

2.10. MAIN DIRECTIONS IN THE STUDY AND DESIGN OF TERAHERTZ-BAND HARDWARE

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The use of short-wavelength electromagnetic radiation in the systems for radio detection of hidden terroristic devices allows one to proportionally reduce the size of a system while keeping the same resolution. However, a practically feasible frequency range is now the range from 100 to 150 GHz. This is the operation bandwidth of compact Gunn diodes. The energy potential in active radio vision systems is 50 – 60 dB. In passive radio vision systems, available direct amplifiers allow one to design receivers with a gain of up to 50 dB and frequencies of up to 100 GHz.

A serious obstacle to the development of active and passive radio vision systems to shorter wavelengths is caused by the absence of high efficiency receiver arrays. We have developed a quasioptical active arrays operating at wavelengths of 3 mm that allowed us to detect various linear objects (including dielectric objects) hidden behind an obstacle. However, this array consists of rather large elements (20 mm). Therefore, the discreteness in the image of an object is large. Nevertheless, these arrays do not provide the limit accuracy.

When choosing tactical problems that can be solved in the terahertz band, one should bear in mind that the penetrability of radiation strongly depends on the humidity of the screening wealls. For example, 100-GHz radiation is damped by a 1-mm layer of water by a factor of 7,000, whereas, 150-GHz radiation, by a factor of greater than 10,000. However, most building materials and cloth have a rather small decay factor. Moreover, investigations in this field are not systematic, which does not give reliable information in each specific case.

It is important that the system should combine the advantages of terahertz-band radio vision with computer programs. In the case of large databases, this factor allows one to limit information flow and save manpower for operating the system.

We have considered conditions under which terahertz-band radiation can be used in radio vision systems. It is necessary do design hardware in this band and a methodical basis for systematic investigation of materials. It is necessary to develop efficient receiver arrays based on modern technological facilities. It is necessary to develop or upgrade available software necessary for computer-aided systems.