading optical information (for example, for recording by means of a two-layer plate - copper, cupric oxide). After transforming optical information into an electrical signal, it arrives at unit 4 for information processing and storage, consisting of a microprocessor and integrated circuits.
The recording cell contains at least two elements, an insulator and a conductor (silver or aluminium can be used as a conducting material). The cell of a multilayered design can also be used. According to available data, the cell keeps its the information structure for no less than 3-5 years at a room temperature without exposure to external electromagnetic fields, for example, an ultraviolet radiation. A power source supplying both alternating and direct currents is used in the circuit. A recording cell database and a switchboard for connecting the cells can also be built in a single unit of control and analysis.

After exposing an object to electromagnetic radiation of a weak power (electric current), the wave pack of a spectral structure, which corresponds to the features of spectral characteristics of all the objects, is stimulated in this object. Thus, the current in the circuit repeats the features of spectral characteristics of the object. In the case of a direct current in the circuit, one of the electrodes is active (measuring), another one is a base electrode. In the case of an alternating current, each of the electrodes performs alternately the specified functions, according to an instant direction of the current. The power supply is desirable to choose in the form of a source of adjustable basic voltage. It allows to set the level of a direct current or an alternating current, which passes through the investigated object, so that to ensure the best information response.

The physical mechanism of diagnostics of Intest Diagnostic Unit is based on comparing the electromagnetic field characteristics of a biological object (a person or an animal) and the records of electromagnetic field characteristics of the superfluorescence (generation) in samples prepared in advance, which consist of the base solution and a virus. As is known, the virus consists basically of proteins and amino-acids possessing unique spectral characteristics.

If a biological agent is present in an investigated object or a chemical substance corresponds to one of the connected cells, the dynamic characteristics will cause an increasing current due to the signal interference. After digitizing the current, it is processed by the algorithms of the unit. On the basis of conformity between the dynamic characteristic parameters of the structure and the cell along with a change in the value of the measured current, one can determine the presence of the chemical substance or the biological agent corresponding to the connected cell in the investigated object.

The accuracy of the method is proportional to the area of a measured object, which is due to decreasing the useful signal with its reduction, while the noise remains constant and reduces the accuracy of recognising viruses.
The results of recording were checked by visualising and analysing the power-information fields of the biological objects, which were registered as a power-information field pack in two-shutter field-effect transistors. Shooting was done by an electro-phonograph EG-100A with an accelerating voltage of 40 kV, using a rectangular grid with 100x100 mcms cells and systems of a plate-ball type (dia 0.5 m), to which the potential of the field analogue of a virus or bacterium was applied. The moiré picture turned out to be a double exposure on a photo-plate due to the lack of external disturbance of the applied field. The results of shooting are presented in Fig. 3.

![Moiré pictures of biological objects](image)

Fig. 3. Results of recording and analysis of the power-information fields of biological objects.

The pictures were scanned, digitized and then mathematically processed by means of specially selected function (in the form of "sombrero") and "the drop" method with the change of scale and area by steps. The results of processing moiré pictures by means of the wavelet-analysis can be presented as pictures or schedules, given in Fig. 4. The obtained pictures represent an intermediate stage of mathematical processing. The degree of darkness in them is defined by the value of a field-energy in each point. Then further step-by-step processing the obtained pictures is done, which results in the schedules of energy or degree of darkness dependent on the area.

The results of mathematical processing show that the dependence inherent in a given object corresponds to its field analogue with sufficient reproducibility in both qualitative and quantitative terms. Thus it is shown that the method of electron-optical moiré allows registering the electromagnetic parameters of the information fields of objects of various natures.

The information about a wave code remains intact after converting the corresponding modulated signal into another frequency range.
Fig. 8. Results of wavelet-analysis of moiré pictures of the biological object fields.

Fig. 9. A circuit for comparing an excited test signal and the standardised signals stored in a computer memory.

From monochromatic light source 1 radiation passes to cell 4, containing the base medium and an object under study (viruses, microorganisms). Then the radiation passes into unit 6 for reading and recording optical information. After transforming optical information into an electrical signal, it passes into unit 8 for information processing and storage, consisting of a microprocessor and integrated circuits. A more complex design version of the device (Fig. 8) works as follows. Radiation from three lasers with various wavelengths in a visible and near infrared range is consistently directed from unit 1 (for example, through a fiber waveguide 2) into unit 3 for measuring light. Then a part of radiation is directed onto cell 4 containing the base medium (water, spirit, salt solutions) and the biological agent (virus, bacterium) under study. After passing cell 4, the radiation is fed simultaneously into spectrum analyzer 5 and unit 6 for recording and reading the optical information, then a re-recorded carrier containing the established information is fed to the rotary device 7, allowing to change an angle between a source and a receiver of optical information. Unit 6 for recording and reading optical information (for example, a device containing a registering layer on phase transitions or a holographic device) is needed for a long-term storage of the database for numerous researched object spectra and for their exact reproduction while rewriting and duplicating. After analysing the readings of spectrum analyzer 5, the narrower range of the spectrum and the angle between the source of...
radiation in unit 2 and the receiver in unit 6 are selected for recording so that the most typical features were represented. A more detailed description of the device is given in [2].

Significant changes of the current in the registration circuit were noted if spectral characteristics of the radiation from an object under testing were fully identical to the spectral characteristics of own radiation from one of the identified virus. If the spectral characteristics of the radiation from an object could not be identified with any of the identified viruses, i.e. the object did not contain the virus; the fluctuations of the current were within the measuring errors. The experimental distribution of the circuit current and the spectral distributions of the radiation from DNA under study were compared with the theoretical distributions, suggested in [1]. The theory and the experiment appeared to be in good qualitative agreement.

The current distribution in the circuit for the case of matching the pathogen in the cuvette and the pathogen in the PC memory (Fig. 10).

Fig. 10. The current distribution in the circuit if the pathogen in the cuvette does not match the pathogen in the PC memory.

CONCLUSIONS

The scattered laser radiation in a solution of an object containing DNA may cause an excitation Frohlich mode, with the intensity proportional to the concentration of a dissolved object.

Spectral distributions of various objects containing DNA are unique.

The information encrypted in DNA can be recorded by the laser.

The spectral distribution of the DNA luminescence taken together with the transmission spectra of the laser can be the basis for a series of devices for the diagnostics of pathogenic organisms.

The series of experiments allowed us to identify the method underlying the design principles of a stand for monitoring the Intest Diagnostic Unit efficiency.

REFERENCES

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