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Chaotic Escape of Rays from a Vase-shaped Billiard: Simulations and Experiment[1] JAISON NOVICK, College of William and Mary, MATTHEW LEN KEELER, University of Minnesota, Morris, JOHN DELOS, College of William and Mary — We study the escape of rays from a two dimensional, specularly-reflecting open vase-shaped cavity. The narrowest point of the vase's neck defines a dividing surface between rays that escape without return and those turned back into the cavity. Our simulations show that a point burst of rays emitted in all directions can contain both regular and chaotic scattering trajectories. The chaotic trajectories leak out in an infinitely long pulse train organized by a fractal. For escaping trajectories, we record the propagation time to escape and find that the fractal manifests itself in the escape time versus the launch angle. We have experimentally verified the early fractal structure. A two dimensional aluminum vase with reflective Teflon walls was constructed with an ultrasound transmitter as the point source. A microphone was placed at points along the vase's mouth. We find good agreement between measurements and classical simulations.

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