

**RADIO SCIENCE
FOR HUMANITY**

Micro-Doppler Signature of Rotating Targets in SAR-GMTI System Using the CSI Technique

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Abstract

Synthetic Aperture Radar and Ground Moving Target Indicator (SAR-GMTI) technologies provide strategical, technical and economic advantages in radar imaging, especially in the moving target detection and imagery. Micro-motion of objects in an illuminated scene introduce complex micro-Doppler effects in the received radar echoes. Combining the advantages introduced by SAR-GMTI technologies and the usefulness of the micro-Doppler signature characterization will provide a powerful tool for remote sensing applications such as target recognition and classification. In this paper, a rotating micro-Doppler signature for a SAR-GMTI system using the tri-antenna Clutter Suppression Interferometry (CSI) technology is analysed and compared to the signature obtained before the CSI processing. After establishing the geometry scene and the signal model, we theoretically analyze the residual energies of the rotating target echo after CSI and investigate the relationship between the residual energies and the rotation motion parameters in detail. The micro-Doppler effect is derived for a rotating target in the SAR-GMTI system and the derived model is useful for micro-Doppler classification of rotating targets, such as ground-based mechanical antennas, helicopter rotors and windmills. Simulations for 10GHz are given and the experiment results confirm the derived model.