

Abstract Submitted
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Whistling Bubbles: All-fluidic linear frequency sweep generators¹

MANU PRAKASH, Harvard Society of Fellows, MATTHIAS KLAUSER, Massachusetts Institute of Technology — Complex biochemical systems are often composed of networks of interacting elements with spatial and temporal dynamics. Unlike ever so prevalent electronic debugging tools, automated tools to chemically probe these systems are in their infancy. Here we demonstrate one such novel tool - an all-fluidic frequency sweep generator capable of linear and exponential sweeps from a few Hz to KHz response. This is accomplished by coupling a flow-focusing geometry driven by negative pressure (-FF), a non-linear resistor and retraction dynamics of fluid threads in micro-channels. The device exhibits various modes including accordions and bursts with negative ramps to generate the desired sweep. The sweep parameters including f_{min} , f_{max} and T_{off} can be programmed by knobs including the hydrostatic pressure at inlet geometries. Our work highlights the importance of exploiting dynamics of drops and bubbles in fluidic networks to engineer desired function.

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