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Nanometer-resolved collective micromenisci oscillations through optical diffraction HELMUT RATHGEN, Physics of Complex Fluids, University of Twente, The Netherlands., KAZUYASU SUGIYAMA, DETLEF LOHSE, Physics of Fluids, University of Twente, The Netherlands., FRIEDER MUGELE, Physics of Complex Fluids, University of Twente, The Netherlands. — We study the dynamics of periodic arrays of micrometer-sized liquid-gas menisci formed at superhydrophobic surfaces immersed into water. By measuring the intensity of optical diffraction peaks in real time we are able to resolve nanometer scale oscillations of the menisci with sub-microsecond time resolution. Upon driving the system with an ultrasound field at variable frequency we observe a pronounced resonance at a few hundred kHz, depending on the exact geometry. Modeling the system using the time-dependent Stokes equation, we find that this unexpectedly low resonance frequency is caused by a collective mode of the acoustically coupled oscillating menisci.

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