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Detection and Countermeasures » Active & Passive Radar Detection & Equipment

Chaff Theoretical/Analytical Characterization and Validation Program

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Abstract: This report describes the modeling of radar returns from **chaff**. The dipoles are allowed to follow helical paths as they fall, and the signal scintillation characteristics of the entire **chaff** cloud are assumed to be the same as those of a small collection of up to 1000 dipoles. The dipole motion model is based upon the solution of the aerodynamic force equations over small time intervals. The scintillation signal is normalized with respect to the contribution of a single dipole. The mean amplitude of the return from the entire cloud is computed assuming a bivariate Gaussian distribution for the dipole number density in a plane transverse to the axis of a plume of **chaff**. The computation of the amplitude requires a numerical integration of the product of the radar antenna radiation pattern and the dipole density in a spherical shell centered on the radar. When this is done for several concentric shells, the range dependence of the return can be displayed. The antenna need not be pointed at the cloud. Unfortunately, the numerical integration consumes large blocks of CPU time and the program was used to study a limited sample of test dipoles. The bandwidth of the signal received from collections of 16 to 1024 dipoles was less than 150 Hz and was essentially independent of the number of dipoles.

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