LA 27E RENCONTRE DU NON LINÉAIRE (18-20 MARS 2024)

Experimental test of the static bell's inequality in a hydrodynamic system

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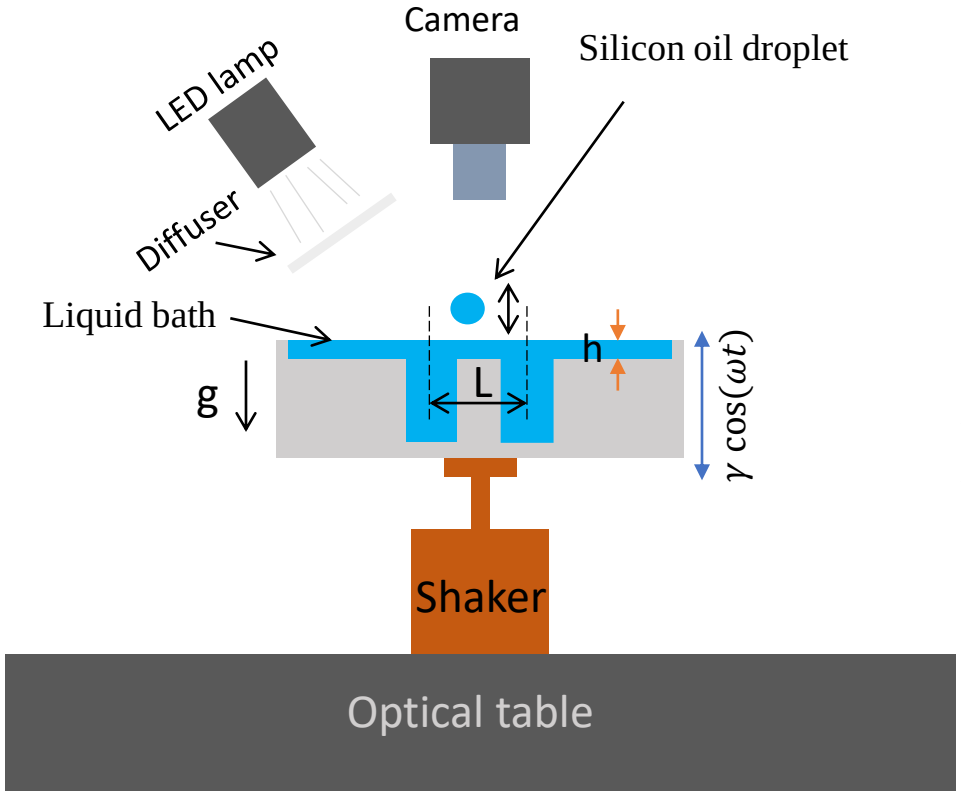
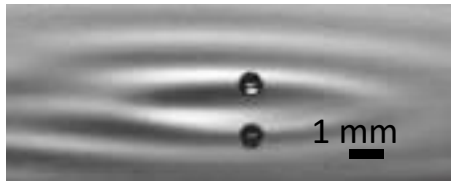
Experimental setup



Bouncing of droplet



Courtesy: A. Eddi

Memory $\mathrm{Me} = \dfrac{1}{1-\dfrac{\gamma}{\gamma_f}}$

$\gamma \longrightarrow$ Driving acceleration

$\gamma_f \longrightarrow$ Faraday thresold acceleration

Walking of the droplet

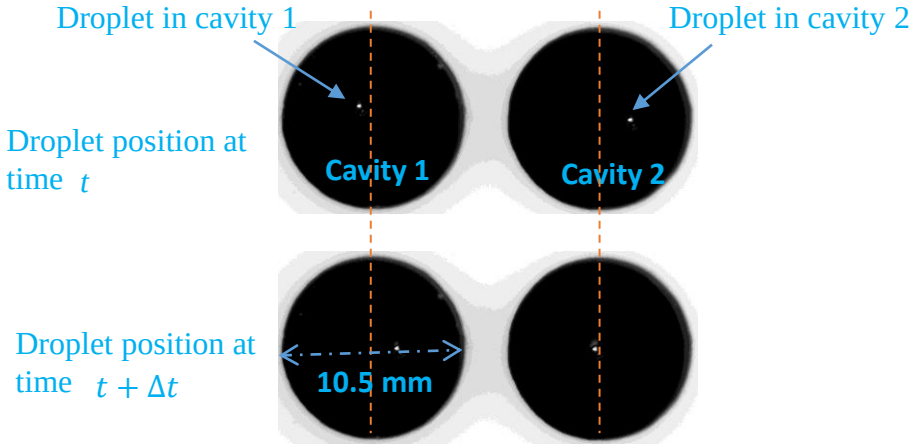
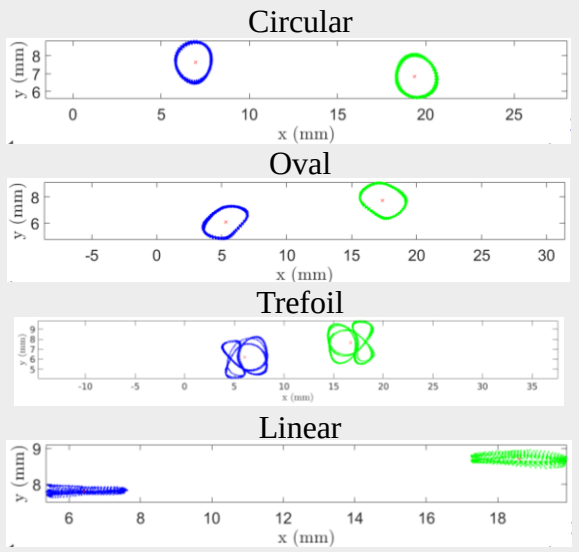


