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ELECTROCARDIOGRAPH ON NANOELECTRODES

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Science-innovation sphere is vital part of the economy, without development of which it's impossible to increase country's competitiveness at world markets.

Questions of higher education science development, its result implementation into national economy are important issues nowadays.

It is important to use science-innovation potential of Russia's Higher School more actively by strengthening relations between higher education institutions and industry.

The issue of commercial usage of the results of scientific research of educational institutions is quite important [1].

On the basis of research institute of introscopy of Tomsk Polytechnic Institute there's developed an electrocardiograph on nanoelectrodes for monitoring according to the method of Halter with higher resolving power for early diacrisis of heart-vascular system and detection of ischemic changes of myocardium by estimation of ST- segment shift.

The project has social meaning and is directed to improve quality of electrocardiographic research.

Halter monitoring is an obligatory method of cardio patient examination and is widely used nowadays.

ST- segment shifts as possible sign of ischemic changes of myocardium are thoroughly estimated. Analysis of ST- segment is connected with big technical difficulties and almost always a doctor should not rely on automatic measurement of ST- segment changes without medical control of fiducial points [2].

Accuracy in measurement of ST- segment shift is very important for qualified estimation of ischemic changes of ECG. It's ideal when it's no worse than 10÷15 uV. Systems with accuracy in measurement of ST- segment shift at level 40÷50 uV may make it difficult to detect slight shift as diacritically important ST- segment shift is 100 uV [3].

Quality, with which Halter monitors register ECG, depends on frequency interval, capacity of analog-to-digital converter (ADC). Using 8-digit ADC, as it is in a number of systems, accuracy in measurement of amplitudes can't be better than 40÷50uV, and it is not enough for estimation of low-amplitude components of ECG (P waves, ST-segment), that's why such monitors can be used only for rough estimations of rhythm disturbance [3].

There's a great variety of electrocardiological equipment at world and Russian markets. Electrocardiographs work in narrow band and have restrictions for low frequency (from 0,05 Hz and more) and for high frequency (20 Hz, 40 Hz, 75 Hz, 100 Hz) because usually metallic electrodes are used for ECG in hospitals and polyclinics. These electrodes are polarized under the influence of direct current and have essential drift on direct current and mush.

Ideal cardiogram should be done in frequency band from 0 to 100 Hz without filters in acceptance band, including barrier filter 50 Hz.

Filter of high frequency leads to mutilation of ECG-signal in the field of low frequency and to mistakes detecting ischemic heart disease, patients with which usually have enstrophe of S-T complex of cardiogram.

High quality of electrocardiogram is necessary first of all in polyclinics, where there's main stream of patients and where detection of pathologic processes at the beginning stage of heart disease is needed.

Contemporary achievements in the field of nanotechnologies and nanomaterials allowed developing nanotechnologies in a number of applied fields of science and engineering. One of the examples is the development of medical nanoelectrodes on the basis of porous ceramics, created in research institute of introscopy.

By using nanoelements of silver in chlorine-argentic electrodes on the basis of porous ceramics we got the following characteristics of nanoelectrodes on direct current [4]:

- drift of electrode-electrolyte-electrode system with DC strain ≤ 1nA – 0,005 uV/sec;
- drift of electrode-electrolyte-electrode system with DC strain 100nA – (0,05-0,1) uV/sec;

Nanoelectrodes almost do not polarize with currents up to 0,5 μмA and have low contact potential.

When examining heart during 20 heart cycles isoline drift with current 1nA will be 0,1uV; with current 100nA – (1-2_uV; change of electrode potential difference is no more than 2-3 mV with current influence 100nA.

The carried out preliminary technical and medical researches of electrocardiograph and nanoelectrodes models showed the ability to research ECG-signal without using low frequency filters, limiting signals in the field of low frequency, blocking filters 50hz, with currents over 1nA and less 100nA, and in frequency interval 0- 100hz.

Contemporary electrocardiographic equipment, based on the most top quality high-resistant electrodes (nanoelectrodes), PC and software which will provide timely high quality express-diagnostics of heart-vascular system in on-line mode should be used in polyclinics.

The development of portative small-sized electrocardiographic equipment which will allow register true electric heart activity distortionlessly, estimate ST-segment drift as possible sign of ischemic changes of myocardium will allow improve quality of electrographic examination.

Medicine is a field, where product commercialization has its own specifity, is connected with high responsibility for patient's health and life.

Developments made by Higher Education Institutes are in demand and lead to decreasing buying expensive foreign equipment.

Role of science-research and innovation activity of Higher Education Institutes is great. Science-innovation potential of Higher Education Institutes is the most important element, providing development and production in university R&D, thus increasing competitive positions of Russia at world market.

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THE SOCIAL INFORMATION IN THE SOCIAL COMMUNICATION SYSTEM

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The defined and the specified presentations on the information are being formed in the social communication conceptions [1].

The environment, through which the communication is being conducted, is the communicative one. If, for example, the communication is being carried out by the electromagnetic waves (e.g. the radio waves), then they are made the environment in the defined and the specified space. The environmental air is such kind of the environment for the information transmission between the people by means of the articulated speech. When the environment is being served, only for the information transmission realization, then it, in the full measure, is being corresponded to the name of the communicative one. If the environment is being used not only for the transmission, but and for the information storage, then such environment, with the good reason, it is quite possible to be named the communicative one. The social memory material elements are being formed in such kind of the environment. Thus, this environment is being evolved, and the social memory material cells and the informational environment are being improved, and they are being perfected.

As A.V. Petrov [1] notes, the informational environment evolution has historically been passed in the space unification forms: if the branch points' quantity has been defined by the big cities and the metropolises geographical location for the flag telegraph, then the electrical telegraph has already multiplied the connection points' quantity. Subsequently, the telephony has been making up the «homogenous» space, including the cellular communications, which almost completely is being removed the subscriber's location challenge, having organized the necessary «information» access to the man in his house, in his apartment, at his work, in his car… in the quite various and the different places.

The whole physically realized network complexity is being acquired the one measurement, when the space structure significance is being disappeared (e.g. the special differences have already been leveled hardwarily, by means of the peculiar cells, or «the honeycombs»): the devices are being gotten more complex and sophisticated, which, in their turn, «are being leveled» the geological and the municipal relief.

So, and the human contact character is constantly being changed together with the information network formation. When the messenger carries the letter, he is being restricted in his own possibilities to be accelerated the message transfer by the horse power (e.g. the speed). So, the telephone has already been restricted, owing to the large quantity of the «operating» points at the early stage of its development. The connections inside the network are being depended on the telephone «young lady's» manual dexterity, but on the telephone talkers' comprehension – in the telephone contact sphere. As the information transmission must be left the functional one (e.g. the network, which is being passed the information, having left behind the telephone talkers' comprehension, is not carried out its main function), then the network development potential is being realized in its further internal improvement and the perfection. There are the main optimization resources, here, as the information transmission velocity, well as the contact quality. So, the technique is begun to be withdrawn the man from the intermediary events sphere. If the distance, at which the message is being passed, is the great one, but the quality must be excluded the natural noise,