

## **Enhanced Line of Sight Velocity Analysis Using an Aperiodic Pulse Sequence on the Kodiak and King Salmon Radars.**

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A previously developed 16 pulse sequence was recently tested on both the Kodiak and King Salmon radars. The resulting autocorrelation function (ACF) for this pulse sequence consists of 121 unique, aperiodically spaced lags. The large number of unique lags makes it possible to use aperiodic spectral analysis techniques, such as the Lomb periodogram, to construct an ACF spectrum. Using such a technique, ionospheric backscatter line of sight velocities can be extracted from ranges known to be contaminated by strong ground scatter. The currently implemented FITACF algorithm makes a strict assumption concerning the existence of a single dominant frequency component in the ACF. Thus, the FITACF algorithm is not reliable when multiple strong velocity components are present in the scattering volume, nor can it discern ionospheric backscatter when strong backscatter is dominant. This talk will focus on a comparison of the line of sight analysis of the aperiodic 16 pulse sequence using both the traditional FITACF algorithm as well as aperiodic spectral analysis techniques. The analysis of several examples of multiple velocity component situations will be presented. It will be argued that the 16 pulse sequence can be used in place of the traditional 8 pulse sequence without significantly disrupting the existing FITACF line of sight velocity data products. Furthermore, the 16 pulse sequence raw samples or rawacf information can be processed off-line to identify occurrences of multi-mode backscatter to supplement FITACF fitted velocity data.