

## **Transverse Doppler Effect using engineered optical beams.**

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### **ABSTRACT**

When a light beam with a transverse spatially-varying phase is considered for optical remote sensing, in addition to the usual longitudinal Doppler frequency shift of the returned signal induced by the motion of the scatter along the beam axis, a new transversal Doppler shift appears which is due to the motion of the scatterer in the plane perpendicular to the beam axis. With engineered light, light scattered by a particle at a particular location is associated with a specific value of the phase of the incident field at that point. As the particle move across the beam, it produces an echo that is dependent on the phase of the incident field. By noting the change of the phase of the echo (Doppler Effect), the movement can be measured. We discuss here how this new effect can be used to enhance the current capabilities of optical remote sensing systems, adding the capacity to detect more complex movements of scatters.