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Title:Quasi-optical and waveguide components for UH, EH and THz frequencies based on film slides
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Abstract:In the paper, the properties of mesh polarisers and plates with micro-miniature holes providing the coupling region in the waveguide directional couplers are investigated. The basis of realisation methods of mesh polarisers and plates for directional couplers on the polyimide films and thin metallic slides is the use of the technology of chemical-dynamic (aerosol) etching. The intensive development of the technique over UH (ultrahigh), EH (extremely high), and THz frequency ranges is connected with the progress in the field of creation of a component base for these frequency bands, as well as the equipment on their basis. However, the processes of manufacturing and industrial production of such components remain complex and labour-consuming, and due to this fact their costs remain extremely high (e.g., mesh polarisers of Microtech Instr., USA). At present, in Russia, such components as mesh polarisers, polarisable attenuators, filters and others devices for above bands are not produced. Enterprises or organisations are obliged to manufacture these devices themselves for their purposes, often without the necessary technical documentation and quality certificates. And the applying technology does not allow one to produce qualitative devices with the sufficient degree of reproducing their characteristics and quantity capability. As a rule, the following methods of forming the holes are used for production of the direction coupler plates with coupling holes: direct mechanical drilling of holes in plates using micro-drills; by means of electric-spark milling; by use of the technology of electric metal deposition on masks. In this connection, the problem was formulated: to develop the technology that allows one not only to manufacture quasi-optical components with the prescribe characteristics, but to produce them in quantity with the accessible prices. Besides, the developed technology must provide the creation of other components of quasi-optical and waveguide channels, such as band filters, high-pass and low-pass filters, Notch-filters and others. The samples of mesh polarisers and plates with coupling holes for directional couplers were manufactured. Typical transmission level value of mesh polarisers in parallel and perpendicular directions according to a polarisation plate of an electric field strength vector of THz-radiation is less than -30 dB and -0.2-0.3 dB, respectively. The mesh wire thickness is 18 microns at the mesh spading equal to 50-110 microns. The plates with coupling holes of

0.212 mm to 0.369 mm intended for waveguide directional couplers of the channel dimensions 1.2×0.55 mm are manufactured and investigated. A chemical-dynamic etching method provides more efficient technology of quantity-(lot-) production of the above devices. The developed technology can be applied for creation of components for EH, UH, and THz frequencies such as band filters, high-pass and low-pass filters, directional couplers and other devices.

Number of references:4
Inspec controlled terms:aerosols - etching - high-pass filters - low-pass filters - masks - milling - notch filters - optical directional couplers - optical waveguide filters - plates (structures) - polymer films
Uncontrolled terms:quasioptical components - waveguide components - ultrahigh frequency - extremely high frequency - terahertz frequency - film slides - mesh polarisers - microminiature holes - waveguide directional couplers - polyimide films - thin metallic slides - chemical-dynamic etching - aerosol - manufacturing process - industrial production - Microtech Instr., USA - Russia - direction coupler plates - coupling holes - direct mechanical drilling - microdrills - electric-spark milling - electric metal deposition - masks - high-pass filters - low-pass filters - notch filters - electric field strength vector - size 18 micron
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