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Use of Global Navigation Satellite Systems Radiation for Solving of Radar Problems[1]

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Abstract—The possibility of using radiation of global navigation satellite systems (GNSS) for the detection of air targets is discussed. Relations for evaluation the detection range are obtained. The requirements for the degree of suppression of the direct signal lights are suggested. The requirements for receiving systems located on the low Earth orbit satellites to overcome the challenges of the global radar are proposed. The range of target detection when simplify signals of backlight pseudolites are used, is received. A bistatic radar system with the backlight pseudolites is presented.

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1. INTRODUCTION

The first idea of using an active-passive radar can be connected to the 50th years of the last century. Recently, interest in active-passive multiposition radar was increased. This is due to the greater persistence of these radars and stealth work.

The theory for constructing active-passive radar was developed. Tests of such radars were performed and many important components of multiposition radars were introduced [1, 2]. Ways to create active-passive systems using radiation of existing broadcasting stations [3], television centers or mobile communication systems [4, 5] had identified.

In [1, 2, 5] the aspects of building a spatially coherent bistatic radar applying quasi noise-like signals for "backlight" zones radiation detection of air targets are shown. The possible variants of the channel for passive bistatic radar systems in the form of angle-angle measuring (triangulation) and azimuth-rangedifference (hyperbolic) were analyzed. Such principles of multi-position systems are used in direction finding jammers [1, 2].

Angular-rangefinder systems and angular-sum-rangefinder systems are used for constructing of multi-position systems when one of the items is equipped by noise-like signal transmitter. In active-passive systems a backlight goal from the transmitting point and coordinate measuring in receiving and transmitting points [2, 5] is used. The variant of backlight target by a signal from external transmitter and using of secondary scattered field to detect and target coordinates is possible [2]. Detection of backlight target is carried out at reception points, usually with the amplitude characteristics.

Detection the signals of object by frequency characteristics (Doppler effect) is possible as well. Signals of broadcast HF stations are used for backlight in this case [6, 7]. The detection based on bearing fluctuations when a target overlaps the area essential for distribution is discussed in [8].

In this paper we consider the possibility of air object detection based on information of pseudoranges using a backlight. GNSS signals (GPS and GLONASS) are external source creating a backlight.

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