

Non-uniform motion and the Doppler effect

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The non-uniform motion Doppler effect in radar occurs when an object being tracked by a radar is undergoing any type of motion that is other than constant speed. Examples include: accelerations, jerk motion, exponential slowdown, and periodic motion such as rotation, vibration, or what is now termed micro-Doppler. I review a physics model based on a perfectly reflecting mirror which captures the essential features of the physics of non-uniform laws of motion. Then, we discuss the frequency spectrum of these types of motion as well as raise some questions for signal analysis for this type of physics. Finally, we pose some interesting questions that might be of interest to mathematicians concerning direct and inverse problems associated with observing non-uniform motion data.