

INVESTIGATION OF HOPPED FREQUENCY WAVEFORMS FOR RANGE AND VELOCITY MEASUREMENTS OF RADAR TARGETS

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Abstract

In the field of radar, High Range Resolution (HRR) profiles are often used to improve target tracking accuracy in range and to allow the radar system to produce an image of an object using techniques such as inverse synthetic aperture radar (ISAR) processing. These profiles are typically formed from wideband linearly stepped frequency waveforms which are synthesised by combining the spectra of the transmitted pulses in the burst [1]. This work focuses on the use of HRR profiles generated from hopped frequency waveforms. This adds the advantage of range-Doppler decoupling and robustness against electronic countermeasures (ECM) [2], [3]. However hopped frequency waveforms suffer from high levels of sidelobes [4]. Improving the spurious free dynamic range (SFDR) of target measurements is required for various applications such as target recognition. This was done with the CLEAN technique [5] which could reduce the sidelobes to under 40 dB below the maximum amplitude of the profiles. To show how this work can be applied to areas such as ISAR, simulated rotating targets were used. In terms of range and velocity measurement accuracy, the CLEAN method performed adequately for signal to noise ratios (SNR) above -10 dB. This work can be extended to incorporate acceleration, extended targets and measured data.