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WAYS TO IMPROVE THE OPERATING CHARACTERISTICS OF RADAR SYSTEMS

Radar systems to air-cover critical and military infrastructure are used widely in the world armies. The main systems are mobile radar stations (radars). For most radars, the maximum target detection range with an effective scattering area of 3…5 m^2 (for example fighter) does not exceed 200…250 km, taking into account the target speed of 0.8…1.8 Mach. Sometimes, it does not provide enough time to be hit by air defenses.

The radar range is affected by several factors. First, it is the power of the electromagnetic wave transmitter. Assuming that all factors (other than transmitter power) are constant, then it is possible to determine from the radar equation [1] that to increase the radar distance by 20% it is necessary to double the transmitter power. Now this is virtually impossible for mobile radars due to the lack of high-power transmitters that are small in size and consume little electricity.

Another factor that also affects the output power is the losses in the waveguide path, which can reach up to 1 dB per transmission and up to 3 dB per reception [2]. Thus, when the loss increases from 0.5 dB to 1 dB, the power on the transmitter decreases from 12% to 26% [3]. Power losses in the waveguide path are caused by the presence of high surface roughness of the channel and surface defects. These shortcomings must be eliminated by finishing, but they may exceed the permissible values due to the presence of hard-to-reach places in the channel of the waveguides and the use of imperfect processing methods.

The main way to reduce losses in the waveguide path is to reduce the surface roughness of the channel with the finishing. The use of modern methods of processing hard-to-reach places in the channel of waveguides by polishing with polymer-abrasive brush tools (PABT) allows to ensure the required surface quality and properties of the surface layer of the channel [4]. Finishing with these tools allows you to reduce costs, solve the problem of production automation and it is practically feasible.

It was found [5] that the values of the attenuation coefficient were 1.3...2.7 times lower when processing with PABT due to the high quality of the surface compared to other types of tools. Also, the processing with PABT provides minimal additional local hardening and optimal electrical parameters of the surface layer of the waveguide walls.

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