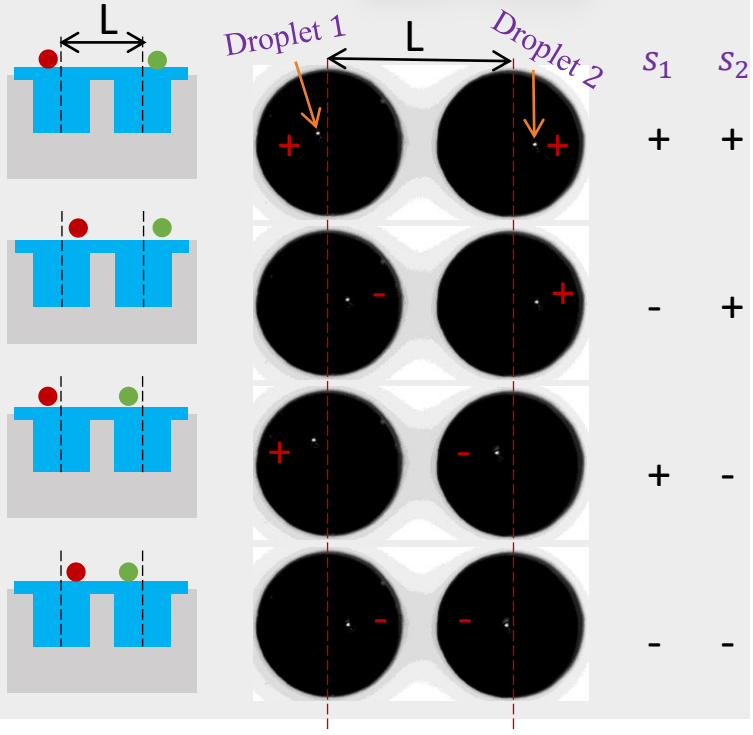
Illustration of trajectory change due to wave mediated interaction between two droplets

Results

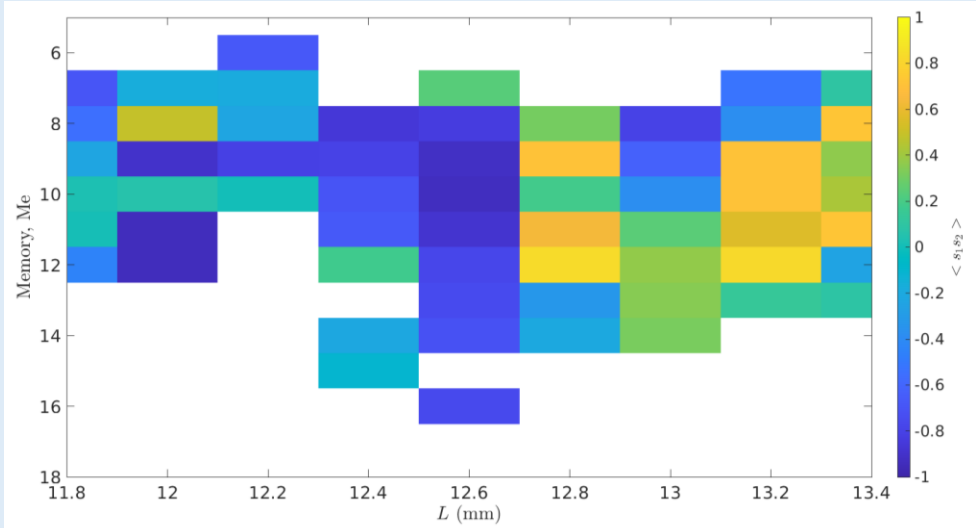
Trajectories



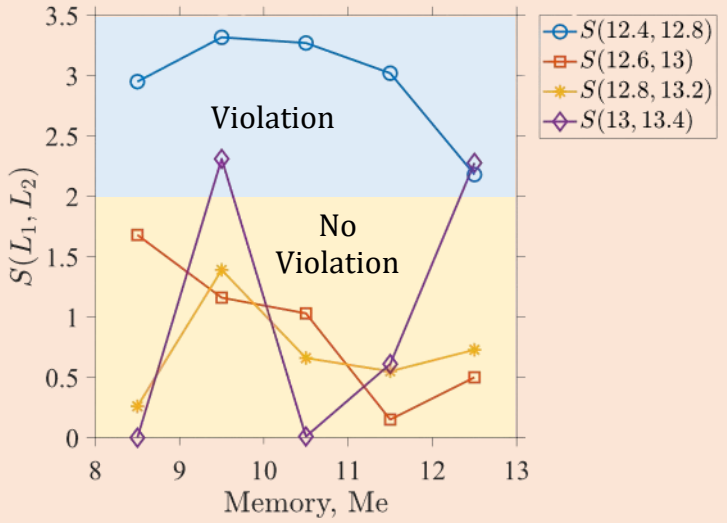
Correlation $M(L) = \langle s_1 s_2 \rangle$



Correlation map



Bell's parameter (S)



- The condition for the violation of Bell's inequality:

$$S(L_1, L_2) = \left| M(L_1) + 2\,M\left(\frac{L_1+L_2}{2}\right) - M(L_2) \right| \geq 2.$$

- The max violation of the Bell's inequality is observed for L = 12.4 mm to 12.8 mm

Thank you

Merci!