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Microfluidic droplets and electric fields PATRICK TABELING, CNRS, LAURE MENETRIER, ESPCI, ALICE MCDONALD, MIT, HERVE WILLAIME, CNRS, DAN ANGELESCU, Schlumberger — Manipulating droplets through mazes of microchannels is a challenge faced by digital microfluidics (i.e microfluidics based on droplets). In this domain, using electric fields is an option. This option is justified by the fact that producing large electric fields in miniaturized systems is feasible, and dielectric contrasts between dispersed and continuous phases are typically large. Examples of devices reported in the literature are droplet guides, droplet mergers. In the present paper, we extend this approach by reporting two novel examples of droplet manipulations that exploit the action on an electric field in a microfluidic system: one is the control of droplet emission frequencies and the other is the inhibition of droplet breakup. Throughout the work, we analyze in some detail the various aspects of the action of the electric field. The experiments are performed in PDMS microfluidic systems using hexadecane and water for the continuous and dispersed phases respectively.

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