# WAVEFORM CONSIDERATIONS FOR DUAL-POLARIZATION DOPPLER WEATHER RADAR WITH SOLID-STATE TRANSMITTERS

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The fundamental limitation with a pulsed Doppler radar is the coupling of maximum unambiguous range and maximum unambiguous velocity. This coupling between range and velocity is governed by the operating wavelength. Figure 1 shows the range ambiguity for different operating frequencies. It can be observed that the range velocity ambiguity is very severe at higher frequencies such as X-band and Ku-band. Even though the operating range of short range radars at X-band is around 30 km, there will be overlaid echoes that will contaminate the measurements. Apart from overlaid echoes and velocity folding, the radar signal will be contaminated by strong clutter. The ability to mitigate clutter will be governed by the dwell time and the waveform used. The above-mentioned challenges need to be mitigated along with the need to improve sensitivity due to low-power solid-state transmitters. The improvement in sensitivity is achieved by using pulse compression waveforms. However, pulse compression waveforms have drawbacks of blind zone and range side lobes. An X-band radar system with solid-state transmitter is capable of a waveform system to resolve the blind zone issue. These waveforms need to be considered in conjunction with the ability to resolve ambiguities and adequately suppress clutter. In this paper, we present preliminary designs to address the major challenges in designing the waveforms for a X-band dual polarization Doppler radar operating with a solid-state transmitter. The performance of the proposed system is also quantified using signal and system simulations.

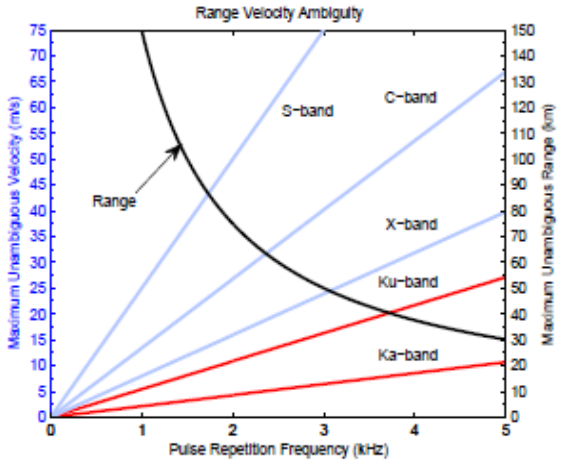


**Figure 1: The relation between maximum unambiguous range and maximum unambiguous velocity for different operating frequencies.**