Interaction of a shock wave with a high-speed vortex ring

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This is a detailed experimental study of the behavior of diffraction and refraction of a shock front resulting from the interaction of a shock wave and a vortex ring. A spherical shock wave impinges on a vortex ring which is traveling at a high speed in the opposite direction. The configuration of the wave front is visualized by a shadowgraph technique using a pulse dye laser. The shock front is influenced by the non-uniform flow induced by the vortex and diffracted around the vortex core. The shock front passing through the inside of the ring is decelerated by the counter-flow, and the density behind it increases. The diffracted front over the vortex ring expands spirally around the core and intersects the front passing through the inside of the ring. The intersecting circular curve converges toward the central axis of the ring. The diffracted shock in the inner part of the core forms branching waves. The branching points also focus on the central axis of the ring.

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