Shock Waves

D 5 Ion Thermalization in Strong, High-Beta Shocks.* D. L. MORSE, P. L. AUER, and W. W. DESTLER, Laboratory of Plasma Studies, Cornell University, Ithaca, N.Y.--Strong, high-beta collisionless shocks are generated by the interaction of a flowing plasma with a magnetic obstacle in a plasma wind tunnel device. The shock waves thus formed are grossly stationary in the laboratory reference frame, and simulate in many respects the earth's bow shock. The upstream plasma flow is characterized by beta $\simeq$ 3 and magnetosonic Mach number M $\simeq$ 7, and the duration of the experiment is greater than one-half millisecond, or 10 ion gyro-periods. The shock waves are observed to be nonstationary on a time scale comparable with the upstream ion gyro-period. The electrons are heated only moderately, and the bulk of the upstream flow energy appears as thermal energy of the ions. In this paper we report measurements of the ion energy distribution function as the shock wave is traversed, and space-resolved density measurements of the shock transition using guided microwaves. The results will be discussed in the context of current theories of particle thermalization in the bow shock.

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