ABSTRACT

The National Telecommunications and Information Administration (NTIA) in the Department of Commerce undertook a detailed program to investigate the signal processing properties of the primary radars in the 2.7 to 2.9 GHz band, and the Automated Radar Terminal System (ARTS-IIIA) post processor planned for use by the Federal Aviation Administration on the Airport Surveillance Radars (ASRs). This investigation was the second investigation in a series of tasks undertaken by NTIA as part of a spectrum resource assessment of the 2.7 to 2.9 GHz band. The overall objective of the spectrum resource assessment was to assess the degree of congestion in the band in designated areas in the United States, and to promote more effective utilization of the band.

The investigation into the signal processing properties of the primary radars and ARTS-IIIA included the transfer properties of noise, desired signal, and asynchronous interference along with a detailed parametric analysis of the trade-offs to the desired signal performance in suppressing asynchronous interference. As a result of the investigation, it was concluded that all radars in the 2.7 to 2.9 GHz band have a very low duty cycle (less than 0.2%) thus permitting the use of signal processing techniques in the radars and post processors for suppression of interference to obtain more efficient utilization of the 2.7 to 2.9 GHz band. The use of integrators (enhancers) and other digital signal processing techniques along with the trend of displaying synthetic video on the Plan Position Indicator (PPI) display provides the capability of suppressing asynchronous interference, while also permitting the enhancement of weak desired targets that are below the radar receiver system noise level. Also, with properly designed signal processing techniques, the trade-offs in suppressing the asynchronous interference (target azimuth shift, angular resolution, and desired signal sensititity) in low duty cycle radars are minimal.

In summary, some spectrum conservation techniques can be used by the radiodetermination services in the 2.7 to 2.9 GHz band to obtain more efficient utilization of the spectrum. Also, the current hardware in the later model primary radars and the ARTS-IIIA will suppress asynchronous interference with trade-offs to the desired signal performance.

KEY WORDS

Primary Radar
ARTS-IIIA
Interference Suppression
Signal Processing
Simulation