This study investigated the measurement of turbulent burning velocities of a highly turbulent compressible standing flame induced by shock-driven turbulence in a Turbulent Shock Tube. High-speed schlieren, chemiluminescence, PIV, and dynamic pressure measurements are made to quantify flame turbulence interaction for high levels of turbulence at elevated temperatures and pressure.

Distributions of turbulent velocities, vorticity and turbulent strain are provided for regions ahead and behind the standing flame. The turbulent flame speed is directly measured for the high-Mach standing turbulent flame. From measurements of the flame turbulent speed and turbulent Mach number, transition into a non-linear compressibility regime at turbulent Mach numbers above 0.4 is confirmed, and a possible mechanism for flame generated turbulence and deflagration-to-detonation transition is established.

Future work will further investigate the local ignition and higher speed regimes of non-linear compressibility leading to the onset of the deflagration-to-detonation transition.

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The public is welcome to attend.