

Unique device for personal diagnostics was created in Russia

SibFU scientists created system for continuous monitoring of heart, blood vessels, lungs and a number of other body systems. According to them, the matchbox-sized device, which has no analogues, allows visualising the condition of organs in detail. The results [are published](#) in the journal Biomedical Engineering.



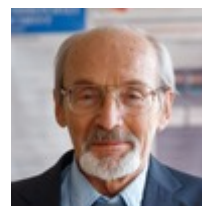
Scientists of Siberian Federal University have created a high-precision portable multifunctional device for continuous monitoring of the functional state of the body. Daily monitoring is a method of continuous monitoring of the heart and other organs using a portable recorder that the patient carries with them.

Such an analysis, according to experts, can be very useful both in the prevention and in the diagnosis and therapy of various cardiac and other pathologies, which today requires research in clinical settings and the work of highly qualified personnel. In addition, the analysis is limited due to the size and cost of the devices.

The device created at SibFU allows you to visualize in detail a number of key body systems without the help of X-rays and detect foci of pathologies in them. One of the priorities, but not the only application of the new system, is to prevent the consequences of COVID—19, the authors reported.

The new biotester, which can be produced from Russian—made components, has a relatively low cost and miniature dimensions - 7x50x70 mm. According to the creators, there are no similar systems in the world today.

"We supplemented the electrocardiosignals, which are typical for daily monitoring, reflecting the conductivity of the nervous system of the heart, with data from other sensors — a phonocardiogram reporting on the work of the muscular system of the heart, and recording lung noises, which allow us to study the bronchial system and the degree of lung damage," said **Gennady Aldonin**, professor of the Department of Instrumentation and Nanoelectronics at the School of Engineering Physics and Radioelectronics of SibFU.



During the diagnostic process, the user is not limited by anything, even an active sports load does not interfere with the operation of the device, the creators emphasized. To display monitoring data, the biotester communicates with a smartphone or computer using Bluetooth, WI-FI and cellular networks.

"To assess the state of the body's systems, we applied the method of wavelet transformations based on the analysis of the wavelet spectra of biosignals. It makes it possible to identify all branches of biosystems and "see" the conductive nervous system of the heart, the circulatory system from the heart to the vessels, bronchial and other biosystems, as well as defects in them," explained **Aldonin**.

A joint analysis of these parameters, according to scientists, also allows you to indirectly register blood pressure, changes in blood viscosity from sugar (in diabetes) and prothrombins in the blood and a number

of other characteristics of the body.

The research team has successfully completed the testing of prototypes and in the future intends to implement a non-invasive coronography system based on the proposed development, which will allow for the prompt diagnosis of early signs of ischemia and other heart diseases.

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