

Foreign object detection based on circular bistatic synthetic aperture radar

ABSTRACT

Synthetic Aperture Radar is well known for producing a radar image of the ground, so it can be used for detecting on-the-ground object which is interesting for some applications. A possible application can be Foreign Object Detection (FOD), which is an important issue in aviation safety. A ground-based Circular Bistatic Synthetic Aperture Radar (Circular-BiSAR) is introduced in this paper. The circular movement makes it more practical while the bistatic configuration offers some advantages. Wideband Linear Frequency Modulated (LFM) chirp pulses are employed here, for transmission and reception of reflection pulses to and from the under test object. A simulated model is developed for the system which analyzes the transmitting, receiving, Doppler and LFM signals by considering the distances and movement of antennas. A prototype system is launched, and some experiments are done to detect and localize various objects based on their reflection properties of microwaves. A processing algorithm is proposed in this paper to confirm the detection. The results show that the proposed system can detect and localize on-the ground objects with as small a dimension as 2 cm height and 2 cm diameter located several metres away.

Keyword: Radar; Synthetic Aperture Radar (SAR); Bistatic