1037-42-156 **Matthew Fickus*** (Matthew.Fickus@afit.edu), AFIT/ENC, Bldg 641, Rm 302, 2950 Hobson Way, WPAFB, OH 45433. *A frame-theoretic analysis of continuous wave radar.*

A simple, continuous wave radar emits an electromagnetic wave of constant frequency. After bouncing off of objects in the environment, part of this wave's energy is collected at a receiver. Moving objects, in particular, induce a Doppler shift in the received wave which is proportional to the rate of change of the total distance between transmitter, object and receiver. We discuss two frame-theoretic problems that arise in the analysis of such radar systems. First, we discuss a new technique for determining Doppler shifts in the wave; we show how centroids along vertical strips of the spectrogram may be quickly computed using Toeplitz matrices and the fast Fourier transform. Second, we show how to exploit these Doppler shifts in order to determine an object's position and velocity; we show that such an analysis necessitates the use of multiple transmitter-receiver pairs, which leads to a parametrized manifold of frame operators. The determination of an object's position and velocity is shown to be equivalent to finding an optimal frame from this collection, and we present a Newton's method-based algorithm for accomplishing this task. (Received January 31, 2008)