Boundary-layer stability measurements are conducted on a flared cone in the Mach 6 Quiet Tunnel. The measurements of freestream disturbance levels with high-frequency pressure gauges are discussed and the origins of the Mack’s second-mode wave is described. Hotwire measurements (up to 300 kHz) are used to measure profiles of the basic state and the second-mode waves within a 2 mm boundary layer. The results are compared with computations of Linear Stability Theory (LST) and the Parabolized Stability Equations (PSE) with excellent agreement. A specially-developed focused schlieren (up to 1.2 MHz) with bi-spectral analyses are used to identify the nonlinear higher harmonics that lead to a possible Klebanoff-type breakdown as demonstrated by nonlinear PSE and DNS. Thus, the fundamental breakdown of hypersonic boundary layers may be similar to that of low-speed boundary layers. Efforts to verify this experimentally are underway.

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