CORRECTION OF TARGET DATA TAKING INTO CONSIDERATION THE TROPOSPHERE REFRACTIVITY

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1. INTRODUCTION

The value of relative dielectric permeability of troposphere is slightly larger than one [1, 2] but it changes in time and space essentially influences propagation of microwaves. Therefore there is a necessity to account a tropospheric refraction for scientific and applied tasks. The suggested method is based on homodyne method measurement of phase progression fluctuations in microwave line-of-sight links. Microwave propagation on line-of-sight links has been a subject of many investigations. There are many papers dealt with that problem and there are many methods of theoretical and experimental investigations of microwave propagation processes. The most advantageous is homodyne method, which is described in some papers [3-5]. The main advantage of these investigations is the carrying out of phase progression measurements on microwave line-of-sight links. Such approach let us investigate "thin structure" of electromagnetic field and expand our knowledge about mechanisms of microwave propagation.

2. MAIN PART

It is well known that the atmospheric refraction can result to significant errors at determination of the target position for distance-angle method measuring. For example at the superrefraction the target that located at the distance too much than designed distance margin of radar station can be detected. Usually the atmospheric refraction takes into account by indirect method by means of atmosphere's physical parameters such as pressure, temperature, humidity. The direct investigation of radio-wave propagation mechanism is a great interest.

Presented paper is devoted to analytical method of position data target correction for radar systems. This method is based on investigation of the phase progression measurements on microwave line-of-sight links. The initial data for the task is the length of a measuring link, working wave length, and phase progression in the channel. From these data we determine a parameter of refraction and its gradient. Thus it is estimated the influences of troposphere on propagation of microwaves.

The results of analytical computations of distance and angel errors, that caused by the atmospheric refraction are given in the paper. The algorithm for correction of target coordinate measuring is suggested. The block diagram of measuring device is presented in the paper. Mathematical modeling is made with a length of a measuring link equal 1 km, distance up to the target of 300 km and a gradient of a parameter of refraction $-30\cdot10^{-5}\,\mathrm{km}^{-1}$. In a result the value of radar system errors are obtained: on an elevation bearing 2.579 degree and on distance 944 meters. Settlement values of these errors are accordingly equal: 2.587 and 948 meters. Thus, the discussed method allows us to take into account the influence of troposphere on the propagation of microwaves with high accuracy.

3. CONCLUSION

The suggested method allows us to investigate experimentally the mechanisms of microwave propagation on the on line-of-sight links that is very important for scientific and applied problems. One of probable areas of this research application is the estimation radar system errors caused by troposphere influence. For more accurate accounting of troposphere influence in real-life environment it is necessary to carry out the phase progression measurements at two heights.

4. REFERENCES

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