GNSS-Based Passive Bistatic Radar for Micro-Doppler Analysis of Helicopter Rotor Blades

Carmine Clemente and John J. Soraghan

Abstract

(GNSS) has recently initiated a number of studies that aim to exploit this system as an illuminator of opportunity for a passive radar system. A passive bistatic radar (PBR) configuration using a GNSS as illuminator in near forward scattering zone for micro-Doppler analysis is proposed. It is known that the received signal power is the main issue for this kind of passive radar. It is demonstrated that the enhancement achievable in received signal power strength when operating in a forward scattering mode can cope with this issue. The analysis focuses on the case of helicopters rotor blades where the Doppler shift is very high and a relatively large wavelength is useful in reducing the maximum Doppler shift. The power budget analysis for this kind of configuration and target is presented. This work demonstrates the possibility of detecting these kinds of targets and to measure their micro-Doppler signatures. The theoretical analysis is supported with simulations that demonstrate the effectiveness of the proposed configuration for micro-Doppler signature analysis for helicopter rotor blades.