PIV Measurement of Shock Wave Diffraction

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Keywords: PIV processing, Shock wave diffraction, Supersonic flow

PIV and numerical simulation are used to investigate one of the open questions of the classic gas dynamic problem of shock diffraction, namely to determine whether in this flow field the fluid can locally be decelerated from supersonic to subsonic flow without the usually observed shock wave discontinuity. While theoretically possible, such an isentropic deceleration is difficult to observe in experiments and has so far only been detected through numerical simulations. The current PIV measurements yield local flow velocities that are within ± 5 m/s identical to the values predicted by numerical simulation. The results can be seen as experimental proof of the numerical predictions of the flow field, similar to an earlier found excellent agreement between experimentally and numerically obtained density distributions. Based on the current measurements, the previously stipulated existence of supersonic “pockets” of flow, embedded without discontinuities in a subsonic flow field, is close to be confirmed.