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Experimental determination of the wavelength of the instability developing over the gas-vacuum interface of a supersonic annular flow TAL QUELLER, EYAL KROUPP, DAVID NAIMARK, YITZHAK MARON, Faculty of Physics, Weizmann Institute of Science — In the present experimental work the instability wavelength of the boundary between a supersonic annular gas puff flow, and the ambient vacuum was measured using two-dimensional interferometry. An annular De-Laval nozzle connected to a fast valve was used in order to create the supersonic flow. The interference pattern of the laser beam traversing the boundary was projected onto a large format CCD, resulting in a high spatial resolution (30 um). An ultra-fast mechanical shutter enabled the rapid exposure of the beam, resulting in a high temporal resolution (3 us). These resolutions were necessary in order to enable the observation of the quasi-periodic structure of the boundary. The fact that this structure was not observable when using lower resolutions, enables us to set an upper limit on the wavelength of the instability in the flow edge and a lower limit on the time scale in which this instability wavelength travels. The knowledge of these gas-puff flow parameters can be used for setting more realistically the initial boundary conditions in computer simulations that attempt to study, e.g., the implosion of a plasma cylinder and other processes developing around a gas-vacuum interface of a supersonic flow.

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