BISTATIC RADAR SYSTEM DESIGN FOR CLEAR-AIR WIND MEASUREMENTS

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Bistatic radar systems for measurement of clear-air winds are considered. The proposed systems exploit bistatic Bragg scattering from refractive index turbulence which is visible to short wavelength radars (e.g. C-band and higher frequencies) for particular scattering geometries. These systems might be designed with continuous-wave (CW) radars or with pulsed radars. We first look into the theory, and study the signal-to-noise ratio (SNR) for bistatic radar systems. Then, the differences between monostatic- and bistatic radar SNR as well as the differences between CW and pulsed bistatic radar systems are pointed out. We consider both beam-limited resolution volume and pulsed-limited volume for these systems. We compare the relative influences of Bragg scattering and Rayleigh scattering from particulate tracers on the bistatic radar reflectivity, along with their influences on retrieved wind estimates. The system design constraints are considered. We show that there are limitations on the forward scatter angle, hence on the system design caused by measurement uncertainty and Bragg scattering mechanism. There are also limitations on the sampling time in turn sampling rate and bandwidth of the receiver as a result of measurement errors. We then design bistatic radar systems to sense high Cn2 (refractive index structure parameter, e.g. 1016 m2/3) quantities and show that, systems with relatively low power (e.g. hundreds of watts) are feasible where atmospheric turbulence occurs. Also, we demonstrate that we need to dwell at different times at different places to have small measurement errors for all the places scanned by the radars. Finally, we compare systems with different operating frequencies.

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2. F - Wave Propagation and Remote Sensing
3. (a)
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