Radiophysicists study the properties of composites for 5G devices

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TSU radiophysicists are forming a database of properties of composite materials that can be used to create 5G and space communication devices operating in the terahertz range. The scientists are creating

composite materials from ABS plastic and nanotubes and measuring their properties in a frequency range from 10 MHz to 1 THz.

To create the source material, the radiophysicists are using polymers and filling them with carbon nanotubes, produced by the Boreskov Institute of Catalysis of the Siberian Branch of the Russian Academy of Sciences for the Terahertz Laboratory of the Faculty of Radiophysics.

"By adding nanotubes of different concentrations, we change the electrophysical properties of the material. For example, we can increase the dielectric constant. Then, a 3-D-printed circuit board with elements (conductors, resistors, and others) can be created," says Alexander Badyin, associate professor of the Faculty of Radiophysics. "From the material obtained on a 3-D printer, we print a control sample—plates or rings, depending on the standard of the measuring installation, and examine the properties of the composite in the terahertz range."

According to the researcher, scientists are mainly interested in household radiation up to 4-5 GHz. TSU scientists are working with a wider range—up to 1 THz, which is currently insufficiently studied. At the moment, they have studied the properties of 50 samples.

"We produce materials that are currently in demand in the creation of mobile devices, medicine, and the study of works of art," said Badyin. "It is here that the positive properties of the terahertz range are noted. The terahertz range provides the transition to the 5G standard, and is promising for communications in space. But today, there are no technical means due to a lack of materials that cannot be manufactured without the use of 3-D technology."

In the Terahertz Laboratory of the Faculty of Radiophysics, there are tools and techniques for manufacturing composite filaments based on original materials developed by the university staff. The scientists made

passive elements of the terahertz range (absorbers and polarizers), which were tested experimentally on the equipment of the TSU Measurement Center and were tested at international conferences in Nagoya (Japan), Paris (France), and Moscow and Tambov (Russia).

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